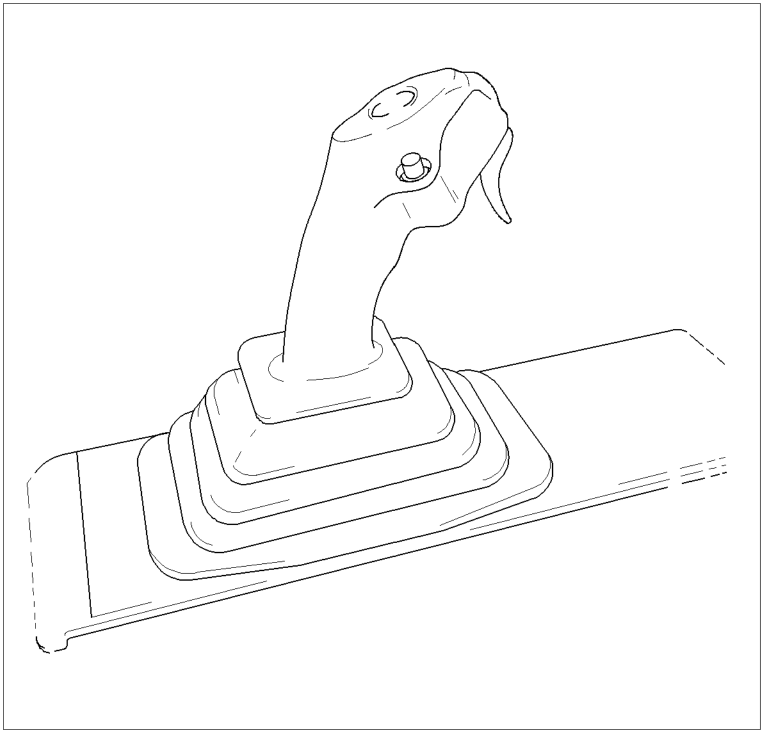
A330

FLIGHT CREW OPERATING MANUAL



FLIGHT OPERATIONS

3

AIRBUS®

00.00 CONTENTS

00.10 ORGANIZATION OF THE MANUAL

– FOREWORD 1
– COMMENTS – QUESTIONS – SUGGESTIONS 1
– CONTENT 1
– USE 2
– PAGINATION 3
– REVISIONS 4
– HOW TO INSERT A REVISION 5
– BEST WAY TO GET UPDATED DOCUMENTATION 5

00.20 LIST OF CODES

00.30 LIST OF NORMAL REVISIONS

00.35 RECORD OF TEMPORARY REVISIONS

00.36 LIST OF EFFECTIVE TEMPORARY REVISIONS

00.70 CROSS REFERENCE TABLE

00.75 HIGHLIGHTS

00.80 LIST OF EFFECTIVE PAGES

00.85 LIST OF MODIFICATIONS

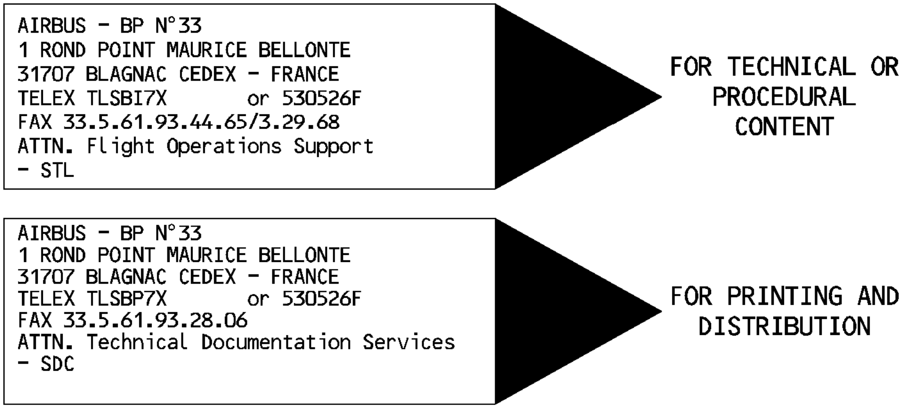
FOREWORD

R This manual complements the approved Flight Manual. Airbus has attempted to ensure that the data contained in this manual agrees with the data in the Flight Manual. If there is any disagreement, the Flight Manual is the final authority.

COMMENTS - QUESTIONS - SUGGESTIONS

All manual holders and users are encouraged to submit any Flight Crew Operating Manual questions and suggestions to :

R



GFC5-03-0010-001-A001AA

CONTENT

R The Flight Crew Operating Manual is the support documentation for flight crew operations. The Flight Crew Operating Manual provides operating crews with the technical, procedural and performance characteristics of the A330 aircraft to ensure a safe and efficient operation during normal and/or abnormal/emergency situations on ground and in flight. However, the Flight Crew Operating Manual is not intended to provide basic jet aircraft piloting techniques or information that are considered as basic airmanship for trained flight crews familiar with that type of aircraft and with its general handling characteristics.

R The Flight Crew Operating Manual is intended :

- To be used directly as flight crew operating manual or to be the basis for elaboration of the relevant parts of the “crew manual” by the operations department of the operator in accordance with applicable requirements.
- To be used as a flight crew training manual (initial and refresher).
  However, the Flight Crew Operating Manual is not intended to be used for teaching basic piloting skills.

The content is divided into four volumes :

Vol 1 = Systems' description (description of the aircraft systems).
Vol 2 = Flight preparation (performance information, plus loading data).
Vol 3 = Flight operations (operating procedures, techniques, and performance information).
Vol 4 = FMGS pilot's guide (procedures for FMGS use).

USE

As a comprehensive set of references, the FCOM :

- can be used by an operator's flight operations department to supplement its own crew manual
- can be issued directly to crew members for training and subsequently for line operations.

WARNINGS, CAUTIONS AND NOTES

WARNING : an operating procedure, technique, etc, which may result in personnel injury or loss of life if not carefully followed.
CAUTION : an operating procedure, technique, etc, which may result in damage to equipment if not carefully followed.
NOTE : an operating procedure, technique, etc, considered essential to emphasize.

COMPLEMENTARY INFORMATION

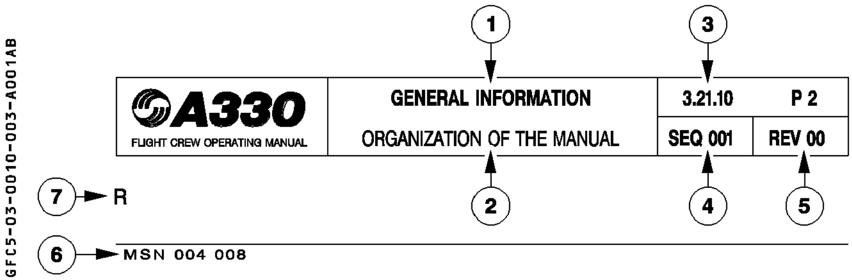
The manual includes technical information required for training as well as complementary information.

- Where a paragraph or schematic is preceded by the heading FOR INFO the details given are considered to be "nice to know". Knowledge of these items is not required for the type rating qualification.
- ECAM warnings and cautions are summarized in a table at the end of each chapter of the volume 1. Numeric values are given for information only.

OPTIONAL EQUIPMENT

The legend ◁ indicates that a paragraph or a schematic is applicable only if the related equipment is installed.

PAGINATION



1. Chapter title

2. Subchapter title

3. FCOM volume number, Chapter number, Section number, Page number

R 4. Sequence number is used for Airbus Industrie management of different aircraft
R configurations and allows to enter into list of effective pages

R 5. Revision number of the manual at which the page has been revised

R 6. Aircraft MSN, or ALL (when a page is applicable to all aircraft covered by the manual).
R Correspondance between MSN and registration may be found in the cross reference
R table

R 7. An “R” in front of a line indicates that the line has been revised.

REVISIONS

NORMAL REVISIONS

There are issued periodically to cover non-urgent corrections and changes, and to add new data.
They are accompanied by filing instructions and an updated List of Effective Pages that includes customized pages.
A normal revision record sheet is at the front of each volume.
In addition, each volume has a "List of MOD/MP affecting the manual", that gives a simple explanation of the technical content of each MOD/MP incorporated and its validity per aircraft.

TEMPORARY REVISIONS

Printed on yellow paper these are issued to cover urgent matters arising between normal revisions. They are accompanied by filing instructions and an updated customized list of effective TR.
A yellow temporary revision record sheet is at the front of each volume.

R **INCORPORATION OF SERVICE BULLETINS IN THE MANUAL**

R When a Service Bulletin (SB) has been accomplished on one or more aircraft of the operator fleet and notified to Airbus Industrie, all affected manuals will reflect the new aircraft configuration at next following revision. If judged necessary by Airbus Industrie, or
R requested by the operator, a "Temporary Revision" is issued between normal revisions.

OPERATIONS ENGINEERING BULLETINS

These are issued as the need arises to give operators revised or new, but significant, technical and procedural information.
OEBs come with an OEB record sheet. This record sheet is re-issued with each normal revision to update the bulletin embodiment status.
They are accompanied by filing instructions and an updated customized list of effective OEB.

HOW TO INSERT A REVISION

FILING INSTRUCTIONS

Use the filing instructions as follows :
- REMOVE : The page must be removed. It may be replaced by a new page if associated with an "INSERT" instruction. If not, the page is cancelled.
- INSERT : The page must be inserted. If not associated with a "REMOVE" instruction, the page is new for the operator fleet and does not replace an existing one.

The column "NOTE" indicates the reason for change. It states "EFFECTIVITY CHANGE ONLY" if the page is only revised due to effectivity change and not due to technical content.

LIST OF EFFECTIVE PAGES (LEP)

The manual after revision must comply with the LEP, which lists all the pages that are in the manual. The new pages are indicated by "N" and the revised pages by "R".

R ## BEST WAY TO GET UPDATED DOCUMENTATION

R The best way to ensure timely receipt of getting correct updated documentation is to advise :
AIRBUS INDUSTRIE
BP 33
31707 BLAGNAC CEDEX
FRANCE
Telex : TLSBP7X.. or 530526F
R FAX 33 5 61 93 28 06
R ATTN : Customer Service Directorate – Technical Documentation Services (AI/SE – D) as soon as any change has been completed on any airplane.

01.00 CONTENTS

01.10 FOREWORD
- GENERAL 1
- KIND OF OPERATIONS 1

01.20 GENERAL LIMITATIONS
- MINIMUM FLIGHT CREW 1
- CENTER OF GRAVITY LIMITS 1
- WEIGHT LIMITATIONS 2
- FLIGHT MANEUVERING LOAD ACCELERATION LIMITS 2
- ENVIRONMENTAL ENVELOPE 2
- AIRPORT OPERATIONS 3
- SPEED LIMITATIONS 3

01.21 AIR COND / PRESS / VENT
- CABIN PRESSURE 1
- RAM AIR INLET 1
- AIR CONDITIONING WITH LP GROUND UNIT 1

01.22 AUTOFLIGHT
- GENERAL 1
- AUTOMATIC APPROACH, LANDING, AND ROLLOUT 3
- PARAVISUAL INDICATOR (PVI) ◁ 4

01.23 COMMUNICATIONS ◁
- VHF3 TUNING IN VOICE MODE FROM THE MCDU

01.24 ELECTRICAL ◁

R **01.25 CREW REST COMPARTMENTS ◁**
R - LOWER DECK MOBILE CREW REST COMPARTMENT 1
R - FLIGHT CREW REST COMPARTMENT 1

01.28 FUEL

01.29 HYDRAULIC

01.32 LANDING GEAR

01.34 NAVIGATION
– ENHANCED GROUNG PROXIMITY WARNING SYSTEM (EGPWS) 1

01.35 OXYGEN
– COCKPIT FIXED OXYGEN SYSTEM 1

01.49 APU
– GENERAL 1
– ENVELOPE 1

01.70 POWERPLANT
– THRUST SETTING/EGT LIMITS 1
– OIL 1
– RPM 2
– STARTER 2
– REVERSER THRUST 2
– REDUCED THRUST TAKEOFF 2

GENERAL

This section includes the limitations required by the regulations and contained in the Flight
R Manual.
All references to airspeed, Mach and altitude relate to indicated airspeed, indicated Mach and pressure altitude, unless otherwise noted.

KIND OF OPERATIONS

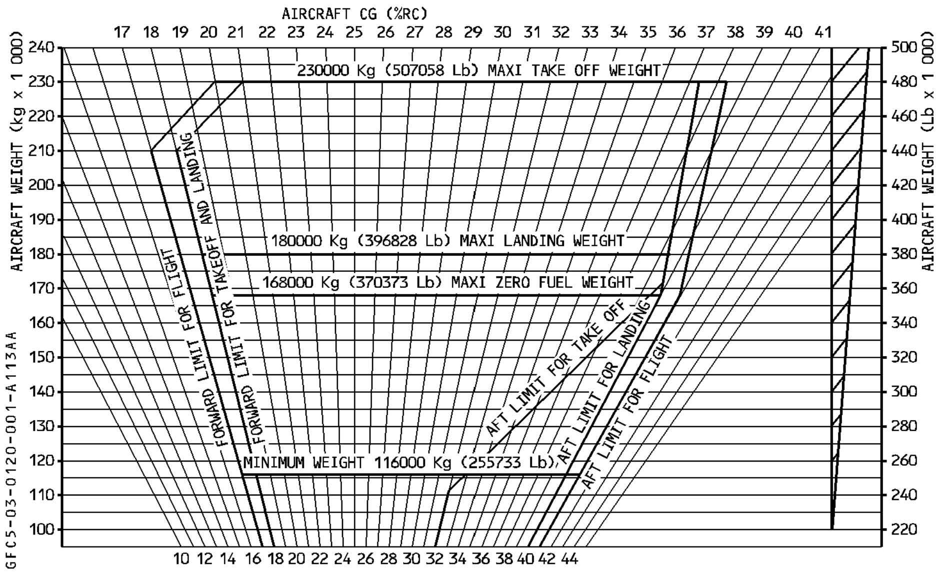
This airplane is certified in the public transport category (passengers and freight) for day and night operations, in the following conditions when the appropriate equipment and instruments required by the airworthiness and operating regulations are approved, installed and in an operable condition :

- VFR and IFR
- Extended overwater flight
- Flight in icing conditions
- R — Maximum number of passenger seats : 375

MINIMUM FLIGHT CREW

The minimum flight crew consists of 2 pilots.

CENTER OF GRAVITY LIMITS



- CG limits are given in percentage of the reference chord length aft of the leading edge.
- The reference chord length is 7.27 m (23.85 feet). It is 24.96 m (81.89 feet) aft of the aircraft nose.
- The CG must always be within these limits regardless of fuel load.

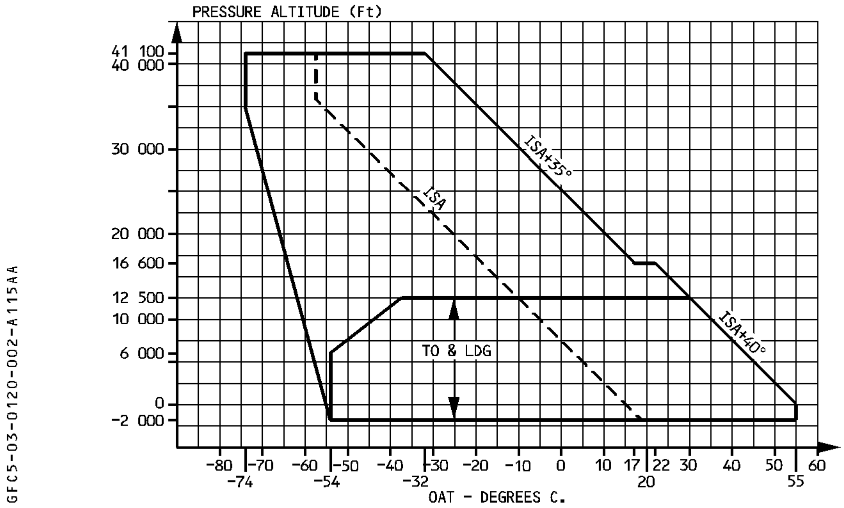
WEIGHT LIMITATIONS

Maximum taxi weight . . . . 230 900 kg (509 042 lb)
Maximum takeoff weight (brake release) . . . . 230 000 kg (507 058 lb)
Maximum landing weight * . . . . 180 000 kg (396 828 lb)
Maximum zero fuel weight * . . . . 168 000 kg (370 373 lb)
R Minimum weight . . . . 116 000 kg (255 733 lb)
* See page 1 for possible increase of these weights
In exceptional circumstances (inflight turn back or diversion), an immediate landing at weight above maximum landing weight is permitted provided that the pilot follows the overweight landing procedure.

FLIGHT MANEUVERING LOAD ACCELERATION LIMITS

Clean configuration . . . . – 1 g to + 2.5g
Slats extended . . . . 0 g to + 2 g

ENVIRONMENTAL ENVELOPE

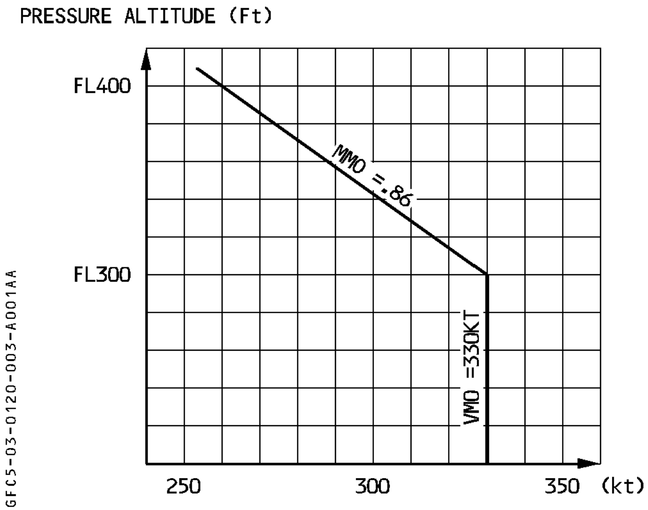


AIRPORT OPERATIONS

· Runway slope (mean) . . . . ± 2 %
· Runway altitude . . . . 12 500 ft
· Wind for takeoff and landing
  — maximum crosswind demonstrated : 32 knots, with gusts up to 40 knots
  — maximum tail wind . . . . 10 kt
R Maximum crosswind values have been demonstrated with flight controls in normal law
R as well as in direct law with and without yaw damper.
· Wind for passenger/cargo door operation :
  — maximum wind for passenger door operation : 40 knots (or 50 knots if the aircraft nose is orientated into the wind)
  — maximum wind for cargo door operation 40 knots (or 60 knots if the aircraft nose is orientated into the wind or door is on the leeward side)
  — the passenger/cargo door must be closed before the wind speed exceeds 60 knots.

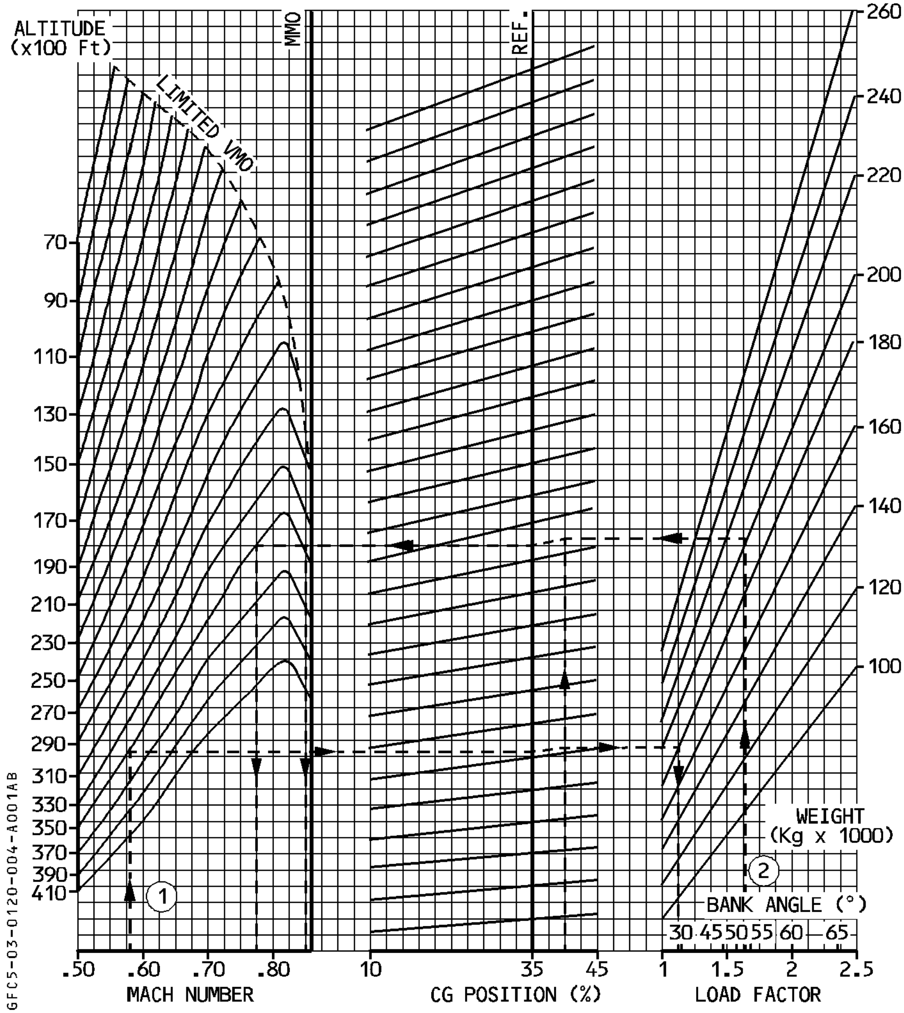
SPEED LIMITATIONS

MAXIMUM OPERATING SPEED VMO/MMO



The maximum operating limit speed VMO/MMO may not be exceeded deliberately in any regime of flight.

R **BUFFET ONSET**



R Examples :
R 1. Determine Maximum Bank Angle limited by buffet :
R DATA : M = 0.58, FL = 350, CG = 40 %, WEIGHT = 180000 kg
R RESULT : load factor = 1.15 g or 30° bank
R 2. Determine low and high speed limited by buffet :
R DATA : 52° bank or 1.63 g, WEIGHT = 200000 kg, CG = 40%, FL = 350
R RESULT : M = 0.775 (low speed buffet) and M = 0.85 (high speed buffet).

MAXIMUM FLAPS/SLATS SPEEDS

Lever Position	SLATS	FLAPS	AILERONS	Ind. on ECAM	MAX SPD	FLIGHT PHASE
1	16	0	0	1	240	HOLDING
		8	5	1 + F	215	TAKEOFF
2	20	8	10	2 (a)	205	APPROACH
	20	14	10	2	196	TAKEOFF/APPROACH
3	23	22	10	3	186	TAKEOFF/APPR/LDG
FULL	23	32	10	FULL	180	LANDING
(a) This slats/flaps position corresponds to CONF 1*						

· Maximum altitude with flaps/slats extended : 20000 feet

GEAR DOWN SPEEDS

· Maximum speed with landing gear extended (VLE) 250 knots/.55
· Maximum speed at which the landing gear may be operated (extension and retraction) (VLO) 250 knots/.55
· Maximum speed for gravity extension (VLE, VLO) . . . . 200 knots
· Maximum altitude at which the landing gear may be extended . . . . 21000 feet

MAXIMUM TIRE SPEED

R · Ground speed . . . . 204 knots

WINDSHIELD WIPERS IN USE

· Maximum speed . . . . 230 knots

COCKPIT WINDOW OPEN

· Maximum speed . . . . 230 knots

Note : It is not possible to open the cockpit windows, with the packs ON.

SPEEDBRAKES

· No limitation.

MINIMUM CONTROL SPEEDS

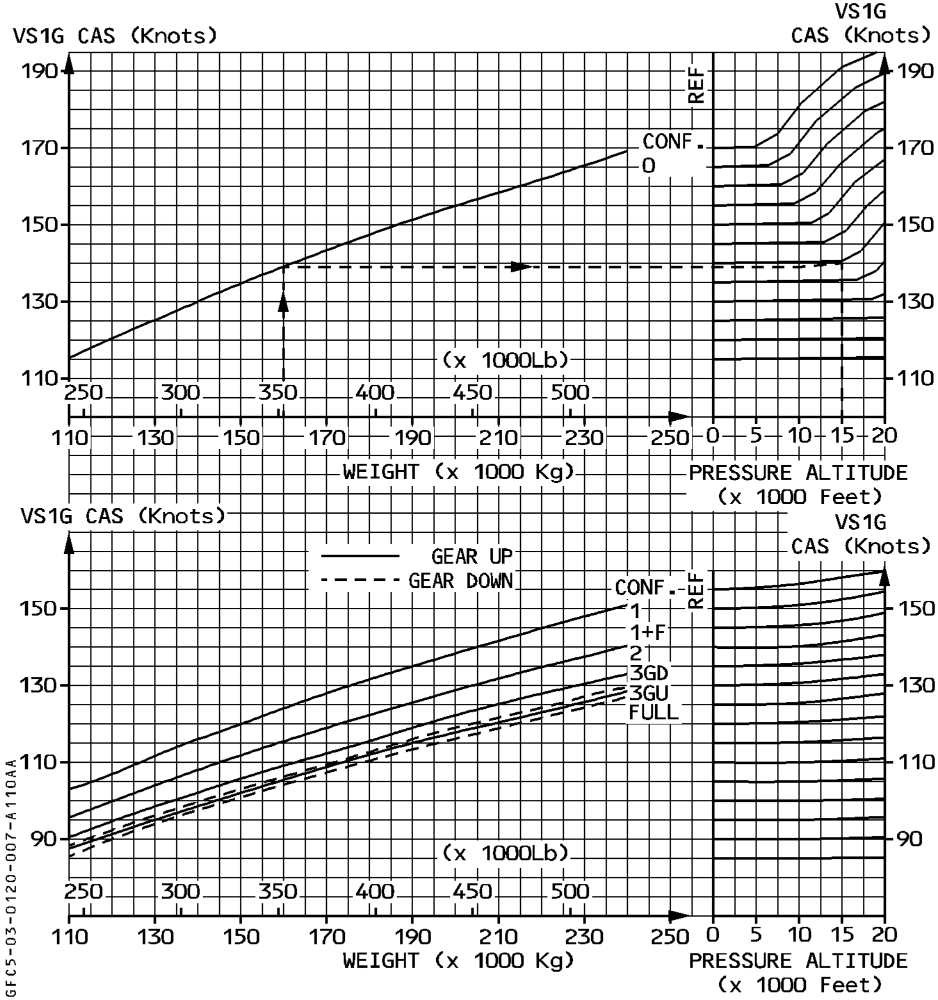
VMCL = 118 (KT IAS)

R

Altitude (ft)	VMCA (KT CAS)	VMCG (KT IAS)		
		CONF 1 + F	CONF 2	CONF 3
0	106	108	108	108.5
2000	103	106	106	106.5
4000	100	103	103.5	103.5
6000	97.5	100	100.5	100.5
8000	94	97.5	97.5	97.5

STALLING SPEEDS

R

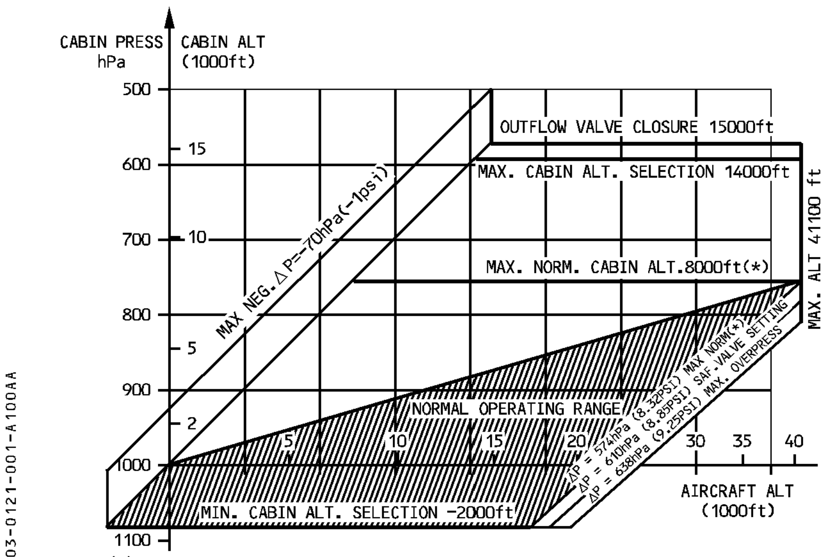


DATA : GW = 160000 kg (352740 lb), PRESSURE ALTITUDE 15000 feet, CLEAN CONFIGURATION

RESULT : VS1G = 140 knots CAS

CABIN PRESSURE

- Maximum positive differential pressure . . . . 9.25 psi
- Maximum negative differential pressure . . . . – 1 psi
- Safety relief valve setting . . . . 8.85/– 1 psi



(*): VALUES FOR FLIGHTS SHORTER THAN 2.5 HOURS. FOR FLIGHTS LONGER THAN 2.5 HOURS, THE MAX NORM CABIN ALTITUDE IS LIMITED TO 7350ft WITH A Δ P OF 593 hPa.

Note : Maximum differential pressure and safety valve setting tolerance = ± 7 hPa (0.1 psi)

RAM AIR INLET

Opens only if differential pressure is lower than 1 psi.

AIR CONDITIONING WITH LP GROUND UNIT

- Do not use conditioned air simultaneously from packs and LP ground units.
- Air flow supplied by two ground carts should not exceed 2 × 1.6 kg/sec (2 × 3.53 lb/sec).

R ## AIR CONDITIONING WITH HP GROUND UNIT

R – Do not use HP ground unit when APU supplies bleed air to avoid bleed system damage.

GENERAL

AUTO PILOT FUNCTION

Minimum weight for use of autoland . . . . 123 000 kg
Minimum height for use of the autopilot on takeoff with SRS mode . . . . . 100 ft AGL
(An internal FMGS logic prevents the autopilot from engaging during the 5 seconds after liftoff).
Minimum height for use of the autopilot in :
Straight-in non precision approach . . . . applicable MDA (MDH)
Circling approach . . . . applicable MDA - 100 ft (or MDH - 100 ft)
ILS approach with CAT 1 displayed on FMA . . . . 160 ft AGL
Go-around (AP or FD engagement) . . . . 100 ft AGL
All other phases . . . . 500 ft AGL
Use of the AP or FD in OPEN DES or DES mode is not permitted in approach, unless the FCU altitude is set to, or above, MDA (MDH) or 500 feet, whichever is the highest.

AUTOTHRUST FUNCTION

Use of the autothrust is approved with, or without, AP/FD in selected or managed mode.

FLIGHT MANAGEMENT FUNCTION

FMGS lateral and vertical navigation has been certified for after takeoff, en route, and terminal area operations, for instrument approach procedures (except ILS, LOC, LOC-BC, LDA, SDF and MLS), and for missed approach procedures.
RNP accuracy with GPS PRIMARY, or radio updating, has been demonstrated to be :

	With AP ON in NAV	With AP OFF and FD ON in NAV	With AP OFF and FD OFF
En route	1 NM	1 NM	1.3 NM
In terminal area	0.5 NM	0.5 NM	0.5 NM
In approach	0.3 NM	0.3 NM	Not authorized

Without GPS PRIMARY (or GPS deselected or inoperative), accuracy has been demonstrated, provided the appropriate RNP value is checked or entered on the MCDU, and HIGH accuracy is displayed.
Without GPS PRIMARY (or GPS deselected or inoperative), the navigation accuracy is a function of ground radio navaid infrastructure, or elapsed time since the last radio update.
The FMGS is also certified for navigation within BRNAV, PRNAV, and RNP 10 airspace.
RNP10 oceanic/remote area operations are approved with GPS PRIMARY or, without GPS PRIMARY (or GPS deselected or inoperative), provided time limitations in IRS only navigation (acceptable to operational authorities), are established.
FMGS approval is based on the assumption that the navigation database has been validated for intended use.
Obstacle clearance and adherence to airspace constraints remains the flight crew’s responsibility.
Fuel, time predictions/performance information is provided for advisory purposes only.
R NAV mode may be used after takeoff, provided FMGS runway updating has been checked.

TAKEOFF IN GPS PRIMARY

R For certain airports, where the difference between the local coordinate system and WGS
R 84 (geodesic standard used by GPS, FMS) is not negligible, an incorrect NAV guidance may
R occur after takeoff.
R GPS must be deselected for takeoff from these airports, until a safe altitude is reached.

USE OF NAV AND FINAL APP MODES FOR NON PRECISION APPROACH

NAV, or NAV and FINAL APP mode may be used for VOR, VOR/DME, NDB, NDB/DME or RNAV (including GPS) approach, but not for ILS, LOC, LOC-BC, LDA, SDF, or MLS final approach.
For instrument approach procedures not coded in WGS 84 (or equivalent) coordinate system, the GPS must be deselected.
FINAL APP mode guidance capability with GPS PRIMARY has been demonstrated down to MDH/DH (barometric) 250 feet.
VOR, VOR/DME, NDB or NDB/DME approach procedures may be performed, in NAV, or NAV and FINAL APP mode, provided AP or FD is used, and :
- GPS PRIMARY is available. In this case, the reference navaid may be unserviceable, or the airborne radio equipment may be inoperative, or not installed, provided operational approval is obtained.
- Without GPS PRIMARY :
  - The reference navaid and the corresponding airborne equipment is serviceable, tuned, and monitored during the approach, or
  - The radio navaid coverage supports the RNP value, specified for the approach procedure, and an operational approval is obtained.

For GPS approach, GPS PRIMARY must be available.
RNAV approach without GPS PRIMARY may be performed only if the radio navaid coverage supports the RNP value and HIGH accuracy is displayed on the MCDU with the specified RNP, and operational approval is obtained.
NAV mode may be used in the terminal area, provided :
- GPS PRIMARY is available, or
- HIGH accuracy is displayed, and the appropriate RNP is checked or entered on the MCDU, or
- R Navaid raw data is monitored.

AUTOMATIC APPROACH, LANDING AND ROLL OUT

CATEGORY II

Minimum decision height : . . . . 100 feet AGL
At least one autopilot must be engaged in APPR mode and CAT 2, CAT 3 SINGLE or CAT 3 DUAL must be displayed on FMA.
If the crew performs an automatic approach without autoland, the autopilot must be disengaged no later than at 80 feet.

CATEGORY III FAIL PASSIVE

Minimum decision height : . . . . 50 feet
At least one autopilot must be engaged in APPR mode and CAT 3 SINGLE or CAT 3 DUAL must be displayed on FMA.

CATEGORY III FAIL OPERATIONAL

A/THR must be used in selected or managed speed.
Alert height : . . . . 200 feet
- CAT III With DH
  2 autopilots must be engaged in APPR mode and CAT 3 DUAL must be displayed on FMA
- CAT III Without DH
  2 autopilots must be engaged in APPR mode and CAT 3 DUAL must be displayed on FMA

Minimum Runway Visual Range : . . . . 75 meters

R ENGINE OUT

R CAT II and CAT III fail passive autoland are only approved in configuration 3, and if
R engine-out procedures are completed before reaching 1000 feet in approach.

MAXIMUM WIND CONDITIONS FOR CAT II/CAT III AUTOMATIC APPROACH, OR AUTOMATIC LANDING AND AUTOMATIC ROLLOUT

Headwind : 35 knots
Tailwind : 10 knots
Crosswind : 20 knots

Note : Wind limitation is based on surface wind, reported by the tower. If the wind displayed on the ND exceeds the above-noted limitations for autoland, but the tower reports surface wind within the limitations, then the autopilot can remain engaged. If the tower reports surface wind beyond limitations, only CAT I automatic approach without autoland can be performed.

AUTOMATIC LANDING

CAT II and CAT III autoland is approved in CONF3 and CONF FULL.
Automatic landing has been demonstrated :
– on CAT II and CAT III ILS beam,
– with ILS slope angle inside a range of (– 2.5°, – 3.15°),
– for airfield elevations lower than 9200 feet.
R – for weights below maximum landing weight.
R – at approach speed (Vapp) = VLS + wind correction
R minimum wind correction 5 knots
R maximum wind correction 15 knots

Automatic rollout performance has been approved on dry and wet runways, but performance on snow-covered or icy runways has not been demonstrated.
Automatic landing system performance has been demonstrated on CAT II and CAT III ILS beams. However, automatic landing in CAT I, or better weather conditions, is possible on CAT I ground installation or when ILS sensitive areas are not protected, if the following precautions are taken :
– The airline has checked that the ILS beam quality and the effect of the terrain profile before the runway have no adverse effect on autopilot guidance. In particular, the effect of terrain discontinuities within 300 meters before runway threshold must be evaluated.
– The crew is aware that LOC or GS beam fluctuations, independent of the aircraft system, may occur and the PF is prepared to immediately disconnect the autopilot and to take the appropriate action, should unsatisfactory guidance occur.
– At least CAT 2 capability is displayed on the FMA, and CAT II/III procedures are used.
– Visual references are obtained at a DH appropriate for the CAT I approach being flown, or a go-around is performed.
– When the crew does not intend to perform an autoland, they should disconnect the AP at, or above, 80 feet. This altitude being considered as a minimum to take over and feel comfortable. Nevertheless, for safety reasons, the AP can be disconnected at any time.

Note : Under the crew's responsibility, and in case of an emergency, autoland can be
R *performed up to Max Takeoff Weight.*

VHF3 TUNING IN VOICE MODE FROM THE MCDU

Do not use the MCDU's VHF3 VOICE DIRECTORY and COMPANY CALL pages to tune VHF3 in Voice mode.
Only use RMP to tune VHF3 in Voice mode.

ELECTRICAL

Electrical Outlets

It is forbidden to use the electrical outlets, during takeoff and landing.

GENERAL

FUEL AND ADDITIVE SPECIFICATIONS

- See engine specification
- The fuel system has been certified with JET A1, JET A, JP 5, and JP 8.

MAXIMUM ALLOWABLE WING FUEL IMBALANCE

Maximum allowed wing fuel imbalance in either inner or outer tanks at takeoff, landing and in flight.

R

INNER TANKS		OUTER TANKS	
Tank content (heavier tank)	Authorized asymmetry	Tank content (heavier tank)	Authorized asymmetry
FULL	2 900 kg (6400 lb)	FULL	1 480 kg (3260 lb)
HALF	4 800 kg (10500 lb)	2400 kg (5290 lb)	1 580 kg (3480 lb)
7 500 kg (16500 lb)	7 500 kg (16500 lb)	1 730 kg (3810 lb)	1 730 kg (3810 lb)

R The variation is linear between these values.
R (No limitation below 7500 kg (16500 lb) for inner tanks and 1730 kg (3810 lb) for outer
R tanks).

Note : Inner and outer authorized asymmetries should not be added.

FUEL TEMPERATURE

Maximum fuel temperature : JET A, JET A1, JP 8 and JP 5 : + 55°C
Minimum fuel temperature : Freezing point + 3°C or – 54°C whichever is the higher in inner tank.
Freezing point in outer or trim tank.

If the actual fuel freezing point of the fuel being used for the flight is unknown, the fuel specification freezing point provided hereafter must be used :

JET A1	JET A	JP 5	JP 8
– 47°C	– 40°C	– 46°C	– 47°C

MINIMUM FUEL QUANTITY FOR TAKEOFF : 5 200 kg (11460 lb)

WING TK LO LVL warning must not be displayed on ECAM for takeoff.

FUEL MANAGEMENT

- Tanks must be emptied in the following order : Center tank, then wing tanks.
- In case of a trim tank forward transfer pump failure, do not select the trim tank forward when the pitch attitude is above 3 degrees to avoid inadvertent fuel aft transfer.

HYDRAULIC

Normal operating pressure is 3000 psi ± 200.

GENERAL

BRAKES

Maximum brake temperature for takeoff (brake fans ⊲ off) . . . . 300° C

AUTOBRAKE

Use of the autobrake does not relieve the pilot of his responsibility to safely stop within the available runway length, by taking over brake control with the brake pedals, if necessary. The pilot may disengage the automatic braking system, either by pressing the armed mode pushbutton, or by applying firm action on the brake pedals.

PARKING BRAKE

CAUTION
Do not set N1 above 80 % with the parking brake ON.

NOSEWHEEL STEERING

The nosewheel steering angle is limited to 72°.
R No braked pivot turn is allowed (ie. differential braking cannot be used to fully stop one
R main gear).
R Asymmetric thrust should be used during the turn, to maintain a continuous speed
R (between 5 and 10 knots). Some anticipation is required to ensure that asymmetric thrust
R is available at the beginning of the turn.
For towing and pushback, the nosewheel steering angle is limited to 65°. The ground crew should make use of the 65° marking on the nose landing gear door, to ensure that this limitation is not exceeded.

TAXI WITH DEFLATED TIRES

R If tire damage is suspected after landing or after a rejeted takeoff, inspection of the tires is required before taxi. If the tire is deflated but not damaged, the aircraft can be taxied at low speed with the following limitations :

1. If one tire is deflated on one or more gears (ie. a maximum of three tires), the speed should be limited to 7 knots when turning.
2. R If two tires are deflated on the same main gear, (the other main gear tires not being R deflated), speed should be limited to 3 knots, and the nosewheel steering angle should be limited to 30 degrees.

R **INERTIAL REFERENCE SYSTEM**

R Refer to the Polar Navigation section in the FCOM 4.04.40.

ISIS

When both PFDs are lost, the ISIS bugs function must not be used.

ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS)

- Aircraft navigation is not to be predicated on the use of the terrain display.
  The terrain display is only intended as a situational awareness tool, and may not provide the accuracy on which to solely base terrain avoidance maneuvers.
  The EGPWS database, display, and alerting algorithms, do not currently take into account man-made obstructions.
- The EGPWS enhanced function should be inhibited (TERR pushbutton to OFF, on the GPWS panel) when the aircraft position is less than 15 NM from the airfield :
  - For operations to/from runways not incorporated in the EGPWS database.
  - For specific approach procedures, which have previously been identified as potentially producing false terrain alerts.

COCKPIT FIXED OXYGEN SYSTEM

MINIMUM FLIGHT CREW OXYGEN PRESSURE

REF TEMPERATURE *		°C	– 10	0	10	20	30	40	50
		°F	14	32	50	68	86	104	122
MIN ** BOTTLE PRESSURE (PSI)	2 CREW MEMBERS		540	560	580	600	620	640	660
	2 CREW MEMBERS	+1 OBS	660	690	710	740	760	790	810
	2 CREW MEMBERS	+2 OBS	810	850	880	910	940	970	1 000

* REF TEMPERATURE :
. on ground : (OAT + CAB TEMP) / 2
. in flight : CAB TEMP (°C) – 10°C
or
CAB TEMP (°F) – 18° F

** MINIMUM BOTTLE PRESSURE TO COVER :
- Preflight checks
- Usage of oxygen when only one pilot is in the cockpit
- Unusable quantity (to ensure regulator functioning with minimum pressure)
- Normal system leakage
- and :
R · Protection after loss of cabin pressure with mask regulator on NORMAL (diluted oxygen) :
  - During emergency descent for all cockpit members for 22 minutes (refer to cabin fixed oxygen system)
  - During cruise at FL 100 for 2 crew members for 98 minutes

  or

  · Protection against smoke with 100 % oxygen for all cockpit members during 15 minutes at 8000 feet cabin altitude.

<u>Note</u> : *The above times, which are based on the use of a sealed mask, may be shorter for bearded crew (in terms of performance, pressure or duration).*

LEFT INTENTIONALLY BLANK

GENERAL

OIL QUANTITY

Minimum before start . . . . APU level indicator at ADD.
R The message LOW OIL LEVEL appears on ECAM APU page at this threshold.

APU STARTER

After three consecutive start attempts without cool down, a 60 minute cooling interval before next start must be observed.

ROTOR SPEED

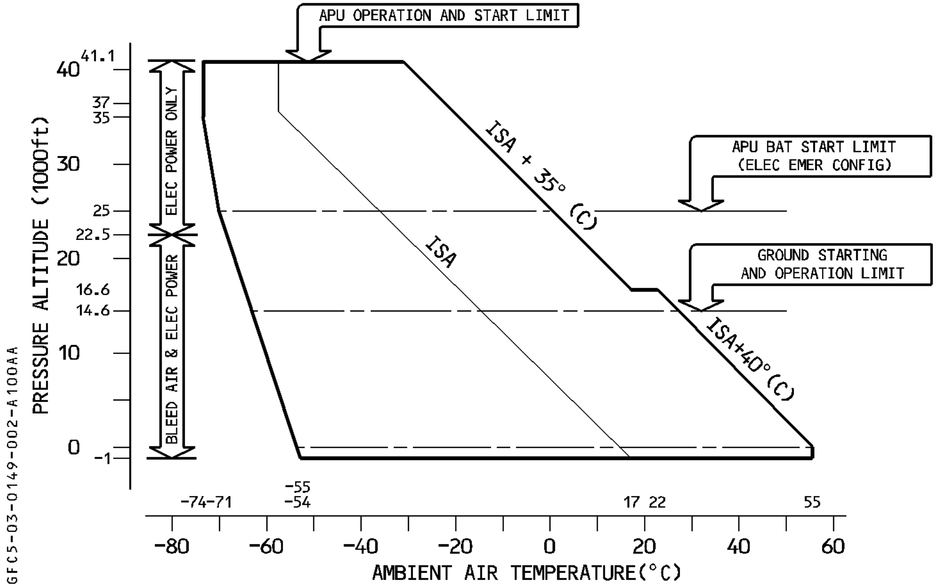
- Maximum N . . . . 107 %

EGT

- Maximum EGT . . . . 650°C
- Maximum for start . . . . 1250°C

ENVELOPE

R



Note : In the APU start envelope, APU start is guaranteed within 3 consecutive start attempts.

· ELEC power extraction only (in flight or on ground) . . . . 115 KVA (100 %)
· APU Air bleed extraction with generator load in flight :

BLEED AIR AND GEN LOAD IN FLIGHT				
TEMP ▶ MAX ALT (feet) ▼		ISA	ISA + 20	ISA + 35
22500 feet	ONE PACK	100 % (115 KVA)	63 % (72 KVA)	35 % (40 KVA)
20000 feet	ENG START	100 % (115 KVA)	74 % (85 KVA)	44 % (51 KVA)
17500 feet	TWO PACKS	100 % (115 KVA)	100 % (115 KVA)	74 % (85 KVA)

· APU air bleed extraction for wing anti-ice is not permitted.

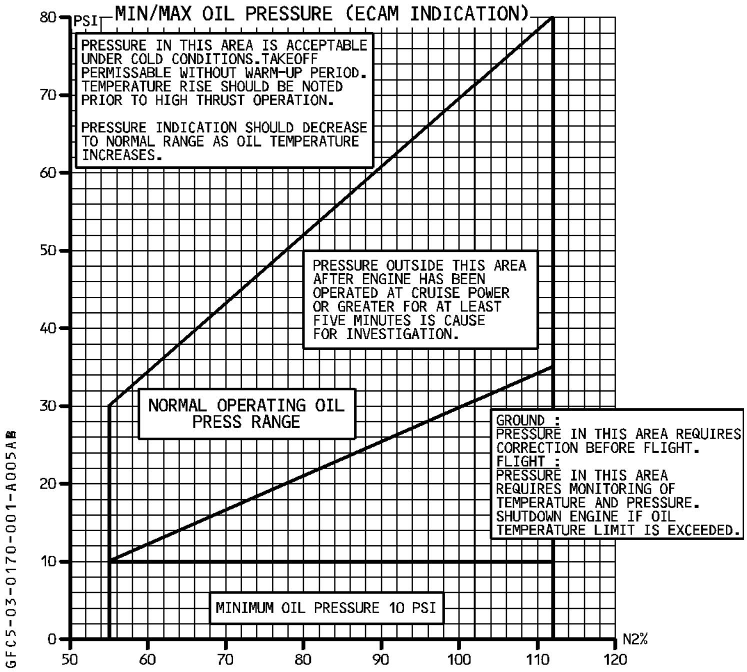
THRUST SETTING / EGT LIMITS

R

OPERATING CONDITION	TIME LIMIT	EGT LIMIT	NOTE
TAKEOFF and GO-AROUND	5 min	975° C	
	10 min		Only in case of engine failure
MCT	Unlimited	940° C	
STARTING		750° C	
		975° C	For air start only

OIL

Maximum continuous temperature . . . . 160° C
Maximum transient temperature (15 min) . . . . 175° C
Minimum starting temperature . . . . – 40° C
Minimum oil quantity . . . . Refer to 3.03.04



RPM

N1 max . . . . 115.5 %

Note : *The N1 limit depends upon ambient conditions and engine airbleed configuration. These may limit the N1 to a value lower than that given above.*

N2 max . . . . 113 %

STARTER

- Starter maximum continuous operation is 5 minutes.
- Between each cycle, wait 30 seconds per minute of operation for starter cooling.
- After two consecutive 5 minutes duty cycles, wait 10 minutes to allow starter to cool before each subsequent 5 minutes duty cycle
- No running engagement of the starter when the N2 is above 30 %.

REVERSE THRUST

- Selection of reverse thrust in flight is prohibited
- Backing the aircraft with reverse thrust is not permitted.
- Maximum reverse should not be used below 70 knots. Idle reverse is allowed down to aircraft stop.

REDUCED THRUST TAKEOFF

- Takeoff at reduced thrust is permissible only if the airplane meets all applicable performance requirements at the planned takeoff weight with the operating engines at the thrust available for the assumed temperature.
- Thrust reduction must not exceed 25 % of the full rated takeoff thrust.
  To meet this requirement, the flexible assumed temperature must not be higher than ISA + 43° C (T MAX FLEX).
- The assumed temperature must not be lower than the flat rating temperature or the actual OAT.
- Takeoff reduced thrust is not permitted on contaminated runways.

R — Takeoff at reduced thrust is allowed with any inoperative item affecting the performance
R only if the associated performance shortfall has been applied to meet all performance
R requirements at the takeoff weight with the operating engines at the thrust available for
R the flex temperature.

02.00 CONTENTS

02.01 INTRODUCTION

02.10 OPERATING TECHNIQUES

REJECTED TAKEOFF 1
ENG FAILURE AFTER V_1 – CONTINUED TO. 4
IMMEDIATE VMC LDG FOLLOWING ENG FAILURE ON TAKEOFF. 6
R APPROACH WITH ONE ENGINE INOPERATIVE. 6a
R CIRCLING APPROACH WITH ONE ENGINE INOPERATIVE. 6a
LANDING WITH SLATS OR FLAPS JAMMED 7
NO FLAPS NO SLATS LANDING 9

02.21 AIR COND / PRESS / VENT

BLOWING FAULT 8
BULK (FWD)(AFT) CRG ISOL FAULT OR VENT FAULT ◁★ 10
BULK (FWD) CRG HEAT FAULT ◁★ 10
BULK CRG DUCT OVHT ◁★ 12
DUCT OVHT 4
EXCESS CAB ALT 5
EXTRACT FAULT 8
FWD CRG COOL FAULT ◁★ 11
FWD (AFT) OFV NOT OPEN 7
GND COOL FAULT ◁★ 9
HOT AIR SYS 1(2) FAULT 4
R IFE BAY VENT FAULT ◁★ 11
L(R) (L+R) CAB VENT FAULT 8
LAV + GAL VENT FAULT 10
LDG ELEV FAULT 7
LO DIFF PR 7
LWR LAV VENT FAULT ◁★ 13
LWR STOWAGE ISOL FAULT ◁★ 13
LWR STOWAGE VENT FAULT ◁★ 13

02.21 AIR COND / PRESS / VENT (cont'd)
– OVBD VALVE FAULT 9
– PACK 1(2) OVHT 1
– PACK VALVE 1(2) FAULT 1
– PACK 1(2) OFF 2
– PACK 1+2 FAULT 2
– PACK 1(2) REGUL FAULT 3
– PACK BAY VENT FAULT 9
– SAFETY VALVE OPEN 7
– SYS 1(2) (1+2) FAULT 6
– VENT SYS FAULT 11
– ZONE CTLR 1 (2) FAULT 4
– ZONE REGUL FAULT 3

02.22 AUTO FLT
– AP OFF 2
– A/THR OFF 2
– A/THR LIMITED 3
– AUTOLAND 5
– FCU FAULT 4
– FM 1(2) (1+2) FAULT 1
– MCDU 1 (2) (3) FAILURE 5
– REAC W/S DET FAULT 3

R

02.23 COMMUNICATIONS

ACARS 1(2) (1+2) FAULT ◁ 1
ACARS CALL (ALERT)◁ 1
CIDS 1+2 FAULT 1
CIDS PA FAULT 1
HF DATA FAULT ◁ 2
SATCOM (DATA) FAULT ◁ 2
SATCOM VOICE FAULT/SATCOM CALL (ALERT) ◁ 2
VHF/HF EMITTING 1
VHF 3 DATA FAULT ◁ 2

02.24 ELECTRICAL

AC BUS 1 FAULT 5
AC BUS 2 FAULT 6
AC ESS BUS FAULT 6
AC ESS BUS SHED 7
AC ESS BUS ALTN 23
APU GEN FAULT 1
BAT 1(2) or APU BAT FAULT or OFF 3
BAT 1(2) or APU BAT SYS FAULT. 4
BUS TIE OFF 23
C/B MONITOR FAULT 4
C/B TRIPPED 4
DC BAT BUS FAULT 23
DC BUS 1 FAULT 16
DC BUS 2 FAULT 17
DC BUS 1+2 FAULT 21
DC ESS BUS FAULT 19
DC ESS BUS SHED 20
ECMU 1(2) FAULT 3
EMER CONFIG 8
GEN 1(2) FAULT 0R OFF 1
GEN 1(2) or APU GEN or EXT PWR OVERLOAD 2
IDG 1(2) DISCONNECTED 2
IDG OIL LO PR or OVHT 2
IDG 1(2) MINOR FAULT 4
REMAINING SYSTEMS IN EMER CONF 12

02.24 ELECTRICAL (Cont'd)

– STATIC INV FAULT 2
– TR 1(2) or APU TR or ESS TR FAULT 4

02.25 COCKPIT DOOR

– COCKPIT DOOR FAULT 1

02.26 FIRE PROTECTION

– AFT/BULK CRG SMOKE 7
– APU FIRE 3
– AVIONICS DET FAULT 8
– AVNCS VENT SMOKE 8
R – BULK AVN SMOKE ◁ 13
R – BULK AVN DET FAULT ◁ 13
R – CAB VIDEO 1(2)(3)(4) SMOKE ◁ 14
R – CAB VIDEO 1(2)(3)(4) DET FAULT ◁ 14
– ENG FIRE ON GROUND 1
– ENG FIRE IN FLIGHT 2
– ENG or APU FIRE LOOP FAULT 3
– ENG or APU FIRE DET FAULT 3
R – FLT (CAB) REST SMOKE ◁ 13
R – FLT (CAB) REST DET FAULT ◁ 13
– FWD CRG SMOKE 6
– FWD (AFT) CRG BTL 1(2) FAULT 6
– FWD CRG (AFT/BULK) DET FAULT 7
R – IFE BAY SMOKE ◁ 14
R – IFE BAY DET FAULT ◁ 14
– LAVATORY DET FAULT 7
– LAVATORY SMOKE 3
R – LWR STOWAGE SMOKE/DET FAULT 14
– SMOKE/AVNCS SMOKE 9
– SMOKE DET FAULT 8
– SMOKE/TOXIC FUMES REMOVAL 4

02.27 FLIGHT CONTROLS

– ADR CHECK PROC . . . . . REFER TO 02.34
– ADR DISAGREE . . . . . REFER TO 02.34
– AIL SERVO FAULT 15
– ALTN LAW 7
– CONFIG L(R) SIDESTICK FAULT (BY TAKE OVER) 2
– CONFIG SLATS (FLAPS) NOT IN T.O CONFIG 5
– CONFIG SPD BRK NOT RETRACTED 13
– CONFIG PITCH TRIM NOT IN T.0 RANGE 16

02.27 FLIGHT CONTROLS (Cont'd)

– CONFIG RUD TRIM NOT IN T.O. RANGE 16
– DIRECT LAW 8
– ELEV SERVO FAULT 13
– ELEV REDUND LOST 9
– FCDC 1(2) (1+2) FAULT 15
– FLAP/MCDU DISAGREE 5
– FLAP LVR NOT ZERO◁ 5
– FLAPS FAULT/LOCKED 3
– FLAPS/SLATS FAULT/LOCKED : MAX SPEED/V_{REF}/LDG DIST . . . 4
– GND SPLR FAULT 12
– IR DISAGREE . . . . REFER TO 02.34
– LOW ENERGY WARNING 7
– L(R) ELEV FAULT 13
– L(R) SIDESTICK FAULT 2
– L(R) INR (OUTR) AIL FAULT 15
– LVR OUT OF DETENT 5
– L+R ELEV FAULT 14
– PEDAL SENSOR FAULT 17
– PITCH TRIM/MCDU/CG DISAGREE 16
– PRIM 1 (2) (3) FAULT 6
– PRIM 1 (2) (3) or SEC 1 (2) PITCH FAULT 18
– RUD B (Y) (G) SERVO FAULT 21
– RUD NORM CTL FAULT 23
– RUD PEDAL FAULT 22
– RUD PRIM (SEC) 1 FAULT 23
– RUDDER FAULT 21
– RUDDER TRIM RUNAWAY 19
– RUDDER JAM/RUDDER PEDAL JAM 20
– RUD TRIM 1(2) FAULT 17
– RUD TRIM FAULT 17
– SEC 1 (2) FAULT 7
– SENSOR FAULT 17
– SLAT or FLAP SYS 1(2) FAULT 1
– SLAT or FLAP TIP BRK FAULT 1
– SLATS FAULT/LOCKED 2

02.27 FLIGHT CONTROLS (Cont'd)
- SPD BRK FAULT or DISAGREE 12
- SPD BRK STILL OUT ⊲ 12
- STAB CTL FAULT 11
- SPLR FAULT 12
- TURB DAMP FAULT 18

02.28 FUEL
- ABNORM MAN FWD XFR 10
- APU AFT PUMP FAULT 10
- CTR TO INNER FAULT 5
- ENG 1 (2) or APU LP VALVE FAULT 3
- EXCESS AFT CG 5
- FCMC 1 (2) (1 + 2) FAULT 9
- FOB BELOW 17 T ⊲ 4
- FUEL IMBALANCE 15
- FUEL LEAK 11
- FUEL LO TEMP 8
- FU/FOB DISCREPANCY ⊲ 13
- GRVTY FUEL FEEDING 2
- JETTISON FAULT ⊲ 16
- JETTISON NOT CLOSED ⊲ 16
- L (R) CTR PUMP LO PR 1
- L (R) INNER TK HI TEMP 13
- L (R) WING PUMPS LO PR 1
- L (R) (L + R) WING TK LO LVL 4
- L (R) PUMP 1(2) LO PR 1
- L (R) STBY PUMP LO PR 1
- L + R CTR PUMPS LO PR 3
- MAN XFR COMPLETED 10
- NO WEIGHT/CG DATA 10
- OUTR TO INR FAULT 5
- T TANK XFR FAULT 6a
- TRIM LINE FAULT 6
- TRIM TANK FUEL UNUSABLE 14
- TRIM TK PUMP LO PR 5
- WING TK OVERFLOW 13
- WING XFEED FAULT 3
- ZFW ZFCG DISAGREE 10

02.29 HYDRAULIC
– B RSVR LO AIR PR/OVHT/LO LVL 3
– B ENG 1 PUMP LO PR 13
– B+Y SYS LO PR 9
– G+B SYS LO PR 5
– G+Y SYS LO PR 7
– G (B) (Y) ELEC PUMP FAULT 11
– G ENG 1(2) PUMP LO PR 11
– G ENG 1+2 PUMP LO PR 12
– G RSVR LO AIR PR/OVHT/LO LVL 1
– G RSVR UNDERFILLED 16
– G SYS LEAK 16
– MONITORING FAULT 15
– RAT FAULT 15
– Y ENG 2 PUMP LO PR 14
– Y RSVR LO AIR PR/OVHT/LO LVL 4a

02.30 ICE AND RAIN PROTECTION
– A. ICE DETECT FAULT 8
– ALL PITOT HEAT 12
– CAPT (F/O) (STBY) PITOT (L STAT) (R STAT) (AOA) HEAT . . . 2
– CAPT (F/O) TAT HEAT 3
– CAPT (F/O) (STBY) PROBES HEAT 3
– CAPT + F/O PITOT HEAT 9
– CAPT + STBY PITOT HEAT 10
– DOUBLE STAT or AOA HEAT FAILURE 3
– ENG 1(2) VALVE CLOSED or OPEN 4
– F/O + STBY PITOT HEAT 11
– ICE or SEVERE ICE DETECTED 8
– L (R) INR (OUTR) WING HI PR 6
– L (R) INR (OUTR) WING LO PR 5
– L (R) INR (OUTR) WING OPEN 6
– L(R) (L+R) WSHLD HEAT 1
– L(R) (L+R) WINDOW HEAT 1
– WAI SYS FAULT 7
– WING OPEN ON GND 4
– WING VLVE NOT OPEN 5

02.31 INDICATING / RECORDING
– DFDR or FDIU FAULT 1
– DISPLAY DISCREPANCY 4
– DISPLAY UNIT FAILURE 5
– ECAM SINGLE DISPLAY 6
– EFIS DMC 1(2) (3) FAULT 3
– ECAM DMC 3 FAULT 3
– ECAM DMC 1(2) FAULT 4
– ECP FAULT 1
– FWC 1(2) FAULT 1
– FWC 1+2 FAULT 2
– OEB/FWC DISCREPANCY ◁ 6
– SDAC 1(2) (1+2) FAULT 2

02.32 LANDING GEAR
BRAKES
– A/SKID FAULT or A/SKID NWS OFF 10
– AUTO BRK FAULT 10
– CONFIG PARK BRK ON 11
– HOT 11
– LOSS OF BRAKING 13
– PARK BRK LO PR ◁ 10
– RELEASED 10
– RESIDUAL BRAKING 14
R – RESIDUAL BRAKING PROC 14
– SYS 1(2) FAULT 12
L/G
– DOORS NOT CLOSED 1
– GEAR NOT DOWN 4
– GEAR NOT DOWNLOCKED 3
– GEAR NOT UPLOCKED 1
– GEAR UPLOCK FAULT 2
– GRAVITY EXTENSION 6
– LDG WITH ABNORMAL L/G 7
– LGCIU 1(2) (1+2) FAULT 5
– L(R) LENGTHENING FAULT 4
– RETRACTION FAULT 4
– SYS DISAGREE 4
WHEEL
– HYD SEL VALVE 12
– NWS OVERSTEER 12
– N/W STRG FAULT 12
– TIRE LO PR ◁ 12

02.34 NAVIGATION

– ADR 1 (2) (3) FAULT 1
– ADR 1+2 (1+3) (2+3) FAULT 2
– ADR 1 + 2 + 3 FAULT 3
– ADR CHECK 17
– ADR DISAGREE 16
– EXTREME LATITUDE 8
– FM/IR POS DISAGREE 6
– FM/GPS POS DISAGREE ⊲ 6
– GPS 1(2) FAULT ⊲ 11
– GPWS ALERTS/EGPWS ALERTS ⊲ 12
– GPWS FAULT 10
– GPWS TERR DET FAULT ⊲ 13
– HDG or ATT or ALTI or BARO REF DISCREPANCY 8
– IAS DISCREPANCY 9
– ILS 1 (2) (1+2) FAULT 10
– IR 1 (2) (3) FAULT 4a
– IR ALIGNMENT IN ATT MODE 5
– IR 1+2 (1+3) (2+3) FAULT 7
– IR DISAGREE 15
R – IR NOT ALIGNED 5
– OVERSPEED 8
– PRED W/S DET FAULT ⊲ 11
– RA 1 (2) (1+2) FAULT 9
– STALL WARNING 11
– TCAS FAULT ⊲ 10
– TCAS WARNINGS ⊲ 13
– UNRELIABLE SPEED INDICATION 18

02.36 PNEUMATIC

– ABNORM BLEED CONFIG 2
– APU BLEED FAULT 4
– APU BLEED LEAK 3
– BMC 1(2) FAULT 5
– BLEED LO TEMP 6
– DUAL BLEED FAULT 7
– ENG 1 (2) BLEED FAULT 1
– ENG 1(2) BLEED NOT CLSD 1
– ENG 1 (2) HPV NOT OPEN 4
– L (R) WING or ENG 1 (2) LEAK 3
– L (R) WING LEAK DET FAULT 4
– X BLEED FAULT 4

02.46 INFORMATION SYSTEM ◅
– ATSU FAULT 1
– ATC FAULT 1
– COMPANY FAULT 1

02.49 APU
– APU FAULT 1

02.52 DOOR
– FWD or AFT or BULK CARGO 1
– L (R) FWD or MID or AFT CABIN 1
– L (R) EMER EXIT or AVIONIC 1
– POS DET 1(2) (1+2) 2
– UPPER DECK CARGO ◅ 1

02.70 POWERPLANT
– ALL ENG FLAMEOUT 4
– BLEED STATUS FAULT 7
– COOL VALVE FAULT ◅ 8
– EGT EXCEEDED ◅ 12
– EIU FAULT 10
– ENG FAIL 1
– ENG SHUTDOWN 3
R – ENG CTL SYS FAULT 7
– ENG CTL VALVE FAULT 11
– ENG 1(2) MINOR FAULT 8
R – ENG START FAULT (THR LEVERS NOT AT IDLE) 20
– ENG 1(2) START VALVE FAULT 20
– ENG 1(2) START FAULT 21
– ENG THRUST LOSS ◅ 22
– ENG STALL 23
– ENG TAILPIPE FIRE 25
– FADEC SYS FAULT 8
– FADEC OVHT or FAULT 9
– FUEL FILTER CLOG 9
– HIGH ENGINE VIBRATION 26
– HP FUEL VALVE 22
– IGN A (B) (A+B) FAULT 11
– N1/N2 EGT OVERLIMIT 12
– OIL LO or HI TEMP 18

02.70 POWERPLANT (Cont'd)
– OIL LO PR 18
– OIL FILTER CLOG 18
– RELIGHT IN FLIGHT 27
– REV PRESSURIZED 13
– REV INHIBITED 13
– REV FAULT 13
– REV SET 14
– REV UNLOCKED 14
– THR LEVERS NOT SET ◁ 9
– T.O. THRUST DISAGREE 9
– THR LEVER DISAGREE 16
– THR LEVER FAULT 17
– THRUST LOCKED 18
– TYPE DISAGREE 13

02.80 MISCELLANEOUS
– BOMB ON BOARD 10
– COCKPIT WINDSHIELD/WINDOW CRACKED 13
– CREW INCAPACITATION 9
– DITCHING 2
– ECAM ADVISORY CONDITIONS 14
– EMER DESCENT 7
– FORCED LANDING 5
– LDG DIST CORRECTIONS FOR FAILURES 16
– ON GROUND EMER / EVACUATION 1
– OVERWEIGHT LANDING 8
– UNRELIABLE SPEED INDICATION . . . . REFER TO 02.34
– VOLCANIC ASH ENCOUNTER 21
– WINDSHEAR 19
– WINDSHEAR AHEAD◁ 20

02.90 DETAILED CABIN/COCKPIT EVAC PROC

GENERAL

Abnormal and Emergency procedures represent the actions applicable after a failure, to ensure adequate safety and to ease the further conduct of the flight. They are applied following the «READ and DO» principle.

PRESENTATION

The presentation of procedures is, as far as practicable, identical to the presentation on ECAM. The abbreviations used are identical to nomenclature on the cockpit panels. All actions or information displayed on ECAM are printed in capital letters. Other information, not on ECAM, is printed in small letters.
Expanded information is inserted in the procedure and printed in italics. It provides :
— identification of the particular failure
— explanation for actions, where the reason is not self evident
— additional background information

· When several procedures are presented under the same title, the starting point of each procedure is marked by a black square.
Only one procedure is applicable at a time.
For example :

GFC5-03-0201-001-A001AB

ANTI ICE CAPT (F/O) (STBY) PROBES

■ **CAPT PROBES** } a

■ **F / O PROBES** } b

■ **STBY PROBES** } c

procedure to be applied
a or b or c

· Black squares are also used to indicate parts of procedure, among which only one is
R applicable at a time.
For example :

GFC5-03-0201-001-B001AB

BRAKES HOT

— BRK FAN (if installed) . . . . ON } a

■ **ON GROUND** } b

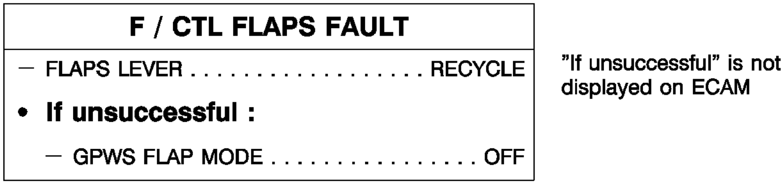
■ **IN FLIGHT** } c

procedure to be applied
(a + b) or (a + c)

The ECAM does not display black squares.

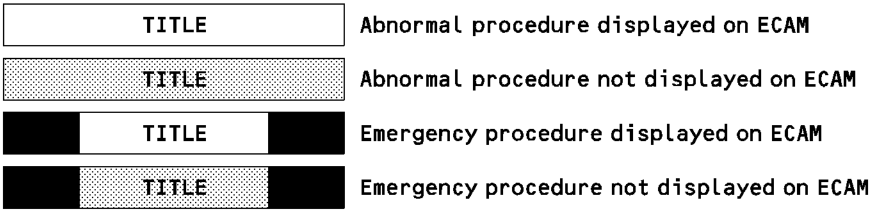
· If an action depends on a precondition, a black dot identifies the precondition. If the precondition appears on ECAM, it appears in large letters. If not, it appears in small letters.
For example :

GFC5-03-0201-002-A001AA



· Titles of the procedures appear in the following ways :

GFC5-03-0201-002-B001AB



TASK SHARING

The general task sharing shown below applies to all procedures.
The pilot flying remains pilot flying throughout the procedure.
PF, the pilot flying, is responsible for :
— thrust levers,
— control of flight path and airspeed,
— aircraft configuration (request configuration change),
— navigation,
— communications.
PNF, the pilot not flying, is responsible for :
— reading aloud the ECAM and checklists,
— executing required actions or actions requested by the PF, if applicable,
— operating the engine master switch and ENG FIRE pushbutton (monitored by the PF).

R **MEMORY ITEMS**

R The following procedures are to be applied without referring to paper : Windshear ◁ ,
R windshear ahead ◁ , TCAS ◁ , EGPWS ◁ , loss of braking, beginning of EMER DESCENT,
R beginning of UNRELIABLE SPEED INDICATION.

USE OF AUTOPILOT

The autopilot may be used in most failure cases, when available :
- In case of engine failure, without any restriction including autoland or CAT II/CAT III ILS.
- In case of other failures, down to 500 ft AGL in all modes. However, the AP has not been certified in all configurations and its performance cannot be guaranteed. If the pilot chooses to use the AP in such circumstances, extra vigilance is required and the AP must be disconnected, if the aircraft deviates from the desired or safe flight path.

INITIATION OF PROCEDURES

Procedures are initiated on pilot flying command.
No action is taken (apart from cancelling audio warnings through the MASTER WARN light) until :
- The appropriate flight path is established, and
- The aircraft is at least 400 feet above the runway, if a failure occurs during takeoff, approach or go-around.
  A height of 400 feet is recommended because it is a good compromise between the necessary time for stabilization and the excessive delay in procedure initiation.
  In some emergency cases, provided the appropriate flight path is established, the pilot flying may initiate actions before this height.

R If an emergency causes LAND ASAP to appear in red on the ECAM, the pilot flying should
R land at the nearest suitable airport.
If an abnormal procedure causes LAND ASAP to appear in amber on the ECAM, the crew should consider the seriousness of the situation and the selection of a suitable airport.

LANDING DISTANCE

Any increase in landing distance, resulting from an emergency or abnormality, must be based on the actual landing distance in Conf FULL (Refer to 3.02.80).

ECAM

Warning Inhibition during takeoff

Some warnings (non-inhibited) appear whenever the prompting situation arises ; others (inhibited) do not appear at once, if the prompting situation arises during takeoff.

CREW COORDINATION

When carrying out a procedure displayed on ECAM, both pilots must be aware of the present display. Before any "CLEAR" action, the pilots should crosscheck to confirm that there remains no blue message (except in case of no action feedback) that they can eliminate by a direct action.

NO CLEAR ACTION BEFORE CROSS-CONFIRMATION

Example of crew coordination and cross confirmation :

WARNING DISPLAY		PILOT FLYING	PILOT NOT FLYING
HYD B RSVR OVHT BLUE ENG 1 PUMP.....OFF		READ FAILURE TAKE ATC RADIO CTL – REQUEST ECAM ACTION (1)	READ FAILURE – PERFORM ECAM ACTION OR REQUEST EXECUTION BY THE PF
HYD B RSVR OVHT B SYS LO PR	* F/CTL	– CHECK ECAM ACTION COMPLETED – CONFIRM CLEAR	– REQUEST CLEAR
SEAT BELTS	* F/CTL	– CONFIRM CLEAR	– REVIEW ALL AFFECTED EQUIPMENT SHOWN IN AMBER ON F / CTL PAGE – REQUEST CLEAR
STATUS APPR PROC IF BLUE OVHT OUT : BLUE ENG 1 PUMP .... ON CAT 2 ONLY SLATS SLOW	 INOP SYS CAT 3 BLUE HYD PART SPLRS ALTN BRK REV 1	– CONFIRM CLEAR	– READ STATUS LINE BY LINE – REQUEST CLEAR

R For standard calls, refer to 3.03.90.

(1) Although it is the responsability of the pilot flying to request ECAM actions, this does not preclude the captain from either taking control of the aircraft or ordering ECAM actions he considers to be necessary.

R *Note : ECAM procedures and STATUS information, supplemented by a PFD/ND check*
R *suffice for handling the fault. However, before applying the ECAM procedures,*
R *the fault should be confirmed on the system display.*
R *When ECAM actions have been performed, and the ECAM STATUS has been*
R *reviewed, the crew may refer to FCOM procedure (3.02) for supplementary*
R *information, if time permits.*

USE OF SUMMARIES

GENERAL

The summaries consist of QRH procedures. They have been created to help the crew handle the actions to be carried out, in the event of an electrical emergency configuration dual hydraulic failure.
In any case, the ECAM should be applied first.
This includes both the procedure and the STATUS review.
Only after announcing "ECAM ACTIONS COMPLETED", should the PNF refer to the corresponding QRH summary.
When the failure occurs, and after performing the ECAM actions, the PNF should refer to the "CRUISE" portion of the summary, in order to determine the landing distance coefficient.
Since normal landing distances are also given on this page, the PNF will be able to compute the landing distance taking failure(s) into account, in order for the pilot to decide whether to divert or not.

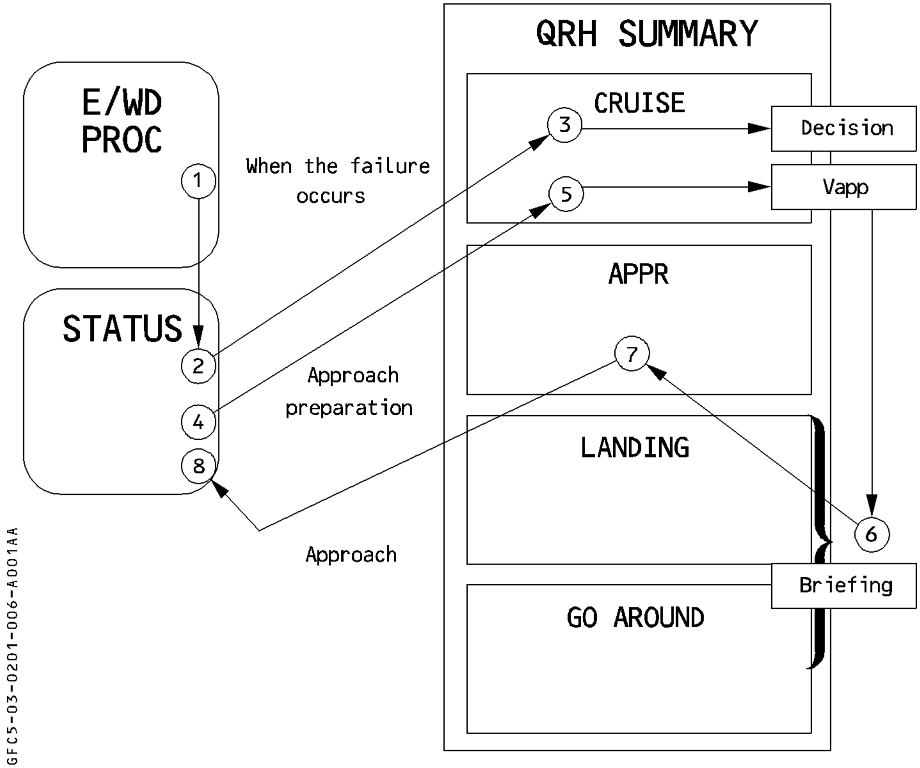
APPROACH PREPARATION

As always, approach preparation includes a review of the ECAM STATUS.
After reviewing the STATUS, the PNF should refer to the "CRUISE" portion of the summary to determine the VREF correction, and compute the VAPP.
The pilot is presumed to know the computation method, and use the VREF given on the MCDU (the destination having been previously updated).
A VREF table is provided in the summary, for failure cases leading to the loss of the MCDU.
The LANDING and GO-AROUND portions of the summary should be used for the approach briefing.

APPROACH

The APPR PROC actions should be performed by reading the APPROACH portion of the summary. This portion has primarily been added due to the flap extension procedure, which is not fully addressed by the ECAM.
As the recommendations provided in this portion of the summary are deened sufficient, it is not necessary to refer to the "LANDING WITH FLAPS (SLATS) JAMMED" paper procedure.
After referring to the APPROACH portion of the summary, the PNF should then review the ECAM STATUS, and check that all APPR PROC actions have been completed.

SEQUENCE



REJECTED TAKEOFF

GENERAL

The decision to reject the take-off and the stop action shall be made by the captain.
It is therefore recommended that the captain keeps his hand on the thrust levers until V1 is reached whether he is PF or PNF. As soon as he decides to abort, he calls “stop”, takes over and performs the stop actions.
It is impossible to list all the factors which could lead to the decision to discontinue the take-off, but in order to help in the decision process, the ECAM inhibits the warnings which are not paramount from 80 kt to 1 500 ft (or 2 minutes after lift-off, whichever occurs first).
Experience has shown that rejected take-offs were sometimes hazardous even though the performance was correctly calculated, based on flight tests.
This may be due to the following factors :
- Delay in initiating stopping procedure is increase,
- Tyres are damaged,
- Brakes not working correctly, initial temperature higher than normal,
- Brakes not fully applied.
- Runway friction coefficient is lower than assumed in computations
- Error in gross weight determination,
- Runway line up not considered.

The A330 is certificated according to JAR amendment 25-42 which considers 2 seconds between decision and action, thus improving the safety margin.
Since above 100 kt, rejecting the take-off becomes a serious action which may lead to a hazardous situation, in particular as speed approaches V1, be “Go-minded” if none of the main failures quoted below has occurred.

REJECTED TAKEOFF (CONT'D)

DECISION MANAGEMENT

- **Below 100 knots** :
  The decision to reject the takeoff may be taken at the Captain's discretion, depending on the circumstances.
  Although we cannot list all of the causes, the Captain should seriously consider discontinuing the takeoff, if any ECAM warning is activated.
  Note : The speed of 100 knots is not critical, and was chosen in order to help the Captain make his decision and avoid unnecessary stops from high speed.
- **Above 100 knots, and below V1** :
  Rejecting the takeoff at these speeds is a more serious matter, particularly on slippery runways. It could lead to a hazardous situation, if the speed is approaching V1. Very few situations should lead to the decision to reject the takeoff. The main ones are :
  1. Fire warning, or severe damage ;
  2. Sudden loss of engine thrust ;
  3. Malfunctions or conditions that give unambiguous indications that the aircraft will not fly safely.
  4. ECAM warnings, such as :
  · ENG or APU FIRE
  · ENG FAIL
  · CONFIG
  · ENG OIL LO PR
  R · ENG REV UNLOCKED
  · L + R ELEV FAULT
  Nose gear vibration should not lead to an RTO above 100 knots.
  In case of tire failure between V1 minus 20 knots and V1 :
  Unless debris from the tires has caused serious engine anomalies, it is far better to get airborne, reduce the fuel load, and land with a full runway length available.
  The V1 call has precedence over any other call.
- **Above V1** :
  Takeoff must be continued, because it may not be possible to stop the aircraft on the remaining runway.

REJECTED TAKEOFF (CONT'D)

PROCEDURE

R

CAPT	F/O
Phase 1 – CALL . . . . "STOP" Simultaneously : – THRUST LEVERS . . . . IDLE – REVERSE THRUST . . . . MAX AVAIL.	– BRAKE RESPONSE . . . . . MONITOR – REVERSE . . . . CONFIRM – ANY AUDIO . . . . CANCEL – ATC . . . . INFORM – ON GROUND EMER/EVACUATION Checklist . . . . LOCATE
Phase 2 Consider positioning the aircraft to keep any possible fire away from the fuselage.	
– PARKING BRAKE . . . . APPLY *Set parking brake ON after aircraft stops.* – PA call . "ATTENTION CREW!AT STATIONS" – CALL . . . . "ECAM ACTIONS"	– ECAM ACTIONS . . . . INITIATE
The aircraft should remain stationary while the crew evaluates the situation.	
Evacuation phase If required, refer to the ON GROUND EMER/EVACUATION Checklist for evacuation.	Inform ATC of intention and required assistance.

REVERSERS Full reverse may be used until coming to a complete stop. But, if there is enough runway available at the end of the deceleration, it is preferable to reduce reverse thrust when passing 70 knots.

Note : 1. If the brake response does not seem appropriate for the runway condition, FULL manual braking should be applied and maintained. If IN DOUBT, TAKE OVER MANUALLY. Do not attempt to clear the runway, until it is absolutely clear that an evacuation is not necessary and that it is safe to do so.

2. If the autobrake is unserviceable, the Captain simultaneously reduces the thrust and applies maximum pressure on both pedals.
The aircraft will stop in the minimum distance, only if the brake pedals are maintained fully pressed until the aircraft comes to a stop.

3. If normal braking is inoperative, immediately switch the A/SKID & NOSE WHEEL switch to OFF and modulate brake pressure, as required, at or below 1 000 PSI.
If the brake pedals were fully pressed when switching the A/SKID & NOSE WHEEL switch to OFF, full pressure would be applied to the brakes.

4. After a rejected takeoff, if the aircraft comes to a complete stop using autobrake MAX, release brakes prior to taxi by disarming spoilers.

ENG FAILURE AFTER V1 – CONTINUED TAKEOFF

– If an engine fails after the aircraft passes V1 the takeoff must be continued.
– Use rudder conventionally to maintain runway centerline.
R – At VR, initiate the rotation with a positive sidestick input to achieve
R a continuous rotation rate, towards a pitch attitude of 12°5. After lift-off follow the speed reference system (SRS).
– When airborne with a positive rate of climb and when the radio altitude has increased, select the landing gear up.
– Use rudder to prevent yaw. Shortly after lift-off, β target will appear. Adjust rudder position to zero the β target. Control heading conventionally with bank, keeping the β target at zero with rudder. Accelerate if β target cannot be zeroed with full rudder.
– Consider the use of TOGA thrust.
  On derated takeoff (derated takeoff option installed), do not use TOGA thrust if speed is below F in CONF 2 and 3.
– Consider the use of auto pilot.
– At 400 FT mini, apply ECAM procedure
– At acceleration height, level off and allow the speed to increase.
  · At F speed select CONF 1
  · At S speed select CONF 0
– When the flap handle is at zero, β target reverts to side slip indication. Center sideslip indication conventionally.
– At green dot speed (engine-out operating speed in clean configuration – green dot) resume the climb using maximum continuous thrust and maintain green dot speed.
  (If already in the FLX/MCT gate, move to CL and back to MCT)
– MAXIMUM TAKEOFF THRUST IS ALLOWED FOR 10 MINUTES ONLY.

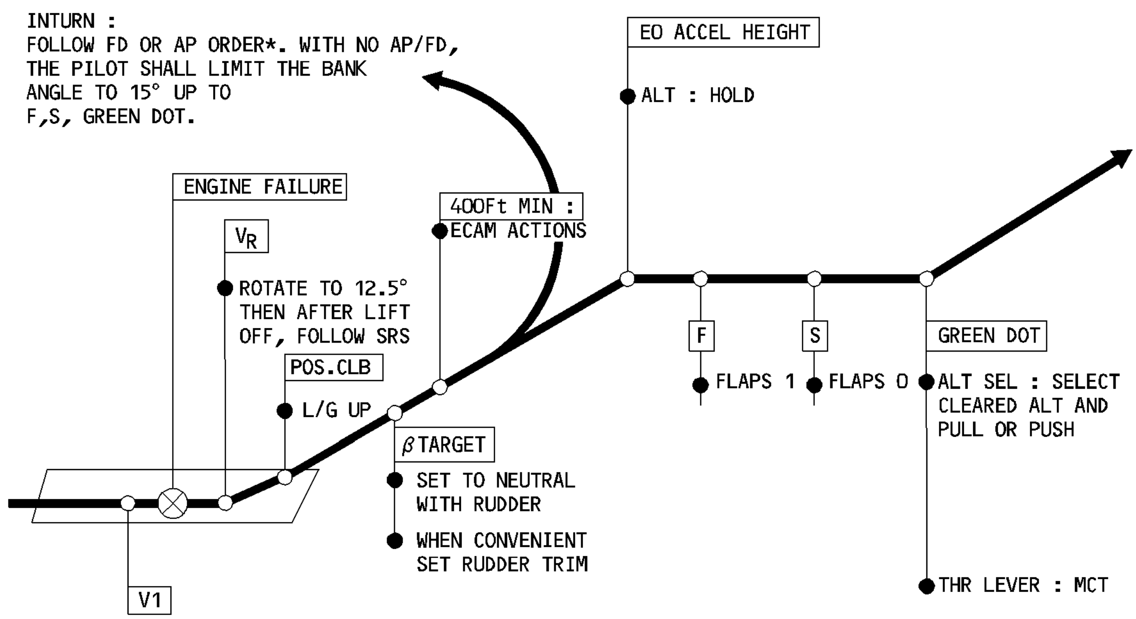
FOR ENG FAIL DURING INITIAL CLIMB-OUT

– Proceed as above. However, if the failure occurs above V2 maintain the SRS commanded attitude (or the speed reached after recovery). In any case, the minimum speed must be equal to V2.

R

ENG FAILURE AFTER V1 – CONTINUED TAKEOFF (CONT'D)

GFC5-03-0210-005-A001AA



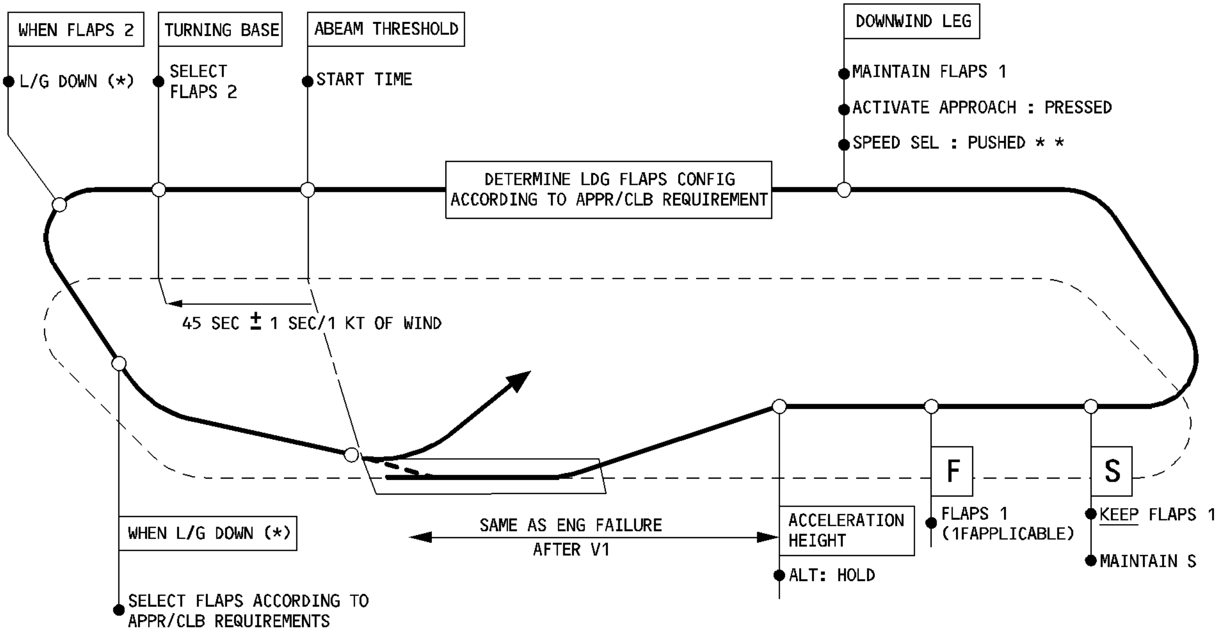
NOTE : FOR APPROACH AND LANDING, APPLY STANDARD APPROACH PROCEDURE.

* BANK ANGLE IS LIMITED TO
- -15° UP TO (MANEUVERING SPEEDS - 10KTS)
- -THEN, LINEAR INCREASE TO 25° UP TO (MANEUVERING SPEEDS - 3KTS)
- -25° ABOVE (MANEUVERING SPEEDS - 3KTS)

R

IMMEDIATE VMC LDG FOLLOWING ENG FAILURE ON TO

GFC5-03-0210-006-A001AB



* AT HIGH ALTITUDE AIRPORT AND HIGH LANDING WEIGHT, DELAY SELECTION OF GEAR DOWN AND LANDING FLAPS/SLATS CONFIGURATION UNTIL FINAL APPROACH.

* * THIS PATTERN ASSUMES THE USE OF MINIMUM GRND SPD (MANAGED). IF NOT, SELECT SPEEDS MANUALLY: F AFTER FLAPS 2 SELECTION, VAPP AFTER LANDING FLAPS SELECTION. SELECTED SPEED MUST BE USED IF THE FLIGHT PLAN HAS NOT BEEN UPDATED WITH THE NEW DESTINATION (MINIMUM GRND SPD NOT CORRECT).

CIRCLING APPROACH WITH ONE ENGINE INOPERATIVE

– LANDING WEIGHT .... CHECK

● **If the aircraft weight is above the maximum weight for circling in CONF 3 (given in the table below) :**

The aircraft cannot maintain flight level with CONF 3 and landing gear down.

– Delay gear extension.

Note : – if the approach is flown at less than 750 ft RA, the warning "L/G NOT DOWN" will be triggered. The pilot can cancel aural warning by pressing the EMER CANC pushbutton on the ECAM control panel.

– "TOO LOW GEAR" warning is to be expected, if the landing gear is not downlocked at 500 ft RA.

MAXIMUM WEIGHT FOR CIRCLING IN CONF 3 (1000 KG)

OAT (°C)	AIRPORT ELEVATION (feet)							
	0	2000	4000	6000	8000	10000	12000	14000
0	224.0	216.0	206.0	198.0	188.0	180.0	172.0	158.0
5	224.0	214.0	206.0	196.0	188.0	180.0	158.0	154.0
10	224.0	214.0	206.0	196.0	186.0	174.0	158.0	148.0
15	222.0	214.0	206.0	194.0	180.0	158.0	154.0	142.0
20	222.0	214.0	202.0	186.0	174.0	158.0	148.0	138.0
25	222.0	208.0	194.0	180.0	158.0	154.0	144.0	132.0
30	214.0	200.0	188.0	174.0	158.0	150.0	138.0	
35	208.0	194.0	182.0	168.0	156.0	144.0		
40	198.0	186.0	176.0	158.0				
45	190.0	180.0	168.0					
50	182.0	172.0						
55	176.0							

LANDING WITH SLATS OR FLAPS JAMMED

Determine landing configuration according to the table 3.02.80.

■ **Repeat the following until landing configuration is reached**

– SPEED SEL . . . . VFE NEXT – 5 KT

Decelerate towards VFE NEXT – 5 kt but not below VLS. In case of turbulence, to avoid VFE exceedance, the pilot may decide to decelerate to a lower speed, but not below VLS.

Note :
- *The autopilot may be used down to 500 feet AGL. As it is not tuned for abnormal configurations its behaviour can be less than optimum and must be monitored.*
- *Approach with A/THR and selected speed is recommended.*
- *OVERSPEED warning and VLS displayed on PFD are computed according to the actual flap/slats position.*
- *VFE and VFE NEXT are displayed on PFD according to the FLAPS lever position. If not displayed use the placard speeds.*
- *If VLS is greater than VFE NEXT (overweight landing case), the flaps lever can be set in the required next position while the speed is reduced to follow VLS reduction as surfaces extend. The VFE warning threshold should not be triggered.*
  In this case, disconnect the A/THR. A/THR can be reengaged when the landing configuration is established.

As speed reduces through VFE NEXT :

– FLAPS LEVER . . . . ONE STEP DOWN

● **When landing configuration is established :**

– DECELERATE TO CALCULATED APPROACH SPEED IN FINAL APPROACH

FOR GO AROUND

Table page 8 provides the MAX SPEEDS for the abnormal configurations.

■ **IF SLATS FAULT :**

● **FOR CIRCUIT :**
– MAINTAIN SLATS/FLAPS CONFIGURATION
– Recommended speed : MAX SPEED – 10 KT

● **FOR DIVERSION :**
– SELECT CLEAN CONFIGURATION

● **If SLATS jammed at 0**
– Normal operating speeds

● **If SLATS jammed > 0**
– Recommended speed for diversion : 205 kt
– Increased fuel consumption

LANDING WITH SLATS OR FLAPS JAMMED (CONT'D)

■ IF FLAPS FAULT :

- **FOR CIRCUIT** :
  - MAINTAIN SLATS/FLAPS CONFIGURATION
  - Recommended speed : MAX SPEED −10KT
- **FOR DIVERSION** :
  - **If FLAPS jammed at 0**
    - SELECT CLEAN CONFIGURATION
    - Normal operating speeds
  - **If FLAPS jammed > 0**
    - MAINTAIN SLATS/FLAPS CONFIGURATION
    - Recommended speed for diversion : MAX SPEED −10KT
    - Increased fuel consumption

    Note : · *In case the SPD LIM flag is displayed on the PFD, use the MAX SPEED displayed on the ECAM status page.*
    · *In case of a go-around with CONF FULL selected, the L/G NOT DOWN warning is triggered at landing gear retraction.*
R · *In some cases, MAX SPEED −10 KT may be a few knots higher than*
R *the VFE. In this situation, pilots may follow the VFE.*

<table>
<tr><th colspan="6">MAX SPEED</th></tr>
<tr><th>Flaps
Slats</th><th>F = 0</th><th>0 < F ≤ 1</th><th>1 < F ≤ 2</th><th>2 < F ≤ 3</th><th>F > 3</th></tr>
<tr><td>S = 0</td><td>NO LIMITATION</td><td rowspan="2">215 knots</td><td rowspan="3">196 knots</td><td rowspan="3">186 knots</td><td rowspan="3">180 knots</td></tr>
<tr><td>0 < S ≤ 1</td><td>240 knots</td></tr>
<tr><td>1 < S</td><td>215 knots</td><td>205 knots</td></tr>
</table>

CAUTION

For flight with SLATS/FLAPS extended, fuel consumption is increased.
Refer to the fuel flow indication.
As a guideline, determine the fuel consumption in clean configuration at the same altitude without airspeed limitation (e.g. From the ALTERNATE FLIGHT PLANNING tables, refer to 2.05.50) and multiply this result by 1.5 (SLATS EXTENDED), or 2.2 (FLAPS EXTENDED), or 2.5 (SLATS and FLAPS EXTENDED), to obtain the fuel consumption required to reach the destination in the current configuration.

NO FLAPS NO SLATS LANDING

– SPEED SEL . . . . GREEN DOT

An initial approach is recommended with the A/THR in selected speed.
The AP is allowed down to 500 feet AGL.

– GPWS FLAP MODE . . . . OFF

– FLAPS LEVER . . . . CONF 1

Disregard the CONF 2 requirement on the ECAM status page.
Set the FLAPS handle to CONF1 to benefit from SRS guidance, in case of a go-around.
The VFE, displayed on the PFD, depends on the flap lever position, so a false VFE will be given.
Plan a long stabilized approach.

● **For the final approach** :

– A/THR . . . . OFF

– SPD SEL . . . . VAPP

Select VLS from the PFD (or VREF + 50 knots, if VLS is not available).
At 500 feet reduce the speed to obtain VLS - 5 knots (or VREF + 45 knots, if VLS is not available) at touchdown.

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

AIR PACK 1(2) OVHT

– PACK (affected) .... OFF

The fault light goes off, when the overheat disappears.
High flow is automatically selected on the remaining pack.

– FWD CRG COOLING (a) .... OFF

● **WHEN PACK OVHT OUT :**

– PACK (affected) .... ON
– FWD CRG COOLING (a) .... ON

STATUS

● **WHEN PACK OVHT OUT :**

– PACK (affected) .... ON
– FWD CRG COOLING (a) .... ON

INOP SYS
PACK 1(2)
FWD CRG TEMP

(a) These lines are only displayed, if the automatic closure of the cargo cooling cold air valve is not operative.

AIR PACK VALVE 1(2) FAULT

■ **If only one PACK VALVE closed (on ground at engine start) :**

PACK (affected) INHIB BY DOORS

In case of pressurization prevention, due to one door not closed, only one pack valve is closed. The other pack's valve abnormally stays in the OPEN position.

– FWD CRG COOLING (a) .... OFF

■ **Other cases :**

– PACK (affected) .... OFF
– FWD CRG COOLING (a) .... OFF

STATUS

INOP SYS
PACK 1(2)
FWD CRG TEMP

(a) These lines are only displayed, if the automatic closure of the cargo cooling cold air valve is not operative.

AIR PACK 1(2) OFF

Crew awareness.

One pack is abnormally selected off.

STATUS

INOP SYS
PACK 1(2)
FWD CRG TEMP

AIR PACK 1 + 2 FAULT

■ **If one door not locked closed on ground :**

PACKS INHIB BY DOORS

Check that the doors are closed and locked. If confirmed closed, maintenance action is due.

■ **In all other cases :**

– PACK (affected) . . . . OFF

The fault light goes off, when the failure disappears.

DESCENT TO FL 100/MEA

Note : The rate at which the cabin altitude increases may be minimized by closing the CARGO ISOL VALVES if the cargo freight permits.

● **WHEN PACK OVHT OUT :**

If the FAULT was due to an overheat

– PACK (affected) . . . . ON

● **WHEN DIFF PR < 1 PSI AND FL BELOW 100 :**

– RAM AIR . . . . ON

MAX FL 100/MEA

STATUS

MAX FL 100/MEA

● **WHEN PACK OVHT OUT :**

If the FAULT was due to an overheat :

– PACK (affected) . . . . ON

INOP SYS
PACK 1 + 2
FWD CRG TEMP

AIR PACK 1(2) REGUL FAULT

■ **If RAM air door failed closed :**

PACK 1 (2) RAM DOOR CLOSED

STATUS

PACK PERF AFFECTED

■ **If PACK controller fault :**

Crew awareness.

STATUS

PACK 1(2) AT FIXED TEMP

The pack delivers a fixed temperature of 12° C ± 3° C.
The flow control valve pneumatically regulates the flow to the NORM value.

■ **If PACK in bypass mode :**

Failure of the Air Cycle Machine.

PACK 1 (2) IN BYPASS MODE

– PACK (affected on ground) . . . . OFF

To avoid overheating on the ground.

PACK (affected) AVAIL IN FLT (only displayed on ground)

STATUS

	INOP SYS
PACK PERF AFFECTED PACK (affected) AVAIL IN FLT (only displayed on ground)	PACK 1(2) (on ground)

COND ZONE REGUL FAULT

Zone controller fault, or loss of trim air system.

ENG HI IDLE

STATUS

	INOP SYS
CAB TEMP REGUL DEGRADED (on ground) PACKS AT FIXED TEMP *The packs deliver a fixed temperature : 20°C (68°F)* *Pack flow and zone temperature selections are lost.* ENG HI IDLE	ZONE REGUL FWD CRG TEMP

COND ZONE CTLR 1(2) FAULT

Crew awareness.

STATUS

INOP SYS
ZONE CTLR (1) (2)

AIR HOT AIR SYS 1(2) FAULT

One hot air valve, and the hot air X is valve failed closed.
Crew awareness.

STATUS

CAB TEMP REGUL DEGRADED (on ground)

INOP SYS
FWD CRG TEMP (only if sys 1 failed)
CKPT TEMP (only if sys 2 failed)

COND DUCT OVHT

FWD CRG DUCT OVHT, or
COCKPIT DUCT OVHT, or
CABIN DUCT OVHT
– HOT AIR (affected) . . . . OFF
If not closed automatically.
● **IF HOT AIR STUCK OPEN** :
– PACK (affected) . . . . OFF
● **WHEN DUCT TEMP < 70 DEG C** :
– HOT AIR (affected) . . . . OFF THEN ON
Hot air pressure regulating valve will reopen.
– PACK (affected) . . . . ON

STATUS

● **WHEN DUCT TEMP < 70 DEG C** :
– HOT AIR (affected) . . . OFF THEN ON
– PACK (affected) . . . . ON
CAB TEMP REGUL DEGRADED (on ground)

INOP SYS
FWD CRG TEMP
CKPT TEMP (only if sys 2 failed)

CAB PR EXCESS CAB ALT

– CREW OXY MASK (if above FL 100) .... ON

It is recommended to descend with the autopilot engaged :
· Turn the ALT selector knob, and pull.
· Turn the HDG selector knob, and pull.
· Set target SPD/MACH.

● **If above FL 100, and under FL 160** :
– DESCENT .... INITIATE

● **If above FL 160** :
EMER DESCENT FL 100/MEA (or minimum obstacle clearance altitude)
– THR LEVERS (if A/THR not engaged) .... IDLE
– SPD BRK .... FULL
– SPD .... MAX/APPROPRIATE

Descent at maximum appropriate speed or, if structural damage is suspected, use the flight controls with care and reduce speed as appropriate.
Landing gear may be extended below 21000 feet ; speed must be reduced to 250 knots.

– SIGNS .... ON
– ENG START SEL .... IGN
– ATC .... NOTIFY

Notify ATC of the nature of the emergency and state intentions.
If ATC cannot be contacted, select ATC code A7700, or transmit a distress message on one of the following frequencies :
(VHF) 121.5 MHz, or (HF) 2182 KHz, or 8364 kHz.
To save oxygen, set the oxygen diluter selector to the N position.
With the oxygen diluter selector set to 100 %, oxygen quantity may be insufficient to cover the entire descent profile.
Ensure that the crew can communicate wearing oxygen masks.
Avoid continuous use of the interphone position to minimize interference from the oxygen mask breathing noise.

● **IF CAB ALT > 14 000 FT** :
– PAX OXY MASKS .... MAN ON

Note : *When descent is established and, if time permits, check that the OUTFLOW VALVES are closed on the CAB PRESS ECAM page. If they are not closed and $\triangle$P is positive, select manual control and the V/S CTL toggle switch to full down.*
Notify the cabin crew when safe flight level has been reached, and oxygen mask use can be stopped.

CAB PR SYS 1 (2) (1 + 2) FAULT

■ **If one system affected :**

Crew awareness.

STATUS

INOP SYS
CAB PR 1 (2)

■ **If both systems affected :**

● **If one door not locked closed on ground :**

R CAB PR INHIB BY DOORS

● **In all other cases :**

R *Due to the slow closure of the outflow valve in manual pressurization mode, and*
R *depending on the failure, the following procedure may not avoid a depressurization.*

– MODE SEL . . . . MAN
– MAN VALVE SEL . . . . BOTH
– MAN V/S CTL . . . . AS RQRD

R · *It may take 10 seconds in manual mode before the crew notices a change of the*
R *outflow valve position.*
R · *Monitor cabin V/S and cabin altitude frequently and adjust as necessary.*
R · *Maintain aircraft altitude at or above cabin altitude.*
R · *The two safety valves limit △P to 8.85 psi.*

STATUS

MAN CAB PR CTL :
TGT V/S : CLIMB 500 FT/MN
: DES 300 FT/MN

A/C FL	CAB ALT TGT
410	8 000
350	6 500
300	5 000
250	2 500
< 200	0

● **DURING FINAL APPR :**

– MAN V/S CTL . . . . FULL UP

When on intermediate approach (below 2500 feet), adjust △P = 0.
When △P at zero, select FULL UP to fully open both outflow valves.

CAUTION
R Check that △P is at zero before opening doors.

INOP SYS
CAB PR 1 + 2

CAB PR LO DIFF PR (in flight)

EXPECT HI CAB RATE
– A/C V/S .... REDUCE

CAB PR FWD (AFT) OFV NOT OPEN (on ground)

– MODE SEL .... MAN
– MAN VALVE SEL .... FWD (AFT)
– MAN V/S CTL .... FULL UP

It may take 10 seconds in manual mode before the crew notices a change in the outflow valve position.

STATUS

FWD OFV CTL : MAN ONLY
(AFT)

CAB PR SAFETY VALVE OPEN

The failure is probably due to an overpressure.

● **IF DIFF PR ABV 8.7 PSI** :
– MODE SEL .... MAN
– MAN VALVE SEL .... BOTH
– MAN V/S CTL .... AS RQRD

If overpressure is confirmed, reduce cabin △P.
For manual control, refer to the CAB PR SYS 1 + 2 FAULT status.
It may take 10 seconds in manual mode before the crew notices a change in the outflow valve position.

● **IF UNSUCCESSFUL** :
– A/C FL .... REDUCE

CAB PR LDG ELEV FAULT

– LDG ELEV .... MAN ADJUST

Landing field elevation from FMGS is not available. Landing elevation must be manually selected with LDG ELEV selector.
If landing is performed using QFE, set 0 feet on LDG ELEV selector.
Refer to the LDG ELEV indication on the CRUISE page, or the CAB PRESS page, to adjust the required landing elevation.

● **If LDG ELEV selector is inoperative** :
LDG ELEV SET AT ZERO

COND L (R) (L + R) CAB VENT FAULT

Failure of the cabin fan(s), or recirculation valve(s).

– PACK FLOW . . . . HI

STATUS

INOP SYS
L CAB VENT
(R) (L + R)

VENT BLOWING FAULT

– PACK FLOW . . . . HI
To increase air flow.
– CAB FANS . . . . ON
– COCKPIT TEMP . . . . DECREASE
– CABIN TEMP . . . . DECREASE
To decrease the temperature of the recirculated air.

● **IF WARNING AFTER 5 MIN :**
MAX FLT TIME . . . . 5 HOURS
R *Note : This flight time limitation intends to prevent premature failures of some minor*
R *equipments (IFE, cabin communication ...) that may occur after 5 hours with a*
R *BLOWING FAULT caution. This 5 hours limitation is not applicable to other*
R *equipments.*

STATUS

● **If warning after 5 minutes :**
MAX FLT TIME . . . . 5 HOURS

INOP SYS
VENT BLOWING

VENT EXTRACT FAULT

Note : Resetting the AEVC computer may clear the EXTRACT FAULT caution, if it is triggered on ground at engine start.

– EXTRACT . . . . OVRD
Air is blown through the overboard extract valve, which is partially open.
The underfloor extract valve is closed.

STATUS

INOP SYS
VENT EXTRACT

VENT OVBD VALVE FAULT

Note : Resetting the AEVC computer may clear the OVBD VALVE FAULT, if it is triggered on ground at engine start.

– EXTRACT . . . . OVRD

● **IF OVBD STILL FULL OPEN :**

MAX FL 100/MEA

– CAB PR MODE SEL . . . . MAN

– CAB PR VALVE SEL . . . . BOTH

– MAN V/S CTL . . . . FULL UP

Pressurization is inhibited to avoid damage to the ducts.

It may take 10 seconds in manual mode before the crew notices a change in the outflow valve position.

STATUS

MAX FL 100/MEA

INOP SYS

OVBD VALVE

VENT PACK BAY VENT FAULT (on ground)

– ONE PACK . . . . OFF

STATUS

● **On ground :**

BOTH PACKS AVAIL IN FLT

INOP SYS

PACK 1 or 2

PACKBAY VENT

FWD CRG TEMP

COND LAV + GAL VENT FAULT

Crew awareness.

– PAX SYS .... OFF (a)

PAX SYS AVAIL IN FLT (a)(b)

Note : When in flight, the PAX SYS pushbutton can be switched ON.

STATUS

- **On ground :**
  CAB TEMP REGUL DEGRADED
  PAX SYS AVAIL IN FLT (a)(b)
  Note : In flight, the PAX SYS pb can be switched ON.

INOP SYS
LAV + GAL VENT

(a) Only if passenger entertainment system is installed in the cabin (VCC).
(b) Displayed, if no smoke is detected and no IFE bay ventilation loss.

COND BULK (FWD) (AFT) CRG ISOL FAULT ◁

Crew awareness.

STATUS

INOP SYS
BULK VENT
(FWD, AFT) CRG◁
FWD CRG TEMP◁

COND BULK (FWD) (AFT) CRG VENT FAULT ◁

Crew awareness.
Failure of ventilation fan.

STATUS

- **If FWD (AFT) affected :**
  FWD (AFT) CARGO VENT REDUCED

INOP SYS
BULK VENT
(FWD, AFT) CRG◁
FWD CRG TEMP◁

COND BULK (FWD) CRG HEAT FAULT ◁

Crew awareness.

STATUS

INOP SYS
BULK HEAT
(FWD CRG TEMP)

COND VENT SYS FAULT

Failure of the ventilation controller, leading to the loss of galley and cargo ventilation.

– PACK FLOW . . . . HI
– PAX SYS . . . . OFF (a)
PAX SYS AVAIL IN FLT (b)

STATUS

● **On ground :**
CAB TEMP REGUL DEGRADED
Cabin temperature sensors are not ventilated.
PAX SYS AVAIL IN FLT (b)

INOP SYS
CRG VENT
L + R CAB VENT
LAV + GAL VENT
IFE BAY VENT

(a) When the passenger entertainment system is installed in the cabin (VCC), or in the avionic bay (IFEC).
(b) When the passenger entertainment system is installed in the cabin (VCC), but not in the avionic bay, and if no smoke is detected.

COND FWD CRG COOL FAULT

– FWD CRG COOLING . . . . OFF

STATUS

INOP SYS
FWD CRG TEMP

COND IFE BAY VENT FAULT

– PAX SYS . . . . OFF

STATUS

INOP SYS
IFE BAY VENT

COND BULK CRG DUCT OVHT

– BULK HOT AIR (If not closed automatically) . . . . OFF

● **WHEN BULK CRG DUCT TEMP<70 DEG C :**

– BULK HOT AIR . . . . OFF/ON

STATUS

● **WHEN BULK CRG DUCT TEMP<70 DEG C:**

– BULK HOT AIR . . . . OFF/ON

INOP SYS

BULK HEAT

AUTO FLT FM 1 (2) FAULT

This warning is associated with MAP NOT AVAIL message, displayed on the related ND.

– FM SOURCE . . . . BOTH ON 2 (1)
  Both NDs will use the same FM information.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
AP 1 (2)
FM 1 (2)
GPWS TERR(a)
CAT 3 DUAL

(a) Only if FM1 is lost

AUTO FLT FM 1 + 2 FAULT

– FM SOURCE . . . . NORM
  The FM source selector must be at NORM to allow the NAV B/UP prompt to be displayed on the MCDU MENU page.
– NAVAID TUNING . . . . USE RMP
  Select both RMPs on NAV.
– LDG ELEV . . . . MAN ADJUST
  CPCs normally use the landing elevation from the FM.

STATUS

MCDU BACK UP NAV AVAIL
CAT 1 ONLY (a)

INOP SYS
FM 1 + 2
AP 1 + 2 (a)
GPWS TERR

Note : As DH indication is lost, ILS approach may only be a CAT 1 approach.
(a) AP 1 + 2 are only lost, if the FG parts of the FMGS are also lost.

AUTO FLT AP OFF

This warning is displayed only for involuntary disconnection. For voluntary disconnection a red AP OFF message is displayed in the right lower part of ECAM upper DU.

Crew awareness

STATUS

CAT 1 ONLY
(if both AP lost)

INOP SYS
AP (affected)

AUTO FLT A/THR OFF

This warning is displayed only for involuntary disconnection. For voluntary disconnection an amber A/THR OFF message is displayed in the right lower part of ECAM upper DU.

– THR LEVERS . . . . MOVE

Thrust is frozen after autothrust disconnection until the thrust levers are moved.

Note : If the thrust levers are not moved within 5 seconds, the "ENG THRUST LOCKED" warning is then triggered every 5 seconds (Refer to 3.02.70).

STATUS

CAT 2 ONLY

INOP SYS
R A/THR
CAT 3

AUTO FLT REAC W/S DET FAULT

Reactive windshear function is lost.

Crew awareness.

STATUS

INOP SYS

REAC W/S DET

AUTO FLT A/THR LIMITED

R *This warning is displayed when autothrust is active and the thrust levers are not in the CL*
R *detent (or MCT detent in case of engine out). The caution is repeated every 5 seconds as*
R *long as the thrust levers are not moved.*

■ **If all engines operative**

– THR LEVER . . . . CLB

■ **In case of engine out :**

– THR LEVER (remaining engine) . . . . MCT

AUTO FLT FCU FAULT

R ■ **Partial loss of the FCU**

– BARO REF . . . . CHECK

The baro reference setting on the FCU and PFDs must be crosschecked.

● **if necessary (a) :**

– AFS TARGET . . . . RESELECT

Although the AP/FD and A/THR are lost, the targets selection and displays are available.

STATUS

CAT 1 ONLY (a)

INOP SYS

R PART FCU

AP 1 + 2 (a)

A/THR (a)

R (a) AP 1+2 and A/THR are only lost in a specific FCU failure mode
R (channel B + C failure in a 3–channel FCU architecture).

■ **Total loss of the FCU**

PFD BARO REF : STD ONLY

With all FCU channels failed, the baro reference value is automatically set at 1013 hPa.
Use the STBY ALTI to set actual baro setting.
In addition :

- *All FCU controls are inop.*
- *A/THR, AP 1+2, and FD 1+2 are not available.*
  (except in LAND TRACK or GO AROUND mode where only A/THR is lost)
- *On PFD :*
  - *Altitude alert is inop.*
  - *ILS deviation scales are displayed.*
  - *TRK/FPA selection is lost.*
  - *MACH selection is lost.*
  - *SPD LIM flag is displayed.*
- *On ND :*
  - *ROSE mode with map (80 NM range) is displayed.*
  - *Weather radar display is lost (blank display or flag).*
  - *VOR/ADF needles :*
    Needle 1, related to VOR1 only.
    Needle 2, related to ADF2 only.
- *On DDRMI*
  VOR/ADF selection is not affected.

AUTO FLT FCU FAULT (CONT'D)

STATUS

PFD BARO REF : STD ONLY
CAT 1 ONLY

INOP SYS
AP 1+2
A/THR
R FCU

AUTOLAND

The red AUTOLAND lights flash on the glareshield when :
- *AP OFF below 200 feet AGL*
- *Excessive LOC deviation between 15 feet and 200 feet AGL*
- *Excessive GLIDE deviation between 100 feet and 200 feet AGL*
- *ILS failure below 200 feet AGL*
- *Radio altimeter discrepancy of more than ± 15 feet below 200 feet AGL.*

Note : In case of voluntary AP OFF below 200 feet AGL (by instinctive disconnect pushbutton), the AUTOLAND lights flash for 3 seconds. If visual references are insufficient, a go around must be initiated.

- PERFORM A GO AROUND

MCDU 1(2)(3) FAILURE

- BRT KNOB (on affected MCDU) . . . . OFF

The MCDU 3 automatically replaces MCDU 1 or 2

COM VHF 1(2)(3)/HF 1(2) EMITTING

1. If any Push to Talk (PTT) transmission selector (sidestick radio selector, hand mike selector, or PTT switch) is jammed in the transmit position, try to release it in order to remove the caution.

R *2. If unsuccessful, deselect the identified failed VHF/HF transmission keys on the associated*
R *Audio Control Panel (ACP) to remove the caution. This ACP should only be used in*
R *reception mode. The associated PTT transmission selectors must not be used.*

Note : In this case, the ACP of the unaffected side may be used to recover the deselected
R *VHF/HF channel.*

COM CIDS 1 + 2 FAULT

Crew awareness.

Passenger address, cabin and service interphone, passenger signs, and communication with the lower deck and flight crew rest compartment (if installed), are inoperative.

STATUS

INOP SYS

CIDS 1+2

COM CIDS PA FAULT

Crew awareness.

Passenger address is inoperative.

STATUS

INOP SYS

CIDS PA

COM ACARS 1(2) (1+2) FAULT ⩤

Crew awareness.

STATUS

INOP SYS

ACARS 1(2) (1+2)

COM SATCOM (DATA) FAULT ◁

Crew awareness.

STATUS

VHF 3 ONLY FOR DATA LINK(a)

INOP SYS
SATCOM (DATA)

(a) Only displayed, if the ATC option is installed.

COM SATCOM VOICE FAULT ◁

Crew awareness.

Telephone communications are inoperative. ACARS is still transmitted by the SATCOM.

Note : This caution may be spuriously triggered on ground when the ADIRUs are not aligned. It will disappear when alignment is complete.

COM VHF 3 DATA FAULT ◁

Crew awareness.

STATUS

SATCOM ONLY FOR DATA LINK(a)

INOP SYS
VHF3 DATA

(a) Only displayed, if the ATC option is installed.

COM HF DATA FAULT ◁

Crew awareness.

Triggered to indicate the loss of the HFDRs' DATA mode.

ELEC GEN 1(2) FAULT

– GEN (affected) .... OFF THEN ON

● **IF UNSUCCESSFUL** :

– GEN (affected) .... OFF

STATUS

CONSIDER APU GEN USE
The APU, if available, may be started.
R CAT 3 SINGLE ONLY (a)

INOP SYS
GEN 1(2)
R PART GALLEY (a)
R CAT 3 DUAL (a)

R (a) Only if APU GEN is not in line.

ELEC GEN 1(2) OFF

Crew awareness.
Switch affected GEN on.

STATUS

INOP SYS
GEN 1(2)
R PART GALLEY (a)
R CAT 3 DUAL (a)

R (a) Only if APU GEN not in line.

ELEC APU GEN FAULT

– APU GEN .... OFF THEN ON

● **IF UNSUCCESSFUL** :

– APU GEN .... OFF

In flight : Restrict use of the APU to emergencies.

STATUS

INOP SYS
APU GEN

ELEC IDG 1(2) DISCONNECTED (on ground)

Crew awareness

STATUS

R CONSIDER APU GEN USE

INOP SYS
GEN 1(2)
PART GALLEY
(only if APU GEN not in line)

ELEC IDG 1(2) OIL LO PR/OVHT

– IDG (affected) . . . . OFF

When the engine is stopped, or below idle, the IDG disconnection is inhibited.
Press IDG pushbutton switch until GEN FAULT light comes on but not more than 3 seconds to avoid damage to the disengage solenoid.
IDG FAULT light stays on as long as overheat is present.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
GEN 1(2)
PART GALLEY
CAT 3 DUAL

ELEC GEN 1(2)/APU GEN/EXT PWR OVERLOAD

– GALLEY . . . . OFF

This warning is only displayed if galley automatic shedding has failed.

STATUS

INOP SYS
GALLEY

ELEC STATIC INV FAULT

Crew awareness

ELEC ECMU 1(2) FAULT

– GEN 1(2) . . . . KEEP ON

The closure control of associated generator line contactor is lost, but the contactor remains closed (self hold) provided the GEN pushbutton switch is ON.
The associated AC BUS TIE contactors open. The APU line contactor opens if ECMU 1 is affected.

STATUS

– GEN 1 (2) . . . . KEEP ON

INOP SYS
ECMU 1(2)
APU GEN (a)
PART GALLEY
EXT PWR A (b)
R EXT PWR B (c)

R (a) if ECMU 1 FAULT
R (b) if ECMU 2 FAULT (on ground)
R (c) if ECMU 1 FAULT (on ground)

ELEC BAT 1(2) or APU BAT FAULT

- **In case of thermal runaway or short circuit :**
  – BAT (affected) . . . . OFF
  Battery contactor is automatically opened by Battery Charge Limiter, but the automatic opening must be manually confirmed.

STATUS

- **IF APU BAT and APU TR fault :**
  APU START NOT AVAIL

INOP SYS
BAT 1(2) or
APU BAT

ELEC BAT 1(2) or APU BAT OFF

Crew awareness
Battery is abnormally selected OFF.

STATUS

- **If APU BAT off and APU TR fault :**
  - **FOR APU START :**
    – APU BAT . . . . ON

ELEC BAT 1(2) or APU BAT SYS FAULT

Crew awareness

STATUS

- **If APU BAT SYS FAULT and APU TR fault**
  APU START NOT AVAIL

INOP SYS
BAT 1(2) or
APU BAT SYS

ELEC TR 1(2) or APU TR or ESS TR FAULT

Crew awareness

- **In case of APU TR fault** :
  - **If APU NOT REQUIRED** :
    – APU BAT . . . . OFF

STATUS

- **If APU TR fault and APU BAT off** :
  - **FOR APU START** :
    – APU BAT . . . . ON

CAT 3 SINGLE ONLY (if TR 1 or 2 is failed)

INOP SYS
TR 1(2) or APU TR
or ESS TR
CAT 3 DUAL (if TR 1 or 2 is failed)

ELEC C/B MONITOR FAULT

Crew awareness

STATUS

INOP SYS
C/B MONITOR

ELEC C/B TRIPPED

Crew awareness

Press the C/B pushbutton on the ECP to identify the affected circuit breakers on the ECAM SD.

ELEC IDG 1(2) OIL SYS FAULT (on ground)

Crew awareness.

ELEC AC BUS 1 FAULT

If the automatic transfer of AC ESS BUS is inoperative, the ECAM's E/WD and SD DUs are simultaneously lost.
The ECAM/ND SEL must be used to recover the E/WD on the NDU, in order to apply the ECAM procedure.

– AC ESS FEED . . . . ALTN
This line is displayed, if automatic AC ESS transfer has failed.

– EMER ELEC PWR . . . . MAN ON
This line is displayed, if manual AC ESS transfer has failed.

– VENT EXTRACT . . . . OVRD
Air is blown through the overboard valve which is partially open.

R – PACK FLOW . . . . HI

PAX SYS AVAIL IN FLT (if VCC installed)

STATUS

	INOP SYS
CAB TEMP REGUL DEGRADED (only on ground) CAT 2 ONLY PAX SYS AVAIL IN FLT	See below

INOP SYS DISPLAYED ON ECAM

EFIS DMC 3	TR 1	GPWS
ECAM DMC 1	G ELEC PUMP	TCAS ◁
REV 1	Y ELEC PUMP	L WNDW HEAT
STBY AOA	L CAB VENT	STBY PITOT (a)
ACARS 1 + 2	GND COOL ◁	CAPT TAT
PART GALLEY	VENT EXTRACT	ADR 1
RA 1	AFT CRG VENT	ADR 3
R FUEL STBY	CAT 3	FUEL AFT XFR
L FUEL STBY	LAV + GAL VENT	ENG1 IGNB

OTHER INOP SYS

BRK FAN (WHEELS 5,6,7,8)◁	ECAM SD	PART CKPT LIGHTS
MDDU	AEVC	L VACUUM GEN
PRINTER	DATA LOADER	HUD ◁
R PVI	FWD APU PUMP	

(a) If AIR DATA SWTG is set to CAPT ON 3, STBY PITOT is supplied by the AC ESS BUS, CAPT PITOT is no longer supplied.

Note : *The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.*

ELEC AC BUS 2 FAULT

– PACK FLOW . . . . HI

STATUS

FWD CRG VENT REDUCED ◁ CAT 1 ONLY	INOP SYS EFIS DMC 2 See below

INOP SYS DISPLAYED ON ECAM

BULK VENT	ATC 2	ECAM DMC 2
TR 2	R WNDW HEAT	REV 2
FUEL AFT XFR	B ELEC PUMP	FWD CRG TEMP ◁
APU TR	R WSHLD HEAT	F/O AOA
R CAB VENT	F/O PITOT	PART GALLEY
F/O TAT	L FUEL PUMP 1	RA 2
HF 2	R FUEL PUMP 1	SDAC 2
ADR 2	F T.TK PUMP	FWC 2
ILS 2	FWD CRG VENT ◁	GPS 2
R CAT 2	DFDR	FDIU
ENG 2 IGN B		

OTHER INOP SYS

BRK FAN (WHEELS 1,2,3,4)◁	RADAR 2	VOR 2
F/O PFD	DME 2	PRESSURIZED WATER SYS
F/O ND	ADF 2 ◁	PARTIAL CKPT LIGHTS
MCDU 2	R LDG LTS	CMC 2
AFT CRG LOAD	STROBE LT	DRAIN HEAT
R VACUUM GEN		

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC AC ESS BUS FAULT

– AC ESS FEED . . . . ALTN

● **IF UNSUCCESSFUL** :

R – CAPT EFIS DMC . . . . 3 (a)

– ECAM SWTG DMC 1

R – AIR DATA SWTG . . . . CAPT ON 3 (a)

ELEC AC ESS BUS FAULT (CONT'D)

STATUS

CAT 1 ONLY

INOP SYS
See below

INOP SYS DISPLAYED ON ECAM

EFIS DMC 1	ILS 1	ECAM DMC 3
GPS 1	SDAC 1	CAPT PITOT
CAT 2	FWC 1	GPWS G/S
ADR 1	ENG 1, 2 IGN A	

OTHER INOP SYS

AFT APU PUMP	DDRMI	CMC 1
	CAPT PFD	VOR 1
PAX OXY MASK ACTUATION	E/WD	ADF 1 ◁
L/G IND PANEL	CABIN EMER LTS	

R (a) These lines are only displayed if AC ESS BUS SHED is available.

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC AC ESS BUS SHED

– AIR DATA SWTG . . . . CAPT ON 3

STATUS

INOP SYS
CAPT AOA
ATC 1
FUEL AFT XFR
HF 1
L WSHLD HEAT
L FUEL PUMP 2
R FUEL PUMP 2
See below

OTHER INOP SYS

MCDU 1	CVR	L LDG LTS
CAPT ND	DME 1	RADAR 1

Note : 1. The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.
2. AP2 pushbutton light is lost. AP2 engagement can be checked on the FMA.

ELEC EMER CONFIG

LAND ASAP

– EMER ELEC PWR . . . . MAN ON

Displayed, only if the EMER GEN is not automatically coupled.

– ALL GEN . . . . OFF THEN ON

● **IF UNSUCCESSFUL :**

- BUS TIE . . . . OFF

  Setting the BUS TIE pushbutton to OFF segregates both generator channels.
- ALL GEN . . . . OFF THEN ON

  If the emergency generator is automatically or manually coupled, and if at least one generator is recovered, the DC and AC ESS buses are still supplied by EMER GEN.
  If normal aircraft supply is recovered through one GEN, or the APU GEN, select LAND RECOVERY ON for approach (recovery of LGCIU1, BSCU1, SFCC1, WHC1).
  Engine anti-ice is ON, regardless of the pushbutton's position, so fuel consumption increases by approximately 1.5 %.
- VHF 1/ATC 1 (if EMER GEN supplied by eng. hyd pumps) . . . . USE
- VHF 1 (if EMER GEN supplied by RAT) . . . . USE

  Only VHF 1, HF1, and ATC 1, are supplied in electrical emergency configuration. SELCAL is inoperative.
- VENT EXTRACT . . . . OVRD

  Switch EXTRACT OVRD, since the extract fan and cabin fans are lost.
- CTR TANK XFR BY GRAVITY

CTR TK UNUSABLE IF < 15 T

> CAUTION
> In case of discrepancies between airspeed indications on the Captain's PFD and on the standby indicator, disregard the standby indicator (probe not deiced).

Note : · *Only VOR 1 or ADF 1 (as selected on the DDRMI) is available. The ADF/VOR selector position on the FCU must be in accordance with the ADF/VOR selector on the DDRMI.*

⇩

ELEC EMER CONFIG (CONT'D)

- **WHEN SPD > 270 KT AND NOT IN CLIMB :**
  - T TANK MODE . . . . FWD

    Check that the pitch attitude is below 3 degrees. Fuel consumption increases by approximately 1%.

    Note : As fuel is fed from one side only, fuel balance must be monitored. To maintain fuel balance, L PUMP 2 can be selected off, then R PUMP 2 will automatically start (its corresponding FAULT light will go off).
  - WEIGHT/CG . . . . INITIALIZE
- **FOR SLATS EXTENSION :**
  - LAND RECOVERY . . . . ON

R *SFCC 1, LGCIU 1, BSCU 1, WHC1 are recovered. The remaining fuel pump is lost.*
- **FOR L/G GRVTY EXTN :**

  MAX SPEED . . . . 200 KT
  - L/G GRVTY EXTN . . . . DOWN
- **WHEN L/G DOWNLOCKED :**
  - L/G LEVER . . . . DOWN

    Note : In case of go-around, gear retraction is not available and CLIMB performance is degraded.

ELEC EMER CONFIG (CONT'D)

STATUS

SPD BRK . . . . DO NOT USE
MAX SPEED 330/.82
APPR PROC
- **FOR SLATS EXTENSION** :
  - LAND RECOVERY . . . . ON
- **AT SLATS EXTENSION** :
  - T TANK MODE . . . . AUTO
  - FOR LDG . . . . USE FLAP 3
- **FOR L/G GRVTY EXTN** :
  MAX SPEED . . . . 200 KT
  - L/G GRVTY EXTN . . . . DOWN
- **WHEN L/G DOWNLOCKED** :
  - L/G LEVER . . . . DOWN
- **WHEN L/G DN** :
  - MAN PITCH TRIM . . . . USE
    As Direct law becomes active at landing gear extension, the Automatic Trim is inoperative.
- **WHEN SPD > 270 KT AND NOT IN CLIMB (if T TK not empty)** :
  - T TANK MODE . . . . FWD
- LDG DIST PROC . . . . APPLY

ALTN LAW : PROT LOST
CONSIDER APU GEN USE (b)
INCREASED FUEL CONSUMP
ENG HI IDLE
CTR TK UNUSABLE IF < 15 T
CTR TO INR : MAN ONLY
CAT 1 ONLY

INOP SYS
F/CTL PROT
PRIM 2+3
RA 1+2
AP 2
VHF 2+3
HALF SPLRS
REVERSERS
ADR 2 (a)
CAT 2
N/W STRG
MOST F PUMPS (a)
GPS 2

ELEC EMER CONFIG (CONT'D)

(a) After LAND RECOVERY selection :

R · SLATS/FLAPS channel 1, LGCIU 1, BSCU 1 and WHC1 are recovered.
R But FLAPS remain lost, if ENG2 failed and IDG1 lost.

· Remaining fuel pump (L FUEL PUMP 2 or R FUEL PUMP 2) will stop.

· SLATS/FLAPS SLOW is displayed as information on STS.

· HF 1, AP 1 and ADR 3 are lost after LAND RECOVERY selection.

(b) Only in case of GEN or ENG failure. For this purpose, BUS TIE pushbutton must be switched back to AUTO.

Note : STATUS is simplified in ELEC EMER CONFIG ; only the most significant STS items are displayed.

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING		BAT ONLY	
		SUPPLIED BY ENG HYD PUMPS	SUPPLIED BY RAT	IN FLT	ON GND (IAS < 50 kt)
AIR COND PRESS VENT	PRESS AUTO SYS 1	Norm	Norm	Norm	Norm
	MAN PRESS CTL	Inop	Inop	Inop	Norm
	RAM AIR	Norm	Norm	Norm	Norm
	PACK VALVE	Norm	Norm	Norm	Norm
	AVIONIC VENT	OVBD only	OVBD only	OVBD only	OVBD only
	CARGO VENT	ISOL valve only	Inop	Inop	Inop
AUTO FLT	FMGC	1 only	Inop	Inop	Inop
	MCDU	1 only	Inop	Inop	3 only
	FCU	1 only	1 only	1 only	1 only
COM	VHF 1	Norm	Norm	Norm	Norm
	HF1	Norm ***	Inop	Inop	Inop
	RMP 1	Norm	Norm	Norm	Norm
	ACP (CAPT., F/O)	Norm	Norm	Norm	Norm
	CIDS	Norm	Norm	Norm	Norm
	INTERPHONE	Norm	Norm	Norm	Norm
	CVR	Norm	Inop	Inop	Inop
	LOUDSPEAKER 1+2	Norm	Norm	Norm	Norm
EIS	PFD 1	Norm	Norm	Norm	Norm
	ND 1	Norm	Inop	Inop	Inop
	ECAM upper DU	Norm	Norm	Norm	Norm
	DMC 1 or 3	Norm	Norm	Norm	Norm
	SDAC 1, FWC 1	Norm	Norm	Norm	Norm
	ECP	Norm	Norm	Norm	Norm
FLT INS	CLOCK	Norm	Norm	Norm	Norm

*** Shed, when the LAND RECOVERY pushbutton is ON.

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING		BAT ONLY	
		SUPPLIED BY ENG HYD PUMPS	SUPPLIED BY RAT	IN FLT	ON GND (IAS < 50 kt)
FIRE	ENG LOOPS	A only	A only	A only	A only
	APU LOOP	A only	A only	A only	A only
	CARGO SMOKE DET	1 only	Inop	Inop	Inop
	FIRE EXT. (Eng. Apu, Cargo)	Squib A	Squib A	Squib A	Squib A
	APU AUTO EXT.	–	–	–	Norm
FLT CTL	PRIM 1	Norm	Norm	Norm	Norm
	SEC 2	Norm	Norm	Norm	Norm
	SEC 1	Norm	Norm	Norm	Norm
	FCDC 1	Norm	Inop	Inop	Inop
	SFCC SLATS	1 only *	1 only *	1 only	1 only
	SFCC FLAPS	1 only *	Inop	Inop	Inop
	PITCH TRIM	1 only	Inop	Inop	Inop
	RUDD TRIM	Norm	Inop	Inop	Inop
	RUDD TRAVEL	Norm	Norm	Norm	Norm
FUEL	FCMC	1 only	Inop	Inop	2 only
	PUMPS	L PUMP 2 only *****	L PUMP 2 only *****	Inop	Inop
	X FEED	Mot 1 only	Mot 1 only	Mot 1 only	Mot 1 only
	LP VALVES	Mot 1 only	Mot 1 only	Mot 1 only	Mot 1 only
	XFR, ISOL VALVES	Norm	Norm	Norm	Norm
	AFT APU PUMP	Norm ***	Norm ***	Norm ***	Norm ***
	APU LP VALVE	Norm	Norm	Norm	Norm
	JETTISON	Inop	Inop	Inop	Inop

* Operative, when the LAND RECOVERY pushbutton is ON.

*** Shed when the LAND RECOVERY pushbutton is ON.

*****
- The crossfeed valve automatically opens.
- If the L PUMP 2 is inoperative, the R PUMP 2 takes over.
- The remaining pump is lost when LAND RECOVERY pushbutton is at ON.
  When supplied by the RAT only, the remaining pump is lost when the speed is below 260 knots.

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING		BAT ONLY	
		SUPPLIED BY ENG HYD PUMPS	SUPPLIED BY RAT	IN FLT	ON GND (IAS < 50 kt)
HYD	FIRE SOV/RAT CTL	Norm	Norm	Norm	Norm
ICE & RAIN	WING A. ICE	Norm	Inop	Inop	Inop
	ENG A. ICE	Open	Open	Open	Open
	CAPT PITOT	Norm	Norm	Norm	Norm
	WHC 1	Norm *	Inop	Inop	Inop
	CAPT AOA	Norm	Inop	Inop	Inop
	STBY AOA/PITOT	Norm ****	Inop	Inop	Inop
	RAIN REPEL ◁	Capt	Capt	Capt	Capt
L/G	LGCIU	1 only *	1 only *	1 only *	1 only
	GRVTY EXT	Norm	Norm	Norm	Norm
	IND. PANEL	Norm	Norm	Norm	Norm
	AUTO BRK/ANTI SKID	Inop/Norm *	Inop	Inop	Inop
	PARK BRK	Norm	Norm	Norm	Norm
LIGHTS	L LDG LT	Norm *	Inop	Inop	Inop

* Operative, when the LAND RECOVERY pushbutton is ON.
*** Shed, when the LAND RECOVERY pushbutton is ON.
**** Shed when the LAND RECOVERY pushbutton is ON, unless the AIR DATA selector is switched to “CAPT ON 3”. (This leads to loss of the autopilot).

ELEC EMER CONFIG SYS REMAINING		EMER GEN RUNNING — SUPPLIED BY ENG HYD PUMPS	EMER GEN RUNNING — SUPPLIED BY RAT	BAT ONLY — IN FLT	BAT ONLY — ON GND (IAS < 50 kt)
NAV	IR 1 and 3	Norm	Norm	Norm	Norm
	IR 2	5 min	5 min	5 min	5 min
	ADR 1	Norm	Norm	Norm	Norm
	ADR 3	Norm ****	Inop	Inop	Inop
	VOR or ADF ◁ **	1 only	1 only	1 only	1 only
	DME	1 only	Inop	Inop	Inop
	MMR	1 only	1 only	1 only	1 only
	DDRMI	Norm	Norm	Norm	Norm
	ATC	1 only	Inop	Inop	Inop
	RADAR	1 only ***	Inop	Inop	Inop
	ISIS	Norm	Norm	Norm	Norm
OXYGEN	CREW OXY valve ctl	Norm	Inop	Inop	Inop
	PAX OXY	Norm	Norm	Norm	Norm
PNEU	ENG BLEED	BMC 1 only	BMC 1 only	BMC 1 only	BMC 1 only
	X BLEED	man only	man only	man only	man only
APU		Norm	Norm	Norm	Norm
DOORS	SLIDES ARM/WARN	Norm	Norm	Norm	Norm
PWR PLT	FADEC's	A only	A only	A only	A only
	IGNITION	A only	A only	A only	A only
	REV	Inop	Inop	Inop	Inop
	HP VALVE closure	Norm	Norm	Norm	Norm

** Only VOR1 or ADF1 ◁ (as selected on DDRMI) is available at a time.
If the DDRMI is deactivated, only VOR1 is available on the ND (ADF1 will not be available, independently of the selection performed on the DDRMI).

*** Shed, when the LAND RECOVERY pushbutton is ON.

**** Shed when the LAND RECOVERY pushbutton is ON, unless the AIR DATA selector is switched to "CAPT ON 3". (This leads to loss of the autopilot).

ELEC DC BUS 1 FAULT

Crew awareness.

STATUS

PACK 1 AT FIXED TEMP
CAT 3 SINGLE ONLY

INOP SYS
See below

INOP SYS DISPLAYED ON ECAM

VHF 3	REV 1 (GE engine only)	G ELEC PUMP
ZONE CTLR 1	B ELEC PUMP	GND COOL
FUEL AFT XFR	PART GALLEY	PACKBAY VENT
L+R CAPT STAT HEAT	L FUEL STBY	C/B DISPLAY
L+R STBY STAT HEAT	R FUEL PUMP 2	ACP 3
R FUEL STBY	CAT 3 DUAL	TR 1
JETTISON		

OTHER INOP SYS

SELCAL	CAPT WIPER	Brake Temp ind. (5 to 8)
TPIS◁	DATA LOADER	RMP 3
BLOW DET	PART COCKPIT LTS	R LDG LTS
PACK 1 REGUL	HUD ◁	

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC DC BUS 2 FAULT

– AIR DATA SWTG (if ADR 3 AVAIL) . . . . F/O ON 3
– FM SOURCE . . . . BOTH ON 1
– SEC 2 . . . . KEEP ON

Note : SEC 2 FAULT light is unduly illuminated.

● **If CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :**
  – T TANK MODE . . . . FWD
  Note : If the trim tank pump is inoperative, apply the action if the CG is aft of 32 %, and when SPD is greater than 270 knots, and not in climb.

Secondary Failure
* F/CTL

STATUS

– SPD BRK . . . . DO NOT USE
● **IF CG AFT 32 % WHEN SPD > 270 KT AND NOT IN CLIMB**
  – T TANK MODE . . . . FWD
– LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.

BOTH PFD ON SAME FMGEC
PACK 2 AT FIXED TEMP
SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS
See below

INOP SYS DISPLAYED ON ECAM

PRIM 2+3	R WSHLD HEAT	AP 2 (FMGC 2)
BMC 2	R WNDW HEAT	VHF 2
ZONE CTLR 2	HALF SPLRS	LGCIU 2
FCDC 2	REV 2 (GE engine only)	FUEL AFT XFR
CAB PR 2	F/O TAT	L+R F/O STAT HEAT
GALLEY	FM 2	R FUEL PUMP 1
FCMC 2	TR 2	L FUEL PUMP 1
ENG 1+2 LOOP B	CAT 3 DUAL	BRAKES SYS 2
F T.TK PUMP	Y ELEC PUMP	

ELEC DC BUS 2 FAULT (CONT'D)

OTHER INOP SYS

PACK 2 REGUL	F/O WIPER	SFCC 2
SDCU 2	F/O RAIN REP.	RMP 2
BRAKE TEMP IND (1 to 4)	ENG 1+2 SQUIB B	PART COCKPIT LTS
CARGO SQUIB B	AUTOBRAKE	CDLS

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC DC ESS BUS FAULT

AC ESS SHED, DC ESS SHED and AC LAND RCVRY buses are also lost.
For AC ESS SHED and DC ESS SHED BUS FAULT, refer to corresponding cautions for additional procedures.

– ECAM SWTG DMC 3
To recover the STATUS page.
– PFD BARO REF : STD ONLY(a)
– AUDIO SWTG . . . . SELECT
– VHF 2 or 3/ATC 2 . . . . USE
– BARO REF . . . . CHECK
– GPWS . . . . OFF
(a) This line is only displayed, if the DC BUS 2 is also lost
In this case, the BARO REF .... CHECK line is not displayed.

Note : 1. To shut down the engines on ground, use the fire pushbutton.
2. Trim tank fuel may be unusable. Apply the TRIM TK UNUSABLE procedure.

STATUS

	INOP SYS
AVOID ICING CONDITIONS	See below
APPR PROC	
– GPWS FLAP MODE . . . . OFF	
– T TK UNUSBL PROC . . . . APPLY	
● **IF ICE ACCRETION**	
– APPR SPD . . . . VLS + 10 KT	
– LDG DIST PROC . . . . APPLY	
Refer to the QRH Part 2, or to the FCOM 3.02.80.	
BOTH PFD ON SAME FMGC	
SLATS/FLAPS SLOW	
CAT 1 ONLY	

INOP SYS DISPLAYED ON ECAM

WING A. ICE		CAB PR 1
AP 1	CAT 2	L FUEL PUMP 2
VHF 1	L WSHLD HEAT	GPWS
CAPT AOA	L WNDOW HEAT	FCDC 1
ACP 1+2	PART FCU	
HF 1	LGCIU 1	RUD TRIM 1
FM 1	FCMC 1	APU LOOP A
BRAKES SYS 1	ENG 1+2 LOOP A	

ELEC DC ESS BUS FAULT (CONT'D)

OTHER INOP SYS

CAPT ND	MCDU 1	HF 1
BMC 1	FLT INTERPHONE	STBY COMPASS
SFCC 1	L/G IND. PANEL	STBY HORIZON
RMP 1	CAPT RAIN REP	PAX OXY AUTO CTL
STBY ALTIMETER (vibrator)	ECP	SDCU 1
FCMC 2 (part)	APU	CVR
RADAR 1	DME 1	LANDING LTS CTL

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC DC ESS BUS SHED

AC ESS SHED BUS is also lost.
Refer to the corresponding caution for additional procedures and status.

– FM SOURCE . . . . BOTH ON 2

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

APPR PROC

– GPWS FLAP MODE . . . . OFF

● **IF ICE ACCRETION :**

– APPR SPD . . . . VLS + 10 KT

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

BOTH PFD ON SAME FMGC

FLAPS SLOW

CAT 3 SINGLE ONLY

INOP SYS

WING A. ICE
AP 1
CAPT AOA
FM 1
CAT 3 DUAL
BRAKES SYS 1
L WSHLD HEAT
ATC 1
L WNDOW HEAT
RUD TRIM 1
FCMC 1
JETTISON
See below

OTHER INOP SYS

FCMC 2 (part)	SFCC FLAPS 1	SDCU 1
STBY ALTIMETER	LANDING LTS CTL	

Note : The warning may be caused by a sub BUS failure. Consequently, only a part of the above-listed systems may be lost.

ELEC DC BUS 1 + 2 FAULT

– WING X FEED . . . . ON
Only the L FUEL PUMP 2 is supplied.
– FM SOURCE . . . . BOTH ON 1
– FUEL IMBALANCE . . . . MONITOR
To stop the imbalance, consider descent to FL 200 to use gravity feeding on the right side. In this case, close the WING X FEED.
CTK TANK XFR BY GRVTY
CTR TANK UNUSABLE IF < 15 T
● **IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB**
– T TANK MODE . . . . FWD

Secondary Failure
* F/CTL

STATUS

– SPD BRK . . . . DO NOT USE
APPR PROC
● **FOR L/G GRVTY EXTN :**
MAX SPEED . . . . 200 KT
– L/G GRVTY EXTN . . . . DOWN
● **WHEN L/G DOWNLOCKED :**
– L/G . . . . DOWN
● **IF CG AFT 32 % WHEN SPD > 270KT AND NOT IN CLIMB**
– TTK MODE . . . . FWD
– LDG DIST PROC . . . . APPLY
Refer to the QRH Part 2, or to the FCOM 3.02.80.
CTR TANK XFR BY GRVTY
CTR TANK UNUSABLE IF < 15 KT
R FUEL GRVTY FEED ONLY
ENG 1 AUTOSTART ONLY
ENG 2 AUTOSTART ONLY
PACKS AT FIXED TEMP
ENG HI IDLE
BOTH PFD ON SAME FMGC
SLATS/FLAPS LOW
CAT 3 SINGLE ONLY

ELEC DC BUS 1 + 2 FAULT (CONT'D)

INOP SYS

F/CTL PROT
See below

INOP SYS DISPLAYED ON ECAM

PRIM 2+3	AP 2	TR 1+2
VHF 2+3	HALF SPLRS	REVERSERS
GND COOL ◁	FUEL AFT XFR	L+R CAPT STAT HEAT
R WNDW HEAT	C/B DISPLAY	L+R F/O STAT HEAT
REAC W/S DET	L+R STBY STAT HEAT	FCDC 2
ACP 3	FCMC 2	FM 2
CAT 3 DUAL	ZONE REGUL	ENG 1+2 LOOP B
BRAKES SYS 2	R FUEL PUMPS	G ELEC PUMP
L FUEL PUMP 1	B ELEC PUMP	L FUEL STBY
Y ELEC PUMP	F TTK PUMP	F CTR PUMPS
BMC 2	LGCIU 2	R WSHLD HEAT
MAN CAB PR	N/W STRG	CAB PR 2
GALLEY		

OTHER INOP SYS

RMP 2+3	TPIS ◁	SDCU 2
PACK 1+2 REGUL	WIPERS	BLOW DET
SELCAL	BRAKE TEMP IND	CARGO SQUIB B
DATA LOADER	L/G SAFETY VALVE	ENG SQUIB B
R LDG LTS	PART COCKPIT LTS	SFCC 2
F/O RAIN REP	AUTOBRAKE	CDLS ◁

ELEC DC BAT BUS FAULT

ENG HI IDLE

Due to the loss of the EIVMUs.

STATUS

ENG 1 AUTO START ONLY
ENG 2 AUTO START ONLY
ENG 1 HI IDLE
ENG 2 HI IDLE
CAT 2 ONLY

INOP SYS

A/THR
REVERSERS
MAN CAB PR
APU LOOP B
See below

OTHER INOP SYS

APU SQUIB B | CAPT PHC | STBY PHC

ELEC BUS TIE OFF

The BUS TIE pushbutton is abnormally selected OFF.

Crew awareness.

ELEC AC ESS BUS ALTN (on ground)

Crew awareness.

AC ESS BUS is supplied from AC BUS 2, even if the AC ESS FEED pushbutton is set to normal.

Note : This alert is inhibited, when the AC ESS BUS FAULT caution is triggered.

COCKPIT DOOR FAULT

This procedure should be applied, if the Cockpit Door Locking System (CDLS) fails. This failure is indicated when the FAULT light on the center pedestal's CKPT DOOR panel comes on.

– CKPT DOOR CONT PANEL . . . . CHECK

This panel is located on the overhead panel. It is used to identify the faulty CDLS item, and to verify the status of the pressure sensors and the three electrical latches (referred to as strikes).

● **If two or more electrical latches (strikes) are faulty** :

The cockpit door is not intrusion-proof.

● **If two pressure sensors are faulty** :

Automatic latch release is unavailable, in case of cockpit decompression.

● **If no LED on the CKPT DOOR CONT panel is on** :

The CDLS control unit is faulty ; therefore, the cockpit door might unlock automatically. If it does not, consider using the mechanical override system to unlock the door.

Note : In case of a DC BUS 2 fault, no FAULT indication appears on the center pedestal's CKPT DOOR panel. The CDLS is not electrically-supplied, and is inoperative.

ENG 1(2) FIRE on ground

R – THR LEVERS .... IDLE

Full reverse may be used to stop the aircraft.

● **WHEN A/C IS STOPPED :**

– PARKING BRK .... ON

– ENG MASTER (affected) .... OFF

Associated LP and HP valves close.

– ENG FIRE P/B (affected) .... PUSH

· Aural warning stops

· ENG FIRE pushbutton remains on, as long as a fire is detected.

· FADEC is no longer supplied. So, the THR LEVERS...IDLE line reappears, even if the thrust levers are at idle.

– AGENT 1 + 2 .... DISCH

– ENG MASTER (opposite side) .... OFF

– ATC (VHF 1) .... NOTIFY

Notify ATC of the nature of the emergency, and state intentions.
Only VHF1 is available on batteries.

– CABIN CREW (PA) .... ALERT

● **IF EVAC RQRD :**

– EVAC COMMAND .... ON

– APU MASTER SW .... OFF

ENG 1(2) FIRE in flight

LAND ASAP

– THR LEVER (affected) . . . . IDLE
– ENG MASTER (affected) . . . . OFF
Associated LP and HP valves close.
– ENG FIRE P/B (affected) . . . . PUSH
· The aural warning stops.
· The ENG FIRE pushbutton remains on, as long as a fire is detected.
R *· The FADEC is no longer supplied.*
– ENG BLEED (affected Eng, if not automatically closed) . . OFF
– APU BLEED (only for Eng 1) . . . . OFF
– X BLEED (if not automatically closed) . . . . CLOSE
The affected side is isolated from any source of air.
– AGENT 1 AFTER 10 S . . . . DISCH
The 10–second delay allows N1 to decrease, reducing nacelle ventilation, and thereby increasing the effect of the agent. Automatic countdown on the ECAM.
– ATC . . . . NOTIFY
Notify ATC of the nature of the emergency, and state intentions.

● **IF FIRE AFTER 30 S :**
  – AGENT 2 . . . . DISCH
  Discharge the second agent, if the fire warning remains 30 seconds after the discharge of the first agent.

ENG 1(2) **SHUT DOWN**

Do not attempt to restart the engine.
For the after ENG SHUTDOWN procedure, see the ENG section (Refer to 3.02.70).

APU FIRE

LAND ASAP

– APU FIRE P/B . . . . PUSH
  · *APU LP valve closes.*
  · *Aural warning stops.*
  · *APU FIRE pushbutton remains lit, as long as fire is detected.*
– AGENT AFTER 10 S . . . . DISCH
  The 10–second delay allows the airflow to decrease, which increases the effect of the agent.
  Automatic countdown on the ECAM.
– APU MASTER SW . . . . OFF
  Do not attempt to restart the APU.

STATUS

INOP SYS
APU

ENG/APU FIRE LOOP A(B) FAULT

Crew awareness.

STATUS

INOP SYS
ENG 1(2)
LOOP A (B) or
APU LOOP A (B)

ENG/APU FIRE DET FAULT

Loss of both fire detection loops.
Crew awareness.

STATUS

INOP SYS
FIRE DET 1 (2) or
APU FIRE DET

SMOKE LAVATORY SMOKE

Crew awareness.
Maintain contact with the cabin crew to follow the status of the fire, and consider the emergency descent and smoke removal procedures.

SMOKE/TOXIC FUMES REMOVAL

· *Use the smoke removal procedure, if there is dense smoke, toxic fumes (smell), or if smoke generation cannot be stopped.*
If a scent similar to orange peels pervades the cockpit, suspect a toxic leak of rain repellent fluid. If the scent is similar to pine needles, suspect a non-toxic leak (⧏).

· *If there is smoke in the cabin, it may be necessary to make a PA announcement to minimize apprehension.*

– OXY MASK/GOGGLE .... ON/100 %/EMERG
Ensure crew communication is established. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.
Turn the emergency knob to remove condensation or smoke from the mask.

– SEAT BELTS/NO SMOKING .... ON

– CAB FANS .... OFF
To prevent smoke from entering the cockpit and cabin.

– PACK FLOW .... HI
To provide maximum airflow from the packs.
Do not shut down the air conditioning packs, and do not reduce ventilation in an attempt to smother the fire.
Do not deploy oxygen masks, if fire is suspected in the cabin.

● **If cockpit window opening required :**
Unless dense smoke is in the cockpit, do not open the cockpit window to evacuate the smoke.

– LDG ELEV .... 10000 FT/MEA

– DESCENT (FL 100 or MEA or minimum obstacle clearance altitude) .... INITIATE

R *Descent is initiated to FL100, or the MEA, or the minimum obstacle clearance altitude, while the cabin altitude is increased to 10000 feet or MEA.*
The increase in cabin altitude also reduces, at least temporarily, the smoke concentration.
Cabin depressurization starts when descent is initiated.
Passenger oxygen, as required by regulation.

– ATC .... NOTIFY

⇩

SMOKE/TOXIC FUMES REMOVAL (CONT'D)

- **At FL 100 or MEA :**
  - PACK 1+2 .... OFF

    It is not possible to open the cockpit window when the packs are ON.
  - MODE SEL .... MAN
  - R MAN VALVE SEL .... BOTH
  - R MAN V/S CTL .... FULL UP
  - RAM AIR .... ON
    - *At FL100, or MEA, or minimum obstacle clearance altitude, it is possible to open the RAM AIR valve, when $\triangle$P is 1 psi or below. RAM AIR does not assist smoke removal, but allows flying with both packs OFF (after window opening).*
  - MAX SPD .... 230 KT
  - HEADSETS .... ON
  - COCKPIT WINDOW .... OPEN

CAUTION

Due to the increased noise level, pay particular attention to visual warnings.

SMOKE FWD CRG SMOKE

Note : If the warning has been temporarily displayed and no crew action has been taken, normal cargo ventilation may be recovered when ventilation is required for livestock transportation, by a reset of both ventilation controller channels.

LAND ASAP

– FWD ISOL VALVE (if not automatically closed) . . . . OFF ◁
– FWD AGENT . . . . DISCH
– FWD CRG COOLING . . . . OFF ◁

Note :
· Expect the SMOKE warning to remain after agent discharge, even if the smoke source is extinguished. Gases from the smoke source are not evacuated, and smoke detectors are also sensitive to the extinguishing agent. Once isolation valves are closed, the cargo is not ventilated, thus the cargo temperature is unreliable.
Order the ground crew not to open the door of affected cargo compartment, unless the passengers have disembarked and fire services are present.
· If SMOKE warning is displayed on ground with the cargo compartment door open, do not initiate AGENT DISCHARGE. Request the ground crew to investigate and eliminate the smoke source.
· On ground, the warning may be triggered due to a high level of humidity. Provided the smoke is not visually confirmed :
– Deactivate the smoke detection system by pulling the SDCU 1 and 2 reset buttons.
– Reset the cargo ventilation system using the VENT CONT 1 and 2 reset buttons.
– At cargo doors closure, reactivate SDCU 1 and 2.

STATUS

INOP SYS
FWD CRG VENT◁
FWD CRG HEAT◁
FWD CRG TEMP◁
FWD CRG COOL◁

SMOKE FWD (AFT) CRG BTL 1(2) FAULT

Crew awareness.

SMOKE AFT/BULK CRG SMOKE

LAND ASAP

- AFT ISOL VALVE .... OFF◁
- BULK ISOL VALVE (if not automatically closed) .... OFF
- CAB REST .... EVACUATE ◁
- CAB REST DOORS .... CLOSE ◁
- AFT AGENT .... DISCH ◁

Note : Refer to the notes in the FWD CRG SMOKE procedure. They are applicable to the AFT/BULK CRG SMOKE procedure.

STATUS

INOP SYS
AFT CRG VENT◁
BULK VENT
BULK HEAT◁

SMOKE LAVATORY DET FAULT

Toilet smoke detection is lost.

Crew awareness.

STATUS

INOP SYS
LAV DET

SMOKE FWD (AFT/BULK) CRG DET FAULT

● **IF NO LIVESTOCK :**
- AFT ISOL VALVE .... OFF
- BULK ISOL VALVE .... OFF◁

STATUS

INOP SYS
BULK VENT
AFT CRG VENT◁
BULK CRG DET
AFT CRG DET
FWD CRG DET

SMOKE DET FAULT

Both SDCU channels fail. Avionics, cargo, and toilet smoke detection are lost.

– BULK AVNCS . . . . OFF ◁
– PAX SYS . . . . OFF ◁

This will confirm the automatic cut-off of the power supply.

● **IF NO LIVESTOCK :**

– FWD and AFT ISOL VALVE . . . . OFF ◁
– BULK ISOL VALVE . . . . OFF
– FWD CRG COOLING . . . . OFF ◁

STATUS

INOP SYS
SMOKE DET
CRG VENT

SMOKE AVIONICS DET FAULT

Avionics compartment smoke detection is lost.

Crew awareness.

STATUS

INOP SYS
AVNCS DET

SMOKE AVNCS VENT SMOKE

The description of this procedure is included in the SMOKE/AVNCS SMOKE procedure. (Refer to FCOM 3.02.26 p. 9).

SMOKE/AVNCS SMOKE

This procedure is applicable, in case of suspected smoke from the avionics compartment, air conditioning, or cabin equipment. The flight crew should apply this paper procedure, if smoke is detected with or without "AVNCS VENT SMOKE" ECAM activation.

This paper procedure includes all the steps of the AVNCS VENT SMOKE ECAM procedure. Therefore, if the ECAM procedure is displayed, it may be applied, if smoke from avionics is suspected. However, if non-avionics smoke is suspected, the flight crew will refer to the paper procedure.

The procedure layout is organized as follows :

- *The first lines (before the text box) correspond to immediate actions, which must be performed by the crew as soon as smoke is detected (with or without ECAM activation, whatever the smoke source). These immediate actions enable the crew to quickly refer to the steps, most commonly adopted in smoke-related cases.*
- *The text box indicates the immediate procedure to be applied by the crew when, at any time of the procedure, the smoke is so dense that they are no longer able to determine the smoke source and smoke removal is required.*
- *The last part of the procedure corresponds to specific actions to be applied by the crew, once the smoke source has been identified.*

R *In case of a CARGO or LAVATORY (or other area equipped with smoke detectors) SMOKE ECAM warning, without any smoke detected in the cockpit/cabin, directly apply the ECAM/QRH procedure. Note that these warnings may be caused by some other source, that should, ordinarily, first be detected by the flight crew/cabin crew/avionics smoke detectors.*

LAND ASAP

APPLY IMMEDIATELY :

- VENT EXTRACT . . . . OVRD
  Avionics ventilation air is extracted overboard.
- CAB FANS . . . . OFF
  To prevent smoke from entering the cockpit and cabin.
- GALLEYS . . . . OFF

● **IF REQUIRED**

  - CREW OXY MASKS ON/100%/EMERG
    Ensure crew communication is established. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.
    Turn the emergency knob to remove condensation or smoke from the mask.

- FAULTY EQUIPT (if identified) . . . . ISOLATE

⇩

SMOKE/AVNCS SMOKE (CONT'D)

GFC5-03-0226-010-A105AA

● IF DENSE SMOKE, at any time of the procedure :
- DESCENT for smoke removal........................INITIATE
- SMOKE/TOXIC FUMES REMOVAL...........................APPLY
- ELEC EMER CONFIG..................................CONSIDER

Refer to the end of the procedure to set ELEC EMER CONFIG

Guidelines to determine smoke origin :

- *If smoke initially comes out of the cockpit's ventilation outlets, or if smoke is detected in the cabin, the crew may suspect an AIR COND SMOKE. In addition, very shortly thereafter, several SMOKE warnings (cargo, lavatory, avionics) will be triggered. The displayed ECAM procedures must therefore be applied.*
- *Following an identified ENG or APU failure, smoke may emanate from the faulty item through the bleed system and be perceptible in the cockpit or the cabin. In that case, it will be re-circulated throughout the aircraft, until it completely disappears from the air conditioning system.*
- *If only the AVIONICS SMOKE warning is triggered, the crew may suspect AVIONICS SMOKE.*
- *If the AVIONICS SMOKE warning is triggered, while an equipment is declared faulty, the crew may suspect that smoke is coming from this equipment.*

■ **IF AIR COND SMOKE SUSPECTED :**

- APU BLEED .... OFF
- VENT EXTRACT .... AUTO

  Note : When VENT EXTRACT is in the OVRD position, a single pack may not be able to maintain cabin pressure.

- PACK 1 .... OFF

● **If smoke persists :**

- PACK 1 .... ON
- PACK 2 .... OFF
- CRG FWD ISOL VALVE .... OFF

  To prevent a cargo smoke warning from being triggered by smoke coming from the cabin.

● **If smoke still persists :**

- PACK 2 .... ON

  If the crew suspects that the smoke does not come from Pack 2, normal pack configuration can be restored.

- VENT EXTRACT .... OVRD

- SMOKE/TOXIC FUMES REMOVAL .... CONSIDER

SMOKE/AVNCS SMOKE (CONT'D)

■ **IF CAB EQUIPMENT SMOKE SUSPECTED :**

– PAX SYS . . . . OFF

● **If smoke persists :**

– EMER EXIT LT . . . . ON

To recover minimum cabin lighting when the COMMERCIAL will be switched OFF.

– COMMERCIAL . . . . OFF

– SMOKE/TOXIC FUMES REMOVAL . . . . CONSIDER

● **IF SMOKE SOURCE CANNOT BE DETERMINED AND STILL PERSISTS :**

Consider shedding the AC BUS bar on one side. Then, if unsuccessful, ON the other. When it is clear that the shedded side is not involved, reconnect it.

● **AC BUS 1 can be shed as follow :**

– ECAM/ND SEL . . . . F/O

The ECAM SD will be lost during the sequence. Switching is necessary to allow ELEC page monitoring.

– ELEC/AC page . . . . SELECT

– BUS TIE . . . . OFF

The BUS TIE OFF caution is triggered after 5 seconds.

– GEN 2 . . . . CHECK ON

– AC ESS FEED . . . . ALTN

This action avoids autopilot and autothrust disconnection during electrical transients.

– GEN 1 . . . . OFF

ECAM SD is lost.

Note : If this electrical configuration is maintained, Captain's Total Air Temperature and angle-of-attack, standby angle-of-attack and pitot are not deiced.
PFD1 and STBY instruments may display erroneous data in icing conditions. Use PFD 2.

● **AC BUS 2 can be shed as follows :**

– BUS TIE . . . . CHECK OFF

– GEN 1 . . . . ON

– AC ESS FEED . . . . NORM

– ECAM/ND SEL . . . . NORM

– GEN 2 . . . . OFF

PFD2 and ND2 are lost.

SMOKE/AVNCS SMOKE (CONT'D)

TO SET ELEC EMER CONFIG :

- EMER ELEC PWR . . . . MAN ON

● **WHEN EMER GEN AVAIL** :

- GEN 1 . . . . OFF
- GEN 2 . . . . OFF
- APU GEN . . . . OFF

ELEC **EMER CONFIG**

APPLY ECAM PROCEDURE WITHOUT PERFORMING THE GEN RESET.

SMOKE CAB REST SMOKE

- **If SMOKE is in the LDMCR compartment :**
  - CAB REST DOORS . . . . CLOSE

    If it is not possible to fight the smoke source, evacuate and close the hatch. Confirm activation of the crew rest compartment's internal fire extinguishing system.

    Maintain contact with the cabin crew to follow up on the status of the fire, and consider the emergency descent and smoke removal procedures.

    Note : If, in flight, the warning has been temporarily displayed and identified as a false warning, crew rest compartment ventilation may be recovered by resetting both VENT controller channels.

SMOKE FLT REST SMOKE

Crew awareness.

Maintain contact with the cabin crew to follow up on the status of the fire, and consider the emergency descent and smoke removal procedures.

SMOKE FLT (CAB) REST DET FAULT

Crew awareness.

Smoke detection is lost in the upper (lower) deck crew rest compartment.

STATUS

INOP SYS

FLT REST DET
(CAB)

SMOKE IFE BAY SMOKE

LAND ASAP

– PAX SYS .... OFF

SMOKE IFE BAY DET FAULT

Smoke detection is lost in the IFE bay.

– PAX SYS .... OFF

STATUS

INOP SYS

IFE BAY DET

SMOKE BULK REST SMOKE ◁

LAND ASAP

Crew awareness.

Maintain contact with the cabin crew to follow up on the status of the fire, and consider applying the emergency descent and smoke removal procedures.

SMOKE BULK DET FAULT ◁

BULK REST

Crew awareness that Bulk rest detection is faulty.

Bulk rest smoke detection is lost.

STATUS

INOP SYS

BLK REST DET

SMOKE BULK REST BTL 1(2) ◁

Crew awareness that Bulk Rest Bottle 1(2) is faulty.

F/CTL SLAT SYS 1(2) FAULT

Crew awareness

STATUS

SLATS SLOW

F/CTL FLAP SYS 1(2) FAULT

Crew awareness

STATUS

R ● **In case of FLAP SYS 1 FAULT**
R APPR PROC :
R – GPWS FLAP MODE . . . . OFF
R *Flap position signal to GPWS is lost.*
R FLAPS SLOW

F/CTL SLAT (FLAP) TIP BRK FAULT

Failure of one slat or flap wing tip brake.

Crew awareness

Note : The "SLAT (FLAP) TIP BRK FAULT" warning is triggered when the automatic test has not been performed during the last 10 days.
This warning being classified as a NO GO item in the MMEL it will have to be
R *corrected prior to the next flight. This can be done on ground by manually launching the WTB engagement test accessing the CMS through the MCDU.*

STATUS

SLATS (FLAPS) SLOW

F/CTL L (R) SIDESTICK FAULT

Crew awareness

CONFIG L (R) SIDESTICK FAULT (BY TAKE OVER)

The warning is triggered on ground, if either stick is inoperative (takeover pushbutton is pressed for more than 30 seconds.).

– L (R) TAKE OVER . . . . DEPRESS
  The affected stick becomes operative.

F/CTL SLATS FAULT/LOCKED

For landing with slats jammed, see OPERATING TECHNIQUES (Refer to 3.02.10).
The autopilot may be used down to 500 feet AGL. As it is not tuned for abnormal configurations, its behavior can be less than optimum and must be monitored.

MAX SPEED . . . . Refer to figure on page 4
Speed is limited to the VFE corresponding to the next slat position.

● **WHEN SPEED BELOW VFE :**

– FLAPS LEVER (if slats not locked) . . . . RECYCLE
  Return to the previous selection, then back to the desired position.
  Note : If slats' fault following double SFCC slats channel failure, ALTN law becomes active (refer to associated procedure). Speed limits are lost on PFD.

STATUS

MAX SPEED . . . . See page 4

APPR PROC :

– GPWS FLAP MODE (if slats < 2) . OFF
– S/F JAMMED PROC . . . . APPLY
  Refer to the S/F JAMMED paper procedure (QRH Part 2, or FCOM 3.02.10) for managing the approach, and be prepared for a go-around.
  The ECAM procedure (below) just provides the final flap lever selection for landing, depending on the failed slats' position.

■ **If SLATS < 2 :**
  – FOR LDG . . . . USE FLAP 2

■ **If SLATS ≥ 2 :**
  – FOR LDG . . . . USE FLAP 3
    Do not select CONF FULL, so as to not degrade handling qualities.

– LDG DIST PROC (See page 4) . . APPLY
  Landing distance is increased, due to the increase in approach speed.

INOP SYS

SLATS

F/CTL FLAPS FAULT/LOCKED

For landing with flaps jammed, see OPERATING TECHNIQUES (Refer to 3.02.10).
The autopilot may be used down to 500 feet AGL. As it is not tuned for abnormal configurations, its behavior can be less than optimum and must be monitored.

MAX SPEED . . . . refer to figure on page 4
Speed is limited to the VFE corresponding to the next flap position

● **WHEN SPEED BELOW VFE :**

– FLAPS LEVER (if flaps not locked) . . . . RECYCLE
Return to the previous selection, then back to the desired position.
Note : In case of FLAPS FAULT, when idle is selected, approach idle is set on all engines. If flaps' fault following dual SFCC failure, ALTN law becomes active (refer to associated procedure). Speed limits are lost on the PFD.

STATUS

MAX SPEED . . . . See page 4
APPR PROC :
– GPWS FLAP MODE (if flaps < 3) . OFF
– S/F JAMMED PROC . . . . APPLY
Refer to the S/F JAMMED paper procedure (QRH Part 2, or FCOM 3.02.10) for managing the approach, and be prepared for a go-around.
The ECAM procedure (below) just provides the final flap lever selection for landing, depending on the failed flaps' position.

■ **If FLAPS < 3 :**
– FOR LDG . . . . USE FLAPS 2
Selecting FLAPS 2, instead of FLAPS 3, enables the PFD's VMAX display to be increased.

■ **If FLAPS = 3 :**
– FOR LDG . . . . USE FLAP 3

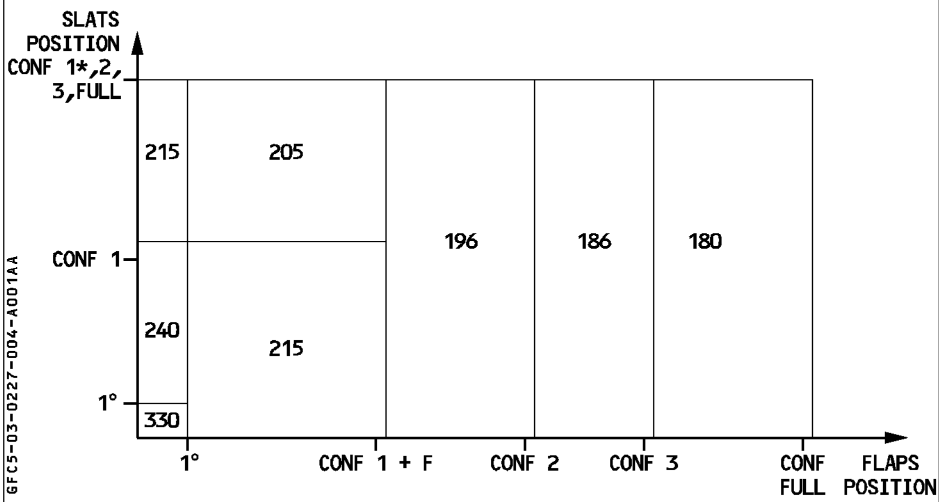
■ **If FLAPS > 3 :**
– FOR LDG . . . . USE FLAP FULL

– LDG DIST PROC (See page 4) . . APPLY
Landing distance may be increased, due to the increase in approach speed.

INOP SYS
FLAPS

FLAPS/SLATS FAULT/LOCKED

This figure gives the MAX SPEED value displayed on ECAM in case of failure for all Slats/Flaps positions.



R

VLS/LDG DIST					
	0 ≤ Flaps < 1+F	1+F ≤ Flaps < 2	2 ≤ Flaps < 3	3 ≤ Flaps < FULL	Flaps FULL
0 ≤ Slats < 1 DRY RWY	VREF + 50 DIST. × 1.7	VREF + 40 DIST. × 1.6	VREF + 30 DIST. × 1.4	VREF + 25 DIST. × 1.3	VREF + 25 DIST. × 1.3
1 ≤ Slats < 2 DRY RWY	VREF + 30 DIST. × 1.5	VREF + 20 DIST. × 1.3	VREF + 15 DIST. × 1.2	VREF + 10 DIST. × 1.2	VREF + 10 DIST. × 1.2
Slats = 2 DRY RWY	VREF + 30 DIST. × 1.5	VREF + 15 DIST. × 1.3	VREF + 10 DIST. × 1.2	VREF + 5 DIST. × 1.1	VREF

CAUTION

For flight with SLATS/FLAPS extended, fuel consumption is increased. Refer to fuel flow indication.
As a guide line, determine the fuel consumption in clean configuration at same altitude without airspeed limitation (e.g. from ALTERNATE FLIGHT PLANNING TABLES) and multiply this result by 1.5 (SLATS EXTENDED) or 2.2 (FLAPS EXTENDED) or 2.5 (SLATS and FLAPS EXTENDED) to give the fuel consumption required to reach the destination in the current configuration.

CONFIG SLATS (FLAPS) NOT IN T.O CONFIG

Crew awareness

F/CTL LVR OUT OF DETENT

The flaps lever is between two detents.

Crew awareness

F/CTL FLAP/MCDU DISAGREE

This caution is triggered when pressing the T.O CONFIG TEST pushbutton in phase 2 or at take off initiation if the flap lever position and the FLAPS position as entered on the PERF T.O MCDU page are different.

Crew awareness

R

F/CTL FLAP LVR NOT ZERO

The flap lever is not at zero when altitude is above 22000 ft.

F/CTL PRIM 1(2)(3) FAULT

– PRIM (affected) . . . . OFF THEN ON

● **IF UNSUCCESSFUL:**

– PRIM (affected) . . . . OFF

● **In case of dual PRIM failure :**

– SPD BRK . . . . DO NOT USE

In case of a third PRIM failure : If the speedbrakes are out, they immediately retract, inducing a strong pitch down effect.

● **If CG AFT 32 % :**

– T TANK MODE . . . . FWD

Fuel consumption is increased by approximately 1%.

Note : If the trim tank pump is inoperative, this part of the procedure is replaced by:

· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :

– T TANK MODE .... FWD

STATUS

● **In case of an all PRIM failure :**

RUD WITH CARE ABV 160 KT

The rudder travel limit value is frozen at its value, at the time when the failure occurred. Therefore, rudder inputs must be limited, at speeds above 160 knots, so as not to damage structure. At slats extension, full rudder travel authority is recovered.

● **In case of a dual or an all PRIM failure :**

– SPD BRK . . . . DO NOT USE

● **If CG AFT 32 % :**

– T TANK MODE . . . . FWD

Note : If the trim tank pump is inoperative, this part of the procedure is replaced by:

· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :

– T TANK MODE .... FWD

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

CAT 3 SINGLE ONLY

INOP SYS

PRIM 1(2)(3)
PART (HALF, MOST) SPLRS
CAT 3 DUAL (PRIM 1 or PRIM 2 failure)
REVERSERS (if PRIM 1+3 failure)
SPD BRK (all PRIM failure)
GND SPLRS (all PRIM failure)
AP 1+2 (all PRIM failure)
RUD TRV LIM (all PRIM failure)

F/CTL SEC 1(2) FAULT

– SEC (affected) . . . . OFF THEN ON

● **IF UNSUCCESSFUL** :

– SEC (affected) . . . . OFF

STATUS

	INOP SYS
CAT 1 ONLY(a) CAT 3 SINGLE ONLY	PART SPLRS SEC 1 (2) CAT 3 DUAL AP 1+2(a) RUD TRIM 1 (2)(a)

(a) In case of a dual SEC failure, RUD TRIM and AP 1+2 are lost.

LOW ENERGY WARNING

The "SPEED SPEED SPEED" synthetic voice is triggered every 5 seconds, each time the aircraft's energy goes lower than a threshold under which thrust shall be increased to recover a positive flight path angle.

– THR LEVERS . . . . PUSH

Increase thrust, until the warning disappears.

F/CTL ALTN LAW (PROT LOST)

Maneuver protections (pitch, bank) are lost, high speed and high AOA protections are degraded, and the load factor protection is maintained.

SPD BRK (in case of EMER ELEC CONFIG) . . . . DO NOT USE

MAX SPEED 330/.82

Speed is limited, due to degraded high speed protection.

Note : In case of EGPWS alerts, since protections are lost, respect the stall warning when applying the EGPWS procedure.

STATUS

	INOP SYS
MAX SPEED . . . . 330/.82 APPR PROC : – FOR LDG . . . . USE FLAP 3 ALTN LAW : PROT LOST	F/CTL PROT

F/CTL DIRECT LAW (PROT LOST)

The PFD displays "USE MAN PITCH TRIM" in amber.

SPD BRK . . . . DO NOT USE

MAX SPEED 330/.80

Note : In case of EGPWS alerts, since protections are lost, respect stall warnings when applying the EGPWS procedure.

Speed is limited, due to the loss of high speed protection.

Do not exceed M.80, so as not to degrade handling qualities.

– MAN PITCH TRIM (except if B + Y HYD LO PR) . . . . USE

Automatic trim is inoperative in direct law.

MANEUVER WITH CARE

Use small control inputs at high speed since, in direct law, the controls are powerful. Use of manual thrust is recommended. Avoid large thrust changes.

● **If CG AFT 32 % :**

– T TANK MODE . . . . FWD

Fuel consumption is increased by approximately 1%.

Note : If the T TK pump is inoperative, this part of the procedure is replaced by :

· IF CG AFT 32 %, AND WHEN SPD > 270 KT AND NOT IN CLIMB :

– T TANK MODE .... FWD

STATUS

SPD BRK . . . . DO NOT USE

MAX SPEED 330/.80

MANEUVER WITH CARE

APPR PROC :

– FOR LDG . . . . USE FLAP 3

– MAN PITCH TRIM . . . . USE

(Except, if B + Y HYD LO PR)

● **If CG AFT 32 % :**

– T TANK MODE . . . . FWD

Note : 1. If the T TK pump is inoperative, this part of the status is replaced by :

· IF CG AFT 32 %, AND WHEN SPD > 270 KT AND NOT IN CLIMB :

– T TANK MODE .... FWD

2. If trim tank transfer is unavailable, consider descending to a lower altitude, where controllability is improved.

DIRECT LAW : PROT LOST

CAT 1 ONLY

INOP SYS

F/CTL PROT

AP 1 + 2

F/CTL ELEV REDUND LOST

This caution is triggered, in case of dual failure cases, when a subsequent third failure affecting the F/CTL system may lead to degraded pitch control, or to pitch mechanical backup. Certain failure combinations lead to an aileron preset to limit the pitch up effect, in case of a third failure. If this third failure occurs, the ELEV REDUND LOST PROC and
R *associated FL and speed limitations no longer apply. In this case, the MAN PITCH TRIM ONLY message is displayed. It is recommended that the autothrust be disconnected to improve longitudinal control of the aircraft.*

■ **Ailerons are preset upwards**

The autopilot is not available.

– SPD BRK . . . . DO NOT USE
– MAX FL 350
– MAX SPEED M0.80

● **WHEN SPD > 270 KT AND NOT IN CLIMB** :

– T TANK MODE . . . . FWD

Displayed if the trim tank pump is failed. In case of an engine-out, the aileron preset is cancelled, and the autopilot may be recovered. Apply normal engine-out procedures. Below 2000 feet RA, or when in CONF ≥ 2, the aileron preset is cancelled. The autopilot is available (provided, it is not lost due to another failure, such as an elevator failure).

STATUS

R SPD BRK . . . . DO NOT USE R MAX FL . . . . 350 R MAX SPEED . . . . M0.80 R ● **WHEN SPD>270KT AND NOT IN** R **CLIMB** : R – T TANK MODE . . . . FWD R *Displayed, if the trim tank pump is failed.* R APPR PROC R ● **AT SLATS EXTENSION** R – T TANK XFR . . . . AUTO R – LDG DIST . . . . PROC APPLY R AP MAY BE AVAIL IN CONF 2 R UNDUE AFT CG WARNG RISK R FUEL CONSUMP : + 16 % R CAT 3 SINGLE ONLY R ● **IF NEW F/CTL FAILURE** : R EXPECT MAN P. TRIM ONLY	INOP SYS CAT 3 DUAL

F/CTL ELEV REDUND LOST (CONT'D)

Note : The STATUS and the INOP SYS list is completed according to the failures, which led to the loss of elevator redundancy (green system, PRIM 2 or SEC 2).

■ Ailerons are not preset

The autopilot is available

- SPD BRK . . . . DO NOT USE
- MAX FL 300
- MAX SPEED M0.75

● **WHEN SPD > 270 KT AND NOT IN CLIMB :**

- T TANK MODE . . . . FWD

  Fuel consumption is increased by approximately 1 %.
  Displayed, if the trim tank pump is failed.

STATUS

SPD BRK . . . . DO NOT USE	INOP SYS
MAX FL 300	CAT 3 DUAL
MAX SPEED M0.75	
● **WHEN SPD > 270 KT AND NOT IN CLIMB :**	
– T TANK MODE . . . . FWD	
Displayed, if the trim tank pump is failed.	
APPR PROC	
● **AT SLATS EXTENSION**	
– T TANK XFR . . . . AUTO	
– LDG DIST . . . . PROC APPLY	
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*	

Note : The STATUS and the INOP SYS list is completed according to the failures, which led to the loss of elevator redundancy (green system, PRIM 2 or SEC 2).

F/CTL STAB CTL FAULT

– MAN PITCH TRIM . . . . CHECK

The force needed on the PITCH TRIM wheel may be higher than usual (pre-takeoff manual setting).

● **IF MAN TRIM AVAIL** :

– TRIM FOR NEUTRAL ELEV

If man pitch trim is available, trim to maintain elevator at zero position (indications on ECAM F/CTL page).

To improve the longitudinal control of the aircraft, it is recommended that the autothrust be disconnected.

● **IF TRIM LOCKED > 8 UP** :

MAX SPEED . . . . 180 KT

If trim is locked above 8 degrees UP, pitch down authority may be insufficient for speed above 180 knots.

Select the configuration, as appropriate. Fuel consumption is increased.

F/CTL ALTN LAW (PROT LOST)

MAX SPEED 330/.82

STATUS

MAX SPEED 330/.82

● **IF TRIM LOCKED > 8 UP** :

MAX SPEED . . . . 180 KT

APPR PROC :

– FOR LDG . . . . USE FLAP 3

● **IF MAN TRIM NOT AVAIL** :

– PITCH AUTHORITY REDUCED

Start the flare slightly earlier. More stick deflection may be needed to achieve the flare.

– GPWS FLAP MODE . . . . OFF

– FOR LDG . . . . USE FLAP 2

Do not select CONF FULL, or CONF 3, so as not to degrade handling qualities.

– APPR SPD . . . . VLS + 10 KT

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST

CAT 1 ONLY

INOP SYS

F/CTL PROT

AP 1 + 2

F/CTL SPLR FAULT

Loss of one or more spoilers.

Crew awareness

STATUS

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

INOP SYS

PART SPLRS (HALF) (MOST) (ALL)

F/CTL GND SPLR FAULT

Crew awareness

STATUS

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

INOP SYS

GND SPLRS

F/CTL SPD BRK FAULT

Loss of speedbrake surfaces, due to failure of speedbrake lever transducer. In addition, associated ground spoilers are only available through reverse selection.

Crew awareness

STATUS

INOP SYS

SPD BRK

F/CTL SPD BRK DISAGREE

Disagree between the spoiler position and the speedbrake lever order.

– SPD BRK LEVER . . . . RETRACT

SPD BRK . . . . DO NOT USE

STATUS

SPD BRK . . . . DO NOT USE

F/CTL SPD BRK STILL OUT

The speedbrakes are commanded to extension and the engines are not at idle.

CONFIG SPD BRK NOT RETRACTED

Crew awareness.

F/CTL L (R) ELEV FAULT

Failure of one elevator or elevator frozen at zero subsequent to elevator oscillation detection. In the latter case, the ECAM caution will require that the autopilot be disconnected during the approach to get sufficient pitch authority.

SPD BRK . . . . DO NOT USE

F/CTL ALTN LAW (PROT LOST)

MAX SPEED 330/.82

STATUS

SPD BRK . . . . DO NOT USE
MAX SPEED 330/.82
APPR PROC :
- **If elevator oscillation is detected** :
  - AP . . . . OFF
- GPWS FLAP MODE . . . . OFF
- FOR LDG . . . . USE FLAP 2
- APPR SPD . . . . VLS + 10 KT
- LDG DIST PROC . . . . APPLY
  Refer to the QRH Part 2, or to the FCOM 3.02.80.

ALTN LAW : PROT LOST
CAT 1 ONLY

INOP SYS
F/CTL PROT
AP 1 + 2 (a)
L (R) ELEV

(a) Not displayed, in case the elevator is frozen at zero, subsequent to elevator oscillation.

F/CTL ELEV SERVO FAULT

Crew awareness.
The remaining servojack controls the elevator.

STATUS

CAT 3 SINGLE ONLY

INOP SYS
CAT 3 DUAL

F/CTL L + R ELEV FAULT

PITCH MECH BACK UP
SPD BRK .... DO NOT USE
Do not use speed brakes because it is difficult to control induced pitch moment with manual pitch trim only.
MAX SPEED 305/.80
Due to loss of high speed protections.
– MAN PITCH TRIM .... USE
Only manual trim is available for pitch control.
To improve the longitudinal control of the aircraft, it is recommended to disconnect the autothrust.
MANEUVER WITH CARE
● **IF CG AFT 32 % :**
– T. TANK MODE .... FWD
Fuel consumption is increased by approximately 1%.
Note : If the T TK pump is inoperative, this part of the procedure is replaced by :
· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :
– T TANK MODE .... FWD

STATUS

SPD BRK .... DO NOT USE
MAX SPEED 305/.80
MANEUVER WITH CARE
APPR PROC :
– GPWS FLAP MODE .... OFF
– FOR LDG .... USE FLAP 2
Do not select CONF FULL so as not to degrade handling qualities.
– APPR SPD .... VLS + 10 KT
– MAN PITCH TRIM .... USE
● **IF CG AFT 32% :**
– T TANK MODE .... FWD
Note : If the T TK pump is inoperative, this part of the procedure is replaced by :
· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :
– T TANK MODE .... FWD
– LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
PITCH MECH BACK UP
ROLL DIRECT LAW
CAT 1 ONLY

INOP SYS
L + R ELEV
F/CTL PROT
AP 1 + 2

F/CTL AIL SERVO FAULT

Crew awareness.

F/CTL L (R) INR (OUTR) AIL FAULT

Crew awareness.

STATUS

INCREASED FUEL CONSUMP

Note : For one aileron (INR or OUTR) fault, fuel consumption is increased by approximately + 6 %.
For two or more ailerons' fault, fuel consumption is increased by approximately + 16%.

INOP SYS
L(R) OUTR (INR) AIL

F/CTL FCDC 1(2) FAULT

Crew awareness.

STATUS

INOP SYS
FCDC 1(2)

F/CTL FCDC 1 + 2 FAULT

● **ABOVE FL 200 :**

SPD BRK . . . . DO NOT USE

Audio stall warning is available. It is not corrected for speedbrakes' extension and may come early with the speedbrakes out.

– MONITOR F/CTL OVHD PNL

Note : – Control law remains normal.
– All information is flagged on the F/CTL system page.
– F/CTL warnings are not available on the ECAM.
– Stall warning is available.
– Bank and pitch limits become amber on the PFD.
– Vαmax, Vα prot, and Vsw indications are lost on the PFD.

STATUS

● **ABOVE FL 200 :**

SPD BRK . . . . DO NOT USE

F/CTL INDICATIONS LOST

INOP SYS
FCDC 1 + 2

CONFIG RUD TRIM NOT IN T.O RANGE

Crew awareness.

CONFIG PITCH TRIM NOT IN T.O RANGE

Crew awareness.

F/CTL PITCH TRIM/MCDU/CG DISAGREE

Crew awareness.

R *The system detects a disagreement between any of the following : The real pitch trim value,*
R *the pitch trim value calculated by the FCMC, based in the CG, and the pitch trim value*
R *entered in the MCDU.*

F/CTL RUD TRIM 1(2) FAULT

Crew awareness.

STATUS

CAT 3 SINGLE ONLY

INOP SYS

RUD TRIM 1(2)

CAT 3 DUAL

F/CTL RUD TRIM FAULT

Crew awareness.

STATUS

CAT 1 ONLY

INOP SYS

RUD TRIM

AP 1 + 2

F/CTL SENSOR FAULT

A failure, affecting a F/CTL system sensor, is detected.

Crew awareness

F/CTL PEDAL SENSOR FAULT

A failure, affecting a pedal sensor, is detected.

Crew awareness.

LEFT INTENTIONALLY BLANK

F/CTL PRIM 1(2)(3)(SEC 1)(2) PITCH FAULT

Failure of the pitch channel in the associated computer.

Crew awareness.

F/CTL TURB DAMP FAULT

The turbulence damper function is inoperative.

Crew awareness.

STATUS

INOP SYS
TURB DAMPER

Note : When no caution is triggered, but abnormal vibrations are present in non-turbulent conditions, this function may be disconnected via the TURB DAMP pushbutton. Note the effect and report.

F/CTL RUDDER TRIM RUNAWAY

– LATERAL CONTROL . . . . USE TO LEVEL WINGS
– RUDDER . . . . CENTER

Check the rudder position on the ECAM F/CTL page.

Note : This failure is mainly seen as an uncommanded roll (induced by yaw). In most conditions, the aircraft will self-stabilize in a steady heading sideslip.
For continued flight, either maintain the rudder central, or leave the aircraft in a steady stabilized heading sideslip. But ensure that all changes between the centralized rudder and the steady heading sideslip are done smoothly. As speed is reduced, the TLU may gradually open to allow more rudder to be applied by the trim runaway.

– FOR LDG . . . . USE NORMAL CONF

F/CTL RUDDER JAM / RUDDER PEDAL JAM

Use the ECAM F/CTL page for a visual check of the rudder position.
This procedure also applies to RUDDER PEDAL JAM cases.

FOR APPROACH

- AVOID LANDING WITH CROSSWIND from the side where the rudder is deflected.
- FOR LANDING .... USE FLAP 2
- GPWS FLAP MODE .... OFF

● **If all engines are operative :**
- SPEED and TRAJECTORY .... STABILIZE ASAP
- LDG DIST PROC .... APPLY

  Refer to the QRH Part 2, or to the FCOM 3.02.80.

● **In case of an Engine-Out :**
- APPR SPEED .... 170 knots
- SPEED and TRAJECTORY .... STABILIZE ASAP
- AP + A/THR .... OFF

■ **In case of a Go-Around :**
- SPD .... SELECT 170 knots
- LDG DIST PROC .... APPLY

  Refer to the QRH Part 2, or to the FCOM 3.02.80.

ON GROUND

- DIFFERENTIAL BRAKING .... USE ASAP

  Do not use asymmetrical reverse.
  Use the nosewheel steering handle below 100 knots only in case of RUDDER PEDAL JAM.

F/CTL RUD B(Y)(G) SERVO FAULT

Crew awareness.
Loss of the blue, green, or yellow rudder servojack.

F/CTL RUDDER FAULT

This warning is triggered, when the rudder is detected to be faulty or jammed in the 0° position.

MAX X WIND FOR LDG : 15 KT

- **AT LDG ROLL** :
  - DIFF BRAKING . . . . AS RQRD

STATUS

MAX X WIND FOR LDG : 15 KT
APPR PROC
- GPWS FLAP MODE . . . . OFF
- FOR LDG . . . . USE FLAP 2
- **AT LDG ROLL** :
  - DIFF BRAKING . . . . AS RQRD

CAT 1 ONLY

INOP SYS
RUDDER
AP 1 + 2
RUD TRIM
CAT 2

F/CTL RUD PEDAL FAULT

MAX X WIND FOR LDG : 15 KT

● **AT LDG ROLL** :

– DIFF BRAKING . . . . AS RQRD

STATUS

MAX X WIND FOR LDG : 15 KT

APPR PROC

R ● **BEFORE AUTOLAND**

R – RUD TRIM . . . . RESET

R *Manual landing is prefered, however autoland can be performed.*

R *The autopilot normally adjusts the rudder trim by comparing the rudder trim command with the feedback on the rudder pedal. As the rudder pedal is faulty, the autopilot cannot apply rudder trim on the rudder surface, but it still internally computes a rudder trim up to its maximum value. During the flight, the AP maintains the correct flight path, if necessary by a permanent rudder deflection (as the AP' trim order would have done). However, just before landing, during the align mode, the computed maximum rudder trim is added to the rudder demand and could cause lateral deviation. To prevent this, the rudder trim must be reset to its zero position, before the align mode, at around 1000 feet.*

R *To perform this reset, the autopilot must be disconnected and then reconnected to perform the autoland.*

● **AT LDG ROLL** :

– DIFF BRAKING . . . . AS RQRD

INOP SYS

RUD PEDAL
RUD TRIM

Loss of nosewheel steering via the pedals. However, it remains available using the handwheel. The rudder may be deflected by the yaw damper.

F/CTL RUD NORM CTL FAULT

RUD WITH CARE ABV 160 KT

The Back up Control Module takes over the rudder control but cannot ensure the rudder travel limit function. Therefore, rudder inputs must be limited at speeds above 160 knots, so as not to damage structure. However, aerodynamic limitations ensure that excessive load cannot be reached on the rudder.

STATUS

RUD WITH CARE ABV 160 KT
RUD BACKUP CTL

Rudder, via the rudder backup module.

F/CTL RUD PRIM (SEC) 1 FAULT

Crew awareness.

FUEL LEFT (RIGHT) PUMP 1 (2) LO PR

The corresponding standby pump automatically replaces the faulty main pump.

– PUMP (affected) . . . . OFF

STATUS

INOP SYS
FUEL AFT XFR
L (R)FUEL PUMP 1(2)

FUEL L (R) STBY PUMP LO PR

– STBY PUMP (affected) . . . . OFF

STATUS

INOP SYS
FUEL AFT XFR
L (R) FUEL STBY

FUEL L (R) WING PUMPS LO PR

– WING X FEED . . . . ON
– PUMPS (affected side) . . . . OFF
– STBY PUMP (affected side) . . . . OFF

● **WHEN L (R) TK FUEL RQRD :**
L (R) FUEL GRVTY FEED ONLY
– GRVTY FEED PROC . . . . APPLY

STATUS

L (R) FUEL GRVTY FEED ONLY

INOP SYS
FUEL AFT XFR (only if center tank empty)
L (R) FUEL PUMPS

FUEL L (R) CTR PUMP LO PR

– CTR PUMP (affected) . . . . OFF

STATUS

INOP SYS
L (R) CTR PUMP

GRVTY FUEL FEEDING

– ENG START SEL .... IGN

AVOID NEGATIVE G FACTOR

● **DETERMINE GRVTY FEED CEILING** :

Depending when the fuel pumps have failed, the flight altitude must be limited to the following value :

Flight conditions at the time of gravity feeding	Gravity feed ceiling
Flight time from take-off greater than 30 min (fuel deaerated)	20 000 ft
Flight time from take-off less than 30 min (fuel non deaerated)	15 000 ft

DESCEND TO GRVTY FEED CEILING (if applicable)

● **WHEN REACHING GRVTY FEED CEILING** :

– WING X FEED .... AUTO

FUEL ENG 1 (2) LP VALVE FAULT

Crew awareness
Valve open or closed disagree

FUEL APU LP VALVE FAULT

Crew awareness
Valve open or closed disagree

FUEL WING X FEED FAULT

Valve disagree

■ **If the WING X FEED is failed open :**
- FUEL IMBALANCE .... MONITOR

■ **If the WING X FEED is failed closed :**
- FUEL IMBALANCE PROC .... APPLY
  Refer to FUEL IMBALANCE procedure (WING X FEED failed closed case).

STATUS

INOP SYS
F WING XFEED

FUEL L + R CTR PUMPS LO PR

- L + R CTR PUMP .... OFF

● **WHEN EITHER INR < 17 T :**
- CTR TANK XFR .... MAN

CTR TK XFR BY GRVTY
CTR TK UNUSABLE IF < 15 T

Note : The trim tank is transfered to the center tank unless the center tank is empty. If the quantity of trim and center tank fuel is less than 15 T, the trim tank fuel is unusable.

STATUS

CTR TK UNUSABLE IF < 15 T

INOP SYS
FUEL AFT XFR
(only if CTR TK not empty)
F CTR PUMPS

FUEL L(R) WING TK LO LVL

- **If the center tank is not empty :**
  - CTR TANK XFR . . . . MAN
- OUTR TK XFR . . . . ON
- **If the TRIM TK not empty :**
  - T TANK MODE . . . . FWD

    Fuel consumption is increased by approximately 1 %.
- **IF NO FUEL LEAK AND FUEL IMBALANCE :**
  - WING X FEED . . . . ON
  - L(R) STBY PUMP (side with LO LVL) . . . . OFF
  - LEFT (RIGHT) PUMPS 1 + 2 (side with LO LVL) . . . . . . OFF

STATUS

- LVL OFF FOR MAN FWD XFR

  Displayed, if the trim tank pump is failed.

FUEL L + R WING TK LO LVL

LAND ASAP

- **If the center tank is not empty :**
  - CTR TANK XFR . . . . MAN
- OUTR TK XFR . . . . ON
- **If the TRIM TK not empty :**
  - T TANK MODE . . . . FWD

    Fuel consumption is increased by approximately 1 %.
  - WING PUMPS . . . . ON
  - WING X FEED . . . . ON

STATUS

- LVL OFF FOR MAN FWD XFR

  Displayed, if the trim tank pump is failed.

FUEL CTR TO INNER FAULT

This caution is triggered if an anomaly is detected during the center to inner transfer or, the left (right) outer inlet valve is failed open or, the left (right) inner inlet valve is failed open.

– L + R CTR PUMPS .... OFF

● **WHEN EITHER INR < 17 T :**

– OUTR TK XFR (if OUTR inlet valve open) .... ON

– CTR TANK XFR (if low level sensor failed) .... MAN

– L + R CTR PUMPS .... ON

● **WHEN CTR TK EMPTY :**

– CTR TANK XFR .... AUTO

STATUS

– CTR TO INR : MAN ONLY

FUEL OUTR TO INR FAULT

– L + R CTR PUMPS (if center tank not empty) .... OFF

– OUTR TK XFR .... ON

● **WHEN BOTH OUTR EMPTY :**

– OUTR TK XFR .... OFF

– L + R CTR PUMPS (if center tank not empty) .... ON

Note : This caution is recalled when the center tanks become empty.

FUEL TRIM TK PUMP LO PR

– T TANK MODE .... AUTO

FWD XFR BY GRVTY ONLY

STATUS

– LVL OFF FOR MAN FWD XFR *The pitch attitude must be less than 3 degrees to permit a fuel forward transfer by gravity.*	INOP SYS F T.TK PUMP

FUEL EXCESS AFT CG

– PITCH ATT .... BELOW 3 DEG

This line is only displayed if the trim tank pump is failed.

– T TANK MODE .... FWD

Fuel consumption increases by approximately 1 %.

STATUS

– LVL OFF FOR MAN FWD XFR

Displayed if the trim tank pump is failed.

FUEL TRIM LINE FAULT

– T TANK FEED . . . . ISOL
– APU MASTER sw . . . . OFF

● **IF T TK ISOL AFTER TO :**
  – T TANK FEED . . . . AUTO
  Trim tank may be recovered after takeoff, if manual isolation was selected on ground.

STATUS

APPR PROC	INOP SYS
● **IF T TANK NOT EMPTY :**	FUEL AFT XFR
R – T TANK FEED . . . . . . ISOL	APU (When T TK isol)

R ■ **If trim line isol valve failed open and CTR TK not empty**
  – JETTISON ⊲ . . . . OFF
  – L + R CTR PUMPS . . . . OFF
  – T TANK MODE . . . . FWD
  Note : If the trim tank pump is failed, this part of the procedure is replaced by :
  . WHEN SPD > 270 KT AND NOT IN CLIMB :
  – T TANK MODE . . . . FWD

● **If CG is further forward than 32 % :**
  Trim tank transfer has to be initiated in two steps.
  ● **WHEN T TANK < 2.4 T :**
    – T TANK FEED . . . . ISOL
    – L + R CTR PUMPS . . . . ON
  ● **WHEN CTR TK EMPTY :**
    – L + R CTR PUMPS . . . . OFF
    – T TANK FEED . . . . AUTO

● **WHEN T TANK EMPTY :**
  – T TANK MODE . . . . AUTO
  – L + R CTR PUMPS . . . . ON
  – JETTISON ⊲ . . . . AS RQRD

Note : The caution is recalled at each step of the procedure, or when the tank becomes empty. If unsuccessful, and if fuel is trapped in the trim tank, refer to the TRIM TANK FUEL UNUSABLE procedure.

STATUS

	INOP SYS
	FUEL AFT XFR
R	APU (When T TK isol)

FUEL T TANK XFR FAULT

– T TANK MODE (b) . . . . FWD
– T TANK FEED (a) . . . . OPEN

Fuel consumption is increased by approximately 1 %.
Either line (a) or (b) will be displayed.
(a) Displayed if the trim tank isolation valve is failed closed or if the trim tank low level sensor is failed.
(b) Displayed in all other cases.
Note : 1. If the trim tank pump is failed, the above procedure is preceded by :
WHEN SPD > 270 KT AND NOT IN CLIMB.
2. If forward transfer is initiated by T TANK FEED switch, do not completely empty the trim tank. This avoids drainage of the trim line and so ensures APU supply.

● **If either aft transfer valve is failed open :**

– FUEL IMBALANCE . . . . MONITOR

● **IF TRIM TK QUANTITY NOT DECREASING :**

– T TANK MODE . . . . AUTO
– T TANK FEED . . . . ISOL

T TK FUEL UNUSABLE

These steps prevent uncommanded aft transfer via a failed aft transfer valve.

FUEL T TANK XFR FAULT (CONT'D)

R ● **If CG forward of 32 % :**
R *Trim tanks transfer has to be done in two steps.*
R ● **WHEN T TANK < 2.4 T :**
R – T TANK MODE (b) . . . . AUTO
R – T TANK FEED (a) . . . . AUTO
R *This stops the transfer after the first step.*
R ● **WHEN CTR TANK EMPTY :**
R – T TANK MODE (b) . . . . FWD
R – T TANK FEED (a) . . . . OPEN
R *If the trim tank pump is failed or not installed, the above step is preceded by :*
R *WHEN CTR TANK EMPTY AND WHEN SPD > 270 KT AND NOT IN CLIMB.*
R ● **WHEN T TANK EMPTY :**
R – T TANK MODE (b) . . . . AUTO
R – T TANK FEED (a) . . . . AUTO
R ● **If either aft transfer valve is failed open :**
R – T TANK FEED . . . . ISOL
R ● **IF T TK FUEL UNUSABLE :**
R – T TK UNUSBL PROC . . . . APPLY

STATUS

● **WHEN SPD > 270 KT AND NOT IN CLIMB**
– T TANK MODE . . . . FWD
– T TANK FEED . . . . OPEN
Displayed if the trim tank pump is failed.

FUEL FUEL LO TEMP

R *Inner tank temperature is below – 37°C or outer tank temperature is below – 40°C or trim*
R *tank temperature is below – 40°C*

■ **On the ground before takeoff :**

● **IF JET A FUEL :**

– DELAY T.O.

Do not takeoff until temperature is within limits.

■ **In flight**

R ● **If inner tank temp < – 37°C (automatic recall at – 44°C)**

R ● **IF JET A FUEL (not displayed at – 44°C – cf. note 1) :**

– CTR TANK XFR . . . . MAN

R ● **If outer tank temp < – 40°C (automatic recall at – 47°C)**

R ● **IF JET A FUEL (not displayed at – 47°C – cf. note 1) :**

– OUTR TK XFR . . . . ON

Note : If center tank is not empty, center tank pumps must be selected OFF to avoid inadvertent fuel transfer from center to outer tanks.

R ● **If trim tank temp < – 40°C (automatic recall at – 47°C)**

R ● **IF JET A FUEL (not displayed at – 47°C – cf. note 1) :**

– T TANK MODE . . . . FWD

Note : 1. If the trim tank pump is failed this part of the procedure will be replaced by :
. WHEN SPD > 270 KT AND NOT IN CLIMB :
– T TANK MODE . . . . FWD

R *2. If the CG is further forward than 26 %, the CG should be monitored during the forward transfer, ensuring forward CG limits are not exceeded.*

R *3. Fuel consumption increases by approximately 1 %.*

● **IF NECESSARY :**

– TAT . . . . INCREASE

Consider descending to a lower altitude and/or increasing Mach to increase TAT

Note : 1. ". IF JET A" is displayed once at the first time, i.e. when :
R *Inner tank temperature is below – 37°C or outer tank temperature is below – 40°C*
R *or trim tank temperature is below – 40°C, since this temperature threshold is only*
R *applicable when JET A fuel is used.*

2. If a fuel type other than Jet A is used, see 3.01.28 page 1 for the appropriate limits and apply the procedure according to those limits.

STATUS

● **WHEN SPD > 270 KT AND NOT IN CLIMB**

– T TANK MODE . . . . FWD

Displayed only if the trim tank pump is failed or not installed.

FUEL FCMC 1 (2) FAULT

Crew awareness

STATUS

INOP SYS
FCMC 1(2)

FUEL FCMC 1 + 2 FAULT

Transfers are controlled using the T TANK MODE, and the OUTR XFR pushbutton switches.

– FCMC 1 + 2 . . . . RESET
– WEIGHT/CG . . . . INITIALIZE

In flight, after a dual FCMC reset, the weight and CG displayed on the FUEL PRED page are those computed by the FE.
R *The GW and CG must be re-initialized in the FCMC by manually re-entering in the FUEL*
R *PRED page these values.*

FUEL TK XFR : MAN ONLY

● **IF CG AFT 32 % :**

Read the CG on the MCDU FUEL PRED page.

– T TANK MODE . . . . FWD

Fuel consumption increases by approximately 1 %.

Note : If the trim tank pump is failed, this part of the procedure is replaced by :
· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :
- T TANK MODE . . . . FWD

● **WHEN FOB BELOW 60 T :**

Determine FOB from engine start fuel minus fuel used.

– CTR TANK XFR . . . . MAN
– OUTR TK XFR . . . . ON

● **WHEN FL < 250 IN DESCENT**

– T TANK MODE . . . . FWD

Note : If the trim tank pump is failed, this part of the procedure is replaced by :
· WHEN FL < 250 IN DESCENT AND SPD > 270 KT :
- T TANK MODE . . . . FWD

● **WHEN SPD > 270 KT AND NOT IN CLIMB**

– T TANK MODE . . . . FWD

FUEL TK XFR : MAN ONLY

STATUS

INOP SYS
FCMC 1+2

FUEL ZFW ZFCG DISAGREE

This caution is triggered in case of disagree between ZFW or ZFCG values from FMGC 1 and 2.

– FMGC VALUES . . . . CONFIRM

Confirm that the ZFW and ZFCG values from each FMGC are the same as the loadsheet values.

FUEL APU AFT PUMP FAULT

● **IF APU RQRD :**

MAX FL 250

These lines are displayed on ECAM if the trim tank is not empty.

STATUS

● **IF T TANK NOT EMPTY :**

APU AVAIL BELOW FL 250

FUEL ABNORM MAN FWD XFR

This warning is triggered when the T TANK MODE pushbutton is selected FWD or when the TRIM TANK FEED selector is set OPEN if :

– The trim tank pump is not available and

– The aircraft pitch attitude is above 3.4 degrees for more than 30 seconds.

This warning is not triggered in case of inner tank low level or in case of AFT CG warning.

● **FOR SPD < 270 KT OR IN CLIMB :**

– T TANK MODE . . . . AUTO
– T TANK FEED . . . . AUTO

● **WHEN SPD > 270 KT AND NOT IN CLIMB :**

– T TANK MODE . . . . FWD
– T TANK FEED . . . . OPEN

FUEL NO WEIGHT/CG DATA

This caution is triggered at engine start if no WEIGHT/CG has been entered by the crew.

– WEIGHT/CG . . . . INITIALIZE

FUEL MAN XFR COMPLETED

The center and outers tanks are empty, the manual XFR pushbuttons are ON.

– CTR TANK XFR . . . . AUTO
– OUTR TK XFR . . . . AUTO

FUEL LEAK

A fuel leak may either be detected by :

R *· The sum of FOB and F. USED significantly less than FOB at departure or decreasing, or*
· Passenger observation (fuel spray from engine or from wing tip), or
· Total fuel quantity decreasing at an abnormal rate, or
· A fuel imbalance, or
· A tank emptying too fast (leak from engine, or a hole in a tank), or
· A tank overflowing (due to a pipe rupture in a tank), or
R *· An excessive fuel flow (leak from engine), or*
· A smell in the cabin.

R *If visibility permits, a visual check from the cabin may enable identification of the leak*
R *source.*

WHEN A LEAK IS CONFIRMED

LAND ASAP

■ **LEAK FROM ENGINE :**

– THR LEVER (of affected engine) .... IDLE
– ENG MASTER (of affected engine) .... OFF
R – WING X-FEED .... USE AS RQRD
The crossfeed valve can be opened for re-balancing, or to allow use of the fuel from both wings. Do not restart the engine.

■ **LEAK NOT FROM ENGINE or LEAK NOT LOCATED :**

– WING X FEED .... AUTO
The crossfeed valve must remain closed to prevent the leak from affecting both sides. Selecting AUTO maintains the crossfeed valve closed.
R – L + R INR TK SPLIT .... ON
R *Shut the INR TK SPLIT valves to isolate the fuel leak.*

● **If Center Tank or Trim Tank not empty :**

R – CTR TK XFR .... MAN
R – T TANK MODE (if not empty) .... FWD
R *A manual trim tank transfer(via the center tank), and/or manual center tank*
R *transfer must be done, to symmetrically transfer fuel to both inner tanks, and*
R *avoid automatic transfer to only the least full inner tank.*

R ● **When Trim Tank empty :**

R – T TANK MODE .... AUTO
– T TK FEED .... ISOL

● **When Center Tank empty :**

R – CTR TK XFR .... AUTO

FUEL LEAK (CONT'D)

– DESCEND TO GRVTY FUEL FEEDING CEILING
See the gravity fuel feeding procedure.
– ENG START SEL . . . . IGN
– ALL TK PUMPS (when gravity ceiling is reached) . . . . OFF
In almost all cases, switching the pumps off will prevent any further loss of fuel. All pumps must be switched off, even if the leak is from only one wing, as there are some failures on one side that will result in fuel loss from the other side.
– AVOID NEGATIVE G FACTOR

CAUTION
Do not apply the FUEL IMBALANCE procedure : Even with one inner tank full/one inner tank empty, no special procedure is required for approach and landing.

● **If one engine flames out when there is still fuel in the feeding tank :**
R – ALL TK PUMPS . . . . ON
R – LEAK FROM ENGINE proc . . . . APPLY
Note : The flameout is due to air suction from a leak from the engine.

FOR LANDING

CAUTION
– Notify the ATC, and do not use reverse.

FUEL FU/FOB DISCREPANCY

Difference between initial FOB and current FOB plus fuel used data is more than 3500 kg.

– FUEL LEAK . . . . PROC APPLY

FUEL L(R) INNER TK HI TEMP

■ **On ground, before takeoff :**

● **If JET B FUEL** :

– DELAY T.O

– ENG MASTER (affected side) . . . . OFF

– APU . . . . AS RQRD

Note : The ECAM caution is triggered at 45°C (without procedure), and automatically recalled at 49°C (with procedure for JET B) and 60°C (with the procedure for all fuels).
For JET A, delay takeoff when fuel temperature reaches 55°C.

■ **In flight :**

Crew awareness.

FUEL WING TK OVERFLOW

– L + R CTR PUMPS . . . . OFF

To stop the center to inner transfer.

– T TANK MODE (only if CTR TANK empty) . . . . FWD

To force transfer into the center tank, and prevent forward transfer into the inner tanks.

Note : If the trim tank pump is failed, this part of the procedure is replaced by :
. WHEN SPD > 270 KT AND NOT IN CLIMB :
– T TANK MODE . . . . FWD

● **WHEN EITHER INR < 17 T** :

– L + R CTR PUMPS . . . . ON

STATUS

● **WHEN SPD > 270 KT AND NOT IN CLIMB:**

– T TANK MODE . . . . FWD

Displayed, if the trim tank pump is failed.

TRIM TANK FUEL UNUSABLE

– T TANK MODE . . . . FWD
– T TANK FEED . . . . OPEN

● **If TRIM TANK FUEL is still unusable :**

– OUTR TK XFR . . . . ON
The CG moves forward.

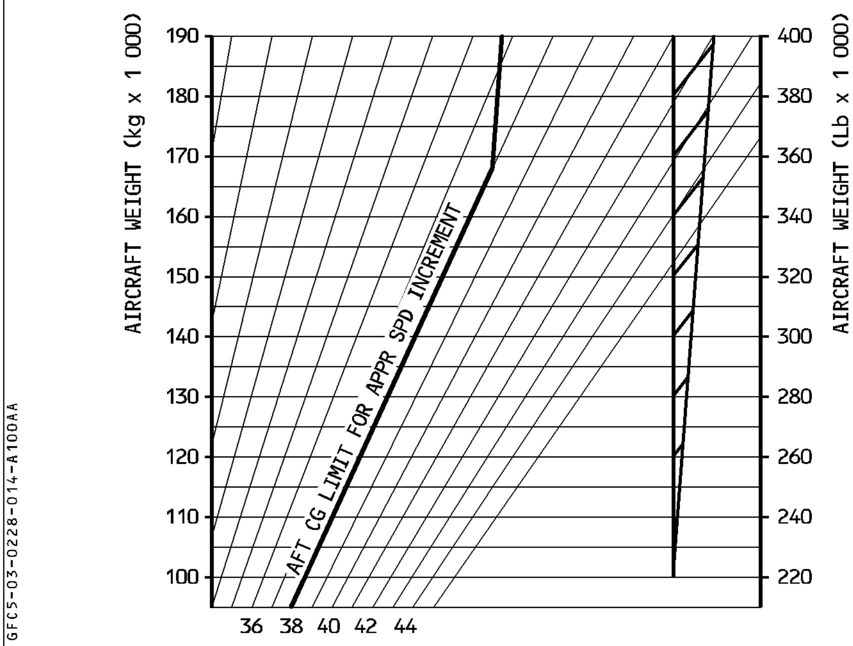
– CTR TK PUMPS . . . . OFF
R *If the center tank is not yet empty, maintain fuel in the aircraft's center tank by*
R *switching off the pumps. This will reduce the effect of unusable trim tank fuel on the*
R *aircraft's center of gravity.*

MAXIMUM FLIGHT TIME . . . . 4 HOURS
After 4 hours, depending on the fuel distribution, the aft CG limit may be reached.

FOR LANDING

● **If CG > aft CG limit shown below :**

– APPR SPD . . . . VLS + 10 KT
– LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
To keep the nosewheel on the runway and prevent the aircraft from sitting on its tail, apply continuous braking throughout the landing rollout.



FUEL IMBALANCE

– FOB . . . . CHECK

Compare the FOB+FU with the FOB at departure. If the difference is significant, or if the FOB+FU decreases, suspect a fuel leak.

CAUTION

A fuel imbalance may indicate a fuel leak. Do not apply this procedure, if a fuel leak is suspected. Refer to the FUEL LEAK procedure.

– WING X FEED . . . . ON

■ **<u>If the WING X FEED valve is open :</u>**

● **On the lighter side :**

– (ALL) FUEL PUMPS (STBY then NORM) . . . . OFF

● **When fuel balanced :**

– PUMPS (NORM then STBY) . . . . ON

– WING X FEED . . . . AUTO

■ **<u>If the WING X FEED valve is failed closed :</u>**

– OUTER TK XFR . . . . ON

This will allow inner fuel tanks' communication via the refuelling gallery.

– BANK ANGLE . . . . 3 DEG WING DOWN ON LIGHTER SIDE

Fuel transfer only occurs if the bank angle is at, or above, 2 to 3 degrees.
Modulate the fuel imbalance through the bank angle.

– RUDDER TRIM . . . . USE

Use rudder trim to get constant course and neutral stick.

FUEL JETTISON NOT CLOSED

– JETTISON . . . . OFF

● **IF JETTISON CONFIRMED :**

Jettison is confirmed, if the quantity still decreases at an abnormally high rate, or if fuel can be seen coming from the jettison outlet.

– L + R CTR PUMPS . . . . OFF

Selecting the center tank pumps off stops jettison.

● **WHEN EITHER INR < 17 T :**

– CTR TANK XFR . . . . MAN

Allows some center tank fuel to be recovered.

CTR TK XFR BY GRVTY
CTR TK UNUSABLE IF < 15 T

STATUS

CTR TK UNUSABLE IF < 15 T

INOP SYS
FUEL CTR PUMPS
FUEL AFT XFR

FUEL JETTISON FAULT

Jettison system is inhibited.

JETTISON NOT AVAIL

HYD G RSVR LO AIR PR/OVHT/LO LVL

■ RSVR OVHT or LO LVL :

Note : False fluid temperature signal leads to undue related pump FAULT lt illumination without ECAM warning.

– GREEN PUMPS (ENG 1 + 2 + ELEC) .... OFF

■ RSVR LO AIR PR :

● IF PRESS FLUCTUATES :

– GREEN PUMPS (ENG 1 + 2 + ELEC) .... OFF

G SYS LO PR

Secondary Failure
* WHEEL
* F/CTL

Note : · As a general rule, do not manually select an HYD ELEC PUMP ON, except temporarily, to retract the SPLRS if they remain out after an hydraulic failure.
· On ground, avoid to retract the FLAPS when the aircraft is moving, to prevent a loss of alternate brakes efficiency.

HYD G RSVR LO AIR PR/OVHT/LO LVL (CONT'D)

STATUS

APPR PROC

■ **Sys lost by RSVR LO AIR PR :**

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

– GREEN ENG 1 + 2 PUMPS . . . ON

● **IF HYD NOT RECOVERED :**
Same as RSVR LO LVL

■ **Sys lost by RSVR OVHT :**

● **IF GREEN OVHT OUT :**
– GREEN ENG 1 + 2 PUMPS .. ON

● **IF HYD NOT RECOVERED :**
Same as RSVR LO LVL

■ **Sys lost by RSVR LO LVL :**

R ● **FOR L/G GRVTY EXTN :**
MAX SPEED . . . . 200 KT
– LDG GRVTY EXTN . . . . . DOWN

● **WHEN L/G DOWNLOCKED :**
– L/G (lever) . . . . DOWN
– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM*
R *3.02.80.*

SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS

GREEN HYD
L/G RETRACT
PART SPLRS
CAT 3 DUAL
N/W STRG
AUTO BRK
NORM BRK

HYD B RSVR LO AIR PR/OVHT/LO LVL

LAND ASAP

"LAND ASAP" is only triggered if the green hydraulic system is supplied by the RAT.

■ **RSVR OVHT or LO LVL :**

Note : A false fluid temperature signal leads to undue related pump FAULT light illumination, without an ECAM warning.

– BLUE PUMPS (ENG 1 + ELEC) .... OFF

■ **RSVR LO AIR PR :**

● **IF PRESS FLUCTUATES :**

– BLUE PUMPS (ENG 1 + ELEC) .... OFF

B SYS LO PR

● **If G HYD SYS is supplied by the RAT :**

– A/SKID NWS .... OFF
– MAX BRK PR .... 1000 PSI
– BRK B ACCU PR ONLY

Secondary Failure
* F/CTL

Note : As a general rule, do not manually select an HYD ELEC PUMP ON, except temporarily, to retract the spoilers if they remain out after a hydraulic failure.

STATUS

R MAX BRK PR .... 1000 PSI (a)

HYD B RSVR LO AIR PR/OVHT/LO LVL (CONT'D)

STATUS

APPR PROC

■ **Sys lost by RSVR LO AIR PR :**

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

– BLUE ENG 1 PUMP . . . . ON

● **IF HYD NOT RECOVERED :**
Same as RSVR LO LVL

■ **Sys lost by RSVR OVHT :**

● **IF BLUE OVHT OUT :**
– BLUE ENG 1 PUMP . . . . ON

● **IF HYD NOT RECOVERED :**
Same as RSVR LO LVL

■ **Sys lost by RSVR LO LVL :**

R – LDG DIST PROC . . . . APPLY

SLATS SLOW
BRK B ACCU PR ONLY (a)
CAT 3 SINGLE ONLY

INOP SYS

BLUE HYD
PART SPLRS
REV 1 (PW or RR engines)
CAT 3 DUAL
ALTN BRK
AUTO BRK (a)
ANTI SKID (a)
NORM BRK (a)
N/W STRG (a)

(a) If the G HYD SYS is supplied by RAT.

Note : *Following a blue hydraulic system failure, the parking brake may be inoperative due to blue accumulator low pressure.*

HYD Y RSVR LO AIR PR/OVHT/LO LVL

LAND ASAP

"LAND ASAP" is only triggered, if the green hydraulic system is supplied by the RAT.

■ **RSVR OVHT or LO LVL :**

Note : False fluid temperature signal leads to the undue illumination of the related pump FAULT light, without the ECAM warning.

– YELLOW PUMPS (ENG 2 + ELEC) .... OFF

■ **RSVR LO AIR PR :**

● **IF PRESS FLUCTUATES :**

– YELLOW PUMPS (ENG 2 + ELEC) .... OFF

Y SYS LO PR

Secondary Failure
* F/CTL

Note : As a general rule, do not manually select a HYD ELEC PUMP ON, except temporarily to retract the SPLRS, if they remain out after a hydraulic failure.

STATUS

APPR PROC

■ **Sys lost by RSVR LO AIR PR :**

The probability of cavitation increases with altitude. Therefore, it may be possible to restore the system after descending to a lower altitude.

– YELLOW ENG 2 PUMP .... ON

● **IF HYD NOT RECOVERED :**
Same as RSVR LO LVL

■ **Sys lost by RSVR OVHT :**

● **IF YELLOW OVHT OUT :**
– YELLOW ENG 2 PUMP ...... ON

● **IF HYD NOT RECOVERED :**
Same as RSVR LO LVL

■ **Sys lost by RSVR LO LVL :**

– LDG DIST PROC .... APPLY

FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS

YELLOW HYD
PART SPLRS
REV 2 (PW or RR engines)
CAT 3 DUAL
CARGO DOORS
(if Y LO LVL)

HYD G + B SYS LO PR

LAND ASAP

– RAT . . . . MAN ON

"RAT MAN ON" is only triggered on the ECAM in case of G + B or G + Y hydraulic system low level.

– CONSIDER RAT MAN USE

"CONSIDER RAT MAN USE" is not triggered in case of green reservoir overheat, or in case of G + B or G + Y hydraulic system low level.

Note : With the RAT extended, the green system is recovered. This permits slat extension recovery. However, green pressure will be lost when the speed drops below 140 knots.
At that time, the red "G + B SYS LO PR" warning will be triggered again, and antiskid will be lost. To anticipate the loss of antiskid, the ECAM "HYD B RSVR LO AIR PR/OVHT/LO LVL" procedure requests to select it OFF. With the RAT extended, fuel consumption increases by approximately 1 %.

MIN RAT SPD (if RAT extended) . . . . 140 KT

– Affected PUMPS . . . . OFF

SPD BRK . . . . DO NOT USE

Due to the loss of one elevator.

– MANEUVER WITH CARE

To avoid high hydraulic demand on the remaining system.

Note : As a general rule, do not manually select HYD ELEC PUMP ON, except temporarily, to retract the spoilers if they remain out after a hydraulic failure.

F/CTL ALTN LAW (PROT LOST)

MAX SPEED 330/.82

Secondary Failure
* WHEEL
* F/CTL

STATUS

CONSIDER RAT MAN USE

"CONSIDER RAT MAN USE" is not triggered in case of green reservoir overheat, or in case of G + B or G + Y hydraulic system low level.

SPD BRK . . . . DO NOT USE
MAX SPEED 330/.82
MIN RAT SPEED (if RAT extended) . . 140 KT
MANEUVER WITH CARE
MAX BRK PR . . . . 1000 PSI

HYD G + B SYS LO PR (CONT'D)

STATUS

APPR PROC

■ **If system lost by RSVR LO AIR PR :**
– Affected ENG PUMP . . . . ON

■ **If system lost by RSVR OVHT :**

● **IF GREEN OVHT OUT :**
– GREEN ENG 1 + 2 PUMPS .. ON

● **IF BLUE OVHT OUT :**
– BLUE ENG 1 PUMP . . . . ON

■ **If HYD not recovered :**

● **BEFORE S/F EXTENSION :**
– YELLOW ELEC PUMP . . . . . OFF
Switch OFF the yellow electrical pump to avoid flight control jerk, in case Engine 2 is additionally lost.

– GPWS FLAP MODE (if S < 2) . OFF

● **FOR GO AROUND :**
– S/F JAMMED PROC . . . . APPLY

– FOR LDG (if S < 2) . . USE FLAP 2
– FOR LDG (if S ≥ 2) . . . USE FLAP 3

● **FOR L/G GRVTY EXTN :**
MAX SPEED . . . . 200 KT
– L/G GRVTY EXTN . . . . . . DOWN

● **WHEN L/G DOWNLOCKED :**
– L/G lever . . . . DOWN

– APPR SPD (if S ≥ 1) . . VLS+10 KT
Approach speed increases, due to the loss of one elevator.

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80*

HYD G + B SYS LO PR (CONT'D)

STATUS

ALTN LAW : PROT LOST
BRK B ACCU PR ONLY
7 full brake applications are available.
INCREASED FUEL CONSUMP
Fuel consumption increases by approximately 16 %, due to the inner ailerons in the upfloat position.
FLAPS SLOW
CAT 1 ONLY
Note : Following a blue hydraulic system failure, the parking brake may be inoperative, due to blue accumulator low pressure.

INOP SYS
F/CTL PROT
G + B HYD
ANTI SKID
L/G RETRACT
AP 1 + 2
SLATS
L ELEV
MOST SPLRS
REV 1
(PW/RR Eng)
L + R INR AIL
N/W STRG
AUTO BRK
NORM BRK
ALTN BRK

HYD G + Y SYS LO PR

LAND ASAP

– RAT . . . . MAN ON

"RAT MAN ON" is only triggered on the ECAM, in case of a G + B or G + Y hydraulic system low level.

– CONSIDER RAT MAN USE

"CONSIDER RAT MAN USE" is not triggered, in case of a green reservoir overheat, or in case of a G + B or G + Y hydraulic system low level.

Note : With the RAT extended, the green system is recovered. This enables recovery of the flap extension.
However, green pressure will be lost when the speed drops below 140 knots.
At that time, the red "G + Y SYS LO PR" warning will retrigger.
With the RAT extended, fuel consumption is increased by approximately 1 %.

MIN RAT SPD (if RAT extended) . . . . 140 KT

– Affected PUMPS . . . . OFF

SPD BRK . . . . DO NOT USE

Due to the loss of one elevator.

– MANEUVER WITH CARE

To avoid high hydraulic demand on the remaining system.

Note : As a general rule, do not manually select a HYD ELEC PUMP ON, except temporarily, to retract the spoilers if they remain out after a hydraulic failure.

F/CTL ALTN LAW (PROT LOST)

MAX SPEED 330/.82

Secondary Failure
* WHEEL
* F/CTL

STATUS

CONSIDER RAT MAN USE

"CONSIDER RAT MAN USE" is not triggered, in case of a green reservoir overheat, or in case, of a G + B or G + Y hydraulic system low level.

SPD BRK . . . . DO NOT USE
MAX SPEED 330/.82
MIN RAT SPEED (if RAT extended) . . 140 KT
MANEUVER WITH CARE

HYD G + Y SYS LO PR (CONT'D)

STATUS

APPR PROC

■ **If system lost by RSVR LO AIR PR :**
- Affected ENG PUMP . . . . ON

■ **If system lost by RSVR OVHT :**
- ● **IF GREEN OVHT OUT :**
  - GREEN ENG 1 + 2 PUMP . . ON
- ● **IF YELLOW OVHT OUT :**
  - YELLOW ENG 2 PUMP . . . . . ON

■ **If HYD not recovered :**

R ● **BEFORE S/F EXTENSION and if**
R **ENG 2 S/D :**
- YELLOW ELEC PUMP . . . . . OFF

R *Switch OFF the yellow electrical pump to avoid*
R *flight control jerk, in case Engine 2 is lost.*

● **If FLAPS < 3 :**
- GPWS FLAP MODE . . . . OFF
- FOR LDG . . . . USE FLAP 2

Selecting FLAP 2, instead of FLAP 3, permits the VMAX display on PFD to be increased.

● **If FLAPS = 3 :**
- FOR LDG . . . . USE FLAP 3

● **If FLAPS > 3 :**
- FOR LDG . . . . . USE FLAP FULL

- S/F JAMMED PROC . . . . . . APPLY

● **FOR L/G GRVTY EXTN :**

MAX SPEED . . . . 200 KT
- LDG GRVTY EXTN . . . . . DOWN

HYD G + Y SYS LO PR (CONT'D)

STATUS

● **WHEN L/G DOWNLOCKED :**
– L/G (lever) .... DOWN
– APPR SPD (if F ≥ 2) .... VLS + 10 KT
Approach speed increases, due to the loss of one elevator.
– LDG DIST PROC .... APPLY
R *Refer to the QRH part 2, or to the FCOM 3.02.80*

ALTN LAW : PROT LOST
SLATS SLOW
CAT 1 ONLY
INCREASED FUEL CONSUMP
Fuel consumption increases by approximately 16 %, due to the outer ailerons in the upfloat position.

INOP SYS
F/CTL PROT
G + Y HYD
L/G RETRACT
AP 1 + 2
FLAPS
L + R OUTR AIL
R ELEV
MOST SPLRS
N/W STRG
AUTO BRK
NORM BRK
CARGO DOORS
(if Y LO LVL)
REV 2
(PW/RR Eng)
L/G DOOR

HYD B + Y SYS LO PR

LAND ASAP

– Affected PUMPS . . . . OFF

MANEUVER WITH CARE

To avoid high hydraulic demand on the remaining system.

Note : As a general rule, do not manually select HYD ELEC PUMP ON, except temporarily, to retract the spoilers if they remain out after a hydraulic failure.

● **IF TRIM LOCKED > 8 UP**

MAX SPEED . . . . 180 KT

R *Select the configuration, as appropriate. Fuel consumption is increased.*
180 knots is the limit speed. Recommended speed is 160 knots.
Use manual thrust.

F/CTL ALTN LAW (PROT LOST)

MAX SPEED 330/.82

Secondary Failure
* F/CTL

HYD B + Y SYS LO PR (CONT'D)

STATUS

MAX SPEED 330/.82

● **IF TRIM LOCKED > 8 UP :**

MAX SPEED . . . . 180 KT

MANEUVER WITH CARE

APPR PROC

■ **If system lost by RSVR LO AIR PR :**

– affected ENG PUMP . . . . ON

■ **If system lost by RSVR OVHT :**

● **IF BLUE OVHT OUT :**

– BLUE ENG 1 PUMP . . . . ON

● **IF YELLOW OVHT OUT :**

– YELLOW ENG 2 PUMP . . . . . ON

■ **If HYD not recovered :**

– PITCH AUTHORITY . . . . REDUCED

Start the flare slightly earlier. More stick deflection may be needed to achieve the flare.

– GPWS FLAP MODE . . . . OFF

– FOR LDG . . . . USE FLAP 2

Due to the loss of the stabilizer, do not select CONF FULL or CONF 3, so as not to degrade handling qualities.

● **FOR L/G GRVTY EXTN :**

MAX SPEED . . . . 200 KT

– LDG GRVTY EXTN . . . . . DOWN

● **WHEN L/G DOWNLOCKED :**

– L/G lever . . . . DOWN

– APPR SPD . . . . VLS + 10 KT

Approach speed must be increased, due to the partial loss of spoilers and stabilizers.

– LDG DIST PROC . . . . APPLY

Refer to the QRH Part 2, or to the FCOM 3.02.80.

ALTN LAW : PROT LOST

SLATS/FLAPS SLOW

CAT 1 ONLY

Note : Following a blue hydraulic system failure, the parking brake may be inoperative, due to blue accumulator low pressure.

INOP SYS

F/CTL PROT
STABILIZER
B + Y HYD
AP 1 + 2
MOST SPLRS
ALTN BRK
N/W STRG
CARGO DOORS
(if Y LO LVL)
REVERSERS
(PW/RR Eng.)
L/G DOORS

HYD G (B) (Y) ELEC PUMP FAULT

In case of an electrical pump overheat, or if an electrical pump fails while in use :

– Affected ELEC PUMP .... OFF

STATUS

R *Note : In case of an electrical pump overheat, and until the*
R *system is reset on ground, the electrical pump*
R *pushbutton FAULT light (on the overhead panel) stays*
R *on, and the OVHT indication (on the ECAM) stays*
R *displayed, even if the overheat has stopped.*

INOP SYS

G ELEC PUMP
(B) (Y)

HYD G ENG 1 (2) PUMP LO PR

– GREEN ENG PUMP (affected) .... OFF

STATUS

Note : On ground, avoid retracting the FLAPS when the aircraft is moving, to prevent a loss of normal braking.

INOP SYS

G ENG 1(2)
PUMP

HYD G ENG 1+2 PUMP LO PR

– GREEN ENG 1+2 PUMPS . . . . OFF

G SYS LO PR

Secondary Failure
* F/CTL
* WHEEL

STATUS

APPR PROC
R ● **FOR L/G GRAVITY EXTN** :
MAX SPEED . . . . 200 KT
– L/G GRVTY EXTN . . . . DOWN
● **WHEN L/G DOWNLOCKED** :
– L/G (lever) . . . . DOWN
– LDG DIST PROC . . . . APPLY
SLATS/FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS
GREEN HYD
L/G RETRACT
PART SPLRS
CAT 3 DUAL
N/W STRG
AUTO BRK
NORM BRK
G ENG 1 PUMP
G ENG 2 PUMP

HYD B ENG 1 PUMP LO PR

LAND ASAP

R "LAND ASAP" is only triggered, if the green hydraulic system is
R supplied by the RAT.
R

– BLUE ENG 1 PUMP . . . . OFF

B SYS LO PR

● **If G HYD SYS is supplied by the RAT** :

– A/SKID NWS . . . . OFF
– MAX BRK PR . . . . 1000 PSI
– BRK B ACCU PR ONLY

Secondary Failure
* F/CTL

STATUS

MAX BRK PR . . . . 1000 PSI (a)
– LDG DIST PROC . . . . APPLY
BRK B ACCU PR ONLY (a)
SLATS SLOW
CAT 3 SINGLE ONLY

INOP SYS
BLUE HYD
PART SPLRS
REV 1 (PW or RR engines)
CAT 3 DUAL
ALTN BRK
AUTO BRK (a)
ANTI SKID (a)
NORM BRK (a)
N/W STRG (a)
B ENG 1 PUMP

(a) If green HYD SYS is supplied by RAT

Note : Following a blue hydraulic system failure, the parking brake may be inoperative due to a blue accumulator low pressure.

HYD Y ENG 2 PUMP LO PR

LAND ASAP

"LAND ASAP" is only triggered, if the green hydraulic system is supplied by the RAT.

– YELLOW ENG 2 PUMP . . . . OFF

Y SYS LO PR

Secondary Failure
* F/CTL

STATUS

– LDG DIST PROC . . . . APPLY
FLAPS SLOW
CAT 3 SINGLE ONLY

INOP SYS
YELLOW HYD
PART SPLRS
REV 2 (PW or RR engines)
CAT 3 DUAL
Y ENG 2 PUMP

HYD RAT FAULT (on ground)

Crew awareness.

STATUS

INOP SYS

RAT

HYD MONITORING FAULT

Crew awareness.

HSMU not properly connected.

Note : The following functions are lost :

- *Automatic control of the electrical pumps*
- *Automatic RAT extension*
- *Automatic closure of the fire shutoff valves*
- *OVHT warning on the hydraulic circuit*
- *Reservoir fluid level on the ECAM*

STATUS

INOP SYS

HYD MONG

HYD G RSVR UNDERFILLED (on ground)

This caution is triggered on the ground, if the reservoir quantity is below 17 l when the temperature is above 0°C, or below a quantity function of the temperature when the temperature is below 0°C. Maintenance action is due.

HYD G SYS LEAK

This caution is triggered in flight, with the same logic as the G RSVR UNDERFILLED caution.

– LEAK RATE . . . . MONITOR

● **IF LEVEL DECREASES**

– GREEN ENG 1 + 2 PUMP . . . . OFF
– GREEN ELEC PUMP . . . . OFF

A. ICE L(R) WSHLD HEAT

R ● **If due to a WHC command failure :**
L(R) WINDOW HEAT
– PROBE WINDOW HEAT . . . . ON

STATUS

INOP SYS
L (R) WSHLD HEAT

A. ICE L + R WSHLD HEAT

● **If due to a WHC command failure :**
L + R WINDOW HEAT
– PROBE WINDOW HEAT . . . . ON

STATUS

INOP SYS
WSHLD HEAT
WINDOW HEAT (If WHC command failed)

A. ICE L (R) (L + R) WINDOW HEAT

Crew awareness.

STATUS

INOP SYS
L(R) WNDW HEAT
(WINDOW HEAT)

A. ICE CAPT PITOT or L (R) STAT or AOA HEAT

– AIR DATA SWTG (if ADR 3 avail and not used) . . . CAPT ON 3
ADR 3 supplies data to PFD 1 and ND 1.

● **IF ICING EXPECTED :**
Only for PITOT HEAT FAULT, and if ADR 2 or 3 are FAULT or OFF.
– UNREL SPD PROC . . . . CONSIDER

STATUS

INOP SYS
CAPT PITOT
(CAPT L STAT)
(CAPT R STAT)
(CAPT AOA)

A. ICE F/O PITOT or L (R) STAT or AOA HEAT

– AIR DATA SWTG (if ADR 3 avail, and not used) . . . . F/O ON 3
ADR 3 supplies data to PFD 2 and ND 2.

● **IF ICING EXPECTED :**
Only for PITOT HEAT FAULT, and if ADR 1 or 3 are FAULT or OFF.
– UNREL SPD PROC . . . . CONSIDER

STATUS

INOP SYS
F/O PITOT
(F/O L STAT)
(F/O R STAT)
(F/O AOA)

A. ICE STBY PITOT or L (R) STAT or AOA HEAT

– AIR DATA SWTG . . . . AS RQRD
If standby instruments are used, monitor air data information.

STATUS

INOP SYS
STBY PITOT
(STBY L(R) STAT)
(STBY AOA)

A. ICE CAPT (F/O) TAT HEAT

- **If TAT abnormally heated on ground :**
  TAT HEATED ON GND

A. ICE CAPT (F/O) (STBY) PROBES HEAT

– PROBE WINDOW HEAT . . . . ON

- **IF UNSUCCESSFUL :**
  – AIR DATA SWTG . . . . . . CAPT ON 3 (F/O ON 3) (AS RQRD)

STATUS

INOP SYS
CAPT PROBES
(F/O) (STBY)

DOUBLE STAT (AOA) HEAT FAILURE

In case of double failure of the static probe or alpha probe heaters in icing conditions, the choice made by the computers among the 3 ADR values may be erroneous.

- **If icing conditions cannot be avoided :**
  – One of affected ADRs . . . . OFF
  There will be a disagreement between the two remaining ADRs, which will trigger the F/CTL ADR DISAGREE ECAM caution.

A. ICE ENG 1 (2) VALVE CLOSED

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

INOP SYS
ENG 1 (2) A. ICE

A. ICE ENG 1 (2) VALVE OPEN

R *This warning is triggered, if one ENG ANTI ICE pushbutton is selected OFF, and the*
R *corresponding ENG ANTI ICE valve is detected OPEN.*
R *If the fault is present before takeoff, it may lead to an ENG THRUST LOSS warning upon*
R *takeoff power application.*
R *Refer to the MMEL for dispatch.*

Crew awareness.

Note : Continuous ignition remains selected on the 2 engines, if one nacelle anti-ice valve is open.

A. ICE WING OPEN ON GND

Following ground test the valves are still open after 40 seconds.
This caution is automatically recalled in phase 9.

– WING ANTI ICE . . . . OFF

WAI AVAIL IN FLT

STATUS

WAI AVAIL IN FLT

A. ICE L(R) INR (OUTR) WING LO PR

In flight low pressure is detected when wing anti ice is selected on.

– THRUST . . . . INCREASE

● **IF UNSUCCESSFUL :**

– WING ANTI ICE . . . . OFF

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

APPR PROC

● **IF ICE ACCRETION :**

– APPR SPD . . . . VLS + 10 KT

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

Note : In case of severe ice accretion, with wing anti ice failed, the angle of attack protections are still efficient. However, if full back stick is maintained while at maximum angle of attack, a divergent roll oscillation may appear. Releasing slightly the stick will stop this oscillation.

INOP SYS

WING A. ICE

A. ICE WING VLVE NOT OPEN

In flight one wing valve remains closed when WAI is selected on.

– WING ANTI ICE . . . . OFF

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS

APPR PROC

● **IF ICE ACCRETION :**

– APPR SPD . . . . VLS + 10 KT

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

Note : In case of severe ice accretion, with wing anti ice failed, the angle of attack protections are still efficient. However, if full back stick is maintained while at maximum angle of attack, a divergent roll oscillation may appear. Releasing slightly the stick will stop this oscillation.

INOP SYS

WING A. ICE

A. ICE L (R) INR (OUTR) WING OPEN

One wing anti ice valve is abnormally not closed.

■ **Failure detected on ground :**

– WING ANTI ICE . . . . OFF
– X BLEED (if not closed) . . . . CLOSE
– ENG BLEED (affected side) . . . . OFF
– APU BLEED (if left wing affected) . . . . OFF

WAI AVAIL IN FLT

● **After take-off when above 1500 ft (automatic recall)**

– ENG BLEED (affected side) . . . . ON
– X BLEED . . . . AUTO
– WING ANTI ICE . . . . AS RQRD

R *On the failed side, wing anti ice is continually ON and so is available if needed.*

WAI AVAIL IN FLT.

● **After landing (automatic recall) :**

– WING ANTI ICE . . . . OFF
– X BLEED (if not closed) . . . . CLOSE
– ENG BLEED (affected side) . . . . OFF
– APU BLEED (if left wing affected) . . . . OFF

STATUS

WAI AVAIL IN FLT

INOP SYS
ENG BLEED
PACK

■ **Failure detected in flight :**

– WING ANTI ICE . . . . AS RQRD

WAI AVAIL IN FLT

Wing anti ice is available if needed and anyway is continuously on, on failed side.

● **Depending on Bleed configuration :**

– X BLEED . . . . OPEN or AUTO

R ● **After landing (automatic recall) :**

Refer to failure detected on ground.

STATUS

WAI AVAIL IN FLT

A. ICE L (R) INR (OUTR) WING HI PR

Crew awareness

A. ICE WAI SYS FAULT

The wing anti ice command relay is failed.

■ **WING ANTI ICE pb ON – All WAI valves CLOSED**

The wing anti ice valves stay closed.

– WING ANTI ICE . . . . OFF

AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS	INOP SYS
APPR PROC	WING A. ICE
● **IF ICE ACCRETION**	
– APPR SPD . . . . VLS + 10 KT	
– LDG DIST PROC . . . . APPLY	
R *Refer to the QRH part 2, or to the FCOM 3.02.80.*	
Note : In case of severe ice accretion, with anti ice failed, the angle of attack protections are still efficient. However, if full back stick is maintained while at maximum angle of attack, a divergent roll oscillation may appear. Releasing slightly the stick will stop this oscillation.	

■ **WING ANTI ICE pb OFF – All WAI valves OPEN**

The wing anti ice valves are abnormally open.

WING ANTI ICE ON

● **If on the ground :**

– X BLEED (if not closed) . . . . CLOSE
– ENG BLEED (1 + 2) . . . . OFF
– APU BLEED . . . . OFF

WAI AVAIL IN FLT

STATUS

WAI AVAIL IN FLT	INOP SYS
	ENG BLEED
	PACK

● **If in flight or after TO when above 1500 ft (automatic recall)**

– ENG BLEED (1 + 2) . . . . ON
– X BLEED (depending on Bleed Config) . . . OPEN or AUTO

● **After landing (automatic recall)**

– X BLEED (if not closed) . . . . CLOSE
– ENG BLEED (1 + 2) . . . . OFF
– APU BLEED . . . . OFF

A. ICE ICE DETECTED

Ice is signalled by either detector in flight with TAT < 10°C.

– ENG (all) ANTI ICE .... ON

SEVERE ICE DETECTED

Ice accretion is signalled by either detector in flight with TAT < 10°C.

– ENG (all) ANTI ICE .... ON
– ENG START SEL .... IGN

The line is displayed if continuous ignition is not automatically selected.

● **If bleed configuration (due to failures) permits WAI selection:**
  – WING ANTI ICE .... ON

● **If bleed configuration (due to failures) does not permit WAI selection :**
  – WING ANTI ICE .... OFF
  AVOID ICING CONDITIONS

A. ICE DETECT FAULT

Ice detection is lost.

– ANTI ICE .... AS RQRD

STATUS

INOP SYS
ICE DETECT

ANTI ICE CAPT + F/O PITOT HEAT

Capt and F/O pitot heating is lost. In case of simultaneous pitot icing and in the same amount, ADR 1 and ADR 2 speeds will be in agreement, but incorrect. Therefore, flight controls will consider the remaining correct source as being faulty, and will reject the only correct source. The following ECAM procedure avoids that the flight controls use 2 erroneous, but coherent, sources.

- **If all probes heating is lost on the CAPT and/or F/O side :**
  - PROBE/WINDOW HEAT . . . . ON
    In some failure conditions, probe heating may be recovered.
- **IF UNSUCCESSFUL :**
  - **If ADR 3 operative and ON**
    - ADR 1 (2) . . . . OFF
      Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 2 be switched OFF.
      Note : In case of subsequent, significant, speed discrepancy between the 2 remaining ADRs, the "ADR DISAGREE" ECAM caution will be triggered.
  - **If ADR 3 failed or OFF**
    No action is required, as long as there are no icing conditions, in order to keep 2 independent speed sources.
    - **IF ICING EXPECTED :**
      - ADR 1 (2) . . . . OFF
        Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 2 be switched OFF.
      - UNREL SPD PROC . . . . CONSIDER
        Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the unreliable speed procedure.

NAV ADR FAULT

- **If ADR 3 failed or OFF**
  - **IF ICING EXPECTED :**
    - ADR 1 (2) . . . . OFF
    - UNREL SPD PROC . . . . CONSIDER

STATUS

INOP SYS

CAPT PITOT
F/O PITOT
CAPT PROBES
(If all CAPT PROBES heating is lost)
F/O PROBES
(If all F/O PROBES heating is lost)

ANTI ICE CAPT + STBY PITOT HEAT

Capt and STBY pitot heating is lost. In case of simultaneous pitot icing and in the same amount, ADR 1 and ADR 3 speeds will be in agreement, but incorrect. Flight controls will consider the remaining correct source as being faulty, and will reject the only correct source. The following ECAM procedure avoids that the flight controls use 2 erroneous, but coherent, sources.

● **If all probes heating is lost on the CAPT and/or STBY side :**
- PROBE/WINDOW HEAT . . . . ON

In some failure conditions, probe heating may be recovered.

● **IF UNSUCCESSFUL :**

■ **If ADR 2 operative and ON**
- ADR 1 (3) . . . . OFF

Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 3 be switched OFF.

Note : In case of subsequent, significant, speed discrepancy between the 2 remaining ADRs, the "ADR DISAGREE" ECAM caution will be triggered.

■ **If ADR 2 failed or OFF**

No action is required, as long as there are no icing conditions, in order to keep 2 independent speed sources.

● **IF ICING EXPECTED :**
- ADR 1 (3) . . . . OFF

Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1 or 3 be switched OFF.
- UNREL SPD PROC . . . . CONSIDER

Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the unreliable speed procedure.

NAV ADR FAULT

■ **If ADR 2 failed or OFF**

● **IF ICING EXPECTED :**
- ADR 1 (3) . . . . OFF
- UNREL SPD PROC . . . . CONSIDER

STATUS

INOP SYS
CAPT PITOT
STBY PITOT
CAPT PROBES
(If all CAPT PROBES heating is lost)
STBY PROBES
(If all STBY PROBES heating is lost)

ANTI ICE F/O + STBY PITOT HEAT

F/O and STBY pitot heating is lost. In case of simultaneous pitot icing and in the same amount, ADR 2 and ADR 3 speeds will be in agreement, but incorrect. Therefore, flight controls will consider the remaining correct source as being faulty, and will reject the only correct source. The following ECAM procedure avoids that the flight controls use 2 erroneous, but coherent, sources.

- **If all probes heating is lost on the F/0 and/or STBY side :**
  - PROBE/WINDOW HEAT . . . . ON

    In some failure conditions, probe heating may be recovered.
- **IF UNSUCCESSFUL :**
  - **If ADR 1 operative and ON**
    - ADR 2 (3) . . . . OFF

      Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 2 or 3 be switched OFF.

      Note : In case of subsequent, significant, speed discrepancy between the 2 remaining ADRs, the "ADR DISAGREE" ECAM caution will be triggered.
  - **If ADR 1 failed or OFF**

    No action is required, as long as there are no icing conditions, in order to keep 2 independent speed sources.
    - **IF ICING EXPECTED :**
      - ADR 2 (3) . . . . OFF

        Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 2 or 3 be switched OFF.
      - UNREL SPD PROC . . . . CONSIDER

        Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the unreliable speed procedure.

NAV ADR FAULT

- **If ADR 1 failed or OFF**
  - **IF ICING EXPECTED :**
    - ADR 2 (3) . . . . OFF
    - UNREL SPD PROC . . . . CONSIDER

STATUS

INOP SYS

F/O PITOT
STBY PITOT
F/O PROBES
(If all F/O PROBES heating is lost)
STBY PROBES
(If all STBY PROBES heating is lost)

ANTI ICE ALL PITOT HEAT

Capt, F/O and STBY pitot heating is lost. In case of simultaneous pitot icing and in the same amount, ADR 1, ADR 2, and ADR 3 speeds will be in agreement, but incorrect. The following ECAM procedure avoids that the flight controls use erroneous, but coherent, sources.

- **If all probes heating is lost on the CAPT and/or F/O and/or STBY side :**
  - PROBE/WINDOW HEAT . . . . ON
- **IF UNSUCCESSFUL :**
  - ADR 1 (2) (3) . . . . OFF

    Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1, 2 or 3 be switched OFF.

    Note : In case of subsequent, significant, speed discrepancy between the 2 remaining ADRs, the "ADR DISAGREE" ECAM caution will be triggered.
  - **IF ICING EXPECTED :**
    - ADR 2 (3) . . . . OFF

      Depending on the status of the static, AOA, and TAT heating, the ECAM requires that either ADR 1, 2 or 3 be switched OFF.
    - UNREL SPD PROC . . . . CONSIDER

      Only one ADR is available, and the corresponding pitot probe may be affected by ice accretion. Be prepared to use the unreliable speed procedure.

NAV ADR FAULT

Single ADR FAULT or double ADR FAULT ECAM cautions may be triggered, depending on the number of ADRs switched OFF.

F/CTL ALTN LAW (PROT LOST)

Alternate law becomes active, if :
- *One ADR has already been switched OFF, and the 2 remaining ADRs are not in agreement, or*
- *Two ADRs have been switched OFF.*

ANTI ICE ALL PITOT HEAT (CONT'D)

STATUS

- **IF ICING EXPECTED :**
  - ADR 2 (3) . . . . OFF
  - UNREL SPD PROC . . . . . . CONSIDER

INOP SYS

CAPT PITOT
F/O PITOT
STBY PITOT
CAPT PROBES
(If all CAPT PROBES heating is lost)
F/O PROBES
(If all F/O PROBES heating is lost)
STBY PROBES
(If all STBY PROBES heating is lost)

RECORDER DFDR FAULT

Crew awareness

STATUS

INOP SYS
DFDR

RECORDER FDIU FAULT

Crew awareness

STATUS

INOP SYS
FDIU

FWS ECP FAULT

ECP KEYS AVAIL :
CLR, RCL, STS, ALL,
EMER CANC.

CLR, STS, RECALL, EMERGENCY CANCEL, ALL keys are directly wired to the EIS computers.

FWS FWC 1(2) FAULT

Crew awareness

CAT 3 SINGLE ONLY

STATUS

INOP SYS
FWC 1(2)
CAT 3 DUAL

FWS FWC 1 + 2 FAULT

– MONITOR SYS
– MONITOR OVERHEAD PANEL
CAT 1 ONLY

NOT AVAIL
ECAM WARN
ALTI ALERT
STATUS
A/CALL OUT
MEMO

ECAM Cautions and Warnings, aural warnings, master caution and warning lights are lost. ECAM system pages are still available. Therefore cockpit panels must be monitored for local warnings and ECAM system pages must be regularly called for system checks.
Check the general status of the systems for the DES/APPR preparation.

FWS SDAC 1(2) FAULT

Crew awareness

STATUS

INOP SYS
SDAC 1(2)

FWS SDAC 1 + 2 FAULT

– MONITOR OVERHEAD PANEL
Part of amber cautions is lost.
All red warnings, engine and fuel parameters are available on ECAM upper DU.
ECAM SYS PAGES AVAIL :
ENG, F/CTL, FUEL, WHEEL,
PRESS, C/B

STATUS

INOP SYS
SDAC 1 + 2

EIS DMC 1(2) FAULT

– CAPT (F/O) EFIS DMC (if EFIS DMC3 avail) 3
– CAPT (F/O) EFIS DMC (if EFIS DMC2 or 1 avail) . . . . 2(1)

STATUS

INOP SYS
DMC 1(2)

EIS DMC 3 FAULT

Crew awareness

● **If DMC 1(2) failed :**
  – ECAM SWTG DMC . . . . 2(1)
  – CAPT (F/O) EFIS DMC . . . . 2(1)

STATUS

INOP SYS
DMC 3

EIS ECAM DMC 1(2) FAULT

● **If ECAM DMC 3 failed :**
- ECAM SWTG DMC 2

In case of ECAM DMC 1 failure these two lines are not displayed on ECAM as ECAM DMC 1+3 are lost.

STATUS

INOP SYS
ECAM DMC 1(2)

EIS DISPLAY DISCREPANCY

CHECK EWD
CHECK SD
CHECK PFD
CHECK ND

The DMC detects a discrepancy between acquisition and display on a DU.
This warning is associated with an amber message displayed on the concerned DU. In case of EWD display discrepancy, the amber message is displayed on the EWDU and on both NDUs.

- DMC/DU SWTG . . . . AS RQRD

R *Note : The failure may be due to a DMC or a DU problem.*

The following part of the procedure is not displayed on ECAM :

■ **In case of CHECK EWD or CHECK SD :**
- ECAM SWTG DMC . . . . 1 or 2

DMC 1 or 2 may be selected if not failed.

● **If unsuccessful :**

Return to normal DMC configuration
In case of CHECK EWD :

R - ECAM UPPER DISPLAY . . . . OFF

EWD is automatically transferred on SDU

- ECAM/ND . . . . CAPT or F/O

SD display may be recovered on CAPT or on F/O ND.

In case of CHECK SD :
- ECAM/ND . . . . AS RQRD
- SDU . . . . AS RQRD

The DU may be switched off.

EIS DISPLAY DISCREPANCY (CONT'D)

■ **In case of CHECK PFD or CHECK ND :**

- Crosscheck with standby instrument.
- EFIS DMC (affected side) 3

● **If unsuccessful :**

- Return to normal DMC configuration.
- PFD/ND XFR (affected side) . . . . AS RQRD
- DU (affected) . . . . AS RQRD

  The DU can be switched off.

DISPLAY UNIT FAILURE

■ **DU is blank, or display is distorted, or INVALID DISPLAY UNIT message is displayed :**

- DU (affected) . . . . AS RQRD

  The DU can be switched off.
- ECAM/ND SEL (if ECAM DUs affected) . . . . USE

  Transfer SD to F/O or CAPT ND.
- PFD/ND XFR (if EFIS DUs affected) . . . . USE

■ **INVALID DATA message displayed :**

This failure may be due to a DMC FAULT, or a communication interruption between the DMC and DU.

- DMC SWITCHING (EFIS OR ECAM) . . . . AS RQRD

● **If unsuccessful :**

- DU (affected) . . . . OFF THEN ON

  Note : ND display may disappear, in case too many waypoints and associated information are displayed. Reduce the range, or deselect WPT or CSTR, and display will automatically recover after about 30 seconds.

■ **INVALID DATA message displayed on ECAM DUs (EWD and SD) :**

- ECAM DMC SWITCHING 2

  This action permits the recovery of both ECAM DUs.

■ **Inversion of EWD and SD :**

- ECAM UPPER DISPLAY . . . . OFF THEN ON

  The action on the ECAM DMC SWITCHING selector produces the same effect.

ECAM SINGLE DISPLAY

Only the EWD is available. No SD on the other DUs.

■ **To call a SYS page :**

– PRESS AND MAINTAIN SYS page key on ECP.

■ **OVERFLOW ON THE STATUS page :**

– PRESS AND MAINTAIN STS KEY ON ECP
First page of STATUS is displayed.

– RELEASE IT THEN PRESS AGAIN WITHIN 2 SECONDS
Second page of STATUS is displayed.

– CONTINUE UNTIL DISAPPEARANCE OF THE OVERFLOW ARROW
When the STS key is released for more than 2 seconds, EWD is displayed again.

FWS OEB/FWC DISCREPANCY

– OEB DATABASE . . . . X CHECK

L/G DOORS NOT CLOSED

This warning appears, if the landing gear sequence is not completed after 30 seconds.

MAX SPEED 250/.55

● **WHEN SPD < 250/.55 :**

– L/G lever . . . . RECYCLE

Recycling the landing gear switches landing gear control to the other LGCIU.

STATUS

MAX SPEED . . . . 250/.55 | INOP SYS
INCREASED FUEL CONSUMP | L/G DOOR

L/G GEAR NOT UPLOCKED

This warning appears, if the landing gear sequence is not completed after 30 seconds.

■ **L/G doors closed :**

AVOID EXCESS G FACTOR

Since the gears rest on the doors, avoid excessive load factors in order not to damage the door structure.

STATUS

AVOID EXCESS G FACTOR |

■ **L/G doors not closed :**

MAX SPEED 250/.55

● **WHEN SPD < 250/.55 :**

– L/G leve . . . . RECYCLE

Recycling the landing gear switches landing gear control to the other LGCIU.

● **IF UNSUCCESSFUL :**

– L/G . . . . DOWN

MAX SPEED 250/.55

STATUS

MAX SPEED . . . . 250/.55 | INOP SYS
INCREASED FUEL CONSUMP | L/G RETRACT

R *Note :* – *Flight with landing gear extended has a significant effect on fuel consumption*
R *and climb gradient (see "SPECIAL OPERATIONS" FLIGHT WITH GEAR DOWN*
R *FCOM 2.04.25). Multiply fuel consumption by approximately 2.8. Disregard*
R *FM fuel predictions.*
R – *Other predictions should also be disregarded (altitude, speed and time),*
R *except time predictions at waypoints when in cruise.*
R – *Do not use managed speed (except in approach), and CLB and DES autopilot*
R *modes.*

L/G GEAR UPLOCK FAULT

MAX SPEED 250/.55

– L/G lever . . . . KEEP DOWN

Landing gear must be left down to avoid structural damage, as the uplock device will stay in the locked position.

STATUS

MAX SPEED 250/.55	INOP SYS
– L/G lever . . . . KEEP DOWN	L/G RETRACT
INCREASED FUEL CONSUMP	

Flight with the landing gear extended has a significant effect on fuel consumption and climb
R *gradient (See "SPECIAL OPERATIONS", FLIGHT WITH GEAR DOWN). Multiply fuel*
R *consumption by approximately 2.8.*

L/G GEAR NOT DOWNLOCKED

This warning appears if the landing gear sequence is not completed after 30 seconds.

R – L/G lever .... RECYCLE

Recycling the landing gear, switches the landing gear control to the other LGCIU.

- **IF UNSUCCESSFUL :**
  - **FOR L/G GRVTY EXTN :**
    MAX SPEED .... 200 KT
    – LDG GRVTY EXTN .... DOWN
  - **WHEN L/G DOWNLOCKED :**
    – L/G lever .... DOWN
- **IF WARNING AFTER 40 S :**
  – LDG GRVTY EXTN .... RESET
  – L/G lever .... UP
- **FOR L/G GRVTY EXTN :**
  MAX SPEED .... 200 KT
  – LDG GRVTY EXTN .... DOWN
- **WHEN L/G DOWNLOCKED :**
  R – L/G lever .... DOWN

STATUS

APPR PROC	INOP SYS
R ● **FOR L/G GRVTY EXTN :**	CAT 3 DUAL
R MAX SPEED .... 200 KT	N/W STRG(a)
R – L/G GRVTY EXTN .... DOWN	
R ● **WHEN L/G DOWNLOCKED :**	
R – L/G LEVER .... DOWN	
CAT 3 SINGLE ONLY	
If the second gravity extension is unsuccessful refer to "LDG WITH ABNORMAL L/G" procedure.	

(a) As nose gear doors remain open, the hydraulic power for nose wheel steering is lost.

L/G GEAR NOT DOWN

This warning appears in approach at 750 feet RA if the landing gear is not selected DOWN although the system is not failed.
This warning is associated with the illumination of the red arrow on the instrument panel.
Crew awareness

L/G RETRACTION FAULT

MAX SPEED 250/.55
– L/G lever . . . . RECYCLE
R ● **IF UNSUCCESSFUL** :
R – L/G lever . . . . KEEP DOWN

STATUS

MAX SPEED 250/.55	INOP SYS
– L/G lever . . . . KEEP DOWN	L/G RETRACT
INCREASED FUEL CONSUMP	

L/G L (R) LENGTHENING FAULT

MAX SPEED 250/.55
– L/G lever . . . . KEEP DOWN
Note : The shock absorber performance of the affected gear is degraded. Touch down as smooth as possible.

STATUS

MAX SPEED 250/.55	INOP SYS
– L/G lever . . . . KEEP DOWN	L/G RETRACT
INCREASED FUEL CONSUMP	

L/G SYS DISAGREE

Disagreement between the landing gear positions detected by LGCIU 1 and by LGCIU 2.
R *Provided there is no other landing gear ECAM warning, the landing gear position is in*
R *agreement with the landing gear lever position.*
Crew awareness

L/G LGCIU 1 (2) (1 + 2) FAULT

■ One LGCIU FAULT

– GPWS (if LGCIU 1 affected) .... OFF

As LGCIU 1 is lost, GPWS receives "L/G in up position" information, even if the L/G is down. Setting the GPWS SYS pushbutton OFF, prevents untimely warnings in approach.

STATUS

INOP SYS
LGCIU 1(2)
GPWS (if LGCIU 1 failed)

■ Both LGCIU FAULT :

– GPWS .... OFF

As LGCIU 1 is lost, GPWS receives "L/G in up position" information, even if the L/G is down. Setting the GPWS SYS pushbutton OFF, prevents untimely warnings in approach.

● **FOR L/G EXTN :**

– L/G NORMAL EXTN .... TRY

● **IF UNSUCCESSFUL :**

L/G GRVTY EXTN ONLY

Refer to the L/G GRAVITY EXTENSION procedure.

● **FOR L/G GVRTY EXTN :**

– MAX SPEED .... 200 KT

STATUS

R APPR PROC :

● **FOR L/G EXTN**

– L/G NORMAL EXTN .... TRY

● **IF UNSUCCESSFUL :**

● **FOR L/G GRVTY EXTN :**

– MAX SPEED .... 200 KT

L/G GRVTY EXTN ONLY

ENG HI IDLE

When idle is selected on ground, only approach idle is available.

CAT 3 SINGLE ONLY

Note : Partial spoiler extension at landing, when only one MLG is compressed, is not available.
Spoilers extend normally on ground, when the wheel speed > 72 knots.

INOP SYS
LGCIU 1 + 2
REVERSERS
N/W STRG
GPWS
CAT 3 DUAL

L/G GRAVITY EXTENSION

MAX SPEED .... 200 KT

Speed with main landing gear doors open is limited to 200 knots to avoid vibrations transmitted through the cabin floor.

– LDG GRVTY EXTN .... DOWN

Note : Both switch guards have to be open before selecting DOWN.

– L/G lever .... DOWN

The landing gear lever should be confirmed in the DOWN position for the following reasons :

· To extinguish the UNLK lts on landing gear indications panel.

· To prevent the L/G CTL ECAM message on WHEEL page and the L/G NOT DOWN warning on ECAM.

· To minimize the risk of landing gear retraction on the ground, due to unknow system fault, when the free fall system is reset.

– GEAR DOWN indications .... CHECK

R CAUTION
Nose wheel steering is lost.

■ **If successful :**

The free fall system should not be reset to avoid undesirable effect such as further fluid loss in the event of a leak or possible landing gear unlocking in the event of a gear selector valve jammed in UP position.

Note : The free fall system may be reset in flight after use for training.
Provided the green hydraulic system is available resetting the free fall system may permit to restore landing gear doors closure and nose wheel steering operation.

STATUS

● **WHEN L/G DOWNLOCKED**

– L/G lever .... DOWN

■ **If unsuccessful :**

Refer to “LDG WITH ABNORMAL L/G” procedure.

Note : 1. One gravity extension reset is allowed in case of “L/G GEAR NOT DOWNLOCKED” warning display.
2. In all cases the free fall system should not be reset by flight crew on the ground following free fall extension.

LDG WITH ABNORMAL L/G

The procedure is intended for use when nose or main landing gear fail to extend and/or lockdown following the application of L/G GRVTY EXTN procedure.
It is preferable to use any available landing gear, rather than carry out a belly landing.
Under these circumstances, a hard surface runway landing is recommended.
Full advantage should be taken of any foam spread on the runway.

PREPARATION

– CABIN CREW . . . . NOTIFY
Notify the cabin crew of the nature of emergency encountered and state intention. Specify the amount of preparation time available.
– ATC . . . . NOTIFY
Notify ATC of the nature of the emergency and state intentions.
– JETTISON . . . . CONSIDER
Consider fuel reduction to safe minimum. This reduces VREF and, as a consequence, the load factor at impact and the energy to be dissipated.

● **If NOSE L/G abnormal**
– CG location (if possible) . . . . AFT
· 10 passengers from front to rear about + 2 %

● **If one MAIN L/G abnormal**
– FUEL IMBALANCE . . . . CONSIDER
Open the fuel X-FEED valve and switch off the pumps on the side with landing gear normally extended.

– OXYGEN CREW SUPPLY . . . . OFF
– SEAT BELTS/NO SMOKING . . . . ON
– CABIN and COCKPIT . . . . PREPARE
· Loose equipment secured
· Survival equipment prepared
· Belts and shoulder harnesses locked

LDG WITH ABNORMAL L/G (CONT'D)

APPROACH

- GPWS SYS . . . . OFF
- L/G LEVER . . . . CHECK DOWN
- L/G GRVTY EXTN . . . . RESET
- AUTOBRAKE . . . . DO NOT ARM

R *Manual braking will enable better pitch and roll control. Moreover, with at least one*
R *main landing gear in the abnormal position, the autobrake cannot be activated (ground*
R *spoilers not armed).*

- EMER EXIT LT . . . . ON
- COMMERCIAL . . . . OFF
- CABIN REPORT . . . . OBTAIN
- JETTISON . . . . OFF
- T TANK FEED . . . . ISOL

● **If one or both MAIN L/G abnormal**

- A/SKID & N/S STRG . . . . OFF

R *With one main landing gear not extended the reference speed used by the*
R *anti-skid to detect a wheel blockage is not correctly initialized. Consequently, the*
R *anti-skid must be switched off to prevent permanent brake relase.*

- MAX BRAKE PR 1000PSI

R *Modulate the brake pressure to 1000 psi because the anti-skid is off.*

- GROUND SPOILERS . . . . DO NOT ARM

To keep as much roll authority as possible for maintaining the wings level.
Ground spoiler extension would prevent spoilers from acting as roll surfaces.

BEFORE LANDING

- RAM AIR . . . . ON

To ensure full depressurization of the aircraft before impact.

- BRACE FOR IMPACT . . . . ORDER

FLARE, TOUCH DOWN AND ROLL OUT

Engines should be shut down sufficiently early to ensure fuel is shut off before the nacelles impact, but sufficiently late to ensure adequate hydraulic supplies for the flight controls.
Engine pumps continue to supply adequate hydraulic pressure for 30 seconds after engine shutdown.

- REVERSE . . . . DO NOT USE

R *Do not use reverse to prevent ground spoiler extension, and because the engine will*
R *touch the ground during roll-out.*

LDG WITH ABNORMAL L/G (CONT'D)

● **If NOSE L/G abnormal**

– NOSE .... MAINTAIN UP

After touchdown, keep the nose off the runway by using the elevator. Then, lower the nose onto the runway before elevator control is lost.

– BRAKES (compatible with elevator efficiency) . . . APPLY

– ENG MASTERS .... OFF

Shut down the engines before nose impact.

● **If one MAIN L/G abnormal**

– ENG MASTERS (in sequence) .... OFF

After main gear touchdown, shut down the engine on the failure side first, then the other engine before nacelle touchdown.

– FAILURE SIDE WING .... MAINTAIN UP

Use roll control, as needed, to keep unsupported wing up as long as possible.

– DIRECTIONAL CONTROL .... MAINTAIN

Use rudder and brakes (maximum 1000 psi) to maintain runway axis as long as possible.

● **If both MAIN L/G abnormal**

– ENG MASTERS .... OFF

Shut down the engines in the flare, before touchdown.

– PITCH ATTITUDE (at touchdown) . . NOT LESS THAN 6°

WHEN A/C STOPPED

– ENG (all) and APU FIRE pushbutton .... PUSH

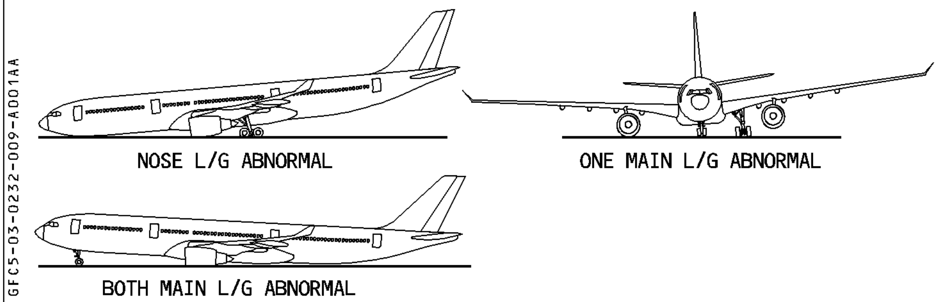
Pressing the ENG FIRE pb shuts off the related hydraulic pressure within a short time.

– ALL ENG and APU AGENT .... DISCH

R – EVACUATION .... INITIATE

· *Announce : "PASSENGER EVACUATION" over the Passenger Address system, and press the EVAC COMMAND pushbutton.*

· *All emergency and passenger doors may be used to evacuate the aircraft.*



NOSE L/G ABNORMAL

ONE MAIN L/G ABNORMAL

BOTH MAIN L/G ABNORMAL

BRAKES AUTO BRK FAULT

Crew awareness.

A tachometer is failed, or a servovalve is jammed closed, on one or two wheels.

STATUS

CAT 3 SINGLE ONLY	INOP SYS AUTO BRK CAT 3 DUAL

BRAKES A/SKID FAULT or A/SKID NWS OFF

Antiskid is failed, or A/SKID & N/W STRG switch is at OFF. Braking is in alternate mode. For any pedal deflection, the braking effect is higher in alternate mode than in normal mode.

MAX BRK PR . . . . 1000 PSI

Monitor brake pressure on the BRAKES PRESS indicator. Limit brake pressure to approximately 1000 psi and, at low ground speed, adjust brake pressure as required.

Avoid landing on an icy runway.

STATUS

MAX BRK PR . . . . 1000 PSI – LDG DIST PROC . . . . APPLY R *Refer to the QRH Part 2, or to the FCOM 3.02.80.* CAT 3 SINGLE ONLY *Note : As specified in the QRH 5.04, automatic rollout is not permitted.*	INOP SYS ANTI SKID CAT 3 DUAL N/W STRG (only if sw at OFF) AUTO BRK

BRAKES RELEASED

A tachometer is failed, or a servovalve is jammed closed, on one or two wheels.

BRAKE 1 (2, 3, 4, 5, 6, 7, 8) RELEASED

STATUS

– LDG DIST PROC . . . . APPLY R *Refer to the QRH Part 2, or to the FCOM 3.02.80.* CAT 3 SINGLE ONLY	INOP SYS AUTO BRK CAT 3 DUAL

BRAKES PARK BRK LO PR

– BRK ACCU PR . . . . CHECK

The blue electrical pump can be used to pressurize the accumulators.

● **BEFORE ENG S/D :**

– CHOCKS . . . . CONSIDER

Consider requesting the chocks before shutting down the engine, if the parking brake accumulator pressure is not in the green band.

CONFIG PARK BRK ON

Crew awareness.

Check that the parking brake handle is in the OFF position. If the warning stays on, check that the brake pressure, on the BRAKES PRESSURE indicator, is at zero.

R
BRAKES HOT

■ **On ground :**

– BRK FAN (if installed) . . . . ON

R *Note : The brake temperature sensor is located close to the carbon, but not inside. Consequently, when the brake fan is ON, the indicated temperatures decrease rapidly.*

– PARK BRK : PREFER CHOCKS

· *If the BRAKES HOT message is still on, when the aircraft is parked, the flight crew should not set the parking brake ON.*

– DELAY T.O. FOR COOLG

· *Delay takeoff, until the brake temperature is below 300°C (or 150°C, if the brake fans are on).*

· *Refer to 3.04.32, for brake temperature limitations requiring maintenance action.*

■ **In flight :**

● **IF PERF PERMITS :**

– L/G . . . . DN FOR COOLG

MAX SPEED 250/.55

· *If performance permits, landing gear retraction should be delayed to improve brake cooling.*

· *Reduce the speed to 250 knots for landing gear operation.*

STATUS

MAX SPEED 250/.55

WHEEL HYD SEL VALVE

Failure of the normal brake selector valve, or the steering selector valve, in the open position.

- *If the normal brake selector valve is failed open, full green hydraulic pressure is present at normal servovalves' entry.*
  Nosewheel steering remains available.
- *On ground, do not tow the aircraft with the green hydraulic system pressurized. Nosewheel steering remains pressurized, and so towing may break either the towbar shear pin, or the nose gear (if towbarless towing).*
- *Setting A/SKID & N/W STRG to OFF, or resetting the BSCU, will cause the nosewheel to go to maximum deflection.*
- A/SKID N/WS . . . . KEEP ON
  As long as antiskid is operative, brake pressure is regulated by normal servovalves.

STATUS

- A/SKID N/WS . . . . KEEP ON

BRAKES SYS 1 (2) FAULT

One BSCU channel has failed.

Crew awareness.

STATUS

INOP SYS

BRAKES SYS 1 (2)

WHEEL N/W STRG FAULT

Crew awareness.

STATUS

CAT 3 SINGLE ONLY

R *Note : As specified in the QRH 5.04, automatic rollout is not*
R *authorized.*

INOP SYS

CAT 3 DUAL

N/W STRG

WHEEL TIRE LO PR

Crew awareness.

R
NWS OVERSTEER

Maintenance action is due, when the NWS TOWING FAULT light comes on.

R
LOSS OF BRAKING

- **IF AUTOBRAKE IS SELECTED :**
  - BRAKE PEDALS . . . . PRESS

    This will override the autobrake.
- **IF NO BRAKING AVAILABLE :**
  - REV . . . . MAX
  - BRAKE PEDALS . . . . RELEASE

    Brake pedals shoud be released when the A/SKID & N/W STRG selector is switched
    R *OFF, since the pedal force or displacement produces more braking action in alternate*
    R *mode than in normal mode.*
  - A/SKID & N/W STRG . . . . OFF

    Braking system reverts to alternate mode.
  - BRAKE PEDALS . . . . PRESS

    Apply brakes with care since initial pedal force or displacement produces more braking action in alternate mode than in normal mode.
  - MAX BRK PR . . . . 1000 PSI

    Monitor brake pressure or BRAKES PRESS indicator. Limit brake pressure to approximately 1000 psi and at low ground speed adjust brake pressure as required.
  - **If STILL NO BRAKING :**
    - PARKING BRAKE . . . . USE

      Use short successive parking brake applications to stop the aircraft. Brake onset asymmetry may be felt at each parking brake application. If possible delay use of parking brake until low speed to reduce the risk of tyre burst and lateral control difficulties.

BRAKES RESIDUAL BRAKING

ON BRAKE 1 (2, 3, 4, 5, 6, 7, 8)

Residual brake pressure is detected with the pedals released :
– On at least one wheel, if on the normal braking system, or
– On the left or right main gear side (affecting the four wheels).
Maintenance action is due.

– RESIDUAL BRK PROC . . . . APPLY

RESIDUAL BRAKING PROC

■ **ON GROUND :**

On ground, a BSCU reset may be attempted, since the "BRAKES RESIDUAL BRAKING" ECAM caution may be spurious, due to :
– Drifted pressure transducer, after aircraft electrical power-up.
– BSCU detection of residual pressure decay after brake release.
The aircraft must be stopped, and the parking brake applied, before switching the A/SKID & N/W STRG selector OFF then ON.

■ **IN FLIGHT :**

For simplification purposes, the following procedure must be applied in all residual braking cases (of the normal or alternate system), even if some actions are not really necessary in the case of actual residual pressure on the normal braking system.

– BRAKES PEDALS . . . . APPLY SEVERAL TIMES
Press the brakes pedals several times. This could zero a residual pressure on the alternate system.

● **IF RESIDUAL PRESSURE REMAINS :**

– A/SKID & N/W STRG selector . . . . KEEP ON

■ **IF AUTOBRAKE IS AVAILABLE :**

– FOR LANDING . . . . AUTO/BRK MED
Using MED mode gives immediate priority to normal braking upon landing gear touchdown, which cancels alternate pressure.

■ **IF AUTOBRAKE IS NOT AVAILABLE :**

– JUST AFTER TOUCHDOWN . . . . APPLY BRAKING
Pressing the brake pedals gives immediate priority to normal braking, which cancels residual alternate pressure.

– Beware of possible braking asymmetry after touchdown, which can be controlled by using the pedals.

Note : In case of taxi with deflated or damaged tires, refer to the TAXI WITH DEFLATED TIRES procedure (FCOM 3.01.32, page 2).

NAV ADR 1 (2) (3) FAULT

■ **ADR 1 FAULT :**

– AIR DATA SWTG . . . . CAPT ON 3
Select ADR 3 to captain side

– ADR 1 . . . . OFF

– GPWS . . . . OFF

R *The GPWS TERR amber FAULT light comes as the enhanced functions of the EGPWS*
R *are inhibited. As such, the GPWS TERR pushbutton switch should be switched OFF.*

■ **ADR 2 FAULT :**

– AIR DATA SWTG . . . . F/O ON 3
Select ADR 3 to F/O side

– ADR 2 . . . . OFF

■ **ADR 3 FAULT :**

– AIR DATA SWTG (if ADR 3 in use) . . . . NORM

– ADR 3 . . . . OFF

STATUS

CAT 3 SINGLE ONLY

INOP SYS

ADR 1 (2)(3)
CAT 3 DUAL
GPWS (in case of ADR 1 failure)

ADR 1+2+3 FAULT

This procedure is not displayed on the ECAM. Only dual ADR warnings are displayed, in case of a detected triple ADR failure.

– ADR (all) . . . . OFF
– STBY INST (ALT + ASI) . . . . USE

Note : Disregard ECAM actions for AIR DATA SWTG and ATC, since these have no effect in case of a total loss of ADRs.

F/CTL ALTN LAW (PROT LOST)

Note : The STALL WARNING is lost.

MAX SPEED 330/.82

See the following table for the IAS/M relationship for .82.

FL	410	390	370	350	330	310	290	270 and below
MAX SPD	243	252	265	278	290	305	317	330

Note : Use manual control for cabin pressurization (Refer to 3.02.21) .

STATUS

MAX SPEED 330/.82
RUD WITH CARE ABV 160 KT

The rudder travel limit value is frozen at the value it had at the moment when the failure occurred. Therefore, rudder inputs must be limited at speeds above 160 knots, so as not to damage structure. At slats' extension, full rudder travel authority is recovered.

APPR PROC :

- **FOR L/G GRVTY EXTN** :
  MAX SPEED . . . . 200 KT
  – LDG GRVTY EXTN . . . . DOWN
- **WHEN L/G DOWNLOCKED** :
  – L/G . . . . DOWN

– FOR LDG . . . . USE FLAP 3
– APPR SPD . . . . VREF + 10 KT
Note : VLS is not displayed on the PFD.

- **DURING FINAL APPR**
  – MAN V/S CTL . . . . FULL UP
  – LDG DIST PROC . . . . APPLY
R *Refer to the QRH part 2, or to the FCOM 3.02.80.*

ALTN LAW : PROT LOST
BOTH PFDs ON SAME FMGC

ADR 1+2+3 FAULT (CONT'D)

STATUS

CAT 1 ONLY

Note : Check speed is below VFE of CONF 1+F (215 knots) before selecting Flaps 1; since ADR parameters are lost, the SFCCs will set CONF 1+F instead of CONF1.

CAUTION
Check that the △P is at zero before opening doors.

INOP SYS
See below

INOP SYS DISPLAYED ON ECAM

F/CTL PROT	ADR 1+2+3 AP 1+2	L/G RETRACT
A/THR	WINDSHEAR DET	GPWS CAB PR 1+2

OTHER INOP SYS

FLAPS AUTO RETRACT	ALPHA LOCK ATC ALTI MODE	FLAPS LOAD RELIEF TCAS

Note : Both FCMC use default reference values for ADR parameters, resulting in an automatic one or two step forward transfer.

NAV IR 1(2) (3) FAULT

R *Note : In case of a simultaneous ADR and IR (same ADIRU) failure, apply the ADR FAULT*
R *procedure prior to the IR FAULT procedure.*

– ATT HDG SWTG . . . . CAPT ON 3 (F/O ON 3) (NORM)

Select IR 3 to the affected side.

In case of a NAV IR 1 FAULT, the GPWS TERR amber FAULT light comes on, as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.

● **If IR available in ATT mode :**

– IR MODE SEL . . . . ATT

For IR alignment in ATT mode, refer to page 5.

● **If IR totally faulty :**

– IR . . . . OFF

Set the IR pushbutton OFF.

Note : If desired, one attempt may be made to realign a faulty IRS (light steady) in ATT mode by selecting IR MODE SEL to OFF, then to ATT. But, in this case, ATT HDG SWTG must be in the same position as the AIR DATA SWTG selector during the reset, to avoid the flight controls from temporarily reverting to ALTN law, and to avoid AP/A-THR disconnection.

STATUS

	INOP SYS
CAT 3 SINGLE ONLY	CAT 3 DUAL
	IR 1 (2) (3)
	R GPWS TERR (if
	R IR1 fault)
	R TCAS (*)

R *Note : (*) In case of an IR 1 fault, the TCAS may be inoperative (depending on the TCAS*
R *manufacturer).*

IR ALIGNMENT IN ATT MODE

If IR alignment is lost in flight, the navigation mode is inoperative (red ATT flag on the PFD, and red HDG flag on the ND).
Aircraft attitude and heading may be recovered by applying the following procedure :
The aircraft must stay level, with a constant speed for 30 seconds.

– MODE SELECTOR . . . . ATT
– LEVEL A/C ATTITUDE . . . . HOLD
– CONSTANT A/C SPEED . . . . MAINTAIN

■ **MCDU INITIALIZATION :**

– DATA (MCDU KEY) . . . . PRESS
The DATA INDEX page is displayed.
– IRS MONITOR (2L KEY) . . . . PRESS
The IRS MONITOR page is displayed.
– A/C HEADING . . . . ENTER
The heading must be entered in the SET HDG field (5R KEY).

■ **CDU INITIALIZATION :** ◁

– DISPLAY SYS switch . . . . AFFECTED SYS
– DISPLAY DATA switch . . . . HDG
– H key . . . . PRESS
Degree marker, zero decimal point, ENT and CLR lights come on.
– A/C HEADING . . . . ENTER
Enter the aircraft's magnetic heading on the CDU keyboard. Then press the ENT key to enter data.
Example : To enter the 320° heading, dial 3, 2, 0, 0 then press ENT.
The heading will be displayed on the associated ND.
"HDG ... ATT MODE" will be displayed on the CDU.
Note : The CDU-entered heading is sent to the FMGC and displayed in the SET HDG field of the IRS MONITOR page.

Due to IR drift, the magnetic heading must be periodically crosschecked with the standby compass and updated, if required.

R
NAV IR NOT ALIGNED

This caution is available in Phase 2 (after first engine start, until takeoff)

■ **POSITION MISMATCH**

■ **POSITION MISSING**

– PRESENT POSITION . . . . INSERT

■ **EXCESS MOTION**

■ **IR 1 (2) (3) (1+2) (2+3) (1+2+3) IN ALIGN**

NAV FM/IR POS DISAGREE

This message is generated by the FWC, when it detects a significant drift between any of the FMS positions and any of the IRS positions. For flight continuation, consider periodic NAV ACCURACY checks.

– A/C POS . . . . CHECK
Use the MCDU's POSITION and IRS MONITOR pages.

NAV FM/GPS POS DISAGREE

The FMS and GPS positions differ by more than :
– A longitude threshold that depends on the latitude :
· 0.5 minutes for latitudes below 45°
· 0.7 minutes for latitudes at, or above, 45° and below 60°
· 1 minute for latitude at, or above, 60° and below 70°
– A latitude threshold of 0.5 minutes, regardless of the latitude.

– A/C POS . . . . CHECK

The following procedure is not displayed on the ECAM :

● **If the message occurs at takeoff initiation, or in ILS/LOC approach (LOC green) :**
  – Disregard it.

● **If the message occurs in climb, cruise, or descent :**
  – Check navigation accuracy, using raw data :
  ■ **If the check is positive :**
    – NAV mode and ND ARC/ROSE NAV may be used.
  ■ **If the check is negative :**
    – HDG/TRK mode and raw data must be used.
    – Consider switching off the terrain functions of the EGPWS.
  – When possible, compare the FM position with the GPIRS position on the POSITION MONITOR page :
  ■ **If one FM position agrees with the GPIRS position on the POSITION MONITOR page :**
    – Use the associated FD/AP.
  ■ **If not :**
    – Deselect GPS and revert to basic information.

● **If the message occurs during a non precision approach :**
  ■ **Overlay approach :**
    – SELECT HDG or TRK, and use raw data.
  ■ **GPS or RNAV approach :**
    – GO AROUND or fly visual, if visual conditions are met.

NAV IR 1 + 2 (1 + 3) (2 + 3) FAULT

– ATT HDG SWTG . . . . CAPT ON 3 (NORM) (NORM)

● **If IR (affected) available in ATT mode :**

– IR (affected) MODE SEL . . . . ATT

● **If IR (affected) totally faulty :**

– IR (affected) . . . . OFF

Note : The crewmember on the affected side can recover IR information by using the EFIS DMC selector (copy of the opposite side).

SPD BRK . . . . DO NOT USE

In case of IR 1 + 2 or IR 1 + 3 FAULT, the GPWS TERR amber FAULT light comes on as the enhanced functions of the EGPWS are inhibited. As such, the GPWS TERR pushbutton should be switched OFF.

● **IF CG AFT 32 % :**

– T TANK MODE . . . . FWD

Fuel consumption is increased by approximately 1 %.

Note : If the trim tank pump is not available, this part of the procedure is replaced by:

· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :

– T TANK MODE . . . . FWD

F/CTL ALTN LAW (PROT LOST)

MAX SPEED 330/.82

STATUS

SPD BRK . . . . DO NOT USE

MAX SPEED 330/.82

APPR PROC :

– FOR LDG . . . . USE FLAP 3

● **IF CG AFT 32 % :**

R – T TANK MODE . . . . FWD

R *Fuel consumption is increased by approximately 1 %.*

R *Note : If the trim tank pump is not available, this part of the status is replaced by:*

· IF CG AFT 32 % AND WHEN SPD > 270 KT AND NOT IN CLIMB :

– T TANK MODE . . . . FWD

ALTN LAW : PROT LOST

CAT 1 ONLY

INOP SYS

F/CTL PROT

IR 1+2(1+3)(2+3)

AP 1+2

A/THR

GPWS TERR (if IR 1 fault)

TCAS (*)

R *Note : (*) In case of an IR 1 fault, the TCAS may be inoperative (depending on the TCAS*

R *manufacturer).*

NAV EXTREME LATITUDE

– NORTH REF SEL .... TRUE

Magnetic heading is replaced by true heading on EFIS and DDRMI.

OVERSPEED

VMO/MMO 330/.86

(255/.60 in case of dispatch with landing gear down)

VLE 250/.55

VFE .... see below

CONF	VFE
FULL	180
3	186
2	196
1*	205
1 + F	215
1	240

NAV HDG DISCREPANCY

– HDG .... X CHECK

Compare the 3 IR headings on MCDU page or cross check with standby compass.

– ATT HDG SWTG .... AS RQRD

Select IR 3 to faulty side.

NAV ATT DISCREPANCY

– ATT .... X CHECK

Cross check with standby horizon.

– ATT HDG SWTG .... AS RQRD

Select IR 3 to faulty side.

NAV ALTI DISCREPANCY

– ALT .... X CHECK

Cross check with standby altimeter.

– AIR DATA SWTG .... AS RQRD

Select ADR 3 to faulty side.

R ## NAV BARO REF DISCREPANCY

R *This caution is triggered if the barometer reference selections are different on both FCU*
R *control panels.*

R – BARO REF .... X CHECK

NAV RA 1 (2) (1+2) FAULT

– GPWS (only in case of an RA 1, or RA 1 + 2 fault) . . . . . OFF

STATUS

■ **One RA FAULT :**

CAT 2 ONLY

INOP SYS
CAT 3
GPWS (if RA 1 fault)
RA 1 (2)

■ **Both RA FAULT :**

On the ECAM, only one of the following two statements are displayed, depending on the autopilot status.
Use manual pitch trim, when flare law is active.

● **WHEN L/G DN :**
– MAN PITCH TRIM . . . . USE
Provided the autopilot is off, switching to flare law occurs at landing gear extension.

● **WHEN L/G DN AND AP OFF :**
– MAN PITCH TRIM . . . . USE
When the autopilot is engaged, and the landing gear is extended, switching to flare law occurs at autopilot disengagement.

CAT 1 ONLY
ILS APPR mode cannot be engaged ; LOC mode is available via the FCU LOC pushbutton.

INOP SYS
RA 1 + 2
A/CALL OUT
AP 1 + 2 (in APPR)
CAT 2
GPWS

NAV IAS DISCREPANCY

– AIR SPD . . . . X CHECK
– AIR DATA SWTG . . . . AS RQRD

STATUS

CAT 3 SINGLE ONLY

INOP SYS
CAT 3 DUAL

NAV ILS 1 (2) (1 + 2) FAULT

Crew awareness.

STATUS

■ **One ILS FAULT :**

CAT 1 ONLY

INOP SYS
ILS 1 (2)
CAT 2
GPWS G/S (if ILS 1 fault)

■ **Both ILS FAULT :**

CAT 1 ONLY

INOP SYS
ILS 1 + 2
CAT 2
GPWS G/S
AP 1 + 2 (in APPR)

NAV GPWS FAULT

– GPWS . . . . OFF

This line remains displayed on the ECAM after action.

STATUS

INOP SYS
GPWS

R

NAV TCAS FAULT

– TCAS MODE . . . . STBY

Set the TCAS on standby mode (refer to 1.34.80).The TCAS is electrically-supplied, but it is inoperative.

STATUS

INOP SYS
TCAS

NAV GPS 1 (2) FAULT ◁

Crew awareness

STATUS

INOP SYS
GPS 1 (2)

STALL WARNING

When the threshold is reached, a permanent aural warning is triggered "STALL + CRICKET" as long as a correct angle-of-attack is not recovered. (Refer to 3.04.27).

R
NAV PRED W/S DET FAULT ◁

R *The predictive windshear function is lost.*

R Crew awareness

STATUS

R INOP SYS

R PRED W/S DET

EGPWS ALERTS

CAUTION
During night or IMC conditions, apply the procedure immediately. Do not delay reaction for diagnosis.
During daylight VMC conditions, with terrain and obstacles clearly in sight, the alert may be considered cautionary. Take positive corrective action until the alert ceases, or a safe trajectory is ensured.

■ **"PULL UP" - "TERRAIN TERRAIN PULL UP" - "TERRAIN AHEAD PULL UP" - "OBSTACLE OBSTACLE PULL UP" - "OBSTACLE AHEAD PULL UP" :**

Simultaneously :
- AP . . . . OFF
- PITCH . . . . PULL UP
  Pull up to full backstick and maintain.
- THRUST LEVERS . . . . TOGA
- SPEEDBRAKE lever . . . . CHECK RETRACTED
- BANK . . . . WINGS LEVEL or adjust
  For "TERRAIN AHEAD PULL UP" only, in addition to climbing, and if the crew concludes that turning is the safest way of action, a turning maneuver can be initiated.

● **When the flight path is safe and GPWS warning ceases** :
Decrease pitch attitude and accelerate.

● **When speed is above VLS, and vertical speed is positive** :
Clean up aircraft, as required.

■ **"TERRAIN TERRAIN" - "TOO LOW TERRAIN" :**

Adjust the flight path, or initiate a go-around.

■ **"TERRAIN AHEAD" - "OBSTACLE AHEAD" - "CAUTION OBSTACLE":**

Adjust the flight path. Stop descent. Climb and/or turn, as necessary, based on analysis of all available instruments and information.

■ **"SINK RATE" "DON'T SINK" :**

Adjust pitch attitude and thrust to silence the alert.

■ **"TOO LOW GEAR" - "TOO LOW FLAPS" :**

Correct the configuration, or perform a go-around.

■ **"GLIDE SLOPE" :**

Establish the airplane on the glideslope, or switch OFF the G/S mode pushbutton, if flight below the glideslope is intentional (non precision approach).

NAV GPWS TERR DET FAULT

The enhanced Terrain Clearance Floor and Terrain Awereness and Display modes of the EGPWS are inoperative.

– GPWS TERR . . . . OFF

The basic GPWS Modes 1 to 5 are still operative, if the SYS pushbutton FAULT or OFF lights are not on.

STATUS

R INOP SYS
R GPWS TERR

TCAS WARNINGS

■ **Traffic advisory : "TRAFFIC" messages.**

Do not maneuver based on a TA alone.
Attempt to see the reported traffic.

■ **Preventive resolution advisory : "MONITOR VERTICAL SPEED" message.**

Maintain or adjust vertical speed, as required, to avoid the red
R area of the vertical speed scale.
Notify the ATC.
When "CLEAR OF CONFLICT" is announced :
Resume normal navigation, in accordance with ATC clearance.

■ **Corrective resolution advisory : All "CLIMB" and "DESCEND" "MAINTAIN VERTICAL SPEED MAINTAIN" or "ADJUST VERTICAL SPEED ADJUST" type messages.**

Respond promptly and smoothly to an RA.

– AP (if engaged) . . . . OFF

TCAS orders may require an incremental load factor, which is greater than that achieved by the autopilot.

– BOTH FDs . . . . OFF

Adjust the vertical speed, as required, to that indicated on the green area of the vertical speed scale.

Note : Avoid excessive maneuvers while aiming to keep the vertical speed just outside the red area of the VSI and within the green area. If necessary, use the full speed range between Vαmax and Vmax.

R Respect stall, GPWS, or windshear warning.
Notify the ATC.
When "CLEAR OF CONFLICT" is announced :

– Resume normal navigation, in accordance with ATC clearance.

The AP/FD can be re-engaged, as desired.

● **The GO AROUND procedure must be performed, when an RA "CLIMB" or "INCREASE CLIMB" is triggered on final approach.**

Note : Resolution Advisories (RA) are inhibited below 900 feet.

NAV IR DISAGREE

Disagreement between two IRs, the third one being failed or rejected by the PRIMs.

DIRECT LAW

Direct law becomes active. All protections (pitch and roll) are lost.

– ATT . . . . X CHECK

Use the standby horizon to determine the faulty IR.

● **IF DISAGREE CONFIRMED :**

– FAULTY IR . . . . OFF

– PRIM 3 . . . . OFF THEN ON

– PRIM 2 . . . . OFF THEN ON

– PRIM 1 . . . . OFF THEN ON

After corrective action (faulty IR switched off and PRIMs reset), pitch alternate law with reduced protections is recovered.

F/CTL ALTN LAW

Refer to the associated procedure.

● **If disagree not confirmed (both IRs remain on) :**

F/CTL DIRECT LAW

Refer to the associated procedure.

NAV ADR DISAGREE

This caution is triggered by the PRIMs, when they only use 2 ADRs, and when these 2 ADRs disagree. This may occur, when :
– One ADR has already been selected OFF by the pilot, or
– One ADR has been eliminated by the PRIM, without any caution, because it deviated from the others.

– AIR SPD . . . . X CHECK
Check airspeed information on both PFDs, and on the standby airspeed indicator.

■ **IF NO SPD DISAGREE :**
AOA DISCREPANCY

■ **IF SPD DISAGREE :**
– ADR CHECK PROC . . . . APPLY
Refer to the associated procedure.

F/CTL ALTN LAW (PROT LOST)

Note : Following an ADR DISAGREE, detected by the PRIMs, ALTN law is latched. Resetting the PRIMs, by using the pushbutton, does not allow normal law recovery.
Refer to the associated procedure.

– MAX SPEED 330/.82

STATUS

– MAX SPEED 330/.82
CAT 3 SINGLE ONLY
RISK OF UNDUE STALL WARN
Undue stall warnings may mainly occur, in case of an AOA discrepancy.
RUD WITH CARE ABV 160 KT
The rudder travel limit value is frozen at the value it had at the moment when the failure occurred. Therefore, rudder inputs must be limited at speeds above 160 knots, in order to not damage the structure. At slats' extension, full rudder travel authority is recovered.

INOP SYS
CAT 3 DUAL

ADR CHECK PROC

Use this procedure :

- Following an ADR DISAGREE, if there is a speed disagree (16 knots minimum) between the remaining ADRs.
- In case of an erroneous speed/altitude, which can either be suspected by :
  - Speed discrepancies (between ADR 1, 2, 3, and standby instruments).
  - Fluctuating or unexpected increase/decrease/permanent indicated speed, or pressure altitude.
  - Abnormal correlation of the basic flight parameters (speed, pitch attitude, thrust, climb rate).
  - Abnormal AP/FD/ATHR behavior.
  - STALL warning, or OVERSPEED warnings, or a Flap RELIEF ECAM message, that contradicts with at least one of the indicated speeds.
    - * Rely on the stall warning that could be triggered in alternate or direct law. It is not affected by unreliable speeds, because it is based on angle of attack.
    - * Depending on the failure, the OVERSPEED warning may be false or justified. Buffet, associated with the OVERSPEED VFE warning, is a symptom of a real overspeed condition.
  - Inconsistency between radio altitude and pressure altitude.
  - Reduction in aerodynamic noise with increasing speed, or increase in aerodynamic noise with decreasing speed.
  - Impossibility of extending the landing gear by the normal landing gear control.

To determine the correct ADR, refer to the :

- UNRELIABLE SPEED INDICATION procedure to fly the target pitch and thrust setting (Refer to the FCOM 3.02.34), or
- SEVERE TURBULENCE procedure, if in cruise, to set a thrust and deduce the correct speed indication (Refer to the FCOM 3.04.91).
- FAULTY ADR . . . . OFF

UNRELIABLE SPEED INDICATION

Unreliable speed indication may be due to radome damage, or due to air probe failure or obstruction.
The indicated altitude may also be affected, if static probes are affected.
Unreliable speed cannot be detected by the ADIRU. The flight control and flight guidance computers normally reject erroneous speed/altitude source(s), provided a significant difference is detected.
However, they will not be able to reject two erroneous speeds or altitudes that synchronously and similarly drift away. In this remote case, the aircraft systems will consider the remaining correct source as being faulty and will reject it. Consequently, the flight control and flight guidance computers will use the remaining two wrong ADRs for their computation.
Therefore, in all cases of unreliable speed situation, the pilots must identify the faulty ADR(s) and then switch it (them) OFF. During this failure identification time, since the flight control laws may be affected, it is recommended to maneuver the aircraft with care until the ADR(s) is (are) switched OFF.
Unreliable speed indications may be suspected, either by :

- Speed discrepancies (between ADR 1, 2, 3, and standby instruments).
- Fluctuating or unexpected increase/decrease/permanent indicated speed, or pressure altitude.
- Abnormal correlation of the basic flight parameters (speed, pitch attitude, thrust, climb rate).
- Abnormal AP/FD/ATHR behavior.
- STALL warning, or OVERSPEED warnings, or a Flap RELIEF ECAM message, that contradicts with at least one of the indicated speeds.
  - Rely on the stall warning that could be triggered in alternate or direct law. It is not affected by unreliable speeds, because it is based on angle of attack.
  - Depending on the failure, the OVERSPEED warning may be false or justified. Buffet, associated with the OVERSPEED VFE warning, is a symptom of a real overspeed condition.
- Inconsistency between radio altitude and pressure altitude.
- Reduction in aerodynamic noise with increasing speed, or increase in aerodynamic noise with decreasing speed.
- Impossibility of extending the landing gear by the normal landing gear control.

UNRELIABLE SPEED INDICATION (CONT'D)

How to apply the procedure :

– If the wrong speed or altitude information does not affect the safe conduct of the flight, first apply the ADR CHECK procedure to identify the faulty ADR(s) and switch it (them) OFF. If necessary, enter the unreliable speed procedure, or severe turbulence table (if in cruise), to set the pitch and thrust corresponding to the current flight phase. Check the resulting speed indicated on the table with all the indicated speeds/altitudes (from ADR 1, 2, 3 and standby instruments) to positively identify the faulty ADR(s).
– If the safe conduct of the flight is affected (all the speed indications are unreliable, or the wrong speed indication cannot be positively identified) :
  · Immediately apply the memory items : AP/FD/ATHR OFF, and fly the memory pitch – thrust settings.
  · Then, once stabilized, refer to the QRH in order to determine the pitch and thrust settings required by the current flight phase.
  · Determine the faulty ADR(s) once the aircraft is stabilized, by comparing all of the indicated speeds/altitudes (from ADR 1, 2, 3 and standby instruments) with the expected speed, as per the table ; use ground speed and GPS speed/altitude variations for reasonableness considerations.
  · In the extreme case where the faulty ADR(s) cannot be identified and all speed indications remain unreliable, apply the proper pitch-thrust settings for each flight phase until landing and refer to ground speed and GPS speed/altitude variations for assistance.

UNRELIABLE SPEED INDICATION (CONT'D)

CAUTION
If the failure is due to radome destruction, the drag will increase and therefore N1 must be increased by 3 % (CRZ) or 1.5 % (APP). Fuel flow will increase by about 13 %.

IMMEDIATE ACTIONS

- AP/FD . . . . OFF
- A/THR . . . . OFF
- FLAPS . . . . MAINTAIN CURRENT CONFIG
- SPEEDBRAKES . . . . CHECK RETRACTED

  Note : If failure is detected while in CONF FULL and go-around is initiated, select CONF 3.
- L/G . . . . UP WHEN AIRBORNE

IMMEDIATE PITCH ATTITUDE AND THRUST GUIDANCE

■ **If the failure occurs before thrust reduction :**
- THRUST LEVER . . . . TOGA
- PITCH ATTITUDE . . . . 15°

■ **If the failure occurs after thrust reduction :**
- THRUST LEVER . . . . CLB
- PITCH ATTITUDE below FL 100 . . . . 10°
- PITCH ATTITUDE above FL 100 . . . . 5°

UNRELIABLE SPEED INDICATION (CONT'D)

Respect the Stall warning. Ground speed variations and radio altimeter indications can provide valuable short-term information at low altitude. If the altitude information is affected, the FPV is unreliable. In that case, GPS (◁) altitude variations may be a valuable aid for flying in level flight. ATC altitude will also be unreliable.
In other cases, if the altitude information is not affected, the FPV is a valuable aid in establishing a safe flight path.

WHEN FLIGHT PATH IS STABILIZED

– PROBE WINDOW HEAT . . . . ON
– ATTITUDE/THRUST . . . . ADJUST

Takeoff phase	Pitch	Thrust	Remark
Before thrust reduction	15°	TOGA	Keep at least till thrust reduction altitude
Above thrust reduction	10°	CL	Up to MSA or Circuit Altitude
Acceleration	7.5°	CL	At MSA or Circuit Altitude, TO RETRACT SURFACE : CONF 3(2) to CONF 1 : * IMMEDIATE CONF 1 to CONF 0 : If TO in CONF 2 or 3 : *30 s. If TO in CONF 1 : . Failure before thrust reduction : *15 s. . Failure after thrust reduction : *30 s.

* Time from pitch 7.5° / thrust CL setting.
In case of immediate return to departure airport, keep the flaps in the takeoff configuration and climb to the circuit altitude or MSA. Level off at maneuvering speed : see approach table.
In case the flight continues, climb to MSA or Circuit Altitude. Retract the surfaces as explained in the above table. Then establish initial climb as per climb table.

Phase	Weight	Flight Level	Speed	Pitch Attitude	N1
CLIMB	ANY WEIGHT	Below FL50	240 knots	12.0°	CL
		FL50 to FL100		11.0°	
		FL100 to FL150		10.0°	
		FL150 to FL200		8.5°	
		FL200 to FL250	260 knots / M0.80	6.5°	
		FL250 to FL300		5.5°	
		FL300 to FL370		4.0°	
		Above FL370		3.5°	

The speeds indicated in the above table correspond to the turbulence speeds.

UNRELIABLE SPEED INDICATION (CONT'D)

Phase	Weight	Flight Level	Speed	Pitch Attitude	N1
CRUISE	Above 190 T	Below FL200	240 knots	4.5°	Adjust N1 to maintain approximate level flight with pitch attitude held constant. When time permits, refer to FCOM 3.04.91 SEVERE TURBULENCE and adjust pitch to maintain level flight
	190 T to 160 T			3.5°	
	Below 160 T			2.5°	
	Above 190 T	FL200 to FL370	260 knots	3.5°	
	190 T to 160 T			2.5°	
	Below 160 T			2.0°	
	Above 170 T	Above FL370	M0.80	3.0°	
	170 T to 150 T			2.5°	
	Below 150 T			2.0°	
DESCENT	Above 160 T	Above FL370	M0.80	0°	IDLE
		FL370 to FL200	260 knots	0.5°	
		FL200 to FL100	240 knots	1.5°	
		Below FL100	240 knots	1.0°	
	Below 160 T	Above FL370	M0.80	– 1.0°	
		FL370 to FL200	260 knots	– 0.5°	
		FL200 to FL100	240 knots	0°	
		Below FL100	240 knots	– 0.5°	

The speeds indicated in the above table correspond to the turbulence speeds.

UNRELIABLE SPEED INDICATION (CONT'D)

The approach phase between Green Dot speed (clean configuration) and the landing configuration (CONF 3 or CONF FULL), is flown in level flight.

R

INITIAL AND INTERMEDIATE APPROACH IN LEVEL FLIGHT						
A/C CONF		Speed	FPA	Weight	Pitch	N1
Gear Up	0	Green Dot Speed	0	Above 210 T	5.0°	67 %
				210 T to 140 T	5.0°	59 %
				below 140 T	5.0°	53 %
	1	S Speed	0	Above 210 T	9.0°	71 %
				210 T to 140 T	9.0°	62 %
				below 140 T	9.0°	57 %
	2	F Speed CONF 2	0	Above 210 T	6.0°	74 %
				210 T to 140 T	6.0°	66 %
				below 140 T	5.0°	60 %
Gear Down	3	F Speed CONF 3	0	Above 210 T	7.0°	80 %
				210 T to 140 T	7.0°	72 %
				below 140 T	5.0°	66 %
	FULL	VREF + 10	0	Above 210 T	6.0°	83 %
				210 T to 140 T	6.0°	74 %
				below 140 T	3.0°	69 %
FINAL APPROACH AT STANDARD – 3° DESCENT PATH						
A/C CONF		Speed	FPA	Weight	Pitch/AOA	N1
Gear Down	3	VLS + 10	– 3°	Above 210 T	5.0°/8.0°	59 %
				210 T to 140 T	4.0°/7.0°	51 %
				below 140 T	3.0°/6.0°	47 %
	FULL	VREF + 10	– 3°	Above 210 T	3.0°/6.0°	64 %
				210 T to 140 T	3.0./6.0°	55 %
				below 140 T	0°/3.0°	50 %

Flying technique :
- Adjust pitch, in order to fly the required path.
- When target pitch is reached, flying the intended flight path, adjust thrust to target :
  - If the aircraft pitch tends to increase to fly intended FPA, then increase thrust ;
  - If the aircraft pitch tends to decrease to fly intended FPA, then decrease thrust.

AIR ENG 1(2) BLEED FAULT

This caution appears in case of overheat, overpressure or low pressure.

– ENG BLEED affected (if not automatically closed) .... OFF

The ENG BLEED is not automatically closed in case of LO PR.
The FAULT lt extinguishes when the failure disappears (overheat or overpressure).
R *PACK FLOW is limited to 80 %.*

STATUS

INOP SYS
ENG 1 (2) BLEED

AIR ABNORM BLEED CONFIG

Refer to associated procedure.

AIR ENG 1(2) BLEED NOT CLSD

This caution appears if engine bleed valve is unduly open during engine start or when APU BLEED is selected on.

– ENG BLEED (affected) .... OFF

● **When engine start is completed or APU BLEED is deselected (automatic recall) :**
  – ENG BLEED (affected) .... ON

AIR ABNORM BLEED CONFIG

At least one BLEED system is faulty, off, or not supplied.

● **If BLEED is abnormally selected off :**
ENG 1(2) BLEED OFF

● **IF BLEED NOT RECOVERED**
– X BLEED .... CLOSE or OPEN
CLOSE, if :
– LEAK, or
– ENG FIRE (detected, or FIRE pushbutton pressed), or
– Engine start valve failed open, or
– Overpressure with bleed valve failed open.
OPEN in all other cases.

■ **X BLEED OPEN**

● **If WING A. ICE off, and no engine failed :**
– PACK FLOW .... LO
Pack flow is limited to 80 %
– FWD CRG COOLING .... OFF

● **If WING A. ICE on or one engine failed :**
– PACK (affected side if opposite pack healthy) ..... OFF
Note : If the pack is switched off following an engine shutdown, it may be recovered, provided performance permits and wing anti-ice is selected off.

STATUS

ONE PACK ONLY IF WAI ON

INOP SYS
ENG 1 (2) BLEED
FWD CRG TEMP
PACK 1 (2)
(if selected off)

■ **X BLEED CLOSE**
– WING A. ICE .... OFF
AVOID ICING CONDITIONS
Note : APU BLEED must not be used for wing anti-ice purposes, or after ENG 1 FIRE.

STATUS

● **IF ICE ACCRETION :**
– APPR SPD .... VLS + 10 KT
– LDG DIST PROC .... APPLY
R *Refer to the QRH Part 2, or to the*
R *FCOM 3.02.80.*

INOP SYS
WING A. ICE
ENG 1 (2) BLEED
FWD CRG TEMP
PACK 1(2)

AIR L(R) WING or ENG 1(2) BLEED LEAK

– ENG BLEED (affected side, if not automatically closed) . . OFF
- *With the ENG BLEED pushbutton on, the FAULT light remains on*
- *With the ENG BLEED pushbutton OFF, the FAULT light goes off, when the overheat disappears.*

– APU BLEED (if not closed, only in case of L WING LEAK or ENG 1 BLEED LEAK) . . . . OFF

AIR ABNORM BLEED CONFIG

– X BLEED (if not closed) . . . . CLOSE
– FWD CRG COOLING . . . . OFF
– WING A. ICE . . . . OFF
AVOID ICING CONDITIONS

STATUS

AVOID ICING CONDITIONS
APPR PROC
● **IF ICE ACCRETION :**
– APPR SPD . . . . VLS + 10 KT
– LDG DIST PROC . . . . APPLY
R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*

INOP SYS
WING A. ICE
ENG 1(2) BLEED
PACK 1 (2)
APU BLEED
(left side affected)
FWD CRG TEMP

AIR APU BLEED LEAK

– APU BLEED (if not automatically closed) . . . . OFF
- *With the APU BLEED pushbutton on, the FAULT light remains on.*
- *With the APU BLEED pushbutton OFF, the FAULT light goes off, when the overheat disappears.*

STATUS

INOP SYS
APU BLEED

AIR ENG 1(2) HPV NOT OPEN

Crew awareness.

STATUS

NO BLEED 1 (2) AT LOW PWR

AIR APU BLEED FAULT

The valve position disagrees with the commanded position, when the APU is running.

Crew awareness.

STATUS

INOP SYS
APU BLEED
(if valve closed)

AIR L(R) WNG LEAK DET FAULT

Crew awareness.

STATUS

INOP SYS
L(R) LEAK DET

AIR X BLEED FAULT

– X BLEED . . . . MAN CTL

R *Select OPEN, when the APU BLEED VALVE pushbutton is ON, or for engine start, or when WING ANTI ICE is ON with one bleed inoperative.*

● **If manual opening is inoperative, and one BLEED is off :**

AIR ABNORM BLEED CONFIG

Refer to the associated procedure.

STATUS

AIR X BLEED MAN CTL

INOP SYS
AIR X BLEED
(if closed)

AIR BMC 1(2) FAULT

- **If APU bleed is selected ON :**
  - ENG (affected) BLEED . . . . OFF
- **If APU bleed is selected OFF :**
  - ENG (affected) BLEED . . . . ON

STATUS

INOP SYS

BMC 1(2)

AIR BLEED LO TEMP

If the "BLEED LO TEMP" warning is triggered when crossing 1500 feet, whilst the wing anti-ice system is "off", it is to be considered as a spurious warning. It can be cleared by setting the wing anti-ice pushbutton "ON", then "off".

ON BLEED 1(2)

In flight, engine bleed temperature is too low for wing deicing.

– ENG PWR . . . . INCREASE

The thrust lever of the affected engine must be advanced with the autothrust OFF.

R *Low bleed temperature may be due to low outside air temperature. Therefore, increasing*
R *engine thrust may increase bleed temperature and clear the ECAM caution.*

■ **If one BLEED LO TEMP :**

● **IF UNSUCCESSFUL :**

– ENG BLEED (affected) . . . . OFF

■ **If both BLEEDs LO TEMP :**

– WING ANTI ICE . . . . OFF

AVOID ICING CONDITIONS

AIR ABNORM BLEED CONFIG

STATUS

● **If both BLEEDs LO TEMP :**

AVOID ICING CONDITIONS

APPR PROC

● **IF ICE ACCRETION**

– APPR SPD . . . . VLS + 10 KT

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH part 2, or to the FCOM 3.02.80*

INOP SYS

WING A. ICE

ENG 1(2) BLEED

AIR DUAL BLEED FAULT

Do not apply this procedure if ENG BLEED 1 was lost due to :
· LEAK on side 1
· ENG 1 FIRE
· Start Air Valve 1 failed open

MAX FL 220
Descend rapidly to FL 220 with full speedbrakes to recover the BLEED supply from the APU.
– APU . . . . START
Start the APU during the descent.

● **AT OR BELOW FL 220** :
● **If ENG 2 BLEED loss due to** :
LEAK on side 2 or
ENG 2 FIRE or
Start air valve 2 failed open
– X BLEED . . . . CLOSE
R – PACK 2 (if above 17500 ft) . . . . OFF
R *Only if PACK 1 is available.*
– WING A.ICE . . . . OFF
APU BLEED must not be used for wing anti-ice.
– APU BLEED . . . . ON
AVOID ICING CONDITIONS

DATALINK ATSU FAULT

Crew awareness.
ATSU INIT FAULT
Displayed in case of failure at ATSU initialization. Refer to 3.04.46 for ATSU initialization.

STATUS

ATC COM VOICE ONLY
COMPANY COM VOICE ONLY

INOP SYS
ATSU
DATALINK ATC
DATA COMPANY

DATALINK ATC FAULT

Crew awareness.
ATC COM VOICE ONLY

STATUS

ATC COM VOICE ONLY

INOP SYS
DATALINK ATC

DATALINK COMPANY FAULT

Crew awareness.

STATUS

INOP SYS
DATA COMPANY

APU FAULT

■ EMER SHUT DOWN

EMER SHUT DOWN is triggered if :
- *the ground crew presses the APU SHUT OFF pushbutton on the nose gear interphone panel, or*
- *the flight crew presses the APU FIRE pushbutton in the cockpit, or*
- *the ground crew presses the APU EMER SHUT DOWN pushbutton on the Refuel/Defuel panel.*

– MASTER SW .... OFF

■ AUTO SHUT DOWN

– MASTER SW .... OFF

■ Non automatic APU shut down

A failure has been detected by the ECB, but the APU remains available.
Shut down the APU manually, except if it is required in flight for electrical or pneumatic purposes.

R ● **IF USE NOT ESSENTIAL :**

– MASTER SW .... OFF

STATUS

INOP SYS
APU

DOOR

DOOR L(R) FWD CABIN, or
DOOR L(R) MID CABIN, or
DOOR L(R) AFT CABIN, or
DOOR L(R) EMER EXIT, or
DOOR FWD (AFT) (BULK) CARGO, or
DOOR AVIONIC, or
DOOR UPPER DECK CARGO ⊲

Crew may confirm a cabin door warning by checking the visual indicator on the door.
R *Prior to taxi-out, the FWD (AFT) CARGO warning can be confirmed by checking the visual*
R *indicator flags on the base of the cargo doors.*

■ **On ground :**

PACKS + CAB PR NOT AVAIL

STATUS

INOP SYS
CAB PR 1+2
PACK 1+2

■ **In flight :**

No crew action is required, as long as cabin pressure is normal.

● **IF ABN CAB V/S :**

Limit maximum flight level to FL 100, or MEA, or minimum obstacle clearance altitude.

MAX FL 100/MEA

If the door warning is accompanied by an abnormal increase in cabin altitude, the flight crew must reduce cabin △P and altitude by descending.
Cabin and Avionic doors are of the plug type. Therefore, full depressurization is not recommended.

STATUS

MAX FL 100/MEA

DOOR POS DET 1(2) (1+2)

- **on ground before take off :**
  PACKS + CAB PR NOT AVAIL
  Failure of PSCU channel 1(2) (1+2)

STATUS

INOP SYS
PACK 1+2
CAB PR 1+2
DOOR DET 1(2)
(DOORS DET)

ENG 1 (2) FAIL

An engine flame-out may be recognized by a rapid decrease in EGT, N2, FF, followed by a decrease in N1.
Engine damage may be accompanied by :
– Explosions
– Significant increase in aircraft vibrations, and/or buffeting
– Repeated, or uncontrollable, engine stalls
– Associated abnormal indications, such as hydraulic fluid loss, no N2 indication.

■ **Before takeoff, or after landing :**

– THR LEVER (affected engine) . . . . IDLE
– ENG MASTER (affected engine) . . . . OFF

● **IF DAMAGE :**
– ENG FIRE P/B (affected engine) . . . . PUSH
– AGENT 1 . . . . DISCH
– L + R INR TK SPLIT . . . . ON

● **IF NO DAMAGE :**
– ENG (affected) RELIGHT . . . . CONSIDER

ENG 1(2) $\boxed{\text{SHUT DOWN}}$

Apply the After ENG SHUT DOWN procedure, if damage, or if engine relight is unsuccessful.

ENG 1 (2) FAIL (CONT'D)

■ In flight

- ENG START SEL .... IGN

  Selection of continuous ignition confirms the FADEC's immediate relight attempt.
- THR LEVER (affected engine) .... IDLE

  Note : In case of GPWS (EGPWS ◁) alerts, reduce speed with care below VLS with flaps extended (at light weights VMC may be reached before αmax), when applying the GPWS (EGPWS ◁) procedure.

● **IF NO ENG RELIGHT AFTER 30 S :**

- ENG MASTER (affected engine) .... OFF

● **IF DAMAGE :**

- ENG FIRE P/B (affected engine) .... PUSH

  If the ENG FIRE pushbutton is pushed, the FADEC is no longer supplied. So, the THR LEVER....IDLE line reappears, even if the thrust lever is at idle.
- AGENT 1 AFT 10 S .... DISCH
- L + R INR TK SPLIT .... ON

  Note : If no fuel leak is evident, set both INR TK SPLIT pushbuttons back to the normal position.

● **IF NO DAMAGE :**

- ENG (affected) RELIGHT .... CONSIDER

  Apply the ENG RELIGHT (in flight) procedure.

ENG 1(2) SHUT DOWN

Apply the After ENG SHUT DOWN procedure, if damage, or if engine relight is unsuccessful.
If high vibration occurs and continues after engine shutdown, reduce airspeed and descend to a safe altitude.
Attempt to define, and use, a practical airspeed and altitude for minimum vibrations. For performance reasons, the landing is in CONF 3. CONF 3 should be selected, as the landing configuration, on the MCDU.

After ENG 1(2) SHUTDOWN

LAND ASAP

– ENG START SEL . . . . IGN

Continuous ignition is selected to protect the remaining engine.

Note : If the Y ELEC PUMP is running after ENG 2 failure (engine failure before flaps retraction), SWITCH OFF the pump when in clean configuration.

– L/G (displayed during the takeoff phase) . . . . UP

– FUEL IMBALANCE . . . . MONITOR

Note : If engine windmilling induces transient HYD SYS LO PR warnings, it is recommended that the hydraulic pumps, associated with the failed engine, be switched off. This procedure is only applicable if the engine will not be restarted.

– TCAS MODE SEL ◁ . . . . TA

Secondary Failure
* ELEC
* HYD
* F/CTL

Note : In some conditions, with full asymmetric power, the aircraft may be control-limited before reaching the limits of the protection system. Therefore, in extreme conditions, where low speed may be advantageous (GPWS, WINDSHEAR, etc), reduce speed with care below VLS and respect the minimum control speed.

AIR ABNORM BLEED CONFIG

Refer to 3.02.36.

STATUS

APPR PROC

● **BEFORE S/F EXTENSION** :

● **If ENG 1 S/D and green hyd lost** :

– BLUE ELEC PUMP . . . . OFF

● **If ENG 2 S/D and green hyd lost** :

– YELLOW ELEC PUMP . . . . . OFF

– FOR LDG . . . . USE FLAP 3

– FUEL IMBALANCE . . . . MONITOR

– LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or the FCOM 3.02.80.*

CONSIDER APU GEN USE

SLATS SLOW (if ENG 1 shutdown)

FLAPS SLOW (if ENG 2 shutdown)

CAT 3 SINGLE ONLY

Note : If one ENG FIRE pushbutton has been pressed, A/THR may be inoperative for RR and PW engines. Therefore, landing capability is degraded to CAT 2.

INOP SYS

BLUE HYD
(YELLOW HYD)
PART SPLRS
REV 1 (2)
CAT 3 DUAL
ENG 1 (2) BLEED
PACK 1(2)
G ENG 1 (2) PUMP
B ENG 1 PUMP
(Y ENG 2 PUMP)
GEN 1 (2)
ALTN BRK (if ENG 1 shutdown)
PART GALLEY

ENG ALL ENG FLAME OUT

LAND ASAP

This warning inhibits the EMER ELEC CONFIG warning.

– RAT . . . . MAN ON

This confirms RAT extension.

– ENG START SEL . . . . IGN

This confirms immediate relight attempt.

– THR LEVERS . . . . IDLE

– OPTIMUM RELIGHT SPD 300/.82

300/.82 is the optimum airspeed for a windmilling start. One fuel pump is supplied down to 260 knots. Increase speed during descent toward 300 knots. Do not exceed MMO.

Note : · At 300/.82 with all engines stopped, it takes about 15 minutes to descend from FL 400 to the ground. Distance is about 100 NM.

· In case of a speed indication failure (volcanic ash), the pitch attitude for optimum relight speed is – 2 degrees (for weights above 150 tons, add 1/2 degree for each additional 20 tons).

– EMER ELEC PWR . . . . MAN ON

Only displayed, if the emergency generator is not automatically coupled.

– VHF1 . . . . USE

Only VHF1 is supplied. Notify traffic control of the nature of the emergency, and state intentions. Transmit a distress message on VHF frequency 121.5 MHz (ATC not supplied).

● **IF NO RELIGHT AFTER 30 SEC :**

– ENG MASTERS . . . . OFF 30S/ON

ENG MASTERS must be left OFF for 30 seconds, to allow ventilation of the combustion chamber.

● **IF UNSUCCESSFUL :**

– CREW OXY MASK (above FL 100) . . . . ON

● **WHEN BELOW FL 250 :**

– APU (if operative) . . . . START

● **WHEN BELOW FL 200 :**

– WING ANTI ICE . . . . OFF

– APU BLEED . . . . ON

● **IN SEQUENCE**

– ENG MASTERS (one at a time) . . . . OFF 30S/ON

– OPTIMUM SPEED (when APU BLEED available) . . . 230 KT

Green dot speed is not displayed on the Captain's PFD. Use 230 knots initially, then use the one engine-out green dot value (Refer QRH 4.01).

ENG ALL ENG FLAME OUT (CONT'D)

If forced landing or ditching is expected, use the forced landing or ditching procedure found in the QRH.

- **EARLY IN APPROACH** :
  - CAB SECURE . . . . ORDER
- **FOR SLATS EXTENSION** :
  - LAND RECOVERY . . . . ON
  - FOR LDG . . . . USE FLAP 1

    At FLAP 1 selection, the emergency generator stops.
  - MIN RAT SPEED . . . . 140 KT

    F/CTL servos are supplied by the RAT down to 130 knots.
- **FOR L/G GRVTY EXTN** :

  MAX SPEED . . . . 200 KT
  - L/G GRVTY EXTN (if no ditching expected) . . . . DOWN

    Disregard "USE MAN PITCH TRIM" on the PFD, since stabilizer control is lost.
- **WHEN L/G DOWNLOCKED** :
  - L/G lever . . . . DOWN

  TARGET SPD . . . . 170 KT
- **AT TOUCHDOWN** :
  - ENG MASTERS . . . . OFF
  - APU MASTER SW . . . . OFF
  - EVACUATION . . . . INITIATE

HYD B + Y SYS LO PR

– AFFECTED PUMPS . . . . OFF

MANEUVER WITH CARE

F/CTL ALTN LAW (PROT LOST)

SPD BRK . . . . DO NOT USE

MAX SPEED 330/.82

ENG ALL ENG FLAME OUT (CONT'D)

STATUS

SPD BRK . . . . DO NOT USE
MAX SPEED 330/.82
MIN RAT SPEED . . . . 140 KT
MANEUVER WITH CARE
AVOID ICING CONDITIONS
MAX BRK PR . . . . 1000 PSI
APPR PROC
- **FOR SLATS EXTENSION** :
  - LAND RECOVERY . . . . ON
  - FOR LDG . . . . USE FLAP 1
- **AT SLATS EXTENSION (if a FUEL FWD XFR has been selected)** :
  - TTK MODE . . . . AUTO
  - TTK FEED . . . . AUTO
- **FOR L/G GRVTY EXTN** :
  MAX SPEED . . . . 200 KT
  - L/G GRVTY EXTN . . . . DOWN
- **WHEN L/G DOWNLOCKED** :
  - L/G . . . . DOWN
- PITCH AUTHORITY REDUCED
- TARGET SPD . . . . 170 KT

ALTN LAW : PROT LOST
CONSIDER APU GEN USE
MCDU BACK UP NAV AVAIL
CAT 1 ONLY

INOP SYS
F/CTL PROT
STABILIZER
B + Y HYD
PACK 1 + 2
PRIM 2 + 3
ADR 2+3
RA 1 + 2
A/CALL OUT
ANTI SKID
RUD TRIM
WING A.ICE
MOST SPLRS
REVERSERS
HF 1 + 2
N/W STRG
AUTO BRK
ALTN BRK
MOST F.PUMPS
GPS 2

AFTER LAND RECOVERY : LGCIU 1, SLATS CHANNEL 1, are recovered. SLATS SLOW is displayed on the STATUS. Remaining Fuel pump stops. ALL F.PUMPS is displayed in INOP SYS list.

Note : STATUS is simplified in ALL ENG FLAME OUT configuration, only the most important STATUS items are kept.

ENG 1(2) CTL SYS FAULT

■ **On ground :**
- THR LEVER 1(2) . . . . IDLE
- ENG MASTER 1(2) . . . . OFF

■ **In flight :**

■ **In case of VBV or VSV failures :**
AVOID RAPID THR CHANGES

■ **In case of a FMV failure :**
ENG 1(2) AT IDLE

STATUS

■ **In case of VBV or VSV failures :**
AVOID RAPID THR CHANGES

■ **In case of a FMV failure**
ENG 1(2) AT IDLE

ENG 1(2) BLEED STATUS FAULT

Bleed valves, pack valves, wing and engine anti-ice valves, crossbleed valve position status is not received by the active FADEC channel.

HI IDLE

The FADEC increases minimum idle on the related engine, as if bleed and pack valves were open.

● **BEFORE T.O :**
- PACK 1+2 . . . . OFF
- WING ANTI ICE (if ENG ANTI ICE on) . . . . ON

BOTH PACKS AVAIL IN FLT (displayed on ground)

STATUS

BOTH PACKS AVAIL IN FLT (displayed on ground)
ENG (affected) HI IDLE

ENG 1(2) COOL VALVE FAULT

- **If IDG valve failed closed (open) :**
  IDG VALVE CLOSED (OPEN)
- **If core valve failed closed :**
  CORE VALVE CLOSED

ENG 1(2) FADEC SYS FAULT

This caution is triggered only on ground, if one NO DISPATCH failure affects one or both channels.

– THR LEVER 1(2) .... IDLE
– ENG MASTER 1(2) .... OFF

ENG 1(2) MINOR FAULT

This caution is triggered when a failure, requiring repair before 150 flight hours, is detected by the FADEC.

Crew awareness.

ENG 1(2) FADEC OVHT or FAULT

CONFIRM ENG STATUS
ON DISPLAYS

Since engine indications are lost, other system pages such as HYD, ELEC AC or BLEED must be used to confirm engine status.

● **IF ABN ENG OPERATION :**
- THR LEVER (affected engine) . . . . IDLE
- ENG MASTER (affected engine) . . . . OFF

ENG 1(2) **SHUT DOWN**

Apply ENG SHUT DOWN procedure.

ENG THR LEVERS NOT SET

This caution is triggered when one thrust lever is set between CLB and FLEX MCT at takeoff and in case of disagree between the thrust levers position and the thrust mode selected by the FADECs.

■ **Aircraft without derated takeoff option :**

● **If FLEX temp not set and thrust levers at FLX MCT:**
- THR LEVERS . . . . TO GA

■ **Aircraft with derated takeoff option :**

● **If no FLX temp neither derate level set and thrust levers at FLX-MCT :**
- THR LEVERS . . . . IDLE

● **If derate level it set and thrust levers at TO GA :**
- THR LEVERS . . . . MCT/DRTO

ENG T.O THRUST DISAGREE

The two FADECs select different thrust takeoff mode (FLEX, MAX) on the ground.

Crew awareness.

ENG 1(2) FUEL FILTER CLOG

Crew awareness.

Maintenance action is due.

ENG 1(2) EIU FAULT

The data bus between EIU and FADEC fails. Therefore :
- *Autothrust control is lost.*
- *Thrust reverser is lost on the affected engine.*
- *When idle is selected, only high ground idle is available on the affected engine.*
- *Bleed corrections on N1 limit are lost on the affected engine.*
- *Manual start is lost on the affected engine.*
- *Flex takeoff is lost.*
- *On ground, the affected engine's anti-ice fault light may be ON, if the affected engine does not run.*
- *On ground, when the crossbleed valve is open, the 2 packs may be controlled closed.*

Note : If continuous ignition is selected, the engine anti-ice valves open, triggering the A.ICE ENG 1(2) VALVE OPEN cautions. Set ENG A.ICE to ON to suppress the cautions.

■ ON GROUND

T.O THR : TOGA ONLY
HI IDLE

The FADEC increases minimum idle on the related engine, as if the bleed and pack valves were opened.

● BEFORE T.O :

– PACK 1+2 . . . . OFF
– WING ANTI ICE (if ENG ANTI ICE on) . . . . ON

As the FADEC directly receives the ENG ANTI ICE pushbutton position, it assumes that wing anti-ice is selected ON, when engine anti-ice is selected ON.
Wing anti-ice must be selected ON, to have the selection in accordance with the FADEC Bleed status.

BOTH PACKS AVAIL IN FLT

STATUS

	INOP SYS
T.O THR : TOGA ONLY	PACK 1+2
ENG (affected) AUTOSTART ONLY	A/THR
BOTH PACKS AVAIL IN FLT	REV 1(2)
ENG (affected) HI IDLE	CAT 3
CAT 2 ONLY	

■ IN FLIGHT

– THR LEVER (affected engine) . . . . MAN ADJUST
HI IDLE

STATUS

	INOP SYS
ENG (affected) AUTOSTART ONLY	A/THR
ENG (affected) HI IDLE	REV 1 (2)
CAT 2 ONLY	CAT 3

ENG 1(2) CTL VALVE FAULT

HPTCC, LPTCC or nacelle cooling valve is failed open.

- **HPTCC VALVE OPEN**
- **LPTCC VALVE OPEN**
- **NAC COOL VALVE OPEN**

ENG 1(2) IGN A(B) FAULT

Crew awareness.

STATUS

INOP SYS
ENG 1 (2) IGN A (B)

ENG 1(2) IGN A+B FAULT

AVOID ADVERSE WEATHER

STATUS

AVOID ADVERSE WEATHER

INOP SYS
ENG 1 (2) IGN

ENG 1(2) N1/N2 OVERLIMIT

■ **Maximum pointer indications :**

N1 above 115.5 %
N2 above 113 %

– THR LEVER (affected engine) . . . . BELOW LIMIT
Normal operation may be resumed to next landing.
Report in maintenance logbook.

● **If THR LEVER at idle for more than 3 seconds :**

– ENG MASTER (affected engine) . . . . OFF
If conditions do not permit engine shut down land as soon as possible using the minimum thrust required to sustain safe flight.

ENG 1(2) SHUT DOWN

Apply after ENG SHUT DOWN procedure.

ENG 1(2) EGT OVERLIMIT

■ **Maximum pointer indications :**

EGT above 940°C or above 975°C at takeoff power.

– THR LEVER (affected engine) . . . . BELOW LIMIT
Normal operation may be resumed to next landing.
Report in maintenance logbook.

● **If THR LEVER at idle for more than 5 seconds :**

– ENG MASTER (affected engine) . . . . OFF
If conditions do not permit engine shut down land as soon as possible using the minimum thrust required to sustain safe flight.

ENG 1(2) SHUT DOWN

Apply after ENG SHUT DOWN procedure.

ENG 1(2) EGT EXCEEDED

DURING AIR START.
This is triggered when there was an EGT amber line exceedance during an air start of the previous flight.
Crew awareness.

ENG TYPE DISAGREE

Crew awareness.

The engine ratings seen by the FWC are not identical for both engines, or they are different from the rating memorized by the FWC.

ENG 1 (2) REV PRESSURIZED

Reverse thrust system is pressurized without reverse deployment order.

- **If IDLE automatically selected by FADEC :**
  ENG (affected) AT IDLE
  – THR LEVER (affected engine) . . . . IDLE
  Select thrust lever at idle, even if idle is automatically selected by the FADEC.

ENG 1(2) REV INHIBITED

Reverse is inhibited by maintenance action.

Crew awareness.

STATUS

INOP SYS
REV 1 (2)

ENG 1(2) REV FAULT

A failure affects the reverser system.

Crew awareness.

STATUS

INOP SYS
REV 1 (2)

ENG 1(2) REV SET

Reverse thrust has been selected in flight.

– THR LEVER (affected engine) . . . . FWD THR

ENG 1(2) REV UNLOCKED

■ **On ground :**

- **If IDLE not automatically selected by the FADEC :**
  – THR LEVER (affected engine) . . . . IDLE
- **IDLE automatically selected by the FADEC :**
  ENG (affected) AT IDLE
  – THR LEVER (affected engine) . . . . IDLE
  Select thrust lever at idle, even if idle is automatically selected by the FADEC.

■ **In flight :**

MAX SPEED 300/.82
ENG (affected) AT IDLE
Displayed, only if the engine is automatically set at idle.
– THR LEVER (affected engine) . . . . IDLE
Select thrust lever at idle, even if idle is automatically selected by the FADEC.

- **IF BUFFET :**
  MAX SPEED 250/.70
  – THR LEVER . . . . IDLE
  – ENG MASTER (affected engine) . . . . OFF

ENG 1(2) **SHUT DOWN**

Apply the ENG SHUT DOWN procedure.

Note : 1. Lateral control (up to the equivalent of 1/2 stick) will be applied by the normal lateral law and thus spoilers will be extended and large aileron deflection will be used. However, adequate roll control remains.
2. Do not follow beta and beta target.
Apply full rudder and rudder trim towards the live engine.

ENG 1(2) REV UNLOCKED (CONT'D)

STATUS

MAX SPEED 300/.82
- **IF BUFFET** :
  MAX SPEED 250/.70

APPR PROC
- FOR LDG . . . . USE FLAP 3
- **IF BUFFET** :
  - GPWS FLAP MODE . . . . OFF
  - FOR LDG . . . . USE FLAP 2
  - APPR SPD . . . . VLS + 15 Kts
- LDG DIST PROC . . . . APPLY

R *Refer to the QRH Part 2, or to the FCOM 3.02.80.*
- FUEL UNBALANCE . . . . MONITOR

ENG 1 (2) AT IDLE (if selected by FADEC)
SLATS SLOW (if ENG 1 shutdown)
FLAPS SLOW (if ENG 2 shutdown)
CAT 3 SINGLE ONLY

INOP SYS
BLUE HYD
(YELLOW HYD)
PART SPLRS
REV 1(2)
CAT 3 DUAL
ENG 1 (2) BLEED
G ENG 1 (2) PUMP
B ENG 1 PUMP
(Y ENG 2 PUMP)
GEN 1 (2)
ALTN BRK
(if ENG 1 shut dn)
PART GALLEY

Note : *The approach speed of VLS + 15 knots is recommended, both to increase lateral control and to maintain the approach angle-of-attack at a reasonable value. Note that a reduction in lift may result from this failure and, therefore, a higher angle-of-attack than normal may be advised at a given speed.*

ENG 1(2) THR LEVER DISAGREE

LAND ASAP

Both thrust lever angle TLA sensors are not in agreement on one engine.
If the failure occurs during takeoff (with thrust lever in TOGA or FLX/MCT gate), FADEC maintains T.O., FLEX, TO, DRT TO ◁ thrust until thrust reduction, after which the maximum available thrust is MCT. If the failure occurs while thrust lever is between idle and MCT, the FADEC selects the higher TLA limited at MCT in flight, or the FADEC selects idle thrust on the ground or in approach phase (at landing gear down).

■ **On ground** :

ENG (affected) AT IDLE (if TLA not at TO.GA or FLX/MCT)
FADEC automatically selects idle power.

■ **In flight** :

MAX AVAIL PWR : MCT (if TLA at or below MCT and L/G up)
ENG (affected) AT IDLE (if TLA not at TOGA/FLX/MCT and L/G DOWN)
At landing gear extension (or when Mn < 0.40 if the onside EIU is failed), the FADEC automatically selects idle thrust.

– A/THR (if on) . . . . KEEP ON
– A/THR (if not on) . . . . ON
With autothrust engaged, thrust is automatically managed between idle and the higher TLA position as long as the landing gear is up.

STATUS

■ **On ground** :

ENG (affected) AT IDLE (if TLA not at TO. GA or FLX/MCT)

■ **In flight** :

ENG (affected) AVAIL MAX PWR : MCT

● **WHEN L/G DOWN or**
● **WHEN MN < 0.40** :
(Displayed if the onside EIU is failed)
ENG (affected) AT IDLE

APPR PROC
– FOR LDG . . . . USE FLAP 3

INOP SYS
ENG 1 (2) THR

ENG 1(2) THR LEVER FAULT

R LAND ASAP

No validated thrust lever angle for one engine thrust lever

■ **On the ground :**

ENG (affected) AT IDLE

FADEC selects idle power automatically.

If associated thrust reverser is already deployed, FADEC commands restow.

■ **In flight :**

If the selected thrust lever position at the time of fault detection is :

TOGA or FLEX : FADEC freezes takeoff or flex takeoff thrust until slat retraction. At slat retraction it will select MCT thrust.

Between IDLE and MCT : in manual thrust setting mode, engine rating increases and freezes at maximum continuous. At slats or landing gear extension, FADEC selects idle power automatically.

It is possible to activate autothrust. If selected, autothrust mode will manage thrust between idle and MCT as long as the landing gear is up and the slats are in.

● **During takeoff or when slats and landing gear are retracted :**

ENG (affected) HI PWR IN MAN THR

● **If A/THR on :**

– A/THR . . . . KEEP ON

● **If A/THR not on**

– A/THR . . . . ON

● **BEFORE SLATS IN :**

– A/THR . . . . ON

● **If EIU not avail and FLX/MCT/TOGA selected :**

ENG (affected) HI PWR ONLY

Engine thrust is frozen at takeoff power.

STATUS

APPR PROC	INOP SYS
– FOR LDG . . . . USE FLAP 3 ● **WHEN L/G DOWN OR SLATS OUT :** ● **WHEN MN < 0.40 :** (Displayed if the onside EIU is failed) ENG (affected) AT IDLE	ENG 1 (2) THR LVR REV 1 (2)

ENG THRUST LOCKED

Thrust is frozen on one or more engines, after a failure or an involuntary autothrust disconnection. This caution is automatically repeated every 5 seconds, until the thrust levers are moved.

– THR LEVERS .... MOVE

ENG 1(2) OIL LO TEMP

The engine oil temperature is less than - 10°C.

– THR LEVER (affected engine) .... IDLE
– DELAY T.O. FOR WARM UP

ENG 1(2) OIL HI TEMP

The engine oil temperature is between 160°C and 175°C for more than 15 minutes, or the oil temperature is above 175°C.

– THR LEVER (affected engine) .... IDLE
– ENG MASTER (affected engine) .... OFF

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure.

ENG 1(2) OIL LO PR

– THR LEVER (affected engine) .... IDLE

● **IF WARNING PERSISTS :**

– ENG MASTER (affected engine) .... OFF

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure

ENG 1(2) OIL FILTER CLOG

– THR LEVER (affected engine) .... REDUCE
Reduce the thrust lever until the caution disappears.
– ENG MASTER (affected engine) .... OFF
If the caution is still present with thrust lever at idle, shut down the engine.

ENG 1(2) SHUT DOWN

Apply the ENG SHUT DOWN procedure.

LEFT INTENTIONALLY BLANK

ENG START FAULT

THR LEVERS NOT AT IDLE

– THR LEVERS . . . . IDLE

ENG 1(2) START VALVE FAULT

■ **START VALVE STUCK CLOSED**

The valve is mechanically stuck closed.
On ground, consider application of "START VALVE MANUAL OPERATION" procedure.

– MAN START (affected engine, if manual start performed) . . . . OFF
– ENG MASTER (affected engine) . . . . OFF

■ **START VALVE NOT OPEN**

WINDMILL START AVAIL (in flight only)

– X BLEED (if opposite engine is running or APU available when right side affected) . . . . OPEN
– APU BLEED (if APU available below FL 220 and opposite engine not running) . . . . ON

● **IF UNSUCCESSFUL** :

– MAN START (affected engine) . . . . OFF
– ENG MASTER (affected engine) . . . . OFF

■ **START VALVE NOT CLOSED**

Remove all bleed sources supplying the faulty starter valve.

– APU BLEED (only for left side) . . . . OFF
– X BLEED (if opposite engine is running or APU available from left side) . . . . CLOSE
– ENG BLEED (affected side) . . . . OFF

● **On ground** :

– MAN START (affected engine) . . . . OFF
– ENG MASTER (affected engine) . . . . OFF

Maintenance action is due.

● **In flight** :

– WING ANTI ICE . . . . OFF

AIR **ABNORM BLEED CONFIG**

Refer to chapter 3.02.36 for the associated procedure.

ENG 1(2) START FAULT

■ LOW N1 (on the ground)

No N1 rotation during start.

- THR LEVER (affected engine) .... IDLE
- ENG MASTER (affected engine) .... OFF

■ ENG STALL or EGT OVERLIMIT or NO LIGHT UP

● In flight :

- ENG MASTER (affected engine) .... OFF

  Wait 30 seconds before a new start attempt (to drain the engine).

● On ground (auto start) :

In case of hot start, start stall, or overtemperature, the FADEC reduces the start fuel schedule in steps of 7 %, down to 14 %, until the start is successful.

The following message is displayed on the ECAM.

NEW START IN PROGRESS

If the start is unsuccessful, the fuel valve closes.

● If the start is still unsuccessful :

- ENG MASTER (affected engine) .... OFF

  The fuel metering valve, and the starter air valve close automatically. Both igniters are turned off.

  In case of stall, consider X BLEED start if pressure is low.

● On ground (manual start) :

- ENG MASTER (affected engine) .... OFF
- MAN START (affected engine) .... OFF
- ENG START SEL .... CRANK
- MAN START .... ON

  Dry crank the engine for 30 seconds. The start valve automatically reopens, when N2 below is 15 %.

  Note : These last two lines are not displayed on the ECAM. The pilot must decide whether to attempt a new start, or to report the no start condition for appropriate maintenance condition.

■ STARTER FAULT or STARTER TIME EXCEEDED

R - ENG MASTER (affected engine) .... OFF

R - MAN START (affected engine) .... OFF

ENG 1(2) HP FUEL VALVE

■ **Associated engine below idle**

HP FUEL VALVE NOT OPEN

Failure of high pressure fuel valve.

– MAN START (affected engine) .... OFF
– ENG MASTER (affected engine) .... OFF

■ **Associated engine at or above idle**

HP FUEL VALVE NOT CLSD

Failure of high pressure fuel valve.
Engine will shut down by closure of the fuel low pressure valve.

– MAN START (affected engine) .... OFF
– ENG MASTER (affected engine) .... OFF

Note : In case there is no fuel in the engine fuel system, the high pressure fuel valve may be unduly detected open while being closed.

ENG THRUST LOSS

■ **Bleed configuration as seen by the FADEC is not in accordance with the bleed configuration requested by the crew.**

● **if abnormal engine anti ice :**
ABNORMAL ENG A. ICE

● **if abnormal wing anti ice :**
ABNORMAL WING A. ICE

● **if abnormal bleed or pack :**
ABNORMAL BLEED OR PACK
– THR LEVERS .... IDLE

ENG 1 (2) STALL

A stall may be indicated by varying degrees of abnormal engine noises, accompanied by flame from the engine exhaust (and possibly from engine inlet in severe cases), fluctuating performance parameters, sluggish or no thrust lever response, high EGT and/or a rapid EGT rise when thrust lever is advanced. Engine stalls must be reported for maintenance action.

- THR LEVER (affected engine) . . . . IDLE
- ENG PARAMETERS (affected engine) . . . . CHECK

● **If abnormal parameters :**

- ENG MASTER (affected engine) . . . . OFF

ENG 1(2) **SHUT DOWN**

Apply ENG SHUT DOWN procedure.
Engine restart at crew discretion.

● **If normal parameters :**

- ENG A ICE (affected engine) . . . . ON
- WING A ICE . . . . ON

Operation of the engine and wing anti ice will increase the stall margin but EGT will increase accordingly.

- THR LEVER . . . . SLOWLY ADVANCE

● **If stall does not reoccur :**

Continue engine operation

LEFT INTENTIONALLY BLANK

ENG TAILPIPE FIRE

Internal engine fire may be encountered during engine start or engine shutdown.
It may be seen by the ground crew, or the EGT may fail to decrease after the MASTER switch is turned off.

CAUTION
External fire agents can cause severe corrosive damage and should, therefore, only be considered after having applied the following procedure :

– ENG MASTER (affected) . . . . OFF
  Note : Do not press the engine fire pushbutton, since this would cut off the FADEC power supply, which would prevent motoring sequence.
– AIR BLEED PRESS . . . . ESTABLISH
  · Select the APU, or opposite ENG BLEED, to motor the engine.
  · If APU BLEED is not available, and the other engine is shut down, connect external pneumatic power (if readily available).
R – BEACON . . . . ON
● **When N2 < 30 % :**
  – ENG START SEL . . . . CRANK
  – MAN START . . . . ON
    The start valve automatically reopens, when N2 is below 15 %.
● **When burning has stopped :**
  – MAN START . . . . OFF
  – ENG START SEL . . . . NORM
    Maintenance action is due.

HIGH ENGINE VIBRATION

The ECAM's vibration advisory (N1 greater than 5.7 units, N2 greater than 5.6 units) is mainly a guideline to induce the crew to monitor engine parameters more closely.
Vibration detection alone does not require engine shutdown.

Note : 1. High engine vibrations may be accompanied by cockpit and cabin smoke and/or the smell of burning. This may only be due to compressor blade tip contact with associated abradable seals.
2. High N1 vibrations are generally accompanied by perceivable airframe vibrations. High N2 vibrations can occur without perceivable airframe vibrations.

■ **IF NO ICING CONDITIONS EXIST :**

– ENG PARAMETERS . . . . CHECK
Check engine parameters and especially EGT, crosscheck with other engine.
Report in maintenance logbook.

● **If rapid increase above the advisory :**

– THRUST LEVER (affected engine) . . . . RETARD
Flight conditions permitting, reduce N1 to maintain the vibration level below the advisory threshold.
Note : If the VIB indication does not decrease following thrust reduction, this may indicate other problems on the engine. Apply adequate procedure.

■ **IF ICING CONDITIONS EXIST :**

An increase of N1 vibration in icing conditions, with or without engine anti-ice, may be due to fan blades and/or spinner icing.

– A/THR . . . . OFF
– ENG ANTI ICE . . . . CHECK
If ENG ANTI ICE is off, switch it ON at idle fan speed, one engine after the other with approximately 30 seconds interval.
– THRUST LEVER (one engine at a time) . INCREASE THRUST
Increase thrust with power setting compatible with the flight phase. Vibration level will return to normal after ice shedding, despite a light increase during acceleration. Resume normal operation.

Note : If possible, shut down the engine after landing for taxiing, when vibrations above the advisory level have been experienced during the flight.

ENG RELIGHT (in flight)

MAX GUARANTEED ALTITUDE .... 30 000 FT

- ENG MASTER (affected engine) .... OFF
- THR LEVER (affected engine) .... check IDLE
- MAN START pb (affected engine) .... OFF

Note : Auto start is recommended in flight.
Be aware that, contrary to auto start on ground, the crew must take appropriate action in case of abnormal start.

- ENG START SEL .... IGN
- X BLEED .... OPEN

If outside windmilling start envelope, FADEC opens starter valve.

- WING ANTI ICE (for starter assisted start) .... OFF
- ENG MASTER .... ON

Note : Engine light up must be achieved within 30 seconds after fuel flow increases.
– Monitor N2
– If uncertain about successful relight, move the thrust lever forward and check engine response.

■ **When idle reached (AVAIL indication pulses in green) :**

- ENG START SEL .... NORM
R - TCAS MODE SEL ◁ .... check TA/RA
R *Check that the selector is at TA/RA since if the ENG SHUT DOWN procedure has been*
R *applied, the TCAS mode selector may have been set at TA position.*
- Affected SYS .... RESTORE

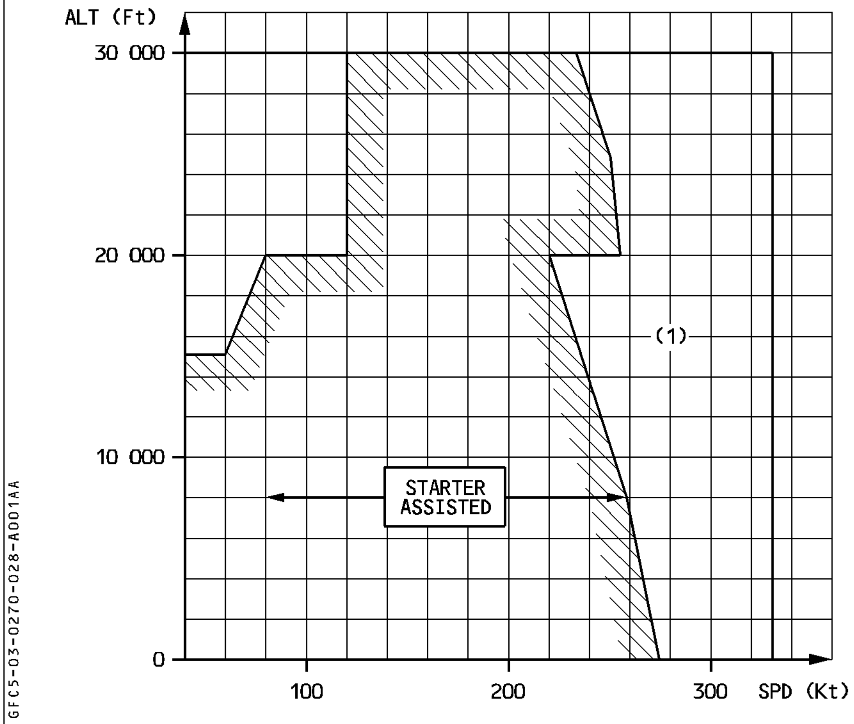
Restore affected systems and set XBLEED selector at AUTO.

ENG RELIGHT (in flight) (CONT'D)

■ **if no relight :**

– ENG MASTER (affected engine) .... OFF

Wait 30 seconds before new start attempt (to drain the engine)



(1) A windmilling relight can be attempted in this zone while N2 is decreasing provided N2 has not dropped below 15%.

ON GROUND EMER/EVACUATION

Carefully analyze the situation before deciding to evacuate passengers. However, do not waste valuable time.

- AIRCRAFT/PARKING BRK . . . . STOP/ON
- ATC (VHF 1) . . . . NOTIFY

  Notify ATC of the nature of the emergency, and state intentions.
  Only VHF 1 is available on batteries.

R – △P . . . . CHECK ZERO

R *If △P is not at zero, select manual mode and V/S CTL FULL UP, in order to fully open the*
R *outflow valves.*

- ENG MASTER (all) . . . . OFF

  Associated LP and HP valves close.

- CABIN CREW (PA) . . . . NOTIFY

  Notify the cabin crew of the nature of the emergency, and state intentions.

- ENG (all) and APU FIRE pushbutton . . . . PUSH
- AGENT (ENG and APU) . . . . AS RQRD

R – EVACUATION . . . . INITIATE

  Using the Passenger Address system, announce an appropriate command such as "PASSENGER EVACUATION - EVACUATE THROUGH LH or RH DOORS", and press the EVAC COMMAND pushbutton.

DITCHING

This procedure has been established, based on the assumption that APU generator was not available.

PREPARATION

- OPTIMUM SPEED . . . . 230 KT/GREEN DOT
  Fly 230 kt initially.
  When time permits, check Green dot speed on QRH 4.01.
- CABIN CREW . . . . NOTIFY
  Notify the cabin crew of the nature of the emergency and state intentions.
  Specify the available time.
- ATC/TRANSPONDER (if available) . . . . . . NOTIFY/AS RQRD
  Notify ATC of the nature of emergency encountered and state intentions.
  If not in contact with ATC, select transponder code A7700 or transmit the distress message on : (VHF) 121.5 MHZ or (HF) 2182 KHZ or 8364 KHZ.
- JETTISON (if engines running) . . . . ON
- GPWS SYS . . . . OFF
  R *Pressing the SYS pushbutton off avoids nuisance warnings.*
- SEAT BELTS/NO SMOKING . . . . ON
- EMER EXIT LT . . . . ON
- COMMERCIAL . . . . OFF
- CABIN and COCKPIT . . . . PREPARE
  · Loose equipment secured
  · Survival equipment prepared
  · Belts and shoulder harnesses locked
- LDG ELEV . . . . SELECT 00
- V. BUGS . . . . SET
  See QRH 4.01 VLS CONF1
- BARO . . . . SET
  Omit normal approach and landing check list.
- CREW MASKS/OXY SUPPLY (below FL 100) . . . . OFF

DITCHING (CONT'D)

APPROACH

- L/G lever . . . . UP
- **If engines running :**
  - SLATS and FLAPS . . . . MAX AVAIL
- **If engines not running :**
  - **3 minutes before landing :**
    - LAND RECOVERY . . . . ON
    - FLAP 1 . . . . SELECT

      EMER GEN is lost at slat extension. The aircraft is supplied by batteries only.
    - FLY VLS CONF1
  - **At slats extension, if FUEL MAN FWD XFR has been selected :**
    - T TK MODE . . . . AUTO
    - T TK FEED . . . . AUTO

R – USE RUDDER WITH CARE

R – MIN RAT SPEED . . . . 140 KT

- ENG START SEL . . . . NORM
- CABIN REPORT . . . . OBTAIN
- JETTISON . . . . OFF

BEFORE DITCHING

- CAB PRESS MODE SEL . . . . CHECK AUTO
- BLEED (ENGs and APU) . . . . OFF

  Touch down with approximately 11° pitch attitude, and minimum aircraft V/S.

R – DITCHING pushbutton . . . . ON

- BRACE FOR IMPACT . . . . ORDER

DITCHING (CONT'D)

The ditching direction mainly depends on wind direction and the state of the sea. These factors may be considered as follows:

1. Wind direction : May be determined by observing the waves, which move and break downwind. Spray from the wave tops is also a reliable indicator.
2. Wind speed : The following guidelines can be used to evaluate wind speed :
   A few white crests . . . . 8-17 knots
   Many white crests . . . . 17-26 knots
   Streaks of foam along the water . . . . 23-35 knots
   Spray from the waves . . . . 35-43 knots
3. State of the sea :
   This is best determined from a height of 500 to 1000 feet. At a lower height, the direction of the swell may be less obvious than the direction of the waves, even though the waves are much smaller. When there is no swell, align into the wind. In the presence of swell, and provided that drift does not exceed 10 degrees, ditch parallel to the swell and as closely into the wind as possible. If drift exceeds 10 degrees, ditch into wind. The presence of drift on touchdown is not dangerous, but every effort should be made to minimize roll.
   Touchdown with approximately 11 degrees of pitch, and minimum aircraft vertical speed.

JUST BEFORE DITCHING

– ENG MASTERS . . . . OFF

AFTER DITCHING

– ATC (VHF 1) . . . . NOTIFY
  With engines and APU shutdown, only VHF 1 is supplied.
– FIRE pushbutton (ENG and APU) . . . . PUSH
– AGENT (ENG and APU) . . . . DISCH
– EVACUATION . . . . INITIATE
– ELT . . . . CHECK EMITTING
  If not, switch on the transmitter.

FORCED LANDING

This procedure has been established, based on the assumption that APU generator was not available.

PREPARATION

- OPTIMUM SPEED . . . . 230 KT/GREEN DOT
  Fly 230 kt initially.
  When time permits, check Green dot speed on QRH 4.01.
- CABIN CREW . . . . NOTIFY
  Notify the cabin crew of the nature of the emergency and state intentions.
  Specify the available time.
- ATC/TRANSPONDER (if available) . . . . . . NOTIFY/AS RQRD
  Notify ATC of the nature of emergency encountered and state intentions.
  If not in contact with ATC, select transponder code A7700 or transmit the distress message on : (VHF) 121.5 MHZ or (HF) 2182 KHZ or 8364 KHZ.
- JETTISON (if engines running) . . . . ON
- GPWS SYS . . . . OFF
  R *Switching SYS pushbutton OFF avoids nuisance warnings.*
- SEAT BELTS/NO SMOKING . . . . ON
- EMER EXIT LT . . . . ON
- COMMERCIAL . . . . OFF
- CABIN and COCKPIT . . . . PREPARE
  · Loose equipment secured
  · Survival equipment prepared
  · Belts and shoulder harnesses locked
- LDG ELEV . . . . SET
  · If not known, select an approximate value.
- V BUGS . . . . SET
  See QRH 4.01 VLS CONF1
- BARO . . . . SET
  Omit normal approach and landing check list.
- CREW MASKS/OXY SUPPLY (below FL 100) . . . . OFF

APPROACH

- RAM AIR . . . . ON
  Switch ON the RAM AIR to ensure complete depressurization on the ground.

● **If engines running :**
  - L/G lever . . . . DOWN
  - SLATS and FLAPS . . . . MAX AVAIL

FORCED LANDING (CONT'D)

- **If engines not running :**
  - **3 minutes before landing :**
    - LAND RECOVERY . . . . ON
    - FLAP 1 . . . . SELECT

      EMER GEN is lost at slat extension. The aircraft is supplied by batteries only.
  - **At slat extension, if FUEL MAN FWD XFR has been selected :**
    - T TK MODE . . . . AUTO
    - T TK FEED . . . . AUTO
  - **2 minutes before landing :**
    - L/G GRVTY EXTN . . . . DOWN

      Flight controls revert to direct law.
    - FLY VLS CONF1
  - **When L/G downlocked :**
    - L/G lever . . . . DOWN
  - USE RUDDER WITH CARE
  - MIN RAT SPEED . . . . 140 KT
  - MAX BRK PR . . . . 1000 PSI
- GND SPLR . . . . ARM
- ENG START SEL . . . . NORM
- CABIN REPORT . . . . OBTAIN
- JETTISON . . . . OFF

BEFORE LANDING

- BRACE FOR IMPACT . . . . ORDER

JUST BEFORE TOUCHDOWN

- ENG MASTERS . . . . OFF

AFTER TOUCHDOWN

- **When aircraft has stopped :**
  - PARKING BRK . . . . ON
  - ATC (VHF 1) . . . . NOTIFY

    With engines and APU shutdown, only VHF 1 is supplied.
  - FIRE pushbutton (ENG and APU) . . . . PUSH
  - AGENTS (ENG and APU) . . . . DISCH
  - R EVACUATION . . . . INITIATE
  - ELT . . . . CHECK EMITTING

    If not, switch on the transmitter.

EMER DESCENT

R **IMMEDIATE ACTIONS**

– CREW OXY MASKS . . . . ON

The recommendation is to descend with the autopilot engaged :
– Turn the ALT selector knob and pull.
– Turn the HDG selector knob and pull.
– Adjust the target SPD/MACH.

– THR LEVER (if A/THR not engaged) . . . . IDLE

· If autothrust is engaged, check IDLE on the UPPER ECAM.
· If not engaged, retard the thrust levers.

– SPD BRK . . . . FULL

R **WHEN DESCENT ESTABLISHED**

EMER DESCENT FL 100 or minimum allowable altitude.

– SPEED . . . . MAX/APPROPRIATE

CAUTION
Descend at the maximum appropriate speed. If structural damage is suspected, use the flight controls with care and reduce speed as appropriate.

Landing gear may be extended below 21000 feet. Speed must be reduced to 250 knots.

– SIGNS . . . . ON
– ENG START SEL . . . . IGN
– ATC . . . . NOTIFY

Notify ATC of the nature of the emergency, and state intentions. If not in contact with ATC, select transponder code A 7700, or transmit a distress message on one of the following frequencies : (VHF) 121.5 MHZ, or (HF) 2182 KHZ, or 8364 KHZ.
To save oxygen, set the oxygen diluter selector to the N position.
With the oxygen diluter selector left at 100 %, oxygen quantity may be insufficient to cover the entire emergency descent profile.
· Ensure crew communication is established with oxygen masks. Avoid continuous use of the interphone to minimize interference from the oxygen mask breathing noise.

● **IF CAB ALT > 14000 feet :**

– PAX OXY MASKS . . . . MAN ON

Confirm passenger oxygen masks released.
Note : Notify the cabin crew, when a safe flight level has been reached and oxygen mask use can be terminated.

OVERWEIGHT LANDING

Automatic landing is certified up to MLW, but has been demonstrated in flight up to MTOW. In determining the best course of action, the flight crew may consider the option to perform an automatic landing, provided the runway is approved for automatic landing.

- JETTISON ◁ . . . . CONSIDER
- LDG CONF . . . . AS REQUIRED

R *Use the ECAM flap setting, if required for abnormal operations. In all other cases :*

R *– FULL is preferred for optimized landing performance.*

– If the aircraft weight is above the maximum weight for go-around (given in the table below), use FLAP 3 for landing.

R *In all cases, if landing configuration is different from FLAP FULL, use 1 + F for go-around.*

- LDG DIST . . . . CHECK
- PACK 1 and 2 . . . . OFF or supplied by APU

Selecting packs OFF (or supplied from APU) will increase the maximum thrust available from the engines, in the event of a go-around.

● **In the final stages of approach**

- TARGET SPEED . . . . VLS

Reduce speed to reach VLS at runway threshold.
For automatic landing, maintain VLS + 5.
Touch down as smoothly as possible (Maximum V/S at touchdown 360 ft/min).

● **At main landing gear touchdown**

- REVERSE THRUST . . . . USE MAX AVAILABLE

● **After nosewheel touchdown**

- BRAKES . . . . APPLY AS NECESSARY

Max braking may be used after nosewheel touchdown. But, if landing distance permits, delay or reduce braking to take full benefit of the available runway length.

● **Landing complete**

- BRAKE FANS . . . . ON if available

Be prepared for tire deflation, if temperatures exceed 800° C.

MAXIMUM WEIGHT FOR GO AROUND IN CONF 3 (1000 kg)

OAT °C	AIRPORT ELEVATION (FT)							
	0	**2000**	**4000**	**6000**	**8000**	**10000**	**12000**	**14000**
10	238	227	214	200	187	173	159	145
15	238	226	214	200	185	169	154	140
20	237	226	213	197	180	164	148	135
25	237	226	209	191	174	157	143	131
30	235	218	202	184	167	151	138	
35	227	210	194	177	160			
40	218	202	187	170				
45	209	193	179					
50	198	182						
55								

CREW INCAPACITATION

The remaining crew member must call a cabin attendant as soon as practicable.

The best way to request assistance from the cabin crew, is by passenger address system :

"ATTENTION", "PURSER TO COCKPIT PLEASE". The Purser or any other cabin attendant must proceed to the cockpit immediately.

The cabin attendant must then :

- tighten and manually lock the shoulder harness of the incapacitated crew member ;
- push the seat completely aft ;
- recline the seat back.

It takes 2 people to remove the dead weight of an unconscious body from a seat without endangering any controls and switches.

If it is not possible to remove the body, one cabin attendant must stay in the cockpit to take care of and observe the incapacitated crew member.

In coordination with the purser :

- request assistance from any medically qualified passenger ;
- check if a type qualified company pilot is on board to replace the incapacitated crew member.

BOMB ON BOARD

IF POSSIBLE, LAND AND EVACUATE THE AIRCRAFT IMMEDIATELY.

R If it is not possible to land and evacuate the aircraft within 30 minutes, apply the following procedures :

COCKPIT PROCEDURES

Background

To avoid the activation of an altitude-sensitive bomb, the cabin altitude should not exceed the value at which the bomb has been discovered.

To reduce the effects of the explosion, the aircraft should fly as long as possible with approximately 1 PSI differential pressure, to help the blast go outwards. 1 PSI differential pressure corresponds to a 2500 feet difference between the aircraft and the cabin altitude.

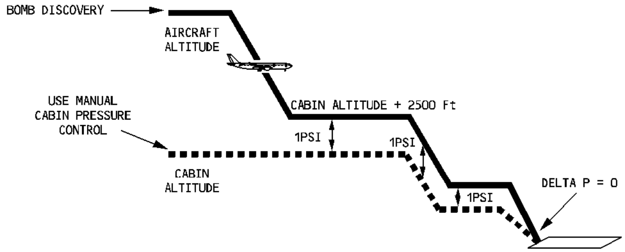
These conditions are achieved by using the manual pressure control.

Procedure

The following procedure assumes that it is initiated during climb or cruise :

- First, maintain the cabin altitude.
- While maintaining the cabin altitude, descend the aircraft to the cabin altitude + 2500 feet and maintain delta P at 1 PSI.
- During further steps of descent, maintain delta P at 1 PSI.
- For landing, reduce the differential pressure to zero, until the final approach.

If flight conditions are different, the crew should adapt the procedure, bearing in mind the above-mentioned principles (background paragraph).



GFC5-03-0208-010-A001AA

BOMB ON BOARD (CONT'D)

- AIRCRAFT (if climbing) .... LEVEL OFF
- CABIN PRESS MODE SEL .... MAN
  The purpose is to immediately prevent the cabin altitude from increasing, in order to avoid the activation of an altitude-sensitive bomb.
- CAB ALT .... MAINTAIN
  Use MAN V/S CTL to maintain the cabin altitude at the value it had when the bomb was discovered.
- CABIN CREW .... NOTIFY
- ATC/COMPANY OPERATIONS .... NOTIFY
  To obtain expert advice from explosive specialists.
- FUEL RESERVES .... DETERMINE
  Keep in mind that when flying at cabin altitude + 2500ft, the fuel consumption in CONF1, with landing gear down, will be about 2.1 times that consumed in clean configuration.
- NEXT SUITABLE AIRPORT .... DETERMINE
- FCU SPEED SELECTION KNOB .... PULL AND TURN
  Select the most appropriate speed, taking into account the time to destination, the fuel consumption and the fact that low speed could reduce the consequences of possible structural damage, if the bomb explodes.
- DESCENT TO CAB ALT + 2500 FT or MEA or minimum obstacle clearance altitude .... INITIATE
  Descending to 2500ft above the cabin altitude gives a cabin differential pressure of approximately 1 PSI, which helps to ensure that the blast goes outwards, if the bomb explodes.
- AVOID SHARP MANEUVERS
  which might result in the bomb moving.
- CAB ALT .... MAINTAIN
  Use MAN V/S CTL to maintain the cabin altitude. Initially brief UP input should be required; but, be careful not to increase the cabin altitude.

● **When at CAB ALT + 2500 FT :**
  - 1 PSI DELTA P .... MAINTAIN
    Use MAN V/S CTL to adjust delta P to 1 PSI. Brief DN input should be initially required to set 0 ft/min cabin vertical speed.
  - GALLEY/COMMERCIAL .... OFF
  - FLAPS (fuel permitting) .... AT LEAST CONF 1
    For landing, use normal configuration.

BOMB ON BOARD (CONT'D)

– LANDING GEAR (fuel permitting, except for flight over water) . . . . DOWN

The detonation could damage the landing systems. Therefore, if fuel permits, configure the aircraft for landing as soon as possible. Reducing the speed will minimize stress on the aircraft structure.

- **For any other steps of descent :**

– 1 PSI DELTA P . . . . MAINTAIN

Use MAN V/S CTL to DN to adjust delta P to 1 PSI.

- **During approach :**

– CABIN PRESS MODE SEL . . . . AUTO

The purpose is to allow the CPC to automatically control the cabin altitude to 0 during final approach.

- **When the aircraft is on ground and stopped in a remote area (if possible) :**

R – EVACUATION . . . . INITIATE

Avoid exits and exiting on the same side as the bomb and near the bomb.

CABIN PROCEDURES

> CAUTION
> The least risk bomb location for the aircraft's structure and systems is the CENTER OF THE RH AFT CABIN DOOR.

– EOD PERSONNEL ON BOARD . . . . CHECK

Announce "Is there any EOD personnel on board ?". By using the initials, only persons familiar with EOD (Explosive Ordnance Disposal) will be made aware of the problem.

– BOMB . . . . DO NOT OPEN, DO NOT CUT WIRES, SECURE AGAINST SLIPPING, AVOID SHOCKS

Secure in the attitude found, and do not lift before having checked for an anti-lift ignition device.

– PASSENGERS . . . . LEAD AWAY FROM BOMB

Move passengers at least 4 seat rows away from the bomb location. If the other seats are full, these passengers should sit on the floor in protected areas.

Passengers near the bomb should protect their heads with pillows, blankets, etc, and sit in the brace position.

All passengers must remain seated with seatbelts on and, if possible, head below the top of the head rest. Seat backs and tray tables should be in their full upright position.

BOMB ON BOARD (CONT'D)

– BOMB . . . . CHECK NO ANTI-LIFT DEVICE

To check for an anti-lift switch or lever, slide a string or stiff card, (such as the emergency information card) under the bomb, without disturbing the bomb.

If the string or card cannot be slipped under the bomb, it may indicate that an anti-lift
R *switch or lever is present and that the bomb cannot be moved.*

If a card is used and can be slid under the bomb, leave it under the bomb and move together with the bomb. If it is indicated that an anti-lift device is present, it may be possible to move the bomb together with the surface on which the bomb is located such as a shelf or seat cushion.

R *If it is not possible to move the bomb, then it should be surrounded with a single thin*
R *sheet of plastic (e.g. trash bag), then with wetted materials, and other blast attenuation materials, such as seat cushions and soft carry-on baggage. Move personnel as far away from the bomb location as possible.*

● **If the bomb can be moved :**

PLACE THE BOMB AS CLOSE TO THE CENTER OF THE RH AFT CABIN DOOR AS POSSIBLE.

– PASSENGERS . . . . MOVE/ADVISE

Move passengers at least 4 seat rows away from the least risk bomb location (RH aft cabin door). If the other seats are full, these passengers should sit on the floor in protected areas towards the front of the aircraft.

Passengers near the bomb should protect their heads with pillows, blankets, etc, and sit in the brace position.

All passengers must remain seated with seatbelts on and, if possible, head below the
R *top of the head rest. Seat backs and tray tables should be in their full upright position.*

R – RH AFT CABIN DOOR SLIDE . . . . DISARM

– LEAST RISK BOMB LOCATION (LRBL) . . . . PREPARE

Build up a platform of solid baggage against the door up to about 25cm (10 in) below the middle of the door.

On top of this, build up at least 25cm (10 in) of wetted material such as blankets and pillows.

R *Place a single thin sheet of plastic (e.g. : trash bag) on top of the wetted materials.*
R *This prevents any possible short circuit.*

BOMB ON BOARD (CONT'D)

– BOMB .... MOVE TO LRBL

Carefully carry in the attitude found and place on top of the wetted materials in the same attitude and as close to the door structure as possible.

– LEAST RISK BOMB LOCATION .... COMPLETE

R *Place an additional single thin sheet of plastic over the bomb.*

Build up at least 25cm (10in) of wetted material around the sides and on top of the bomb.

DO NOT PLACE ANYTHING BETWEEN THE BOMB AND THE DOOR, AND MINIMIZE AIRSPACE AROUND THE BOMB.

The idea is to build up a protective surrounding of the bomb so that the explosive force is directed in the only unprotected area into the door structure.

Fill the area around the bomb with seat cushions and other soft materials such as
R *hand luggage (saturated with water or any other nonflammable liquid) up to the cabin*
R *ceiling, compressing as much as possible. Secure the LRBL stack in place using belt,*
R *ties, or other appropriate materials. The more material stacked around the bomb, the*
less the damage will be.

USE ONLY SOFT MATERIAL. AVOID USING MATERIALS CONTAINING ANY INFLAMMABLE LIQUID AND ANY METAL OBJECTS WHICH COULD BECOME DANGEROUS PROJECTILES.

– EVACUATION/DISEMBARKATION .... EXECUTE

Evacuate through normal and emergency exits on the opposite side of the bomb location.

Do not use the door just opposite the bomb.

Use all available airport facilities to disembark without delay.

R

COCKPIT WINDSHIELD/WINDOW CRACKED

In case of a one-ply failure, whichever the one may be, the windshield is still able to sustain the maximum differential pressure. Nevertheless, because the pilot is unable to accurately determine how many plies have failed, differential pressure must be reduced to 5 PSI by applying the following procedure :

MAX FL 230

The maximum flight level is restricted to FL230 to obtain △P 5 PSI, without resulting in an excessive cabin altitude and corresponding EXCESS CAB ALT warning. The following procedure allows maintaining △P 5 PSI in manual cabin pressure mode.

– CAB PRESS MODE SEL . . . . MAN
– MAN V/S CTL . . . . AS RQRD

Set the cabin altitude, according to the table below :

△P = 5 PSI	FL	100	150	200	230
	CABIN ALTITUDE	0	3000	6000	8000

● **When starting the final descent :**

– CAB PRESS MODE SEL . . . . AUTO

ECAM ADVISORY CONDITIONS

SYST	CONDITIONS	RECOMMENDED ACTION
CAB PRESS	CAB VERT SPD V/S > 1800 ft/mn or V/S < – 1800 ft/mn	CPC changeover is recommended : MODE SEL . . . . MAN ● AFTER 3 SEC MODE SEL . . . . AUTO
	CAB ALT alt ≥ 8800 ft	MODE SEL . . . . MAN Manual press control
	CAB DIFF PRESS △P ≥ 1.5 PSI in phase 7	LDG ELEV . . . . MAN ADJUST ● If unsuccessful : MODE SEL . . . . MAN Manual press control
COND	PACK LO FLOW Pack flow insufficient to satisfy temperature demand	PACK FLOW . . . . INCREASE
ELEC	IDG OIL TEMP T > 142°C	Reduce IDG load, if possible (GALLEY or COMMERCIAL or GEN OFF). If required, restore when the temperature has dropped. Restrict use of the generator to a short time, if temperature rises again excessively.
FUEL	Difference between L and R inner tank fuel quantities is greater than 3000 kg	FUEL MANAGEMENT . . . . CHECK If a fuel leak is suspected, refer to the FUEL LEAK procedure.
APU	LOW OIL LEVEL The oil level is below 4.4 l	
	EGT high (inhibited during APU start)	
OXY/ DOOR	CKPT OXY Pulsing Green : When pressure is < 600 PSI Amber : When pressure is < 300 PSI	If mask is not being used, check if it is correctly stowed, as per FCOM 1.35.20.
	PAX OXY ⊲ 200 < pressure < 1200 PSI	

R

SYST	CONDITIONS	RECOMMENDED ACTION
ENG	OIL TEMP 160°C < T < 175° C for 15 min	An increase in oil temperature, during normal steady-state operation, indicates a system malfunction and should be closely-monitored for other engine malfunction symptoms. An increase in oil temperature could be related to the IDG oil cooling system. To reduce the increase in oil temperature before limits are reached, the following are recommended : Reduce GEN load, or turn off GEN. If the oil temperature continues to rise, mechanically disconnect the IDG.
	OIL QTY < 2 Qts	If the oil quantity is low, at high power setting, expect level increase after power reduction.
	NAC TEMP > 260° C	Monitor engine parameters and crosscheck with other engine.
	VIBRATION N1 ≥ 5.7 units N2 ≥ 5.6 units	(Refer to 3.02.70)

LDG CONF/APPR SPD/LDG DIST FOLLOWING FAILURES

<table>
<tr><th>A330</th><th colspan="2">FAILURE</th><th>FLAPS LEVER POSITION FOR LDG</th><th>△ VREF APPR SPD INCREMENT</th><th>MULTIPLY DRY RWY LDG DIST (CONF FULL) BY</th></tr>
<tr><td rowspan="4">ELEC</td><td colspan="2">EMER CONFIG</td><td>3</td><td>–</td><td>1.1</td></tr>
<tr><td colspan="2">DC BUS 1+2 FAULT</td><td>NORM (1)</td><td>–</td><td>1.1</td></tr>
<tr><td colspan="2">DC BUS 2 FAULT</td><td>NORM (1)</td><td>–</td><td>1.1</td></tr>
<tr><td colspan="2">· if ice accretion :
DC ESS BUS FAULT/
DC ESS SHED</td><td>NORM (1)</td><td>10</td><td>1.2</td></tr>
<tr><td rowspan="9">S/F</td><td rowspan="5">FLAPS FAULT</td><td>0 ≤ FLAPS < 1 + F</td><td>2</td><td>30</td><td>1.5*</td></tr>
<tr><td>1 + F≤ FLAPS < 2</td><td>2</td><td>15</td><td>1.3*</td></tr>
<tr><td>2 ≤ FLAPS < 3</td><td>2</td><td>10</td><td>1.2*</td></tr>
<tr><td>FLAPS = 3</td><td>3</td><td>5</td><td>1.1*</td></tr>
<tr><td>FLAPS > 3</td><td>FULL</td><td>5</td><td>1.1*</td></tr>
<tr><td rowspan="3">SLATS FAULT</td><td>0 ≤ SLATS < 1</td><td>2</td><td>30</td><td>1.4*</td></tr>
<tr><td>1 ≤ SLATS < 2</td><td>2</td><td>15</td><td>1.2*</td></tr>
<tr><td>SLATS ≥ 2</td><td>3</td><td>5</td><td>1.1*</td></tr>
<tr><td colspan="2">NO FLAPS NO SLATS</td><td>1</td><td>50</td><td>1.7*</td></tr>
<tr><td rowspan="7">F/CTL</td><td colspan="2">STAB CTL FAULT
(MAN TRIM NOT AVAIL)</td><td>2</td><td>20</td><td>1.3*</td></tr>
<tr><td colspan="2">L/R/L + R ELEV FAULT</td><td>2</td><td>20</td><td>1.3*</td></tr>
<tr><td colspan="2">RUDDER JAM/
RUDDER FAULT</td><td>2</td><td>10</td><td>1.7*</td></tr>
<tr><td colspan="2">RUDDER JAM (engine out)</td><td>2</td><td>APPR SPD :
170 KT</td><td>2.3*</td></tr>
<tr><td colspan="2">ALTN/DIRECT LAW</td><td>3</td><td>–</td><td>1.1*</td></tr>
<tr><td colspan="2">PRIM 1+3, 2+3, FAULT</td><td>NORM (1)</td><td>–</td><td>1.1</td></tr>
<tr><td colspan="2">PRIM 1+2+3 FAULT</td><td>3</td><td>–</td><td>1.2</td></tr>
<tr><td rowspan="3">SPLR</td><td colspan="2">ONE/TWO SPLRS per wing</td><td>NORM (1)</td><td>–</td><td>NEGLIGIBLE</td></tr>
<tr><td colspan="2">THREE/FOUR SPLRS
per wing</td><td>NORM (1)</td><td>–</td><td>1.1</td></tr>
<tr><td colspan="2">FIVE/ALL SPLRS per wing</td><td>NORM (1)</td><td>–</td><td>1.2</td></tr>
</table>

(1) If CONF 3 is used when "NORM" is indicated in the table, multiply the resulting landing distance by an additional factor of 1.1.

R

A330	FAILURE		FLAPS LEVER POSITION FOR LDG	△ VREF APPR SPD INCREMENT	MULTIPLY DRY RWY LDG DIST (CONF FULL) BY
FUEL	T TANK UNUSABLE If CG > limit shown on 3.02.28 p 14		NORM (1)	10	1.2
HYD	G SYS LO PR		NORM (1)	–	1.1
	B SYS LO PR		NORM (1)	–	NEGLIGIBLE (2)
	Y SYS LO PR		NORM (1)	–	NEGLIGIBLE
	G +B	SLATS < 1	2	30	2.4
		1 ≤ SLATS < 2	2	25	2.3
		SLATS ≥ 2	3	15	1.9
	G +Y	0 ≤ FLAPS < 1+F	2	30	1.7
		1+F ≤ FLAPS < 2	2	15	1.4
		2 ≤ FLAPS < 3	2	20	1.5
		FLAPS = 3	3	15	1.4
		FLAPS > 3	FULL	15	1.4
	B +Y		2	20	1.3
A.ICE	If ice accretion : WING LO PR/WING VLVE NOT OPEN/WAI SYS FAULT		NORM (1)	10	1.2
BRK	ANTI SKID		NORM (1)	–	1.4
	NORM BRK (ALTN with ANTI SKID)		NORM (1)	–	1.1
	RELEASE FAULT		NORM (1)	–	1.4
NAV	TRIPLE ADR FAULT		3	10	1.2*
	DOUBLE ADR FAULT/ IR FAULT		3	–	1.1*
BLEED	If ice accretion : WING LEAK/ENG BLEED LEAK/ABNORM BLEED CONFIG/BLEED LO TEMP		NORM (1)	10	1.2

(1) If CONF 3 is used when “NORM” is indicated in the table, multiply the resulting landing distance by an additional factor of 1.1.

(2) If the green hydraulic system is supplied by the RAT, the landing
R distance coefficient to be applied is 1.4 on dry runway, (A/SKID lost).

A330	FAILURE	FLAPS LEVER POSITION FOR LDG	△ VREF APPR SPD INCREMENT	MULTIPLY DRY RWY LDG DIST (CONF FULL) BY
ENG	SHUTDOWN	3	–	1.1
	THR LEVER FAULT	3	–	1.1*
	REV UNLOCKED (WITH BUFFET)	2	25	1.4*
	REV UNLOCKED (WITHOUT BUFFET)	3	–	1.1*

USE OF THE TABLE

- *The APPR SPD INCREMENT accounts for corrections due to the failure, and to the required landing configuration. These values are rounded off to cover the entire weight range. LDG DIST factors have to be applied to the actual LANDING DISTANCE WITHOUT AUTOBRAKE - CONFIGURATION FULL (4.03).*
- *For a single failure :*
  - *Determine the required LDG CONF to be selected.*
  - *Determine the APPR SPD INCREMENT.*
  - *VAPP = VREF + APPR SPD INCREMENT + WIND CORRECTION (refer QRH page 2.40).*
  - *Determine the LDG DIST factor.*
- *For multiple failures :*
  - *Only SINGLE or PRIMARY failures should be combined. In case of a PRIMARY failure, the effect of the related SECONDARY failures are already taken into account in △ VREF and LDG DIST factor computation.*
  - *Use the lowest LDG CONF.*
  - *Use the highest APPR SPD INCREMENT to compute VAPP.*
  - *LDG DIST factors : Multiply the landing distance factors together, except when all failures are indicated by an asterisk (*). In this case, the highest factor has to be taken.*
  - *Examples*

FLAPS FAULT (2 ≤ F < 3)	LDG CONF 2	△ VREF = 10 KT	LDG DIST × 1.2*
NORM BRK FAULT	NORM CONF	△ VREF = 0	LDG DIST × 1.1
TOTAL	LDG CONF 2	△ VREF = 10 KT	LDG DIST × 1.32

VREF = 131 KT → VAPP = 131 + 10 + WIND (10 KT MAX)
= 141 KT + WIND (10 KT MAX)

R

STAB CTL FAULT	LDG CONF 2	△ VREF = 20 KT	LDG DIST × 1.3*
FLAPS FAULT (2 ≤ F < 3)	LDG CONF 2	△ VREF = 10KT	LDG DIST × 1.2*
TOTAL	LDG CONF 2	△ VREF = 20 KT	LDG DIST × 1.3

VREF = 139 KT → VAPP = 139 + 20 + 0 (no wind correction) = 159 KT

WINDSHEAR

A red flag "WINDSHEAR" message is displayed on each PFD, associated with an aural "WINDSHEAR" message repeated three times.

If windshear is detected, either by the system or by pilot observation, apply the following recovery technique :

■ **At takeoff :**

● **If before V1**

The takeoff should only be rejected, if significant airspeed variations occur below the indicated V1, and the pilot decides that there is sufficient runway remaining to stop the airplane.

● **If after V1**

– THR LEVERS . . . . TOGA
– REACHING VR . . . . ROTATE
– SRS ORDERS . . . . FOLLOW

■ **Airborne - initial climb or landing :**

– THR LEVERS AT TOGA . . . . SET OR CONFIRM
– AP (if engaged) . . . . KEEP
– SRS ORDERS . . . . FOLLOW

This includes use of full backstick, if demanded.

Note : 1. Autopilot will disengage, when α greater than α prot.
2. If FD is unavailable, use a initial pitch attitude up to 12.5 degrees. If necessary, to minimize the loss of height, increase this pitch attitude.

– DO NOT CHANGE CONFIGURATION (SLATS/FLAPS, GEAR) UNTIL OUT OF SHEAR.
– CLOSELY MONITOR FLIGHT PATH AND SPEED.
– RECOVER SMOOTHLY TO NORMAL CLIMB OUT OF SHEAR.

WINDSHEAR AHEAD

The "W/S AHEAD" message is displayed on each PFD. The color of the message depends on the severity and location of the windshear.

W/S AHEAD red

■ **Takeoff :**

Associated with a synthetic aural voice : "WINDSHEAR AHEAD, WINDSHEAR AHEAD".

● **Before takeoff :**
- Delay takeoff, or select the most favorable runway.

● **During takeoff run :**
- Reject takeoff.

Note : The predictive windshear alerts are inhibited above 100 knots, until 50 feet.

● **When airborne :**
- THR LEVERS . . . . TOGA

As usual, the slat/flap configuration can be changed, provided the windshear is not entered.
- SRS ORDERS . . . . FOLLOW

Note : If engaged, the autopilot disengages when α greater than α prot.

■ **Landing :**

Associated with a synthetic aural voice : "GO AROUND, WINDSHEAR AHEAD".

Note : If a positive verification is made that no hazard exists, the warning may be considered cautionary.

- THR LEVERS . . . . TOGA
- ANNOUNCE . . . . "GO AROUND-FLAPS"
- FLAPS . . . . RETRACT ONE STEP
- L/G UP . . . . SELECT

This includes use of full backstick, if demanded.

Note : If engaged, the autopilot disengages when α greater than α prot.

W/S AHEAD amber

Apply precautionary measures, as indicated in the SUPPLEMENTARY TECHNIQUES (3.04.91).

VOLCANIC ASH ENCOUNTER

Accomplish the following, while making a 180 degree turn :

- ATC . . . . NOTIFY
- A/THR . . . . OFF

  This prevents autothrust from generating thrust variations.
- THRUST (conditions permitting) . . . . DECREASE

  To reduce ash ingestion.

  If altitude permits, reduce thrust to idle : This maximizes the engine surge margin, and lowers engine turbine temperature.
- CREW OXYGEN MASKS . . . . ON/100 %
- CABIN CREW . . . . NOTIFY
- PASSENGER OXYGEN . . . . AS RQRD

  Depending on contamination.
- ENG ANTI ICE . . . . ON
- WING ANTI ICE . . . . ON
- PACK FLOW . . . . HI
- APU . . . . START

  If possible, start the APU and have it ready for an assisted engine relight in the event of an engine flame-out. Refer to APU Limitations (3.01.49).
- ENGINE PARAMETERS . . . . MONITOR

  Monitor EGT, in particular. If the EGT exceeds limits, it may become necessary to consider a precautionary engine shutdown and engine restart in flight.
- AIRSPEED INDICATIONS . . . . MONITOR

  If airspeed is unreliable or lost, use the UNRELIABLE SPEED INDICATION procedure.

  Note : If both engines flame out and speed indications are lost, use the ALL ENGINE FLAME OUT procedure to obtain the required pitch attitude for the optimum relight speed. In case of an engine failure, switch off the wing anti-ice before engine restart.

GENERAL

R A successful outcome of an emergency situation depends, first of all, upon each crew
R member's perfect knowledge and execution of the duties assigned to him.
The captain should frequently check that all crew members know exactly their assigned positions and their specific duties, as well as the duties of the other crew members, in case of an abnormal or an emergency condition.
R Since it is not possible to cover all the situations which may occur, the captain will be
R responsible for adapting the following instructions, to obtain the best coordination of the
R emergency operation. Should it be physically impossible for the captain to carry out his
R duties, another crew member will substitute for him according to the chain of command.
R The procedures in this manual are AIRBUS INDUSTRIE procedures and should be
R considered to be a reference.

R **COCKPIT-ASSIGNED DUTIES FOR EVACUATION**

- If it is NOT POSSIBLE to reach the passenger cabin :
  The cockpit crew should evacuate the aircraft via the cockpit clearview windows, by using the escape ropes.
  On ground, each crewmember must help passengers, and direct them away from the aircraft.
- If it is POSSIBLE to reach the passenger cabin :

CAPT	– Is the last person to leave the cockpit : Proceeds to the cabin, and helps with passenger evacuation, as necessary. – Is the last person to leave the aircraft : Checks that all persons have evacuated the aircraft. – Evacuates the aircraft via the rear door, or any other available exit, if he/she cannot reach the rear door. – On ground, he/she takes command of operations until rescue units arrive.
F/O	– Proceeds to the cabin, and takes the emergency equipment. – Evacuates the aircraft, using any available exit. – Helps passengers on ground, and directs them away from the aircraft.

CABIN CREW-ASSIGNED AREAS FOR EVACUATION

R

CABIN CREW DESIGNATION	ASSIGNED JUMPSEAT AND DOOR	ASSIGNED AREA
1 PURSER	DOOR 1 LH	FWD - ALL CABIN
1 CABIN CREW	DOOR 1 RH	FWD
2 CABIN CREWS	DOOR 2 RH/LH	MID/FWD
2 CABIN CREWS	DOOR 3 RH/LH	MID/AFT
2 CABIN CREWS	DOOR 4 RH/LH	AFT/MID

R Note : *These procedures are established for the minimum required number of 8 cabin*
R *crews.*

COMMUNICATIONS

R

1. EMERGENCY CALL			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– Press "EMER" CALL pushbutton on the CALLS panel, or – Passenger Address (PA) System : "PURSER TO COCKPIT PLEASE! "	The Purser must immediately go to the cockpit.
CABIN	COCKPIT	– Interphone : "PRIO CAPT"	Any cabin crewmember can make such a call. The cockpit crew must reply.

R

2. EMERGENCY ALERT			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "ATTENTION CREW! AT STATIONS!"	The cockpit crew makes a short and precise announcement to warn that an emergency evacuation may soon be required. Cabin crews must proceed to their emergency stations, and fasten their seatbelts.

R

3. NOTIFICATION TO PASSENGERS			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– "NO SMOKING/SEAT BELT" signs ON. – PA System	For psychological reasons, the cockpit crew should be the first to inform of an intended emergency landing.
PURSER	CABIN	– CABIN LIGHTS 100 % – PA System	Purser informs passengers that they have to pay special attention to these warnings : – "FINISH PREPARATION" – "BRACE FOR IMPACT" – "PASSENGER EVACUATE"

R

4. FINISH PREPARATION			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– Passenger Address (PA) System : "FINISH PREPARATION!"	The cockpit crew gives this order a short time before an emergency landing.

R

5. BRACE FOR IMPACT			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "BRACE FOR IMPACT!"	The cockpit crew gives this order no later than 1 minute before impact.

R

6. INITIATE EVACUATION (RESTRICTED EXITS)			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "PASSENGERS EVACUATE!" – Activate EVAC signals.	The cockpit crew orders an immediate evacuation, and the cabin crew directs passengers to all available exits.
CABIN	COCKPIT AND CABIN	– EVAC SIGNAL SYSTEM on FWD ATTND panel (FAP) – PA System or megaphone	Used by the cabin crew, if there is no signal or order from the cockpit, and if it is unmistakably clear that the aircraft must be evacuated.
CABIN	CABIN	– Verbal	The cabin crew stands up and shouts : – "SEATBELTS OFF!" – "LEAVE EVERYTHING!" – "GET OUT!" – "COME THIS WAY!"

R

7. EVACUATION NOT REQUIRED			
FROM	TO	COMMUNICATION METHOD(S)	REMARKS
COCKPIT	CABIN	– PA System : "CABIN CREW and PASSENGERS REMAIN SEATED!"	When the Captain decides that an evacuation is not required, the cockpit crew makes an immediate annoncement to this effect.

R **ON GROUND EVACUATION**

R **COCKPIT CREW PROCEDURES**

R – **The cockpit crew notifies the cabin crew of the nature of the emergency, and**
R **states intentions.**

R – **The cockpit crew uses the Passenger Address System to make an appropriate**
R **announcement, such as : "PASSENGERS EVACUATE", and presses the EVAC**
R **COMMAND pushbutton.**

R **CABIN CREW PROCEDURES**

R When the cabin receives the order to evacuate, each cabin crewmember must proceed as
R follows :

R – **STAND UP AND SHOUT . . . . "UNFASTEN SEATBELTS"**

R – **OUTSIDE CONDITIONS . . . . CHECK**

R ● **If outside conditions are safe :**

R – **DOOR IN ARMED POSITION . . . . OPEN FIRMLY**

R – **SHOUT . . . . "COME THIS WAY"**

R ● **If the door does not open automatically :**

R – **DOOR . . . . PUSH AND OPEN MANUALLY**

R – **SLIDE (or SLIDERAFT) DEPLOYMENT . . . . CHECK FULL DEPLOYMENT**
R It takes approximately four seconds for the slide (or slideraft) to deploy.

R ● **If the slide (or slideraft) does not automatically inflate :**

R – **RED, MANUAL INFLATION HANDLE . . . . PULL**
R The red, manual inflation handle is located on the right-hand side of the slide (or
R slideraft) girt extension.

R – **ORDER . . . . "PASSENGERS EVACUATE"**

R – **PASSENGER EVACUATION . . . . EXPEDITE**

R ● **If the slide (or slideraft) becomes unserviceable :**

R – **PASSENGER EVACUATION . . . . STOP**

R – **PASSENGERS TO ANOTHER USABLE EXIT . . . . REDIRECT**

R – **TOTAL ZONE EVACUATION . . . . CHECK**

R – **CABIN CREW . . . . EVACUATE**

R – **PASSENGERS AWAY FROM THE AIRCRAFT . . . . DIRECT**

R ● **If outside conditions are unsafe :**

R – **EXIT DOOR . . . . BLOCK**

R – **PASSENGERS TO NEAREST USABLE EXIT . . . . REDIRECT**

EVACUATION ON WATER

CABIN CREW RESPONSIBLE FOR TYPE "A" DOORS

When the cabin receives the order to evacuate, each cabin crewmember must proceed as follows :

- **CHILDREN LIFEVESTS . . . . DISTRIBUTE**
- **STAND UP AND SHOUT . . "UNFASTEN SEATBELTS - PUT ON YOUR LIFEVEST"**
  Inflate the lifevest, only once outside the aircraft.
- **ORDER . . . . "REMOVE SHOES"**

● **If the Type A door is usable :**

- **DOOR IN ARMED POSITION . . . . OPEN**
- **SLIDERAFT . . . . DEPLOY**
- **RED, MANUAL INFLATION HANDLE . . . . PULL**
  Do not wait for automatic inflation of the slideraft.

■ **If the water level is close to the door sill :**
The slideraft inflates on the water.

- **SLIDERAFT . . . . LEAVE ATTACHED TO CABIN FLOOR**
- **PASSENGER LIFEVESTS . . . . INFLATE WHEN BOARDING SLIDERAFT**
- **PASSENGERS . . . . BOARD SLIDERAFT**
- **TOTAL ZONE EVACUATION . . . . CHECK**
- **LAST CREWMEMBER . . . . BOARD SLIDERAFT**
- **SLIDERAFT . . . . SEPARATE FROM DOOR SILL**
  The last crewmember must separate the slideraft from the door sill, and board with all necessary safety equipment.
- **MOORING LINE . . . . CUT**
- **SURVIVAL KIT . . . . RETRIEVE**
  The survival kit is attached to the slideraft via a lanyard.

■ **If the water level is too far away from the door sill :**

– **SLIDERAFT . . . . DISCONNECT FROM DOOR SILL**
The slideraft remains tied to the aircraft by a 6–meter (20 feet) mooring line.

– **MOORING LINE . . . . HOLD**
To keep the slideraft close to the exit, hold the mooring line.

– **PASSENGER LIFEVESTS . . . . INFLATE WHEN BOARDING SLIDERAFT**

– **PASSENGERS . . . . BOARD SLIDERAFT**

– **TOTAL ZONE EVACUATION . . . . CHECK**

– **LAST CREWMEMBER . . . . BOARD SLIDERAFT**
The last crewmember must board with all the necessary safety equipment.

– **MOORING LINE . . . . CUT**

– **SURVIVAL KIT . . . . RETRIEVE**
The survival kit is attached to the slideraft via a lanyard.

CABIN CREW RESPONSIBLE FOR EMERGENCY EXIT TYPE "I" DOORS

When the cabin receives the order to evacuate, each cabin crewmember must proceed as follows :

– **CHILDREN LIFEVESTS . . . . DISTRIBUTE**

– **STAND UP AND SHOUT . . "UNFASTEN SEATBELTS - PUT ON YOUR LIFEVEST"**

– **ORDER . . . . "REMOVE SHOES"**
Evacuation is usually done through the passenger doors. However, if one of the passenger doors is not usable, Exit 3 door (Type 1) may be used for evacuation, and the slide may be used as a flotation device.

03.00 CONTENTS
03.01 GENERAL INFORMATION
03.02 FLIGHT PREPARATION
03.03 SAFETY EXTERIOR INSPECTION
03.04 PRELIMINARY COCKPIT PREPARATION
03.05 EXTERIOR INSPECTION
03.06 COCKPIT PREPARATION
03.07 BEFORE PUSHBACK OR START
03.08 ENGINE START
03.09 AFTER START
03.10 TAXI
03.11 BEFORE TAKEOFF
03.12 TAKEOFF
03.13 AFTER TAKEOFF
03.14 CLIMB
03.15 CRUISE
03.16 DESCENT PREPARATION
03.17 DESCENT
03.18 ILS APPROACH
03.19 NON PRECISION APPROACH
03.20 VISUAL APPROACH
03.21 PRECISION APPROACH
03.22 LANDING
03.23 GO AROUND
03.24 AFTER LANDING
03.25 PARKING
03.26 SECURING THE AIRCRAFT
R 03.90 STANDARD CALLS

FOREWORD

R The procedures contained in this Chapter are recommended by Airbus, and are consistent with the other Chapters of this manual.
The Authorities do not certificate Standard Operating Procedures. The manufacturer presents them herein as the best way to proceed, from a technical and operational standpoint. They are continually updated and the revisions take into account Operator input, as well as manufacturer experience.
In addition, Operators may amend them, as needed. However, the manufacturer recommends that Operators using the FCOM as onboard operational manual submit suggested changes to expedite publication, and maintain consistency of the manual.
The Operator should note that they may rewrite this Chapter, at their own responsibility ; this could, however, make it difficult to update the manual and keep it consistent with the other Chapters.

PRELIMINARY

The following sections contain expanded information on normal procedures.
Standard Operating Procedures consist of inspections, preparations, and normal procedures. All items of a given procedure are listed in a sequence that follows a standardized scan of the cockpit panels, unless that sequence goes against the action priority logic, to ensure that all actions are performed in the most efficient way.
Standard Operating Procedures are divided into flight phases, and are performed by memory.
These procedures assume that all systems are operating normally, and that all automatic functions are used normally.
Some normal procedures, that are non-routine will be found in the SUPPLEMENTARY TECHNIQUES Chapter (3.04), and in the SPECIAL OPERATIONS Chapter (2.04).

NORMAL CHECKLIST

After completing a given procedure, the flight crew uses the related normal checklist to ascertain that they have checked the safety points.
The crewmember that reads the checklist should announce completion of the checklist (Example : "LANDING CHECKLIST COMPLETED").
R The normal checklist, developed by Airbus, takes advantage of the ECAM system and only includes the items that may directly impact safety and efficiency if done incorrectly.
All normal checklists are requested by the PF, and read by the PNF. They are of the challenge/response type. The responding crewmember only responds to the challenge after having checked the configuration. If the configuration does not agree with the checklist response, he must take corrective action before answering.

If corrective action is not possible, the pilot modifies the response to reflect the actual situation (specific answer). Whenever necessary, the other crewmember crosschecks the validity of the response. The challenger waits for the response, before proceeding any further.
For the checklist items identified "AS RQRD", the response states the actual condition or configuration of the system (for example "ANTI ICE".............."ON").

Note : *Normal checklists are not "TO DO" lists. The flight crew should have performed the actions, or checks, prior to going through the checklist.*
Obviously, the flight crew must take corrective action on any item that is not in the proper condition, when it reads the list.

COMMUNICATION

R · Cross-cockpit communications :
Cross-cockpit communication is VITAL for any two-pilot crew. Whenever a crewmember makes any adjustments or changes to any information or equipment on the flight deck, he must advise the other crewmember and obtain an acknowledgement. This includes such items as : FMGS alterations, changes in speed or Mach, the tuning of navigation aids, flight plan modifications, and the selection of such systems as anti-ice and pack low flow.
The flight crew must use headsets from engine startup to top of climb, and from top of descent until the aircraft is parked.
R · Sterile cockpit rule :
R Below 10 000 feet, any non-essential conversation within the cockpit and between the
R cabin and cockpit crews should be avoided. Adherence to this policy facilitates effective
R crew communication, as well as communication of emergency or safety-related
R information by cabin crew.

USE OF THE FLIGHT MANAGEMENT AND GUIDANCE SYSTEM

The FMGC has 3 functions :
– The two FG (Flight Guidance) functions :
  · Autopilot (AP) and Flight Director (FD)
  · Autothrust (A/THR)
– The FM (Flight Management) function.

AUTOPILOT AND FLIGHT DIRECTOR

The design objective of the autopilot and flight dorector is to provide assistance to the crew throughout the flight :
– By freeing up the Pilot Flying from routine handling tasks, and thus providing time and resources to assess the overall operational situation.
– By providing the Pilot Flying with adequate attitude or flight path orders, with the flight director symbol on the Primary Flight Display, so as to facilitate accurate handling of the aircraft.

The AP/FD guides the aircraft along the intended flight path, or at the intended speed, according to the guidance modes engaged by the pilot on the Flight Control Unit (FCU) (Example : NAV-HDG-V/S...).
The FCU is the short-term interface between the pilot and the FMGC, used to select guidance targets and arm/engage guidance modes.
There are 2 types of modes and associated targets :
- Managed modes and targets : The aircraft is guided along the FMS lateral and vertical flight plan and speed profile. These modes and targets are armed or engaged by pressing the FCU knobs.
- Selected modes and targets : The aircraft is guided by selected targets according to the modes selected on the FCU. These modes and targets are armed or engaged by the pilot by turning and pulling the FCU knobs.

The PF's task is to set the desired modes and targets to fly the aircraft where he wants to go.
- If the autopilot is used, the PF may select the modes on the FCU.
- R If the autopilot is not used. The PF asks the PNF to select the intended modes and targets on the FCU.

The armed and engaged modes are indicated on the Flight Mode Annunciator (FMA) on top of the PFD ; the targets (SPD, ALT, HDG...) are indicated on the associated scales on the PFD.
- The crew must check the FCU-selected targets on the PFD.
- The crew must monitor the engaged/armed modes on the FMA.

If the autopilot and/or flight director do not guide the aircraft where the crew is expecting:
- The PF should disengage the autopilot using the instinctive disconnect pushbutton on the side stick, or both pilots should delete the flight director symbols from the PFDs with the flight director pushbuttons located on the EFIS control panel, and fly the aircraft manually.
- The PF should not disengage the autopilot by sidestick override except if instinctive reaction.

The autopilot may be used from after takeoff down to a late stage of the approach (including autoland when permitted).
The autopilot may be used in most failure case, when available :
- In case of engine failure, without any restriction including autoland on CATII/CATIII ILS.
- In case of abnormal configuration, down to 500 feet AGL in all modes.

When the autopilot is engaged, there is no backdriven feedback system to the sidestick since this is no longer necessary with fly-by-wire controls.
When the PF handflies the aircraft using the flight director, he must obey the flight director orders ; in other words, the crossbars must be centered, or the flight path vector must be on the flight path director symbol so as to fly according to the selected modes and targets.
- If the PF does not wish to fly the flight director orders, both pilots must delete the flight director symbols from the PFDs.
- When flying a visual approach, the flight directors should be deselected.

AUTOTHRUST (A/THR)

The A/THR's design objective is to provide assistance to the crew for thrust management throughout the flight.
The A/THR may be engaged in one of the following modes, which automatically depend on the AP/FD vertical modes :
- THRUST mode : The A/THR maintains a fixed thrust level (e.g. THR CLB or THR IDLE), when the AP/FD guides the aircraft in climb or descent at a constant speed (e.g. CLB or DES modes)
- SPEED/MACH mode : The A/THR varies the thrust, so as to maintain a target speed, when the AP/FD guides the aircraft on a given trajectory (e.g. V/S, ALT, G/S modes).

When the A/THR is active, the thrust levers are set to detents (e.g. MCT, CLB) ; they remain in this fixed position, while the A/THR varies or sets the thrust according to the active mode.
When the A/THR is active, the thrust lever position defines the maximum thrust available for the A/THR.
The crew must monitor the A/THR to ensure correct operation :
- On the PFD, by checking the active mode on the FMA, the current speed versus the target speed and, most importantly, the speed trend vector on the speed scale.
- On the ECAM, by checking the thrust command symbols on the engine thrust indication (N1 or EPR).

In case the PF is not satisfied with the A/THR operation, he must disengage it using one of the instinctive disconnect pushbuttons located on the thrust levers.
He can then command the thrust manually, which is totally conventional.
R The A/THR may be used from thrust reduction, after takeoff, down to flare, at landing.
The A/THR may be used in most failure cases, when available, in case of :
- One engine failure, without any restrictions
- Abnormal configuration, with selected target speed for the approach.

FLIGHT MANAGEMENT SYSTEM (FMS)

The FMS is designed to provide assistance to the crew for :
- Navigation,
- Flight planning,
- Aircraft performance (optimum speeds/altitudes),
- Predictions.

The FMS is an important long-term planning and management tool, linked to the AP/FD.
When the AP/FD is engaged in managed modes, the aircraft is guided along the FMS flight plan, using the FMS target speeds.
The Multipurpose Control and Display Unit (MCDU) is used to insert and retrieve data to/from the FMS.
The FMS MCDU is a major interface between the pilots and the FMS. However, the various FMS entries required at successive flight phases should not distract the crew from the general flight conduct and duties.

The prime concern for the flight crew should be :
– Is the aircraft flying as expected NOW ?
– What is the aircraft expected to fly NEXT ?
If any doubt is raised about the aircraft current trajectory, or proposed target speed..., the PF must immediately select the appropriate modes and targets on the FCU (which automatically disengages the managed modes).
Subsequently and if time permits, the PNF will analyze and correct whatever might have gone wrong on the MCDU.

GENERAL RULES FOR GOOD USE OF THE FMGS

– Monitor the AP/FD/ATHR modes and engagement status on the FMA
– Any FMA modification must be announced.
– Monitor the result of any target selection performed on the FCU, on the related scales of the PFD (e.g. SPD target, on SPD scale)
– Monitor the AP/FD/ATHR resulting guidance, on the basic flight instrument scales of the PFD (HDG, SPD, ALT, attitude...)
– If the PF is not satisfied with the guidance he must :
. REVERT TO BASICS
. FLY THE AIRCRAFT where he wants to go.

The FMGS description and procedures are provided in the FCOM VOL 4 called FMGS PILOT'S GUIDE.

TAKING OVER THE FLIGHT CONTROLS

Because of the nature of "fly by wire" and "sidestick" system, the PNF should not make control inputs to correct the PF's handling of the aircraft.
If a take-over becomes necessary during flight, the PNF must call clearly "I have control", and press the sidestick priority pushbutton keeping it pressed until the transfer of control is clearly established.

TECHNICAL CONDITION OF THE AIRCRAFT

— The crew will verify the technical state of the aircraft (deferred defect list), with regard to airworthiness, acceptability of malfunctions (MEL), and influence on the flight plan.

WEATHER BRIEFING

— The crew will get a weather briefing.
— The briefing should include :
· Actual and expected weather conditions, including runway conditions for takeoff and climb-out.
· Significant weather enroute, including winds and temperatures.
· Terminal forecasts for destination and alternate airports.
· Actual weather for destination and alternates, for short range flights and recent past weather, if available.
· Survey of the meteorological conditions at airports along the planned route.

Weather can affect the choice of routing (for example, influence which route is quickest) and the choice of flight level. The flight crew must also consider the possibility of runways being contaminated at the departure and destination airfields. The flight crew must also verify ISA deviations and enroute icing conditions, and must consider the possibility of holding due to weather at the destination.

NOTAMS

— The flight crew must examine NOTAMs for changes to routings, unserviceable navaids, availability of runways and approach aids etc, all of which may affect the final fuel requirement.

FLIGHT PLAN and OPERATIONAL REQUIREMENTS

— The crew will check the company flight plan for routing, altitudes and flight time.
— The Captain will check the ATC flight plan and ensure that it :
R · Is filled in an filed, in accordance with the prescribed procedures,
· Agrees with the fuel flight plan routing.
— The crew will check the estimated load figures, and will calculate the maximum allowable takeoff and landing weights.

OPTIMUM FLIGHT LEVEL

The flight crew should choose a flight level that is as close to the optimum as possible. To obtain the optimum flight level, use the chart in the QRH or in the FCOM (Refer to FCOM 2.05.20).

R As a general rule, an altitude that is 4000 feet below the optimum produces a significant
R penalty (approximately 5 % of fuel). Flight 8000 feet below the optimum altitude produces
R a penalty of more than 10 % against trip fuel. (The usual contingency allowance is 5 %).
R If flight above optimum (up to ceiling) is intended. The increase in consumption may reach
R 3%.

FUEL REQUIREMENTS

COMPUTERIZED FLIGHT PLAN CHECK

In most cases the flight crew uses a computer-derived flight plan to obtain the correct fuel requirements. Although these computerized requirements are normally accurate, the flight crew must check them for gross errors.

The easiest way to do this is to use the "Quick Determination of F-PLN" tables in FCOM 2.05.40. Although the aircraft will fly at ECON MACH that is based on the cost index, the
R 0.82 Mach table is accurate enough to permit the crew to check for gross error.

Ensure that both the captain and the first officer have verified that the fuel calculations and required fuel on board are correct and that the figure complies with the applicable regulations.

FUEL TRANSPORTATION

The flight crew must check the policy covering the "tankering" of fuel on sectors where there is a favourable fuel price differential or operational requirement.

Remember that carrying unnecessary extra fuel increases the fuel consumption for that sector and therefore reduces the economy of the operation (lower flex temperature, more tire and brake wear, more time in climb phase, lower optimum flight level etc).

SAFETY EXTERIOR INSPECTION

Items marked by (*) are the only steps to be completed during a transit stop.
This inspection ensures that the aircraft and its surroundings are safe for operations. On arriving at the aircraft, check for obstructions in the vicinity, engineering activity, refueling etc.

*– **WHEEL CHOCKS . . . . CHECK IN PLACE**

*– **LANDING GEAR DOORS . . . . CHECK POSITION**

WARNING
Do not pressurize the green hydraulic system without clearance from ground personnel if any gear door is open.

*– **APU AREA . . . . CHECK**
Observe that the APU inlet and outlet are clear.

PRELIMINARY COCKPIT PREPARATION

Items marked by (*) are the only steps to be completed during a transit stop.
The following procedure, performed by the PNF, ensures that all required safety checks are performed before the application of electrical power to avoid inadvertent operation of systems and danger to the aircraft and personnel.
Included is APU starting and the establishment of electrical and pneumatic power.

ENG

– **ENG MASTER 1 and 2 . . . . OFF**

– **ENG START selector . . . . NORM**

L/G

– **L/G lever . . . . Check DOWN position**

WIPERS

– **WIPERS . . . . OFF**

ELEC

■ **If the aircraft has not been electrically supplied for 6 hours or more, perform the following check :**

– **BAT 1 and 2 and APU BAT . . . . CHECK OFF**

– **BAT 1 and 2 and APU BAT VOLTAGE . . . . CHECK ABOVE 25.5 V**
Battery voltage above 25.5 V ensures a charge above 50 %.
R After, the check, the selector should remain on APU position to avoid discharge of
R BAT 1 or 2.

● **If battery voltage is below 25.5 V :**
a charging cycle of about 20 minutes is required.

– **BAT 1 and 2 and APU BAT . . . . AUTO**

– **EXT PWR . . . . ON**
Check on ECAM ELEC DC page, battery contactors closed and batteries charging.

● **After 20 minutes :**

– **BAT 1 + 2 and APU BAT . . . . OFF**

– **BAT 1 and 2 and APU BAT VOLTAGE . . . . CHECK ABOVE 25.5 V :**
After the check, the selector should remain on APU position.

● **If battery voltage is above 25.5 V :**

– **BAT 1 and 2 and APU BAT . . . . AUTO**

Note : The ground horn will be triggered, associated with the ventilation EXTRACT FAULT illumination and ECAM warning after 5 minutes when the aircraft is supplied with batteries only.

■ **If the aircraft has been electrically supplied during the last 6 hours**

– **BAT 1 and 2 and APU BAT . . . . AUTO**

Note : In case of APU start on battery only, perform the following check :
– BAT 1 and 2 and APU BAT . . . . AUTO
– BAT 1 and 2 and APU BAT . . . . CHECK ABOVE 23.5 V
If one battery voltage is lower than 23.5 V, there is a risk of aborted APU start. A charging cycle of the battery is required.

– **EXT PWR (when AVAIL light is on) . . . . ON**
AVAIL light goes out.

Note : 1. When only one electrical power is available, it is recommended to connect EXT PWR A since :
– EXT PWR B does not permit GND/FLT buses to be supplied directly, without energizing the total aircraft network.
– EXT PWR B cannot be used simultaneously, with APU GEN.
2. If AVAIL light does not come on (external power connected) or ON/AVAIL lights go out during external power operation, the GPCU protection has tripped. Reset using the EXT PWR pushbutton.

HYD

WARNING
Do not pressurize hydraulic systems without clearance from ground crew.

APU FIRE

– **APU FIRE pushbutton . . . . IN and GUARDED**

– **AGENT light . . . . OUT**

If the APU is already running, ensure that the following check has already been completed. If not, perform it.

– **APU FIRE TEST pushbutton . . . . PRESS**

Check :

· APU FIRE warning on ECAM + CRC + MASTER WARN light.
· APU FIRE pushbutton lighted red.
· SQUIB and DISCH lights on.

APU START

– **APU MASTER switch . . . . ON**

ON light comes on. APU page appears on ECAM.

Note : If only batteries are supplying, press the APU pushbutton on the ECAM control panel during the start sequence (to permit the ECAM upper display to display the APU page).

– **APU START . . . . ON**

FLAP OPEN indication appears on the ECAM APU page. On the ECAM APU page, N and EGT rise. When N = 95 % :

. On ECAM APU page, AVAIL indication appears.
. On APU panel : START ON light goes out.
AVAIL light comes on.

10 seconds later : ECAM DOOR/OXY page replaces the ECAM APU page.

R *Note : A bleed pressure up to 12 psi can be observed on the ECAM APU and BLEED*
R *pages in cold weather conditions (below approx. 10°C), when the APU bleed*
R *valve is indicated closed.*

ELEC

*– **EXT PWR (if ON) . . . . AS RQRD**

External power may be kept on to reduce APU load, especially in hot conditions.

COCKPIT LIGHTS

*– **COCKPIT LIGHTS . . . . AS RQRD**
· Set STBY COMPASS, DOME, ANN LT switches as required.
· Set FLOOD LT and INTEG LT as required.

PARKING BRAKE

*– **PARKING BRAKE . . . . ON**
The parking brake must be on during the exterior inspection to allow the flight crew to check brake wear indicators.

*– **ACCU PRESS & BRAKES PRESS indicators . . . . CHECK**
– Check for normal indications.
– The ACCU PRESS indication must be in the green band. If required use the electric pump on blue hydraulic system to recharge the brake accumulators.

> WARNING
> Blue hydraulic system is pressurized from blue electric pump. Get ground crew clearance before using the electric pump.

ALTERNATE BRAKING SYSTEM

Note : *The purpose of this check is to verify, before the first flight of the day, the efficiency of the alternate braking system (absence of "spongy pedals").*

– **CHOCKS . . . . CHECK IN PLACE**

– **PARKING BRAKE . . . . OFF**

– **BRAKE PEDALS . . . . PRESS**
Apply maximum pressure on both pedals.

– **BRAKE PRESSURE (on BRAKE press indicator). . . . . CHECK**
Pressure must build up without delay symmetrically on left and right sides for the same application simultaneously applied on left and right pedals. The maximum pressure (2538 psi $\pm$ 145 psi) must be reached with full pedal deflection.

– **BRAKE PEDALS . . . . RELEASE**

– **PARKING BRAKE . . . . ON**
The parking brake must be on during the exterior inspection to allow the flight crew to check brake wear indicators.

F/CTL

– **FLAPS . . . . CHECK POSITION**
Check the upper ECAM display to confirm that the FLAPS position agrees with the handle position.

R *– **SPEEDBRAKE lever . . . . CHECK RETRACTED and DISARMED**

WARNING
If flight control surface positions do not agree with the control handle positions, check with the maintenance crew before applying hydraulic power.

PROBE/WINDOW HEAT

– **PROBE/WINDOW HEAT . . . . CHECK AUTO**

AIR COND

– **APU BLEED . . . . ON**
R Do not use APU BLEED, if ground personnel confirms that ground air unit is connected.
R Pilots should also check the ECAM BLEED page to determine whether an HP ground air
R unit is connected (pressure in the bleed system).

– **ALL WHITE LIGHTS . . . . OFF**

– **X BLEED . . . . AUTO**

– **Cabin and cockpit temperature selectors . . . . AS RQRD**
Full range temperature 24 ± 6°C (75 ± 11°F).
The temperature selection recommended for the cabin is 21.5° C (about 10 o'clock).

CARGO AIR COND ◁

– **SELECTORS . . . . AS RQRD**
Set temperature selectors, as required.
Set cargo cooling selector to OFF, unless livestock, plants, food, or dry ice are carried.

ELEC

– **Scan and check that there are no amber lights, except GEN FAULT lights.**

VENT

– **Check all lights off.**

* ECAM

*– **RECALL . . . . PRESS**
- Press the RECALL pushbutton for at least 3 seconds to recall all warnings that have been cleared or cancelled.
- If applicable, check warnings compatible with MEL, then CLEAR or CANCEL them. If any action is required, call maintenance personnel as soon as possible.

*– **DOOR . . . . PRESS**
If oxygen pressure is below 1500 psi (boxed in amber), check “MIN FLT CREW OXY CHART” to ascertain if it is sufficient for the scheduled flight (Refer to 3.01.35).

*– **HYD . . . . PRESS**
Check that the quantity indexes are in the normal filling range.

*– **ENG . . . . PRESS**
- Set the FADEC GND POWER pushbutton on the overhead panel to ON, to supply the FADEC.
- Check that the oil quantity is at, or above, 12 qt + estimated consumption
R (maximum average estimated consumption = 0.56 qt/h. Engine operation with
R engine oil consumption above 0.56 and up to 0.87 qt/h, is allowed, provided the
R engine oil consumption permits fulfillment of the mission.

EMERGENCY EQUIPMENT

– **Check the following equipment :**
- Life jackets stowed
- Axe stowed
- Smoke hoods ⩤ or portable oxygen equipment and full face masks ⩤ stowed and serviceable.
- Portable fire extinguisher lockwired and pressure in the green area
- Smoke goggles stowed (smoke hoods if installed)
- Oxygen masks stowed
- Flashlights stowed
- Escape ropes stowed.

RAIN REPELLENT (if installed and operative)

– **Pressure and quantity indicators . . . . CHECK**

> CAUTION
> Never use rain repellent to wash the windshield, and never use it on a dry windshield.

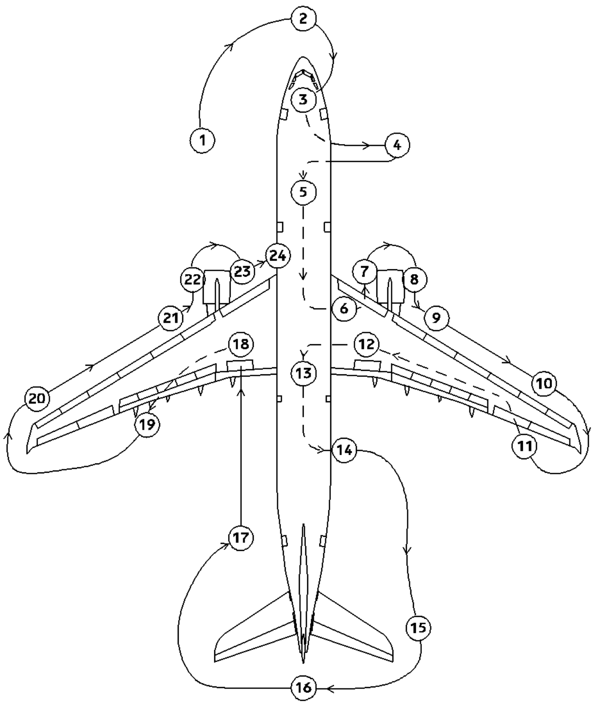
GENERAL

The exterior inspection ensures that the overall condition of the aircraft and its visible components and equipment are safe for the flight.
Complete inspection is normally performed by maintenance personnel or, in the absence of maintenance personnel, by a flight crewmember before each originating flight.
Items marked by (*) must be performed again by a flight crewmember before each flight.
The parking brake must be ON during the exterior inspection, to allow the flight crew to check break wear indicators.
- Check structure for impact damage.
- Check that there is no evident fuel, oil, or hydraulic leaks.

R - Check that all ground access doors are closed.

> **WARNING**
> If a landing gear door is open, contact the maintenance crew before applying hydraulic power.

EXTERIOR WALKAROUND



GFC5-03-0305-001-A001AA

(1) LH FWD FUSELAGE

- Outflow valve . . . . CONDITION
- Static ports . . . . CLEAR
*– AOA probe . . . . CONDITION
R – Wing and engine scan lights . . . . CONDITION

(2) NOSE SECTION

*– Pitot probes . . . . CONDITION
*– TAT probes . . . . CONDITION
*– Radome and latches . . . . CONDITION/LATCHED
- Avionics compartment door . . . . CLOSED
- Ice detection probes . . . . CONDITION
- Crew oxygen discharge indicator . . . . GREEN

(3) NOSE L/G

- Taxi and turn off lights . . . . CONDITION
*– Nosewheel chocks . . . . IN PLACE
*– Wheels and tires . . . . CONDITION
- Nose gear structure . . . . CONDITION
- Hydraulic lines and electrical wires . . . . CONDITION
- Wheel well . . . . CHECK
- Safety pin . . . . REMOVED
- Ground electrical power door (if not required) . . . . CLOSED
- Avionic ventilation overboard valve . . . . CONDITION

(4) RH FWD FUSELAGE

*– AOA probes . . . . CONDITION
- Pax oxygen discharge indicator ◁ . . . . GREEN
- Cargo loading operation access door . . . . CLOSED
- Cargo door operation access door . . . . CLOSED
- Cargo door . . . . CLOSED
- Static ports . . . . CLEAR
- Antennas . . . . CONDITION
*– Drain mast . . . . CONDITION
R – Wing and engine scan lights . . . . CONDITION

(5) LOWER CENTER FUSELAGE

— RAM air inlet flap . . . . CONDITION
— LP ground connection door . . . . CLOSED
— Anticollision light . . . . CHECK
— Pack air intakes and outlets . . . . CLEAR
— HP ground connection door . . . . CLOSED
— Ground hydraulic connection blue . . . . CLOSED
— Left L/G ground opening handle access door . . . . CLOSED
— Right L/G ground opening handle access door . . . . CLOSED
— Ground hydraulic connection yellow . . . . CLOSED

(6) RH CENTER WING

— Inner tank magnetic fuel levels R1 and R2 . . . . FLUSH
— Fuel water drain valves (inner tank) . . . . NO LEAK
— Water drain valve door . . . . CLOSED
— Landing light . . . . CONDITION
*— Slat 1 . . . . CONDITION

(7) ENG 2 LH SIDE

— IDG Oil fill access door . . . . CLOSED
*— Thrust reversers cowl door . . . . CLOSED
— Pressure relief doors . . . . CLOSED
*— Fan cowl door . . . . CLOSED/LATCHED
*— Drain masts . . . . CONDITION/NO LEAK
— Access to starter valve manual override . . . . CLOSED
— Access door to reversers latches . . . . CLOSED
*— Engine inlet and fan blades . . . . CHECK

(8) ENG 2 RH SIDE

— Engine Oil fill access door . . . . CLOSED
*— Fan cowl door . . . . CLOSED/LATCHED
*— Thrust reverser cowl door . . . . CLOSED
— Pressure relief door . . . . CLOSED
— Turbine exhaust . . . . CLEAR

(9) RH WING LEADING EDGE

R
- Refuel coupling door . . . . CLOSED
- Magnetic fuel levels R3, R4, R5 and R6 . . . . FLUSH
- Fuel water drain valve (outer tank) . . . . NO LEAK
- RAT doors . . . . CLOSED
- *– Slats 2, 3, 4 . . . . CONDITION

(10) RH WING TIP

- *– Fuel ventilation overpressure disc . . . . INTACT
- Wing fence . . . . CONDITION
- Magnetic fuel levels R7 and R8 . . . . FLUSH
- Fuel water drain valve (surge tank) . . . . NO LEAK
- Surge tank air inlet . . . . CLEAR
- *– Slats 5, 6, 7 . . . . CONDITION
- Navigation light . . . . CONDITION
- Antennas on top of fuselage . . . . CONDITION

(11) RH WING TRAILING EDGE

- Static dischargers . . . . CHECK
- *– Control surfaces . . . . CONDITION
- *– Flaps and fairings . . . . CONDITION

(12) RH LANDING GEAR

- *– Chocks . . . . REMOVED
- *– Wheels and tires . . . . CONDITION
- Brakes and brake wear indicators. . . . . CONDITION
- Hydraulic lines . . . . CHECK
- Landing gear structure . . . . CHECK
- Downlock springs . . . . CHECK
- Safety pin . . . . REMOVED

(13) CENTER FUSELAGE

- Refuel electric control panel . . . . CLOSED
- APU FUEL Drain . . . . CONDITION/NO LEAK
- Ground hydraulic connection green and reservoir filling . . . . . . CLOSED

(14) RH AFT FUSELAGE

— Antennas . . . . CONDITION
— Drain mast . . . . CONDITION
— Potable water aft drain panel . . . . CLOSED
— Cargo loading operation access door . . . . CLOSED
— Cargo door operation access door . . . . CLOSED
— Cargo door . . . . CLOSED
— Bulk door . . . . CLOSED
*— Potable water service panel . . . . CLOSED
*— Waste service panel . . . . CLOSED

(15) * TAIL

*— Stabilizer, elevator, fin and rudder . . . . CONDITION
— Surge tank air inlet . . . . CLEAR
— Fuel water drain valves (3) . . . . NO LEAK
— Static dischargers (elevator rudder) . . . . CHECK
*— Lower fuselage structure (tail impact on runway) . . . . CONDITION
— Flight records access door . . . . CLOSED
R *— Fuel ventilation overpressure disc . . . . INTACT

(16) APU

— Access door . . . . CLOSED
— Air intake . . . . CONDITION
— Exhaust . . . . CLEAR
— Navigation light . . . . CONDITION
— Fire extinguishing overpressure indication (red disc) . . . . IN PLACE

(17) LH AFT FUSELAGE

*— Stabilizer, elevator, fin and rudder . . . . CONDITION
— Outflow valve . . . . CONDITION

(18) LH L/G AND FUSELAGE

*— Chocks . . . . REMOVED
*— Wheels and tires . . . . CONDITION
— Brakes and brake wear indicator . . . . CONDITION
— Hydraulic lines . . . . CHECK
— L/G structure . . . . CHECK
— Downlock spring . . . . CHECK
— Safety pin . . . . REMOVED

(19) LH WING TRAILING EDGE

*– Flaps and fairing . . . . CONDITION
*– Control surfaces . . . . CONDITION
– Static dischargers . . . . CHECK

(20) LH WING TIP

– Navigation light . . . . CONDITION
*– Slats 7, 6, 5 . . . . CONDITION
– Surge tank air inlet . . . . CLEAR
– Fuel water drain valve (surge tank) . . . . NO LEAK
– Magnetic fuel levels L8 and L7 . . . . FLUSH
– Wing fence . . . . CONDITION
*– Fuel ventilation overpressure disc . . . . INTACT

(21) LH WING LEADING EDGE

– Magnetic fuel levels L6, L5, L4 and L3 . . . . FLUSH
– Fuel water drain valve (outer tank) . . . . NO LEAK
*– Slats 4, 3, 2 . . . . CONDITION
R – Refuel coupling door . . . . CLOSED

(22) ENG 1 LH SIDE

Identical to ENG 2

(23) ENG 1 RH SIDE

Identical to ENG 2

(24) LH CENTER WING

– Inner tank magnetic fuel levels L2 and L1 . . . . FLUSH
– Fuel water drain valves (inner tank) . . . . NO LEAK
– Water drain valve panel . . . . CLOSED
– Landing light . . . . CONDITION
*– Slat 1 . . . . CONDITION

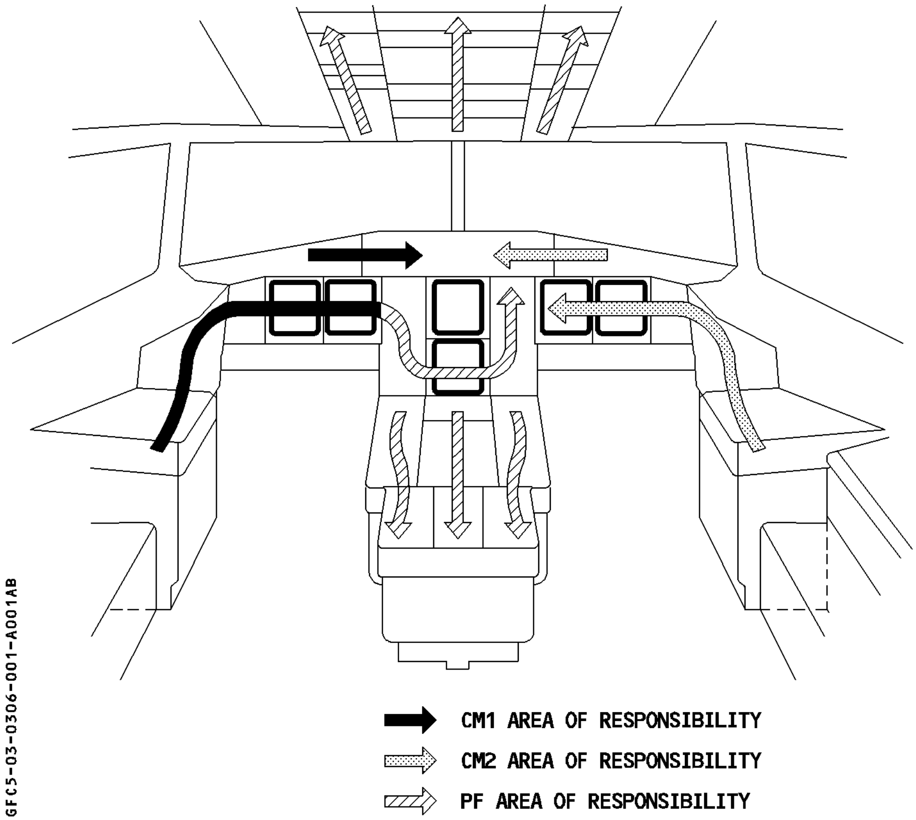
INTRODUCTION

Items marked by (*) are the only steps to be completed during a transit stop.
The PF and PNF should perform the cockpit preparation according to the panel scan sequence, defined below, and the task sharing defined in the Quick Reference Handbook (QRH).

DOCUMENTATION AND MAINTENANCE

On entering the aircraft, obtain the technical (maintenance) log and verify that the certificate of maintenance and daily inspection (or similar) are up to date and signed. Check the deferred or carried-forward defects. If refueling has already been completed, check the uplift.

PANEL SCAN SEQUENCE



*– **GEAR PINS and COVERS . . . . CHECK**
Check that three are on board and stowed.

OVERHEAD PANEL

IT IS A GENERAL RULE TO TURN OFF ALL WHITE LIGHTS FOR ALL THE SYSTEMS DURING THE SCAN SEQUENCE. THEREFORE, THESE ACTIONS ARE NOT LISTED HERE.

*** RCDR**

*– **RCDR GND CTL . . . . ON**

EVAC ◁

– **CAPT and PURS/CAPT switch . . . . AS RQRD**
The usual position is CAPT.

*** ADIRS**

*– **Mode rotary selectors (3) . . . . NAV**
- The ADIRS outputs are used by many of the aircraft's systems, so it is essential to set the selectors to NAV as early as possible to provide data to the related systems.
- For a complete realignment, select the OFF position for more than 5 seconds (approximately 10 minutes, depending on the latitude).
- IRS IN ALIGN is indicated on the ECAM MEMO.

Note : For flights with long segments on which there are no FMGC position updates with radio navigation, perform a complete alignment. For other flights, a fast alignment is sufficient.

CKPT DOOR LKG SYS

– **ON/OFF CONTROL SWITCH . . . . ON**
This position must be maintained throughout the entire flight.

EXT LT

– **EXTERIOR LIGHTS . . . . AS RQRD**
Set the STROBE switch to AUTO, the BEACON and the WING switches to OFF, and remaining switches as required.
WING lights may be used briefly for wing inspection. However, as this light can cause heat damage to the jetway, it must be switched off, if the jetway is on the aircraft.

*** SIGNS**

*– **SEATBELTS . . . . ON/AUTO**

*– **NO SMOKING . . . . AS RQRD**

*– **EMER EXIT LT . . . . ARM**

CABIN PRESS

– **LDG ELEV . . . . AUTO**

– **VALVE SEL . . . . BOTH**

*** AIR COND**

*– **PACK FLOW . . . . AS RQRD**
Select :
LO : If less than 60 % of the seats in economy class are occupied, but no more than 200 passengers in all classes.
HI : For abnormally hot and humid conditions.
NORM : For all other normal operating cases.
If the APU is supplying, pack controllers automatically select HI flow, irrespective of the selector position.

ELEC

– **ECAM ELEC DC PAGE . . . . CALL**

– **BAT 1 and 2 and APU BAT . . . . OFF then ON**
10 seconds after selecting ON, check on the ECAM ELEC page that the three battery charge currents are below 60 A and decreasing.

FUEL

– **T. TANK . . . . AUTO**

ENG 1 – ENG 2 FIRE

– **ENG 1 and 2 FIRE pushbuttons . . . . CHECK IN and GUARDED**

– **AGENT 1 and AGENT 2 lights . . . . CHECK OUT**

– **TEST pushbutton . . . . PRESS**
Check :
· ENG 1 FIRE warning on the ECAM + CRC + MASTER WARN light
· ENG 2 FIRE indication on the ECAM MEMO
· ENG FIRE pushbutton is red.
· SQUIB and DISCH lights on.
· FIRE light (on ENG panel) on.

DATA LOADER

– **DATA LOADER . . . . CHECK OFF**

MAINTENANCE PANEL

– **Check that all lights are out. If not, select associated pushbutton to turn off.**

THIRD OCCUPANT AUDIO CONTROL PANEL

– **PA reception knob . . . . Select reception**
· This allows cabin attendant announcements to be recorded on the CVR.
· For proper recording, set the volume at or above medium range.

CVR

– **CVR TEST . . . . PRESS**
R Check that at least one green LED is illuminated on the test result indicator.

RMP

– **RMP . . . . ON**

– **Green NAV light . . . . CHECK OFF**

– **SEL light . . . . CHECK OFF**

– **COM FREQUENCIES . . . . TUNE**
Use VHF 1 for ATC (only VHF 1 is available in emergency electrical configuration), VHF 2 for ATIS and company frequencies. VHF 3 is normally devoted to ACARS.

*** AIRFIELD DATA**

Obtain data needed for initializing the system and preparing the cockpit. This should include: RUNWAY IN USE, ALTIMETER SETTING, and WEATHER DATA.

*** ATC CLEARANCE**

Obtain ATC clearance, or use the probable clearance.

*** ACARS**

Initialize ACARS at that point, or after FMGS INITIALIZATION, as per company policy.

***FMGS INITIALIZATION**

At electrical power-up, the FMGSs and FCU run through various internal tests. Allow enough time (3 minutes) for tests' completion, and do not start to press pushbuttons until the tests are over. If the "PLEASE WAIT" appears, do not press any MCDU key until the message clears.

*– **ENGINE & AIRCRAFT TYPE . . . . CHECK**

*– **FM database validity . . . . CHECK**
· Press the DATA key, and display the STATUS page (if not displayed).
· Check DATA BASE validity and stored WPT/NAVAIDS/RWY/ROUTES, if any.
If applicable, review the stored data for deletion decision.

*– **NAVAID DESELECTION . . . . AS RQRD**
If NOTAMs warn of any unreliable DME or VOR/DME, display DATA, then POSITION MONITOR. Access the SEL NAVAID page, and deselect the related navaid.

*– **FLIGHT PLAN INITIALIZATION . . . . COMPLETE**
· Press the INIT key.
· Insert CO RTE or city pair, and check FROM/TO.
· Check/modify ALTN/CO RTE.
· Enter flight number.
R For ATC needs, the crew should enter exactly the entire flight number, as shown on
R the ICAO flight plan, without inserting any space, on the MCDU INIT page.
· Enter (and/or check) cost index.
· Enter intended initial CRZ FL, or check it if it was already supplied by the database. Modify it, if necessary, taking into account ATC constraints or expected gross weight.
· Check and modify CRZ FL TEMP and tropopause level to agree with forecast.
· Check latitude/longitude.

*– **ALIGN IRS prompt . . . . AS APPROPRIATE**
Do not move the aircraft, as long as alignment is not completed. The IRS are automatically initialized using the GPS position. Pilot intervention is not required. If the pilot has entered a CO RTE or FROM/TO, the INIT page displays the departure airport reference point coordinates (as stored in the navigation database), and the ALIGN IRS prompt appears. Do not press the ALIGN IRS prompt key. The ADIRS is initialized to the GPS position at the end of the alignment time. If the GPS position is not available, the pilot manually initializes the ADIRS by pressing the ALIGN IRS prompt key. By doing this, the airport reference point coordinates are sent to the ADIRS. When flying long segments without radio position update, initialize the ADIRS to the gate coordinates (insert/slew in the INIT page). When IRS alignment is completed, the MCDU's RESET IRS TO NAV message may indicate that the INIT page coordinates have been modified and are different from the IRS coordinates.

*– **F-PLN A page . . . . COMPLETE AND CHECK**
If CO RTE has been inserted, the F-PLN should automatically include the preferential or most probable takeoff runway, approach and landing runway, associated SIDs, STARs, transition and enroute waypoints. However, some databases will only include departure and arrival airport idents and enroute waypoints. The crew must check, modify, or insert (as applicable) the F-PLN in the following order according to the data given by ATIS, ATC or MET :
· Lateral revision at departure airport. Select RWY, then SID, then TRANS.
· Lateral revision at WPT for ROUTE modification, if needed. (Refer to 4.04.10).
· Vertical revision. Check or enter climb speed limit/constraints according to ATC clearance. Enter step altitude, as appropriate.

*– **WINDS . . . . AS APPROPRIATE**
Choose between using TRIP WIND (INIT B page), or forecast wind, for CLB or CRZ phases (Refer to 4 04.20).

*– **F-PLN . . . . CHECK**
· Check the F-PLN, either by using the ROUTE SELECTION page versus ATC F-PLN, or F-PLN page, or the ND PLAN mode versus the computer (paper) flight plan or navigation chart.
· Check DIST TO DEST along the F-PLN. Compare it with the total distance computed for the flight with the computer (paper) flight plan.

*– **SECONDARY FLIGHT PLAN . . . . AS APPROPRIATE**
This is routinely a copy of the active flight plan. However, consideration may be given to the following :
a) Copy the active F-PLN, but modify it at a suitable WPT for an immediate return to the departure airfield in the event of, for example, engine failure.
b) If weather is below landing minimums at the departure airfield, the secondary flight plan should be that required for a diversion immediately after takeoff.
c) If there is a chance of a runway or SID change during taxi, prepare for it by copying the active flight plan and making the necessary modifications.

*– **RADIO NAV . . . . CHECK**
· Check the VOR and ILS tuned by the FMGC.
· Modify them, if required, and check that the correct identifier is displayed on the ND and PFD (ILS). If unsatisfactory, go through the audio check.

*** FMGS DATA INSERTION**

GROSS WEIGHT INSERTION (INIT B page) :

*– **ZFCG/ZFW . . . . INSERT**

*– **BLOCK FUEL . . . . INSERT**
Block fuel may be automatically computed by the FMGC, using the FLIGHT PLANNING function.

CAUTION

Part of characteristic speeds, displayed on the PFD (green dot, F, S, VLS), are computed from the ZFW and ZFCG entered by the crew on the MCDU. Therefore, this data must be carefully checked (Captain's responsibility).

The flight crew should insert the weights after completing all other insertions. This is to avoid cycles of prediction computations at each change in flight plan, constraints, etc...
If ZFCG and ZFW are not available, it is acceptable to enter the expected values in order to obtain predictions. Similarly, the flight crew may enter the expected fuel on board, if refueling has not been completed at that time.
If ZFCG, ZFW, and BLOCK FUEL are inserted, the FM will provide all predictions, as well as the EXTRA fuel, if any.

TAKEOFF DATA INSERTION (PERF TAKEOFF page)

*– **V1, VR, V2 . . . . INSERT**

*– **FLEX TO TEMP/DERATE . . . . INSERT**

*– **THR RED/ACC altitude . . . . SET or CHECK**
For noise abatement procedure "A", the crew must set the acceleration altitude at, or above, 3000 feet.

*– **ENG OUT ACC altitude . . . . SET or CHECK**

*– **FLAPS/THS reminder . . . . INSERT**

*– **TO SHIFT . . . . AS RQRD**
Enter takeoff SHIFT distance, if takeoff is to be from an intersection. This is essential for position updating at takeoff and, consequently, for navigation accuracy.

R **CLIMB, CRUISE, DESCENT SPEED PRESELECTION**

*– **PRESET SPEEDS . . . . AS RQRD**
If the flight is cleared for a close-in turn or close-in altitude constraint, the flight crew may preselect green dot speed on the PERF CLB page. Once the CLB phase is active, the preselected speed will be displayed in the FCU speed window and on the PFD as a selected speed (blue symbol). Once the turn is completed or the altitude cleared, the pilot will resume the managed speed profile by pressing the SPD selector on the FCU. Similarly, the pilot may select a CRZ MACH number on the PERF CRZ page (constant CRZ Mach segment, for example). When the CRZ phase is active, the preselected CRZ MACH number will be displayed in the FCU speed window and on the PFD. When ECON MACH number may be resumed, the crew presses the FCU SPD selector.
In either of the above cases, the pilot may cancel the CLB or CRZ preselected SPD/MACH prior to activating the related phase, by selecting ECON on the PERF CLB or CRZ pages
SPD LIM is defaulted to 250 knots below 10000 feet in the managed speed profile. This may either be cleared, or modified, on the VERT REV page at the origin (or a climb waypoint).

*** GLARESHIELD**

– **Glareshield and FCU integral light . . . . AS RQRD**

*– **LOUDSPEAKER . . . . SET**
Approximately at the 1 o'clock position.

*– **BARO REF . . . . SET**
· Set QNH on the EFIS control panel and on the standby altimeter.
· Check barometer settings and altitude indications on the PFD and standby altimeter. (Tolerance limits are given in 3.04.34).

*– **FD . . . . CHECK ON**

*– **LS . . . . AS RQRD**

Note : Do not engage the autothrust on ground, as it may generate the AUTO FLT A/THR OFF warning at engine start.

* EFIS CONTROL PANEL

*– **ND mode and range . . . . AS RQRD**
MODE : Display the ARC mode on the ND, if the takeoff direction is approximately the departure direction or the ROSE NAV mode, if the direction change will be more than 70° after takeoff (to allow the ND to display the area behind the aircraft).
RANGE : Set the minimum range to display the first waypoint after departure, or as required for weather radar.

*– **VOR/ADF selector . . . . AS RQRD**
Display VOR and ADF needles, as needed.

* FCU

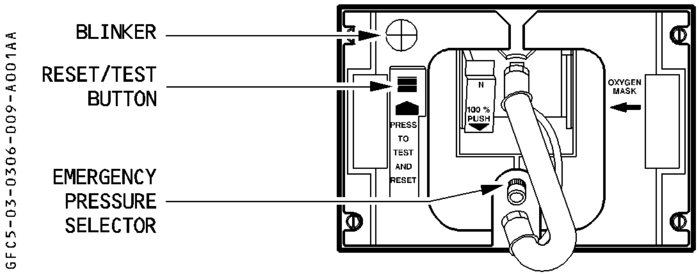
*– **SPD MACH window . . . . DASHED**

*– **HDG V/S-TRK FPA . . . . HDG V/S**

*– **ALT window . . . . INITIAL EXPECTED CLEARANCE ALT**

LATERAL CONSOLES

OXYGEN MASK TEST



On the OXYGEN panel :

– **CREW SUPPLY . . . . CHECK ON**

On the glareshield :

– **LOUDSPEAKERS . . . . ON**

On the audio control panel :

– **INT reception knob . . . . PRESS OUT - ADJUST**

– **INT/RAD switch . . . . INT**

On the mask stowage box :

· Press and hold the reset/test button in the direction of the arrow.
 – Check that the blinker turns yellow for a short time, and then goes black.
· Hold the reset/test button down, and press the emergency pressure selector.
 – Check that the blinker turns yellow, and remains yellow as long as the emergency pressure selector is pressed.
 – Listen for oxygen flow through the loudspeakers. Warn any engineer, whose headset may be connected to the nose intercom, that a loud noise may be heard.
· Check that the reset/test button returns to the up position and the N 100 % selector is in the 100 % position.
R · Press the emergency pressure selector again, and check that the blinker does not turn
R yellow. This ensures that the mask is not supplied.

On the ECAM DOOR/OXY page :

– **REGUL LO PR message . . . . CHECK OFF**
 · The crew must perform this check after having checked all masks. It ensures that the LP valve is open. (Due to residual pressure between the LP valve and the oxygen masks, an LP valve failed closed may not be detected during the oxygen mask test).

CM 1/2 INSTRUMENT PANELS

– **EFIS DMC selector . . . . CHECK NORM**

– **PFD and ND brightness knob . . . . AS RQRD**
Check the ND outer ring to maximum range (radar display).

*– **PFD . . . . CHECK**
- Check that the PFD/ND is not transferred.
- Check for correct display, when ATT and HDG are available.
- Check IAS, FMA, initial target ALT, altimeter readings, VSI, altimeter settings, heading and attitude display.

*– **ND . . . . CHECK**
- Check for correct display.
- Crosscheck compass indication on the ND and DDRMI.
- Check ground speed less than 5 knots, heading, initial waypoint, VOR/ADF indications.

CTR INSTRUMENT PANEL

*– **ISIS . . . . CHECK**
- Adjust brightness.
- Check IAS, altimeter readings, altimeter settings and attitude display.
- Check no flags - Reset attitude, if necessary.

Note : Use of ISIS bugs function is not recommended (Refer to FCOM 1.34.25).

*– **NORTH REF . . . . CHECK**
Check TRUE blue light off.

* ECAM SWITCHING panel

– **Check DMC at AUTO, and ECAM/ND at NORM.**

* CLOCK

– **Check time, and adjust if necessary ; elapsed time at zero, chrono at zero.**

Note : If the clock is readjusted for a value above ten days, maintenance must perform the Wing Tip Brake engagement test.

LANDING GEAR

– **LDG GEAR GRVTY EXTN . . . . OFF**

*– **A/SKID & N/W STRG . . . . ON**

PEDESTAL

ACP

– **INT knob . . . . PRESS OUT/VOLUME CHECK**
Ensure that INT volume is turned up, to enable contact with the ground crew.

– **VHF . . . . CHECK**
Check transmission and reception.

– **HF . . . . CHECK**
· Check transmission and reception.
· Do not transmit on HF during refueling.

*** WEATHER RADAR**

*– **Power supply switch . . . . CHECK OFF**

*– **WINDSHEAR switch . . . . CHECK OFF**

*– **GAIN . . . . AUTO**

*– **Mode . . . . AS RQRD**

*** PARKING BRK**

*– **PARKING BRK . . . . ON then OFF**
– Check pressure on BRAKE PRESS indicator.
– If chocks are in place, release parking brake to increase brake cooling.

*** SWITCHING panel**

R *– **SWITCHING panel . . . . CHECK**
Check all selectors at NORM.

*** ECAM control panel**

*– **PRESS . . . . PRESS**
Check that the CAB PRESS page displays LDG ELEV AUTO to confirm correct position of the LDG ELEV selector.

*** THRUST LEVERS**

*– **THRUST LEVERS . . . . CHECK IDLE**
Check reverse levers stowed.

ENG

– **ENG MASTER switches . . . . CHECK OFF**

– **ENG START selector . . . . CHECK NORM**

ATC

R – **ATC . . . . SET FOR OPERATION**

– **SYS 1 . . . . SELECT**
Only system 1 is available in the emergency electrical configuration.

*** FMGS DATA CONFIRMATION**

*– **AIRFIELD DATA . . . . CONFIRM**

*– **ATC CLEARANCE . . . . OBTAIN**

*– **IRS ALIGN . . . . CHECK**
Confirm coordinates

*– **GROSS WEIGHT INSERTION . . . . CHECK**
The PNF checks FMGS data.

*– **TO DATA . . . . CALCULATE/CHECK**
The PNF calculates and checks takeoff data.

*– **F-PLN A and B pages . . . . CHECK**
· Select EFIS CSTR pushbutton switch on.
· The PNF ensures that the inserted F-PLN agrees with planned routes.
(Refer to 4 05.10)
· If company policy requires it, use the scroll key to check the whole F-PLN thoroughly. Tracks and distances between waypoints are displayed on the second line from the top of the MCDU.
Compare them with the navigation charts, if necessary.
Check correct stringing, using ND in PLAN mode.
SID and EOSID tracks and distances must be checked from the appropriate navigation charts.

*** ATC**

*– **ATC CODE . . . . SET**

*** FUEL**

*– **FUEL QTY . . . . CHECK**
· Check that ECAM fuel on board corresponds to the F-PLN.
· Check that fuel imbalance is within limits.
· Check that ECAM CG is within operational limits.

***TAKEOFF BRIEFING**

*– **TAKEOFF BRIEFING . . . . PERFORM**
The purpose of the takeoff briefing is for the PF to inform the PNF of the planned cause of action for both normal and abnormal situations during takeoff.
Whenever practical, it is recommended, that as much of the takeoff briefing as possible be completed at the gate.
Prior to the first flight of a trip series the PF should conduct a complete departure briefing. It should include, but not necessarily be limited to, a review of the following areas :
· Adverse weather and runway conditions.
· Crew coordination in the event of a rejected takeoff.
· A discussion of any unusual, non-standard, or abnormal conditions which might affect the safety of the flight.
· SID with 1 engine out, making extensive use of FMGS
R · For airlines having different models of A330, mention if the aircraft is an A330–200
R or an A330–300. Awareness of the aircraft model may prevent tailstrike.
The PF will brief for all subsequent flights, however, the briefing may be substantially reduced when continuing with the same crew.
However, any change or items peculiar to the specific departure should be thoroughly covered.

* PC DEDICATED TO MAINTENANCE

Check that the Personal Computer (PC), dedicated to maintenance use and located in front of the 4th occupant console, is stowed.
Check that the light of its manual switch is off. If not, switch it off.
Check that its associated printer, located in the LH rear corner of the cockpit, is stowed.

BEFORE PUSHBACK or START

– **LOADSHEET . . . . CHECK**
The Captain should thoroughly check the load and trim sheet, particularly for gross errors. Make sure that the loadsheet data is correct : Correct flight, correct aircraft, dry operating index, configuration, fuel on board, etc.
Compare ZFW/ZFCG with the previously-entered data, and adjust if necessary.
· Check loadsheet CG, versus ECAM CG.
In case there is a discrepancy of more than 2 %, check that the ZFW and ZFCG have been correctly inserted in the MCDU, then rely on the ECAM CG.
If the difference is less than 2 %, no further action is required. Rely on the ECAM CG.

– **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
Once the loadsheet is checked :
– The PNF checks or recomputes the takeoff speeds and the flexible temperature, using the RTOW charts.
– The PF independently calculates the takeoff speeds and the flexible temperature, as a crosscheck.
Take particular care in determining the takeoff configuration. (Refer to 2 02.20).
R Confirm any takeoff weight limitation.
– The PF checks (or revises) the takeoff data in the INIT B and PERF pages of the MCDU.

– **SEATS, SEAT BELTS, HARNESSES, RUDDER PEDALS, ARMRESTS . . . ADJUST**
The seat is correctly adjusted when the pilot's eyes are in line with the red and white balls.

– **MCDU . . . . IN TAKEOFF CONFIGURATION**
It is recommended that the crew displays F-PLN on the PNF side and PERF TAKEOFF on the PF side.

– **EXT PWR . . . . CHECK OFF**
Request that external power be removed.

– **BEFORE START CHECKLIST down to the line . . . . COMPLETE**

– **PUSHBACK/START UP CLEARANCE : . . . . OBTAIN**

Obtain ATC pushback/startup clearance.
Make sure that the ground crew is aware of the 65° limitation, and that they ensure that this value is not exceeded, making use of markings on the nose landing gear doors.
Obtain ground crew clearance.

– **N/WS DISC . . . . CHECK AS RQRD**

In case of pushback (conventional or towbarless), the nosewheel steering selector bypass pin must be in the tow position. The ECAM N/WS DISC memo indicates this to the flight crew.

CAUTION

If N/WS DISC is not displayed on the ECAM, but the ground crew confirms that the steering selector bypass pin is in the towing position, then the pushback must not be performed. This is to avoid possible nose landing gear damage upon green hydraulic pressurization.
To dispatch the aircraft in such a case, refer to the MMEL.

– **WINDOWS and DOORS . . . . CHECK CLOSED**

- Check that the cockpit windows are closed and locked (flush, no red).
- Check, on the ECAM lower display, that all the aircraft doors are closed.
- When required by local airworthiness authorities, check that the cockpit door is closed and locked (no cockpit door open/fault indication).
  If entry is requested, identify the person requesting entry before unlocking the door. With the cockpit door selector on NORM, the cockpit door is closed and locked. If entry is requested from the cabin, and if no further action is performed by the pilot, the cabin crew will be able to unlock the door by using the emergency access procedure. Except for crew entry/exit, the cockpit door should remain closed until engine shutdown.

  Note : Starting one engine, whilst a door is not closed, will result in pack valve closure.

– **BEACON . . . . ON**

– **THR LEVERS . . . . IDLE**

CAUTION

Engine will start, regardless of thrust lever position ; thrust will rapidly increase to the corresponding thrust lever position, causing a hazardous situation, if thrust levers are not at IDLE.

– **PARKING BRAKE ACCU PRESS . . . . CHECK**
The ACCU PRESS indication must be in the green band.

– **PARKING BRAKE . . . . AS RQRD**
– If no pushback is required, check that the PARKING BRK handle is ON, and check the BRAKES PRESS indication.

CAUTION

If, during engine start with the parking brake on, the aircraft starts to move due to a parking brake failure, immediately release the PARKING BRK handle to restore braking by pedals.

– If pushback is required, set the PARKING BRK to OFF.

CAUTION

Do not use brakes during pushback, unless required due to an emergency.

After pushback is completed, set the PARKING BRK to ON, and inform the ground crew to allow the towbar to be disconnected.

– **BEFORE START CHECKLIST below the line . . . . COMPLETE**

AUTOMATIC ENGINE START

– **ENG START selector . . . . IGN START**
Lower ECAM display shows the ENG page.

– **ANNOUNCE . . . . "STARTING ENGINE 1"**
Engine 1 is usually started first (It powers the blue hydraulic system, which pressurizes the parking brake.)

– **MASTER switch 1 . . . . ON**
Do not turn the MASTER switch ON before all amber crosses and messages have
R disappeared on the engine parameters (upper ECAM display). In addition, before setting
R the engine 1 master switch to ON, wait for three seconds after having selected "IGN
R START" in the engine start selector.

ON ECAM UPPER DISPLAY	ON ECAM LOWER DISPLAY
N2 increases	Corresponding start valve in line. Bleed pressure indication green. Oil pressure increases.
At 10 % N2 :	Indication of the active igniter (A or B)
At 15 % N2 : – FF increases 20 seconds (maximum) after fuel is on – EGT increases – N1 increases	
At 50 % N2 :	Start valve crossline.
At 54 % N2 :	Igniter indication off.

Parameter callouts are not mandatory.

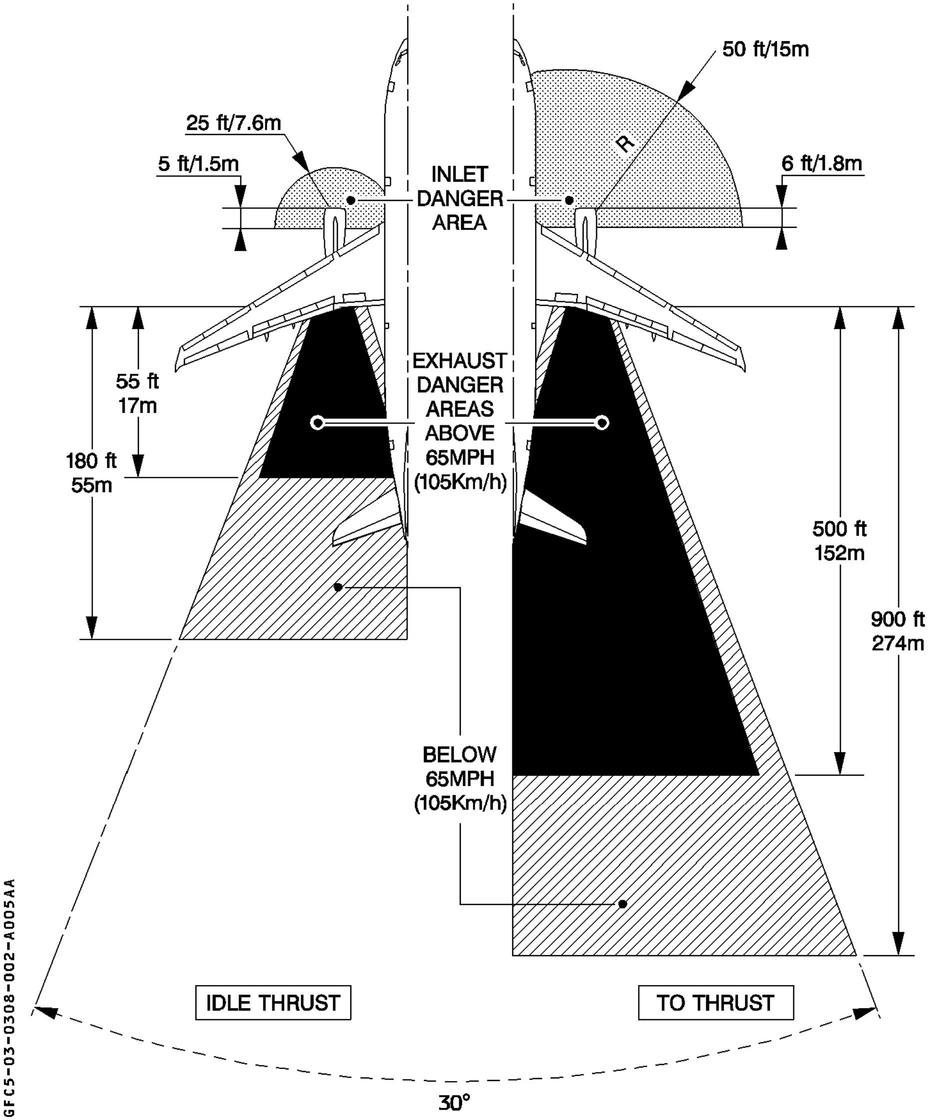
● **When idle is reached (AVAIL indication is displayed) :**

– **MAIN AND SECONDARY ENG. IDLE PARAMETERS . . . . . . CHECK NORMAL**
At ISA sea level : N1 about 23 %
N2 about 63 %
EGT about 360°C
FF about 550 kg/h (1210 lb/h)

– **ANNOUNCE . . . . "STARTING ENGINE 2"**

– **MASTER switch 2 . . . . ON**
Same procedure as for Engine 1.

GROUND RUN UP – DANGER AREAS



AFTER START

– **ENG START selector . . . . NORM**
- Turning the ENG START selector to NORM indicates the end of the start sequence ; AFTER START actions may be performed.
- ON ECAM lower display the ENG page is replaced by the WHEEL page.

Note : If the ENG START selector is not switched to NORM, the ENG page is automatically replaced by the WHEEL page 15 seconds after second engine start.

- Leaving the ENG START Sel at START/IGN position would inhibit continuous relight selection on ground (would be supplied at lift off). The selector must be cycled to recover normal control of ignition.
- After start, to avoid thermal shock, the engine should be operated at idle or near idle for at least 3 minutes prior to advancing the thrust lever to high power. Taxi time at idle may be included in the warm-up period.

– **APU BLEED . . . . OFF**
- APU BLEED is selected off just after engine start to avoid engine exhaust gases ingestion.
- APU BLEED valve closes, ENG BLEED valves open.

– **GROUND SPOILERS . . . . ARM**

– **RUD TRIM . . . . ZERO**
If RUD TRIM position indication not at zero, press the RESET pushbutton.

– **FLAP lever . . . . SET**
- Set FLAPS for takeoff
- Check position on ECAM upper display
- If taxiing in slush conditions, keep flaps retracted until reaching the holding point before takeoff.

– **PITCH TRIM . . . . SET**
R Set CG on pitch trim wheel. For this purpose use CG indicated on ECAM.

– **ECAM STATUS . . . . CHECK**
- Check no status reminder on ECAM upper display
- If status reminder displayed, press the STS pushbutton

– **ENG ANTI ICE . . . . AS RQRD**

Note : *Icing conditions may be expected when the OAT (on ground and for takeoff), or the TAT (in flight), is 10°C or below, and there is visible moisture in the air (such as clouds, fog with low visibility, rain, snow, sleet, ice crystals), or when standing water, slush, ice or snow is present on the taxiways or runway.*

· If icing conditions exceed 30 minutes, or if significant engine vibration occurs, the engine should be accelerated to 60 % N1 minimum for approximately 30 seconds prior to higher thrust operation. (See also parking brake limitation 3.01.32).
· If switched on, the IGNITION memo appears on the ECAM, as continuous ignition is automatically selected.

– **WING ANTI ICE . . . . AS RQRD**
When WING ANTI ICE is switched on, on ground, the anti-ice valves open for about 30 seconds (test sequence), then close as long as the aircraft is on ground.

– **APU MASTER switch (if APU not required) . . . . OFF**
AVAIL light goes off after the APU cooling period.

– **NWS TOWING FAULT light off . . . . CHECK**

– **ECAM DOOR page . . . . CHECK**
· Check all slides armed.
· Deselect DOOR page after slide verification.

– **ANNOUNCE . . . . "CLEAR TO DISCONNECT"**
Request : Chocks removed.
Nosewheel steering bypass pin removed.
Nosewheel steering towing light on the nose landing gear checked off.
Interphone disconnect.
Hand signal on the left/right side

– **AFTER START C/L . . . . COMPLETE**

TAXI

– **TAXI clearance . . . . OBTAIN**

R – **NOSE light . . . . TAXI**
R Turn on nosewheel light to TAXI day and night.
R RWY TURN OFF lights may be switched on, as required.

– **PARKING BRK . . . . OFF**
Check that brake pressure is zero (triple indicator). Slight residual pressure may be indicated for a short period of time.

– **ELAPSED TIME . . . . AS RQRD**
If ACARS is not installed, start ELAPSED TIME to record block time.

– **THRUST LEVERS . . . . AS RQRD**
· In order to get the aircraft moving, little, if any, power above idle thrust will be required (max 40 % N1). Thrust should normally be used symmetrically. Once aircraft is moving, little thrust is required.
· Use of the engine anti-ice increases ground idle thrust so the pilot must take care on slippery surfaces.
· The engines are close to the ground. Avoid positionning them over unconsolidated, or unprepared ground (e.g over the edge of taxiways).
Avoid high thrust settings at low ground speeds, due to the risk of ingestion (FOD).
· "Square wheel effect" may be noticed, if the aircraft was parked for a long time (more than 6 hours) with high tire temperature conditions and with a high weight.

– **BRAKES . . . . CHECK**

– Once the aircraft starts moving :

· Check the brake efficiency of the normal braking system : The aircraft must slow down when pressing the brake pedals.

CAUTION

R If the aircraft has been parked in wet conditions for a long period, the efficiency of
R the first brake application at low speed will be reduced.

· Also check that green pressure has taken over blue pressure : The blue pressure on the brake pressure triple indicator must be at 0 when pressing the brake pedals. Although green hydraulic power supplies the braking system, if pedals are quickly pressed a brief brake pressure indication appears on the BRAKE PRESS indicator.

· Thereafter, the normal maximum taxi speed should be 30 knots in a straight line on long taxiways, and 10 knots for a sharp turn. The ground speed is difficult to assess, so monitor ground speed on the ND. Do not "ride" the brakes. As 30 knots are exceeded with idle thrust, apply brakes smoothly and decelerate to 10 knots; release the brakes and allow the aircraft to accelerate again.

· If a "spongy" pedal is felt during taxi, this indicates a degraded performance of the alternate braking system.

· If an arc is displayed on the ECAM WHEEL page above the brake temperature, select brake fans on (if installed).

– **NOSEWHEEL STEERING . . . . AS RQRD**

· Use smooth and progressive handwheel inputs. Avoid the use of large rapid inputs that introduce big variations in demand, which cannot be satisfied by the steering mechanism (maximum rate for nosewheel deflection of about 12°/sec). Be aware that it will take approximately 7 seconds for the nosewheel to return to zero deflection from its full travel. Therefore, some anticipation is needed to reduce the nosewheel steering deflection when exiting a turn.

When exiting a tight turn, roll straight a short distance to take the stress out of the main gears.

· The nosewheel steering angle is limited to 72°.

· No braked pivot turn is allowed (ie. differential braking cannot be used to fully stop one main gear).

· Asymmetric thrust may be used during turns at high NWS angles, in order to initiate the turn and to keep the aircraft moving during the turn. But, it should not be used to tighten the turn.

– **FLIGHT CONTROLS . . . . CHECK**

R 1. At a convenient stage, prior to or during taxi, and before arming the autobrake, the PF silently applies full longitudinal and lateral sidestick deflection.
R On the F/CTL page, the PNF checks full travel of all elevators and all ailerons, and the correct deflection and retraction of all spoilers.
R The PNF calls out "full up", "full down", "neutral", "full left", "full right", "neutral", as each full travel/neutral position is reached.
R The PF silently checks that the PNF calls are in accordance with the sidestick order.

R *Note : In order to reach full travel, full sidestick must be held for a sufficient period of time.*

R 2. The PF presses the PEDAL DISC pushbutton on the nosewheel tiller, and silently applies full left rudder, full right rudder, and neutral. The PNF calls out "full left", "full right", "neutral", as each full travel/neutral position is reached.
R 3. The PNF applies full longitudinal and lateral sidestick deflection, and silently checks full travel and the correct sense of all elevators and all ailerons, and the correct deflection and retraction of all spoilers, on the ECAM F/CTL page.

R *Note : The F/CTL page is automatically displayed for 20 seconds.*

– **AUTO BRK . . . . MAX**
- The ON light comes on.
- AUTO BRK may be armed, with the parking brake on.
- The selection of MAX mode prior to takeoff improves safety, in the event of an aborted takeoff.
  If the takeoff must be aborted, the autobrake system applies maximum braking (if the ground speed is above 72 knots), as soon as the thrust levers are set to idle, which represents a single action done without delay.

– **ATC clearance . . . . CONFIRM**

TAKE OFF DATA/CONDITIONS

If the takeoff data has changed, or in the case of a runway change, prepare updated takeoff data and, as appropriate :

– **F-PLN (Runway) . . . . REVISED**

– **FLAP LEVER . . . . AS APPROPRIATE**
Select takeoff position.

– **V1, VR, V2 . . . . REINSERT**

– **FLEX TO temperature . . . . REINSERT**

FMGS

– **F-PLN (SID,TRANS) . . . . REVISE or CHECK**
Carefully confirm that the ATC clearance agrees with the FMGS, if NAV mode is to be used.

– **INITIAL CLIMB SPEED AND SPEED LIMIT . . . . MODIFY or CHECK**
Use VERT REV at departure, or at a CLB waypoint.

– **CLEARED ALTITUDE ON FCU . . . . SET**

– **HDG ON FCU . . . . IF REQUIRED PRESET**
R · If an ATC HDG is required after takeoff, in case of a radar vector departure, preset the
R heading on the FCU. NAV mode will be disarmed.
· RWY TRK mode will keep the aircraft on the centerline.

– **FD . . . . CHECK SELECTED ON**

– **FMA . . . . CHECK**

– **FLIGHT INSTRUMENTS . . . . CHECK**

– **RADAR (if required) . . . . ON**
If the radar is required for the flight, use the following test procedure :
Adjust the tilt downward until ground returns appear, and then slowly adjust it in 1 to 2 degree steps, up to 15 degrees UP, for weather returns.
Select tilt at 4 degrees UP for takeoff.

– **PREDICTIVE WINDSHEAR SYSTEM . . . . AUTO**

– **ATC code . . . . CONFIRM/SET**

– **TAKEOFF BRIEFING . . . . CONFIRM**
This briefing should normally be only a brief confirmation of the thorough takeoff briefing made at the gate. Any changes in the clearance are to be addressed at this time.
Make as extensive use of the displays as possible. For example :
"Takeoff in RWY 07 (Perf page), weight 208 T (lower ECAM) configuration 2, 65 T of fuel, FLEX 50° , 93% N1 (upper ECAM) LMG 2D departure (FPLN page) V1 155 V2 158 (PFD), initial clearance 12 000 feet blue (FMA)").

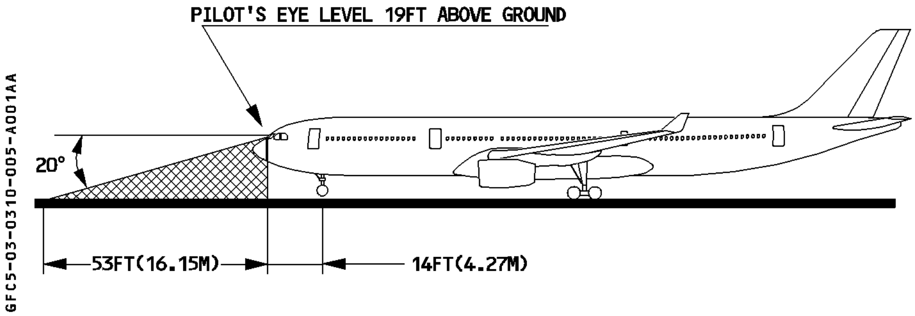
– **CABIN REPORT . . . . RECEIVED**
Check the CABIN READY message on the ECAM MEMO, or obtain a cabin report from the purser, as a minimum : "CABIN SECURED FOR TO"

– **TO CONFIG pb . . . . PRESS**
Check "TO CONFIG NORMAL" displayed on ECAM upper display.

– **TO MEMO . . . . CHECK NO BLUE LINE**

– **BEFORE TO C/L down to the line . . . . COMPLETE**

VISUAL GROUND GEOMETRY



180 ° TURN ON RUNWAY

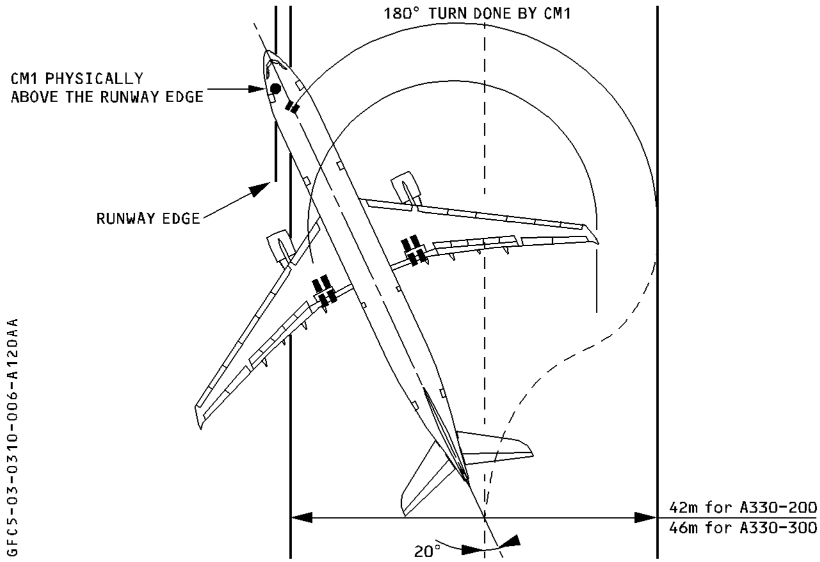
A standard runway is 45 meters wide. With the maximum nosewheel steering angle (72°), the actual turn width (without margin) is 42 meters for an A330–200 and 46 meters for an A330–300. These distances are based on the following procedure :

● **FOR THE CM1**

- Taxi on the right hand side of the runway and turn left, maintaining 20° (check on the PFD) divergence from the runway axis.
- Asymmetric thrust should be used during the turn, to maintain a continuous speed (between 5 and 10 knots). Some anticipation is required to ensure that asymmetric thrust is available at the beginning of the turn.
- When the CM1 is physically over the runway edge, he turns and maintains the nosewheel 72° right.
- No braking pivot is allowed (ie. differential braking cannot be used to fully stop one main gear).

● **FOR THE CM2**

The procedure is symmetrical. (Taxi on the left hand side of the runway).



BEFORE TAKE OFF

- **If the brake fans are running ◁:**

  – **BRAKE TEMP . . . . CHECK**

  - **If BRAKE TEMP above 150°C :**

    – **Delay takeoff**

  - **If BRAKE TEMP below 150°C :**

    – **BRAKE FANS . . . . OFF**

– **TAKEOFF OR LINE UP CLEARANCE . . . . OBTAIN**

– **APPROACH PATH CLEAR OF TRAFFIC . . . . CHECK**

– **CABIN CREW . . . . ADVISE**

– **ENG START selector . . . . AS RQRD**
Select IGN/START if :
· Runway with standing water, or in case of heavy rain
· Heavy rain, or severe turbulence is expected after takeoff.

<u>Note</u> : *Continuous ignition is automatically selected, if the ENG ANTI ICE pushbutton is ON.*

– **TCAS (◁) Mode selector . . . . TA or TA/RA**
FAA recommends selecting TA only mode :
– In case of known nearby traffic, which is in visual contact ;
– At particular airports, and during particular procedures identified by an operator as having a significant potential for unwanted, or inappropriate RAs. (Closely-spaced parallel or converging runways...)

R – **PACK 1 and 2 . . . . AS RQRD**
R Consider selecting packs OFF or APU bleed ON.
R This will improve performance when using TOGA thrust.
R In the case of a FLEX takeoff, selecting packs OFF or APU bleed ON will reduce takeoff
R EGT, and thus reduce maintenance costs.
R The use of APU bleed is not authorized if wing anti-ice is to be used.
R Select APU bleed on, at least 20 seconds before takeoff power application. This will
R prevent triggering the ENG THRUST LOST ECAM warning due to incorrect valve
R positions.

– **EXTERIOR LIGHTS . . . . SET**
Set the RWY TURN OFF, LAND, and NOSE switches to ON/TO, in order to minimize bird strike hazard during takeoff.
R Set the STROBE lights to ON, before entering the runway.

– **SLIDING TABLE ⊲ . . . . STOWED**

– **ATC . . . . When cleared for takeoff : ON (or XPDR or XPNDR ⊲)**
It is not applicable to ATC panels equipped with an AUTO position, if AUTO is selected.

– **BEFORE TO C/L below the line . . . . COMPLETE**
Read the checklist below the line, when line up or takeoff clearance is received.

TAKEOFF

– **ANNOUNCE . . . . "TAKEOFF"**

– **BRAKES . . . . RELEASE**

R Rolling takeoff is recommended, when possible.

● **If the crosswind is at, or below, 20 knots and there is no tailwind :**

– **THRUST LEVERS . . . . FLX or TOGA**

· To counter the nose-up effect of setting engine takeoff thrust, apply half forward stick until the airspeed reaches 80 knots. Gradually release the stick to reach neutral at 100 knots.

· For crosswind takeoffs, routine use of into-wind aileron is not recommended. In strong crosswind conditions, small amounts of lateral control may be used to maintain wings level, but the pilot should avoid using excessive amounts. This causes excessive spoiler deployment, which increases the aircraft's tendency to turn into wind.

· PF progressively adjusts engine thrust in two steps :

– From idle to about 50 % N1 (1.1 EPR).

– From engines at similar N1 to takeoff thrust.

· Once the thrust is set, the Captain maintains his hand on the thrust levers until the aircraft reaches V1.

● **In case of tailwind, or if crosswind is greater than 20 knots :**

– **THRUST LEVERS . . . . FLX or TOGA**

· PF applies full forward stick.

R · For crosswind takeoffs, routine use of into-wind aileron is not recommended. In
R strong crosswind conditions, small amounts of lateral control may be used to
R maintain wings level, but the pilot should avoid using excessive amounts. This
R causes excessive spoiler deployment, which increases the aircraft's tendency to
R turn into wind.

· PF sets 50 % N1 (1.1 EPR) on both engines, then rapidly increases thrust to about 70 % N1 (1.3 EPR), then progressively to reach takeoff thrust at 40 knots ground speed, while maintaining stick full forward up to 80 knots. Gradually release the stick to reach neutral at 100 knots.

· Once the thrust is set, the Captain maintains his hand on the thrust levers until the aircraft reaches V1.

Note : The ENG page replaces the WHEEL page on the ECAM's lower display.

– **DIRECTIONAL CONTROL . . . . USE RUDDER**

– **CHRONO . . . . START**

– **PFD/ND . . . . SCAN**
· Check the flight mode annunciator on the PFD. MAN TOGA (MAN FLX xx), SRS, RWY (or blank) 1FD2.
· Check the FMGS position update (aircraft on runway centerline).

● **Reaching 80 knots :**

– **TAKEOFF N1 . . . . CHECK**
Check that the actual N1 of individual engines has reached the N1 rating limit before the aircraft reaches 80 knots. Check EGT.

Note : *If there is a discrepancy of more than 1 % of N1 between the engines, it should be entered in the logbook after flight.*

– **ANNOUNCE . . . . "POWER SET"**

– **PFD and ENG indications . . . . SCAN**
· Scan airspeed, N1, and EGT throughout the takeoff.

– **ANNOUNCE . . . . "ONE HUNDRED KNOTS"**
· The PF crosschecks the speed indicated on the PFD and announces "checked".
· Below 100 knots, the Captain may decide to abort the takeoff, depending on the circumstances. Above 100 knots, rejecting the takeoff is a more serious matter.

– **ANNOUNCE . . . . "V1"**
V1 synthetic voice is triggered.

– **ANNOUNCE . . . . "ROTATE"**

– **ROTATION . . . . PERFORM**
· At VR, initiate the rotation with a positive sidestick input to achieve a continuous rotation rate of about 3°/sec, towards a pitch attitude of 15° (12.5° if one engine is failed).
· Minimize lateral inputs on ground and during the rotation, to avoid spoiler extension.
· After lift-off, follow the SRS pitch command bar.

> CAUTION
> If a tailstrike occurs, avoid flying at an altitude requiring a pressurized cabin, and return to the originating airport for damage assessment.

– **ANNOUNCE . . . . "POSITIVE CLIMB"**
Announce positive climb, when the vertical speed indication is positive and the radio altitude has increased.

– **ORDER . . . . «GEAR UP»**

– **LDG GEAR . . . . SELECT UP**

– **GRND SPLRS . . . . DISARM**

– **EXTERIOR LIGHTS . . . . SET**
R · Set NOSE and RWY TURN OFF light switches to OFF.
R · LAND lights may be left ON, according to the airline policy/regulatory recommendation.

– **AP . . . . AS RQRD**
Above 100 feet, AP 1 or 2 may be engaged.

– **ANNOUNCE . . . . FMA**

– **ANNOUNCE . . . . “GEAR UP”**

● **At thrust reduction altitude (LVR CLB flashing on FMA).**

– **THRUST LEVERS . . . . CL**
The thrust levers should be moved to the CL detent, when the flashing LVR CLB prompt annunciates on the FMA. Autothrust is now active.
In manual flight, the pitch attitude change must be anticipated, to prevent a speed decay at thrust reduction.

– **PACK 1 and 2 (if applicable) . . . . ON**
· Select PACK 1 ON, after CLB thrust reduction
· Select PACK 2 ON, after FLAP retraction

Note : 1. *Selecting both packs ON simultaneously may affect passenger comfort.*
2. *If packs are not switched ON after takeoff phase, an ECAM caution will be triggered.*

R ● **At acceleration altitude :**

R – **ANNOUNCE FMA . . . . "THR CLB/OP CLB" or "THR CLB/CLB"**
R Check target speed change from V2 + 10 to the first CLB speed (either preselected
R or managed).

R *Note : 1. For most normal operations, thrust reduction and acceleration altitudes will*
R *be the same. So the FMA will change from MAN FLX/SRS/RWY to THR*
R *CLB/CLB/NAV (or THR CLB/OP CLB/NAV).*
R *2. If the FCU-selected altitude is equal or close to acceleration altitude, the*
R *FMA will switch from SRS to ALT*.*

● **Above acceleration altitude (or once in CLB phase) :**
The following procedure ensures that the aircraft is effectively accelerating toward CLB speed.

• **At F speed**

Note : For takeoff in CONF 1+F, the "F" speed is not displayed.

– **ORDER . . . . "FLAPS 1"**

– **FLAPS 1 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "FLAPS 1"**

• **At S speed**

– **ORDER . . . . "FLAPS ZERO"**

– **FLAPS ZERO . . . . SELECT**

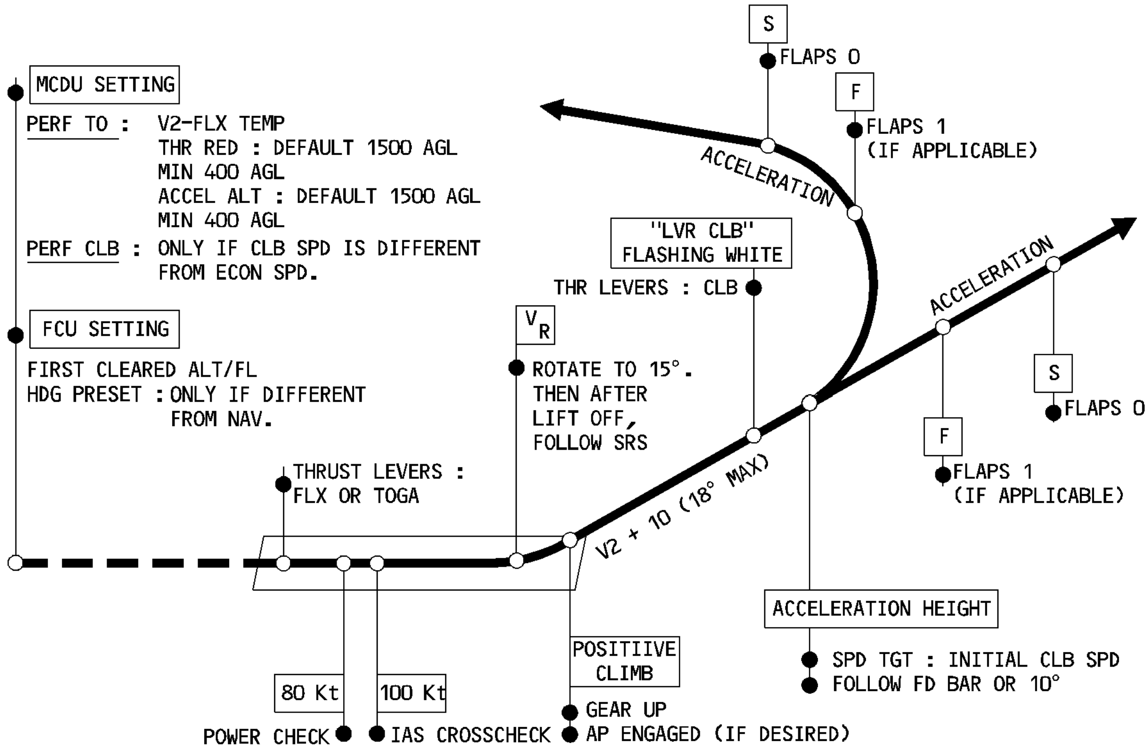
– **CONFIRM/ANNOUNCE . . . . "FLAPS ZERO"**

Note : The CRUISE page replaces the ECAM ENG page, when reaching 1500 feet.

R

GFC5-03-0312-005-A001AA

NORMAL TAKE OFF PATTERN



NOTE : IN CASE OF IMMEDIATE LANDING, IF THE PATTERN IS MADE BELOW 1500 Ft, SELECT ECAM RECALL DURING DOWNWIND LEG.

AFTER TAKE OFF

- **APU BLEED . . . . AS RQRD**
  If the APU has been used to supply air conditioning during takeoff, set the APU BLEED to OFF. For use of the APU BLEED, refer to the APU LIMITATION Chapter (3.01.49).

- **APU MASTER switch . . . . AS RQRD**

- **ENG START selector . . . . AS RQRD**
  Select IGN/START, if severe turbulence or heavy rain is encountered.

- **TCAS (◁) Mode selector . . . . TA/RA**
  Select TA/RA, if the takeoff has been performed with TA only.

- **ANTI ICE PROTECTION . . . . AS RQRD**
R ENG ANTI ICE should be ON, when icing conditions are expected with a TAT at, or
R below, 10°C.

  Note : With ENG ANTI ICE ON, the FADEC automatically selects continuous ignition. The IGNITION memo appears on ECAM.

- **AFTER TAKEOFF/CLIMB CHECKLIST down to the line . . . . COMPLETE**

CLIMB

– **Normal vertical climb mode is CLB or OP CLB with managed speed active.**

– **PF MCDU . . . . PERF CLB**
· PF MCDU should be preferably set on PERF CLB page (allowing to monitor when the FCU selected altitude is reached) but other pages as F-PLN may be selected as tactically necessary.
With the AP engaged, the PF will make any required F-PLN revisions.
· OPT FL and MAX REC FL are displayed on MCDU PROG page. It is worth noting that OPT FL displayed is function of the CI.
· The displayed MAX REC FL gives at least 0.3 g buffet margin. A cruise flight level entry may be made above this level in the MCDU and will be accepted by the FMGS, provided it does not exceed the level at which the margin is reduced to 0.2 g.

– **PNF MCDU . . . . F-PLN**
PNF MCDU should be preferably set on F-PLN page (allowing to be carried out any ATC long term lateral or vertical revisions).

– **CLIMB SPEED MODIFICATIONS :**

● **If a speed change is required by ATC, or for turbulence or operational considerations (e.g. increase CLB rate) :**
Select new speed with FCU SPD selection knob and pull.
Speed target is now selected.

● **To resume to MANAGED SPD profile :**
Push FCU SPD selection knob. Speed target is now managed.

Note : *The best rate of climb speed for long term situations lies between green dot and ECON speed. Acceleration from green dot to ECON speed at high altitude can take a long time.*

– **BARO REF . . . . SET**
· At transition altitude (baro setting flashing on PFD) set STD on EFIS control panels and on standby altimeter.
· Cross check baro settings and altitude readings.

– **CRZ FL . . . . SET AS RQRD**
- If ATC clears the aircraft to intended CRZ FL or above, there is no need to modify the CRZ FL inserted in INIT A page during cockpit prep. Higher CRZ FL will be taken automatically into account by FCU ALT knob selection.
- If ATC limits CRZ FL to a lower level than the one inserted in the INIT A page (or present on PROG page) it is necessary to insert this lower CRZ FL in the PROG page. Otherwise there is no transition into CRZ phase : consequently the managed speed targets and Mach are not modified and SOFT N1 mode is not available.
In that case FMA will display ALT instead of ALT CRZ in the 2nd column.

– **AFTER TAKE OFF/CLIMB C/L below the line . . . . COMPLETE**

– **ENG ANTI ICE . . . . AS RQRD**
ENG ANTI ICE should be ON when the aircraft encounters icing conditions, unless the SAT is below – 40°C.

– **RADAR TILT . . . . ADJUST**
The tilt angle depends on aircraft altitude and on the selected range on ND. A slightly negative tilt is required to avoid overscanning and to provide some ground returns at the top edge of the ND.

R ● **At 10000 ft :**

R – **LAND light . . . . OFF**

R – **SEAT BELTS . . . . AS RQRD**

R – **EFIS option . . . . ARPT**

R – **ECAM MEMO . . . . REVIEW**

– **RAD NAV . . . . CHECK**
Clear manually tuned VORs from MCDU RAD/NAV page.

– **SEC F-PLN . . . . AS RQRD**
Recopy the active flight plan in the secondary if an immediate return flight plan has previously been constructed.

– **OPT/MAX ALT . . . . CHECK**

CRUISE

– **ECAM MEMO . . . . REVIEW**

– **ECAM SYS PAGES . . . . REVIEW**

Periodically review the system display pages and, in particular :

ENG : Oil press and temperature
BLEED : BLEED parameters
ELEC : Parameters, GEN loads
HYD : Fluid quantity. Green system is lower than on ground, following landing gear retraction.
COND : Duct temperature, compared with zone temperature. Avoid large differences for passenger comfort.
FLT CTL : Note any unusual control surface position.
FUEL : Fuel distribution, trim tank quantity, and CG.

– **FLIGHT PROGRESS . . . . CHECK**

Note : VLS shown on the PFD ensures a 0.3g buffet margin and therefore, no additional margin is necessary in cruise.

Monitor flight progress in the conventional way.
When overflying a waypoint :
· Check track and distance to the next waypoint.
R When overflying a waypoint, or every 30 minutes :
· Check fuel : Check FOB (ECAM), and fuel prediction (FMGC), and compare with the computer flight plan or the in-cruise quick-check table (Refer to 3.06.20).(3.06.20).
· Check that the sum of the fuel on board and the fuel used is consistent with the fuel on board at departure. If the sum is either unusually smaller than the fuel on board at departure, or if it decreases, suspect a fuel leak. R

CAUTION
This check must also be performed each time a FUEL IMBALANCE procedure is necessary. Perform the check before applying the FUEL IMBALANCE procedure. If a fuel leak is confirmed, apply the FUEL LEAK procedure.

– **STEP FLIGHT LEVEL . . . . AS APPROPRIATE**

– **NAVIGATION ACCURACY . . . . CHECK**

On aircraft equipped with GPS PRIMARY, the navigation accuracy check is not required, as long as GPS PRIMARY is available.

Otherwise, navigation accuracy must be monitored, particularly when any of the following occurs :

· IRS only navigation
· The PROG page displays LOW accuracy, or
· "NAV ACCUR DOWNGRAD" message appears.

Methods for checking accuracy :

· Manually tune VOR (VOR/DME or ADF) that is within range on RAD NAV page and select associated needles on ND.
  Check that the needle (raw data) overlies the corresponding blue navaid symbol (FM computed) and that the DME distance is equal to the distance in between the aircraft symbol and the navaid symbol on the ND, or
· Insert a VOR/DME ident in the BRG/DIST TO field of the PROG page, and compare the computed BRG (DIST) with the raw data on the ND. This last method allows the FM error to be quantified.

If the check is positive (error ≤ 3NM EN ROUTE) : FM position is reliable.

– ND ARC or NAV and managed lateral guidance may be used.

If the check is negative (error > 3NM EN ROUTE) : FM position is not reliable.

– Use raw data for navigation and monitor it.
– If there is a significant mismatch between the display and the real position : Disengage MANAGED NAV mode and use raw data navigation (possibly switch to ROSE VOR so as not to be misled by FM data).

– **RADAR TILT . . . . ADJUST**

Below 20000 feet	:	A near zero degree tilt setting should be adjusted. Should two different ranges be selected on both NDs it is recommended to set a down tilt with the shorter ND range (in order to monitor and detect weather activity) and a near zero tilt with the longer ND range (in order to monitor course changes).
Above 20000 feet	:	A slight downward tilt is recommended.

– **CABIN TEMP . . . . MONITOR**

Pay regular attention to the ECAM CRUISE page in order to monitor passenger cabin temperatures and adjust them, as necessary.

R ● **If the oxygen mask has been used :**

R – **OXYGEN MASK . . . . CHECK**
R Check that the oxygen mask has been properly stowed, as indicated in the FCOM
R 1.35.20.

DESCENT PREPARATION

Descent preparation and approach briefing can take approximately 10 minutes, so they should be initiated approximately at 80 NM before Top of Descent.

– **LDG ELEV . . . . CHECK**
  Check on ECAM CRUISE page that LDG ELEV AUTO is displayed.

– **WEATHER AND LANDING INFORMATION . . . . OBTAIN**
  Check weather reports at ALTERNATE and DESTINATION airports. Airfield data if any should give RWY in use for arrival.

FMGS

– **ARRIVAL page . . . . COMPLETE/CHECK**
  Insert APPR, STAR, TRANS and APPR VIA if applicable (access by LAT REV at destination.)

– **PERF DES page . . . . CHECK**
  Prior to descent, access PERF DES page and check ECON MACH/SPD.
  If a different speed from ECON is required, insert that MACH or SPD into the ECON field. This new MACH and/or SPD is the one applicable for the descent path and TOD computation, and will be used for the managed speed descent profile (instead of ECON).
  Below 10 000 ft a 250 kt SPD limit is defaulted in the managed speed descent profile: it may be deleted or modified if necessary on VERT REV at DEST.

– **PERF APPR page . . . . COMPLETE/CHECK**
  – Enter the QNH, temperature, and wind at destination.

  Note : *The entered wind should be the average wind given by the ATC or ATIS. Do not enter gust values, for example, if the wind is 150/20-25, insert the lower speed 150/20 (ground speed mini-function will cope with the gusts).*

  – Insert the MDA (MDH if QFE used) or DH, whichever applies.

R Note : *To avoid undershooting the MDA (MDH) during go-around, due to the aircraft*
R *inertia during pull-up, the flight crew should add an additional number of feet*
R *(defined by the operator) to the published MDA (MDH).*

WARNING

If QNH altimeter setting is used with an aircraft with QFE option, refer to 3.04.34.

  Note : *Changing the RWY or type of arrival (VOR, ILS) automatically erases the previous MDA/MDH or DH.*

  – Check or modify the landing configuration. Always select the landing configuration on the PERF APP page :
    · The pilot may choose FLAP 3, rather than FLAP FULL for landing, depending on the available runway length and go-around performance, or if windshear/severe turbulence is considered possible on the approach.
    · The ECAM may require a specific landing configuration, in case of a system failure:
      * First read the VLS CONF FULL value on the PERF APP page to determine the VAPP (or use QRH 2.40).
      * Then, keep CONF FULL on the PERF APP page, for landing in CONF 2 or FULL, or
      * Select CONF 3 on the PERF APP page, for landing in CONF 3.

    As a general rule, managed speed can be used if the landing configuration and the configuration selected on the PERF APP page are the same. (If they are not the same, the managed speed will not drop down to the approach speed).
  – Check VAPP.
    VAPP is computed as follows :
    VAPP = VLS + 1/3 of headwind component. The wind correction is limited to a minimum of 5 knots and a maximum of 15 knots, and is derived from the wind entered on the PERF APPR page.
    When using selected speed to compute VAPP, it is recommended that the same method be used to compute VAPP, as when in managed speed. The pilot can modify VAPP.
    The new value will be taken into account for the ground speed mini-function.

– **PERF GO-AROUND page . . . . CHECK/MODIFY**
  Check THR RED ALT and ACC ALT, and modify if necessary.

– **RADIO NAV page . . . . CHECK**
Set navaids, as required, and check idents on the NDs (VOR-ADF) and PFDs (ILS).
For an ILS approach, check the frequency and course of the selected ILS.
If a VOR/DME exists close to the airfield, select it and enter its ident in the BRG/DIST field of the PROG page, for NAV ACCY monitoring during descent.

– **SEC F PLN page . . . . AS RQRD**
The SEC F-PLN should be set before the top of descent, either to an alternate runway for destination, or to the landing runway in case of circling. In all cases, the routing to the alternate should be available. If there is a last-minute runway change, then the flight crew only needs to activate the secondary F-PLN, without forgetting to set new MDA/DH and navaids.

– **APPROACH BRIEFING . . . . PERFORM**
It is recommended to use FMGS pages as a guide for descent and approach briefing
· PERF page : Safe altitude is... Transition altitude is...
· RAD NAV page ILS, VOR, ADF + associated crossing altitudes.
· F PLN page to check STAR - APPR - missed approach.
· FMA MDA/DH.
· Go-around (Standard call/task sharing, Diversion decision).
· Terminal area topography to ensure a proper terrain awareness.
· Weather at destination.
· Fuel needed for diversion. Holding fuel avaibility (FUEL page).
· Landing configuration including ground spoilers, reverser application and autobrake selection.
· Runway condition, lighting, and dimensions
· For airlines having different A330 models, mention whether the aircraft is an A330-200, or an A330-300.
Awareness of the aircraft model may prevent tailstrike.

– **DESCENT CLEARANCE . . . . OBTAIN**
When clearance is obtained, set the ATC-cleared altitude (FL) on FCU (considering also what is the safe altitude).
If the lowest safe altitude is higher than the ATC-cleared altitude, check with the ATC that this constraint applies.
If it is confirmed, set the FCU altitude to the safe altitude, until it is safe to go to the ATC-cleared altitude.

– **ANTI ICE PROTECTION . . . . AS RQRD**
· During descent ENG ANTI ICE must be ON, when icing conditions are encountered.
· With engine ANTI ICE ON, the FADEC automatically controls continuous ignition and selects a higher idle thrust, which gives better protection against engine flame-out.
· IGNITION memo appears on ECAM.
· ANTI ICE ON reduces the descent path angle when at idle. The pilot can compensate for this by increasing descent speed, or by extending up to half speedbrakes.

DESCENT INITIATION

– **DESCENT . . . . INITIATE**
The normal method of initiating the descent is to select DES mode at the FMGS calculated TOD.

■ **If ATC requires an early descent :**
DES mode is used and will guide the aircraft down with a reduced V/S in order to converge with the required descent path. (V/S - 1000 ft/min may also be used).

■ **If the descent is delayed by ATC :**
Beyond TOD, a DECELERATE message comes up on PFD and MCDU. This suggests to the crew to reduce the speed towards green dot speed (with ATC permission).
When cleared down for descent, select DES mode with managed speed active.

DESCENT MONITORING

– **PF MCDU . . . . PROG/PERF DES**
R PF MCDU should be preferably set to PROG or PERF DES page :
· PROG page in order to get VDEV information
· PERF DES in order to get predictions down to any inserted altitude in DES/OP DES modes.

– **PNF MCDU . . . . F-PLN**
With AP engaged the PF will usually make any required F-PLN revisions.

Note : On NDs a level off symbol ↳ is provided along F-PLN assuming current active AP/FD and A/THR modes.

– **DESCENT . . . . MONITOR**
(Refer to FCOM 4 05.60)
 – When flying in NAV mode, DES mode is normally used.
R The aircraft descends along the descent flight path : VDEV is provided on PFD and on PROG page, and may be thus monitored. All constraints of the FPLN will be taken into account for the guidance.
 – When flying in HDG (TRK) modes, thus out of the lateral F-PLN, DES mode is not available.
R However VDEV is still provided on the PFD, and is useful whenever XTK is small (up to 5 NM)
 The level ↳ symbols, as well as Energy Circle on ND may be used to monitor the descent.
R Predictions on MCDU assume a return to lateral FPLN and descent flight path.
 Note that whenever the lateral mode is changed from NAV to HDG/TRK the vertical mode reverts to V/S at the value pertaining at the time of the mode change.
 – From time to time, during stabilized descent FPA may be selected to check that the remaining distance to destination is approximately the FL change required divided by FPA in degrees.

$$\boxed{\text{FPA}\ (°) = \Delta\ \text{FL/DIST (NM)}}$$

DESCENT ADJUSTMENT

If RATE INCREASE is desired :
- PREFERABLY increase descent SPD (by use of selected speed) if comfort and ATC permit. It is economically better (Time/Fuel).
- Maintain high SPD as long as possible (SPD LIM may be cleared, subject to ATC clearance).
- If aircraft is high with high SPD, it is more efficient to keep high speed until ALT* and THEN decelerate rather than to mix descent and deceleration.
- If A/C goes below the desired profile, use SPEED V/S mode to adjust rate of descent.

– **SPEEDBRAKES . . . . AS RQRD**
In OPEN DES : Use speedbrakes to increase the rate of descent. The pilot may use up to half speedbrake extension to maintain the required rate of descent, when engine anti-ice is used. In DES mode : If the aircraft is on, or below, the flight path and the ATC requires a higher rate of descent, do not use speedbrakes because the rate of descent is dictated by the planned flight path. Thus, the A/THR may increase thrust to compensate for the increase in drag. In this case, use OPEN DES with speedbrakes.

– **RADAR TILT . . . . ADJUST**
Every 10000 feet of the planned descent, and down to about 15000 feet, adjust tilt upwards to eliminate ground clutter on the upper part of the ND. Every 5000 feet below 15000 feet, adjust tilt angle one degree upwards, to keep the ND relatively free of ground clutter.

– **BARO REF . . . . SET**
R · Set QNH on the EFIS control panel and on the standby altimeter, when approaching the transition level and when cleared for an altitude.
· Crosscheck baro settings and altitude readings.

<u>Note</u> : *When operating in low OAT, altitude corrections, as defined in 3.05.05 page 6, should be considered.*

● **If EGPWS available :**

R – **TERR ON ND . . . . ON**
R If the use of radar is required, consider selecting radar display on PF side, and TERR
R ON ND on PNF side only.

– **ECAM STATUS . . . . CHECK**
· ECAM STATUS page automatically appears, if not empty, when the BARO setting is selected.
· Check ECAM status page before completing approach checks. Take particular note of any degradation in landing capability, or any other aspect affecting approach and landing.

● **At 10000 feet :**

– **LAND LIGHTS . . . . ON**

– **SEATBELTS . . . . AS RQRD**

– **EFIS option . . . . CSTR**

– **LS pushbutton . . . . AS RQRD**
Select LS, if an ILS or LOC approach is intended. PFD displays the LOC and glide scales and deviation symbol, if there is a valid ILS signal.

– **RAD NAVAIDS . . . . SELECTED/IDENTFIED**
Ensure that appropriate radio navaids are tuned and identified.

– **NAV ACCURACY . . . . CHECK**
On aircraft equipped with GPS primary, no navigation accuracy check is required as long as GPS PRIMARY function is available.
Otherwise, crosscheck NAV ACCURACY using the PROG page (BRG/DIST computed data) and the ND (VOR/DME raw data).
The navigation accuracy check determines which autopilot mode the flight crew should use for the approach, and the type of displays to be shown on the ND.

GENERAL

For precision approaches and more information on how to use the FMGS, see FMGS pilot's guide (Refer to 4 05.70) . The described approach procedures assume the use of managed speed guidance which is recommended.

INITIAL APPROACH

– **ENG START selector . . . . AS RQRD**
Select IGN if runway covered with standing water, heavy rain or severe turbulence is expected in approach or go around area.

– **SEAT BELTS . . . . ON/AUTO**

R – **APPROACH PHASE . . . . CHECK/ACTIVATE**
· If in NAV, when overflying DECEL pseudo waypoint, the APPR phase will activate automatically.
· If in HDG/TRK mode, at approximately 15 NM from touchdown activate and confirm
R APPROACH phase on MCDU. (PERF DES page).

– **POSITIONING . . . . MONITOR**
· In NAV mode, use V DEV information on PFD and PROG page.
· In HDG or TRK mode, use the energy circle on ND representing the required distance to land.

– **MANAGED SPEED . . . . CHECK**
If ATC requires a particular speed to be flown then use selected speed. When the ATC speed constraint (e.g. "maintain 170 knots to the outer marker") no longer applies, return to managed speed.

– **SPEED BRAKES . . . . AS RQRD**

– **NAV ACCURACY . . . . MONITOR**

· When GPS PRIMARY is available, no NAV ACCURACY monitoring is required.

· When GPS PRIMARY is lost, check the PROG page to verify that the required navigation accuracy is appropriate to the flight phase. Monitor NAV accuracy, and be prepared to change ILS interception strategy. If NAV ACCUR DOWNGRAD occurs, use raw data to crosscheck navigation accuracy.
Navigation accuracy determines which autopilot mode the flight crew should use, the type of displays to be shown on the ND, and the use of EGPWS.

R

<table>
<tr><th rowspan="2">NAVIGATION ACCURACY</th><th colspan="2">ND</th><th rowspan="2">AP/FD mode</th><th rowspan="2">TERR pushbutton</th></tr>
<tr><th>PF</th><th>PNF</th></tr>
<tr><td>GPS PRIMARY</td><td colspan="2" rowspan="3">ARC or ROSE NAV with navaid raw data</td><td rowspan="3">NAV</td><td rowspan="3">ON</td></tr>
<tr><td>NAV ACCUR HIGH</td></tr>
<tr><td>NAV ACCUR LOW and NAV ACCURACY check ≤ 1 NM</td></tr>
<tr><td>GPS PRIMARY LOST and NAV ACCUR LOW and NAV ACCURACY check > 1 NM</td><td rowspan="2">ROSE ILS</td><td rowspan="2">ARC or ROSE NAV or ROSE ILS with navaid raw data</td><td rowspan="2">HDG or TRK</td><td rowspan="2">OFF</td></tr>
<tr><td>GPS PRIMARY LOST and Aircraft flying within unreliable radio navaid area</td></tr>
</table>

– **RADAR TILT . . . . ADJUST**

Increase tilt, as required (+ 3° to + 4°).

– **APPROACH CHECKLIST . . . . COMPLETE**

INTERMEDIATE/FINAL APPROACH (ILS approach entered in the flight plan)

The objective is to be stabilized on the final descent path at VAPP, thrust above idle, with landing configuration at 1000 feet after continuous deceleration on the glideslope.

R To be stabilized, all of the following conditions must be achieved prior to, or upon, reaching
R this stabilization height :
R – The aircraft is on the correct lateral flight plan,
R – The aircraft is in the desired landing configuration,
R – The thrust is stabilized above idle, to maintain the target speed on the desired glide path,
R – No excessive flight parameter deviation.

The advantages are :
· Lower fuel consumption ; lower noise levels ; time saving
· Flexibility and ability to vary speed to suit ATC.

If the aircraft is not stabilized on the approach and in landing configuration, at 1000 feet in instrument conditions, or 500 feet in visual conditions, or as restricted by airline
R policy/regulations, a go-around must be initiated.

– **APPR pushbutton on FCU . . . . PRESS**
  · APPR pushbutton is to be pressed only when ATC clears the aircraft for the approach. This arms LOC and G/S modes.
  · LOC and/or G/S capture modes will engage, at the earliest, 3 sec. after arming them.

  Note : *ICAO defines the envelope where the quality of the G/S signal ensures a normal capture. This envelope is within 10 NM, +/– 8 deg of the centerline of the ILS glide path and up to 1.75 Θ and down to 0.3 Θ (Θ = nominal glide path angle). When arming the approach well outside of the normal G/S capture envelope, a spurious G/S* engagement may occur due to a wrong G/S deviation signal. This spurious G/S capture will order a pitch up, if the aircraft is below the glide beam, and a pitch down attitude, if the aircraft is above the glide beam. Whenever the pilot notices the pitch movement, or the spurious G/S*, or the trajectory deviation, he will immediately disconnect the AP, if engaged, to re-establish a normal attitude and will disengage APPR mode. It is then recommended to arm/rearm APP (ILS) mode within the normal capture zone.*

– **Both AP . . . . ENGAGE**
  When APPR mode is selected, both autopilots should be engaged.

AT GREEN DOT SPEED

– **ORDER . . . . "FLAPS 1"**

– **FLAPS 1 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "FLAPS 1"**
· FLAPS 1 should be selected no later than 3 NM prior to FAF (Final Approach Fix).
· Check deceleration towards "S" speed.
· The aircraft will reach, or be established on, the glideslope with FLAPS 1 and S speed at or above 2000 feet AGL.
· In the event that aircraft speed is significantly higher than S on the G/S, or the aircraft does not decelerate on the G/S, extend the landing gear to slow down the aircraft. Use of speedbrakes is not recommended, as it will cause an undesired VLS increase.

R – **TCAS Mode selector . . . . TA or TA/RA**
FAA recommends selecting TA only mode :
· In case of known nearby traffic, which is in visual contact ;
· At particular airports, and during particular procedures identified by an operator as having a significant potential for unwanted, or inappropriate RAs (Closely-spaced, parallel runways, converging runways, low terrain along the final approach...).

– **FMA . . . . CHECK**

– **LOC CAPTURE . . . . MONITOR**

– **ANNOUNCE . . . . « LOC* »**

– **G/S CAPTURE . . . . MONITOR**

● **If above the glideslope :**

– **V/S mode . . . . SELECT**

– **FCU ALTITUDE . . . . SET ABOVE A/C ALTITUDE**

– **ANNOUNCE . . . . « G/S* »**

– **GO AROUND ALTITUDE . . . . SET**
Set GA altitude on FCU.

Note : · If the aircraft intercepts the ILS above radio altimeter validity range (no radio altitude indication available on the PFD), CAT 1 is displayed on FMA. Check that the FMA displays the correct capability for the intended approach when the aircraft is below 5000 feet.

AT 2000 FT AGL MINIMUM

– **ORDER . . . . "FLAPS 2"**

– **FLAPS 2 . . . . SELECT**

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS 2"**
- Check deceleration towards F speed.
- If the ILS glideslope is intercepted from below 2000 feet AGL, select FLAPS 2 at one dot below the glideslope.
- In the event that the aircraft speed is significantly higher than S on the G/S, or the aircraft does not decelerate on the G/S, extend landing gear in order to slow down the aircraft. Speed brake use is not recommended.

WHEN FLAPS ARE AT 2

– **ORDER** . . . . **"GEAR DOWN"**

– **L/G DOWN** . . . . **SELECT**

– **GROUND SPOILERS** . . . . **ARM**

– **AUTO BRK** . . . . **AS RQRD**

The Use of the autobrake is recommended.
Use of MAX mode is not recommended at landing.
On short or contaminated runways, use MED mode.
On long and dry runways, LO mode is recommended.

Note : *If, on very long runways, the pilot anticipates that braking will not be needed, use of the autobrake is unnecessary.*

Press the appropriate pushbutton, according to runway length and condition, and check that the related ON light comes on.

– **CONFIRM/ANNOUNCE** . . . . **"GEAR DOWN"**

WHEN LANDING GEAR IS DOWN

– **ORDER** . . . . **"FLAPS 3"**

– **FLAPS 3** . . . . **SELECT**
· Select FLAPS 3 below VFE.

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS 3"**

– **ECAM WHEEL page** . . . . **CHECK**
· The ECAM WHEEL page appears below 800 feet, or at landing gear extension.
· Check for three landing gear green indications.

– **ORDER** . . . . **"FLAPS FULL"**

– **FLAPS FULL** . . . . **SELECT**
· Select FLAPS FULL below VFE.
· It is recommended to retract the speedbrakes before selecting FLAPS FULL.

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS FULL"**
Check deceleration towards VAPP.

– **A/THR** . . . . **CHECK IN SPEED MODE OR OFF**

– **WING ANTI ICE** . . . . **OFF**
Switch WING ANTI ICE ON, only if severe icing conditions exist.

– **EXTERIOR LIGHTS** . . . . **SET**
Set NOSE switch to TAXI
RWY TURN OFF switch to ON, and
LAND switch to ON

– **SLIDING TABLE ◁ . . . . STOWED**

– **LDG MEMO . . . . CHECK NO BLUE LINE**

– **CABIN REPORT . . . . OBTAIN**

– **CABIN CREW . . . . ADVISE**

– **LANDING C/L . . . . COMPLETE**

– **FLIGHT PARAMETERS . . . . CHECK**
PF announces any FMA modification (LAND green at 350 feet and any other change).
PNF calls out if :
· the speed, becomes lower than speed target – 5 knots or greater than speed target + 10 knots.
· the pitch attitude becomes lower than 0° or greater than 10° nose up.
· the bank angle becomes greater than 7°.
· the descent rate becomes greater than 1000 ft/min.
· excessive LOC or GLIDE deviation occurs.

AT DH + 100 FT (or MDA/MDH + 100 FT) :

– **MONITOR or ANNOUNCE . . . . « ONE HUNDRED ABOVE »**

AT DH (or MDA/MDH)

– **MONITOR or ANNOUNCE . . . . « MINIMUM »**

– **ANNOUNCE . . . . « LANDING » or « GO AROUND/FLAPS »**
Maintain a stabilized flight path down to flare.
At 50 feet, one dot below the glideslope is 14 feet below the glideslope.
Do not duck under the glideslope.

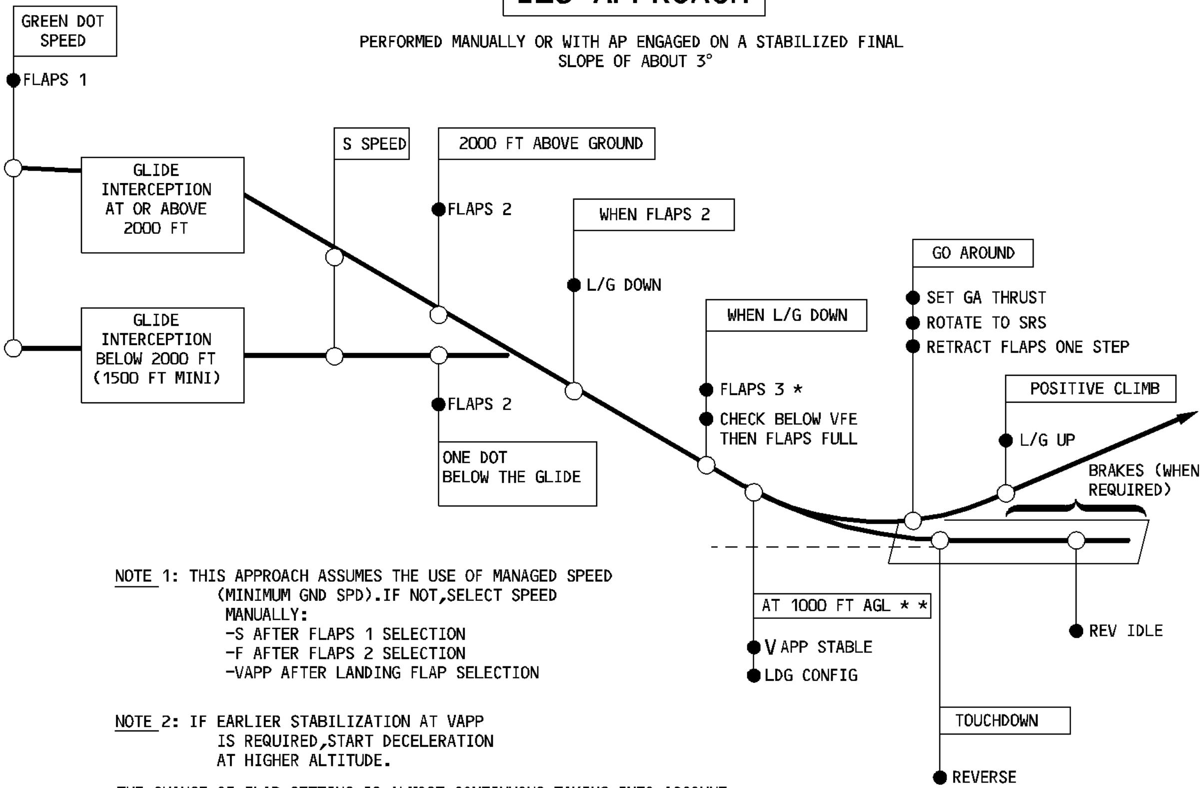
R

DAH ALL

GFC5-03-0318-008-A001AA

ILS APPROACH

PERFORMED MANUALLY OR WITH AP ENGAGED ON A STABILIZED FINAL SLOPE OF ABOUT 3°



NOTE 1: THIS APPROACH ASSUMES THE USE OF MANAGED SPEED (MINIMUM GND SPD).IF NOT,SELECT SPEED MANUALLY:

- -S AFTER FLAPS 1 SELECTION
- -F AFTER FLAPS 2 SELECTION
- -VAPP AFTER LANDING FLAP SELECTION

NOTE 2: IF EARLIER STABILIZATION AT VAPP IS REQUIRED,START DECELERATION AT HIGHER ALTITUDE.

* THE CHANGE OF FLAP SETTING IS ALMOST CONTINUOUS TAKING INTO ACCOUNT THE EXTENSION TIME OF THE SURFACES. HOWEVER,VFE NEXT WHICH IS DISPLAYED ON THE PFD HAS TO BE CONSIDERED IN CERTAIN CASES (A/C HEAVY).

* * 1000 FT AGL MINIMUM IMC, 500 FT AGL MINIMUM VMC (OR AS RESTRICTED BY AIRLINE POLICY/REGULATION).

INTRODUCTION

APPROACH GUIDANCE FOR NON PRECISION APPROACHES OTHER THAN LOC, LOC B/C AND RNAV NON PRECISION APPROACHES

Three different approach strategies are available to perform non-precision approaches :
1. Lateral and vertical guidance, selected by the crew : TRK-FPA (or HDG-V/S) modes.
2. Lateral guidance, managed by the FM, and vertical guidance selected by the crew : NAV-FPA (or NAV-V/S) modes.
3. Lateral and vertical guidance, managed by the FM : FINAL APP mode.
   In all cases, the recommended flying reference is FPV, which should be selected during the initial approach.

- Approach procedures including a PI-CF leg (PROC-T indicated on the MCDU F-PLN) are not eligible for the use of NAV and FINAL APP modes.
- Lateral managed guidance (NAV) can be used, provided the approach is stored in the navigation database and the final approach is laterally and vertically monitored, using the adequate raw data (reference navaid, altimeter).
- Lateral and vertical managed guidance (FINAL APP) in IMC conditions can be used, provided the following conditions are met :
  - The approach stored in the navigation database has been validated, and is approved by the operator for use of FINAL APP mode.
    R This validation includes evaluation of the OAT effect on obstacle clearance : It is
    R necessary to define a minimum OAT, below which selected vertical guidance must be
    R used.
  - The final approach (FAF to runway or MAP), as extracted from the navigation database and inserted in the primary F-PLN including altitude constraints, is not revised by the crew.
  - Before starting the approach, the crew must check the lateral and the vertical FM F-PLN against the published approach chart, using the MCDU and ND.
  - The approach trajectory is laterally and vertically intercepted, before the FAF, or equivalent waypoint in the FM F-PLN, so that the aircraft is correctly established on the final approach course before starting the descent.
  - The final approach is laterally and vertically monitored, using the appropriate raw data (navaids, distance to the runway or MAP, altitude, FPV).

R <u>Note</u> : *For additional information on recommended flight crew procedures, and on*
R *navigation database flight path validation, refer to the FCOM Bulletin N° 10 and*
R *the FMGS Pilot's Guide (4.02.20 and 4.05.70).*

If the FM/GPS POS DISAGREE ECAM caution is triggered during the approach, use selected guidance to continue the approach with radio navaid raw data.
If GPS PRIMARY is lost, NAV and FINAL APP mode can be used to continue the approach, provided the radio navaid raw date indicates the correct navigation.

APPROACH GUIDANCE FOR RNAV APPROACH

Two different approach strategies are available to perform RNAV approaches :

1. Lateral guidance, managed by the FM, and vertical guidance selected by the crew : NAV-FPA (or NAV-V/S) modes.
   This strategy applies, when LNAV ONLY (Lateral Navigation only) RNAV approach is intended.
2. Lateral and vertical guidance, managed by the FM : FINAL APP mode.
   This strategy applies, when LNAV/VNAV (Lateral and Vertical Navigation) RNAV approach is intended.
   In all cases, the recommended flying reference is FPV, which should be selected during the initial approach.
   RNAV approach can be performed, provided :
   - The approach stored in the navigation database has been validated, and is approved by the operator.
R This validation includes evaluation of the OAT effect on obstacle clearance : It is
R necessary to define a minimum OAT, below which selected vertical guidance must be
R used.
   - The final approach (FAF to runway or MAP), as extracted from the navigation database and inserted in the primary F-PLN including altitude constraints, is not revised by the crew.
   - Before starting the approach, the crew must check the lateral and the vertical FM F-PLN against the published approach chart, using the MCDU and ND.
   - Before starting the approach, two navigation systems must be operative : 2 FMGS and 2 sensors (2 GPS, 2 DME, 2 VOR as appropriate).
   - The approach trajectory is laterally and vertically intercepted, before the FAF, or equivalent waypoint in the FM F-PLN, so that the aircraft is correctly established on the final approach course before starting the descent.
   - The final approach is laterally and vertically monitored, using the appropriate raw data (distance to the runway, altitude, FPV).

R *Note : For additional information on recommended flight crew procedures, and on*
R *navigation database flight path validation, refer to the FCOM Bulletin N° 10*
R *and the FMGS Pilot's Guide (4.02.20 and 4.05.70).*

For RNAV approach with GPS PRIMARY

Unless an instrument approach procedure, not requiring GPS PRIMARY, is available at destination or destination alternate (and at required takeoff alternate, and enroute alternate), the GPS PRIMARY availability must be verified prior to flight.
RAIM is available worldwide, if 24 or more GPS satellites are operative.
If the number of GPS satellites is 23, check RAIM availability, using the approved version of the Honeywell ground-based prediction software.
If the number of GPS satellites is 22 or less, the GPS PRIMARY availability cannot be checked prior to flight. RAIM availability can be checked in flight, using the PREDICTIVE GPS MCDU page.
Before starting the approach, check that GPS PRIMARY is available on both MCDUs.
If the GPS PRIMARY LOST indication appears on the ND during the approach, discontinue the approach, unless :
- For RNAV approach not requiring GPS, HIGH accuracy is displayed on the MCDU with the appropriate RNP value.
- If GPS PRIMARY is lost on only one FMGC, the approach can be continued, using the AP/FD associated to the other FMGC.

If the FM/GPS POS DISAGREE ECAM caution is triggered during the approach, discontinue the approach.

For RNAV approach without GPS PRIMARY

Before starting the approach, check FM position accuracy with radio navaid raw data.
Check, in addition, that HIGH accuracy is displayed on the MCDU with the specified RNP value.
If HIGH accuracy is lost on one FMGC, the approach can be continued with the AP/FD associated to the other FMGC.
If HIGH accuracy is lost on both FMGCs, discontinue the approach.

APPROACH GUIDANCE FOR LOC AND LOC B/C NON PRECISION APPROACHES

The Standard Operating Procedure of this section can be used for flying LOC or LOC B/C approaches, provided the following approach guidance items are observed.
The FM NAV mode can be used down to LOC or LOC B/C interception.
For LOC or LOC B/C intermediate and final approach, use the LOC or LOC B/C AP/FD mode for lateral navigation, associated with the FPA (or V/S) for vertical navigation.
Vertical navigation must be monitored using raw data (altimeter, distance to the runway given by radio-navaid).
The VDEV indication on the PFD must be disregarded, since it may be incorrect if the MAP is located before the runway threshold.

APPROACH SPEED TECHNIQUE

In all cases, the crew should use managed speed.
The standard speed technique is to make a stabilized approach using AP/FD and A/THR :
The aircraft intercepts the final descent path in landing configuration, and at VAPP. For this purpose, the flight crew should insert VAPP as a speed constraint at the FAF.
If the operator adopts a decelerated approach technique and the crew uses managed guidance, the aircraft should intercept the final descent path at S speed in CONF 1.
R The objective is to be stabilized on the final descent path thrust above idle, in the landing
R configuration at 1000 feet.
R To be stabilized, all of the following conditions must be achieved prior to, or upon, reaching
R this stabilization height :
R — The aircraft is on the correct lateral flight plan,
R — The aircraft is in the desired landing configuration,
R — The thrust is stabilized above idle, to maintain the target speed on the desired descent
R path,
R — No excessive flight parameter deviation.
R If the aircraft is not stabilized on the approach and in landing configuration, at 1000 feet in
R instrument conditions, or at 500 feet in visual conditions, or as restricted by airline
R policy/regulations, a go-around must be initiated.

INITIAL APPROACH

– **ENG START selector . . . . AS RQRD**
Select IGN if the runway is covered with standing water, or heavy rain, or if severe turbulence is expected in the approach or go-around area.

– **SEATBELTS . . . . ON/AUTO**

– **APPROACH PHASE . . . . ACTIVATE**
· In NAV mode, the APPR phase automatically activates at the DECEL pseudo waypoint.
· In HDG or TRK mode, manually activate the APPR phase on the PERF APPR page, when the distance to land is approximately 15 NM.

– **POSITIONING . . . . MONITOR**
· In NAV mode, use VDEV information on the PFD and PROG page.
· In HDG or TRK mode, use the energy circle displayed on ND, representing the required distance to land.

– **MANAGED SPEED . . . . CHECK**
If the ATC requires a particular speed, use selected speed. When the ATC speed constraint no longer applies, return to managed speed.

– **SPEEDBRAKES . . . . AS RQRD**

– **NAVIGATION ACCURACY . . . . MONITOR**

· When GPS PRIMARY is available, no accuracy is required.

· When GPS PRIMARY is lost, check the PROG page to ensure that the required navigation accuracy is appropriate to the phase of flight. Perform a navigation accuracy check (as described in 3.03.15).

If the approach is stored in the navigation database, determine the strategy to be used for the final approach, according to the table below :

R

NAVIGATION ACCURACY	Approach guidance	ND		AP/FD mode	TERR pushbutton
		PF	PNF		
GPS PRIMARY	Managed***	ARC or ROSE NAV * With navaid raw data		NAV-FPA or APP-NAV/ FINAL ***	ON
NAV ACCUR HIGH					
NAV ACCUR LOW and NAV ACCURACY check ≤ 1NM					
GPS PRIMARY LOST and NAV ACCUR LOW and NAV ACCURACY check > 1 NM	Selected	ROSE VOR **	ARC or ROSE NAV or ROSE VOR ** With navaid raw data	TRK-PFA	OFF
GPS PRIMARY LOST and aircraft flying within unreliable radio navaid area					

(*) For VOR approaches, one pilot may select ROSE VOR.

(**) For LOC approaches, select ROSE ILS.

(***) Managed vertical guidance can be used, provided the approach coding in the navigation database has been validated.

R <u>Note</u> : *1. During approach in overlay to a conventional radio navaid procedure, monitor raw*
R *data. If raw data indicates unsatisfactory managed guidance, revert to selected*
R *guidance.*

2. The pilot can continue to fly a managed approach, after receiving a NAV ACCUR DOWNGRADED message, if raw data indicates that the guidance is satisfactory.

– **RADAR TILT . . . . ADJUST**

Increase tilt, as required (+ 3° to + 4°).

– **APPROACH CHECKLIST . . . . PERFORM**

INTERMEDIATE/FINAL APPROACH

R ● **For RNAV approach :**

R – **GPS 1+2 on GPS MONITOR page . . . . CHECK BOTH IN NAV**

R – **GPS PRIMARY on PROG page . . . . CHECK AVAILABLE**

R ● **If GPS PRIMARY is not available**

R – **RNP for approach . . . . CHECK/ENTER**

R – **HIGH accuracy . . . . CHECK**

R *Note : RNAV approach without GPS is subject to a specific operational approval.*

● **For approach in managed vertical guidance :**

– **APPR pushbutton on FCU . . . . PRESS**
Once cleared for the approach, press the pushbutton when flying towards the FAF. Check that APPR NAV is engaged, FINAL is armed, and the VDEV scale is on the PFD.

Note : For instructions for switching from a non ILS to an ILS approach, see the FMGS pilot's guide. (Refer to 4.05.70)

AT GREEN DOT SPEED

– **ORDER . . . . "FLAPS 1"**

– **FLAPS 1 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "FLAPS 1"**

– **TCAS Mode Selector . . . . TA OR TA/RA**
· See ILS approach (Refer to 3.03.18)

– **ND DISPLAY . . . . SELECT RANGE/MODE**

AT S SPEED

– **ORDER . . . . "FLAPS 2"**

– **FLAPS 2 . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "FLAPS 2"**

WHEN FLAPS ARE AT 2

– **ORDER . . . . "GEAR DOWN"**

– **L/G DOWN . . . . SELECT**

– **GROUND SPOILERS . . . . ARM**

– **AUTO BRK . . . . AS RQRD**
Use of the autobrake is recommended.
The use of MAX mode is not recommended at landing.
On short or contaminated runways, use MED mode.
On long and dry runways, LO mode is recommended.

Note : If, on very long runways, the pilot anticipates that braking will not be needed, autobrake use is unnecessary.

Firmly press the appropriate pushbutton, depending on the runway length and condition, and check that the related ON light comes on.

– **CONFIRM/ANNOUNCE . . . . "GEAR DOWN"**

WHEN LANDING GEAR IS DOWN

– **ORDER . . . . "FLAPS 3"**

– **FLAPS 3 . . . . SELECT**
· Select FLAPS 3 below VFE.

– **CONFIRM/ANNOUNCE . . . . "FLAPS 3"**

– **ECAM WHEEL page . . . . CHECK**
· The ECAM WHEEL page appears below 800 feet, or at landing gear extension.
· Check for three landing gear green indications.

– **ORDER** . . . . **"FLAPS FULL"**

– **FLAPS FULL** . . . . **SELECT**
· Select FLAPS FULL below VFE. VFE – 15 knots is recommended to minimize flaps wear.
· Retract the speedbrakes before selecting FLAPS FULL to avoid an unexpected pitch down when the speedbrakes automatically retract.

– **CONFIRM/ANNOUNCE** . . . . **"FLAPS FULL"**
· Check deceleration towards VAPP.
R · Check correct TO waypoint on the ND.

MANAGED VERTICAL GUIDANCE	SELECTED VERTICAL OR SELECTED LATERAL AND VERTICAL GUIDANCE
. After the FAF : **– FINAL APP . . . . CHECK** Check FINAL APP green on the FMA. **– GO AROUND ALTITUDE . . . . SET** Set, when below the go-around altitude.	**. At FAF :** **– FPA for final approach . . . . SET** **. After the FAF :** **– GO AROUND ALTITUDE . . . . SET** Set, when below the go-around altitude.
– POSITION/FLIGHT PATH . . . . MONITOR **· For approach in overlay to a conventional radio navaid procedure :** Use radio navaid raw data and altitude to monitor the lateral and vertical navigation. If the navigation is unsatisfactory, revert to selected guidance. In particular, monitor the vertical guidance, using altitude indication versus radio navaid position, and be prepared to revert to NAV-FPA, if the vertical guidance is unsatisfactory. **· For RNAV approach :** Monitor VDEV and FPV (on the PFD) and XTK error (on the ND). Use altitude indication versus distance to the runway to monitor the vertical navigation. If the vertical guidance is unsatisfactory, revert to NAV/FPA or consider the go-around. If the lateral guidance is unsatisfactory, perform a go-around.	**– POSITION/FLIGHT PATH . . MONITOR/ADJUST** **· For approach in overlay to a conventional radio navaid procedure :** Use radio navaid raw data to monitor the lateral navigation. Using altitude indication versus radio navaid position, adjust the FPA, as necessary, to follow the published descent profile, taking into account the minimum altitudes. Do not use the FMGC VDEV on the PFD. If the lateral navigation is unsatisfactory, revert to TRK/FPA. **· For RNAV approach :** Monitor XTK error on ND. Using altitude indication versus distance to the runway, adjust the FPA as necessary to follow the published descent profile, taking into account the minimum altitudes. If the lateral guidance is unsatisfactory, perform a go-around.

– **A/THR . . . . CHECK IN SPEED MODE OR OFF**

– **WING ANTI ICE . . . . OFF**
Switch WING ANTI ICE ON, only in severe icing conditions.

– **EXTERIORS LIGHTS . . . . SET**
Set NOSE switch to TAXI, RWY TURN OFF switch to ON, and LAND switch to ON.

– **SLIDING TABLE . . . . STOW**

– **LDG MEMO . . . . CHECK NO BLUE LINE**

– **CABIN REPORT . . . . OBTAIN**

– **CABIN CREW . . . . ADVISE**

– **LANDING CHECKLIST . . . . COMPLETE**

– **FLIGHT PARAMETERS . . . . CHECK**
PF announces any FMA modification.
PNF calls out :

R – ”SPEED”, when the speed goes below Vapp – 5 knots, or goes above the speed target
R + 10 knots.
R – ”SINK RATE”, when V/S is greater than – 1000 feet/minute.
R – ”BANK”, when the bank angle goes above 7 degrees.
R – ”PITCH”, when the pitch attitude goes below 0 degrees, or goes above + 10 degrees.
R – ”COURSE”, when greater than 1/2 dot (VOR) or 5 degrees (ADF).
R – ”_ FT HIGH (LOW)” at altitude checkpoints.

R ● **AT ENTERED MDA/MDH + 100 FT :**

– **MONITOR or ANNOUNCE . . . . "ONE HUNDRED ABOVE"**

R ● **AT ENTERED MDA/MDH**

– **MONITOR or ANNOUNCE . . . . "MINIMUM"**

● **If ground references are visible :**

– **ANNOUNCE . . . . "LANDING"**

– **AP . . . . OFF**
Continue, as with a visual approach (Refer to 3.03.20).

● **If ground references are not visible :**

– **ANNOUNCE . . . . "GO AROUND/FLAPS"**
Begin a go-around.

Note : *1. In managed guidance (FINAL APP mode engaged), when the aircraft reaches MDA (MDH) – 50 feet or MAP (whichever occurs first), the autopilot automatically disengages.*
2. In selected guidance, if ground references are not visible when the aircraft reaches MDA, the pilot should make an immediate go-around. However, if the distance to the runway is not properly assessed, a step descent approach may be considered, and a level-off at MDA may be performed while searching for visual references. If the pilot has no visual reference at MAP, at the latest, he must begin a go-around.

CIRCLING APPROACH

For a circling approach, the flight crew should prepare the flight plan as follows :
Primary flight plan : Introduce the instrument approach
Secondary flight plan : – Copy the ACTIVE F-PLN
– Revise the landing runway
The aircraft should circle in CONF 3 at F speed.
Upon reaching MDA/MDH :
– Push the ALT pushbutton.
– Search for visual references.

● **If the flight crew finds no visual reference :**

- **AT MAP : Initiate go-around**

● **If the flight crew finds sufficient visual references :**

- **Select TRK for downwind**

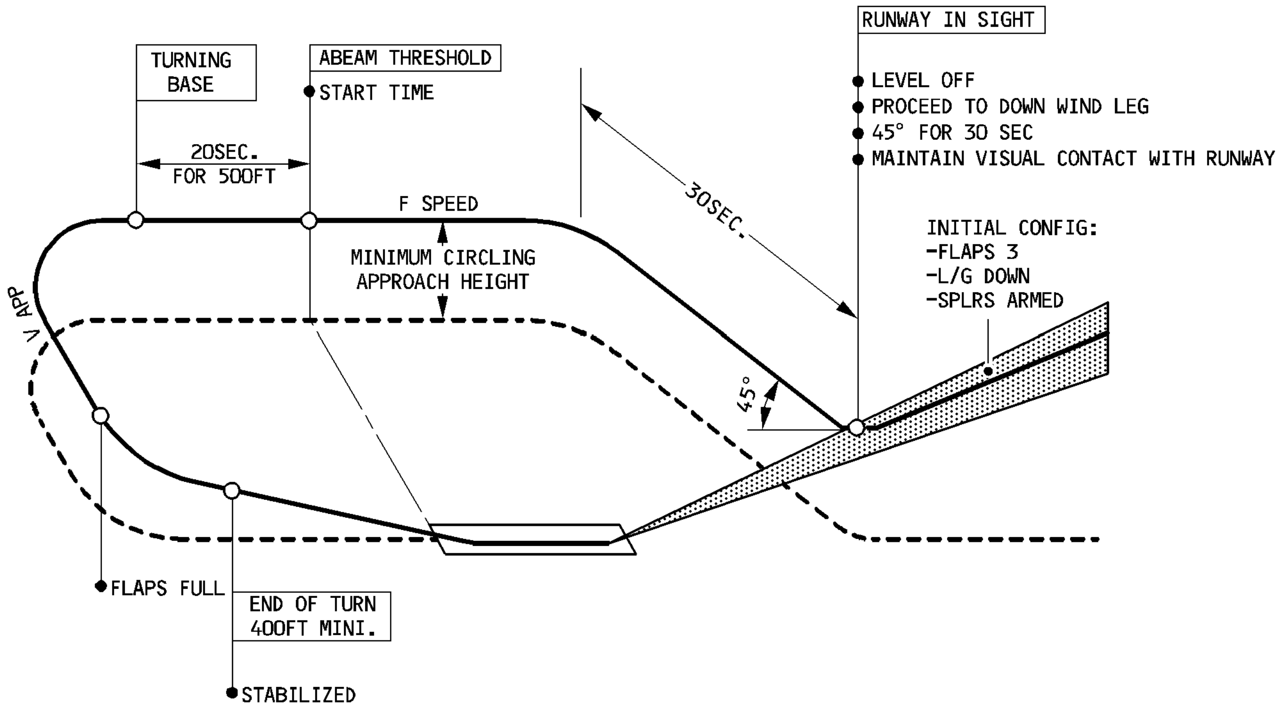
- **Early on downwind : Activate SEC F-PLN**

CAUTION
The PNF should activate the SEC F-PLN.
The PF should maintain visual contact during all the circling.

- **Disengage autopilot before reaching the base leg.**

GFC5-03-0319-013-A001AA

LOW VISIBILITY CIRCLING APPROACH



OBJECTIVE

Perform the approach on a nominal 3 degree glideslope using visual references. Approach to be stabilized by 500 feet AGL on the correct approach path, in the landing configuration, at VAPP.

Method :

- The autopilot is not used.
- Both FDs are off.
- FPV use is recommended.
- A/THR use is recommended with managed speed.

R Bear in mind the possible risk of optical illusions due to hindered night vision.

VISUAL CIRCUIT

INITIAL/INTERMEDIATE APPROACH

The flight plan selected on the MCDU should include the selection of the landing runway. The downwind leg might also be part of the Flight plan. This may be a useful indication of the aircraft position in the circuit on the ND.

However, visual references must be used.

Therefore, at the beginning of the downwind leg :

- **Manually ACTIVATE APPR.**
- **Select FDs to OFF.**
- **Select TRK-FPA to display FPV.**
- **Check A/THR active in speed mode.**
  Downwind leg extension 45 seconds (± wind correction)
  Turn into base leg with a maximum of 30° bank. Descent with appropriate FPA, in FLAPS 2, at F speed.

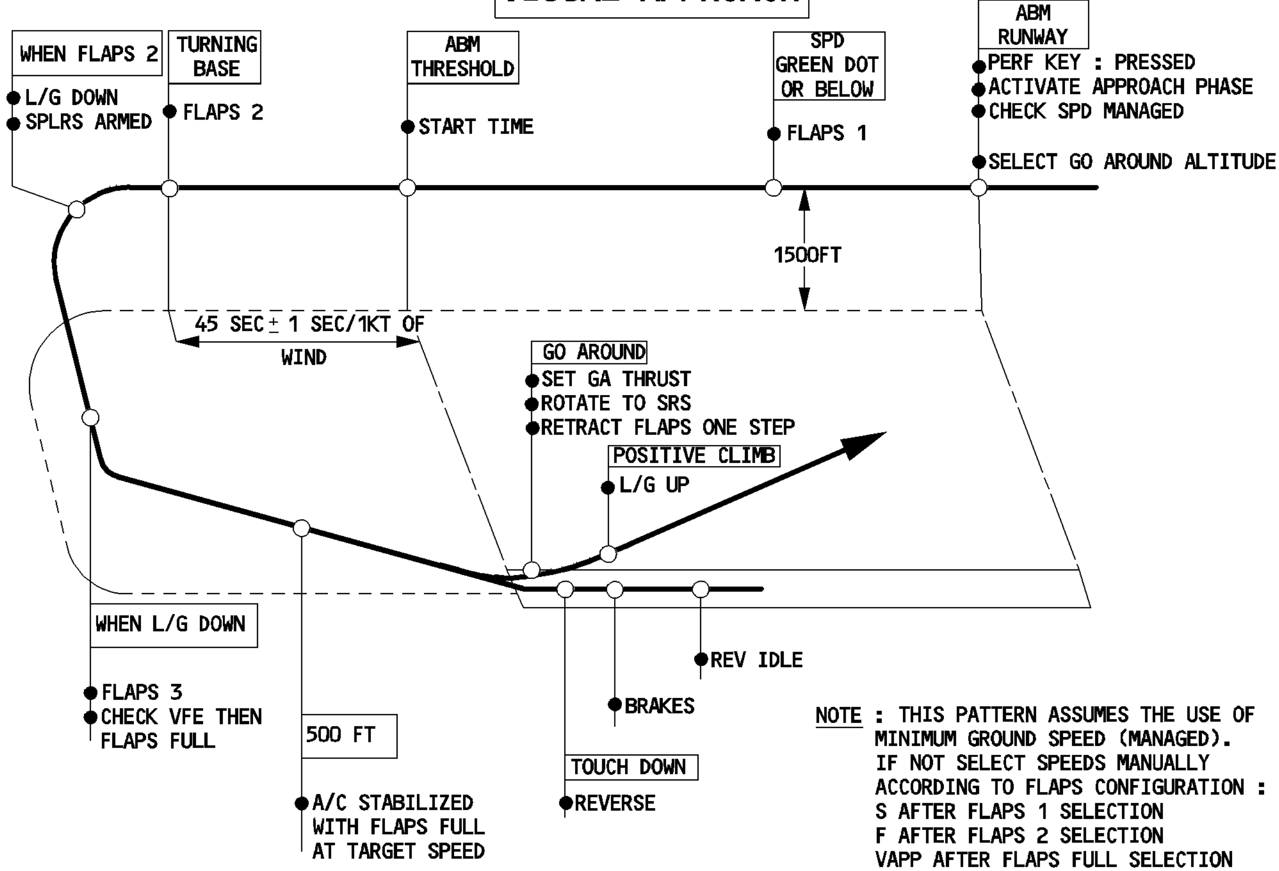
FINAL APPROACH

- The speed trend arrow and FPV help the flight crew make timely and correct thrust settings (if in manual thrust), and approach path corrections. Avoid descending through the correct approach path with idle thrust. (Late recognition of this situation without a prompt thrust increase may lead to considerable speed decay and altitude loss).
- Have the aircraft "stabilized" by 500 feet AGL, on the correct approach path at VAPP (or ground speed mini) with the appropriate thrust applied. If not stabilized, a go-around should be considered.
- Avoid any tendency to "duck under" in the late stages of the approach.
- Avoid destabilizing the approach in the last 100 feet, in order to have the best chance of performing a good touchdown at the desired position.

DAH ALL

GFC5-03-0320-002-A001AA

VISUAL APPROACH



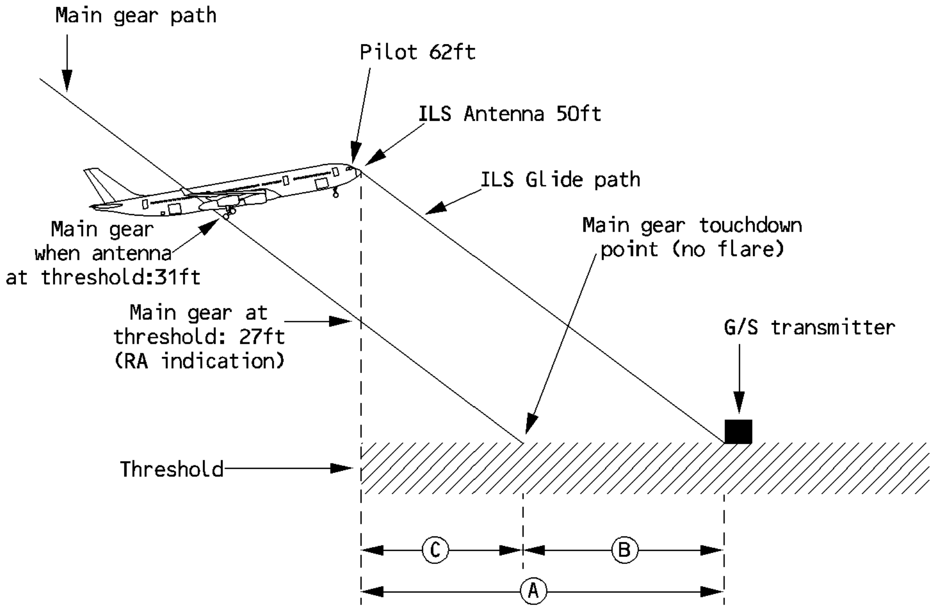
NOTE : THIS PATTERN ASSUMES THE USE OF MINIMUM GROUND SPEED (MANAGED).
IF NOT SELECT SPEEDS MANUALLY ACCORDING TO FLAPS CONFIGURATION :
S AFTER FLAPS 1 SELECTION
F AFTER FLAPS 2 SELECTION
VAPP AFTER FLAPS FULL SELECTION

PRECISION APPROACH

(Refer to 4.05.70).

ILS FINAL APPROACH AND LANDING GEOMETRY

R

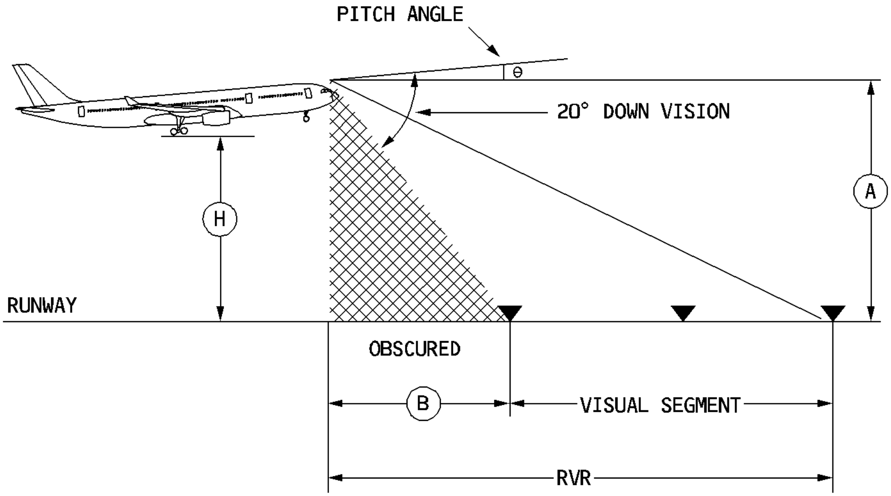


CONDITIONS : - FLAPS FULL - ILS ANTENNA AT 50 ft AT THRESHOLD - NO FLARE - PITCH ANGLE : 5°	GLIDE PATH (°)	A	B	TOUCHDOWN POINT C
	2°5	349 m 1145 ft	161 m 530 ft	185 m 615 ft
	3°	291 m 954 ft	140 m 457 ft	152 m 497 ft

GFC5-03-0322-001-A100AA

MINIMUM VISUAL GROUND SEGMENTS (Flare phase)

R



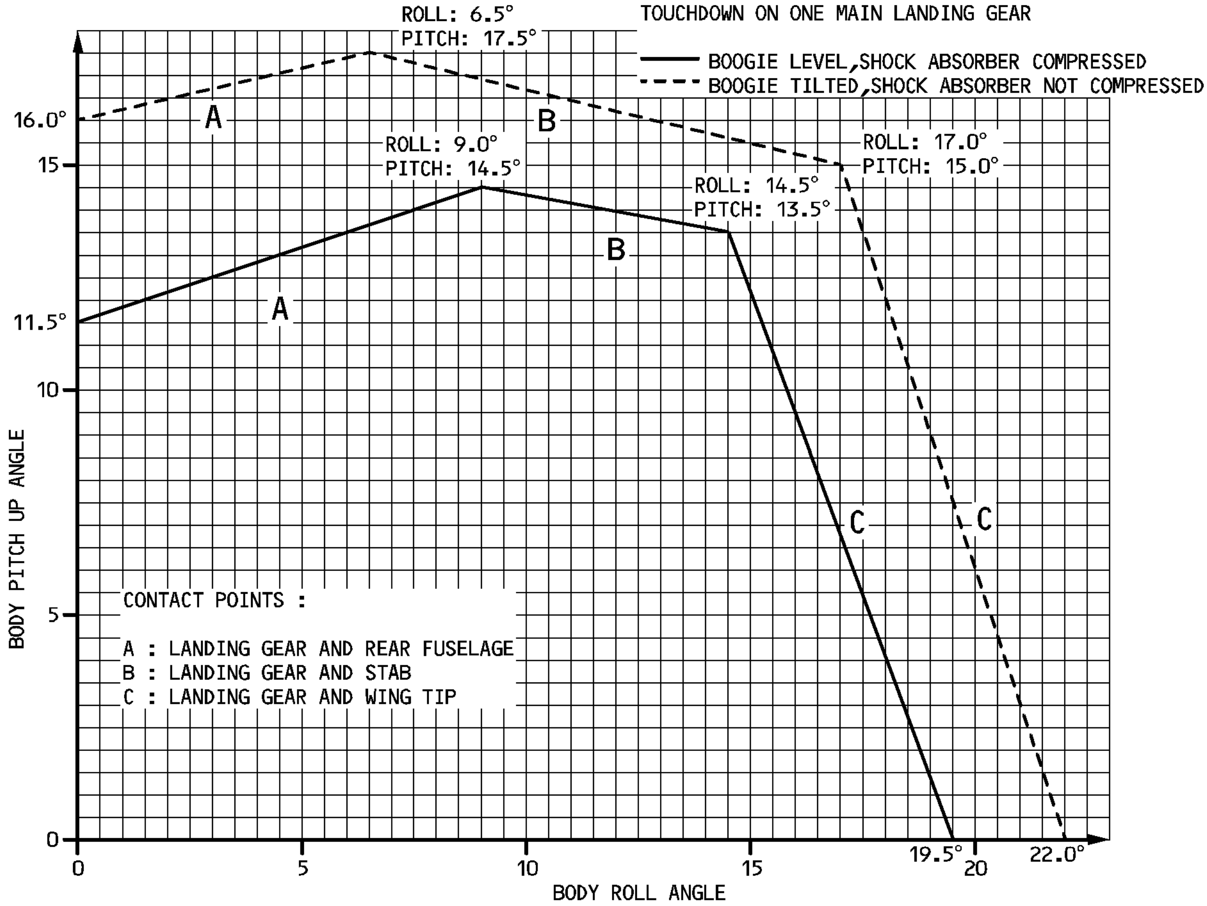
	CAT III		CAT II
H	15 ft (θ = 5°1)	50 ft (θ = 5°)	100 ft (θ = 5°)
VISUAL SEGMENT	60 m (197 ft)		120 m (394 ft)
A	47 ft	82 ft	132 ft
OBSCURED B	54 m (177 ft)	93 m (306 ft)	150 m (493 ft)
MINIMUM RVR	114 m (374 ft)	153 m (503 ft)	270 m (887 ft)

GFC5-03-0322-002-A100AA

R *Note : This drawing illustrates that, for a CAT III landing (60 meters minimum visual*
R *segment), the minimum RVR is 114 meters at 15 feet.*

GROUND CLEARANCE DIAGRAM

GFC5-03-0322-003-A100AA



LANDING

The cockpit cut-off angle is 20 degrees.

● **At about 30 feet :**

– **FLARE** . . . . **PERFORM**

R – **ATTITUDE** . . . . **MONITOR**
R The PNF should monitor the attitude, and call out :
R – "PITCH, PITCH", if the pitch angle reaches 7.5°.
R – "BANK, BANK", if the bank angle reaches 7°.

– **THRUST levers** . . . . **IDLE**
In manual landing conditions, the "RETARD" callout is generated at 20 feet RA, as a reminder. Start a gentle progressive flare, and allow the aircraft to touch down without prolonged float.

Crosswind landings

· The preferred technique is to use the rudder to align the aircraft with the runway heading, during the flare, whilst using lateral control to maintain the aircraft on the runway centerline.
· For a crosswind landing, routine use of into wind aileron is not recommended, because sidestick deflection commands the roll rate until touchdown.
In strong crosswind conditions, small amounts of lateral control may be used to maintain the wings level. This lateral stick input must be reduced to zero at first main landing gear touchdown.

Ground clearance

– Avoid flaring high.
R – A tailstrike occurs, if the pitch attitude exceeds : 11° (landing gear compressed) ; 16°
R (landing gear extended).
– A wingtip, or engine scrape occurs, if the roll angle exceeds 16.5°.

Derotation

Derotation should be started, as soon as the main wheels have touched down. In flare law, the aircraft will tend to nose down naturally, as the aft stick applied for flare is relaxed towards neutral. A comfortable nosewheel touchdown will be achieved, if the stick is maintained just aft of neutral during derotation. If brakes are applied with the nose high, the pilot must be prepared to use up to full backstick to restrain the nose down pitching moment.

– **REV . . . . PULL**
· Pull to reverse idle at main landing gear touchdown (not before).
· When REV green indicated on ECAM select MAX REV.
· In case of engine failure, the use of the remaining reverser is recommended.
· If the airport regulations restrict the use of reversers, maintain reverse idle until taxi speed is reached.
· Lower the nose wheel without undue delay if MED is selected.
· Braking may be commenced before nose wheel is down if required for performance reasons, but when comfort is the priority it should be delayed until the nose wheel has touched down.
· During roll-out, sidestick inputs (either lateral or longitudinal) should be avoided.
If directional control problems are encountered, reduce thrust to reverse idle until directional control is satisfactory.
· After reverse thrust is initiated, a full stop landing must be made.

– **GROUND SPOILERS . . . . CHECK**
Check ground spoilers deployed after touch down on ECAM WHEEL page. Announce
R “Ground spoilers” then “Reverse green”.

– **DIRECTIONAL CONTROL . . . . ENSURE**
· Use rudder pedals for directional control
· Do not use nose wheel steering control handle before taxi speed is reached.

– **BRAKES . . . . AS RQRD**
Monitor autobrake if on. If required use pedal braking.

● **At 70 knots :**

– **REVERSE levers . . . . IDLE**

CAUTION
The use of high levels of reverse thrust at low airspeed should be avoided since the distortion of the air flow caused by gases re-entering the compressor can cause engine stalls which may result in excessive EGT.

- **At taxi speed :**

  – **REVERSE levers . . . . STOW**
  Stow the reversers when taxi speed is reached and before leaving the runway.

  CAUTION
  On taxiways, the use of reversers, even restricted to idle thrust, may have the following effects :
  – Fine sand and debris may be ingested which might be detrimental to both the engine and airframe systems.
  – On snow covered areas, snow will be recirculated into the air inlet, which may result in engine flame out or roll back.Except in an emergency, reverse thrust should not be used to control aircraft speed while taxiing.

R - **Before 20 kt :**

R

R – **AUTO BRK . . . . DISENGAGE**

R Disengage the autobrake to avoid some brake jerks at low speed.

GO AROUND

Apply the following three actions simultaneously :

– **THRUST LEVERS . . . . TOGA**

– **ANNOUNCE . . . . "GO AROUND – FLAPS"**

– **ROTATION . . . . PERFORM**
  · Rotate the aircraft to achieve a positive rate of climb, and establish the required pitch attitude, as directed by SRS pitch command bar.
  · Check and announce FMA : TOGA, SRS, GA TRK.

  Note : The MCDU PERF page automatically switches to the GO AROUND phase.

– **FLAPS . . . . RETRACT ONE STEP**

– **ANNOUNCE . . . . "POSITIVE CLIMB"**

– **ORDER . . . . "GEAR UP"**

– **L/G UP . . . . SELECT**

– **CONFIRM/ANNOUNCE . . . . "GEAR UP–FLAPS"**

Note : Consider retarding to CL detent, if TOGA thrust is not required.

– **NAV or HDG mode . . . . SELECT**

Note : Go-around may be achieved with both AP engaged. Whenever any other mode engages AP 2 disengages.

● **At go-around thrust reduction altitude (LVR CLB flashing on FMA) :**

R – **THRUST LEVERS . . . . CL**

- **At go-around acceleration altitude :**

  – **Monitor target speed increases to green dot.**

  - **If target speed does not increase to green dot :**

    – **FCU ALT . . . . CHECK and PULL**

  – **Retract flaps on schedule.**

  Note : Consider the next step :
  – Engage NAV mode, to follow the published missed approach procedure, or
  – Prepare for a second approach by selecting the ACTIVATE APP PHASE, and CONFIRM on the PERF page.

AFTER LANDING

- **LAND LIGHTS . . . . OFF**
  Retract landing lights, unless they are needed.
R Set the STROBE lights to AUTO, when leaving the runway.

- **GROUND SPOILERS . . . . DISARM**

- **FLAPS . . . . RETRACT**
  · Set the FLAP lever to position 0.
  · If the approach was made in icing conditions, or if the runway was contaminated with slush or snow, do not retract the flaps until after engine shutdown, and after the ground crew has confirmed that flaps and slats are clear of obstructing ice.
  · On ground, hot weather conditions may cause overheating to be detected around the bleed ducts in the wings, resulting in "AIR L(R) WING LEAK" warnings. Such warnings may be avoided during transit by keeping the Slats in Configuration 1, when the OAT is above 30°C.

- **ENG START selector . . . . NORM**

- **ATC . . . . STBY/OFF**
  This is not applicable to transponder panels equipped with an AUTO position, if AUTO is selected.

- **TCAS Mode selector ⊲ . . . . STBY**
  This is only applicable to transponder panels equipped with an AUTO position, if AUTO is selected.

- **ANTI ICE . . . . AS RQRD**
  If engine anti-ice is used, take care to control taxi speed, especially on wet or slippery surfaces (ground idle is increased).

- **APU . . . . START**
  APU START may be delayed until just prior to engine shutdown.

- **RADAR . . . . OFF/STBY**

- **PREDICTIVE WINDSHEAR SYSTEM ⊲ . . . . OFF**
  Switching the radar and predictive windshear system OFF after landing avoids risk of radiating persons at the gate area.

– **BRAKE TEMPERATURE . . . . CHECK**
- Check brake temperature on the ECAM WHEEL page for discrepancies and high temperature.
- If brake fans are installed (◁) :
R Brake fans selection should be delayed for a minimum of about 5 minutes, or done just before stopping at the gate (whichever occurs first), to allow thermal equalization and stabilization, and thus avoid oxidation of brake surface hot spots.
  However, when turnaround times are short, or brake temperatures are likely to exceed 500°C, use the brake fans, disregarding possible oxidation phenomenon.
- Refer to 3.04.32 for the brake temperature limitations requiring maintenance actions.

– **AFTER LANDING CHECKLIST . . . . COMPLETE**
Ensure that the after landing checks are completed, once the aircraft has cleared the runway.

PARKING

- **PARKING BRAKE ACCU PRESS . . . . CHECK**
  The ACCU PRESS indication must be in the green band. In case of low accumulator pressure, chocks are required before engines shutdown.

- **PARKING BRK . . . . ON**
  · Above 500°C, parking brake application should be avoided, unless operationally necessary.

R – **ANTI-ICE . . . . OFF**

- **APU BLEED . . . . ON**
  Select APU bleed ON just before engine shutdown to prevent engine exhaust fumes from entering the air conditioning.

- **ENG MASTER switch 1 and 2 . . . . OFF**
  · It is suggested that the engine be operated at, or near, idle for a 3–minute cooling period after landing, to minimize the potential for oil coking in the main engine-bearing compartment.
  · A cooling period, between 90 seconds and three minutes, may be utilized at the airline's discretion, based on its experience.
  · If APU is not available, set EXT PWR at ON before setting the ENG MASTER OFF.
  · Check that engine parameters decrease.
  · The DOOR/OXY page is displayed on the lower ECAM display.

- **GROUND CONTACT . . . . ESTABLISH**
  Establish ground communication
  Check chocks in place.

– **SLIDE DISARMED . . . . CHECK**
Check slides disarmed on the ECAM DOOR/OXY page. Warn the cabin crew, if any slide is not disarmed.

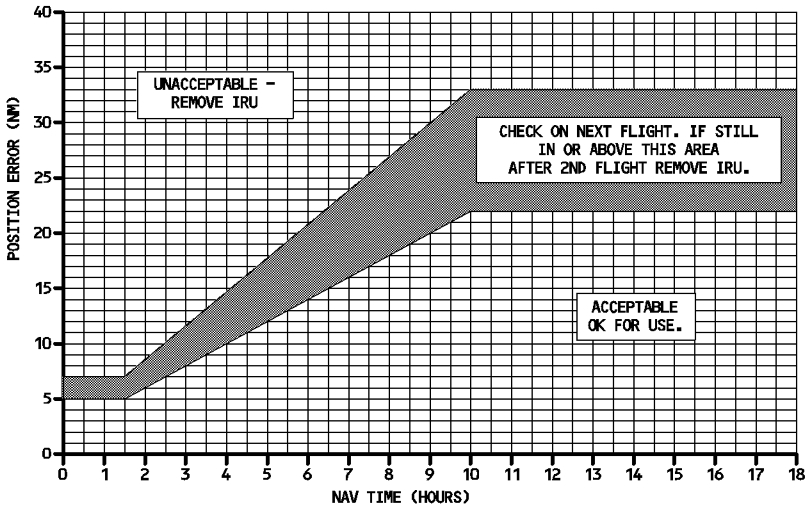
– **EXTERIOR LIGHTS . . . . AS RQRD**
Switch off the BEACON switch, once both engines have obviously spooled down.

– **SEAT BELTS . . . . OFF**

– **ELAPSED TIME (if applicable) . . . . STOP**

– **FUEL PUMPS . . . . OFF**

– **IRS PERFORMANCE . . . . CHECK**
· Drift check
– Access the POSITION MONITOR page. Check that the drift does not exceed the following :



GFC5-03-0325-002-A001AA

· Residual ground speed check :
– Access the IRS page via the IRS MONITOR page :
∗ If the ground speed is above 15 knots : Report (The excessive deviation must be confirmed after two consecutive flights).
∗ If the ground speed is above 21 knots : Report (The IRU must be removed).

Note : On aircraft equipped with LITTON IRS, the ground speed check must be performed within the 2 minutes following aircraft stop. (Ground speed reset to 0 after 2 minutes).

R – **FUEL QUANTITY . . . . CHECK**
R Check that the sum of the Fuel On Board and the Fuel Used is consistent with the Fuel
R On Board at departure. If an unusual discrepancy is found, maintenance action is due.

– **STATUS (ECAM Control panel) . . . . DEPRESS**
– Check the STATUS page.
If MAINTENANCE status messages are displayed :
· At transit : Disregard.
· At main base, or at an airport where repairs can easily be made (at the end of the last flight of the day) : Report for maintenance analysis.

– **BRAKE FAN (⊲) . . . . OFF**
· Switch off, when not required.

– **PARKING BRAKE . . . . AS RQRD**
· If the “BRAKES HOT” ECAM caution is displayed, the parking brake should be released after the chocks are in place.
Releasing the parking brake prevents the critical structures from being exposed to high temperature levels for an extended time. However, if operational conditions dictate (e.g. slippery tarmac), the parking brake may remain applied.

– **DUs . . . . DIM**
Dim EFIS, ECAM and MCDU display units.

– **PARKING CHECKLIST . . . . COMPLETE**

SECURING THE AIRCRAFT

Prior to performing this check, consideration should be given to COLD weather (Refer to 3.04.91)

– **PARKING BRAKE . . . . CHECK ON**
Keep the parking brake on to reduce hydraulic leak rate in the brake accumulator.

– **OXYGEN CREW SUPPLY . . . . OFF**

– **ADIRS (1 + 2 + 3) . . . . OFF**
ADIRS should not be switched off during transits at latitudes above 70°N in order to avoid excessive alignment time.
After having switching off the ADIRS, wait at least 10 seconds before switching off the electrical supply to ensure that the ADIRS memorize the last data.

– **EXTERIOR LIGHTS . . . . OFF**

– **GND SELECT CTL switch . . . . AS RQRD**
· Should electrical power be required for crew or servicing personal, consider selecting the GND SELECT CTL switch in the forward cabin to the ON position prior to selecting aircraft power off.

– **APU BLEED . . . . OFF**

– **EXT PWR . . . . AS RQRD**

– **APU MASTER switch . . . . OFF**
Switch off the APU after the passengers have disembarked.

– **EMER EXIT LT . . . . OFF**

– **NO SMOKING . . . . OFF**
Switching off the NO SMOKING signs permits the emergency batteries to be charged (provided external power is supplying the aircraft network).

– **BAT 1 and 2 and APU BAT . . . . OFF**
Wait until the APU flap is fully closed (about 2 minutes after the APU AVAIL light goes
R out) before switching off the APU battery. Switching the batteries off before the APU flap
R is closed may cause smoke in the cabin during the next flight.

– **SECURING THE AIRCRAFT CHECKLIST . . . . COMPLETE**

COMMUNICATIONS AND STANDARD TERMS

Standard phraseology is essential to ensure effective crew communication. The phraseology should be concise and exact. The following Chapter lists the calls that should be used as standard. They supplement the callouts identified in the SOP.
These standard Airbus callouts are also designed to promote situational awareness, and to ensure crew understanding of systems and their use in line operation.

R ## CHECKLIST CALLOUTS

– "CHECK" : A command for the other pilot to check an item.
– "CHECKED" : A response that an item has been checked.
– "CROSSCHECKED" : A call verifying information from both pilots stations.

R If a checklist needs to be interrupted, announce : "HOLD CHECKLIST AT ___" and "RESUME
R CHECKLIST AT ___" for the continuation.
Upon completion of a checklist announce : "__CHECKLIST COMPLETE".

ACTIONS COMMANDED BY PF

The following commands do not necessarily initiate a guidance mode change, eg : selected to managed/managed to selected. The intent is to ensure clear, consistent, standard communication between crewmembers.
All actions performed on the FCU must be verified on the PFD/ND.

SET

The "SET" command means using an FCU knob to set a value, but not to change a mode. SET is accomplished by only rotating the appropriate selection knob. Example :
– "SET GO AROUND ALTITUDE__"
– "SET QNH __"
– "SET FL __"
– "SET HDG __"

MANAGE/PULL

The "MANAGE" command means pushing an FCU knob to engage, or arm, a managed mode or target.
The "PULL" command means pulling an FCU knob to engage, or arm, a selected mode or target. Example :

– "HDG 090 PULL"	(Heading knob is turned and pulled).
– MANAGE NAV	(Heading knob is pushed).
– "FL 190 PULL"	(Altitude knob is turned and pulled).
– "FL 190 MANAGE"	(Altitude knob is turned and pushed).
– SPEED 250 KTS PULL	(Speed knob is turned and pulled).
– MANAGE SPEED	(Speed knob is pushed).

Note : 1. If the value was previously set, there is no requirement to repeat the figure. Simply call e.g. HDG PULL : SPEED PULL : FL PULL
2. It is sometimes preferable to first pull the FCU knob before setting the value (e.g. a long turn).

The VS/FPA selector knob has no managed function. The standard calls for the use of this knob are as follows :
V/S Plus (or Minus) 700 PULL or –
FPA Minus 3° PULL (V/S (FPA) knob is turned and pulled)
PUSH TO LEVEL OFF (V/S (FPA) knob is pushed)

ARM

The "ARM __" command means arming a system by pushing the specified FCU button.
e.g. : "ARM APPROACH"
e.g. : "ARM LOC."

ON/OFF

The simple ON or OFF command is used for the autopilot, flight directors, autothrust and the bird (flight path vector).
e.g. : BIRD ON (The HDG-V/S/TRK-FPA pushbutton is pushed).

Note : All actions on the FCU and MCDU must be verified on the PFD and ND, as follows :
– First, ensure that the correct FCU knob is used, then verify indications on the PFD/ND.
– Mode changes should be confirmed by calling the color when appropriate (e.g. BLUE, MAGENTA).

FMA

Unless listed otherwise (eg CAT II & III task sharing), all FMA changes will be normally called by the PF.

ALTITUDE

The PNF calls when passing 1000 feet before the cleared altitude or FL, and is acknowledged by the PF calling "CHECKED".
R e.g. : 1000 below 4000
R e.g. : 1000 above 290

FLAP OR GEAR CONFIGURATION

FLAPS CALLS

FLAPS CONFIGURATION	CALL
1	One
1 + F	One
0	Zero

The reply will be given when selecting the new flap position.
e.g. :

	CALL	REMARK
PF	″FLAPS FULL″	PF commands Flaps Full
PNF	″SPEED CHECKED″ ″FLAPS FULL″	PNF replies when selecting the Flap position, and checks the blue number on the ECAM flap indicator to confirm the correct selection has been made.

GEAR CALL

	CALL	REMARK
PF	″GEAR UP (DOWN)″	PF commands Gear Up (Down)
PNF	″GEAR UP (DOWN)″	PNF replies when selecting the Gear position, and checks the lights on the landing gear indicator panel to confirm gear operation.

FLIGHT PARAMETERS

PNF will make call-outs for the following conditions during final approach. Attitude callouts also to be made through to landing.

– “SPEED” when speed becomes less than Vapp – 5 or more than speed target + 10.
– “SINK RATE” when V/S is greater than – 1000 ft/min.
– “BANK” when bank angle becomes greater than 7°.
– “PITCH” when pitch attitude becomes lower than 0° or higher than + 10°.
– ‘LOC” or “GLIDE” when either localizer or glide slope deviation is one dot.
– “COURSE” when greater than 1/2 dot (VOR) or 5 degrees (ADF).
– “__ FT HIGH (LOW)” at altitude checks points.

PF/PNF DUTIES TRANSFER

Transfer of control is initiated by a command and followed by an acknowledgement.

- "I HAVE CONTROL" is either the command that the other pilot is to pass control and assume PNF duties ; or the acknowledgement by the other pilot that he has assumed PF duties.
- "YOU HAVE CONTROL" is either the command that the other pilot is to take control and assume PF duties ; or the acknowledgement by the other pilot that he has assumed PNF duties.

ABNORMAL AND EMERGENCY CALL OUTS

ECAM Procedures

1. "ECAM ACTION" is commanded by PF when required.
2. "CLEAR __ (title of the system)" is asked by the PNF for confirmation by the PF, that all actions have been taken/reviewed on the present ECAM WARNING/CAUTION or SYSTEM PAGE.
   e.g. : CLEAR HYDRAULIC
3. "CLEAR __ (title of the system)" is the command by the PF that the action and review is confirmed.
4. "ECAM ACTIONS COMPLETE" is the announcement by the PNF that all APPLICABLE ACTIONS have been completed.
5. Should the PF require an action from the PNF during ECAM procedures, the order "STOP ECAM" will be used. When ready to resume the ECAM the order "CONTINUE ECAM" will be used.

SUMMARY FOR EACH PHASE

TO REMOVE GROUND SUPPLY		
EVENT	**PF or PNF**	**GND Mech**
Initial ground contact	GROUND (from) COCKPIT	COCKPIT (from) GROUND
External __ disconnection	REMOVE EXTERNAL __	EXTERNAL__ REMOVED

BEFORE ENGINE START/PUSH BACK		
EVENT	**PF**	**PNF**
Before start up clearance received	BEFORE START C/L TO THE LINE	BEFORE START C/L TO THE LINE COMPLETE
After start up clearance received	BELOW THE LINE	BEFORE START C/L COMPLETE

PUSH BACK/ENGINE START		
EVENT	**PF**	**GND Mech.**
When ready for push back and push back clearance received from ATC	GROUND (from) COCKPIT, CLEARED FOR PUSH	COCKPIT (from) GROUND, RELEASE BRAKES
Start of push	BRAKES RELEASED CLEAR TO PUSH	
When ready to start engines	CLEAR TO START ? STARTING ENG(S)__	CLEAR TO START
When push back completed	BRAKES SET	SET BRAKES
When ready to disconnect (after engine started and parameters are stabilized)	CLEAR TO DISCONNECT (hand signals on left/right)	DISCONNECTING (hand signals on left/right)

AFTER ENGINE START		
EVENT	**PF**	**PNF**
All engines started and stabilized and GND is disconnected	AFTER START C/L	AFTER START C/L COMPLETE

TAXI		
EVENT	**PF**	**PNF**
When taxi clearance obtained	CLEAR LEFT (RIGHT) SIDE	CLEAR RIGHT (LEFT) SIDE
Brake transfer check	BRAKE CHECK	PRESSURE ZERO
Flight control check in following sequence (can be done before start of taxi)	FLIGHT CONTROL CHECK	
1. Elevators	FULL UP, FULL DOWN, NEUTRAL	CHECKED
2. Ailerons	FULL LEFT, FULL RIGHT, NEUTRAL	CHECKED
3. Rudder *	FULL LEFT, FULL RIGHT, NEUTRAL	CHECKED
During taxi	BEFORE TAKE-OFF CHECK LIST TO THE LINE	BEFORE TAKE-OFF C/L TO THE LINE COMPLETE
Lining up on the runway	BELOW THE LINE	BEFORE TAKE-OFF C/L COMPLETE

*Note : * The PNF should follow pedal movement with his/her feet*

TAKE-OFF		
EVENT	**PF**	**PNF**
Setting thrust levers to initial stabilisation value	TAKE-OFF	
When thrust levers set to FLEX/TOGA	ANNOUNCE FMA	CHECKED
Before passing 80 kts	CHECKED	POWER SET
At 100 kts	CHECKED	ONE HUNDRED KNOTS
At V1		V1
At VR		ROTATE
When climbing clear of the ground (positive increase of V/S, BARO and RAD ALT)	GEAR UP	POSITIVE CLIMB GEAR UP
If AP is engaged by PNF If AP is engaged by PF	AP 1(2) ON AP 1(2)	CHECKED
When F Speed and accelerating	FLAPS ONE	SPEED CHECKED FLAPS ONE
When S Speed and accelerating	FLAPS ZERO	SPEED CHECKED FLAPS ZERO
After T/O check (not normally requested before flap retraction completed)	AFTER TAKE-OFF C/L	AFTER TAKE-OFF C/L COMPLETED TO THE LINE

ALTIMETER SETTING CHANGES TO/FROM QNH/QFE-STD		
EVENT	**PF**	**PNF**
Barometric setting change and subsequent altimeter cross-check	PULL STANDARD (PUSH QNH/QFE) CHECKED	STANDARD (QNH/QFE) CROSS-CHECKED PASSING FL__(__FT) NOW

R

APPROACH AND LANDING		
EVENT	**PF**	**PNF**
When cleared below transition level or when appropriate	APPROACH C/L	APPROACH C/L COMPLETE
Activation of approach Phase (approx 15nm from touchdown ; automatic, if in managed nav)	ACTIVATE APPROACH PHASE	APPROACH PHASE ACTIVATED
Beginning of radio altimeter indication (could be auto callout of 2500 ft)	CROSS CHECKED	RAD ALT ALIVE (see Note 1 below)
At green dot speed or < VFE	FLAPS ONE	SPEED CHECKED FLAPS ONE
”GS*”, ”FINAL APP”, or ”FAF”	SET GA ALTITUDE__FT	GA ALTITUDE__SET,
2000 ft AGL min (ILS) ; or S speed (non-precision)	FLAPS TWO	SPEED CHECKED FLAPS TWO
When at flaps at two	GEAR DOWN	GEAR DOWN
When gear is down	FLAPS THREE	SPEED CHECKED FLAPS THREE
When flaps at three (unless landing with Flap 3)	FLAPS FULL	SPEED CHECKED FLAPS FULL
FAF	CHECKED	PASSING__(Fix Name),__FT,
When landing flaps set, and landing memo is displayed on ECAM	LANDING C/L	LANDING C/L COMPLETE
1000 ft above TDZE (may be auto callout)	CHECKED	ONE THOUSAND
FMA ”LAND GREEN” (ILS approach)	LAND GREEN	CHECKED
100 ft above MDA/DH	CHECKED	ONE HUNDRED ABOVE (if no Auto Call out)
MDA/DH visual reference	LANDING	MINIMUM
MDA/DH no visual reference	GO AROUND-FLAPS	MINIMUM
PNF monitors pin-programmed auto callout, or announces if inoperative		ONE HUNDRED FIFTY
After touchdown		GROUND SPOILERS, REVERSE GREEN (See the note 2 below)
If autobrake armed		DECEL (See note 3 below)
At 70 kts	CHECK	SEVENTY KNOTS

Note 1 : Crew awareness : Crew should now keep RA in scan to landing.
Note 2 : If reverse deployment is not as expected, call NO REVERSE ENGINE__ or NO REVERSE, as appropriate.
Note 3 : If autobrake is armed and no positive deceleration is observed, call NO DECEL.

04.00 CONTENTS

04.10 OPERATING SPEEDS DEFINITION
– GENERAL 1
– CHARACTERISTIC SPEEDS 1
– PROTECTION SPEEDS 3
– LIMIT SPEEDS 3
– OTHER SPEEDS 4

04.21 AIR COND/PRESS/VENT
– CABIN TEMPERATURE CONTROL 1
– AIR CONDITIONING 2
– CONTROLLER/AEVC/CPC RESET : REFER TO 3.04.24

04.22 AUTO FLIGHT
– FCU/FMGEC/FM/MCDU RESET : REFER TO 3.04.24

04.23 COMMUNICATIONS
– VHF, HF UTILIZATION 1
– SATCOM ◁ 3
– CIDS/ACP/AMU/RMP RESET : REFER TO 3.04.24

04.24 ELECTRICAL SYSTEM
– COMPUTER RESET 1

04.25 COCKPIT DOOR
– COCKPIT DOOR OPERATION 1
– OPENING THE COCKPIT DOOR FROM THE CABIN 3

04.26 FIRE PROTECTION
– SDCU RESET : REFER TO 3.04.24

04.27 FLIGHT CONTROLS (FLYING TECHNIQUES)
– GENERAL 1
– NORMAL OPERATIONS 1
– ABNORMAL OPERATIONS 4
– THE PROTECTION SYSTEMS 8
– AIRCRAFT TRIMMING 11
– PRIM/SEC/FCDC RESET : REFER TO 3.04.24

04.28 FUEL SYSTEM
– FUEL JETTISON ◁ 1
– FCMC RESET : REFER TO 3.04.24

04.30 ICE AND RAIN PROTECTION
– ICING CONDITIONS/OPERATIONS 1
– RAIN REPELLENT ◅ 2
– PHC/WHC RESET : REFER TO 3.04.24

04.31 ELECTRONIC INSTRUMENT SYSTEM
– USE OF FLIGHT PATH VECTOR 1
– DU/DMC/FWC/SDAC RESET : REFER TO 3.04.24

04.32 LANDING GEAR
– BRAKING IN ALTERNATE MODE 1
R – BSCU RESET 1
– BRK TEMP LIMITATIONS REQUIRING MAINT ACTIONS 1
– TIRE PRESSURE 2
– OPERATION WITH NOSEWHEEL STEERING OFFSET 3
R – LGCIU RESET : REFER TO 3.04.24

04.34 NAVIGATION
– PROCEDURES FOR TUNING STANDBY NAVIGATION RADIOS . . 1
– AUTOMATIC IDENTIFICATION OF ADF/VOR/ILS 2
– WEATHER RADAR 3
– FLIGHT INSTRUMENT TOLERANCES 5
– TCAS 6
– APPROACH ON PAPI 11
– QNH USE FOR TO/APPR/LDG ON QFE/QNH PIN PROGRAMMED A/C ◅ 11
– QFE USE FOR TO/APPR/LDG ON A/C WITH QNH ONLY PIN PROGRAMMING ◅ 12
– ENHANCED GROUND PROXIMITY WARNING SYSTEM ◅ . . . 13
R – ADIRS ALIGNMENT 14
R – PARA VISUAL INDICATOR ◅ 17

04.38 WATER/WASTE
– VSC RESET : REFER TO 3.04.24

04.46 INFORMATION SYSTEMS (◅)
– ATSU INITIALIZATION 1
– NOTIFICATION PROCEDURE AND CONNECTION ◅ 3
– CONTROLLER/PILOT DATA LINK COMMUNICATION PROCEDURE ◅ 5
– FLIGHT PLAN MODIFICATIONS ◅ 16
– AUTOMATIC TRANSFER TO NEXT ATC ◅ 20
R – AUTOMATIC DEPENDENT SURVEILLANCE ◅ 21

04.49 APU
– ECB RESET : REFER TO 3.04.24

R **04.52 DOORS**
R – LEAVING THE AIRCRAFT VIA AVIONIC BAY ACCESS DOOR . . 1
R – PSCU RESET : REFER TO 3.04.24

04.70 POWERPLANT
– THRUST CONTROL 1
– MAN ENG START 3
– ENG START WITH EXTERNAL PNEUMATIC POWER 5
– CROSSBLEED ENG START 6
– START VALVE MANUAL OPERATION 7
– DERATED CLIMB ◁ 8
– ENGINE START ON BATTERIES 9

04.80 MISCELLANEOUS
– EIVMU RESET : REFER TO 3.04.24

04.90 ONE ENGINE TAXI
– GENERAL 1
– AT DEPARTURE 1
– AT ARRIVAL 2

04.91 ADVERSE WEATHER
– SEVERE TURBULENCE 1
– OPERATION IN WINDSHEAR / DOWNBURST CONDITIONS . . . 4
– COLD WEATHER 6
– OPERATIONS IN VOLCANIC ASHES 13

04.92 LESS PAPER IN THE COCKPIT
– INTRODUCTION 1
– GENERAL 1
– LPC TAKEOFF MODULE 2
– LPC FCOM MODULE 4
– LPC MEL MODULE 4
– LPC W&B MODULE 4

GENERAL

R This section shows the symbology and definition of speeds.
R Source of computation is also given when applicable.

R CHARACTERISTIC SPEEDS

R The characteristic speeds displayed on the PFD are computed by the FE (Flight Envelope).
R VLS (of normal landing configuration : CONF 3 or FULL), F, S and Green Dot speeds are also
R displayed on the MCDU TAKEOFF and/or APPR, GO AROUND pages.
R These values are computed by the FMGC.
R Computations made by FE and FMGC are based on the gross weight information
R transmitted by the FCMC (Fuel Control and Monitoring Computer).

VS : Stalling speed.
Not displayed.
For a conventional aircraft, the reference stall speed, VSmin, is based on a load factor that is less than 1g. This gives a stall speed that is lower than the stall speed at 1g. All operating speeds are expressed as functions of this speed. (For example, VREF = 1.3 VSmin).
Because the A330 has a low-speed protection feature (alpha limit) that the flight crew cannot override, the airworthiness authorities have reconsidered the definition of stall speed for this aircraft.
All the operating speeds must be referenced to a speed that can be demonstrated by flight test. This speed is designated VS1g.
Airworthiness authorities have agreed that a factor of 0.94 represents the relationship between VS1g for A330 and VSmin for conventional aircraft types. As a result the authorities allow A330 to use the following factors :
V2 min = 1.2 × 0.94 VS1g = 1.13 VS1g
VREF = 1.3 × 0.94 VS1g = 1.23 VS1g
These speeds are identical to those that the conventional 94 % rule would have defined for this aircraft. The A330 has exactly the same maneuver margin that a conventional aircraft would have at its reference speeds.
The FCOM uses VS for VS1g.

VLS : Lowest Selectable speed.
Represented by the top of an amber strip along the airspeed scale on the PFD.
It is equal to :
- 1.13 VS, at takeoff
- 1.18 VS, when the flaps are retracted.
- 1.23 VS, when in clean configuration. (It remains at this value until landing).

VLS is corrected for Mach effect to maintain a 0.3g buffet margin.
In addition, VLS is increased when the speedbrakes are extended.
The VMC is taken into account for VLS computation as follows :
- At takeoff, until retraction of one step of flaps, VLS is equal to or greater than the lowest of :
  · V2/1.05
  · 1.05 VMCA maximum certified.
- In all the other phases, it is equal to or greater than VMCL.

F : Minimum speed at which the flaps may be retracted at takeoff.
In approach, used as a target speed when the aircraft is in CONF 2 or CONF 3.
Represented by “F” on the PFD airspeed scale.
At takeoff, it is equal to about 1.18 VS of CONF 1 + F, and is limited to a minimum of VMCL + 5 knots.
In approach, when the aircraft is in CONF 2, the takeoff value is increased by 14 %. It is limited to a minimum of VMCL + 15 knots and to a maximum of VFE CONF 3 – 2 knots.
Then, when the aircraft is in CONF 3, the takeoff value is increased by 4 %. It is limited to a minimum of VMCL + 10 knots and to a maximum of VFE CONF FULL – 2 knots.

S : Minimum speed at which the slats may be retracted at takeoff.
In approach, used as a target speed when the aircraft is in CONF 1.
Represented by “S” on the PFD airspeed scale.
Equal to about 1.21 VS of clean configuration.
In approach, S is limited to a maximum of VFE CONF 1* – 2 knots.

0 : Green dot speed.
Engine-out operating speed in clean configuration.
(Best lift-to-drag ratio speed).
Also corresponds to the final takeoff speed.
Represented by a green dot on the PFD scale.

R With all engines running :

R - Below 20000 feet equal to 0.6 × weight (tons) + 107 knots
- Above 20000 feet, add 1 knots per 1000 feet.

R With at least one engine-out, subtract 10 knots in the above situations.

PROTECTION SPEEDS

Vα PROT, Vα MAX and VSW are computed by the PRIM, based on aerodynamic data.

Vα PROT	:	Angle-of-attack protection speed. Corresponds to the angle-of-attack at which the angle-of-attack protection becomes active. Represented by the top of a black and amber strip along the PFD speed scale, in normal law.
Vα MAX	:	Maximum angle-of-attack speed. Corresponds to the maximum angle-of-attack that may be reached in pitch normal law. Represented by the top of a red strip along the PFD speed scale, in normal law.
VSW	:	Stall warning speed. Represented by a red and black strip along the speed scale when the flight control normal law is inoperative.
VMAX	:	Represented by the bottom of a red and black strip along the speed scale. Determined by the FE according to the aircraft configuration. Is equal to VMO (or speed corresponding to MMO), VLE or VFE.

LIMIT SPEEDS

VMCG	:	Minimum speed, on the ground during takeoff, at which the aircraft can be controlled by the use of primary flight controls only, after a sudden failure of the critical engine, the other engine remaining at takeoff power.
VMCA	:	Minimum control speed in flight at which the aircraft can be controlled with a maximum bank of 5 degrees, if one engine fails, the other engine remaining at takeoff power (takeoff flap setting, gear retracted).
VMCL	:	Minimum control speed in flight at which the aircraft can be controlled with a maximum bank of 5 degrees, if one engine fails, the other engine remaining at takeoff power (approach flap setting).
VFE	:	Maximum speed for each flap configuration.
VLE	:	Maximum speed with landing gear extended.
R VLO	:	Maximum speed for landing gear operation.
VMO	:	Maximum speed.
VFE NEXT	:	Maximum speed for the next (further extended) flap lever position.

OTHER SPEEDS

V1 : The highest speed, during takeoff, at which the flight crew has a choice between continuing the takeoff or stopping the aircraft.
Represented by “1” on the airspeed scale (or the V1 value when it is off the airspeed scale).
Inserted manually through the MCDU by the crew.
Displayed on the MCDU TAKEOFF page.

VR : The speed at which the pilot rotates in order to reach V2 at an altitude of 35 feet at the latest after an engine failure.
Inserted manually through the MCDU by the crew.
Displayed on the MCDU TAKEOFF page.

V2 : Takeoff safety speed that the aircraft attains at the latest at an altitude of 35 feet with one engine failed and maintains during the second segment of the takeoff.
Represented by the SPEED SELECT symbol on the speed scale.
Minimum value equal to 1.13 VS for the corresponding configuration.
Inserted manually through the MCDU by the crew.
Displayed on the MCDU TAKEOFF page.

VREF : Reference speed used for normal final approach.
Equal to 1.23 × VS of configuration FULL.
Represented on the MCDU APPR page if landing is planned in CONF FULL (VLS CONF FULL).

VAPP : Final approach speed.
Displayed on MCDU APPR page.
Calculated by the FMGCs.
Represents : VAPP = VLS + wind correction.
The wind correction is limited to a minimum of 5 knots and a maximum of 15 knots.
The flight crew may modify VAPP through the MCDU.
R – During autoland or when autothrust is on or in case of ice accretion or
R gusty crosswind greater than 20 knots, VAPP must not be lower than VLS + 5 knots.

VAPP TARGET : Represented by a magenta triangle.
Calculated by FMGCs
Gives efficient speed guidance in approach during various windy conditions.
Represents :
VAPP TARGET = GS mini + actual headwind (measured by ADIRS)
GS mini = VAPP – TOWER WIND (headwind component along runway axis calculated by FMGC from tower wind entered on MCDU).

CABIN TEMPERATURE CONTROL

SYSTEM OPERATION

The cabin is divided into 3 temperature control zones : FWD, MID and AFT. The length of the three zones is, as far as practicable, adapted to the individual cabin class arrangement by respective programming of the CIDS.
The cockpit cabin temperature selector is used to select prior to flight a common cabin master temperature for all zones.
The common master temperature can be individually adapted for the three cabin zones at any time via the cabin temperature page of the Programming and Indication Modul (PIM) on the forward attendant panel. An individual zone correction up to +/– 2.5°C (4.5°F) can be selected for the FWD, MID or AFT cabin zones in steps of 0.5°C (0.9°F).

CABIN TEMPERATURE SELECTION

The system is designed to minimize flight crew workload. The cockpit and cabin selections should be set only once prior to flight. Throughout the flight the system takes care of cabin temperature regulation and under normal operating conditions there is no need to change the selection during flight.
It is recommended to follow these guidelines :

Note : Any change of selection makes the system blow either colder or hotter air into the cabin which may result in a temporary discomfort for the passengers. To reach a stabilized cabin temperature again the system needs about 20 minutes : 10 minutes cabin temperature adjustment plus 10 minutes to compensated for furniture and lining heat dissipation. After a selection has been changed allow the cabin temperature to stabilize again before the selection is changed again.

R **On ground, prior to flight :**

R 1. The cabin temperature selector in the cockpit (AIR panel) should be set to about the 10 o'clock position (21.5°C/70.7°F) for ground and flight operation.
2. The zone correction should be set to zero by pressing the <<RESET TO COCKPIT SELECTED TEMP>> soft key on the cabin temperature page of the PIM.
The above settings provide a good cabin temperature comfort for most operating conditions.

In flight :

1. The master temperature preselection on the cockpit panel should normally not be changed during flight.
   If a cockpit preselection change is required, the cabin crew should be informed since, in the cabin, there is no automatic indication associated.

   Note : *The PIM cabin temperature page will show the newly selected cabin temperature (+ zone correction + altitude correction) in each of the cabin zones.*

2. If required, the cabin crew should normally adjust the zone temperature on the forward attendant panel by no more than 0.5°C (0.9°F).

   Note : *1. Generally, the lowest comfortable temperature should be selected.*
   2. It is recommended that the cabin crew judge the required zone temperature, based on the temperature that is felt, rather than on the indicated value.

AIR CONDITIONING

With passengers on board, it is not recommended to exceed 20 minutes without air conditioning supply. The lack of fresh air supply will significantly reduce the quality of the cabin air.

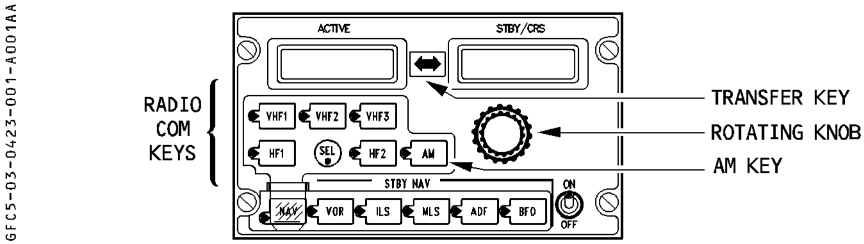
R An external HP source may be used for air conditioning, provided the air supply is
R confirmed to be free from oil contamination.

VHF, HF UTILIZATION

R *Note : 1. Reception of some frequencies could be noisy, on one or more VHFs. In such*
R *cases : try selecting an unaffected one.*
R *2. If two frequencies are closer than 2 MHz (between VHF1 and 2, or between VHF3*
R *and 2), or closer than 6 MHz (between VHF1 and 3), some interference may*
R *occur.*

TUNING

The pilot should normally use his onside RMP, to tune any one of the VHF or HF desired radios. If the SEL lights come on, when tuning the radio, the pilot should turn them off by selecting the appropriate radio system dedicated to his RMP.



– **ON/OFF switch** . . . . **CHECK ON**

– **VHF or HF key** . . . . **PRESS**
The green light comes on.
ACTIVE and STBY/CRS windows display active and preset frequencies, respectively.

Note : The SEL light will come on both RMP if :
– VHF1 is selected on RMP 2 or 3 ;
– VHF2 is selected on RMP 1 or 3 ;
– VHF3, HF1, HF2 is selected on RMP 1 or 2.

To change the frequency :

– **Rotating knob** . . . . **TURN**
Make the STBY/CRS window displays the new frequency.
Outer and inner rotating knobs are used for units and decimals, respectively.

– **Transfer key** . . . . **PRESS**
This interchanges ACTIVE and STBY frequency. The receiver is now tuned to the new ACTIVE frequency.

– **AM key (if necessary) . . . . PRESS**
Green light comes on.

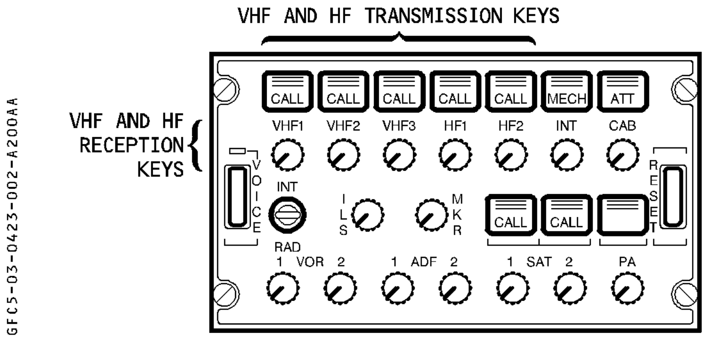
– **SEL light . . . . CHECK OFF**
If the SEL light is on, select the appropriate radio systems dedicated to the onside RMP.

Failure cases :

When an RMP fails :
– The affected RMP no longer controls the selected receiver.
– The frequency displays disappear, and the green VHF or HF lights go off.

– **Affected RMP . . . . SWITCH OFF**
One RMP can control all receivers :
. If RMP1 affected, tune VHF1 through the RMP3.
. If RMP2 affected, tune VHF2 through the RMP3.
. If RMP3 affected, tune VHF3, HF1, HF2 through the RMP1 or RMP2.
. If two RMPs fail, tune all receivers through the remaining RMP.

TRANSMISSION AND RECEPTION



– **VHF or HF transmission key . . . . PRESS**
Green bars of the desired system key light up.
Microphones and PTT command are connected to the selected system.

– **VHF or HF reception key . . . . PRESS**
The integrated white light comes on.
The receiver brings in the selected system.
To adjust the volume, turn the key.

Note : Do not use VHF3 for communications with ATC, unless VHF1 and VHF2 are inoperative.

FROZEN RMP

An RMP is frozen, if it is impossible to interchange the ACTIVE and STBY radio navigation or communication frequencies.
To recover normal operation of the RMP, all RMPs must be reset, because a problem on one RMP may be due to another RMP.

PROCEDURE

All RMP's must be reset, one after the other.

On the RMP control panel :

- **ON/OFF switch . . . . OFF**
  Wait 5 seconds, then
- **ON/OFF switch . . . . ON**

SATCOM

This chapter explains how to use the different Satellite Communication (SATCOM) functions for : Cockpit air to ground communication or, cockpit ground to air communication.
Due to highly customized programming, SATCOM functions may vary for different airlines. This description is, therefore, given only as an example.

COCKPIT AIR TO GROUND COMMUNICATION

The crew selects the phone number via the MCDU, then initiates and terminates the call via the ACPs.

PHONE NUMBER SELECTION

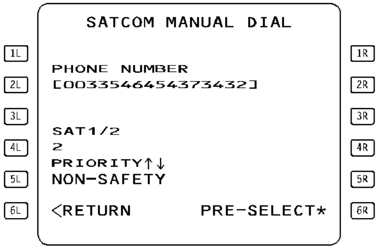
- **PRESS the SAT key on the MCDU main page to access the SATCOM MAIN MENU page.**

- **PRESS the MANUAL DIAL or DIRECTORY key.**
  For air to ground communication, the crew can use the SATCOM manual dialing function or the prerecorded phone numbers.

Manual dailing

On the SATCOM MANUAL DIAL page :

GFC5-03-0423-003-A110AA



- **PRESS the slew up or down keys on the MCDU keyboard to select the priority (The default priority is NON-SAFETY).**

- **PRESS 4L to modify the SATCOM channel (after having entered the desired SATCOM channel in the scratchpad).**

- **ENTER the phone number in the scratchpad and PRESS 2L.**

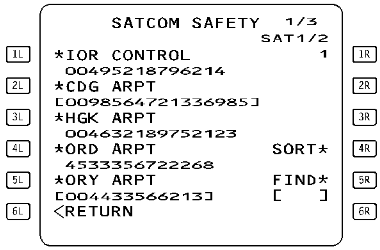
- **PRESS 6R to pre-select the phone number.**
  The MCDU then switches automatically to the SATCOM MAIN MENU page.

Prerecorded phone number

On the SATCOM DIRECTORY page :

– **PRESS 1L, 2L, 3L or 4L**
The MCDU switches to the CATEGORY NUMBER page, where phone numbers have been stored according to their priority. (Example : SATCOM SAFETY) :

GFC5-03-0423-004-A110AA



– **PRESS 1 R (after having entered the desired SATCOM channel in the scratchpad) to modify the SATCOM channel.**

– **PRESS the key (1L, 2L, 3L, 4L or 5L) facing the required phone number.**
The MCDU then switches automatically to the SATCOM MAIN MENU page where the title (of the selected phone number) is displayed. READY TO CONNECT is displayed in front of the selected SATCOM channel.

CALL INITIATION

Once all information, regarding the phone number, is entered in the MCDU, the crew uses the ACP to initiate the SATCOM call. On the SATCOM MAIN MENU page :

– **CHECK 2L or 4L field displays the phone number.**

– **CHECK the availability of the relevant SATCOM channel.**

<u>Note</u> : *The SATCOM channel, used to initiate the call, is displayed above the phone number.*

– **On the ACP, PRESS the SAT 1(2) transmission key, corresponding to the selected SATCOM channel.**
On the ACP, the green lines on the SAT1 (2) transmission key flash. On the MCDU SATCOM MAIN MENU page, the DIALING indication replaces the READY TO CONNECT indication in front of SAT1 (2). When the call is established, on the ACP, the green lines on the SAT1 (2) transmission key become steady. On the MCDU SATCOM MAIN MENU page, CONNECTED indication replaces the DIALING indication in front of SAT1 (2).

– **PROCEED as for a VHF or HF call.**

COCKPIT GROUND TO AIR TRANSMISSION

In case of an incoming call, the amber lines on the ACP's SAT1 (2) transmission key flash and the SATCOM ALERT green memo is triggered on the ECAM, when the priority level is below 4.

– **PRESS the SAT1 (2) transmission key to establish the communication.**
On the ACP, the green lines on the SAT1 (2) transmission key become steady. On the MCDU SATCOM MAIN MENU page, the CONNECTED indication replaces the DIALING indication in front of SAT1 (2).

– **PROCEED as for a VHF or HF call.**

HOLD FUNCTION

If the crew selects another radio communication (HF or VHF) when a SATCOM call is established, the SATCOM audio transmission is temporarily interrupted.
On the ACP :
– The green lines on the SAT1 (2) transmission key flash.
– The green lines on the selected radio (HF or VHF) transmission key come on.
To recover the SATCOM call : On the ACP, the crew reselects the same radio (HF or VHF) or the SAT1 (2) transmission key. This terminates the radio call.

CALL TERMINATION

AIR TO GROUND CALL

– **PRESS the corresponding SAT1 (2) transmission key on the ACP.**
The green lines on the selected SAT1 (2) transmission key go out.
After 3 seconds, the call is terminated.
If the SATCOM call is on HOLD, the crew must cancel the HOLD before terminating the call.

GROUND TO AIR CALL

The ground initiates the call termination.
The green lines of the corresponding SAT1 (2) transmission key go out.
R Do not select the PA after a SATCOM call. This will result in the PA being permanently
R selected.
R First select another system (VHF for example) and then the PA.

COMPUTER RESET

In most cases, computers may be recovered following an abnormal behaviour or a detected fault by either :
– a software reset (reset of the microprocessor), or
– interrupting the power supply of its processing part for a short time.
This may be achieved with the normal cockpit controls (engagement levers, pushbuttons) or by action on the corresponding reset button.
R For this purpose :
R – Select the related normal cockpit control OFF, or pull the corresponding reset button,
R – Wait 3 seconds if a normal cockpit control is used (unless a different time is indicated),
R or 1 second if a reset button is used,
R – Select the related normal cockpit control ON, or push the corresponding reset button,
R – Wait 3 seconds for the end of the reset.

WARNING
R Do not reset more than one computer at the same time, unless instructed to do so.

The following table, lists the various computers for which manual reset capability is provided :
· On the overhead RESET panels
· On the system controls panel.
For each computer, effects and/or precaution in case of reset (if any) are also listed.
– A computer reset has to be attempted when :
  · recommended by an ECAM procedure or
  · recommended by a paper procedure.
– In all other circumstances, where a failure is suspected or detected, there is no specific recommendations as to whether a reset should be performed or not, except those where a reset is specifically forbidden.
R – Before doing any reset that is not asked by the ECAM, or paper check list, consult the
R QRH to ensure that it is not forbidden.
Manual reset on ground will trigger complete power up test.
The number of reset attempt is not limited.

R

ATA	EQUIPMENT	MANUAL RESET		REMARKS
		OVHD RESET panel	System control panel	
21	PACK CONT	2		NIL
	ZONE CONT	1		
	VENT CONT	2		
	AEVC	1		
	CPC	2		To force a CPC changeover : — MODE SEL . . . . MAN • AFTER 3 seconds : — MODE SEL . . . . AUTO The inactive CPC may then be reset (check the CAB PRESS ECAM page).
22	FCU	2		— On ground : The FCU has to be reconfigured after reset. — In flight : Check FCU targets after reset. Following a total FCU reset, targets are selected targets.
	FMGEC and FM	4		· FMGEC or FM resets results in onside AP disconnection (if engaged). · Resynchronization of both FMs will occur after a reset sequence, with associated messages on the MCDU and ND : — PLEASE WAIT — MAP NOT AVAIL · It is recommended to use FMGEC R/B, rather than FM R/B.
	MCDU		BRT OFF CTL	In case the MCDU is blank or locked, refer to 4.06.20.

R

ATA	EQUIPMENT	MANUAL RESET		REMARKS
		OVHD RESET panel	System control panel	
23	CIDS	2		· In the event of reset of this active CIDS (usually CIDS 1 when both are operative) a complete power up test is performed. — In flight, test lasts about 20 seconds: · the cabin light illuminates at full intensity. If selected, dimming is lost and must be reselected after test. · PA, CALL and INTERPHONE functions are interrupted and have to be reselected after test. · FAP cabin temperature corrections are lost and have to be reselected after test. — On ground, test lasts about 80 seconds, and includes additionally : · a sequencial cabin loudspeakers test (triggers a tone for about 10 seconds) · the cabin light might flash shortly. Dimming selection is lost (as in flight)
	ACP/AMU	2		NIL
	RMP		ON/OFF CTL	In case of freezing of one RMP (impossibility to interchange the ACTIVE and STBY radio navigation or communication frequencies,...), all the RMP's have to be reset, one after the other, to recover a normal operation. In order to be reset RMP's must be switched off at least 5 seconds by using the ON/OFF selector on the RMP control panels.
24	GPCU		2 pb on ELEC panel	GPCU reset may be attempted if AVAIL and ON lights are not illuminated. 1. Press once the affected EXT A(B) pb sw to reset the functions of GPCU. 2. Switch on the external power unit to reset the GPU. 3. Check AVAIL light is ON and press the EXT A(B) pb sw to connect the GPU. · If unsuccessful, check GPU voltage and frequency (bite is available on batteries only)

R

ATA	EQUIPMENT	MANUAL RESET		REMARKS
		OVHD RESET panel	System control panel	
24	BCL		3 BAT pb on ELEC panel	Use the BAT pushbutton to reset the BCL. Do not reset the BCL when the BAT FAULT caution has been triggered and the BAT OFF selection has been requested by the ECAM.
26	SDCU	2		NIL
27	PRIM and SEC		FLT/CTL panel	— PRIMs or SECs may be reset, unless the DC ESS BUS FAULT caution is present, as this would result in a loss or the related PRIM or SEC. — If a reset is performed on ground, it must be followed by a flight controls' test (SOP 3-03-10). WARNING : — Do not reset more than one computer at a time. *Note : When a PRIM reset is performed on ground, the crew must check the pitch trim position.*
	FCDC	2		NIL

R

ATA	EQUIPMENT	MANUAL RESET		REMARKS
		OVHD RESET panel	System control panel	
28	FCMC	2		– If the reset is done before engine start, the ZFW and ZFCG must be re-entered on the MCDU (init B page). – If the reset is done after engine start, the actual GW and CG must be re-entered on the MCDU (FUEL PRED page).
30	PHC WHC	3 2		Associated heating is interrupted, when the reset button is pulled.
31	DU (ECAM, PFD,ND)		OFF/BRT CTL	If DU reset is unsucessful, a DMC (driving the affected DU) reset may be attempted.
	DMC	3		EFIS/ECAM displays are lost for 40 seconds on ground, after a reset or power up.
	FWC	2		NIL
	SDAC	2		NIL
32	LGCIU	2		An LGCIU reset must neither be made during landing gear maneuvers nor just prior to touchdown.
	BSCU		A/SKID and N/W STRG sw	Refer to 3.04.32

R

ATA	EQUIPMENT	MANUAL RESET		REMARKS
		OVHD RESET panel	System control panel	
38	VSC		Cabin aft C/B panel (VACUUM TOILET SYSTEM)	In case all toilets of one or both sides are shut down : – VACUUM TOILET SYSTEM (blue button) . . . . RESET *The repeated use of the blue reset button is not recommended.* *If this does not fix the problem, apply the following procedure for both system sides on the cabin aft C/B panel (VACUUM TOILET SYSTEM).* *Do not apply the following procedure in case of a waste tank overfill.* – C/B SYSTEM (both) and VACUUM GEN (both) (4 C/B) . . . . PULL – C/B LAVATORY POWER (LH and RH) (8 C/B) . . . . PULL – C/B LAVATORY POWER (LH and RH) (8 C/B) . . . . PUSH *LH and RH SYSTEM and both VACUUM GEN C/Bs remain pulled. In this configuration :* *· The waste quantity indication is lost,* *· The protection against waste tank overfill is lost,* *· Do not use the toilet below 16000 feet*
46	ATSU	1		ATSU reset, using the reset breaker ATSU1 7TX on 261VU (overhead panel), should be attempted, in case of : – Permanent display of “INVALID DATA” on the DCDU. – No key selection effect on the DCDU or MCDU ATC pages.
49	ECB		APU MASTER sw	Reset must only be attempted when the APU speed is below 7%.
52	PSCU	2		NIL

R

ATA	EQUIPMENT	MANUAL RESET		REMARKS
		OVHD RESET panel	System control panel	
70	EIVMU	2		During the reset, and for the next 5 seconds, the following occurs : — On the corresponding engine : · Loss of thrust reverser · Loss of vibration indication · If idle is selected, only high idle is available · Loss of man start and wet crank · Loss of bleed corrections on thrust limit — On both engines : · Loss of autothrust — Flex/Derated TO is lost.

COCKPIT DOOR OPERATION

This procedure should be applied, if local Airworthiness Authorities require that the cockpit door remain closed throughout the entire flight.

BEFORE PUSHBACK OR ENGINE START

– **COCKPIT DOOR . . . . CLOSE**
With the cockpit door selector at NORM, the cockpit door is closed and locked.

AFTER ENGINE START

● **If ROUTINE ACCESS is requested from the cabin :**
The buzzer sounds in the cockpit for 1 to 9 seconds (3 seconds by default).

– **CAMERA 1 DISPLAY . . . . CHECK**
Camera 1 is automatically displayed upon entry request.

– **VIDEO CAMERA pushbutton . . . . PRESS**

– **CAMERA 2 and 3 DISPLAY . . . . CHECK**
Prior to unlocking the door, the flight crew should identify the person requesting entry.

● **If entry is NOT authorized by the flight crew :**

– **DOOR LOCK switch . . . . LOCK**
Emergency access, the buzzer, and the keypad are inhibited for a preselected time between 5 and 20 minutes.

● **If entry is authorized by the flight crew :**

– **DOOR LOCK switch . . . . UNLOCK**
The flight crew should pull the switch and maintain it in the UNLOCK position, until the cabin crew pushes the door open.

Note : *If the flight crew does not take any action after a routine cabin request, the cabin crew will be able to open the door by using the emergency access procedure.*

- **If EMERGENCY ACCESS is initiated from the cabin :**

  The buzzer will sound continuously in the cockpit, and the OPEN light flashes on the center pedestal's cockpit door panel.

  Note : If the flight crew does not take any action, the door will unlock after a preselected time between 15 and 120 seconds.

  – **DOOR LOCK switch . . . . LOCK**
  Emergency access, the buzzer, and the keypad are inhibited for a preselected time between 5 and 20 minutes.

  – **CAMERA 1 DISPLAY . . . . CHECK**
  Camera 1 is automatically displayed upon entry request.

  – **VIDEO CAMERA pushbutton . . . . PRESS**

  – **CAMERA 2 and 3 DISPLAY . . . . CHECK**
  Prior to unlocking the door, the flight crew should identify the person requesting entry.

  - **If entry is authorized by the flight crew :**

    – **DOOR LOCK switch . . . . UNLOCK**
    The flight crew should pull the switch and maintain it in the UNLOCK position, until the cabin crew pushes the door open.

OPENING THE COCKPIT DOOR FROM THE CABIN

– **CABIN CREW ROUTINE ACCESS . . . . REQUEST ON KEYPAD**

– **CABIN CREW . . . . PRESS #, or N+#**
"N" represents an Operator-defined figure between 0 and 7 seven digits.

– **CABIN CREW . . . . STAND IN COCKPIT DOOR AXIS**
The cabin crew should stand in the axis of the cockpit door.
A buzzer sounds in the cockpit.

● **If entry is NOT authorized by the flight crew :**
 – The flight crew locks the door via the DOOR LOCK switch.
 – The keypad's red light comes on steady, and indicates that the door is locked. Emergency access, the buzzer, and the keypad are inhibited for a preselected time between 5 and 20 minutes.

● **If entry is authorized by the flight crew :**
 – The flight crew unlocks the door via the DOOR LOCK switch.
 – The keypad's green light comes on steady, and indicates that the door is unlocked.

 – **CABIN CREW . . . . PUSH DOOR TO OPEN**

● **If there is no reaction from the flight crew :**

 – **CABIN CREW SECOND ACCESS . . . . REQUEST ON KEYPAD**
 Repeat the above procedure.

● **If there is no reaction from the flight crew, after a second request :**

 – **CABIN CREW . . . . CALL THE COCKPIT**
 To establish contact with the flight crew and request access to the cockpit.

● **If there is no reaction from the flight crew, after a cabin crew interphone call :**

 – **CABIN CREW . . APPLY THE FOLLOWING EMERGENCY ACCESS PROCEDURE**

 – **EMERGENCY ENTRY CODE . . . . ENTER and PRESS #**
 The emergency entry code is an Operator-defined figure between 2 and 7 seven digits. A buzzer will sound continuously in the cockpit and the keypad's green light flashes. After a preselected time between 15 and 120 seconds, the keypad's green light comes on steady, and the cabin crew can then push the door open.

 – **CABIN CREW . . . . PUSH DOOR TO OPEN**
 The cockpit door unlocks for 5 seconds.
 The buzzer stops and indicates that the door is unlocked.

GENERAL

The fly-by-wire system has been designed and certificated to make the new generation of aircraft more cost effective and safer and smoother to fly or ride in than a conventionnal aircraft.

NORMAL OPERATIONS

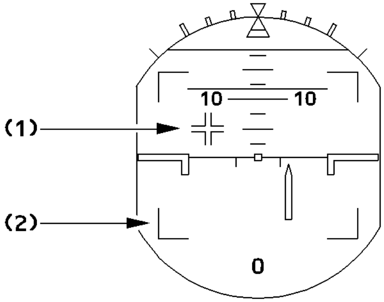
The pilot uses the sidestick to fly the aircraft in pitch and roll (and indirectly, through turn coordination, in yaw).
The computers interpret the pilot's inputs and move the control surfaces as necessary.
However, regardless of the pilot's inputs the computers will prevent :
— Excessive maneuvering
— Loss of control leading to excursions outside the safe flight envelope.

AIRCRAFT ON THE GROUND

On the ground the sidesticks have full authority over the controls in pitch and roll.
With the aircraft in the normal configuration and engines running on the ground :
— When the wheel brakes are released, the aircraft usually rolls with no added thrust.
— Nose wheel steering is "fly by wire", with no mechanical connection between the nose wheel and the steering tiller. The control forces are light : the flight crew should be careful to move the tiller gently to avoid unnecessary high-rate turns.

The aircraft can make very tight turns, but the flight crew should resist any tendency to overcontrol. When making tight turns at low ground speed, the crew should hold the selected tiller position, even if the turn radius is shorter than intended, so as to maintain a smooth turn.

GFC5-03-0427-002-A001AA



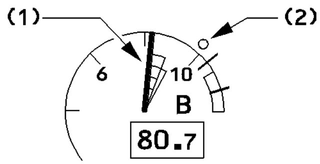
The PFD includes a symbol (1) that is the sum of sidestick positions given to the computers. It permits the PNF to check that the PF is making an appropriate control input
R during takeoff roll.
Small limit marks (2) indicate the limits of stick travel (± 16° in pitch, ± 20° in roll).
They are displayed only with aircraft on ground. Flight crew must not use this display for control checks, because it does not necessarily indicate control position in failure cases. Flight crew must use the ECAM flight controls page for making that check.

IN FLIGHT

TAKEOFF MODE

R

GFC5-03-0427-002-B001AA



Thrust management is very easy. The pilot selects a FLX thrust by stopping the thrust levers in the FLX/MCT detent and checking that the resulting N1 (or EPR) (1) is compatible with N1 (or EPR) target (2). For maximum takeoff thrust, the pilot moves the thrust levers fully forward and makes the same thrust check (N1 or EPR).
To counter the nose up effect of setting engine takeoff thrust, the pilot should apply half forward stick until the airspeed reaches 80 knots. Then he should release the stick
R gradually to reach neutral at 100 knots (Refer to SOP 3.03.12 for additional information).

R Rotation is conventional. As the A330 has a large inertia, it is important to initiate the rotation with a positive backward stick input (typically 2/3 backstick).
R The rotation rate produced by a given sidestick input takes time a build up ; once it has developed, it remains relatively constant for a given sidestick position. Rapid variations in stick position cause discomfort.

The pilot continues the rotation to a typical all-engines attitude of about 15°. As the attitude changes and stabilizes, the control laws change to those for the flight mode in pitch, allowing the sidestick to return to the neutral position to maintain 1g at the chosen attitude.
Pitch trim can begin to work at 50 feet.

For crosswind takeoffs, routine use of into wind aileron is not recommended. In strong
R crosswind conditions, some lateral control may be used, but care should be taken to avoid using large deflections, resulting in excessive spoiler deployment which increases the tendency to turn into wind, reduces lift, and increases drag. Spoiler deflection starts to become significant with more than half sidestick deflection. As the aircraft lifts off, any lateral control applied will result in a roll rate demand.

FLIGHT MODE

The sidestick is normally in the neutral position, with the aircraft stable in pitch and roll at the chosen altitude in straight or turning flight within certain limits. As a result, even in turbulence, the aircraft is best flown with little, or no, stick input.
Hands off, the system maintains 1g in pitch, corrected for pitch and roll attitude, and zero roll rate, within certain limits (+ 30°, – 15° in pitch and ± 33° roll). Hands off, within these limits, the aircraft resists disturbance from the atmosphere and rides well even in heavy turbulence.
The system compensates almost 100% for trim changes, due to speed and configuration changes. Trim changes, due to thrust changes, can be too large for the system to compensate, and the aircraft may respond to them in pitch, in the conventional sense, and then hold the new attitude at which it stabilized after the trim change.
The pitch trim wheel moves as the control law compensates for these changes.
Control laws also make turning easier. They protect against overbanking and, at the chosen bank attitude (less than 33° of bank), the system maintains zero roll rate, stick free.
Steep turns can be made at up to 67° of bank. This is the steepest bank at which it is possible to maintain level flight at 2.5g.
Beyond 33° of bank, the pitch trim stops working and a lateral stability term is introduced. This term becomes progressively stronger, as the bank angle increases, so that it equals a full sidestick demand at 67° of bank, hence forming the limiting system.
The lack of pitch trim makes it necessary for the pilot to hold the nose up in a steep turn. If he releases the stick, the nose drops and the aircraft eases its roll angle to less than 33° of bank and stabilizes at the pitch and bank angles it achieves at less than 33° of bank.
During a normal entry into a turn, the pilot must make an intentional initial change to the pitch attitude in order to maintain level flight. Once he has done this, he can release the stick. The system then maintains a level turn.
In climb, cruise, descent, and approach all these basic rules remain in effect.

LANDING MODE

The system's landing mode gives the aircraft a stabilized flight path and makes a conventional flare and touchdown. It carries out the initial approach as this manual described earlier. At 100 feet, the normal flight law is changed to the flare law which is a full authority pitch direct law compensated for CG and for certain pitching effects so that the pilot has to exert a progressive pull to increase pitch gently in the flare. He should pull the thrust levers back at or above 20 feet, and the landing should occur without a long flare. An audible "RETARD" callout reminds the pilot if he has not pulled back the thrust levers when the aircraft has reached 20 feet.

R Crosswind landings are conventional. The preferred technique is to use the rudder to align
R the aircraft with the runway heading, during the flare, while using lateral control to maintain
R the aircraft on the runway centerline (Refer to SOP 3.03.22). The lateral control mode does not change until the wheels are on the ground, so there is no discontinuity in the control laws. The aircraft tends to roll gently in the conventional sense as drift decreases, and the pilot may have to use some normal cross control to maintain roll attitude.

Even during an approach in considerable turbulence, the control system resists the disturbances quite well without pilot inputs. In fact, the pilot should try to limit his control inputs to those necessary to correct the flight path trajectory and leave the task of countering air disturbances to the flight control system.

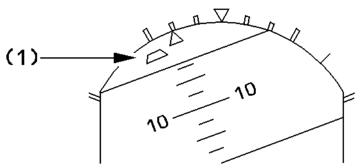
Derotation is conventional.

Pitch trim then resets to 4° UP after the transition to ground law, which happens 5 seconds after the ground condition is confirmed and if the ground spoilers are retracted.

ABNORMAL OPERATIONS

ENGINE FAILURE AT TAKEOFF

GFC5-03-0427-004-A100AA



On the ground the aircraft is conventional. The pilot uses rudder to maintain direction. He should rotate to about 12.5° of pitch and adjust as required. The sideslip indication (1) changes to the engine-out mode (blue). When it is centered, the aircraft is close to the zero aileron position (best drag condition). It is therefore important to zero the slip indication accurately.

Trim the rudder conventionally.

When time permits, the pilot should check the FLT CTL page on ECAM and refine the rudder trim to give neutral lateral control, and also trim the rudder toward the spoilers that are up or toward the aileron that is farthest up to bring the lateral controls back to neutral.

ENGINE-OUT LANDING

The engine-out landing is basically a conventional landing. The pilot should trim to maintain the slip indication centered. It is yellow, as long as N1 is less than 80 %. To make the landing run easier, it is recommended that, in the later stages of the approach, the rudder be reset to zero. With trim at zero, the neutral rudder pedal position corresponds to zero rudder and zero nosewheel deflection.

GO-AROUND WITH ONE ENGINE FAILURE

The piloting technique, in this case is, similar to that for an engine failure at takeoff :
- Zero beta target value for optimum performance with appropriate rudder application.
- At certain weights and CG positions, it will not be possible to satisfy beta target demands at VLS. When obstacle clearance is assured, accelerate to a speed at which beta target can be satisfied.

R BOUNCE AT LANDING

R In case of a light bounce, maintain the current pitch attitude and complete the landing,
R while maintaining the thrust at idle. In case of a strong bounce, initiate a go-around, initially
R maintaining the pitch attitude. Retract the flaps one step, and then the landing gear, once
R the aircraft is properly established on the go-around segment. In all cases, do not attempt
R to soften the (potential) second touchdown by increasing the pitch attitude.

TRAINING TOUCH-AND-GO

With the nosewheel on ground, pitch trim automatically resets to 4° UP : This normally occurs 5 seconds after the pitch attitude is less than 2.5°, and if the ground spoilers are retracted. The pilot should select CONF 2 and add thrust. He must always move the thrust levers to TOGA to bring up the speed reference system (SRS), and then reduce to a lower thrust (not less than CL), if he chooses. Takeoff may be a little out of trim, which may affect the rotation slightly, but once the aircraft is off the ground, the control law holds the “out of trim”, then retrims at 50 feet, provided the aircraft has transitioned to flight law.

ABNORMAL CONTROL LAWS – GENERAL

ALTERNATE LAW

Pitch alternate and roll normal is the first level of degraded control law.
Further failures result in pitch alternate and roll direct.
The autopilot may be available, depending on the cause and type of failure(s).

DIRECT LAW

The sidestick is directly coupled to the controls via the computers, but without any of the stabilization feedbacks. In effect, this law turns the aircraft into a conventional aircraft, but is compensated for configuration and CG. The pilot must use manual pitch trim, as signaled on the PFD. The autopilot is not available.

BACKUP

The pilot can use the pitch trim and rudder to control the aircraft for short periods of total loss of fly-by-wire.

ABNORMAL CONTROL LAWS – IN DETAIL

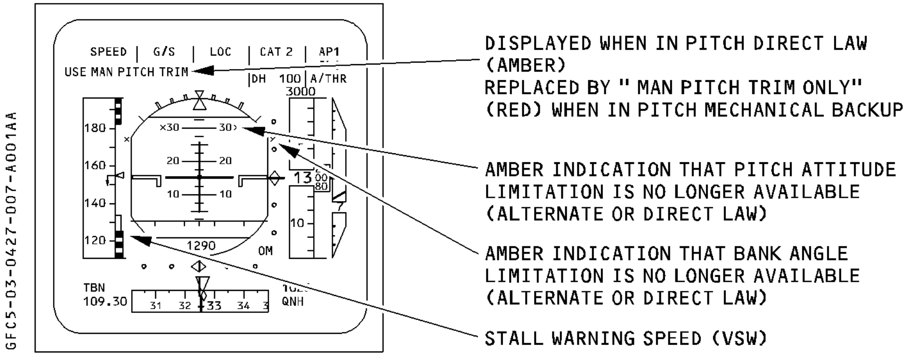
ALTERNATE LAW

Pitch

Alternate law in pitch is almost the same for the pilot, as normal control law.
However, alternate law does not maintain any of the protections, except maneuver protection. As a result, the pilot must fly the aircraft more attentively to avoid inadvertently exceeding the normal limits.
Alternate law reduces MMO to 0.82.
An aural "STALL, STALL, STALL" warning sounds at low speeds. Upon hearing it, the pilot must return to the normal operating speed by taking conventional actions with the controls:
THRUST LEVERS . . . . .TOGA
At the same time :
PITCH ATTITUDE . . . . .REDUCE
BANK ANGLE . . . . .ROLL WINGS LEVEL
SPEEDBRAKES . . . . .CHECK RETRACTED

- If a danger of ground contact exists, reduce pitch attitude no more than necessary to allow airspeed to increase. After initial recovery, maintain speed close to VSW until it is safe to accelerate.
- If below 20000 feet, and if in clean, select FLAP 1.
- Out of stall, when there is no threat of ground contact :
  LANDING GEAR . . . . .UP
  - Recover to normal speeds and select flaps as required.
  - In case one engine is inoperative, use power and rudder with care.

The aural stall warning may also sound at high altitude, where it warns that the aircraft is approaching the angle of attack for the onset of buffet. To recover, the pilot must relax the back pressure on the sidestick and reduce bank angle, if necessary. When the stall warning stops, the pilot can increase back pressure again, if necessary, to return to the planned trajectory.



At low speed, the change in the speed scale is very noticeable. VLS remains, but Vα PROT and Vα MAX disappear, replaced by a single black and red strip, the top of which is stall warning speed. Unlike VLS, which is stable, VSW is g sensitive so as to give additional margin in turns. As mentioned above, ALTERNATE reverts to DIRECT law for landing at 100 feet.

Roll

Roll control is direct. The roll rate is generally higher than with normal law and, at first, the aircraft appears to be very sensitive.
Bank stability and limits are no longer active, and the flight crew should be careful to remain within normal limits.

DIRECT LAW

Normally, direct law in pitch is transitory, due to undetected failures of, for example, a second IRS. Once the flight crew has isolated the failed system, the PRIMs can be reset to acquire alternate law in pitch.
When the system goes into direct law, “USE MAN PITCH TRIM” appears on the PFDs. This message flashes for five seconds, then remains steady.
The pilot should use small control inputs, when the aircraft is in direct law at high speed, because the controls are powerful. Good trimming in pitch is required.
The pilot should avoid using large thrust changes, or sudden speedbrake movements, particularly if the center of gravity is aft. If the speedbrakes are out, and the aircraft has been retrimmed, the pilot should gently retract the speedbrakes, giving time to retrim so as to avoid a large nose-down trim change.
The flight crew must fly the aircraft carefully at all times. Control is precise, but there are no protections.
The aural stall warning for alternate law also serves direct law, and the technique for recovery is the same.
Any tendency to roll stick free can be corrected by conventional use of rudder. Residual rudder forces can be trimmed out by using rudder trim in the direction of the applied force.

After trimming, the sideslip index will be slightly displaced from the center. With some failure conditions, the asymmetric rolling tendency may be increased. It will always be possible to trim the aircraft to flight straight, hands off. There may then be an asymmetry in roll response, but the achieved roll rate is always adequate. Landing in direct law is like landing a conventional aircraft. Trim changes to compensate for configuration changes are small, as is the trim change with speed change. Trim change with a large thrust change is quite large, so the pilot should make smooth thrust changes. The flare height for landing is the same (30 feet), and the pilot uses conventional techniques. (The controls remain light and powerful). Pilots have landed this aircraft in direct law, in moderate to heavy turbulence with gusting winds, without undue difficulty.
Direct law works with the yaw damper and provides a minimal turn coordination.

THE PROTECTION SYSTEMS

GENERAL

The aircraft has a comprehensive flight envelope protection system.
This system increases safety, if the pilot has to perform an extreme maneuver, or if the aircraft enters very violent meteorological conditions.
In either of these situations, the pilot can make full sidestick inputs in normal laws at any speed. The rudder is not protected in this way, but is not normally used during symmetrical flight.
The pilot will never see any aspect of this envelope protection take effect, as long as he flies the aircraft normally.

Note : The normal flight envelope is not different from that of a conventional aircraft, and is defined as VLS to VMO. Pilots should not deliberately fly at a speed that is lower than VLS, except for properly authorized training or testing.

ATTITUDE LIMITS

The system limits the aircraft to 67° of bank, which corresponds approximately to the bank angle needed for a level 2.5g turn.
The system limits pitch attitude to + 30° and – 15°. The + 30° limit decreases to 25° at low speed. If the aircraft attitude approaches these limits, the pitch and roll rates start to decrease 5° before the limit, so that it will stop at the limit without overshooting.

MANEUVER LIMIT

The aircraft is structurally designed to the same limits as any other large aircraft. The 2.5g limit (2g if not in clean configuration) allows the aircraft to make an abrupt maneuver, without structural risk, if such a maneuver becomes necessary.
When this occurs (after a ground proximity warning, for example), the pilot should quickly apply full control and hold it until the flight path is safe. Response time is a vital factor in avoidance : The system allows maneuvers that the pilot would normally not be able to safely perform at any altitude, low or high.

R **EXCEEDING VMO/MMO**

R During descent the aircraft may slightly exceed VMO/MMO with the autopilot engaged.
R This may happen when adverse conditions are encountered.
R Using the following procedure prevents such an exceedance during descent :
R 1. The current speed is close to VMO (maximum operating speed) :
R — Monitor the speed trend symbol on the PFD :
R · If the speed trend reaches or slightly exceeds the VMO limit :
R — Use the FCU immediately to select a lower speed target.
R · If the speed trend significantly exceeds the VMO red band, without high speed
R protection activation :
R — Select a lower target speed on the FCU and,if the aircraft continues to accelerate,
R consider disconnecting the AP.
R — Before re-engaging the autopilot, smoothly establish a shallower pitch attitude.
R 2. If the aircraft accelerates above VMO with the AP engaged :
R The AP will disengage upon reaching the high speed protection. The high speed
R protection will apply a nose-up order up to 1.75 g, in addition to pilot input during VMO
R recovery. Consequently :
R — Make a smooth pitch correction in order to recover proper speed.
R In all events :
R — Check AP engagement status and re-engage it when appropriate. It may have tripped
R if VMO/MMO was significantly exceeded. The associated aural warning may have been
R superseded by the overspeed aural warning.

HIGH SPEED PROTECTION

The aircraft automatically recovers following a high speed upset. Depending on the flight conditions (high acceleration, low pitch attitude) the High Speed Protection is activated at/or above VMO/MMO.
When it is activated, the pitch trim is frozen, spiral static stability is introduced to 0° bank
R angle (instead of 33° in normal law), and the bank angle limit is reduced from 67° to 45°.
As the speed increases above VMO/MMO, the side-stick nose-down authority is progressively reduced, and a permanent nose-up order is applied to aid recovery to normal flight conditions.
The High Speed Protection is deactivated when the aircraft speed decreases below VMO/MMO, where the usual normal control laws are recovered.
The flight crew should never deliberately fly the aircraft beyond VMO/MMO, unless absolutely necessary for operational reasons, such as avoiding another aircraft.
The pilot should, as soon as possible, reduce resistance to the High Speed Protection and allow the aircraft to return to a speed below VMO/MMO, by smoothly relaxing the forward stick force to attain a comfortable nose-up pitch rate. It is not usually necessary to apply a pull force to recover. If a quicker recovery is required for operational reasons, the pilot should pull back smoothly and progressively, monitoring the g indication on the ECAM".

STALL PROTECTION

The aircraft resists attemps by either a pilot or the atmosphere to stall it. If a pilot attemps a stall, he feels the aircraft trying to pitch down as speed approaches the amber and black strip. The pilot can resist this tendency until speed reaches the red band (alpha maximum), and then further nose-up control is not available. Between these two points alpha floor automatically sets go around thrust. The pilot can hold full back stick, if it is needed (see windshear), and the aircraft stabilizes at an angle of attack close to but short of the 1g stall.
WHEN FLYING AT ALPHA MAX, THE PILOT CAN MAKE GENTLE TURNS, IF NECESSARY.
As the aircraft enters protection at the amber and black strip, the system inhibits further nose-up trim beyond the point already reached. Nose-down trim remains available if the pilot pushes the stick forward.
The pilot should not deliberately fly the aircraft in alpha protection except for brief periods when maximum maneuvering is required. If the pilot enters alpha protection inadvertently, he should get out of it as quickly as possible be easing forward on the sidestick to reduce the angle of attack while simultaneously adding power (if alpha floor has not already been activated or has been cancelled). The system will regain the normal load factor law if the stick is pushed forward of neutral, but it will re-enter alpha protection if the stick is released with the angle of attack still greater than the value set for alpha protection. Thus to exit alpha protection properly, the pilot should reduce angle attack to a value less than the value set for alpha protection.
The PFD shows this clearly, because the indicated speed is above the black and amber strip.
The pilot should now increase speed above VLS (clear of the amber strip) as soon as other considerations (ground clearance, for example) allow him to do so.
Alpha floor will usually be triggered just after alpha protection is entered, and go around thrust will automatically be applied. Thus, if the sidestick is held aft, either inadvertently or deliberately, the aircraft will start to climb at a relatively constant low airspeed. To recover to a normal flight condition, alpha protection should be exited by easing forward on the sidestick, as described above, and the alpha floor should be cancelled by using the disconnect pushbutton on either thrust lever as soon as a safe speed is regained.
The aircraft can also enter alpha protection at a high level, where it protects the aircraft from the buffet boundary. The PFD shows that alpha protection is active in the same way it does so at low speed or low level : the amber and black strip rises to the actual speed of the aircraft. As at low speed or low level, if the stick is merely released to neutral the aircraft maintains the alpha for alpha protection. (This value of alpha is not however the same as the values used at low speed : alpha for alpha protection is reduced as a function of Mach so that a typical cruise value is in the order of 5°). Thus the aircraft may climb, stick free, when leaving a turn after entering alpha protection. If the pilot has flown into alpha protection, he should leave it as soon as other considerations allow by easing forward on the stick to reduce alpha below the value of alpha protection while simultaneously increasing thrust or speed as appropriate.

WINDSHEAR

Most of the recommended techniques for flight in windshear apply. However, for this aircraft, the techniques are somewhat simpler.
The aircraft can only survive windshear if it has enough energy to carry it through the loss-of-performance field. It can sustain this energy level in the following three ways :
- Carry extra speed. In some cases, the aircraft does this automatically.
- Add maximum thrust. The aircraft does this automatically.
- Trade height energy for speed. Any aircraft can do this.

Proper pilot technique helps in this survival process. The pilot must follow orders from the Speed Reference System (SRS), even if he has to use full backstick in order to do so. At this stage, maintain full backstick until the shear is passed ; the aircraft will automatically hold close to the maximum angle of attack. The speed should stay close to the beginning of the red strip. But, in turbulence, it could be temporarily below it without significant effect. As speed begins to recover, the pilot can reduce backstick while still following SRS orders until well clear of the shear.

ABNORMAL CONFIGURATIONS

With the horizontal stabilizer jammed, control is much easier than it is in a conventional aircraft because the systems holds the elevator required to maintain the 1g flight path. The pitch control law reverts to alternate, and the lateral control law remains normal to touchdown.

AIRCRAFT TRIMMING

When the aircraft is :
- In the normal cruise range
- In straight flight,
- With the autopilot engaged,
- With symmetrical engine thrust, and
- With fuel symmetrically distributed in the wing tanks,
  the rudder trim should stay between 1.9° right and 1.6° left.

<u>Note</u> : *This indication corresponds to a true rudder deflection within ± 1°, taking into*
R *account the permanent rudder trim indication offset, when the aircraft is in cruise conditions (0.9° right, 0.6° left).*

FUEL JETTISON

Fuel jettison is provided for quick reduction of aircraft weight in order to :
- Comply with the approach and landing climb requirements (not required if the configuration is FLAP 3 for landing),
- Obtain the normal maximum landing weight (if time permits),
- Obtain the planned flight profile, in case of an engine failure en route.

It is possible to jettison in any convenient configuration and at any speed. When feasible, the height should be sufficient to avoid contamination on the ground (5 000 feet AGL is considered to be adequate).
Do not jettison in a thunderstorm.
When jettison is performed, avoid flying into the jettisoned flow (which is descending at about 500 feet/min).
Average weight reduction (by jettison only) is 1000 kg/min (2200 lbs/min).

AUTOMATIC MODE

On MCDU :

- **FUEL PRED key . . . . SELECT**
- **JET GW . . . . ENTER THE FINAL GW**

On OVERHEAD panel :

- **T TANK MODE . . . . CHECK AUTO**
- **JETTISON ARM . . . . ON**
- **JETTISON ACTIVE . . . . ON**

Note : If T TANK XFR FAULT ECAM warning is triggered, disregard the ECAM procedure.

CAUTION
During jettison operation, monitor the CG.
R If either the forward or aft takeoff and landing limit is reached, stop jettison.

- **When jettison is completed, or to manually stop JETTISON operation :**

- **JETTISON ACTIVE . . . . OFF**

– **JETTISON ARM . . . . OFF**

Note : 1. Jettison operation is automatically stopped, when the actual GW reaches the value inserted in the MCDU.
2. Automatic jettison can be restarted by re-entering the JET GW.

MANUAL MODE

On the MCDU, if necessary :

– **FUEL PRED key . . . . SELECT**

– **JET GW . . . . CLEAR**

On the OVERHEAD panel :

– **T TANK MODE . . . . CHECK AUTO**

– **JETTISON ARM . . . . ON**

– **JETTISON ACTIVE . . . . ON**

Note : If the T TANK XFR FAULT ECAM warning is triggered, disregard the ECAM procedure.

CAUTION
During jettison operation, monitor the CG.
If either the forward or aft takeoff and landing limit is reached, stop jettison.

• **To stop JETTISON operation :**

– **JETTISON ACTIVE . . . . OFF**

– **JETTISON ARM . . . . OFF**

CAUTION
The fuel will be jettisoned until both ETOPS level sensors become dry, or until the flight crew turns off the jettison pushbuttons.

ICING CONDITIONS

Icing conditions may be expected when the OAT (on ground and for takeoff), or the TAT (in flight) is 10°C or below, and there is visible moisture in the air (such as clouds, fog with low visibility of one mile or less, rain, snow, sleet, ice crystals), or when standing water, slush, ice or snow is present on the taxiways or runways.

WARNING

Pilots must turn on the engine anti-ice system, when temperature and visible moisture meet these criteria, and should not wait until they see ice building up.

OPERATIONS IN ICING CONDITIONS

Flight in icing conditions

- **Engine anti-ice**
  ENGINE ANTI ICE must be ON during all ground and flight operations, when icing conditions exist, or are anticipated, except during climb and cruise when the SAT is below – 40°C.
  ENGINE ANTI ICE must be ON before and during a descent in icing conditions, even if the SAT is below – 40°C.
- **Wing anti-ice**
  The flight crew may use WING ANTI ICE to either prevent ice formation, or to remove an ice accumulation from the wing leading edges.
  The flight crew should turn WING ANTI-ICE ON, whenever there is an indication that the airframe is icing up. The indication may be an accumulation of the ice on the ice detector (between the two cockpit windshields), or on the windshield wipers.

CAUTION

R 1. The pilot should avoid extended flight in icing conditions with the slats extended.
R 2. In case of suspected significant ice accumulation on non de-iced parts of the
R airframe, the approach speed must not be lower than :
R – In clean configuration, VLS + 15 knots.
R – In CONF 1, 2, 3, FULL, VLS + 5 knots, and multiply the landing distance by
R 1.1.
R 3. In case of suspected significant ice accumulation on de-iced parts (WING ANTI
R ICE inoperative) of the airframe, the approach speed must not be lower than:
R – In clean configuration, VLS + 15 knots ;
R – In CONF 1, 2, 3, FULL, VLS + 10 knots, and multiply the landing distance by
R 1.2.

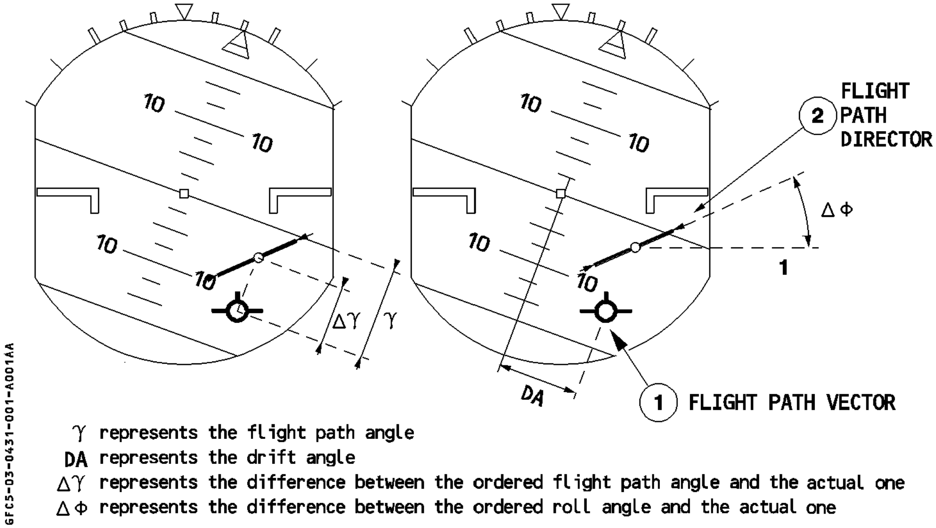
Ground operation in icing conditions

See the Contaminated Runways section (2 04.10).
See the Adverse Weather section for aircraft preparation in cold weather (3.04.91).
See the Standard Operating Procedures for engine operations (3.03.09).

RAIN REPELLENT

If the rain repellent is operative, the flight crew should only use the rain repellent in moderate to heavy rain.

USE OF FLIGHT PATH VECTOR



Υ represents the flight path angle
DA represents the drift angle
ΔΥ represents the difference between the ordered flight path angle and the actual one
ΔΦ represents the difference between the ordered roll angle and the actual one

R The flight path vector (FPV) indicates performance and does not direct or command. Because there is always a slight lag between an attitude change and the change in flight path that results from it, when the pilot uses the FPV he should make an attitude change first, then use the FPV to check the resulting flight path.
R Vertically the FPV indicates the aircraft's flight path angle.
R The FPV is particularly useful when the aircraft is doing visual circuits. For example, when the aircraft is flying downwind the pilot simply adjusts the aircraft attitude to put the FPV symbol on the horizon. This establishes the aircraft in level flight. On the final approach, the pilot puts the FPV three degrees below the horizon to establish the aircraft at a normal angle of descent. If this results in the aircraft going below the chosen approach path (undershooting the touchdown point), the pilot can reduce the angle of descent by raising the FPV. As soon as the aircraft regains the correct descent path, he should bring the FPV back to –3°.
R Laterally, the FPV indicates the aircraft's track and its drift angle. It has the same displacement as the drift diamond on the heading scale and thus appears directly above it. It shows on the PFD the drift the aircraft is experiencing.
R The pilot must take care when making a go-around with the FPV selected. There is inevitably some lag between the pilot's raising the nose to commence the go-around and the aircraft's responding by changing its trajectory. For the same reason the pilot does not use the FPV on takeoff: the primary parameter for rotation, either on takeoff or on go-around, is attitude.

R The TRK-FPA Flight Director is particularly useful for guiding the aircraft during
R non-precision approaches, although it can also be used at other times. When using this
R mode of the FD, the pilot places the FPV symbol in the center of the flight path director
R (FPD) symbol. This is similar to using the FD in HDG-VS, when the pilot puts the center of
R the fixed aircraft symbol at the center of the crossed bars of the FD. If the FCU is set on
R the correct track and flight path angle, and if the FPV and the FPD are aligned, they will
R guide the aircraft along a trajectory that is stabilized with respect to the ground, whereas
R when the pilot is using HDG-VS the trajectory is stabilized with respect to the air. However,
R if the aircraft is disturbed from this ideal trajectory, merely following the FPD will result in
R its following a trajectory that is parallel to the intended trajectory. Thus, when the aircraft
R is disturbed from the original trajectory, the pilot must adjust either its track or its flight
R path angle or both in order to obtain guidance back to the original trajectory. Likewise,
R when the pilot uses the FPA to create a synthetic glide path, it will be positioned correctly
R only if it commences at the right point in space.

R **BSCU RESET**

R In case of braking/steering difficulty, the crew may perform a BSCU reset to recover correct
R functioning of the system. In particular, this applies in the case of any of the following
R ECAM warnings :
R — WHEEL N.W. STEER FAULT
R — BRAKES RESIDUAL BRAKING
R — BRAKES AUTO BRAKE FAULT (except in flight)
R — BRAKES BSCU CH1 (2) FAULT or SYS 1(2) FAULT
R · On ground, aircraft stopped and parking brake applied, by switching OFF then ON the
R A/SKID & N/W STRG selector.
R After any BSCU reset on ground, check the braking efficiency of the normal braking
R system once the aircraft starts moving again (the aircraft must slow down when
R pressing the brake pedals).
R · In flight, with the landing gear retracted, by switching OFF then ON the A/SKID & N/W
R STRG selector.
R In the case of an AUTO BRAKE FAULT, a reset should not be performed in flight so as
R to avoid clearing a real tachometer failure (no tachometer test in flight).
R If required, the autobrake has to be rearmed.

R *Note : Checking the normal braking after a BSCU reset in flight is not necessary (and*
R *not possible), since the BSCU would detect any loss of normal braking at*
R *touchdown, and the ECAM would inform the crew of the switch to alternate*
R *braking without antiskid.*

BRAKING IN ALTERNATE MODE

Apply brakes with care, since initial pedal force or displacement produces more braking action in alternate mode than in normal mode. If antiskid is lost, modulate brake pressure as required at or below 1000 psi. If nosewheel steering is lost, steer the aircraft with differential braking.

BRAKE TEMPERATURE LIMITATIONS REQUIRING MAINTENANCE ACTIONS

Maintenance action is due in the following cases :
— Temperature difference between 2 brakes on a same gear is greater than 150°C, and either temperature of one brake is higher or equal to 600°C, or
— Temperature difference between 2 brakes on a same gear is greater than 150°C, and the temperature of one brake is lower or equal to 60°C, or
— The difference between the LH and RH brake average temperature is higher or equal to 200°C , or
— A fuse plug has melt, or
— The brake temperature exceeds 900°C.

TIRE PRESSURE

R These tables present the different nominal tire pressures, depending on maximum takeoff weight and landing gear loading.

R

A330–200	NOSE				MAIN			
	Unloaded		Loaded		Unloaded		Loaded	
MAXIMUM TAKEOFF WEIGHT	bar	psi	bar	psi	bar	psi	bar	psi
202 000 KG / 445 329 LB 220 000 KG / 485 012 LB 230 000 KG / 507 058 LB 233 000 KG / 513 672 LB	12.2	177	12.7	184	13.6	198	14.2	206

A330–300	NOSE				MAIN			
	Unloaded		Loaded		Unloaded		Loaded	
MAXIMUM TAKEOFF WEIGHT	bar	psi	bar	psi	bar	psi	bar	psi
184 000 KG / 405 646 LB	10.2	148	10.7	155	12.6	183	13.1	189
205 000 KG / 451 943 LB	10.5	152	10.9	158	12.8	186	13.3	194
212 000 KG / 467 375 LB	10.2	148	10.7	155	12.6	183	13.1	189
215 000 KG / 473 989 LB 217 000 KG / 478 398 LB 218 000 KG / 480 603 LB	10.5	152	10.9	158	12.8	186	13.3	194
230 000 KG / 507 058 LB	11.0	160	11.4	165	13.6	198	14.2	206
233 000 KG / 513 672 LB	11.2	162	11.6	168	13.9	202	14.5	210

OPERATION WITH NOSEWHEEL STEERING OFFSET

GENERAL

During taxi, the crew may notice an aircraft veering tendency. It can be due to some external conditions (crosswind, slope....), or it can be due to the nosewheel steering system itself. The latter case is identifiable due to repetitive flight crew reports of permanent aircraft veering tendency. Such reports enable maintenance to determine when corrective action or troubleshooting is required.
A veering aircraft may still be operated before corrective action is taken, provided nosewheel steering deviation is within the values specified in the following table.

NWS OFFSET OPERATIONAL LIMITATION

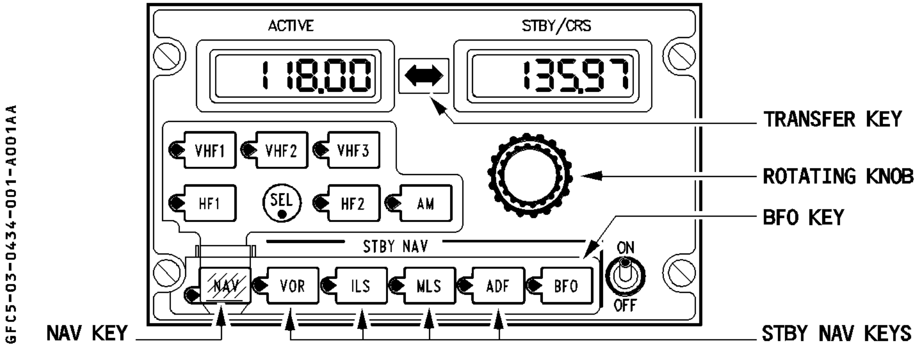
NWS Offset	Offset ≤ 0.8°	0.8° < Offset ≤ 2°	Offset > 2°
Rudder trim to taxi straight	Trim ≤ 6°	6° < Trim ≤ 12°	Trim > 12°
Dispatch	YES	YES	NO
Procedures	No operational limitation	Apply the following procedure At landing : – DIFF BRK . . . . AS REQUIRED Manual landing : – MAX X WIND . . . . 25KT Autoland : – MAX X WIND 14KT	Immediate maintenance action is due

CAUTION

The tolerance required by maintenance (± 0.5° NWS offset, corresponding to the ± 5° rudder trim necessary to taxi straight) remains valid. Operating the aircraft outside the maintenance tolerance is possible by using the applicable procedure. However, in such cases, the flight crew must accurately and systematically make logbook entries (indicating the rudder trim input value to taxi straight) to ensure that maintenance can take corrective action within the applicable timeframe.
When using rudder trim to taxi straight for NWS offset identification, takeoff must only be performed after a rudder trim reset.

PROCEDURES FOR TUNING STANDBY NAVIGATION RADIOS

CAUTION
Pilots should use these procedures only when both FMGCs or all MCDUs are inoperative.
In this case they must press both RMP NAV keys (lighting the green lights).



ON BOTH RMP

– **ON/OFF Switch** . . . . **CHECK ON**

– **NAV key (guarded)** . . . . **PRESS**
R The green light comes on.
System and frequencies previously selected in STBY NAV mode are indicated (STBY NAV key illuminated, ACTIVE and STBY frequencies displayed)

ON THE RMP ASSOCIATED WITH THE RECEIVER TO BE TUNED

Select a STBY NAV system :

● **ADF tuning :**

– **ADF key** . . . . **PRESS**
R The green light comes on.
The windows show the previously selected frequencies.

– **Rotating knob** . . . . **TURN**
Select the desired frequency displayed on STBY/CRS window.
R The outer knob changes units, inner knob decimals.

– **Transfer key** . . . . **PRESS**
This interchanges the ACTIVE and STBY frequencies. The ADF receiver is now tuned to the new ACTIVE frequency.

– **BFO key (if necessary)** . . . . **PRESS**
Green light comes on.

● **VOR (or ILS) tuning :**

– **VOR (or ILS) key** . . . . **PRESS**
Green light comes on.
Both windows display previously selected frequencies.

– **Rotating knob** . . . . **TURN**
Set the frequency in the STBY/CRS window.

– **Transfer key** . . . . **PRESS**
The ACTIVE window displays the selected frequency.
The previous VOR (ILS) course is displayed on the STBY/CRS window.

– **Rotating knob** . . . . **TURN**
Set the course on the STBY/CRS window.
The receiver is now tuned to the frequency of the new station, and the course is selected.
To select another station, press the transfer key making both windows display the previously selected frequency before retuning the VOR (or ILS).

Note : When the radio-nav standby mode is active (NAV key ON) and VHF or HF tuning is required, select the VHF or the HF key on the RMP (normal radio
R *communications use). The NAV key, which has no effect on the selection of a*
R *radio communication frequency, must remain in the ON position in order to*
R *prevent radio navigation aid tuning from changing NAV receiver frequencies.*

R **AUTOMATIC IDENTIFICATION OF ADF/VOR/ILS**

Although the navigation display automatically identifies the tuned ADF, VOR, or ILS station (auto ident decoded), the flight crew must, in the following cases, confirm the correct tuning of the desired station via the audio system :
– A station has either been automatically tuned, or manually tuned by a crew member that enters the associated ident on the MCDU RAD NAV page ; and the decoded ident appearing on the ND is the wrong one.
– A crewmember manually tunes the station on an RMP, or enters the frequency on the MCDU RAD NAV page.

WEATHER RADAR

R Airborne weather radar gives the flight crew an efficient tool for detecting bad weather during flight. The digital weather radar with its multicolor navigation display allows the crew to follow the best route to avoid weather problems.
To this end, some operational advice, based upon a general knowledge of the radar capabilities, is given in this chapter.

R **GENERAL**

R The radar is nothing more than a precipitation detector. How much weather it detects depends upon the raindrops, their size, composition and number.
R The radar does not detect :
· clouds, fog or wind (too small droplets or no precipitation at all)
· clear air turbulence (no precipitation)
· windshear (no precipitation except in microburst)
· lightning.
R The radar does detect :
· rainfall
· wet hail and wet turbulence
· ice crystals, dry hail and dry snow (above 30 000 feet) will only give small reflections.

OPERATIONAL FUNCTIONS

TILT, RANGE AND GAIN

R The three things that the flight crew must understand in order to take full advantage of the weather radar are :
R – antenna tilt, which causes the center of the radar beam to scan above or below the attitude reference plane
R – range control which, in coordination with tilt governs the range of the navigation display
R – gain control, which adjusts the sensitivity of the receiver (and should normally be set to AUTO). The sensitivity of the receiver may vary from one type of radar system to another.

COLOR CODE

R A color code distinguishes areas by the intensity of the precipitation in them :
R – black for the lowest intensity (nothing appears on the ND)
R – green, amber and red for progressively higher intensities
R – magenta for saturated areas, in the weather and turbulence mode (WX + T).

GROUND MAPPING – GROUND CLUTTER SUPPRESSION

Furthermore, if provided, two more functions may be used.

– Ground Mapping mode enables more returns to be produced from less reflective targets on the ground. The associated color code is thus : Black for standing water (no returns), green for the ground, and amber/red for cities and mountains (strong returns).
– Ground Clutter Suppression erases up to 85 % of ground clutter targets. But this mode should only be used at shallow tilt angles (0 to 5° down), and only momentarily since stationary weather targets might be incorrectly identified.
  Steep tilt angles can cause ground and weather targets to be confused.

OPERATIONAL USE

CAUTION

Before selecting WX, WX/T, or MAP mode on the control unit, make certain that :

– No one is within a distance less than 5 meters from the antenna in movement within an arc of plus or minus 135° on either side of the aircraft centerline.
– The aircraft is not directed towards any large metallic obstacle, such as a hangar, which is within 5 meters in an arc of plus or minus 90° on either side of the aircraft centerline.

TILT AND RANGE MANAGEMENT

Refer to 3.03

DETECTION AND INTERPRETATION ADVICE

General

1. Weather monitoring should be done at longer ranges, in order to assess weather developments and, thus, plan course changes.
2. Shorter ranges should periodically be changed to larger ranges to observe distant conditions and avoid blind alley or box canyon situations.
3. Generally speaking, ground returns appear smaller, sharper, more packed, well-defined, and usually more angular than weather targets ; whereas, the latter usually appear with less definite shapes and tend to remain relatively unchanged.
4. It is recalled that the line of sight distance to the horizon is :
   $D(NM) = 1.25 \sqrt{\text{(Aircraft altitude (feet))}}$.

Red/magenta areas : Thunderstorm, tornado, hail

It is recalled that the greater the rate of rainfall, the stronger the turbulence (magenta color) and the possibility of hail.

- To cope with thunderstoms, the following ranges should be selected on the NDs (if possible) :
  at least : 160 NM on the PNF ND
  80 NM on the PF ND
- In case of a large storm, the avoidance decision should be taken at 40 NM from the cell. To this end, the following recommendations apply :
  - Avoid magenta (Wx/T mode) /red areas and fringes by at least 20 NM if above the FL 230 and by 5 to 10 NM if below FL 230.
  - Avoid single magenta areas of turbulence (not associated with heavy precipitation) by at least 5 NM.
- Frequent tilt readjustments are recommended to monitor the storm development and to provide the maximum cell echo.
- Do not forget that omission to periodically adjust the tilt downwards causes targets to disappear.
- The following formula may be used to determine the vertical distance between the top of the cell and the aircraft flight level :

  $\boxed{\triangle h \text{ (feet)} \sim d(\text{NM}) \times \text{Tilt (degrees)} \times 100.}$

  Example :
  Cell at 40 NM disappearing at less than 3 degrees downtilt
  $\triangle h \sim 40 \times 3 \times 100 = 12000$ feet.
- Penetration or overflying by less than 5000 feet should not be attempted since severe turbulence might be encountered.
  R If the top of cell is at or above 25000 feet, overflying should be avoided due to the
  R possibility of encountering turbulence stronger than expected.
  In the same way, flight under a thunderstorm should be avoided due to possible windshears, microbursts, severe turbulence or hail.

Turbulence mode : Wx + T

- The turbulence detection mode provides the most effective detection when on the 40 nm range on ND and with an appropriate tilt such that no ground returns are produced.
- As for heavy rainfall areas it is recommended to adjust frequently the tilt antenna, when in Wx + T mode, since turbulence areas vary with altitude.
- It is worth noting that closely spaced (or thin lines between) color gradations are usually associated with severe turbulence.

FLIGHT INSTRUMENT TOLERANCES

The values given below apply to an aircraft in symmetrical flight (no side slip), in clean configuration, in a straight and level flight.

ALTITUDE TOLERANCES :

– PFD 1 or PFD 2 at ground check : ± 25 ft
– STBY ALTI at ground check : ± 300 ft

Note : On ground, the vibrator of stand-by altimeter is off ; this is why the STBY ALTI tolerance value is high. In flight, the vibrator is on and the value is reduced.

MAXIMUM DIFFERENCES BETWEEN ALTITUDE INDICATIONS.

	ALTITUDE (ft) COMPARISON BETWEEN		
	ADR 1 and ADR 2 (on PFD)	ADR 3 and ADR 1 or ADR 3 and ADR 2 (on PFD)	STBY ALTI and any ADR 1 or 2 or 3
GND CHECK	20	20	*
FL 50/250 kt	55	55	90
FL 100/250 kt	60	60	130
FL 200/300 kt	95	100	220
FL 300/0.82	120	130	320
FL 410/0.82	145	150	380

* on ground, the check is meaningless as the stand-by altimeter vibrator is off

MAXIMUM DIFFERENCES BETWEEN SPEED/MACH INDICATIONS.

	SPEED (kt) MACH COMPARISON BETWEEN					
	ADR 1 and ADR 2 (on PFD)		ADR 3 and ADR 1 or ADR 3 and ADR 2 (on PFD)		STBY ASI and any ADR 1 or 2 or 3	
	SPEED	MACH	SPEED	MACH	SPEED	MACH
GND CHECK	6	0.008	6	0.008	6	–
FL 50/250 kt	4	0.010	4	0.010	7	–
FL 100/250 kt	4	0.009	4	0.009	7	–
FL 200/300 kt	3	0.008	3	0.009	8	–
FL 300/0.82	3	0.009	3	0.009	8	–
FL 410/0.82	4	0.009	4	0.009	7	–

MAXIMUM DIFFERENCE BETWEEN ND MAGNETIC HEADING INDICATIONS :

R Maximum difference between magnetic heading indications on the NDs : 4 degrees.

TCAS

For system description refer to FCOM volume 1 chapter 34.
For operational procedures, refer to the ABN and EMER procedures of the FCOM Vol 3.

CONFLICT RESOLUTION PRINCIPLES

– **Traffic Advisory (TA)**
If an intruder represents a potential collision threat, a visual and aural TRAFFIC ADVISORY will be given. This advisory helps the crew to visually situate the intruder. It also prepares the crew for a possible RESOLUTION ADVISORY. However, not every RA is preceded by a TA.

– **Resolution Advisory (RA)**
If the intruder is considered to be a real collision threat, an aural and visual Resolution Advisory is given. TCAS determines the optimum vertical maneuver that ensures effective separation, with a minimum change in vertical speed. Depending on each situation, TCAS will generate a :
· Preventive Advisory (i.e. the actual vertical speed may be maintained). It displays the vertical speed range to be avoided.
· Corrective Advisory i.e. the actual vertical speed is within the range to be avoided and recommended vertical speed (fly to) range is displayed.
· Modified Corrective Advisory, which changes the already displayed RA (i.e. if the intruder changes their vertical speed).

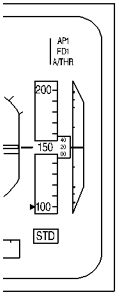
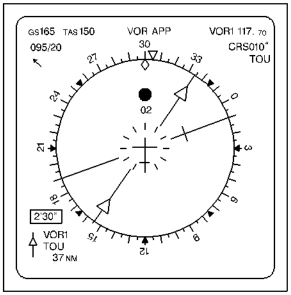
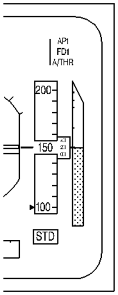
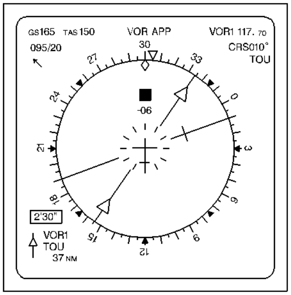
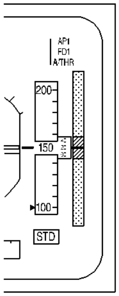
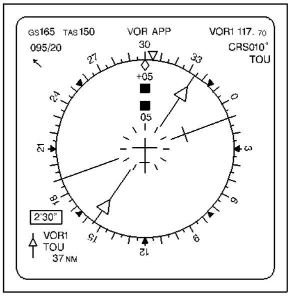
R **OPERATIONAL RECOMMENDATIONS**

● **Avoidance generalities :**
R Always follow the RAs orders, even if they lead to cross the altitude of the intruders,
R as they ensure the best global separation.

CAUTION
R If a pilot does not follow a RA, he should be aware that the intruder may be TCAS
R equipped and may be maneuvering toward his aircraft in response to a coordinated
R RA. This could compromize safe separation.

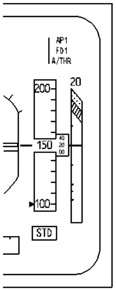
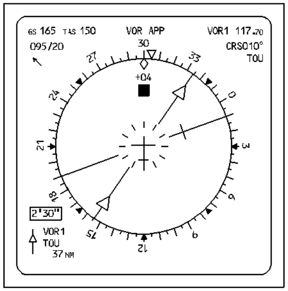
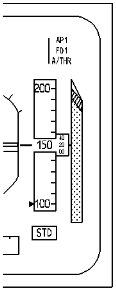
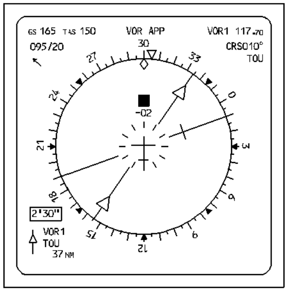
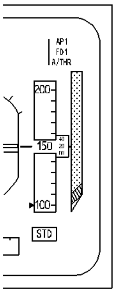
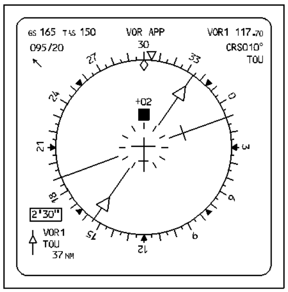
R Pilots should comply with the vertical speed limitations during the last 2000 feet of climb or descent. In particular, pilots should limit vertical speeds to 1500 feet/min during the last 2000 feet of a climb or descent, especially when they are aware of traffic that is converging in altitude and intending to level off 1000 feet above or below the pilot's assigned altitude.

● **Select "TA only" mode in the following cases :**
– Engine failure.
– Dispatch with landing gear down (if applicable).
– In case of known nearby traffic, which is in visual contact.
– At particular airports, and during particular procedures identified by an Operator as having a significant potential for unwanted or inappropriate RAs (closely spaced parallel runways, converging runways, low terrain along the final approach...).

SCENARIO	AURAL WARNING and TYPICAL DISPLAY PFD	ND	CREW RESPONSE
TRAFFIC ADVISORY - one intruder is ahead at 12 o'clock beyond 6 NM, 200 ft below your altitude	"TRAFFIC, TRAFFIC" 		- Do not maneuver on the traffic advisory symbol. - Attempt to visually acquire the intruder. - Be prepared to maneuver if the TA changes to an RA
RESOLUTION ADVISORY (PREVENTIVE) - One intruder is ahead at 12 o'clock, 600 ft below your altitude	"MONITOR VERTICAL SPEED" 		- Do not descend
RESOLUTION ADVISORY (CORRECTIVE) - Two intruders are ahead at 12 o'clock . one, at 500 ft above your altitude . the other, at 500 ft below your altitude	"MAINTAIN VERTICAL SPEED MAINTAIN" 		- Remain in level flight - Do not climb or descend

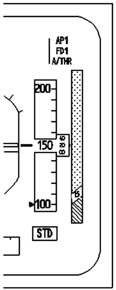
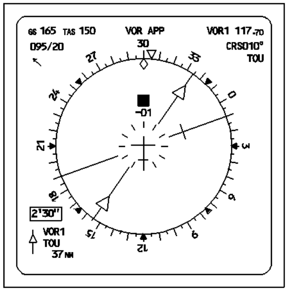
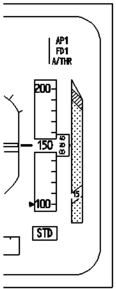
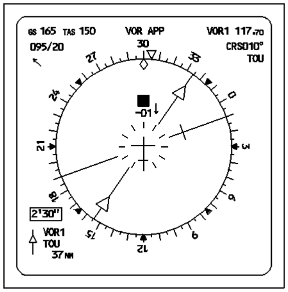
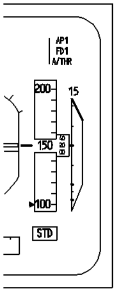
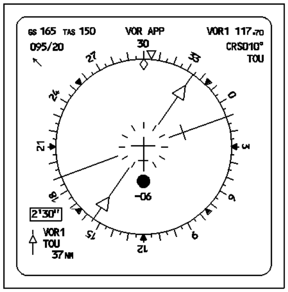
GFC5-03-0434-008-A100AB

V/S scale color legend: (hatched) : green (dotted) : red

SCENARIO	AURAL WARNING and TYPICAL DISPLAY		CREW RESPONSE
	PFD	ND	
RESOLUTION ADVISORY (CORRECTIVE) - The intruder is ahead at 12 o'clock, 400 ft above your altitude - You are already climbing at 2000 ft/mn	"ADJUST VERTICAL SPEED ADJUST" 		- Reduce climb
- The intruder is ahead at 12 o'clock, 200 ft below your altitude	"CLIMB, CLIMB" 		- Promptly (within 5 seconds) and smoothly establish a climb rate of 1 500 ft/mn
- The intruder is ahead at 12 o'clock, 200 ft above your altitude	"DESCEND, DESCEND" 		- Promptly (within 5 seconds) and smoothly establish a descent rate of 1 500 ft/mn

GFC5-03-0434-009-A100AB

V/S scale color legend: (hatched) : green (dotted) : red

SCENARIO	AURAL WARNING and TYPICAL DISPLAY — PFD	AURAL WARNING and TYPICAL DISPLAY — ND	CREW RESPONSE
RESOLUTION ADVISORY (ADDITIONAL CORRECTIVE) - The intruder is ahead and has stopped its climb - It is now 100 ft below your altitude	"INCREASE DESCEND INCREASE DESCEND" 		- Immediately (within 2.5 seconds) and smoothly increase your descent rate to 2 500 ft/mn
- The intruder ahead and above has changed from level flight to a rapid descent after TCAS issued a DESCEND RA - TCAS is now changing that to a CLIMB RA	"CLIMB, CLIMB, NOW CLIMB, CLIMB, NOW" 		- Initiate a change from a descent to a climb maneuver, within 2.5 seconds.
RA CLEARED - The intruder has passed behind and is now 600 ft below your altitude - It is no longer a threat	"CLEAR OF CONFLICT" 		- Return promptly to the previous ATC clearance.

V/S scale color legend: (hatched) : green (dotted) : red

GFC5-03-0434-010-A001AA

APPROACH ON PAPI

Eye to wheel height on approach is 34 feet, and minimum recommended wheel clearance over the threshold is 20 feet. Do not follow the Precision Approach Path Indicator (PAPI) guidance below 200 feet, when the PAPI Minimum Eye Height over the Threshold (MEHT) is less than 54 feet.

QFE USE FOR TO/APPR/LDG ON AIRCRAFT WITH QNH ONLY PIN PROGRAMMING

The crew should not use QFE on aircraft with a "QNH only" pin programming (incorrect profile computation of the managed vertical modes CLB, DES and FINAL APPR, possible false GPWS warnings in mountainous aeras).

R ## QNH USE FOR TO/APPR/LDG ON QFE/QNH PIN PROGRAMMED AIRCRAFT

R The QNH option is the basic reference on the aircraft.
R For airlines using QFE reference, the switching from "QNH only" to "QNH/QFE can be done
R by activating a specific pin program on the following three computers : FMGC, GPWC, FCU.
R For various reasons, some airlines may use QNH reference for approach and landing on
R QNH/QFE pin programmed aircraft. The crew should be aware of the following
R consequences and should use the following procedures.

R **CONSEQUENCES**

R · When the pin program is the QNH/QFE option, the 2R field of the MCDU PERF APPR page
R is named "MDH", independently of the baro setting reference selected by the crew.
R · For some airports in mountainous areas, GPWS warnings may be delayed by a maximum
R of five seconds.

R **PROCEDURES**

R No specific procedures are necessary for takeoff, climb, cruise, descent and go around
R phases.
R Procedure for precision approaches (CAT2 and CAT3) :
R · Insert the DH into the DH field of the PERF APPR pages, as usual.
R Procedure for ILS approach (CAT1) :
R · Insert the DA into the MDH field of the PERF APPR page.
R Procedure for non precision approach :
R · Insert the MDA value into the MDH field of the PERF APPR page.

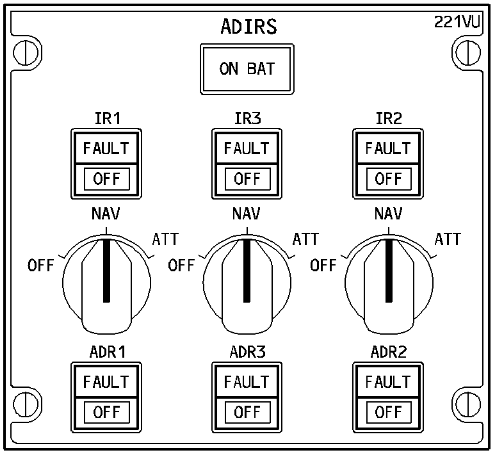
R *Note : If the MDA is greater than 5000 feet, the value is not accepted and the message*
R *OUT OF RANGE is displayed on the MCDU. In such a case, the MDH field remains*
R *blank and the PNF should announce the callouts.*

R · Do not use APPR NAV FINAL.
R · Use selected mode TRK/FPA until visual references are met.
R · The color changes from green to amber on the PFD altitude scale, and the auto callout
R "MINIMUM" will occur at the correct altitude.

ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS)

The Flight Management System (FMS) provides aircraft position inputs to the EGPWS for enhanced function processing purposes.
The TERR pushbutton, located on the overhead panel, enables the activation or de-activation of the enhanced functions of the EGPWS.
During all flight phases, when the navigation accuracy check performed by the pilots (as described in volumes 3.03 and 4.05) is positive, the enhanced functions should be switched ON.
During climb, descent, approach, and go-around phases, when GPS PRIMARY is not available (or not installed) and the FMS navigation accuracy check prevents the crew from using the NAV mode in a phase of flight, the TERR pushbutton must be switched OFF. When the TERR pushbutton is switched OFF, the ECAM "TERR OFF" memo is displayed. Only the basic GPWS modes 1 to 5 remain operative.
If the TERR ON ND is not selected, and a terrain alert is generated, the terrain is automatically displayed on the ND.
The brightness of the terrain indication on the ND is controlled via the weather radar brightness control knob. If the weather radar brightness was set to low (due to bad weather) and a terrain alert occurs, then the terrain display brightness will also be low. Thus when a terrain alert occurs, the ND weather/terrain image brightness may need to be adjusted.

ADIRS ALIGNMENT



GFC5-03-0434-014-A100AA

ALIGNMENT (on the ground)

When an IR is off, the flight crew must align it, before it can enter the navigation mode and supply data to various aircraft systems. The aircraft must be parked during alignment.
Any excessive aircraft motion while in ALIGN mode will restart the alignment process. Also, avoid starting the alignment during engine start, or while engines are running, to avoid aircraft motion.
A normal alignment takes between 5 and 10 minutes (depending on the local latitude). At latitudes between 73° and 82° (North or South), the alignment takes about 17 minutes. The ADIRS cannot be aligned beyond 82° (North or South).
The system first uses gravity to determine level attitude, then determines true heading, based on the earth's rotation. If the GPS position is available, the GPS automatically sends the present position for completing the ADIRS alignment. This becomes the navigation starting point from which the IRs determine subsequent aircraft position during flight.

– **All 3 mode selectors . . . . OFF for more than 10 seconds**

– **All 3 mode selectors . . . . back to NAV**
If the ADIRU are already in "NAV" mode (fully aligned) and their actual position is within +/– 1 arc minute of the gate (or airport) PPOS, no further realignment is necessary.

- **If IRS IN ALIGN memo flashes at the end of the alignment time :**
  The GPS position is not valid

  – **Present position PPOS . . . . ENTER**
  The flight crew uses the MCDU to enter local latitude and longitude. One entry serves all IRs during the alignment phase.

  Note : Refer to Volume 4, for instructions on using the MCDU.
  For transit flights, the best PPOS to be used when performing an alignment are, by priority :
  1. The airport coordinates stored in the FMS database.
  2. The gate coordinates.
  3. The airport coordinates shown on the Jeppesen chart.
  When flying long segments without radio updates, the best PPOS to be used when performing an alignment are, by priority :
  1. The gate coordinates.
  2. The airport coordinates stored in the FMS database.
  3. The airport coordinates shown on the Jeppesen chart.

– **"IRS IN ALIGN" is indicated on the ECAM MEMO with remaining align time.**

– **In the case of a discrepancy, the following message is displayed on the ECAM.**
NAV IR 1(2)(3) NOT ALIGNED
POSITION MISMATCH

– **PRESENT POS . . . . INSERT**
The flight crew must check the present position and enter PPOS again. After the 10 minute alignment, the system automatically goes to NAV.

FAST REALIGNMENT (on the ground)

During transit or enroute stops with brief ground times, the flight crew may perform a realignment and zero the ground speed error, by selecting OFF from NAV then reselecting NAV within 5 seconds.

– **All 3 ADIRS MSU selectors . . . . OFF**

– **All 3 ADIRS MSU selectors . . . . back to NAV within 5 seconds**
The IR starts a 30–second realignment with existing attitude and heading angles and velocities set to zero. The system does not enter the rapid alignment mode, if ground speed is greater than 20 knots.

● **If IRS IN ALIGN memo flashes at the end of the alignment time :**
The GPS position is not valid

– **Present position PPOS . . . . ENTER**
Enter the local latitude and longitude, using the MCDU INIT page during the 30-second realignment.

Note : *Refer to Volume 4, for instructions on using the MCDU.*
For transit flights, the best PPOS to be used when performing an alignment are, by priority :
1. The airport coordinates stored in the FMS database.
2. The gate coordinates.
3. The airport coordinates shown on the Jeppesen chart.
When flying long segments without radio updates, the best PPOS to be used when performing an alignment are, by priority :
1. The gate coordinates.
2. The airport coordinates stored in the FMS database.
3. The airport coordinates shown on the Jeppesen chart.

– **In case of discrepancy, the following message is displayed on the ECAM :**
NAV IR 1(2)(3) NOT ALIGNED
POSITION MISMATCH

– **PRESENT POS . . . . INSERT**
The flight crew must check the present position, and enter the PPOS position again. After the 30-second realignment, the system automatically goes to NAV mode.

ATSU INITIALIZATION

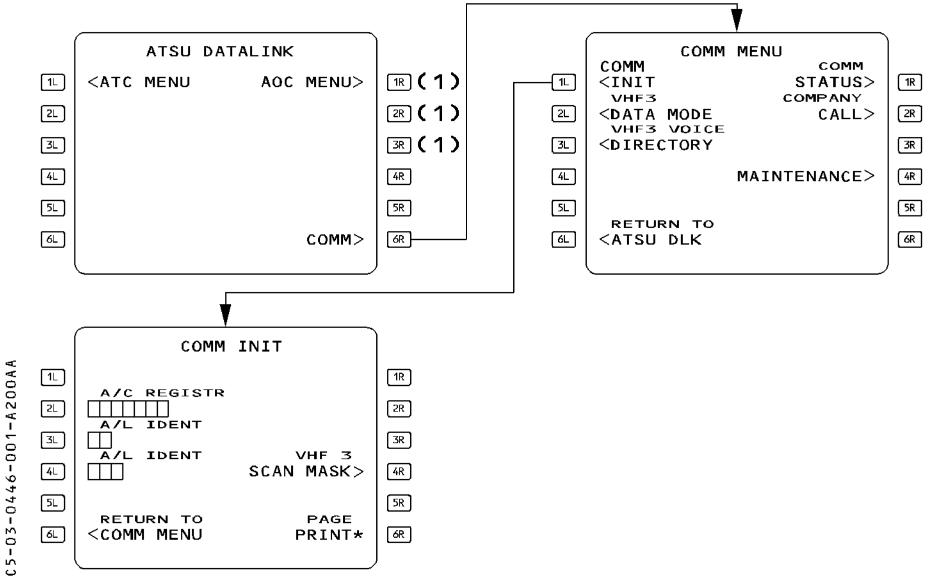
ATSU initialization must be carefully completed, since successful datalink communications require that all information be correctly entered, in accordance with the ICAO flight plan. ATSU is automatically initialized, provided a list of Service Providers has been scanned, and provided the following 3 parameters have been received and validated by the ATSU :

- Aircraft Registration Number (ARN)
- Airline two-letter Identity Code (A/L ID for datalink service providers)
- Airline three-letter Identity Code (A/L ID for ATC).

If one of the above 4 conditions is not fulfilled, then the ATSU or datalink is not available:

- The ECAM displays an ATSU FAULT warning, with the ATSU INIT FAULT line procedure, and
- The MCDU scratchpad displays a message to request crew action.

A manual entry of the missing parameter reinitializes the ATSU, and clears the ECAM and MCDU message.



(1) THESE FIELDS ARE CUSTOMIZED ACCORDING TO THE AOC PROGRAMMING

If ARN is not valid

The MCDU scratchpad displays the “ENTER A/C REGISTER” message. After having cleared the scratchpad, the crew writes the ARN in the scratchpad. Pressing the 2L key on the COMM INIT page enters the ARN in the 2L field.

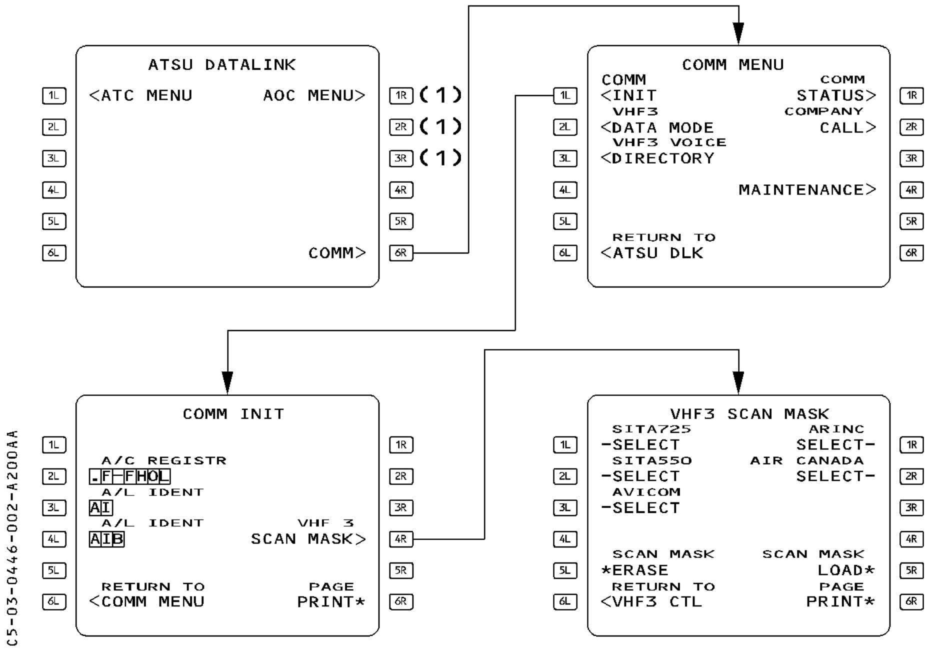
If the A/L ID is not valid

The MCDU scratchpad displays the "ENTER A/L IDENT" message. After clearing the scratchpad, enter the two-letter A/L ID code in the scratchpad. Press the 3L key to enter the A/L ID code in the 3L field. Repeat the same operation for the three-letter A/L ID code, by using the 4L key instead of the 3L key.

If no VHF Service Providers have been selected :

The MCDU scratchpad displays the "ENTER VHF3 SCAN MASK" message.
On the VHF3 SCAN MASK page, select a Service Providers' list, in the airline priority order, and activate the VHF SCAN MASK function.
Example : To select Service Providers SITA 725 and ARINC :

1. Press the 5L key : The star next to the ERASE indication disappears then reappears.
2. Press the 1L key to select SITA 725 : The SELECT indication goes off, and the priority
R number of selection # 1 appears.
3. Press the 1R key to select ARINC : The SELECT indication goes off, and the priority
R number of selection # 2 appears.
4. Press the 5R key to activate the VHF SCAN MASK function : The star next to the SCAN MASK LOAD indication disappears, then reappears.

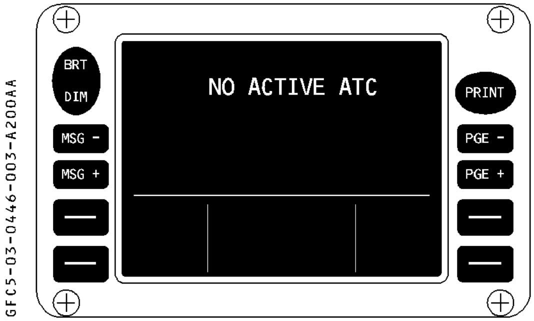


(1) THESE FIELDS ARE CUSTOMIZED ACCORDING TO THE AOC PROGRAMMING

R *Note : Modification of the SCAN MASK setting may result in the loss of air-ground VHF*
R *datalink communication. Therefore, the SCAN MASK setting should not be modified*
R *by the crew, unless they have been instructed to do so.*

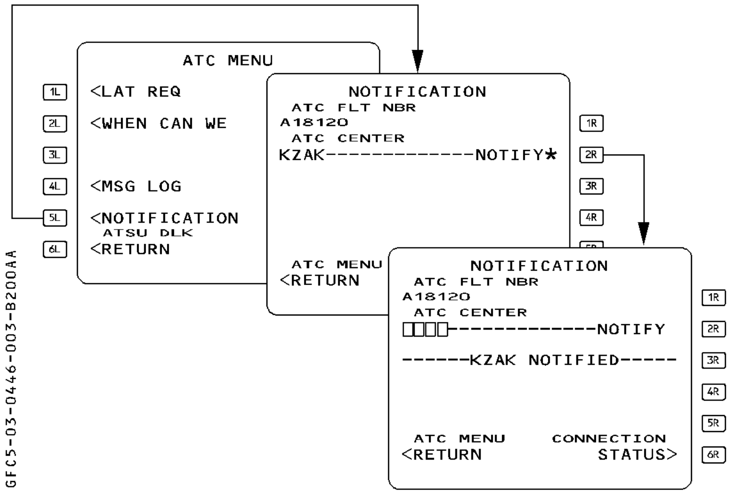
NOTIFICATION PROCEDURE AND CONNECTION

Before connection, the DCDU screen appears as follows :



NOTIFICATION PROCEDURE :

Notification is made through the MCDU NOTIFICATION page :



The FMGC provides the ATC FLT number.
The notification procedure is used by the ATC to correlate the aircraft with the ICAO flight number.
Consequently, it is essential to enter exactly the same number, shown on the ICAO flight plan (with the same number of letters), on the MCDU INIT page.
The ATC CENTER field defaults to the center which was connected during the previous flight. It can be changed, if applicable.

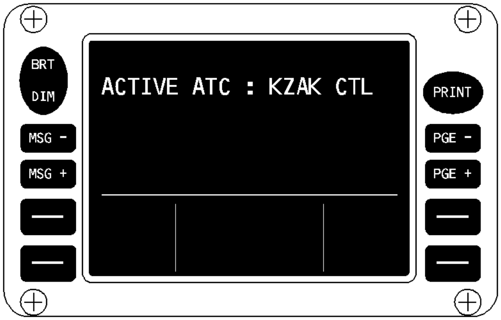
R *Note : 1. Once the ATC center has been notified ("NOTIFIED" is displayed on the MCDU "NOTIFICATION" Page), the ATC center will initiate the CPDLC and/or ADS connection. Therefore, re-notifications should be avoided.*
R *2. For ADS operations, check on the MCDU "CONNECTION STATUS" page that the ADS is set to ON prior to performing a notification.*

CONNECTION

Once notified, the connection is made at the ATC's discretion.

R – For operations in a CPDLC, or CPDLC and ADS environment :
R · When CPDLC connection is established, the active center is then displayed on the DCDU.
· The pilot should verify that the appropriate center is connected.

GFC5-03-0446-004-A200AA



R – For operations in an "ADS only" environment (NO CPDLC), "NO ACTIVE ATC" remains displayed on the DCDU and does not reflect the ADS contract status.
R This is due to the fact that the DCDU is the interface which sustains CPDLC communication, whereas the ADS is an additional feature which is transparent to the crew.

CONTROLLER/PILOT DATA LINK COMMUNICATION PROCEDURE

GENERAL

This chapter gives only a few typical examples of the messages that are exchanged between the crew and the ATC.

General recommendations to avoid ambiguity :
- Avoid sending multiple clearance requests in the same message.
- Avoid duplicate messages. To this end :
  - Answer incoming messages as soon as possible.
  - Do not re-send your message, when the ATC does not answer it immediately. If, after a reasonable period of time, you feel it is necessary to re-send a message, (Example: a clearance request), do not re-send the same request. Use a negotiation query, such as :
    "WHEN CAN WE..."
- Close messages, when they are answered or sent, so as to keep the screen free for additional messages.
- Avoid using free text. If it is necessary to use free text, because pre-formatted messages do not allow for a specific message element, use standard ATC phraseology. Avoid non-standard abbreviations.

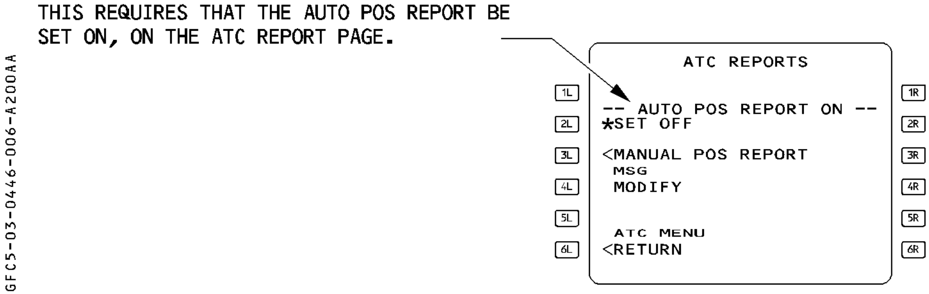
R - Before each flight, erase the MSG LOG file by using the 4L key on the ATC menu.
R - Use the printer to retrieve information on the DCDU. Essential data must first be read on
R the DCDU. The messages displayed on the DCDU are the reference.

POSITION REPORTS

For voice communications, a position report is due when passing a waypoint. This is entirely automatic, on some routes for which the Automatic Dependent Surveillance (ADS) function is active. In other cases, or in addition to the ADS reports (according to local regulations), the pilot has to send position reports by using the DCDU. Position report messages can either be :
- Automatically generated on the DCDU by the FMGS, if the AUTO POS REPORT function has been set to on, or
- Manually prepared by the pilot on the MCDU ATC REPORTS page.

For the ADS function, or the automatic generation of position reports on the DCDU by the FMGS, it is essential to ensure a correct waypoint sequencing. This is why it is recommended that the flight plan be updated. The FMGS offset function should be used, when appropriate. When the heading mode is used, the crew should monitor the waypoint sequencing and clear them when necessary.

POSITION REPORTS AUTOMATICALLY GENERATED BY THE FMGS



When sequencing a waypoint, the FMGC generates the position report message on the DCDU :

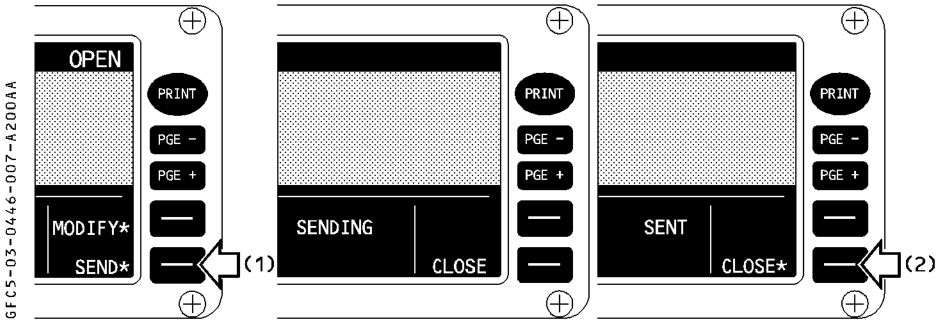
The pilot may modify it by using the MODIFY function key. Then, he sends it to the ATC. He may also use the MODIFY function key to update the parameters displayed on the DCDU before sending the position report.

- **Pilot action :**

On the DCDU :

– **SEND . . . . SELECT (1)**
The message is displayed in green letters, and the OPEN status disappears.

– **CLOSE . . . . SELECT (2)**
The message is removed from the screen.



POSITION REPORTS, MANUALLY PREPARED BY THE PILOT

This has to be done when the AUTO POS REPORT on the ATC REPORTS page is set to OFF. The POSITION REPORT message must be prepared on the MCDU.

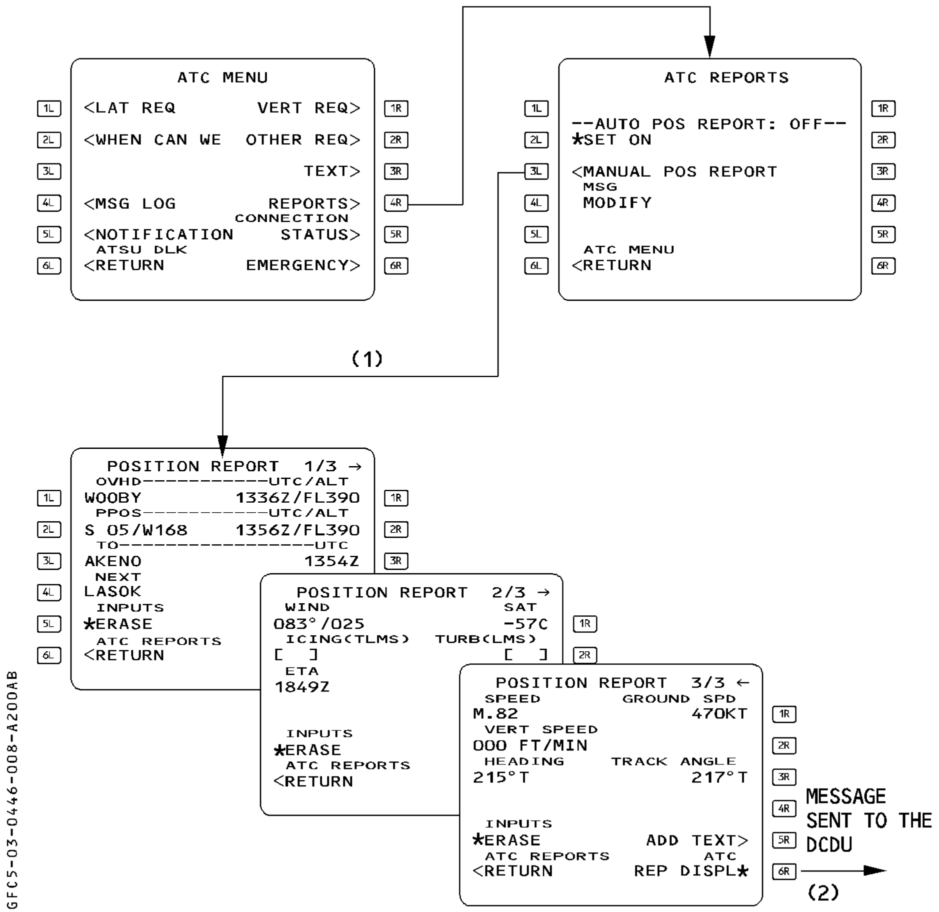
- **Pilot actions :**

On the MCDU ATC REPORTS PAGE :

– **MANUAL POSITION REPORT . . . . SELECT (1)**
POSITION REPORTS pages 1/3, 2/3 and 3/3 show the data which is automatically provided by the FMGC. The crew can manually enter some fields, if desired.

– **REP DISPL . . . . SELECT (2)**
This message is displayed on the DCDU with a blue background. It is ready to be sent.

On the DCDU :
As for the reports that are automatically generated by the FMGS, the pilot can modify a message displayed on the DCDU. It is then sent to the ATC by using the SEND function key, and is removed from the screen by using the CLOSE function key.


ATC MENU
<LAT REQ
VERT REQ>
<WHEN CAN WE
OTHER REQ>
TEXT>
<MSG LOG
REPORTS>
CONNECTION
<NOTIFICATION
STATUS>
ATSU DLK
<RETURN
EMERGENCY>
ATC REPORTS
--AUTO POS REPORT: OFF--
*SET ON
<MANUAL POS REPORT
MSG
MODIFY
ATC MENU
<RETURN
(1)
POSITION REPORT 1/3 →
OVHD
UTC/ALT
WOOBY
1336Z/FL390
PPOS
UTC/ALT
S 05/W168
1356Z/FL390
TO
UTC
AKENO
1354Z
NEXT
LASOK
INPUTS
*ERASE
ATC REPORTS
<RETURN
POSITION REPORT 2/3 →
WIND
SAT
083°/025
-57C
ICING(TLMS)
TURB(LMS)
[ ]
[ ]
ETA
1849Z
INPUTS
*ERASE
ATC REPORTS
<RETURN
POSITION REPORT 3/3 ←
SPEED
GROUND SPD
M.82
470KT
VERT SPEED
000 FT/MIN
HEADING
TRACK ANGLE
215°T
217°T
INPUTS
*ERASE
ADD TEXT>
ATC REPORTS
ATC
<RETURN
REP DISPL*
MESSAGE SENT TO THE DCDU
(2)
GFC5-03-0446-008-A200AB

CREW REQUEST TO ATC :

EXAMPLE : REQUEST FOR WEATHER DEVIATION

This is the example of a request to be made by the crew, when a lateral flight plan deviation is desired due to weather reasons. The use of the "WX DEV UP TO" prompt ensures that the ATC attributes priority to this request.

On the MCDU ATC MENU PAGE :

– **LAT REQ . . . . SELECT (1)**
The ATC LAT REQ page is displayed.

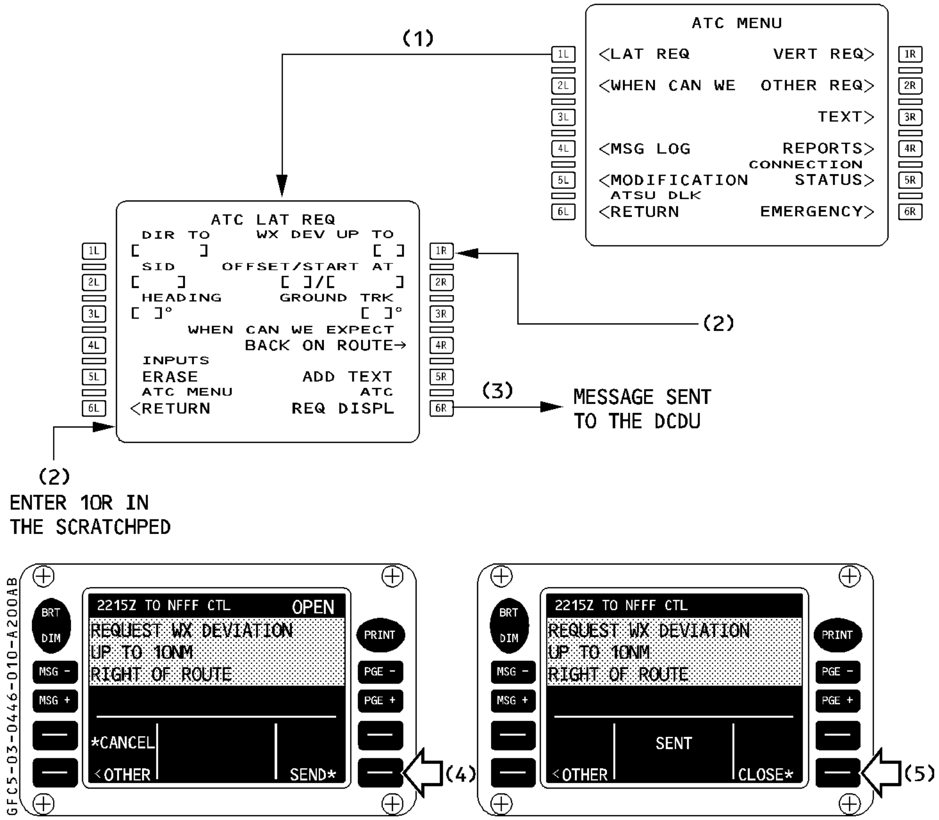
– **Fill the WX DEV UP TO field (2)**

– **REQ DISPL . . . . SELECT (3)**
The request is displayed on the DCDU with a blue background. It is ready to be sent.

On the DCDU :

– **SEND . . . . SELECT (4)**
The message is displayed on a green background.

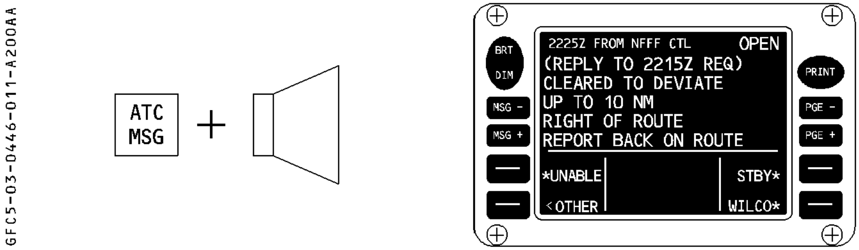
– **CLOSE . . . . SELECT (5)**
The message and its status are removed from the screen.


ATC MENU
<LAT REQ
VERT REQ>
<WHEN CAN WE
OTHER REQ>
TEXT>
<MSG LOG
REPORTS>
CONNECTION
<MODIFICATION
STATUS>
ATSU DLK
<RETURN
EMERGENCY>
(1)
ATC LAT REQ
DIR TO
WX DEV UP TO
SID
OFFSET/START AT
HEADING
GROUND TRK
WHEN CAN WE EXPECT
BACK ON ROUTE→
INPUTS
ERASE
ADD TEXT
ATC MENU
ATC
<RETURN
REQ DISPL
(2)
(3)
MESSAGE SENT
TO THE DCDU
(2)
ENTER 10R IN
THE SCRATCHPED
2215Z TO NFFF CTL
OPEN
REQUEST WX DEVIATION
UP TO 10NM
RIGHT OF ROUTE
*CANCEL
<OTHER
SEND*
(4)
2215Z TO NFFF CTL
REQUEST WX DEVIATION
UP TO 10NM
RIGHT OF ROUTE
SENT
<OTHER
CLOSE*
(5)
GFC5-03-0446-010-A200AB

CLEARANCES FROM ATC AND PILOT ANSWERS

IMMEDIATE CLEARANCE EXAMPLE : WEATHER DEVIATION (answer to the Pilot's request)

The ATSU triggers visual (ATC MSG light) and aural alerts, and displays the message on the screen in white and blue letters. The message status is OPEN and in blue.



- **Pilot action :**

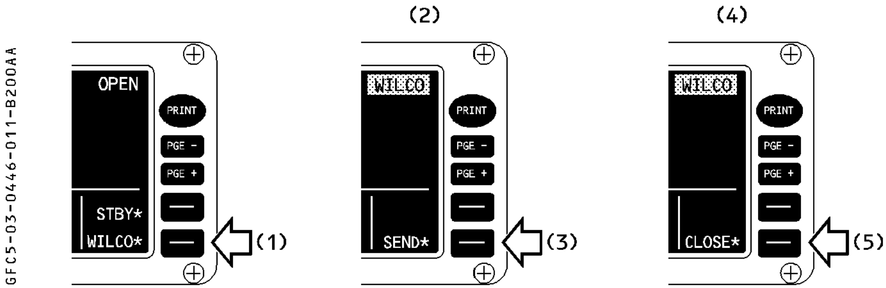
  – **ATC MSG . . . . PRESS**
  This will turn off the light and stop the aural alert.

  On the DCDU :

  – **WILCO . . . . SELECT (1)**
  The message status becomes WILCO, on a blue background. (2)

  – **SEND . . . . SELECT (3)**
  The message is displayed in green letters, and the WILCO status is on a green background. (4)

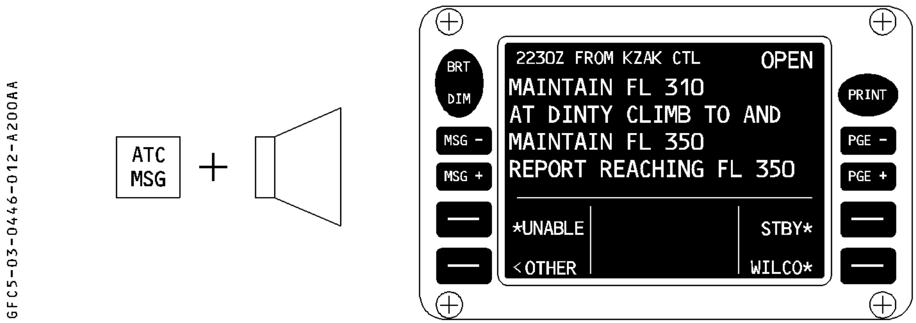
  – **CLOSE . . . . SELECT (5)**
  The message and its status are removed from the screen.



The crew has to insert the offset in the FMGS flight plan.

DEFERRED CLEARANCE, E.G CLIMB

The ATSU triggers visual (ATC MSG light) and aural alerts, and displays the message on the screen in white and blue letters. The message status is OPEN and in blue.



- **Pilot action :**

  – **ATC MSG** . . . . **PRESS**
  This will turn off the light and stop the aural alert.

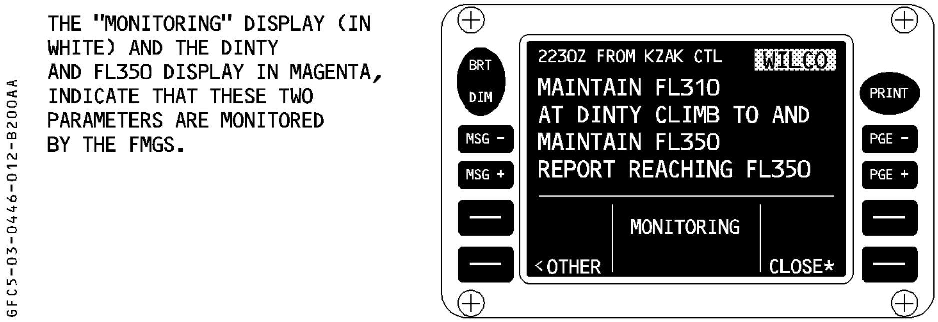
  On the DCDU :

  – **WILCO** . . . . **SELECT**
  The message status becomes WILCO, on a blue background.
  On the DCDU, the waypoint to which clearance is deferred (DINTY) and FL350, turn magenta. This indicates that they will be monitored by the FMGC.

  – **SEND** . . . . **SELECT**
  The message is displayed in green letters, and the WILCO status is on a green background.

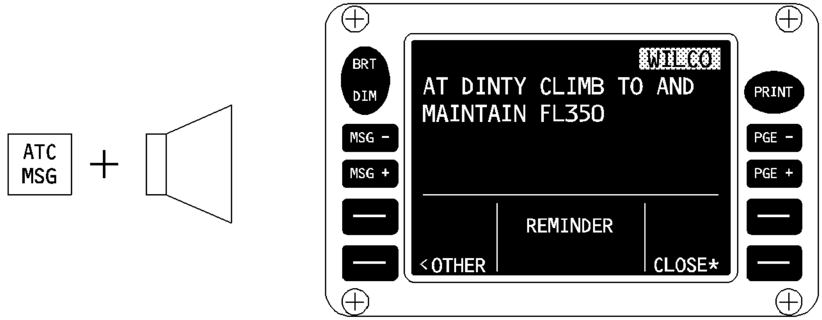
  – **CLOSE** . . . . **SELECT**
  The message and its status are removed from the screen.

THE "MONITORING" DISPLAY (IN WHITE) AND THE DINTY AND FL350 DISPLAY IN MAGENTA, INDICATE THAT THESE TWO PARAMETERS ARE MONITORED BY THE FMGS.



About 30 seconds before DINTY, the appropriate part of the message (related to the first reached parameter) is automatically recalled by the FMGS.

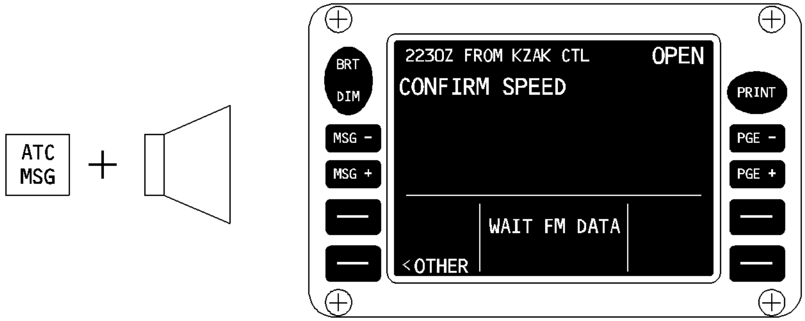
GFC5-03-0446-013-A200AA



“REMINDER” information and the absence of ATC center identification indicates that this is not a new incoming message, but is only an FMGC recall. Flight plan modification has to be done by the crew.

NAVIGATION PARAMETER REQUEST FROM ATC AND PILOT ANSWER

When the ATC requests confirmation of a parameter, the ATSU triggers visual (ATC MSG light) and aural alerts and displays the message on the screen in white letters. The message status is OPEN and in blue.



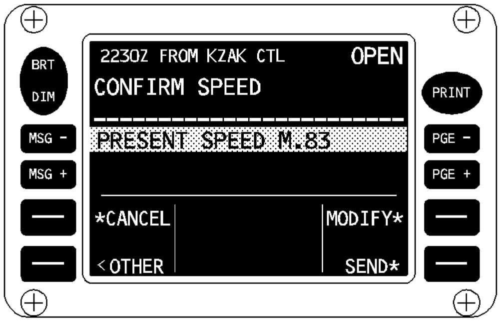
GFC5-03-0446-014-A200AA

- **Pilot action :**

  – **ATC MSG . . . . PRESS**
  This will turn off the light and stop the aural alert.

- **Automatic answer from the FMGS :**

  The “WAIT FM DATA” information indicates that the FMGS is preparing an answer. Then, it displays it on the DCDU.



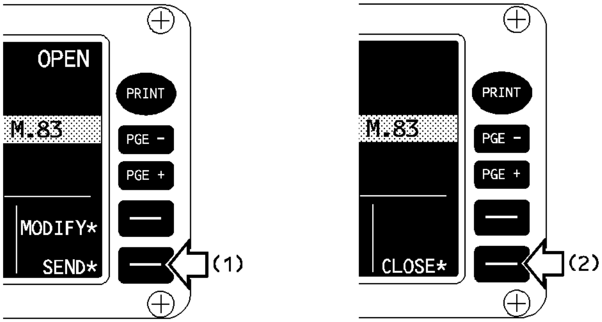
GFC5-03-0446-014-B200AA

- **Pilot action :**

On the DCDU :

– **SEND . . . . SELECT (1)**
The message is displayed in green letters.

– **CLOSE . . . . SELECT (2)**
The message is removed from the screen.



GFC5-03-0446-015-A200AA

FLIGHT PLAN MODIFICATIONS

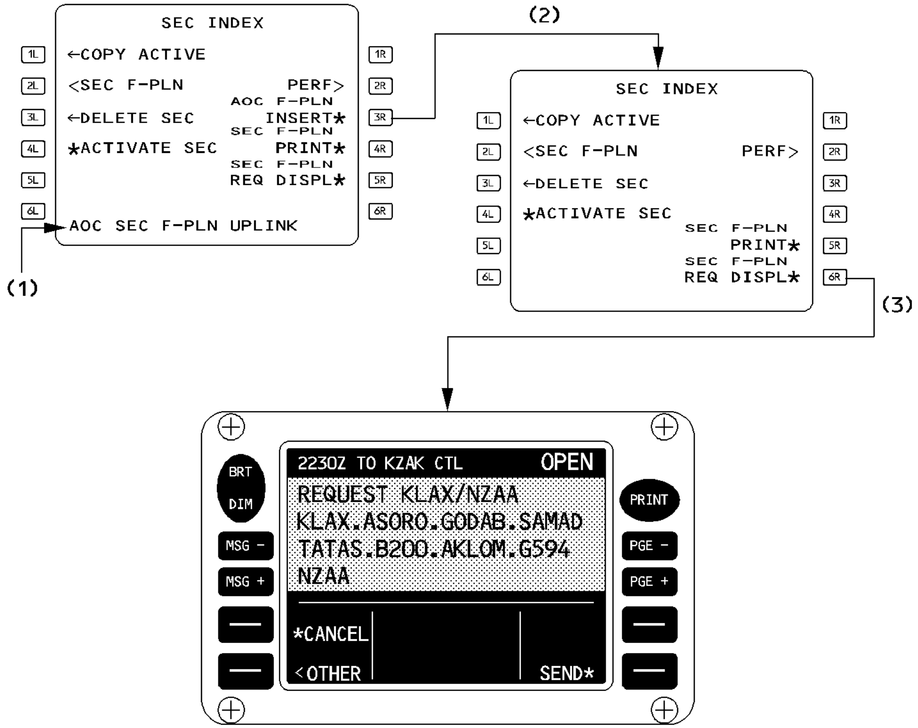
Flight plan modifications, sent by the AOC, can be loaded in the FMGS secondary F-PLN. The crew can also manually prepare modifications. The crew has to obtain ATC clearance prior to activation.

- **When the AOC SEC F-PLN UPLINK message is displayed on the scratchpad (1) :**

On the SEC index page :

– **INSERT* . . . . SELECT (2)**
The flight plan sent by the AOC is inserted in the secondary flight plan. The crew can review it and, if necessary, modify it.

– **REQ DISPL* . . . . SELECT (3)**
The DCDU automatically prepares a message. The crew has to send it to ATC and close it.



GFC5-03-0446-016-A200AA

- **When ATC clearance is received :**
  - **Pilot action :**

    – **ATC MSG . . . . PRESS**
    This will turn off the light and stop the aural alert.

  On the DCDU :

    – **OTHER . . . . SELECT (1)**

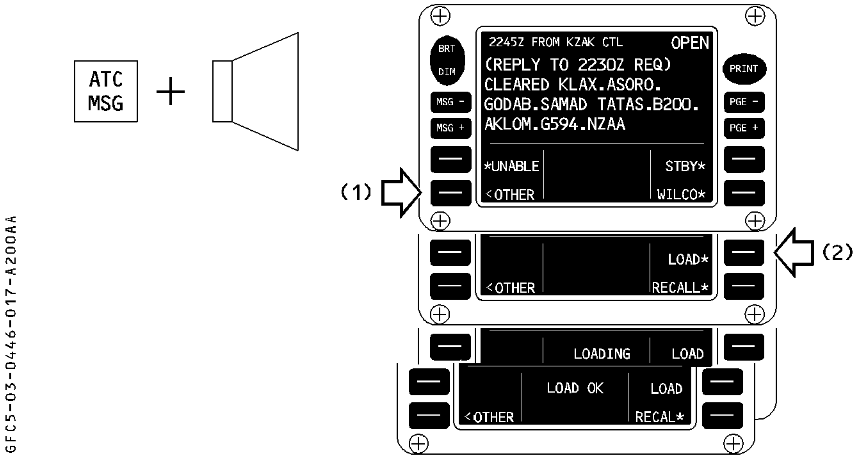
    – **LOAD . . . . SELECT (2)**
    LOAD must be selected at this point. Any other selection may prevent further loading of the clearance. The “LOAD OK” information is displayed to confirm that loading is successful. The clearance can be reviewed on the SEC F-PLN pages.

- **If the crew accepts the clearance :**

  – **OTHER . . . . SELECT**

  – **WILCO . . . . SELECT**
  This has to be sent and cleared, as with other WILCO answers.
  The crew has to activate the secondary F-PLN.

- **If the crew wants to modify the clearance :**
  The clearance should be loaded into SEC P-PLN, then modified.
  On the DCDU, the clearance should be rejected (UNABLE).
  Another request (modified F-PLN) should be submitted to the ATC.



EMERGENCY MESSAGES

EXAMPLE : PANPAN MESSAGE

ON the MCDU ATC MENU PAGE :

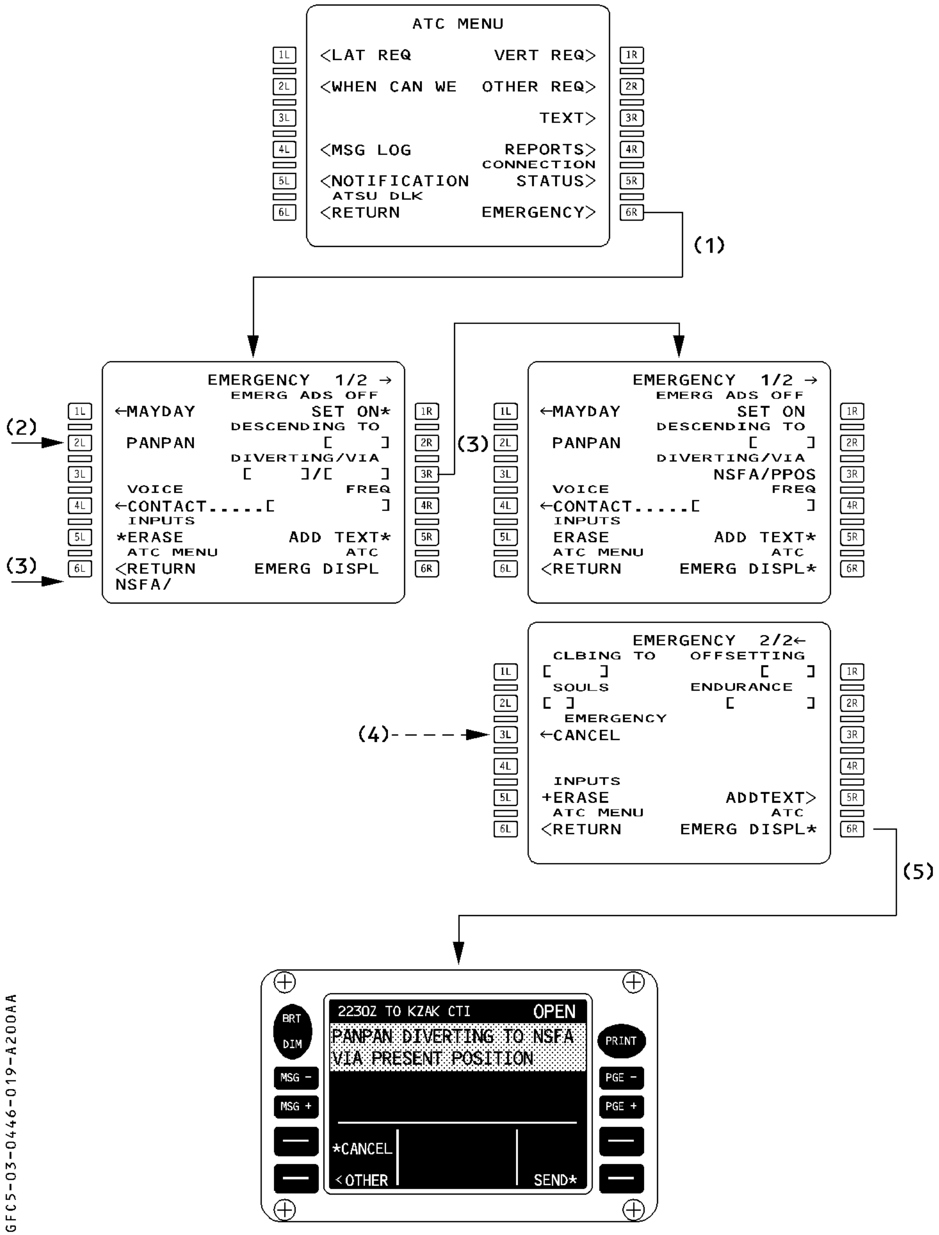
– **EMERGENCY . . . . SELECT (1)**
The EMERGENCY Page 1/2 is displayed.

– **PANPAN . . . . SELECT (2)**
The PANPAN prompt becomes blue.

– **Fill the DIVERTING/VIA field (3).**
The VIA field defaults to the present position, if it is not manually entered.

Note : The emergency can be cancelled by using the CANCEL EMERGENCY prompt on the EMERGENCY page 2/2 (4).

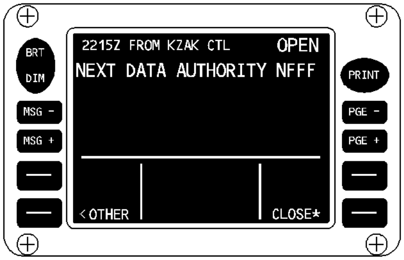
– **EMERG DISPL . . . . SELECT (5)**
The message is displayed on the DCDU. The crew has to send it, then close it, as is done with any downklink message.


ATC MENU
<LAT REQ
VERT REQ>
<WHEN CAN WE
OTHER REQ>
TEXT>
<MSG LOG
REPORTS>
CONNECTION STATUS>
<NOTIFICATION
ATSU DLK <RETURN
EMERGENCY>
(1)
EMERGENCY 1/2 →
EMERG ADS OFF
←MAYDAY
SET ON*
DESCENDING TO
PANPAN
[ ]
DIVERTING/VIA
[ ]/[ ]
VOICE FREQ
←CONTACT.....[ ]
INPUTS *ERASE
ADD TEXT*
ATC MENU <RETURN
ATC EMERG DISPL
NSFA/
(2)
(3)
EMERGENCY 1/2 →
EMERG ADS OFF
←MAYDAY
SET ON
DESCENDING TO
PANPAN
[ ]
DIVERTING/VIA
NSFA/PPOS
VOICE FREQ
←CONTACT.....[ ]
INPUTS ERASE
ADD TEXT*
ATC MENU <RETURN
ATC EMERG DISPL*
EMERGENCY 2/2←
CLBING TO
OFFSETTING
[ ]
[ ]
SOULS
ENDURANCE
[ ]
[ ]
EMERGENCY ←CANCEL
(4)
INPUTS +ERASE
ADDTEXT>
ATC MENU <RETURN
ATC EMERG DISPL*
(5)
2230Z TO KZAK CTI
OPEN
PANPAN DIVERTING TO NSFA
VIA PRESENT POSITION
*CANCEL
<OTHER
SEND*
BRT
DIM
MSG -
MSG +
PRINT
PGE -
PGE +
GFC5-03-0446-019-A200AA

AUTOMATIC TRANSFER TO NEXT ATC

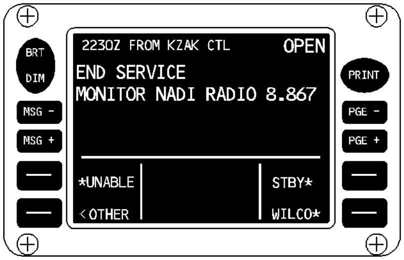
The current ATC center sends the "NEXT DATA AUTHORITY" information message.
The crew only has to close it.

GFC5-03-0446-020-A200AA



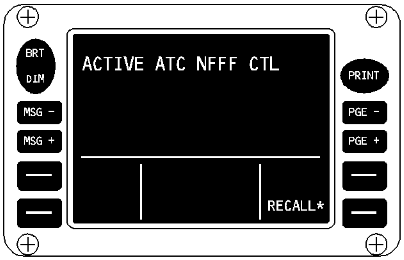
The current ATC center sends the "END SERVICE" message.
It indicates the frequency to be used for voice backup.

GFC5-03-0446-020-B200AA



The crew has to answer "WILCO", as is done with other uplink messages.
When the message is closed, the new ATC center is shown as active.

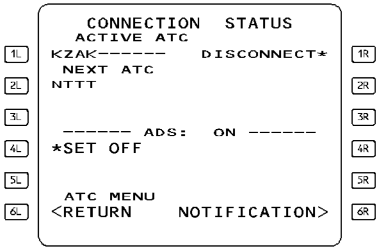
GFC5-03-0446-020-C200AA



AUTOMATIC DEPENDENT SURVEILLANCE (ADS) PROCEDURE

The ADS is fully automatic and works transparently to the flight crew.
The flight crew may activate/deactivate the ADS function via the MCDU's 4L key on the CONNECTION STATUS page :

- When ADS is "ON" : ADS contracts may be established by ground ATC centers.
- When ADS is "OFF" : All ADS contracts are stopped, and no ADS contract can be established by ground ATC centers.



GFC5-03-0446-021-A200AA

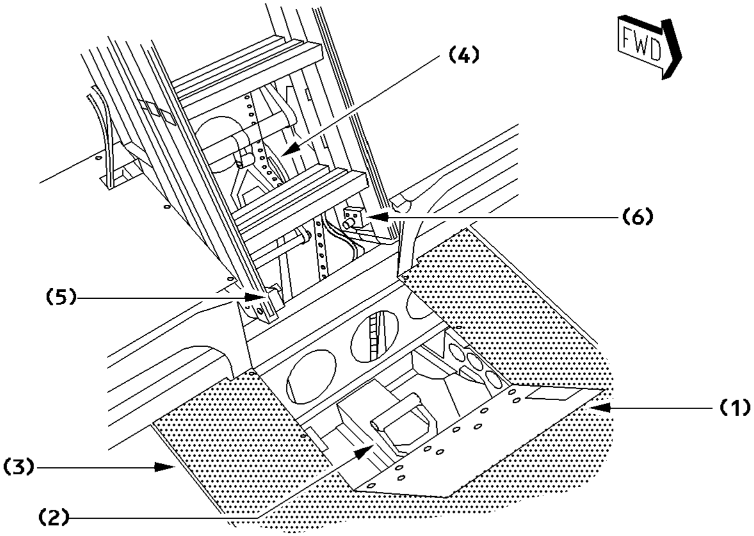
Consequently, ADS should not be set to "OFF", unless instructed to do so (for example, via an ATC request).

LEAVING THE AIRCRAFT VIA AVIONIC BAY ACCESS DOOR

- Move forward the captain seat completely and open the floor hatch to get access to the avionic bay.
- Descend into the avionic bay and take a position RH side of the avionic bay access door

Note : Do not try to open the access door while standing on it.

- Open the floor panel (1) which covers the avionics bay access door handle (2), located at the aft, center part of the access door (coin may be needed to open the lock).
- To open the access door (3) lift the handle (2) and pull the door completely into the bay until it is latched in its upper stop (LH).
- Remove the strap which fixes the ladder assembly against motion.
- Lift the lever (4), located on the RH side aft of the lower rung of the aft ladder element, to unlock the ladder assembly and swing it simultaneously towards the opening.
- Release the lower locking device on the RH inner side of the first ladder element (5) by pulling the orange handle forward (indicated on a placard next to the locking device). Lower the element until it latches.
- Repeat with the second ladder element (locking device (6) is at the LH inner side).
- If the ladder does not touch the ground yet the last element is lowered by pulling forward its orange handle at the lower end on the LH outer side.
- If the ladder touches the ground leave the aircraft via the extended ladder.



GFC5-03-0452-001-A001AA

THRUST CONTROL

GENERAL

Engine thrust is controlled by console mounted levers which electrically signal the FADEC of individual engines. FADEC responds to thrust lever position or auto thrust command to determine engine thrust.
The thrust lever quadrant provides the equivalent of a thrust rating panel. Two detents, one for climb thrust and the other for FLEX on the ground or MCT in flight are provided.
The forward stop of the quadrant always gives Max Take Off or go around thrust as appropriate, and signals the A/P or F/D to go to Take Off or Go Around as appropriate. The indications of the status of the thrust system are displayed to the pilot by the FMA left hand window on each PFD.
Additionally on the engine instrument display, there is a read out of the engine thrust mode (CL, MCT, etc) and the appropriate engine limit.
The actual limit set, thrust lever position, FADEC command, and the maximum engine rating limit are all continuously displayed.

MANUAL THRUST CONTROL

With auto thrust deactivated, thrust control between idle and maximum take off or go around thrust is entirely conventional.
Thrust lever angle determines the thrust demanded.
The rating limit selected by the pilot and the actual engine limit will appear on the engine instrument display.
With the thrust lever at less than the CL position on the quadrant, CL will be continuously displayed. If one of both thrust levers are above CL, MCT/FLEX will be displayed. If one or both thrust levers are above the MCT detent, TO GA will be displayed.
With the thrust lever(s) positioned in a detent the engine (s) will be controlled to that limiting parameter.

AUTO THRUST

With auto thrust active either speed, thrust or retard will be controlled as appropriate. The engine limit corresponds to the thrust lever position. If the thrust lever(s) is below the CL detent then the TLA determines the engine power limit.
With both thrust levers above the CL detent, auto thrust is deactivated, except if alpha-floor is active.
If the thrust levers are not aligned, an asymmetric (ASYM) message will appear in the FMA. Each engine in this case, will be limited to its appropriate TLA position.
This allows the continued use of auto thrust if one engine has to be RPM limited for operational reasons e.g. vibrations.

Autothrust disconnection

Autothrust disconnection occurs when :
- The A/THR fails, or
- The FCU's A/THR pushbutton is pressed, or
- Thrust levers' instinctive disconnect button is pressed, or
- Both thrust levers are set to IDLE.

R — When the radio altitude is below 100 feet, and :
R · Both thrust levers are above CL detent, or
R · One thrust lever is above MCT detent.

1. Disconnection, due to a failure or to the use of the FCU A/THR pushbutton.
If the thrust levers are set in the CL detent (2 engines operative), or one thrust lever in the MCT (one engine operative), thrust is locked at its actual value. The FMA displays "THR LK".
Single chime, ECAM message, and caution light are triggered every 5 seconds, as long
R as thrust lock is active. (For more details, refer to FCOM 1.22.30).
Movement of the thrust lever(s) unlocks the thrust, and the engine then responds to TLA at the normal rate.
2. Disconnection, due to the use of the instinctive disconnect button.
When a pilot presses the instinctive disconnect button, the thrust corresponding to the thrust levers position is immediately recovered, whatever the thrust levers' position.

Instinctive Disconnection procedure

- Set the thrust levers to the current thrust setting by adjusting the levers until the N1 (or EPR) TLA white circle is adjacent to the actual N1 or EPR.
- Use the instinctive pushbutton to the disconnect the A/THR.
- Check that "AUTO FLT A/THR" OFF is displayed on the ECAM, and that there is no annunciator in the first column of the FMA.
- Set the correct manual thrust.

Use of autothrust in approach

R The pilot should use autothrust for approaches. On final approach, it usually gives more
R accurate speed control, although in turbulent conditions the actual airspeed may vary from
R the target speed, by as much as five knots. Although the changeover between auto and
R manual thrust is easy to make with a little practice, the pilot should, when using autothrust
R for the final approach, keep it engaged until he retards the thrust levers to idle for
R touchdown. If the pilot is going to make the landing using manual thrust, he should
R disconnect the A/THR by the time he has reached 1000 feet on the final approach.
R If he makes a shallow flare, with A/THR engaged, it will increase thrust to maintain the
R approach speed until he pulls the thrust levers back to idle. Therefore, he should avoid
R making a shallow flare, or should retard the thrust levers as soon as it is no longer
R necessary to carry thrust, and if necessary before he receives the "retards" reminder.

R When using autothrust, the pilot can always change thrust by moving the thrust levers above the CL detent. The thrust then increases to what corresponds to the thrust lever position. However, autothrust stays armed, and immediately takes effect when the thrust levers are returned to the CL detent. Therefore, the pilot should normally put the thrust levers back to CL, as soon as the aircraft has made the change for which he has increased thrust. This feature gives the pilot a means of advancing phase on the autothrust in very difficult environmental condition. But, it should only be needed in exceptional circumstances.

R *Note : When below 100 feet, moving thrust levers above the CL detent, will result in A/THR disconnection.*

R Although use of the autothrust is recommended for the entire approach, this does not absolve the pilot from his responsibility to monitor its performance, and to disconnect it if it fails to maintain speed at the selected value. Such monitoring should include checking whether or not the managed speed, calculated by the FMGC, is reasonable.
For more information concerning aircraft handling during final approach, refer to the FCOM Bulletin "Aircraft handling in final approach".

R **Engine failure**

R The pilot can continue to use autothrust after an engine failure, but some pilots feel that directional control is more difficult, when autothrust changes the thrust instead of the pilot making the thrust changes manually. The choice between using, or not using, autothrust after engine failure is a personal one. As far as speed control is concerned, autothrust is usually more accurate than a pilot.

MANUAL ENGINE START

Pilots normally use automatic starting to start an engine.
However, manual starting is recommended, in the following cases :

– **After aborting a start, because of :**
  · Engine stall
  · Engine EGT overlimit
  · Low start air pressure

– **When expecting a start abort, because of :**
  · Degraded bleed performance, due to hot conditions, or at a high-altitude airfields.
  · An engine, with a reduced EGT margin, in hot conditions, or at a high-altitude airfields.
  · Marginal performance of the external pneumatic power group.

MAN ENG START PROCEDURE

– **THR LEVERS . . . . IDLE**

CAUTION
Engine will start regardless of thrust lever position and thrust will rapidely increase to that demanded by the TLA causing a hazardous situation if idle not selected.

– **ENG START sel . . . . NORM THEN IGN START**
ENG page is displayed on ECAM lower display

– **ENG MAN START . . . . ON**
· Do not set MAN START pb to ON before all amber crosses have disappeared on engine parameters (upper ECAM display).
· On ECAM lower display check :
– START VALVE in line
· On ECAM displays check :
– OIL PRESS increases, N2 increases.

● **When N2 at maximum motoring speed (minimum 15%) :**
Max motoring speed is defined as when N2 acceleration is less than 1% per 5 seconds approximately.

– **MASTER SW . . . . ON**
The PNF starts timing to monitor the delay in light up.

– **ECAM displays . . . . CHECK**
Check :
– Indication of igniters A and B
– FF increase
– EGT and N1 increase within 20 seconds (max) after fuel is on.

● **When N2 at 50 %**

– **ECAM displays . . . . CHECK**
Check :
– START VALVE cross line
– Igniter indication off

R ● **when idle is reached (AVAIL indication is displayed in green) :**

R – **MAIN AND SECONDARY ENG. IDLE PARAMETERS . . . . . . CHECK NORMAL**

– **MAN START . . . . OFF**

– **ENG START SEL . . . . NORM**

ENG START WITH EXTERNAL PNEUMATIC POWER

- **Before connecting external pneumatic power :**

  – **PACKS 1 and 2 . . . . OFF**
  (To prevent packs contamination)

- **Before start :**

  – **APU BLEED . . . . CHECK OFF**

  – **ENG BLEED (Both engines) . . . . OFF**

  – **X-BLEED . . . . OPEN**

  Note : The X-BLEED is opened to avoid triggering the ABNORMAL BLEED CONFIG ECAM caution after the first engine start.

- **Cleared to start :**

  – **Start Engine 1 first.**

R *Note : As necessary, Engine 2 can also be started by using the external pneumatic*
R *power.*
R *If Engine 2 is started first, check the brake accu pressure prior to engine start.*

  – **Apply the normal engine start procedure.**
  The minimum recommended starter air supply pressure is 25 PSI, when the start valve is open.
  Two external pneumatic power units may be used in parallel, if the pressure/flow relation is expected to be marginal.

- **After Engine 1 start :**

  – **Request removal of the external pneumatic power unit(s).**

  – **PACKS 1 and 2 . . . . ON**

  – **CROSSBLEED ENGINE START PROC for ENG 2 . . . . APPLY**

CROSSBLEED ENG START

CAUTION
Simultaneous use of engine bleed supply and external pneumatic power supply is prohibited.

- **Before start :**

  – **APU BLEED . . . . OFF**
  The BLEED valve of the running engine reopens and the X BLEED valve closes.

  – **ENG BLEED (running engine) . . . . ON**

  – **ENG BLEED (receiving engine) . . . . OFF**
  Bleed valve of engine not running is closed to eliminate reverse flow leakage.

R – **X BLEED . . . . OPEN**

- **Cleared to start :**

  – **Apply the normal engine start procedure**

  – **Confirm area is clear of obstacles.**
  N1 of supplying engine may be increased up to 30% if required in order to obtain starter air supply pressure at about 30 psi.

- **After start :**

  – **X BLEED . . . . AUTO**

  – **ENG BLEED (both) . . . . ON**

  – **PACKS . . . . CHECK ON**

START VALVE MANUAL OPERATION

Advise ground crew to prepare for manual start valve operation.

– **AUDIO CONTROL PANEL . . . . CAB**

● **When ground crew member is ready, order "START 1 or 2"**

– **ENG START SEL . . . . IGN**

– **ENG MASTER . . . . ON**

– **START VALVE . . . . ORDER "OPEN AND KEEP OPEN"**
If not maintained in OPEN position by the ground crew member, the start valve closes.

● **When N2 at 50 % :**

– **START VALVE . . . . ORDER "CLOSE"**
Continue with normal procedure.

DERATED CLIMB

GENERAL

The derated climb (DCLB) reduces the thrust during climb in order to increase the engine life. The crew can select two derated climb ratings :
– DCLB1 reduces the maximum climb thrust by 5 to 10%.
– DCLB2 reduces the maximum climb thrust by 10 to 15%.
The FADEC reduces the difference between derated and maximum climb thrust with the altitude, until zero at high altitude ; The ceiling is therefore not affected by the derated climb. The performance for each derated thrust is given in the IN FLIGHT PERFORMANCE, 3.05.10.

Note : The derated climb does not depend on autothrust, autopilot or flight director engagement.

SELECTION

The crew can select DCLB 1 or 2 on the DRT CLB field of the PERF CLB MCDU page during PREFLIGHT, TAKEOFF, CLIMB or GO-AROUND (with change of destination) phases. During any other phase, the DRT CLB field is not available.

– **PERF key . . . . DEPRESS**
select the PERF CLB page.

– **D1 or D2 . . . . WRITE in the scratchpad then ENTER**

ACTIVATION

The derated climb becomes active during the CLIMB phase when the thrust levers are set at or below the CLB detent.

Note : If the flight plan includes several climb phases (or step climb), the derated climb is available only during the first CLIMB phase.

DEACTIVATION

The derated climb is deselected when one of the following condition is met :
– Manually cleared on MCDU, or
– One of the thrust levers is set to MCT or above (in flight), or
– The FMGS leaves the CLIMB phase, or
– The slats are extended (in flight).

ENGINE START ON BATTERIES

Note : This procedure can be followed when the aircraft electrical network is only supplied with batteries.
Make sure that pneumatic power is available for starting the engines.

- Perform an autostart on Engine 1.
  The secondary engine parameters are unavailable, as long as the aircraft's electrical network is supplied by the batteries.

Note : It is required that Engine 1 be started first, since the crossbleed valve does not automatically open on batteries. Moreover, the parking brake is pressurized by Engine 1.

- When all the parameters are stabilized, check that the aircraft's electrical network is normal.
- Start the other engines, following the autostart procedure.

R **GENERAL**

Except in some operational environments, such as an uphill slope, slippery taxiways or high gross weight, taxi on one engine may be preferred.
Caution must be exercised when taxiing on one engine to avoid excessive jet blast.
It is recommended to taxi with engine 1 to pressurize the blue hydraulic system to ensure brake accumulator pressure.

Note : If taxi is performed with the engine 2, check on BRAKE & ACCU. PRESS indicator that brake accumulator pressure is normal.

AT DEPARTURE

The following may be applied for taxi out if company policy and regulations permit.

– **ENGINE 1 . . . . START**

– **X BLEED . . . . OPEN**
To supply both packs from engine 1

– **Apply "AFTER START" normal procedures (Refer to 3.03.09) except :**
· APU should be kept running to avoid additional elec transients and to allow galley operation.
· Delay WING A. ICE, ENG A. ICE checks.
· APU BLEED should be switched OFF to prevent ingestion of engine exhaust gases in the air conditioning system.

R – **Apply "TAXI" normal procedures (Refer to 3.03.10)**

• **Before ENG 2 start :**

– **APU BLEED . . . . ON**

• **Not less than 3 minutes before take-off :**

– **ENGINE 2 . . . . START**

– **APU . . . . AS RQRD**

– **X BLEED . . . . AUTO**
Proceed with "AFTER START" check list (WING A. ICE, ENG A. ICE)

AT ARRIVAL

The flight crew may use the following procedure for taxiing in :

– **APU . . . . START**

R • **No less than 3 minutes after high thrust operations, and when taxiing straight :**

  – **ENG 2 . . . . SHUT DOWN**

SEVERE TURBULENCE

GENERAL

Whenever possible, avoid areas with known or forecasted severe turbulence. If turbulence is unavoidable, aim to keep the speed in the region of the target speed given in this section, so as to provide the best protection against the effect of gust on the structural limits, whilst maintaining an adequate margin above VLS.
Consider requesting a lower flight level to increase margin to buffet onset.
R Sufficient buffet margin exists at optimum altitude.

SIGNS

R Before entering an area of known turbulence the flight crew and the cabin crew must
R secure all loose equipment and turn on the "SEAT BELTS" and "NO SMOKING" signs.

AUTOPILOT/AUTOTHRUST

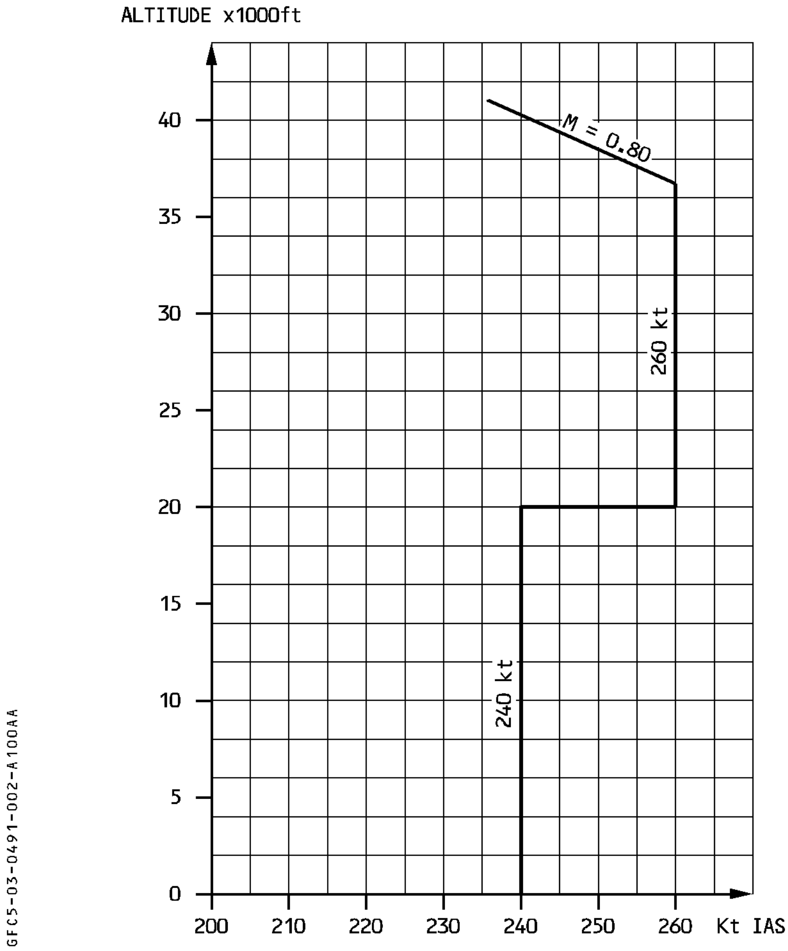
– **Keep the autopilot ON.**

R – **When thrust changes become excessive : Disconnect Autothrust.**

– **For approach : Use A/THR for managed speed.**

THRUST AND AIRSPEED

Set the thrust to give the recommended speed (see table on next page). This thrust setting aims to obtain, in stabilized conditions, the speed for turbulence penetration given in the graph below.
Change thrust only in case of an extreme variation in airspeed, and do not chase your Mach or airspeed.
A transient increase is preferable to a loss of speed that decreases buffet margins and is
R difficult to recover.



R THRUST SETTING (N1) FOR RECOMMENDED SPEED

FL	SPD or Mach	WEIGHT (1000 KG)												
		120	130	140	150	160	170	180	190	200	210	220	230	240
410	0.80	89.2	90.1	91.1	92.1	93.5	95.2	–	–	–	–	–	–	–
390	0.80	88.2	88.9	89.7	90.6	91.6	92.6	94.0	95.7	–	–	–	–	–
370	0.80	87.3	87.9	88.6	89.3	90.1	91.0	91.9	92.9	94.3	95.9	–	–	–
350	260	85.2	85.9	86.6	87.4	88.2	89.0	90.0	90.9	91.9	93.1	94.6	96.1	–
330	260	83.9	84.5	85.2	85.9	86.7	87.6	88.5	89.4	90.4	91.4	92.4	93.7	95.0
310	260	82.4	83.1	83.8	84.5	85.2	86.0	86.8	87.8	88.8	89.8	90.8	91.9	92.9
290	260	81.0	81.6	82.2	83.0	83.7	84.5	85.3	86.1	87.1	88.1	89.1	90.1	91.2
270	260	79.8	80.3	80.9	81.5	82.2	83.0	83.8	84.7	85.5	86.4	87.4	88.4	89.5
250	260	78.2	78.7	79.4	80.1	80.8	81.4	82.2	83.0	83.9	84.9	85.8	86.7	87.7
200	240	71.4	72.1	72.9	73.7	74.5	75.5	76.5	77.5	78.5	79.6	80.8	81.8	83.0
150	240	67.5	68.2	68.9	69.6	70.5	71.4	72.3	73.3	74.2	75.2	76.3	77.5	78.5
100	240	63.4	64.1	64.9	65.6	66.5	67.4	68.4	69.3	70.2	71.1	72.1	73.2	74.3
50	240	59.4	60.2	60.9	61.6	62.4	63.3	64.2	65.2	66.1	67.1	68.1	69.2	70.3

IFP-V11.0330-202

ALTITUDE

If the crew manually flies the aircraft :
– Expect large variations in altitude, but do not chase altitude.
– Maintain attitude, and allow altitude to vary.

R SIGNS

R – Set the Seatbelts and No Smoking switch to ON, in advance of anticipated turbulence.

SPEEDBRAKES

Whenever speedbrakes are applied, keep a hand on the speedbrake handle, except while performing some other specific cockpit function (changing power, resetting altimeter, etc.).

OPERATION IN WINDSHEAR/DOWN BURST CONDITIONS

PRECAUTIONS INTO SUSPECTED WINDSHEAR

- **Before TAKEOFF**

  - **DELAY TAKEOFF until conditions are improved.**
  - **ASSESS CONDITIONS for a SAFE TAKEOFF by :**
    · Using observations and experience.
    · Checking weather conditions.
  - **SELECT the MOST FAVORABLE RUNWAY (considering location of the likely windshear).**

R – **USE the WEATHER RADAR before the takeoff run, to ensure a flight path clear of any potential problem areas.**
  - **SELECT TOGA thrust.**
  - **CLOSELY MONITOR AIRSPEED and AIRSPEED TREND during the takeoff run to detect early signs of windshear.**

- **During APPROACH**

  - **DELAY LANDING, or DIVERT to another airport, until conditions are more favorable.**
  - **ASSESS CONDITION for a SAFE LANDING by :**
    · Using observations and experience.
    · Checking weather conditions.

R – **USE the WEATHER RADAR.**
  - **SELECT the MOST FAVORABLE RUNWAY, in conjunction with the most appropriate runway approach aid.**
  - **SELECT FLAPS 3.**
  - **USE MANAGED SPEED IN APPROACH PHASE.**
  - **CHECK both FDs ENGAGED IN ILS, FPA or V/S.**
  - **ENGAGE AUTOPILOT, for more accurate approach and earlier information of beam deviation when ILS available.**

Note : – *When using the GS mini function associated with managed speed, the system will carry extra speed in strong wind condition.*
– *If downburst is expected, increase VAPP displayed on the MCDU up to a maximum of VLS + 15 kt.*

R **RECOVERY TECHNIQUE AT TAKEOFF**

- **Before V1**

R The takeoff should be rejected only if unacceptable airspeed variations occur below indicated V1 and the pilot decides that there is sufficient runway remaining to stop the airplane.

- **After V1**

– **THRUST LEVERS : TOGA.**

– **ROTATE NORMALLY**

– **FOLLOW SRS ORDERS**

- **During initial climb**

– **SET or MAINTAIN TOGA**

– **IF ENGAGED, AUTO PILOT MAY BE USED, but be aware that automatic disengagement may occur if $\alpha > \alpha$ prot.**

– **FOLLOW SRS ORDERS (including use of full back stick if demanded)**

Note : If SRS not available, initially use pitch attitude up to 12,5° but this pitch attitude can be increased by using up to full back stick if necessary to minimize loss of height.

– **CLOSELY MONITOR THE FLIGHT PATH AND SPEED**

– **DO NOT CHANGE CONFIGURATION (gear, flaps) UNTIL OUT OF SHEAR**

– **RECOVER SMOOTHLY TO A NORMAL CLIMB WHEN OUT OF SHEAR**

RECOVERY TECHNIQUE AT LANDING

– **THRUST LEVERS : TOGA**

– **IF ENGAGED, AUTO PILOT MAY BE USED, but be aware that automatic disengagement may occur if $\alpha > \alpha$ prot.**

– **FOLLOW SRS ORDERS (including use of full back stick if demanded)**

Note : If SRS is not available, initially use pitch attitude up to 12.5°. But, this pitch attitude can be increased by using up to full back stick, if necessary, to minimize loss of height.

– **DO NOT CHANGE CONFIGURATION**

– **CLOSELY MONITOR THE FLIGHT PATH AND SPEED**

– **SMOOTHLY RECOVER NORMAL CLIMB when out of shear**

COLD WEATHER

For flight operations in icing conditions, see Ice and Rain Protection (Refer to 3.04.30) .
For ground operations on contaminated runways, see FCOM Volume 2 (Refer to 2.04.10).
Preparation and ground operation of the aircraft following cold soak in very low temperatures may present particular problems. The following recommendations, which complement the normal operating procedures, should be observed where applicable.
Ice accretion on ground can be expected when air temperature approaches or falls below freezing (0°C/32°F), and when moisture or ice occurs in the form of precipitation or condensation. The aircraft is also most vulnerable to ice build-up when exposed to any form of moisture, after the surfaces have been cold soaked during previous cruise flight at high altitudes, when refuelled with cold fuel or after overnight parking at low air temperatures.

EXTERIOR INSPECTION

– **PRELIMINARY COCKPIT PREPARATION (normal procedures) . . . . COMPLETED**
APU is started and air conditioning is on.

Note : 1. Ground power should be used for the APU start, if the OAT is –15°C (5°F) or lower.
2. For temperatures below –15° C (5°F) in the cockpit, the display units may not
R *be available.*

● **If avionic bay is cold soaked (aircraft parked without electrical ground supply or without air conditioning) :**

– **IRS . . . . INITIATE ALIGNMENT**
For temperatures below – 15°C (5°F) in the avionic bay the IRS alignment needs 15 minutes.

– **PROBE/WINDOW HEAT . . . . ON**

R – **SURFACES . . . . CHECKED FREE OF FROST, ICE AND SNOW**
R All surfaces of the aircraft (critical surfaces : leading edges and upper surfaces of wings,
R vertical and horizontal stabilizers, all control surfaces, slats and flaps) must be clear of
R snow, frost and ice for takeoff.
R Thin hoarfrost is acceptable on the upper surface of the fuselage.

R *Note : Thin hoarfrost is typically a white crystalline deposit which usually develops*
R *uniformly on exposed surfaces on cold and cloudless nights ; it is so thin that a*
R *person can distinguish surface features (lines or markings) beneath it.*

R On the underside of the wing tank area, a maximum layer of 3 mm (1/8 inch) of frost
R will not penalize takeoff performance.

R – **FOLLOWING EQUIPMENT . . . . CHECKED FREE OF FROST, ICE AND SNOW**
R – Landing gear assemblies (lever locks) and tires, landing gear doors.
R – Engine inlets, inlet lips, fans (check for rotation), spinners, fan exhaust ducts, reverser
R assemblies.
R – Drains, bleeds, probes (pitots, static ports, TAT sensors, angle of attack sensors)
R – Fuel tank ventilation.
R – Radome
R – Verify that the commercial water supplies are not frozen and have been refilled (these
R should have been emptied prior to cold soak).

● **after first engine start :**

– **PROBE/WINDOW HEAT . . . . AUTO**
Heating will continue to operate but under automatic control.

PROCEDURE FOR GROUND DE-ICING/ANTI-ICING

In all circumstances, it is the Captain's responsibility to decide whether or not to de-ice/anti-ice the aircraft, or to order a repeated treatment.

CAUTION

R — Check that no external air is supplied to the aircraft, via the low or high pressure
R ground connectors.
— If repeated anti-icing is necessary, ground crew must de-ice the surfaces with a hot fluid mixture before applying a new layer of anti-icing fluid.

Ensure that the ground crew is using de-icing/anti-icing fluids, in accordance with applicable company requirements and Aircraft Maintenance Manual instructions.
The flight crew must establish good communication with the ground personnel, responsible for de-icing or anti-icing, before the procedure begins.
R The aircraft may be de-iced or anti-iced with its engines and APU stopped, or with the APU
R running, and/or with the engines running. However, the flight crew should not start the engines or APU while the fluid is being sprayed on the aircraft.

CAUTION

— Avoid indiscriminate use of de-icing fluid and its ingestion by the engine or APU.
— Do not move flaps or slats, flight control surfaces, or trim surfaces, if they are not free of ice.
— Always have the aircraft treated symmetrically : The left and right sides must receive the same and complete treatment.

BEFORE FLUID SPRAYING :

— **CAB PRESS MODE SEL . . . . CHECK AUTO**

— **ENG BLEED 1, 2 . . . . OFF**

— **APU BLEED . . . . OFF**

– **DITCHING pushbutton . . . . ON**
Outflow valves, pack flow control valves, avionic ventilation overboard valve close. This will prevent de-icing fluid from entering the aircraft. Avionic ventilation is provided by operating cabin fans, since air blows to the inboard valve. Considering the low OAT, there is no time limitation associated to this configuration. The "CAB PRESS FWD OFV NOT OPEN" and "CAB PRESS AFT OFV NOT OPEN" ECAM cautions will be triggered. Disregard the associated procedure.

Note : On ground with passengers on board, it is recommended to avoid packs inoperative for longer than 20 minutes because comfort may be affected.

– **THRUST LEVERS . . . . CHECK IDLE**

– **"AIRCRAFT PREPARED FOR SPRAYING" . . . . INFORM GND CREW**

UPON COMPLETION OF THE SPRAYING OPERATION :

– **DITCHING pushbutton . . . . OFF**

R – **OUTFLOW VALVE . . . . CHECK OPEN**
R On the ECAM PRESS page, confirm that the outflow valve indication reaches the open
R green position to avoid any unexpected aircraft pressurization.

CAUTION

If spraying is performed with the engines not running, a small negative cabin delta P may appear for a short time, just after selecting the ditching pushbutton to OFF. During this time, do not open any doors or windows.

– **ENG BLEED . . . . ON**

• **At least 60 seconds after APU start, or on completion of spraying operation :**

– **APU BLEED . . . . ON**

– **Ground equipment . . . . REMOVE**

– **DE-ICING/ANTI-ICING REPORT . . . . RECEIVED**
The information from ground personnel who carried out de-icing and post application check must include (ANTI-ICING CODE) :
· Type of fluid used.
· The mix ratio of fluid to water (example 75/25).
· When the holdover time began.
· Result of post application check : Aircraft critical parts are clean.

– **NORMAL PROCEDURE . . . . RESUME**
Apply appropriate normal procedures. Pay special attention to the flight control check. In freezing precipitation, make the appropriate checks to evaluate aircraft icing. Base the decision on whether to takeoff, or to re-protect the aircraft, on the amount of ice that has built up on the critical surfaces since the last de-icing, as revealed by a personal inspection from the inside and outside of the aircraft. Make this inspection before the holdover time expires, or just before takeoff.

Note : *If the fuselage has been sprayed, there is a risk of de-icing fluid ingestion by the APU air intake, resulting in specific odors, or SMOKE warnings. Thus, consider APU BLEED OFF during takeoff.*

SECURING THE AIRCRAFT FOR COLD SOAK

Note : At the beginning of a cold soak, due to a transient temperature difference between fluid in the reservoir and the system piping, the G RSVR UNDERFILLED caution may be triggered on the ECAM. Check the reservoir quantity in the upper half part of the norm filling range. The caution may disappear with the operation of the green electrical pump.

Close the outflow valve before leaving the aircraft.

R ● **After switching off all bleeds and before switching off AC power :**

R – **DITCHING pushbutton . . . . ON**
R This closes the outflow valve, the pack valves, and the avionic ventilation inlet and
R extract valves.

R – **PARKING BRAKE . . . . OFF**
R Check chocks in place, and release the parking brake to prevent brakes from freezing.

R ● **After switching off the batteries :**

R – **DITCHING pushbutton . . . . OFF**

– **CAPT SEAT . . . . MOST FWD POSITION**
This facilitates access to the avionics bay, because seat operation becomes difficult once the mechanism is cold-soaked.

– **PROTECTIVE COVERS . . . . INSTALL**

• **If no electrical ground supply or air conditioning is available :**

– **APU BATTERY . . . . REMOVE**
If the APU battery is subject to cold soak for 12 hours or more, and the ambient temperature is below – 15°C (5°F), its remaining capacity may not allow starting the cold soaked APU. Remove the battery and store it in a warm place.

WATER SYSTEM DRAINING

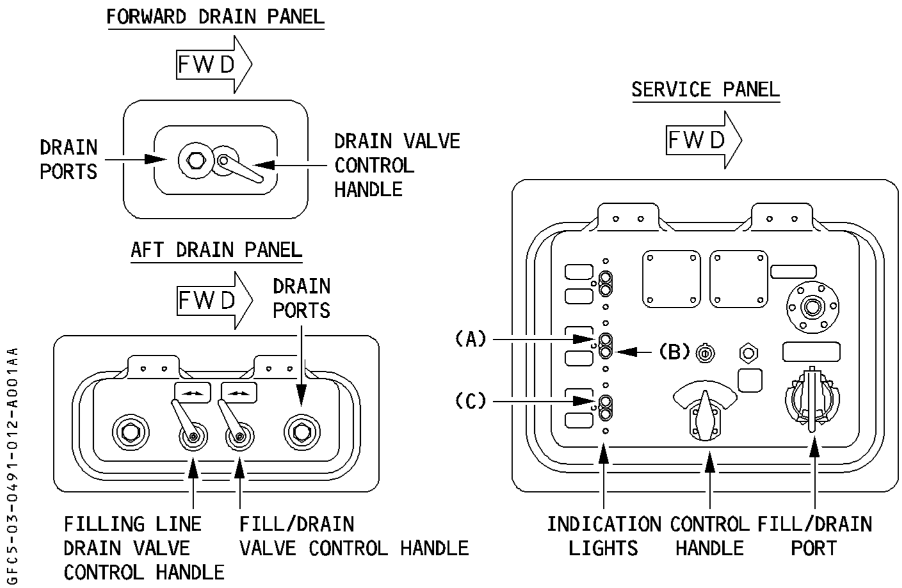
If required, due to the OAT, drain the water system, as shown below :

Configuration			Exposure time	Water tank drain
Air Conditioning	Cabin temperature	Outside Air Temperature		
ON	Above 10°C (50°F)	Between 0°C and – 15°C (32°F and 5°F)	Any	Not required
		Below – 15°C (5°F)	1 h 15 min	Required
OFF		Between 0°C and – 7°C (32° and 19.4°F)	1 h 30 min	
		Between – 7°C and – 15°C (19.4°F and 5°F)	0 h 30 min	
		Below – 15°C (5°F)	Any	

WATER DRAINING PROCEDURE

The following procedure must be applied, when the water system needs to be drained, and when the aircraft is exposed to temperatures below the freezing point.
Draining is usually carried out with the electrical power supply on.

Potable-Water Panels :



– **ACCESS PLATFORM(S) . . . . PUT IN POSITION**

– **SHUT-OFF VALVES IN GALLEYS/TOILETS . . . . CHECK OPEN**

– **WATER FAUCETS IN GALLEYS/TOILETS . . . CHECK MIDDLE (WARM) POSITION**

– **FWD AND AFT DRAIN, SERVICE PANELS' ACCESS DOORS . . . . OPEN**

– **DRAIN PORT CAPS . . . . REMOVE**
Remove the drain port cap of the potable water service panel.

– **DRAIN HOSES . . . . CONNECT**
Connect drain hoses to the drain port on the :
· Forward and aft drain panels
· Potable water service panel

– **CONTROL HANDLE (SERVICE PANEL) . . . . TURN TO "DRAIN" AND PULL**
To drain, turn the handle to the "DRAIN" position, and then pull it out until it reaches its mechanical stop. The (A), (B), (C) indicator lights come on. Water flows out of the drain ports of the forward and aft drain, and the potable water service panels.

● **If the aircraft's electrical network is de-energized :**

– **DRAIN CONTROL HANDLES (FWD and AFT DRAIN PANELS) . TURN TO "OPEN"**
The most aft (filling line drain valve control) handle on the aft drain panel is set to the "OPEN" position. It is no longer possible to close the aft and forward drain panel access doors.

● **When the system is drained :**

– **CONTROL HANDLE (SERVICE PANEL) . . . . PUSH AND TURN TO "NORMAL"**
The (A), (B), (C) indicator lights go off.

● **If the aircraft's electrical network is de-energized :**

– **DRAIN CONTROL HANDLES (FWD & AFT DRAIN PANELS) . . . . TURN TO "SHUT"**

Note : *In freezing temperatures, all drain valves must remain open after draining to prevent damage to the system.*

– **DRAIN HOSES . . . . DISCONNECT**

– **PANELS . . . . CLEAN AND DRY**

Note : *In freezing conditions, when the drain valves must stay open, do not put the caps on the service panel drain port.*

– **ACCESS DOORS (FWD, AFT) . . . . CLOSE**
Water drainage is assured even with access doors closed.

Note : *When the drain valve is manually open it is not possible to close the portable water service panel access door.*

– **ACCESS PLATFORM(S) . . . . REMOVE**

OPERATIONS IN VOLCANIC ASHES

Following procedures are given as advice to operators who fly routes that could take their aircraft through the material erupting from active volcanos.
Volcanic ash is composed of very abrasive particles, which therefore may cause serious damage to aircraft parts exposed to airflow and may significantly impair system operation.
In view of the potential adverse effects, operations from/to airports with volcanic ash deposits should be avoided if possible.
If such exposure is unavoidable, the following recommendations should be applied.

GROUND OPERATIONS ON AIRPORT COVERED WITH ASH OR DUST

Preliminary cockpit preparation

– **APU . . . . DO NOT USE**
Restrict ground use of APU to engine starts, if required. Request ground supply for air conditioning and for electrical supply.

– **WINDSHIELD WIPERS . . . . DO NOT USE**
Do not use windshield wipers for ash dust removal.

Exterior inspection

– **SURFACES AND EQUIPMENT . . . . CHECK FREE OF ASH DEPOSITS**
Ground maintenance should remove ash that has settled on exposed lubricated surfaces and could penetrate seals, enter the engine gas path, air conditioning system, air data probes and other orifices on the aircraft.

– **ENGINE INLETS . . . . CHECK FREE OF ASH DEPOSITS**
Inspect and order cleaning (as far as practical) of any volcanic ash within 25 feet of the engine inlet.

Engine start

Engines should be started with external pneumatic supply, if available (Refer to 3.04.70).

– **ENGINE . . . . CRANK**
Before engine start, ventilate the engines by dry cranking at maximum motoring speed for two minutes. This will blow out any ash that may have entered the booster area.

Taxi

After releasing the brakes :

– **THRUST LEVERS .. ADVANCE SMOOTHLY THEN MOVE TO IDLE WHEN ROLLING**
Smoothly advance the levers to the minimum required of breakaway.
Avoid making sharp or high-speed turns.

– **ENG 1, 2 BLEED . . . . OFF**
Keep the bleed valves closed for taxiing.

Takeoff

– **Allow ash and dust (if present) to settle on the runway before starting the takeoff roll.**

– **Use the rolling takeoff technique, if possible.**

– **Progressively adjust engine power, as is done for normal procedures.**

Landing

– **REVERSERS . . . . AS RQRD**
If it appears that maximum reverse thrust will be needed, apply reverse thrust when the main landing gear touches down. Limit the use of reverse thrust as much as possible, because reverse flow may throw up ash and impair visibility.

Note : *Because of the abrasive effect of the volcanic ash on windshields and landing lights, the visibility for approach and landing may be significantly reduced. Consider diversion to an airfield where AUTO LAND is possible.*

– **BRAKE PERFORMANCE . . . . CONSIDER PENALTY**
A layer of ash on the runway may degrade braking efficiency. Treat landing performance,
R as if it were similar to that on a wet runway (dry ash), or on slush (wet ash).

R **SECURING THE AIRCRAFT IN VOLCANIC ASH**

R ● **After switching off all bleeds, and before switching off AC power :**

R – **DITCHING pushbutton . . . . ON**
R This closes the outflow valve, the pack valves, and the avionic ventilation inlet and
R extract valves.

R ● **After switching off the batteries :**

R – **DITCHING pushbutton . . . . OFF**

R – **PROTECTIVE COVERS . . . . INSTALL**
R Install protective covers and plugs to protect the aircraft and engines from snow and
R ice.

FLIGHT OPERATIONS

Flight into areas of known volcanic activity must be avoided.
If a volcanic eruption is reported while in flight, the flight should remain well clear of the affected area (volcanic dust may be spread over several hundred miles) and, if possible stay on the upwind side of the volcanic dust (typically 20 NM upwind of the erupting volcano).
In hours of darkness or in meteorological conditions when volcanic dust may not be visible, flight into ash cloud can be suspected, should one or several of the following indications be observed :

- Smoke or dust appearing in the cockpit,
- Acrid odor similar to electric smoke,
- At night, St. Elmo fire/static discharges appearing around the windshield,
- Bright white/orange glow appearing in the engine inlets,
- Landing lights casting sharp, distinct, shadows,
- Multiple engine malfunctions, such as increasing EGT, power loss, stall or flame out.

● **If the aircraft inadvertently enters a volcanic ash cloud :**

– **ESCAPE MANEUVER (terrain permitting) . . . . INITIATE**
Since lateral dimensions of ash cloud are not known, best is to fly a 180° reversal turn.

– **ATC . . . . NOTIFY**

– **A/THR . . . . OFF**
This will prevent thrust variations.

– **THRUST (terrain permitting) . . . . DECREASE**
This assists in maintaining the engine stall margin by reducing the ash ingestion and limiting the EGT, the accumulation of molten volcanic ash on turbine vanes is restricted to a minimum. Do not climb, since this increases EGT.

– **CREW OXYGEN . . . . ON/100 %**

– **CABIN CREW . . . . NOTIFY**

– **PAX OXYGEN . . . . AS RQRD**
Depending on contamination.

– **ENG ANTI ICE . . . . ON**

– **WING ANTI ICE . . . . ON**

– **PACK FLOW . . . . HI**
Maximum air bleed provides additional engine stall margin.

Note : *It is recommended to switch off the CARGO ISOL VALVES, to prevent a cargo smoke warning from being triggered.*

– **APU . . . . START**
The APU (if available) may be started in preparation for a starter-assisted relight.

– **ENGINE PARAMETERS . . . . MONITOR**
EGT should be particularly monitored for any exceedance tendency.

Note :
- *If the EGT increases up to the limits, an accumulation of molten volcanic ash on the turbine vanes must be suspected.*
  This accumulation may be cleared by engine shutdown, then restart.
- *If first engine restart attempt is unsuccessful, repeated successive attemps should be made immediately.*
- *A successful engine restart may not be possible until the aircraft has exited the volcanic ashcloud.*
- *Upon restart, the engine acceleration may be very low and should not be misinterpreted as a failure to start.*
- *Consider compressor and turbine blades have been eroded, avoid rapid thrust commands. An increased fuel flow and EGT may be noticed.*

– **AIRSPEED INDICATIONS . . . . MONITOR**
Volcanic ash may clog the pitot probes. If unreliable or loss of airspeed indication is observed, refer to the abnormal procedure : “FLT WITH UNRELIABLE SPD INDICATION” (3.02.34).

Note : *Communication difficulties may be experienced due to electrostatic conditions.*

Reporting

- Whenever operating in areas affected by volcanic activity, flight crews should be aware of volcanic activity reporting procedures and familiar with the use of the ICAO Special Air-Report of Volcanic Activity (Model VAR).
- Should a volcanic ash cloud be encountered, flight conditions and crew duties permitting, the ATC should be notified, providing information concerning the location, altitude and drift direction of the ash cloud.

INTRODUCTION

The Less Paper Cockpit (LPC) concept consists of a complete set of software tools, designed to :
- Improve access to pilots' operational information, and simplify some of their tasks.
- Reduce the quantity of paper documents in the cockpit, and replace them with electronic ones, enabling quicker and easier updates, while improving information retrieval.

The applicable areas include Performance and Weight and Balance computations, in addition to technical operational documentation (FCOM, MEL, Operations Policy Manual..).
This section addresses the procedures corresponding to the modules which are already available.
The various modules are linked via F.O.V.E. (Flight Operations Versatile Environment), which is designed to provide an interface between the various modules by enabling :
- Inter-module communication
- Software compatibility management
- Software version management
- Integrity control between data and the software versions
- Update management
- Context management

Each airline may choose to install one or several modules, each of which is able to work independently.

GENERAL

LPC PROGRAM AND REFERENCE VERSION NUMBER UPDATING

R Each pilot should check that the version of F.O.V.E., installed on their PC, corresponds to the latest updated version provided by their airline's Flight Operations.

POWER SUPPLY

Check that each available PC is electrically-supplied.

PC STOWAGE DURING TAKEOFF AND LANDING

PCs should be stowed during takeoff and landing.

LPC TAKEOFF MODULE

The takeoff module is designed to provide aircraft takeoff performance, based on actual daily environmental conditions, just prior to flight. It allows straightforward computations, and provides the best takeoff performance for the given conditions.

TAKEOFF PERFORMANCE TASKSHARING

The tasksharing policy for data computation, and introduction in the MCDU is consistent with the currently applicable policy, as per the SOP :
One pilot performs the computation, then introduces the resulting data in the MCDU.
The other pilot checks the :
– Computation by using the PC to verify that the entered data is correct.
– Data entered in the MCDU.
Data entry and computation are generally done by the PF, and checked by the PNF. These tasks can be swapped, as per company policy, or as circumstances dictate. For instance, during taxi, data entry and computation should be done by the PNF, since the PF is busy taxiing the aircraft.
The PF will then have to perform the check, by stopping the aircraft or, if a stop is not possible, by transferring command to the other pilot.

COCKPIT PREPARATION

TAKEOFF DATA COMPUTATION

R The PF checks that the version of F.O.V.E., available on the PC, is the applicable one. (The applicable version is indicated on the computerized F-PLN, or other document, as per airline policy).
The PF enters the data, then shows the screen to the PNF for data confirmation.

R ● **If the Weight and Balance module is to be used :**

– **Use the pilot's PC to compute the ZFCG and ZFW :**
The computed values will be automatically fed to the takeoff performance module.

– **Use the pilot's PC to compute takeoff data :**
Any NOTAM affecting airport data should be considered at this stage, and taken into account in the "Modify runway" frame of the pilot interface. When the computation has been performed, a summary of the results is available in the "REMINDER", which is equivalent to the MCDU PERF page. Only the values to be addressed are indicated.

FMGS DATA INSERTION (no change compared to the current SOP)

The PF enters the data, computed on the PC, into the MCDU.

GROSS WEIGHT INSERTION (INIT B page)

– **ZFCG/ZFW . . . . INSERT**

– **BLOCK FUEL . . . . INSERT**

TAKEOFF DATA INSERTION (PERF TO page)

– **V1, VR, V2 . . . . INSERT**

– **FLEX TO TEMP/DERATE . . . . INSERT**

R ● **When refuelling is completed, if the Weight and Balance module is used :**

– **Check the fuel distribution on the ECAM FUEL page.**

– **If necessary, correct the fuel distribution on the pilot PC's loading module.**
This will ensure consistency between the ECAM CG, and the CG computed by the loading module.

FMGS DATA CONFIRMATION

– **GROSS WEIGHT INSERTION . . . . CHECK**
The PNF checks FMGS data.
· If the Aircraft Loading module is used :
– Check, on the pilot's PC, that the entered data is correct.
– Check that the computed data has been correctly introduced in the MCDU.

– **TO DATA . . . . CALCULATE/CHECK**
The PNF checks, on the pilot's PC, that the entered data is correct.
The PNF checks that the computed data has been correctly introduced in the MCDU.

BEFORE PUSHBACK or START

– **LOADING . . . . CHECK**
R – Check the ECAM CG versus the loadsheet CG or, if the W & B module is used, check the ECAM CG versus the CG computed on the pilot's PC.
– In case of a discrepancy, check that the ZFW and ZFCG have been correctly inserted in the MCDU, then rely on the ECAM CG.

– **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
Once the loading is checked :
– Check or re-enter the data entered in the takeoff performance module.
– Check or revise the takeoff data on the MCDU's INIT B and PERF pages. Data to be crosschecked by the other pilot.

BEFORE TAKEOFF

– **PILOT PC . . . . STOWED**

ILS (or NON PRECISION) APPROACH

● **When the landing gear is down :**

– **PILOT PC . . . . STOWED**

R **LPC WEIGHT AND BALANCE MODULE**

R The Weight and Balance module provides a computerized loadsheet and trim sheet. This
R facilitates computation of the ZFW/ZFCG and TOW/TOCG, and enables last-minute changes
R to the passenger/cargo/fuel distribution.
R The following procedure applies to operators using only the W & B module. Operators using
R both the W & B module and the Takeoff module should refer to the LPC TAKEOFF MODULE
R section.

R **WEIGHT & BALANCE TASKSHARING**

R The tasksharing policy for data computation and introduction in the MCDU is consistent
R with the currently applicable policy, as per the SOP :
R One pilot performs the computation, then introduces the resulting data in the MCDU.
R The other pilot checks the :
R – Computation by using the PC to verify that the entered data is correct.
R – Data entered in the MCDU.
R Data entry and computation are generally done by the PF, and checked by the PNF. These
R tasks can be swapped, as per company policy, or as circumstances dictate.

COCKPIT PREPARATION

TAKEOFF DATA COMPUTATION

The PF checks that the version of F.O.V.E., available on the PC, is the applicable one. (The applicable version is indicated on the computerized F-PLN or other document, as per airline policy).
The PF enters the data, then shows the screen to the PNF for data confirmation.

– **Use the pilot's PC to compute the ZFCG and ZFW.**

– **Use RTOW to compute takeoff data.**

FMGS DATA INSERTION (no change compared to the current SOP).

The PF enters the data, computed on the PC, into the MCDU.

GROSS WEIGHT INSERTION (INIT B page)

– **ZFCG/ZFW . . . . INSERT**

– **BLOCK FUEL . . . . INSERT**

TAKEOFF DATA INSERTION (PERF TO page)

– **V1, VR, V2 . . . . INSERT**

– **FLEX TO TEMP/DERATE . . . . INSERT**

● **When refuelling is completed :**

  – **Check the fuel distribution on the ECAM FUEL page.**

  – **If necessary, correct the fuel distribution on the pilot PC's W & B module.**
  This will ensure consistency between the ECAM CG and the CG computed by the W & B module.

FMGS DATA CONFIRMATION

– **GROSS WEIGHT INSERTION . . . . CHECK**
The PNF checks FMGS data.
– Check, on the pilot's PC, that the entered data is correct.
– Check that the computed data has been correctly introduced in the MCDU.

– **TO DATA . . . . CALCULATE/CHECK**

BEFORE PUSHBACK or START

– **LOADING . . . . CHECK**
– Check the ECAM CG versus the CG computed on the pilot's PC.
– In case of a discrepancy, check that the ZFW and ZFCG have been correctly inserted in the MCDU, then rely on the ECAM CG.

– **TAKEOFF DATA . . . . PREPARE and CHECK/REVISE**
Once the loading is checked :
– Check or recompute the takeoff speeds and the flexible temperature, using the RTOW charts.
– Check or revise the takeoff data on the MCDU's INIT B and PERF pages.
Data to be crosschecked by the other pilot.

BEFORE TAKEOFF

– **PILOT PC . . . . STOWED**

ILS (or NON PRECISION) APPROACH

● **When the landing gear is down :**

– **PILOT PC . . . . STOWED**

LPC MEL MODULE

TBD

05.00 CONTENTS

05.05 OPERATING DATA
– CONVERSIONS IAS. MACH – TAS. MACH – SAT. TAT 1
– INTERNATIONAL STANDARD ATMOSPHERE 2
– CONVERSIONS QNH – QFE – PRESSURE ALTITUDE 3
– CONVERSIONS QFE – hPa – in.Hg – ft 4
– WIND COMPONENTS (FOR TAKEOFF AND LANDING) 5
– ALTITUDE TEMPERATURE CORRECTION 6

05.06 THRUST RATINGS

05.10 CLIMB
– GENERAL 1
– CLIMB 250KT/300KT/M.80 2
R – DERATED CLIMB 1 7
R – DERATED CLIMB 2 11

05.15 CRUISE
– GENERAL 1
– OPTIMUM MACH NUMBER 1
– OPTIMUM AND MAXIMUM ALTITUDES 4
– WIND ALTITUDE TRADE FOR CONSTANT SPECIFIC RANGE . 7
– OPTIMUM ALTITUDE ON SHORT STAGE 10
– CRUISE AT M.80 11
– CRUISE AT M.82 15
– CRUISE AT M.84 19
– CRUISE AT LONG RANGE 23

05.20 IN CRUISE QUICK CHECK
– GENERAL 1
– CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT . . 1
– EXAMPLE 2
– IN CRUISE QUICK CHECK M.80 3
R – IN CRUISE QUICK CHECK M.82 7
R – IN CRUISE QUICK CHECK M.84 11
R – IN CRUISE QUICK CHECK LONG RANGE 15

05.25 HOLDING
– GENERAL 1
– CLEAN CONFIGURATION – GREEN DOT SPEED 2
– CLEAN CONFIGURATION – 210KT 3
– CONFIGURATION 1 – S SPEED 4
– CONFIGURATION 1 – 170KT 5

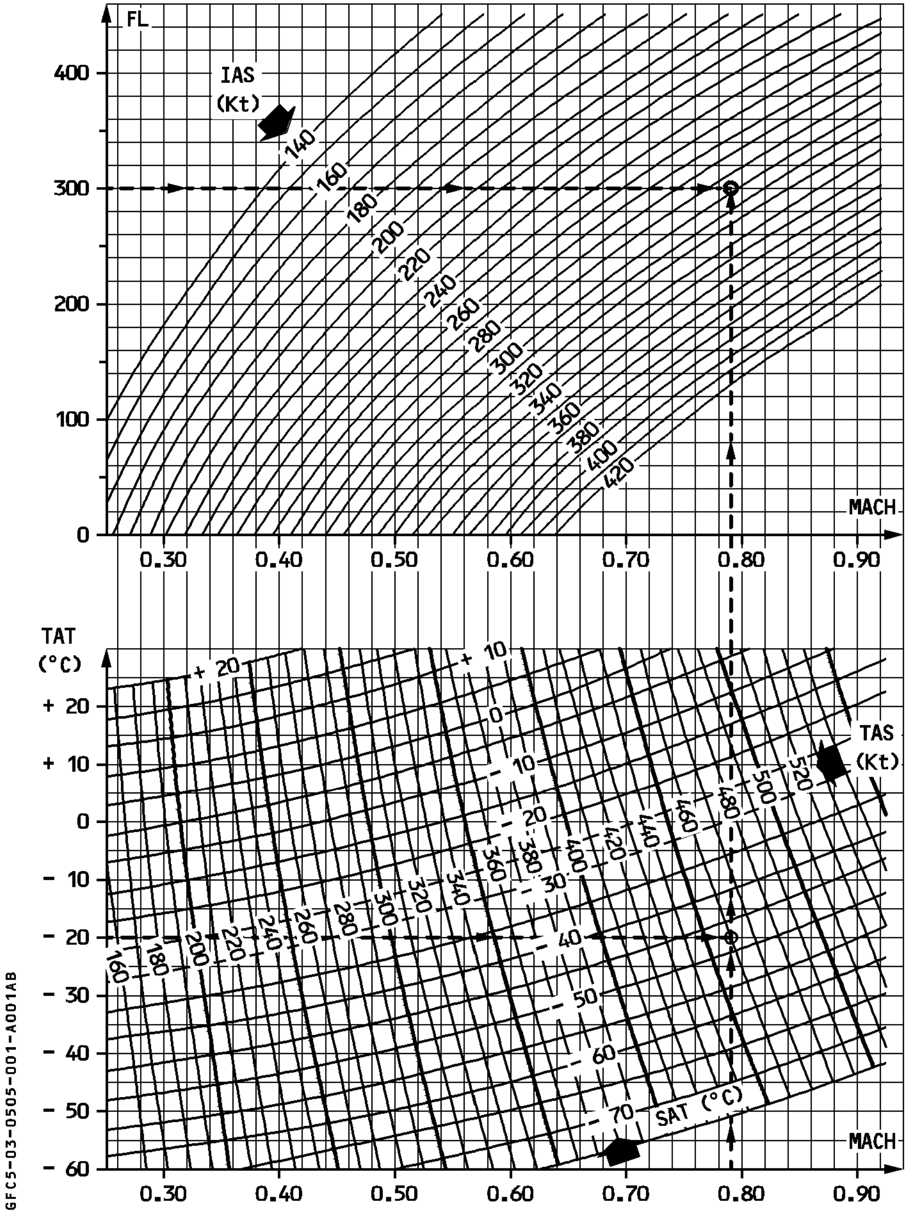
R **05.30 DESCENT**
R – GENERAL 1
R – DESCENT M.80/300KT/250KT 2
R – EMERGENCY DESCENT MMO/VMO 3

05.35 GO AROUND

05.40 ALTERNATE

05.50 GROUND DISTANCE/AIR DISTANCE

R **CONVERSIONS – IAS. MACH – TAS. MACH – SAT. TAT**



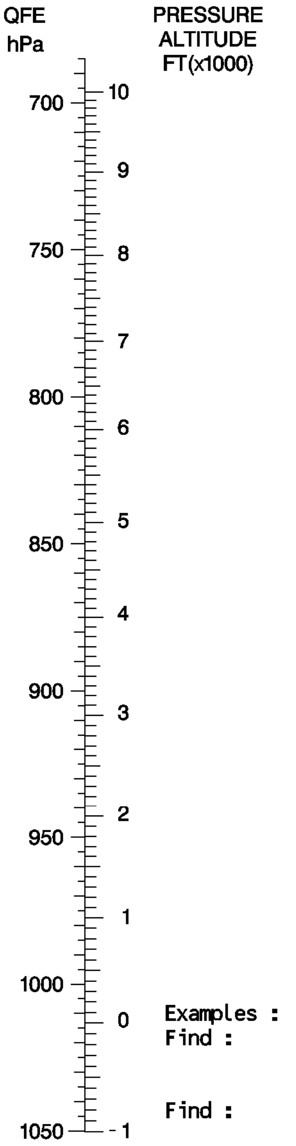
INTERNATIONAL STANDARD ATMOSPHERE (ISA)

R

ALTITUDE (Feet)	TEMP. (°C)	PRESSURE hPa	PRESSURE P.S.I.	PRESSURE In Hg.	PRESSURE RATIO $\delta = P / Po$	DENSITY $\sigma = \rho / \rho o$	SPEED of SOUND (a) kt	ALTITUDE (meters)
41,000	–56.5	179	2.59	5.28	0.1764	0.2346	573	12.496
40,000	– 56.5	188	2.72	5.54	0.1851	0.2462	573	12.192
39,000	– 56.5	197	2.85	5.81	0.1942	0.2583	573	11.887
38,000	– 56.5	206	2.99	6.10	0.2038	0.2710	573	11.582
37,000	– 56.5	217	3.14	6.40	0.2138	0.2844	573	11.278
36,000	– 56.3	227	3.30	6.71	0.2243	0.2891	573	10.973
35,000	– 54.3	238	3.46	7.04	0.2353	0.3099	576	10.668
34,000	– 52.4	250	3.63	7.38	0.2467	0.3220	579	10.363
33,000	– 50.4	262	3.80	7.74	0.2586	0.3345	581	10.058
32,000	– 48.4	274	3.98	8.11	0.2709	0.3473	584	9.754
31,000	– 46.4	287	4.17	8.49	0.2837	0.3605	586	9.449
30,000	– 44.4	301	4.36	8.89	0.2970	0.3741	589	9.144
29,000	– 42.5	315	4.57	9.30	0.3107	0.3881	591	8.839
28,000	– 40.5	329	4.78	9.73	0.3250	0.4025	594	8.534
27,000	– 38.5	344	4.99	10.17	0.3398	0.4173	597	8.230
26,000	– 36.5	360	5.22	10.63	0.3552	0.4325	599	7.925
25,000	– 34.5	376	5.45	11.10	0.3711	0.4481	602	7.620
24,000	– 32.5	393	5.70	11.60	0.3876	0.4642	604	7.315
23,000	– 30.6	410	5.95	12.11	0.4046	0.4806	607	7.010
22,000	– 28.6	428	6.21	12.64	0.4223	0.4976	609	6.706
21,000	– 26.6	446	6.47	13.18	0.4406	0.5150	611	6.401
20,000	– 24.6	466	6.75	13.75	0.4595	0.5328	614	6.096
19,000	– 22.6	485	7.04	14.34	0.4791	0.5511	616	5.791
18,000	– 20.7	506	7.34	14.94	0.4994	0.5699	619	5.406
17,000	– 18.7	527	7.65	15.57	0.5203	0.5892	621	5.182
16,000	– 16.7	549	7.97	16.22	0.5420	0.6090	624	4.877
15,000	– 14.7	572	8.29	16.89	0.5643	0.6292	626	4.572
14,000	– 12.7	595	8.63	17.58	0.5875	0.6500	628	4.267
13,000	– 10.8	619	8.99	18.29	0.6113	0.6713	631	3.962
12,000	– 8.8	644	9.35	19.03	0.6360	0.6932	633	3.658
11,000	– 6.8	670	9.72	19.79	0.6614	0.7156	636	3.353
10,000	– 4.8	697	10.10	20.58	0.6877	0.7385	638	3.048
9,000	– 2.8	724	10.51	21.39	0.7148	0.7620	640	2.743
8,000	– 0.8	753	10.92	22.22	0.7428	0.7860	643	2.438
7,000	+ 1.1	782	11.34	23.09	0.7716	0.8106	645	2.134
6,000	+ 3.1	812	11.78	23.98	0.8014	0.8359	647	1.829
5,000	+ 5.1	843	12.23	24.90	0.8320	0.8617	650	1.524
4,000	+ 7.1	875	12.69	25.84	0.8637	0.8881	652	1.219
3,000	+ 9.1	908	13.17	26.82	0.8962	0.9151	654	914
2,000	+ 11.0	942	13.67	27.82	0.9298	0.9428	656	610
1,000	+ 13.0	977	14.17	28.86	0.9644	0.9711	659	305
0	+ 15.0	1013	14.70	29.92	1.0000	1.0000	661	0
– 1.000	+ 17.0	1050	15.23	31.02	1.0366	1.0295	664	– 305

CONVERSIONS – QNH – QFE – PRESSURE ALTITUDE

R



QNH (hPa)	CORRECTION (FT)	QNH (in Hg)
949 – 951	+ 1900	28.01 – 28.10
952 – 955	+ 1800	28.11 – 28.20
956 – 958	+ 1700	28.21 – 28.30
959 – 961	+ 1600	28.31 – 28.40
962 – 964	+ 1500	28.41 – 28.45
965 – 968	+ 1400	28.46 – 28.56
969 – 971	+ 1300	28.57 – 28.66
972 – 974	+ 1200	28.68 – 28.77
975 – 978	+ 1100	28.78 – 28.86
979 – 981	+ 1000	28.87 – 28.95
982 – 984	+ 900	28.96 – 29.05
985 – 988	+ 800	29.06 – 29.15
989 – 991	+ 700	29.16 – 29.25
992 – 994	+ 600	29.26 – 29.35
995 – 997	+ 500	29.36 – 29.45
998 – 1001	+ 400	29.46 – 29.54
1002 – 1004	+ 300	29.55 – 29.64
1005 – 1007	+ 200	29.65 – 29.74
1008 – 1011	+ 100	29.75 – 29.84
1012 – 1014	0	29.85 – 29.94
1015 – 1018	– 100	29.95 – 30.04
1019 – 1021	– 200	30.05 – 30.14
1022 – 1025	– 300	30.15 – 30.24
1026 – 1028	– 400	30.25 – 30.34
1029 – 1031	– 500	30.35 – 30.44
1032 – 1035	– 600	30.45 – 30.54
1036 – 1038	– 700	30.55 – 30.65
1039 – 1042	– 800	30.66 – 30.75
1043 – 1045	– 900	30.76 – 30.85
1046 – 1050	– 1000	30.86 – 30.95

Examples :
1) Elevation: 2500 ft QNH = 1020 hPa
Find : correction: - 200 ft
Pressure altitude: 2300 ft QFE = 933 hPa
2) Elevation: 1500 ft QFE = 980 hPa
Find : Pressure altitude: 920 ft
Correction: - 580 ft QNH = 1032 hPa

GFC5-03-0505-003-A001AC

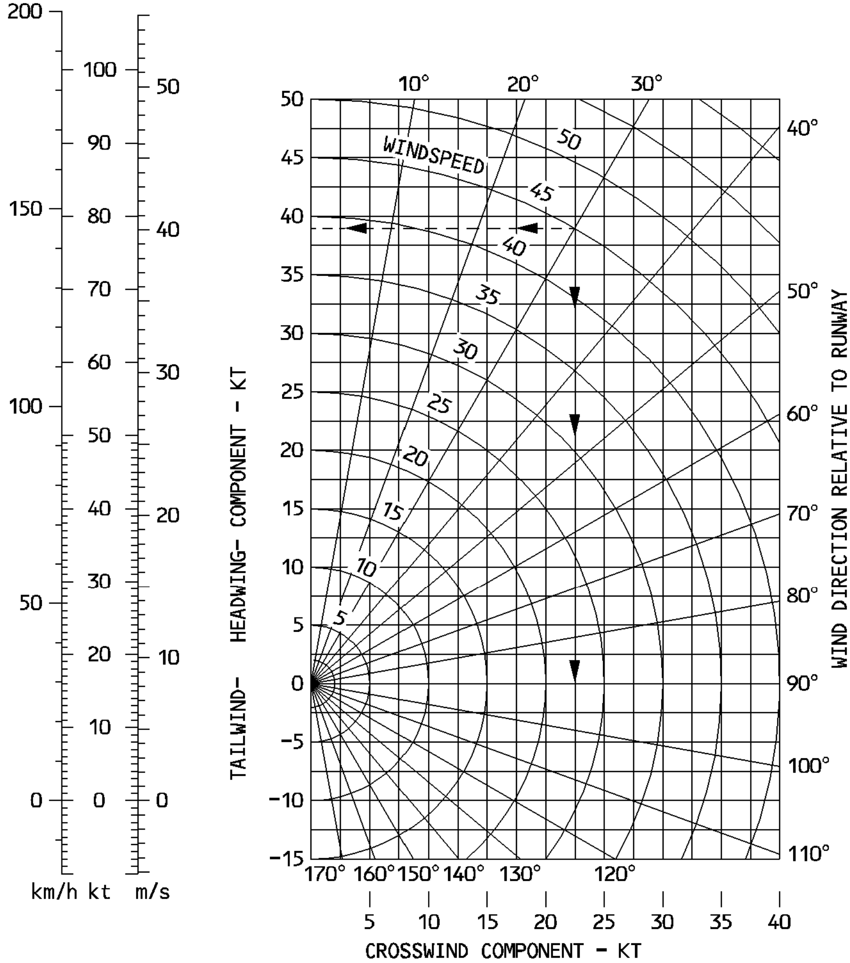
CONVERSIONS QFE hPa – in. Hg – ft

QFE hPa	in. Hg	PRESS. ALT. ft	QFE hPa	in. Hg	PRESS. ALT. ft	QFE hPa	in. Hg	PRESS. ALT. ft
1050	31.01	– 989	960	28.35	1486	870	25.69	4157
1048	30.95	– 936	958	28.29	1543	868	25.63	4219
1046	30.89	– 883	956	28.23	1601	866	25.57	4281
1044	30.83	– 830	954	28.17	1658	864	25.51	4343
1042	30.77	– 776	952	28.11	1715	862	25.45	4405
1040	30.71	– 723	950	28.05	1773	860	25.40	4468
1038	30.65	– 669	948	27.99	1831	858	25.34	4531
1036	30.59	– 615	946	27.94	1889	856	25.28	4593
1034	30.53	– 562	944	27.88	1947	854	25.22	4656
1032	30.47	– 508	942	27.82	2005	852	25.16	4718
1030	30.42	– 454	940	27.76	2062	850	25.10	4781
1028	30.36	– 400	938	27.70	2120	848	25.04	4844
1026	30.30	– 346	936	27.64	2178	846	24.98	4907
1024	30.24	– 292	934	27.58	2236	844	24.92	4970
1022	30.18	– 238	932	27.52	2294	842	24.86	5033
1020	30.12	– 184	930	27.46	2353	840	24.81	5097
1018	30.06	– 129	928	27.40	2412	838	24.75	5161
1016	30.00	– 74	926	27.34	2471	836	24.69	5225
1014	29.94	– 20	924	27.29	2530	834	24.63	5289
1012	29.88	34	922	27.23	2589	832	24.57	5353
1010	29.83	89	920	27.17	2647	830	24.51	5417
1008	29.77	144	918	27.11	2707	828	24.45	5481
1006	29.71	199	916	27.05	2767	826	24.39	5545
1004	29.65	254	914	26.99	2826	824	24.33	5610
1002	29.59	309	912	26.93	2885	822	24.27	5675
1000	29.53	364	910	26.87	2944	820	24.21	5740
998	29.47	419	908	26.81	3004	818	24.16	5805
996	29.41	475	906	26.75	3064	816	24.10	5870
994	29.35	530	904	26.70	3124	814	24.04	5935
992	29.29	586	902	26.64	3183	812	23.98	6000
990	29.23	641	900	26.58	3243	810	23.92	6065
988	29.18	697	898	26.52	3303	808	23.86	6131
986	29.12	753	896	26.46	3363	806	23.80	6197
984	29.06	809	894	26.40	3424	804	23.74	6263
982	29.00	865	892	26.34	3484	802	23.68	6329
980	28.94	921	890	26.28	3545	800	23.62	6394
978	28.88	977	888	26.22	3606	798	23.56	6461
976	28.82	1033	886	26.16	3667	796	23.51	6528
974	28.76	1089	884	26.10	3728	794	23.45	6595
972	28.70	1145	882	26.05	3789	792	23.39	6661
970	28.64	1202	880	25.99	3850	790	23.33	6727
968	28.59	1259	878	25.93	3911	788	23.27	6794
966	28.53	1316	876	25.87	3973	786	23.21	6861
964	28.47	1373	874	25.81	4034	784	23.15	6928
962	28.41	1430	872	25.75	4096	782	23.09	6995

WIND COMPONENTS (FOR TAKEOFF AND LANDING)

MULTIPLY	BY	TO GET
kt	1.852	km/h
kt	0.5144	m/s
m/s	3.6	km/h
m/s	1.9438	kt
km/h	0.5396	kt
km/h	0.2778	m/s

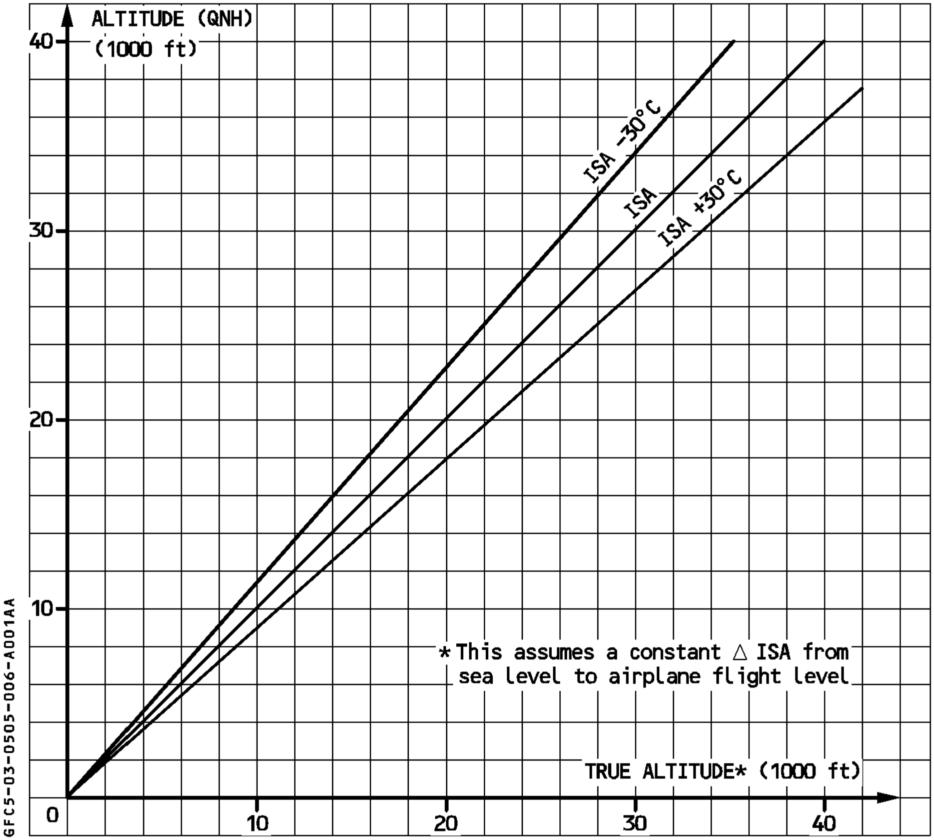
GIVEN	FIND
WIND DIRECTION RELATIVE TO RUNWAY HEADING=30 DEG WIND SPEED=45 kt	CROSS WIND COMPONENT=22.5 kt HEAD WIND COMPONENT=39.0 kt



GFC5-03-0505-005-A001AA

ALTITUDE TEMPERATURE CORRECTION

FOR HIGH ALTITUDE USE



FOR LOW ALTITUDE USE

QNH ALTITUDE MINUS TERRAIN ELEVATION (ft) →		△ Z CORRECTION (ft) 500	1000	1500	2000	2500	3000
△ ISA	– 10 °C	– 17	– 34	– 51	– 68	– 85	– 102
	– 20 °C	– 35	– 70	– 105	– 140	– 175	– 210
	– 30 °C	– 52	– 104	– 156	– 208	– 260	– 312
	– 40 °C	– 70	– 140	– 210	– 280	– 350	– 420

TRUE ALTITUDE = QNH ALTITUDE + △ Z
Note : A constant △ ISA from ground to airplane level has been assumed.

THRUST RATINGS

The thrust rating charts have been established for :

- **Maximum takeoff**
  It is the maximum thrust certified for takeoff and is normally limited to five minutes. This time is extended to ten minutes for engine out contingency as authorized by the approved AFM.

- **Derated takeoff**
  It is a reduced maximum thrust certified for takeoff (Refer to FCOM 2.02.27)

- **Maximum go-around**
  It is the maximum permissible thrust during go-around.

- **Flexible takeoff**
  It is a reduced takeoff thrust as compared to the maximum permissible. The related N1 is calculated as a function of the flexible temperature entered in the FMGS MCDU. The flexible temperature is a function of the aircraft weight and environmental conditions. It guarantees that the regular performance requirements are met.

- **Maximum continuous**
  It is the maximum thrust certified for continuous use.
  This rating should be used, at the pilot's discretion, only when required to ensure safe flight (engine failure).

- **Maximum climb**
  R It is the maximum thrust approved for normal climb.

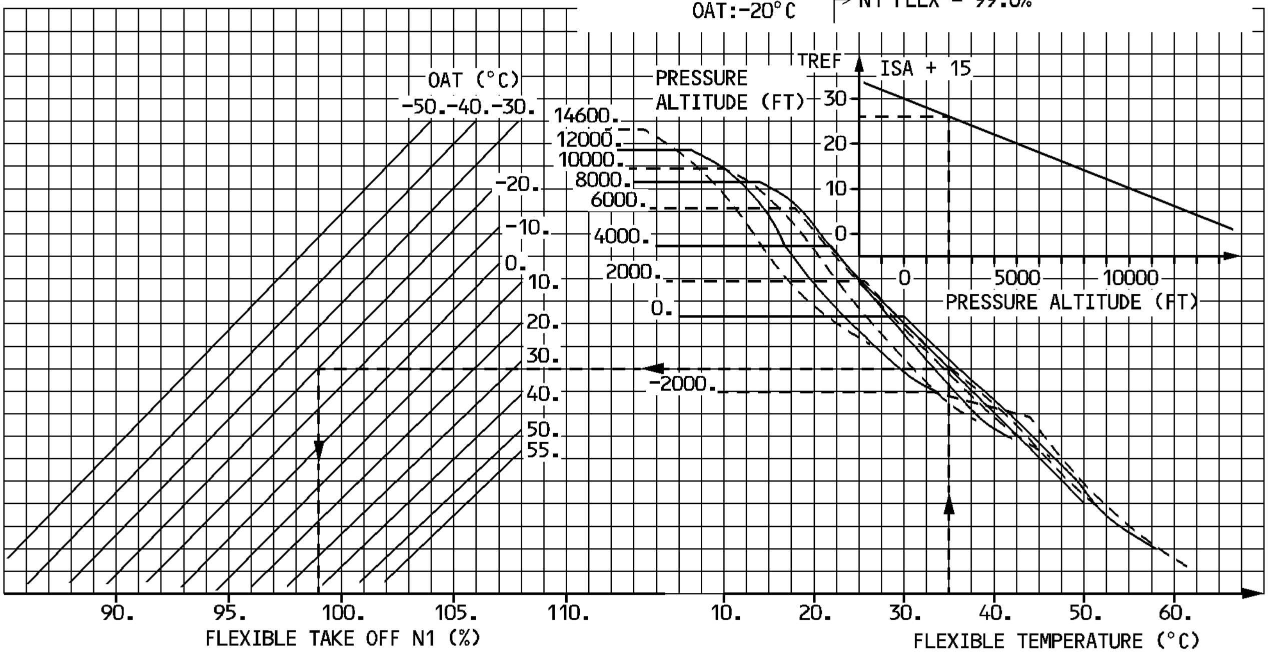
- **Maximum cruise**
  R It is the maximum thrust approved for normal cruise.
  There is no thrust lever position corresponding to this thrust rating.
  It is not displayed to the pilot, and the N1 limit which is displayed in cruise is the maximum climb N1.
  The FMGS uses the maximum cruise N1 to compute the aircraft maximum speed.
  In manual thrust setting, in cruise, the pilot should limit the N1 to the maximum cruise N1 that is equal to the displayed maximum climb N1 minus 5%.

FLEXIBLE TAKEOFF

GFC5-03-0506-002-A015AA

EXAMPLE : PRESS ALT:2000ft. OAT=-20°C. FLX T=35°C.
- FLX TEMP 35°C > FLAT RATING TEMP (ISA+15=26°C)

ALT:2000 ft
OAT:-20°C
→ N1 FLEX = 99.0%



GE CF6-80E1A4	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA+15	OAT ≥ ISA+15
FLEX TAKEOFF N1 MACH = .000	AIR CONDITIONING ON	- 0.8	- 0.8
	ENGINE ANTI ICE ON	0.0	- 0.6
	ENGINE AND WING ANTI ICE ON	0.0	- 1.0

TAKEOFF

CF6-80E1A4	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 15	OAT ≥ ISA + 15
TAKE OFF N1 NO AIR BLEED MACH=.000	AIR CONDITIONING ON	–.8	–.8
	ENGINE ANTI-ICE ON	0.0	–.6
	ENGINE ANTI-ICE AND WING ANTI-ICE ON	0.0	-1.0

OAT (°C)	PRESSURE ALTITUDE (FT) -2000.	-1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.
-54.0	91.4	93.0	94.6	95.4	96.1	96.9	97.7	98.6	99.4	100.0
-50.0	92.2	93.8	95.4	96.2	96.9	97.7	98.5	99.3	100.2	100.8
-46.0	93.0	94.6	96.2	97.0	97.7	98.5	99.3	100.1	101.0	101.5
-42.0	93.8	95.4	97.0	97.8	98.5	99.3	100.1	100.9	101.7	102.3
-38.0	94.5	96.2	97.8	98.5	99.3	100.0	100.8	101.6	102.5	103.1
-34.0	95.3	96.9	98.5	99.3	100.0	100.8	101.5	102.4	103.2	103.8
-30.0	96.0	97.7	99.3	100.0	100.8	101.5	102.3	103.1	103.9	104.5
-26.0	96.8	98.4	100.1	100.8	101.5	102.3	103.0	103.9	104.7	105.2
-22.0	97.5	99.2	100.8	101.5	102.2	103.0	103.7	104.6	105.4	106.0
-18.0	98.2	99.9	101.5	102.3	103.0	103.7	104.5	105.3	106.1	106.7
-14.0	99.0	100.6	102.3	103.0	103.7	104.5	105.2	106.0	106.8	107.4
-10.0	99.7	101.3	103.0	103.7	104.4	105.2	105.9	106.7	107.5	108.1
-6.0	100.4	102.1	103.7	104.4	105.1	105.9	106.6	107.4	108.2	108.8
-2.0	101.1	102.8	104.4	105.1	105.8	106.6	107.3	108.2	109.0	109.5
2.0	101.8	103.5	105.1	105.9	106.6	107.3	108.0	108.9	109.7	110.2
6.0	102.5	104.2	105.8	106.6	107.3	108.0	108.7	109.6	110.4	111.0
10.0	103.2	104.9	106.5	107.3	108.0	108.7	109.4	110.3	111.1	111.7
14.0	103.9	105.6	107.2	108.0	108.7	109.4	110.2	111.0	111.8	112.4
18.0	104.5	106.3	107.9	108.6	109.3	110.1	110.8	111.7	112.5	*112.3*
22.0	105.2	106.9	108.6	109.3	110.0	110.8	111.5	*111.4*	*111.3*	*111.3*
26.0	105.9	107.6	109.3	110.0	110.7	*110.6*	*110.4*	*110.3*	*110.3*	*110.3*
30.0	106.5	108.3	*110.0*	*109.9*	*109.6*	*109.5*	*109.5*	*109.6*	*109.4*	*109.2*
34.0	*107.2*	*108.4*	*109.1*	*109.0*	*108.7*	*108.8*	*108.7*	*108.5*	*108.3*	*108.0*
38.0	*107.4*	*108.1*	*108.4*	*108.2*	*107.9*	*107.9*	*107.7*	*107.6*	*107.3*	*107.0*
42.0	*107.6*	*107.8*	*107.5*	*107.3*	*107.1*	*106.9*	*106.7*	*106.8*	*106.5*	
46.0	*107.0*	*106.7*	*106.5*	*106.2*	*106.0*					
50.0	*105.8*	*105.6*	*105.4*	*105.2*	*104.9*					
54.0	*104.9*	*104.6*	*104.3*							

OAT < ISA + 15

OAT ≥ ISA + 15

GO AROUND

CF6-80E1A4	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 15	OAT ≥ ISA + 15
GO AROUND N1 AIR CONDITIONING ON MACH=.225	AIR CONDITIONING OFF	.8	.8
	ENGINE ANTI-ICE ON	0.0	–.6
	ENGINE ANTI-ICE AND WING ANTI-ICE ON	0.0	-1.1

TAT (°C)	PRESSURE ALTITUDE (FT) -2000.	-1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.
-54.0	91.2	92.9	94.6	95.5	96.4	97.2	97.9	98.2	98.7	99.0
-50.0	91.9	93.7	95.4	96.3	97.2	98.0	98.7	99.0	99.4	99.8
-46.0	92.7	94.5	96.2	97.1	98.0	98.8	99.5	99.8	100.2	100.5
-42.0	93.5	95.3	97.0	97.9	98.8	99.5	100.3	100.6	101.0	101.3
-38.0	94.3	96.0	97.7	98.6	99.5	100.3	101.0	101.3	101.7	102.0
-34.0	95.0	96.8	98.5	99.4	100.3	101.0	101.8	102.1	102.5	102.8
-30.0	95.8	97.5	99.3	100.2	101.0	101.8	102.5	102.8	103.2	103.5
-26.0	96.5	98.3	100.0	100.9	101.8	102.5	103.3	103.5	103.9	104.2
-22.0	97.3	99.0	100.8	101.7	102.5	103.3	104.0	104.2	104.7	105.0
-18.0	98.0	99.8	101.5	102.4	103.3	104.0	104.7	105.0	105.4	105.7
-14.0	98.7	100.5	102.2	103.1	104.0	104.7	105.4	105.7	106.1	106.4
-10.0	99.4	101.2	103.0	103.8	104.7	105.4	106.1	106.4	106.8	107.1
-6.0	100.1	101.9	103.7	104.6	105.4	106.1	106.8	107.1	107.5	107.8
-2.0	100.8	102.6	104.4	105.3	106.1	106.8	107.5	107.8	108.2	108.5
2.0	101.5	103.3	105.1	106.0	106.8	107.6	108.3	108.5	108.9	109.2
6.0	102.2	104.0	105.8	106.7	107.5	108.3	109.0	109.2	109.6	109.9
10.0	102.9	104.7	106.5	107.4	108.2	109.0	109.7	109.9	110.3	110.6
14.0	103.6	105.4	107.2	108.1	108.9	109.7	110.4	110.6	111.0	111.3
18.0	104.3	106.1	107.9	108.8	109.6	110.4	111.1	111.3	111.7	112.0
22.0	105.0	106.8	108.6	109.4	110.3	111.0	111.7	112.0	*112.1*	*111.7*
26.0	105.6	107.5	109.2	110.1	111.0	111.7	*112.0*	*111.8*	*111.5*	*110.9*
30.0	106.3	108.1	109.9	110.8	*111.3*	*111.1*	*111.1*	*111.0*	*110.4*	*109.8*
34.0	107.0	108.8	*110.2*	*110.3*	*110.1*	*110.1*	*109.9*	*109.9*	*109.2*	*108.6*
38.0	*107.5*	*108.7*	*109.4*	*109.3*	*109.1*	*109.1*	*109.0*	*108.6*	*108.3*	*107.8*
42.0	*107.5*	*108.3*	*108.7*	*108.5*	*108.5*	*108.4*	*108.2*	*108.1*	*107.7*	*107.1*
46.0	*107.6*	*107.9*	*107.9*	*107.8*	*107.7*	*107.6*	*107.6*	*107.5*	*106.9*	
50.0	*106.9*	*106.9*	*107.0*	*106.9*	*106.7*	*106.7*	*106.8*			
54.0	*105.9*	*106.0*	*106.1*	*105.9*	*105.6*					
58.0	*105.0*	*105.0*	*104.9*							
62.0	*103.9*									

OAT < ISA + 15

OAT ≥ ISA + 15

MAXIMUM CONTINUOUS

R

CF6-80E1A4 MAXIMUM CONTINUOUS N1 AIR CONDITIONING ON* IAS=230 KT	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
	AIR CONDITIONING OFF	1.1	1.1
	ENGINE ANTI-ICE ON	0.0	-.7
	ENGINE ANTI-ICE AND WING ANTI-ICE ON	0.0	-1.7

TAT (°C)	PRESSURE ALTITUDE (FT) -2000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
-54.0	84.5	89.0	91.4	94.5	99.9	101.5	102.3	98.0	98.2	98.1	98.0
-50.0	85.3	89.8	92.1	95.3	100.7	102.2	103.1	98.8	99.0	98.9	98.8
-46.0	86.1	90.5	92.9	96.1	101.4	103.0	103.9	99.6	99.8	99.7	99.6
-42.0	86.8	91.3	93.7	96.8	102.2	103.8	104.6	100.4	100.6	100.5	100.4
-38.0	87.5	92.0	94.4	97.6	103.0	104.5	105.3	101.2	101.4	101.3	101.2
-34.0	88.3	92.7	95.1	98.3	103.7	105.2	106.0	101.9	102.2	102.1	102.0
-30.0	89.0	93.5	95.8	99.0	104.4	105.9	106.8	102.7	102.9	102.8	102.7
-26.0	89.7	94.2	96.5	99.7	105.2	106.6	107.5	103.5	103.7	103.6	103.5
-22.0	90.4	94.9	97.2	100.4	105.9	107.3	108.2	104.2	104.4	*104.2*	104.3
-18.0	91.1	95.6	97.9	101.1	106.6	108.0	108.9	105.0	105.2	*104.5*	*103.9*
-14.0	91.8	96.3	98.6	101.8	107.2	108.7	109.6	105.7	*105.7*	*104.0*	*103.3*
-10.0	92.5	97.0	99.3	102.5	107.9	109.4	110.2	*105.9*	*105.5*	*103.2*	*102.4*
-6.0	93.2	97.7	100.0	103.2	108.6	110.1	*110.9*	*105.6*	*104.7*	*102.3*	*101.2*
-2.0	93.8	98.3	100.7	103.9	109.2	110.8	*109.9*	*104.8*	*103.8*	*101.3*	*100.3*
2.0	94.5	99.0	101.4	104.5	109.9	*110.5*	*108.4*	*103.9*	*102.9*	*100.7*	*99.5*
6.0	95.2	99.7	102.0	105.2	110.6	*109.0*	*106.8*	*103.2*	*102.2*	*100.0*	*98.9*
10.0	95.8	100.4	102.7	105.9	*109.6*	*107.3*	*105.3*	*102.5*	*101.6*	*99.4*	*98.2*
14.0	96.5	101.1	103.4	*106.3*	*108.3*	*106.0*	*104.4*	*102.0*	*101.2*		
18.0	97.1	101.7	104.1	*105.5*	*107.0*	*105.0*	*103.7*	*101.6*			
22.0	97.8	102.4	*104.2*	*104.8*	*105.9*	*104.3*	*103.2*				
26.0	98.4	103.0	*103.8*	*104.3*	*105.3*	*103.8*					
30.0	99.1	*102.9*	*103.4*	*103.9*	*104.8*	*103.4*					
34.0	99.7	*102.6*	*103.0*	*103.4*	*104.3*						
38.0	*99.7*	*102.2*	*102.6*	*103.1*							
42.0	*99.3*	*101.7*	*102.3*	*102.8*							
46.0	*98.8*	*101.2*	*102.0*								
50.0	*98.3*	*100.8*	*101.6*								
54.0	*97.7*	*100.4*									

OAT< ISA+10
OAT ≥ ISA + 10

* One engine inoperative – 1 pack operative on remaining engine

MAXIMUM CLIMB

CF6-80E1A2/A4	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
MAXIMUM CLIMB N1 AIR CONDITIONING ON 250/300/.80	AIR CONDITIONING OFF	1.0	1.0
	ENGINE ANTI-ICE ON	0.0	-.5
	ENGINE ANTI-ICE AND WING ANTI-ICE ON	0.0	-1.0

TAT (°C)	PRESSURE ALTITUDE (FT) -2000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
-54.0	81.8	86.4	88.6	89.9	91.4	93.3	94.6	95.6	96.5	97.4	97.4
-50.0	82.6	87.2	89.4	90.6	92.2	94.1	95.4	96.4	97.3	98.3	98.2
-46.0	83.3	88.0	90.2	91.4	93.0	94.9	96.2	97.2	98.1	99.1	99.0
-42.0	84.0	88.7	90.9	92.2	93.7	95.7	97.0	98.0	98.9	99.9	99.8
-38.0	84.7	89.4	91.7	93.0	94.5	96.5	97.8	98.8	99.7	100.6	100.6
-34.0	85.4	90.2	92.4	93.7	95.2	97.3	98.5	99.5	100.5	101.4	101.3
-30.0	86.1	90.9	93.2	94.5	96.0	98.0	99.3	100.3	101.3	102.2	102.1
-26.0	86.8	91.6	93.9	95.2	96.7	98.8	100.1	101.0	102.0	102.9	102.9
-22.0	87.5	92.3	94.6	95.9	97.5	99.5	100.8	101.8	102.8	103.7	103.6
-18.0	88.2	93.1	95.3	96.6	98.2	100.2	101.5	102.5	103.5	104.4	104.4
-14.0	88.9	93.8	96.1	97.4	98.9	101.0	102.3	103.3	104.2	*104.8*	*103.6*
-10.0	89.6	94.5	96.8	98.1	99.6	101.7	103.0	104.0	105.0	*104.1*	*102.6*
-6.0	90.2	95.1	97.5	98.8	100.4	102.4	103.7	104.7	105.6	*103.0*	*101.8*
-2.0	90.9	95.8	98.2	99.5	101.1	103.1	104.4	105.4	*104.7*	*102.1*	*100.9*
2.0	91.5	96.5	98.8	100.2	101.8	103.8	105.1	*104.8*	*103.8*	*101.3*	*100.1*
6.0	92.2	97.2	99.5	100.9	102.5	104.5	*104.9*	*104.0*	*102.9*	*100.7*	*99.4*
10.0	92.8	97.9	100.2	101.5	103.1	*104.8*	*104.2*	*103.3*	*102.3*	*100.2*	*98.8*
14.0	93.5	98.5	100.9	102.2	103.8	*104.1*	*103.5*	*102.8*	*101.9*	*99.6*	*98.2*
18.0	94.1	99.2	101.6	102.9	*103.5*	*103.7*	*103.1*	*102.4*	*101.5*	*99.1*	
22.0	94.7	99.8	*102.1*	*103.0*	*103.1*	*103.3*	*102.7*	*102.0*	*101.0*		
26.0	95.4	100.5	*101.7*	*102.6*	*102.8*	*102.9*	*102.4*	*101.5*	*100.6*		
30.0	96.0	*100.7*	*101.4*	*102.4*	*102.4*	*102.6*	*102.0*	*101.1*			
34.0	96.6	*100.3*	*101.0*	*102.0*	*102.1*	*102.2*	*101.6*				
38.0	*97.0*	*99.8*	*100.6*	*101.5*	*101.7*	*101.8*					
42.0	*96.4*	*99.4*	*100.1*	*101.1*	*101.3*						
46.0	*95.9*	*98.9*	*99.6*	*100.7*	*100.9*						
50.0	*95.4*	*98.4*	*99.2*	*100.3*							
54.0	*94.8*	*97.9*									

OAT>ISA+10

OAT ≥ ISA + 10

MAXIMUM CRUISE

CF6-80E1A2/A4	N1 CORRECTIONS FOR AIR BLEED	OAT < ISA + 10	OAT ≥ ISA + 10
MAXIMUM CRUISE N1 AIR CONDITIONING ON 250/300/.82	AIR CONDITIONING OFF	1.0	1.0
	ENGINE ANTI-ICE ON	0.0	-.5
	ENGINE ANTI-ICE AND WING ANTI-ICE ON	0.0	-1.0

TAT (°C)	PRESSURE ALTITUDE (FT) -2000.	3000.	7000.	11000.	15000.	19000.	23000.	27000.	31000.	35000.	39000.
-54.0	75.8	80.4	82.6	83.9	85.4	87.3	88.9	90.2	91.2	91.8	91.8
-50.0	76.6	81.2	83.4	84.6	86.2	88.1	89.7	91.0	92.0	92.7	92.6
-46.0	77.3	82.0	84.2	85.4	87.0	88.9	90.5	91.8	92.8	93.5	93.4
-42.0	78.0	82.7	84.9	86.2	87.7	89.7	91.3	92.6	93.6	94.3	94.2
-38.0	78.7	83.4	85.7	87.0	88.5	90.5	92.0	93.3	94.3	95.0	95.0
-34.0	79.4	84.2	86.4	87.7	89.2	91.3	92.8	94.1	95.1	95.8	95.7
-30.0	80.1	84.9	87.2	88.5	90.0	92.0	93.6	94.9	95.9	96.6	96.5
-26.0	80.8	85.6	87.9	89.2	90.7	92.8	94.3	95.6	96.6	97.3	97.3
-22.0	81.5	86.3	88.6	89.9	91.5	93.5	95.1	96.4	97.4	98.1	98.0
-18.0	82.2	87.1	89.3	90.6	92.2	94.2	95.8	97.1	98.1	98.8	98.7
-14.0	82.9	87.8	90.1	91.4	92.9	95.0	96.5	97.9	98.9	99.6	*98.5*
-10.0	83.6	88.5	90.8	92.1	93.6	95.7	97.3	98.6	99.6	*98.9*	*97.4*
-6.0	84.2	89.1	91.5	92.8	94.4	96.4	98.0	99.3	100.3	*98.0*	*96.6*
-2.0	84.9	89.8	92.2	93.5	95.1	97.1	98.7	100.0	*99.5*	*96.8*	*95.7*
2.0	85.5	90.5	92.8	94.2	95.8	97.8	99.4	*99.4*	*98.6*	*96.1*	*95.0*
6.0	86.2	91.2	93.5	94.9	96.5	98.5	*99.2*	*98.6*	*97.7*	*95.5*	*94.3*
10.0	86.8	91.9	94.2	95.5	97.1	*98.8*	*98.4*	*97.9*	*97.2*	*95.0*	*93.7*
14.0	87.5	92.5	94.9	96.2	97.8	*98.1*	*97.8*	*97.4*	*96.7*	*94.5*	*93.1*
18.0	88.1	93.2	95.6	96.9	*97.5*	*97.7*	*97.4*	*96.9*	*96.3*	*94.0*	*92.6*
22.0	88.7	93.8	*96.1*	*97.0*	*97.1*	*97.3*	*97.0*	*96.6*	*95.8*		
26.0	89.4	94.5	*95.7*	*96.6*	*96.8*	*96.9*	*96.6*	*96.1*	*95.4*		
30.0	90.0	*94.7*	*95.4*	*96.4*	*96.4*	*96.6*	*96.3*	*95.7*			
34.0	90.6	*94.3*	*95.0*	*96.0*	*96.1*	*96.2*	*95.8*				
38.0	*91.0*	*93.8*	*94.6*	*95.5*	*95.7*	*95.8*					
42.0	*90.4*	*93.4*	*94.1*	*95.1*	*95.3*						
46.0	*89.9*	*92.9*	*93.6*	*94.7*	*94.9*						
50.0	*89.4*	*92.4*	*93.2*	*94.3*							
54.0	*88.8*	*91.9*									

OAT<ISA + 10
OAT≥ISA + 10

LEFT INTENTIONALLY BLANK

GENERAL

R Climb tables are established at MAX CLIMB THRUST (and DERATED CLIMB 1 and 2 ⊲)
R with air conditioning in normal mode, and anti ice OFF.
The climb speed profile is :
- 250 kt from 1500 feet up to FL100
- acceleration from 250 kt to 300 kt
- climb at 300 kt then M.80 up to selected altitude

All charts are established with a center of gravity of 30 %.

CLIMB - 250KT/300KT/M.80

MAX. CLIMB THRUST	ISA	**FROM BRAKE** RELEASE	
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN)**	**FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)**	**TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	120		**140**		**160**		**180**		**200**		**220**		**240**	
410	14	2636	17	3187	21	3839	27	4717						
	91	387	113	391	140	395	182	401						
390	13	2498	15	3000	19	3573	23	4258						
	81	380	99	382	120	386	147	390						
370	12	2370	14	2834	17	3352	20	3947	24	4663				
	72	372	87	374	104	377	125	380	152	384				
350	11	2254	13	2688	15	3165	18	3702	21	4325	25	5077	30	6089
	65	364	78	366	93	368	110	371	130	374	157	378	196	385
330	10	2148	12	2555	14	3000	16	3495	19	4057	22	4713	26	5509
	58	356	70	358	83	360	98	362	115	365	136	368	162	372
310	9	2045	11	2428	13	2844	15	3304	17	3820	20	4411	23	5106
	53	348	63	350	75	351	88	353	102	355	120	358	141	361
290	8	1912	10	2266	12	2649	13	3068	16	3535	18	4060	21	4664
	47	336	56	338	65	339	76	340	88	342	103	344	119	347
270	8	1781	9	2107	10	2459	12	2841	14	3263	16	3733	18	4265
	41	324	48	326	57	327	66	328	76	329	88	331	101	333
250	7	1656	8	1957	9	2280	11	2630	12	3013	14	3437	16	3911
	36	312	42	314	49	315	57	316	66	317	76	319	87	320
240	6	1596	8	1884	9	2194	10	2529	12	2895	13	3298	15	3748
	33	307	39	308	46	309	53	310	61	311	70	312	80	314
220	6	1479	7	1744	8	2029	9	2336	11	2669	12	3036	14	3442
	29	295	34	296	40	297	46	298	53	299	61	300	69	302
200	5	1365	6	1609	7	1870	8	2151	10	2456	11	2789	12	3156
	25	284	30	285	35	286	40	287	46	288	52	289	60	290
180	5	1255	6	1478	7	1716	8	1973	9	2250	10	2553	11	2886
	22	272	26	273	30	274	35	275	40	276	45	277	51	278
160	4	1147	5	1350	6	1567	7	1800	8	2052	9	2326	10	2627
	19	259	22	260	26	261	30	262	34	263	39	264	44	265
140	4	1042	5	1224	5	1421	6	1631	7	1859	8	2107	9	2378
	16	246	19	247	22	248	25	249	29	250	33	251	37	252
120	3	938	4	1102	5	1278	5	1467	6	1672	7	1894	8	2138
	13	232	16	233	18	234	21	235	24	236	27	237	31	238
100	3	765	3	897	4	1040	4	1194	5	1361	6	1542	6	1740
	9	206	11	207	13	208	15	209	17	210	19	212	22	213
50	2	519	2	605	2	700	3	802	3	912	4	1032	4	1161
	5	169	6	170	7	170	8	172	9	173	10	175	12	176
15	1	345	1	400	2	460	2	527	2	599	2	677	3	761
	2	122	3	121	3	121	4	122	4	124	5	126	5	128

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 1 %	△FUEL = + 3 %

11 -08F0A330–200 CF6–80E1A4 21100000C5KG300 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .800 0 FCOM-G0–03–05–10–002–015

CLIMB - 250KT/300KT/M.80

MAX. CLIMB THRUST	ISA+10	FROM BRAKE RELEASE
NORMAL AIR CONDITIONING	CG=30.0%	TIME (MIN) FUEL (KG)
ANTI-ICING OFF		DISTANCE (NM) TAS (KT)

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	120		140		160		180		200		220		240	
410	14	2776	18	3359	22	4051								
	96	396	118	399	147	403								
390	13	2629	16	3161	19	3767	23	4493						
	85	388	103	391	126	394	154	398						
370	12	2493	14	2984	17	3531	20	4161	24	4920				
	75	380	91	382	109	385	131	388	159	392				
350	11	2370	13	2828	15	3333	18	3900	21	4558	26	5354	31	6426
	68	372	82	374	97	376	115	379	137	382	164	386	205	393
330	10	2257	12	2687	14	3157	17	3679	19	4273	23	4965	27	5808
	61	364	74	366	87	368	102	370	120	372	142	376	170	380
310	9	2147	11	2551	13	2991	15	3476	18	4020	21	4643	24	5377
	55	355	66	357	78	358	92	360	107	362	125	365	147	368
290	9	2006	10	2379	12	2783	14	3225	16	3717	18	4270	21	4907
	49	343	58	345	68	346	80	347	93	349	107	351	125	354
270	8	1867	9	2211	11	2582	12	2985	14	3428	16	3923	19	4483
	42	331	51	332	59	333	69	335	80	336	92	338	106	340
250	7	1735	8	2052	10	2392	11	2761	13	3164	15	3609	17	4108
	37	319	44	320	52	321	60	322	69	323	79	325	90	326
240	7	1671	8	1975	9	2302	11	2654	12	3039	14	3462	16	3935
	35	313	41	314	48	315	56	316	64	317	73	319	84	320
220	6	1547	7	1827	8	2127	10	2450	11	2801	12	3185	14	3612
	30	301	36	302	42	303	48	304	55	305	63	306	72	308
200	5	1428	6	1684	7	1960	9	2255	10	2575	11	2925	13	3310
	26	289	31	290	36	291	42	292	48	293	55	294	62	295
180	5	1311	6	1546	7	1797	8	2067	9	2358	10	2676	11	3025
	23	277	27	278	31	279	36	280	41	281	47	282	53	283
160	4	1198	5	1411	6	1640	7	1885	8	2150	9	2437	10	2753
	19	264	23	265	27	266	31	267	35	268	40	269	46	270
140	4	1087	5	1279	5	1486	6	1708	7	1947	8	2207	9	2491
	16	251	19	252	23	253	26	254	30	255	34	256	39	257
120	3	977	4	1150	5	1336	5	1535	6	1750	7	1983	8	2238
	14	236	16	237	19	238	22	239	25	240	28	241	32	243
100	3	796	3	936	4	1087	4	1249	5	1424	6	1613	6	1821
	10	210	11	211	13	212	15	213	18	214	20	215	23	217
50	2	538	2	630	2	730	3	837	3	953	4	1078	4	1214
	5	172	6	173	7	174	8	175	9	176	11	178	12	180
15	1	357	1	415	2	479	2	549	2	625	2	707	3	795
	2	124	3	123	3	123	4	124	4	126	5	128	6	130

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 1 %	△FUEL = + 3 %

11.0 -08F0A330–200 CF6–80E1A4 21100000C5KG300 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .800 10 FCOM-G0–03–05–10–003–015

CLIMB - 250KT/300KT/M.80

MAX. CLIMB THRUST	ISA+15	**FROM BRAKE** RELEASE
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN)** **FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) 120		140		160		180		200		220		240	
410	16	2926	20	3560	25	4333								
	107	403	134	407	169	411								
390	14	2763	18	3336	21	3999	26	4817						
	95	395	116	398	142	402	177	406						
370	13	2615	16	3141	19	3733	23	4424	27	5283				
	84	387	102	389	123	392	149	396	183	401				
350	12	2483	14	2971	17	3514	20	4131	24	4861	29	5770		
	75	379	91	381	109	383	130	386	156	390	190	395		
330	11	2360	13	2818	16	3321	18	3885	22	4536	25	5310	30	6283
	68	371	82	373	97	375	115	377	136	380	163	384	198	389
310	10	2242	12	2670	14	3139	17	3660	20	4252	23	4939	27	5767
	61	362	74	363	87	365	103	367	121	370	142	373	169	377
290	9	2091	11	2485	13	2914	15	3386	17	3915	20	4519	23	5224
	54	349	64	351	76	352	89	354	103	356	121	358	141	361
270	8	1943	10	2305	12	2697	13	3125	16	3601	18	4135	21	4748
	47	337	56	338	66	340	76	341	89	342	103	344	119	347
250	8	1802	9	2135	10	2494	12	2884	14	3313	16	3791	18	4331
	41	324	48	326	57	327	66	328	76	329	88	331	101	333
240	7	1734	8	2054	10	2397	11	2769	13	3178	15	3631	17	4141
	38	318	45	320	53	321	61	322	71	323	81	324	93	326
220	6	1603	8	1896	9	2211	10	2551	12	2922	13	3331	15	3788
	33	306	39	308	46	309	53	310	61	311	70	312	80	313
200	6	1477	7	1745	8	2033	9	2343	11	2680	12	3050	14	3461
	28	294	34	295	40	296	46	297	52	298	60	299	68	301
180	5	1354	6	1599	7	1861	8	2144	9	2450	11	2785	12	3154
	25	282	29	283	34	284	39	285	45	286	51	287	58	288
160	5	1236	6	1458	6	1696	7	1953	8	2230	10	2533	11	2866
	21	269	25	270	29	271	34	272	38	273	44	274	50	275
140	4	1120	5	1320	6	1536	7	1767	8	2017	9	2290	10	2589
	18	255	21	257	25	257	28	258	32	259	37	260	42	261
120	4	1006	4	1185	5	1378	6	1586	7	1810	8	2054	8	2322
	15	241	18	242	20	243	24	244	27	245	31	246	35	247
100	3	817	3	962	4	1119	5	1287	5	1469	6	1667	7	1884
	10	214	12	215	14	216	17	217	19	218	22	219	25	221
50	2	551	2	647	3	750	3	861	3	982	4	1111	4	1252
	6	176	7	177	8	178	9	179	10	180	11	182	13	184
15	1	364	1	424	2	491	2	563	2	642	2	726	3	816
	3	127	3	126	3	127	4	128	5	129	5	131	6	133

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 1 %	△FUEL = + 3 %

11 -08F0A330–200 CF6–80E1A4 21100000C5KG300 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .800 15 FCOM-G0–03–05–10–004–015

CLIMB - 250KT/300KT/M.80

MAX. CLIMB THRUST	ISA+20	FROM BRAKE RELEASE
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN) FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM) TAS (KT)**

WEIGHT AT BRAKE RELEASE (1000KG)

FL	120		140		160		180		200		220		240	
410	18	3120	23	3829	29	4735								
	123	411	156	415	202	421								
390	16	2935	20	3566	24	4314	31	5289						
	108	403	134	406	166	410	213	416						
370	14	2769	18	3341	21	3997	26	4786	32	5823				
	95	394	116	397	142	400	174	404	221	411				
350	13	2621	16	3149	19	3743	23	4432	27	5271	34	6381		
	85	386	103	388	124	391	150	394	183	399	230	406		
330	12	2485	15	2977	17	3522	21	4144	24	4875	29	5774	36	6977
	76	377	92	379	110	381	131	384	157	388	191	393	239	400
310	11	2354	13	2812	16	3317	19	3884	22	4539	26	5316	31	6287
	68	368	82	370	98	371	116	374	137	377	164	380	199	386
290	10	2188	12	2607	14	3065	17	3573	19	4150	22	4817	26	5614
	59	355	71	356	84	358	99	360	116	362	137	365	162	368
270	9	2027	11	2411	13	2827	15	3285	17	3797	20	4379	23	5057
	51	342	62	343	73	344	85	346	99	348	115	350	134	353
250	8	1876	10	2227	11	2607	13	3021	15	3480	17	3995	20	4583
	45	329	53	330	62	331	73	333	84	334	97	336	113	338
240	8	1803	9	2139	11	2502	12	2897	14	3332	16	3818	19	4371
	41	323	49	324	58	325	67	326	78	327	90	329	104	331
220	7	1664	8	1972	10	2303	11	2662	13	3055	15	3492	17	3982
	36	310	43	311	50	312	58	313	67	314	77	316	88	317
200	6	1531	7	1812	9	2114	10	2441	11	2797	13	3191	15	3629
	31	298	37	299	43	300	50	301	57	302	66	303	75	304
180	6	1403	7	1659	8	1934	9	2231	10	2554	12	2909	13	3303
	27	285	32	286	37	287	43	288	49	289	56	290	64	291
160	5	1278	6	1511	7	1760	8	2029	9	2321	10	2641	12	2995
	23	272	27	273	32	274	36	275	42	276	48	277	54	278
140	4	1156	5	1366	6	1591	7	1834	8	2097	9	2384	10	2701
	19	258	23	259	27	260	31	261	35	262	40	263	46	264
120	4	1037	5	1225	5	1427	6	1644	7	1879	8	2135	9	2418
	16	243	19	244	22	245	26	246	29	247	33	248	38	250
100	3	841	4	993	4	1156	5	1332	6	1522	6	1729	7	1958
	11	216	13	217	16	218	18	219	21	220	24	222	27	223
50	2	567	2	666	3	774	3	890	4	1016	4	1151	5	1298
	6	178	7	179	8	180	10	181	11	182	12	184	14	185
15	1	373	2	436	2	506	2	581	2	663	3	750	3	843
	3	128	3	128	4	128	4	129	5	130	6	132	6	134

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 1 %	△FUEL = + 3 %

11.0 -08F0A330–200 CF6–80E1A4 21100000C5KG300 0 018590 0 0 2 1.0 500.0 300.00 1 03250.000300.000 .800 20 FCOM-G0–03–05–10–005–015

LEFT INTENTIONALLY BLANK

DERATED CLIMB 1 - 250KT/300KT/M.80

DERATED CLIMB 1 THRUST	ISA	**FROM BRAKE RELEASE**	
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN)**	**FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)**	**TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	120		**140**		**160**		**180**		**200**		**220**		**240**	
410	16	2732	19	3312	24	4001	30	4925						
	101	388	125	391	155	394	200	400						
390	14	2594	17	3125	21	3735	25	4470						
	91	381	111	383	135	386	165	390						
370	13	2466	16	2959	19	3515	23	4160	27	4947				
	82	374	99	376	120	378	144	381	175	385				
350	12	2351	15	2813	17	3328	21	3916	24	4610	29	5467	36	6640
	75	367	90	369	108	371	129	374	154	377	187	381	235	388
330	11	2245	14	2681	16	3163	19	3709	22	4343	27	5103	32	6065
	68	361	83	363	98	364	117	367	138	369	166	373	202	378
310	11	2138	13	2548	15	3001	18	3508	21	4092	24	4779	29	5623
	63	353	75	355	89	357	106	359	125	361	148	364	177	368
290	10	1996	12	2373	14	2787	16	3246	18	3767	22	4369	25	5084
	55	342	66	343	78	345	91	346	107	348	126	351	149	354
270	9	1855	10	2202	12	2579	14	2996	16	3462	19	3993	22	4611
	48	330	57	331	68	333	79	334	92	336	107	338	125	340
250	8	1721	9	2040	11	2386	13	2764	15	3184	17	3658	19	4201
	42	319	50	320	59	321	68	322	79	323	92	325	106	327
240	7	1657	9	1962	10	2293	12	2654	14	3054	16	3502	18	4013
	39	313	47	314	55	315	64	316	74	318	85	319	98	321
220	7	1532	8	1812	9	2114	11	2443	12	2806	14	3210	16	3667
	34	302	40	303	47	304	55	305	64	306	73	307	84	309
200	6	1412	7	1667	8	1944	10	2244	11	2573	13	2938	15	3348
	30	290	35	291	41	292	48	293	55	294	63	295	72	297
180	5	1295	6	1528	8	1780	9	2053	10	2351	11	2681	13	3049
	25	279	30	280	35	281	41	282	47	283	54	284	62	285
160	5	1181	6	1392	7	1621	8	1868	9	2137	10	2435	12	2766
	22	267	26	268	30	268	35	269	40	270	46	271	52	273
140	4	1069	5	1259	6	1465	7	1687	8	1929	9	2196	10	2492
	18	253	22	254	25	255	29	256	34	257	39	258	44	260
120	4	959	5	1129	5	1312	6	1511	7	1727	8	1965	9	2229
	15	239	18	240	21	241	24	242	28	243	32	244	36	245
100	3	777	4	914	4	1061	5	1221	5	1396	6	1587	7	1798
	11	212	13	213	15	214	17	215	19	217	22	218	25	220
50	2	524	2	612	3	708	3	813	3	926	4	1050	4	1184
	5	175	6	175	7	176	9	177	10	179	11	181	13	182
15	1	345	1	400	2	460	2	527	2	599	2	677	3	761
	2	122	3	121	3	121	4	122	4	124	5	126	5	128

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 6 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 8 1.0 500.0 300.00 1 03250.000300.000 .800 0 FCOM-G0-03-05-10-007-215

DERATED CLIMB 1 - 250KT/300KT/M.80

DERATED CLIMB 1 THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=30.0%	**FROM BRAKE RELEASE** **TIME (MIN)** **FUEL (KG)** **DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) 120		140		160		180		200		220		240	
410	16	2876	20	3490	24	4220	31	5200						
	106	396	131	399	163	403	210	409						
390	15	2730	18	3292	22	3937	26	4715						
	95	389	116	392	142	395	174	399						
370	13	2594	16	3115	19	3702	23	4385	28	5218				
	86	382	104	384	125	387	151	390	184	394				
350	13	2471	15	2960	18	3504	21	4125	25	4859	30	5766	37	7009
	78	375	95	377	113	379	135	382	161	385	196	390	247	396
330	12	2358	14	2818	17	3328	20	3904	23	4574	27	5378	33	6397
	72	368	87	370	103	372	122	374	145	377	174	381	212	386
310	11	2244	13	2677	15	3155	18	3690	21	4306	25	5032	30	5924
	66	361	79	362	94	364	111	366	131	369	155	372	186	376
290	10	2093	12	2491	14	2927	16	3411	19	3961	22	4595	26	5350
	58	349	69	350	82	352	96	353	112	356	132	358	156	361
270	9	1944	11	2309	12	2707	15	3146	17	3637	19	4196	23	4847
	50	337	60	338	71	339	83	341	96	342	112	344	131	347
250	8	1802	10	2138	11	2502	13	2900	15	3343	17	3841	20	4412
	44	325	52	326	61	327	71	329	83	330	96	332	111	334
240	8	1734	9	2056	11	2404	12	2784	14	3205	16	3676	19	4214
	41	319	49	320	57	321	66	323	77	324	89	325	102	327
220	7	1602	8	1897	10	2216	11	2562	13	2943	15	3368	17	3847
	35	308	42	309	50	310	57	311	66	312	76	313	88	315
200	6	1475	7	1745	9	2036	10	2351	11	2697	13	3081	15	3511
	31	296	37	297	43	298	50	299	57	300	66	301	75	303
180	6	1352	7	1598	8	1863	9	2150	10	2463	12	2810	13	3196
	27	284	31	285	37	286	43	287	49	288	56	289	64	290
160	5	1233	6	1455	7	1695	8	1955	9	2238	10	2550	12	2897
	23	272	27	273	31	274	36	274	42	275	48	277	55	278
140	4	1115	5	1315	6	1531	7	1765	8	2019	9	2299	10	2609
	19	258	23	259	26	260	31	261	35	262	40	263	46	264
120	4	999	5	1178	5	1371	6	1580	7	1807	8	2056	9	2332
	16	243	19	244	22	245	25	246	29	247	33	249	38	250
100	3	809	4	953	4	1108	5	1276	6	1459	6	1659	7	1881
	11	216	13	217	15	218	18	219	20	221	23	222	26	224
50	2	544	2	637	3	739	3	849	3	968	4	1097	4	1238
	6	178	7	179	8	179	9	181	10	182	12	184	13	186
15	1	357	1	415	2	479	2	549	2	625	2	707	3	795
	2	124	3	123	3	123	4	124	4	126	5	128	6	130

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 4 %	△FUEL = + 8 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 8 1.0 500.0 300.00 1 03250.000300.000 .800 10 FCOM-G0-03-05-10-008-215

DERATED CLIMB 1 - 250KT/300KT/M.80

DERATED CLIMB 1 THRUST	ISA+15	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN)** **FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) 120		140		160		180		200		220		240	
410	18	3066	22	3742	28	4567								
	121	403	150	406	189	411								
390	16	2904	20	3518	24	4235	30	5125						
	108	396	133	399	163	402	202	406						
370	15	2756	18	3323	22	3970	26	4736	32	5698				
	97	389	119	391	144	394	174	397	215	402				
350	14	2624	17	3154	20	3752	24	4444	29	5280	35	6347		
	89	382	108	384	129	387	155	389	188	393	232	398		
330	13	2502	16	3001	19	3559	22	4199	26	4958	32	5893	39	7127
	81	376	98	377	118	380	141	382	169	385	205	390	255	396
310	12	2382	15	2851	17	3375	20	3969	24	4667	29	5512	35	6594
	75	368	90	370	107	372	128	374	152	377	183	381	225	386
290	11	2218	13	2648	16	3125	18	3660	22	4279	25	5012	30	5917
	65	357	79	358	94	360	111	362	131	364	156	368	188	372
270	10	2051	12	2443	14	2874	16	3354	19	3898	22	4529	26	5282
	57	344	68	346	80	347	95	349	111	351	130	353	154	356
250	9	1894	11	2252	12	2644	14	3075	17	3558	19	4110	23	4754
	49	332	59	333	69	334	81	336	94	337	110	339	128	341
240	8	1819	10	2162	12	2535	14	2944	16	3402	18	3921	21	4522
	46	326	54	327	64	328	75	329	87	331	101	332	118	335
220	8	1676	9	1989	10	2328	12	2699	14	3111	16	3573	19	4102
	39	314	47	315	55	316	64	317	75	318	86	320	100	321
200	7	1539	8	1824	9	2133	11	2469	13	2840	14	3254	16	3723
	34	302	40	303	48	304	55	305	64	306	73	307	85	309
180	6	1407	7	1666	8	1946	10	2250	11	2584	13	2955	15	3373
	29	290	35	291	41	292	47	292	54	294	62	295	72	296
160	5	1279	6	1513	7	1766	9	2040	10	2341	11	2674	13	3047
	25	277	29	278	35	279	40	280	46	281	53	282	61	283
140	5	1154	6	1365	7	1592	8	1838	9	2107	10	2404	11	2735
	21	263	25	264	29	265	34	266	39	267	44	268	51	269
120	4	1032	5	1220	6	1422	7	1641	8	1881	9	2144	10	2438
	17	248	20	249	24	250	28	251	32	252	36	253	42	255
100	3	833	4	983	4	1145	5	1321	6	1512	7	1723	8	1957
	12	220	14	221	17	222	19	224	22	225	25	226	29	228
50	2	558	2	655	3	761	3	875	4	999	4	1134	5	1281
	6	182	7	183	8	184	10	185	11	186	13	188	15	190
15	1	364	1	424	2	491	2	563	2	642	2	726	3	816
	3	127	3	126	3	127	4	128	5	129	5	131	6	133

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 3 %	△FUEL = + 4 %	△FUEL = + 8 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 8 1.0 500.0 300.00 1 03250.000300.000 .800 15 FCOM-G0-03-05-10-009-215

DERATED CLIMB 1 - 250KT/300KT/M.80

DERATED CLIMB 1 THRUST	ISA+20	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN)** **FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM)** **TAS (KT)**

FL	120		140		160		180		200		220		240	
	WEIGHT AT BRAKE RELEASE (1000KG)													
410	20	3295	25	4056	32	5027								
	139	410	175	414	226	419								
390	18	3111	23	3794	28	4611	35	5676						
	124	403	153	406	191	410	243	415						
370	17	2945	21	3570	25	4295	30	5178	38	6348				
	111	396	136	398	167	401	205	405	260	411				
350	16	2798	19	3378	23	4042	27	4827	33	5805	41	7121		
	101	389	123	391	149	394	181	397	222	401	282	408		
330	14	2662	17	3207	21	3822	25	4540	30	5412	37	6528	46	8085
	92	382	112	384	135	386	162	389	197	393	244	398	313	405
310	14	2531	16	3042	19	3617	23	4281	28	5077	33	6073	41	7409
	84	374	102	376	123	378	147	381	177	385	217	389	273	395
290	12	2355	15	2823	18	3346	21	3943	25	4648	30	5509	36	6623
	74	363	90	365	107	367	128	369	153	372	185	376	229	382
270	11	2170	13	2594	16	3063	18	3591	22	4202	25	4926	30	5819
	64	350	77	352	92	353	108	355	128	358	153	361	184	365
250	10	1996	12	2380	14	2803	16	3272	19	3806	22	4424	26	5162
	55	337	66	339	78	340	92	342	108	343	126	346	149	349
240	9	1914	11	2280	13	2681	15	3125	18	3627	20	4203	24	4883
	51	331	61	332	72	334	85	335	99	337	116	339	136	341
220	8	1757	10	2090	12	2453	13	2852	16	3298	18	3805	21	4393
	44	319	52	320	62	321	72	322	84	323	97	325	113	327
200	7	1609	9	1911	10	2240	12	2599	14	2998	16	3448	18	3963
	38	306	45	307	53	308	61	309	71	310	82	312	95	314
180	7	1467	8	1741	9	2038	11	2361	12	2719	14	3120	16	3575
	32	294	38	295	45	296	52	296	60	298	70	299	80	300
160	6	1331	7	1578	8	1845	9	2136	11	2457	12	2814	14	3217
	27	281	32	281	38	282	44	283	51	284	59	286	67	287
140	5	1199	6	1420	7	1659	8	1919	9	2205	11	2522	12	2879
	23	266	27	267	32	268	37	269	42	270	49	271	56	273
120	4	1070	5	1266	6	1479	7	1710	8	1963	9	2244	11	2558
	19	251	22	252	26	253	30	254	35	255	40	256	46	258
100	3	860	4	1017	5	1187	6	1371	6	1573	7	1796	8	2045
	13	223	15	224	18	225	21	226	24	227	28	229	32	230
50	2	574	3	676	3	786	3	906	4	1036	4	1177	5	1331
	7	185	8	185	9	186	11	187	12	189	14	190	16	192
15	1	373	2	436	2	506	2	581	2	663	3	750	3	843
	3	128	3	128	4	128	4	129	5	130	6	132	6	134

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 3 %	△FUEL = + 4 %	△FUEL = + 8 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 8 1.0 500.0 300.00 1 03250.000300.000 .800 20 FCOM-G0-03-05-10-010-215

DERATED CLIMB 2 - 250KT/300KT/M.80

DERATED CLIMB 2 THRUST	ISA	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN) FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM) TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	120		**140**		**160**		**180**		**200**		**220**		**240**	
410	16	2782	20	3376	25	4084	31	5030						
	106	387	131	390	162	394	208	400						
390	15	2645	18	3190	22	3819	27	4578						
	95	381	116	383	142	386	174	390						
370	14	2517	17	3024	20	3598	24	4268	29	5090				
	86	374	105	377	126	379	152	382	186	386				
350	13	2402	16	2878	18	3412	22	4025	26	4754	31	5661	39	6908
	79	368	96	370	115	372	137	375	164	378	200	382	253	389
330	12	2295	15	2746	17	3247	20	3818	24	4487	29	5298	35	6339
	73	362	88	364	105	366	125	368	149	371	179	375	220	380
310	11	2189	14	2614	16	3085	19	3618	22	4236	26	4975	32	5899
	67	355	81	357	96	359	114	361	135	363	161	367	196	371
290	10	2044	12	2435	15	2867	17	3350	20	3904	23	4553	28	5341
	59	344	71	346	84	347	99	349	117	351	138	354	165	358
270	9	1897	11	2255	13	2647	15	3083	18	3575	21	4142	24	4811
	52	333	62	334	73	335	86	337	100	339	117	341	138	343
250	8	1757	10	2085	12	2443	14	2837	16	3279	18	3780	21	4362
	45	321	54	322	63	324	74	325	86	326	100	328	116	330
240	8	1690	9	2004	11	2346	13	2722	15	3140	17	3614	20	4160
	42	316	50	317	59	318	69	319	80	320	92	322	107	324
220	7	1561	9	1848	10	2161	12	2502	13	2880	15	3305	18	3790
	36	304	43	305	51	307	59	308	69	309	79	310	92	312
200	6	1436	8	1699	9	1983	10	2293	12	2636	14	3018	16	3450
	32	293	38	294	44	295	51	296	59	297	68	298	78	300
180	6	1316	7	1554	8	1813	9	2094	11	2403	12	2748	14	3135
	27	282	32	283	38	283	44	284	51	285	58	287	67	288
160	5	1198	6	1414	7	1648	8	1902	9	2181	11	2490	12	2836
	23	269	28	270	32	271	37	272	43	273	49	274	56	276
140	5	1083	5	1277	6	1487	7	1715	8	1965	9	2241	11	2549
	19	256	23	257	27	258	31	259	36	260	41	261	47	262
120	4	970	5	1142	6	1329	6	1533	7	1755	8	2000	9	2274
	16	242	19	243	22	243	26	244	30	245	34	247	39	248
100	3	784	4	922	4	1071	5	1234	6	1413	6	1609	7	1827
	11	215	13	216	15	217	18	218	21	219	24	220	27	222
50	2	527	2	616	3	712	3	818	3	933	4	1058	4	1195
	6	177	7	178	8	178	9	180	10	181	12	183	14	185
15	1	345	1	400	2	460	2	527	2	599	2	677	3	761
	2	122	3	121	3	121	4	122	4	124	5	126	5	128

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.5 %	ΔFUEL = + 1.5 %	ΔFUEL = + 3 %	ΔFUEL = + 6 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 9 1.0 500.0 300.00 1 03250.000300.000 .800 0 FCOM-G0-03-05-10-011 -215

DERATED CLIMB 2 - 250KT/300KT/M.80

DERATED CLIMB 2 THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=30.0%	**FROM BRAKE RELEASE** **TIME (MIN)** **FUEL (KG)** **DISTANCE (NM)** **TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) 120		140		160		180		200		220		240	
410	17	2929	21	3558	25	4307	32	5311						
	111	396	137	399	170	403	219	409						
390	15	2782	19	3359	23	4024	27	4828						
	100	389	122	392	149	395	182	398						
370	14	2647	17	3183	21	3790	25	4498	30	5368				
	91	383	110	385	133	387	160	390	195	394				
350	13	2524	16	3028	19	3592	23	4239	27	5010	32	5970	40	7292
	83	376	100	378	120	380	144	383	173	386	210	390	266	397
330	12	2411	15	2886	18	3416	21	4018	25	4725	30	5583	36	6685
	76	370	92	372	110	374	131	376	156	379	188	383	231	388
310	12	2297	14	2746	17	3243	19	3805	23	4458	27	5238	33	6215
	70	363	85	364	101	366	119	368	142	371	169	374	205	379
290	11	2144	13	2556	15	3011	18	3520	21	4104	24	4789	28	5620
	62	352	74	353	88	355	104	356	123	359	145	361	173	365
270	10	1987	11	2365	13	2778	16	3237	18	3755	21	4352	25	5057
	54	339	65	341	76	342	90	344	105	345	123	348	144	350
250	9	1840	10	2186	12	2563	14	2977	16	3442	19	3969	22	4581
	47	328	56	329	66	330	77	331	90	333	104	335	122	337
240	8	1769	10	2100	11	2460	13	2855	15	3295	18	3794	20	4368
	44	322	52	323	62	324	72	325	83	327	97	328	112	330
220	7	1632	9	1935	10	2264	12	2623	14	3021	16	3467	18	3976
	38	310	45	312	53	313	62	314	72	315	83	316	96	318
200	7	1501	8	1777	9	2077	11	2403	12	2763	14	3164	16	3618
	33	299	39	300	46	301	53	302	62	303	71	304	82	306
180	6	1374	7	1625	8	1897	9	2193	11	2518	12	2879	14	3285
	28	287	34	288	39	289	46	290	53	291	61	292	70	293
160	5	1250	6	1478	7	1724	8	1991	10	2283	11	2608	13	2971
	24	275	29	276	34	276	39	277	45	278	51	279	59	281
140	5	1129	6	1333	6	1554	7	1794	9	2056	10	2346	11	2669
	20	261	24	262	28	263	33	264	38	265	43	266	49	267
120	4	1010	5	1192	6	1389	6	1602	7	1836	8	2093	10	2380
	17	246	20	247	23	248	27	249	31	250	36	251	41	253
100	3	815	4	961	4	1118	5	1290	6	1477	7	1682	7	1911
	12	219	14	220	16	221	19	222	21	223	25	224	28	226
50	2	546	2	640	3	743	3	854	4	975	4	1106	4	1249
	6	180	7	181	8	182	9	183	11	184	12	186	14	188
15	1	357	1	415	2	479	2	549	2	625	2	707	3	795
	2	124	3	123	3	123	4	124	4	126	5	128	6	130

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 4 %	△FUEL = + 8 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 9 1.0 500.0 300.00 1 03250.000300.000 .800 10 FCOM-G0-03-05-10-012-215

DERATED CLIMB 2 - 250KT/300KT/M.80

DERATED CLIMB 2 THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+15 CG=30.0%	**FROM BRAKE RELEASE** **TIME (MIN) FUEL (KG)** **DISTANCE (NM) TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG)													
	120		**140**		**160**		**180**		**200**		**220**		**240**	
410	19	3129	23	3823	29	4671								
	126	403	157	406	197	410								
390	17	2967	21	3600	26	4341	31	5262						
	113	396	139	398	171	402	213	406						
370	16	2819	19	3405	23	4076	28	4874	34	5883				
	103	389	125	391	152	394	185	397	229	402				
350	15	2687	18	3236	21	3858	26	4583	31	5467	38	6603		
	94	383	114	385	138	387	166	390	202	394	250	399		
330	14	2565	17	3083	20	3666	24	4339	28	5145	34	6152	42	7500
	87	377	105	379	126	381	152	383	182	387	223	391	280	397
310	13	2445	16	2934	19	3481	22	4110	26	4855	32	5772	39	6971
	80	370	97	372	116	374	139	376	166	379	201	383	250	388
290	12	2281	14	2731	17	3232	20	3801	24	4468	28	5274	34	6298
	71	359	86	361	102	363	122	365	145	368	174	371	213	376
270	11	2108	13	2516	15	2968	18	3476	21	4060	24	4748	29	5590
	62	347	74	349	88	350	104	352	123	354	145	357	174	360
250	10	1942	11	2314	13	2722	16	3175	18	3690	21	4284	25	4989
	53	335	64	336	75	337	88	339	104	341	121	343	143	345
240	9	1864	11	2218	13	2607	15	3036	17	3521	20	4077	23	4731
	49	329	59	330	70	331	82	332	95	334	111	336	131	338
220	8	1714	10	2037	11	2389	13	2776	15	3210	18	3702	20	4271
	43	317	51	318	60	319	70	320	81	322	94	323	110	325
200	7	1571	9	1864	10	2184	12	2533	13	2922	15	3360	18	3861
	37	305	44	306	51	307	60	308	69	309	80	311	93	312
180	6	1434	8	1699	9	1988	10	2303	12	2652	14	3042	16	3486
	31	293	37	294	44	295	51	296	59	297	68	298	78	299
160	6	1301	7	1541	8	1801	9	2084	11	2397	12	2745	14	3138
	27	280	32	281	37	282	43	283	50	284	57	285	66	286
140	5	1172	6	1387	7	1620	8	1873	9	2151	11	2461	12	2809
	22	266	26	267	31	268	36	269	41	270	48	271	55	273
120	4	1046	5	1237	6	1443	7	1668	8	1915	9	2189	10	2495
	18	251	22	252	25	253	30	254	34	255	39	256	45	258
100	3	840	4	992	5	1157	5	1337	6	1533	7	1750	8	1992
	13	223	15	224	17	225	20	226	23	227	27	229	31	230
50	2	561	2	659	3	765	3	881	4	1007	4	1144	5	1294
	6	185	8	185	9	186	10	187	12	189	13	191	15	193
15	1	364	1	424	2	491	2	563	2	642	2	726	3	816
	3	127	3	126	3	127	4	128	5	129	5	131	6	133

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 3 %	△FUEL = + 4 %	△FUEL = + 8 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 9 1.0 500.0 300.00 1 03250.000300.000 .800 15 FCOM-G0-03-05-10-013-215

DERATED CLIMB 2 - 250KT/300KT/M.80

DERATED CLIMB 2 THRUST	ISA+20	**FROM BRAKE RELEASE**
NORMAL AIR CONDITIONING	CG=30.0%	**TIME (MIN) FUEL (KG)**
ANTI-ICING OFF		**DISTANCE (NM) TAS (KT)**

FL	WEIGHT AT BRAKE RELEASE (1000KG) 120		140		160		180		200		220		240	
410	21	3377	27	4162	34	5163								
	146	410	184	413	236	418								
390	19	3193	24	3900	30	4748	37	5855						
	130	403	162	406	201	409	257	415						
370	18	3027	22	3676	27	4434	32	5361	41	6593				
	118	396	145	398	177	401	219	405	278	411				
350	17	2880	20	3485	24	4181	29	5011	36	6054	45	7469		
	108	389	131	392	160	394	194	397	240	402	305	408		
330	15	2745	19	3313	23	3962	27	4725	33	5663	40	6880	51	8607
	99	383	121	385	146	387	176	390	215	394	268	399	347	406
310	15	2614	18	3149	21	3757	25	4466	30	5329	37	6429	46	7940
	91	376	111	378	134	380	161	383	195	386	241	391	307	397
290	13	2438	16	2930	19	3486	23	4129	27	4901	33	5868	41	7163
	81	366	98	368	118	370	142	372	171	376	209	380	263	386
270	12	2250	14	2697	17	3198	20	3770	24	4444	29	5268	35	6328
	71	354	85	356	102	358	122	360	145	363	175	366	216	371
250	11	2061	13	2464	15	2911	18	3413	21	3992	24	4677	29	5517
	60	341	73	342	86	344	102	346	120	348	143	350	172	354
240	10	1972	12	2355	14	2777	17	3249	19	3789	23	4421	27	5182
	56	335	67	336	79	337	93	339	110	341	130	343	154	346
220	9	1805	11	2150	12	2530	15	2950	17	3426	20	3973	23	4617
	48	322	57	323	67	324	79	326	92	327	108	329	127	331
200	8	1648	9	1961	11	2303	13	2679	15	3101	17	3582	20	4140
	41	309	49	311	57	312	67	313	78	314	91	316	106	317
180	7	1500	8	1782	10	2090	11	2427	13	2804	15	3229	17	3717
	35	297	41	298	49	299	57	300	66	301	76	302	88	304
160	6	1357	7	1611	9	1887	10	2189	12	2524	13	2901	15	3330
	29	284	35	285	41	286	48	286	55	288	64	289	74	290
140	5	1219	6	1446	8	1692	9	1961	10	2259	12	2591	13	2968
	24	270	29	270	34	271	40	272	46	273	53	275	61	276
120	5	1085	6	1286	7	1504	8	1742	9	2004	10	2296	11	2627
	20	254	24	255	28	256	32	257	37	258	43	259	50	261
100	4	868	4	1028	5	1201	6	1390	7	1597	8	1827	9	2086
	14	225	16	226	19	227	22	229	26	230	29	231	34	233
50	2	577	3	680	3	792	4	913	4	1045	5	1189	5	1347
	7	187	8	188	10	188	11	190	13	191	15	193	17	195
15	1	373	2	436	2	506	2	581	2	663	3	750	3	843
	3	128	3	128	4	128	4	129	5	130	6	132	6	134

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 3 %	△FUEL = + 4 %	△FUEL = + 8 %

11.3-08F0A330-200 CF6-80E1A4 21100000C5KG300 0 018590 0 0 9 1.0 500.0 300.00 1 03250.000300.000 .800 20 FCOM-G0-03-05-10-014-215

GENERAL

Cruise tables are established :

- for ISA, ISA + 10, ISA + 15 and ISA + 20
- with normal air conditioning and anti ice OFF
- from FL290 to FL410 at M 0.80, M 0.82 and M 0.84
- from FL100 to FL410 at long range speed
- with a 30 % center of gravity below 25 000 feet and a 37 % center of gravity at higher altitudes.

OPTIMUM MACH NUMBER

Six tables give the optimum Mach number versus cost index, altitude and wind as calculated by the FMGC.

COST INDEX = 0 (MAXIMUM RANGE)

WEIGHT/WIND		FLIGHT LEVEL					
1000kg	kt	310	330	350	370	390	410
120	100	.574	.600	.630	.661	.692	.718
	50	.588	.616	.646	.674	.704	.730
	0	.606	.635	.665	.691	.719	.748
	–50	.634	.662	.690	.716	.743	.765
	–100	.681	.704	.728	.748	.767	.781
140	100	.620	.649	.682	.708	.735	.763
	50	.636	.663	.694	.720	.748	.773
	0	.656	.681	.708	.736	.763	.783
	–50	.681	.706	.733	.756	.777	.792
	–100	.719	.740	.760	.776	.789	.800
160	100	.663	.693	.718	.746	.775	.794
	50	.676	.705	.730	.760	.783	.798
	0	.693	.719	.747	.772	.790	.803
	–50	.717	.743	.765	.784	.797	.807
	–100	.748	.766	.781	.794	.804	.811
180	100	.700	.725	.753	.779	.797	
	50	.711	.737	.765	.786	.801	
	0	.727	.755	.776	.793	.805	
	–50	.748	.771	.787	.799	.808	
	–100	.770	.785	.796	.805	.812	
200	100	.729	.756	.781	.798		
	50	.741	.768	.788	.802		
	0	.758	.778	.794	.805		
	–50	.773	.788	.800	.809		
	–100	.786	.797	.806	.813		
220	100	.757	.781	.798			
	50	.768	.788	.802			
	0	.779	.794	.805			
	–50	.788	.800	.809			
	–100	.797	.806	.813			
240	100	.780	.797				
	50	.787	.801				
	0	.793	.805				
	–50	.800	.808				
	–100	.805	.812				

COST INDEX = 100 kg/min

WEIGHT/WIND		FLIGHT LEVEL					
1000kg	kt	310	330	350	370	390	410
120	100	.781	.792	.799	.807	.812	.817
	50	.793	.801	.807	.812	.817	.822
	0	.803	.808	.813	.818	.822	.825
	–50	.810	.816	.821	.823	.826	.829
	–100	.819	.822	.825	.828	.831	.834
140	100	.786	.797	.804	.811	.816	.820
	50	.797	.804	.811	.816	.820	.823
	0	.806	.811	.816	.820	.824	.826
	–50	.813	.818	.822	.825	.827	.829
	–100	.820	.823	.826	.829	.832	.833
160	100	.793	.802	.809	.815	.819	.822
	50	.801	.808	.814	.818	.822	.824
	0	.809	.814	.818	.822	.825	.825
	–50	.815	.819	.823	.826	.828	.827
	–100	.822	.824	.827	.830	.831	.830
180	100	.799	.807	.813	.818	.820	
	50	.806	.812	.817	.820	.822	
	0	.812	.817	.820	.823	.824	
	–50	.817	.822	.825	.826	.826	
	–100	.823	.826	.828	.829	.828	
200	100	.804	.811	.816	.819		
	50	.810	.815	.819	.821		
	0	.815	.819	.822	.823		
	–50	.819	.823	.825	.825		
	–100	.824	.827	.828	.827		
220	100	.809	.814	.818			
	50	.813	.817	.820			
	0	.817	.820	.822			
	–50	.821	.824	.824			
	–100	.825	.826	.826			
240	100	.813	.817				
	50	.816	.819				
	0	.819	.821				
	–50	.822	.823				
	–100	.825	.825				

COST INDEX = 200 kg/min

WEIGHT 1000kg	WIND kt	FL 310	FL 330	FL 350	FL 370	FL 390	FL 410
120	100	.819	.822	.825	.829	.832	.835
	50	.822	.825	.829	.832	.836	.839
	0	.826	.829	.833	.837	.840	.840
	–50	.831	.834	.838	.840	.840	.840
	–100	.837	.840	.840	.840	.840	.840
140	100	.820	.823	.826	.830	.832	.834
	50	.823	.826	.830	.833	.836	.837
	0	.827	.830	.834	.837	.840	.840
	–50	.831	.835	.839	.840	.840	.840
	–100	.837	.840	.840	.840	.840	.840
160	100	.821	.824	.827	.830	.831	.830
	50	.824	.827	.831	.833	.834	.832
	0	.828	.831	.834	.837	.837	.834
	–50	.832	.836	.839	.840	.840	.837
	–100	.838	.840	.840	.840	.840	.840
180	100	.822	.825	.828	.829	.828	
	50	.825	.828	.831	.831	.829	
	0	.829	.832	.834	.834	.831	
	–50	.833	.836	.838	.838	.834	
	–100	.838	.840	.840	.840	.835	
200	100	.823	.826	.827	.826		
	50	.826	.828	.829	.828		
	0	.829	.831	.832	.830		
	–50	.833	.835	.835	.832		
	–100	.838	.840	.839	.834		
220	100	.824	.826	.825			
	50	.826	.828	.827			
	0	.829	.830	.828			
	–50	.833	.833	.830			
	–100	.837	.837	.832			
240	100	.824	.824				
	50	.826	.826				
	0	.829	.827				
	–50	.831	.829				
	–100	.835	.831				

COST INDEX = 300 kg/min

WEIGHT 1000kg	WIND kt	FL 310	FL 330	FL 350	FL 370	FL 390	FL 410
120	100	.830	.834	.838	.840	.840	.840
	50	.835	.839	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
140	100	.831	.835	.839	.840	.840	.840
	50	.835	.839	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
160	100	.832	.835	.839	.840	.840	.837
	50	.836	.840	.840	.840	.840	.839
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
180	100	.832	.836	.838	.837	.834	
	50	.836	.839	.840	.840	.835	
	0	.840	.840	.840	.840	.835	
	–50	.840	.840	.840	.840	.835	
	–100	.840	.840	.840	.840	.835	
200	100	.833	.835	.835	.831		
	50	.836	.838	.837	.833		
	0	.840	.840	.840	.834		
	–50	.840	.840	.840	.834		
	–100	.840	.840	.840	.834		
220	100	.832	.832	.830			
	50	.835	.835	.832			
	0	.839	.838	.832			
	–50	.840	.840	.832			
	–100	.840	.840	.832			
240	100	.831	.829				
	50	.833	.831				
	0	.836	.831				
	–50	.839	.831				
	–100	.840	.831				

COST INDEX = 400 kg/min

WEIGHT 1000kg	WIND kt	FL 310	FL 330	FL 350	FL 370	FL 390	FL 410
120	100	.840	.840	.840	.840	.840	.840
	50	.840	.840	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
140	100	.840	.840	.840	.840	.840	.840
	50	.840	.840	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
160	100	.840	.840	.840	.840	.840	.840
	50	.840	.840	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
180	100	.840	.840	.840	.840	.835	
	50	.840	.840	.840	.840	.835	
	0	.840	.840	.840	.840	.835	
	–50	.840	.840	.840	.840	.835	
	–100	.840	.840	.840	.840	.835	
200	100	.840	.840	.840	.834		
	50	.840	.840	.840	.834		
	0	.840	.840	.840	.834		
	–50	.840	.840	.840	.834		
	–100	.840	.840	.840	.834		
220	100	.840	.839	.832			
	50	.840	.840	.832			
	0	.840	.840	.832			
	–50	.840	.840	.832			
	–100	.840	.840	.832			
240	100	.837	.831				
	50	.839	.831				
	0	.840	.831				
	–50	.840	.831				
	–100	.840	.831				

COST INDEX = 500 kg/min

WEIGHT 1000kg	WIND kt	FL 310	FL 330	FL 350	FL 370	FL 390	FL 410
120	100	.840	.840	.840	.840	.840	.840
	50	.840	.840	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
140	100	.840	.840	.840	.840	.840	.840
	50	.840	.840	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
160	100	.840	.840	.840	.840	.840	.840
	50	.840	.840	.840	.840	.840	.840
	0	.840	.840	.840	.840	.840	.840
	–50	.840	.840	.840	.840	.840	.840
	–100	.840	.840	.840	.840	.840	.840
180	100	.840	.840	.840	.840	.835	
	50	.840	.840	.840	.840	.835	
	0	.840	.840	.840	.840	.835	
	–50	.840	.840	.840	.840	.835	
	–100	.840	.840	.840	.840	.835	
200	100	.840	.840	.840	.834		
	50	.840	.840	.840	.834		
	0	.840	.840	.840	.834		
	–50	.840	.840	.840	.834		
	–100	.840	.840	.840	.834		
220	100	.840	.840	.832			
	50	.840	.840	.832			
	0	.840	.840	.832			
	–50	.840	.840	.832			
	–100	.840	.840	.832			
240	100	.840	.831				
	50	.840	.831				
	0	.840	.831				
	–50	.840	.831				
	–100	.840	.831				

OPTIMUM AND MAXIMUM ALTITUDE

DEFINITIONS

· Optimum altitude : the altitude at which the airplane covers the maximum distance per kilogram of fuel (best specific range). It depends on the actual weight and the deviation from ISA.
· Maximum altitude is defined as the lower of :
– maximum altitude at maximum cruise thrust in level flight and
– maximum altitude at maximum climb thrust with 300 feet/minute vertical speed.

Note : Definition of the maximum altitude in the FMGC is different (Refer to FCOM 4).

CRUISE LEVEL CHARTS

These charts have been established for a center of gravity at 37 % MAC.
Maximum and optimum altitudes are given for different temperatures at long range speed and M.80, M.82, M.84

Note : 1. Optimum and maximum altitude curves do not cover for M.80, M.82 and M.84 the whole weight range because above a given weight these Mach numbers cannot be maintained, whatever the altitude.
2. The n = 1.3 g (n = 1.4 g) curve indicates the buffet margin.

OPTIMUM WEIGHT FOR 4000 FEET STEP CLIMB

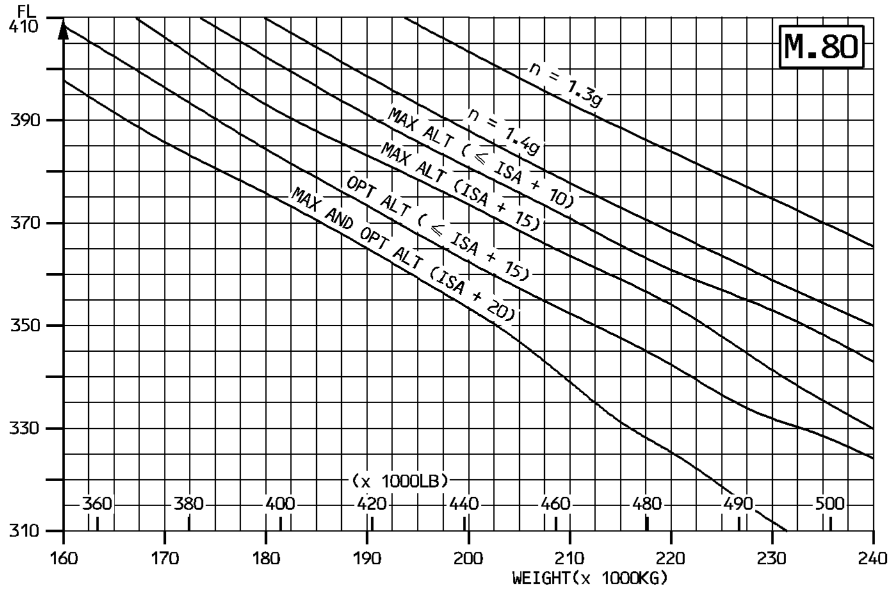
R

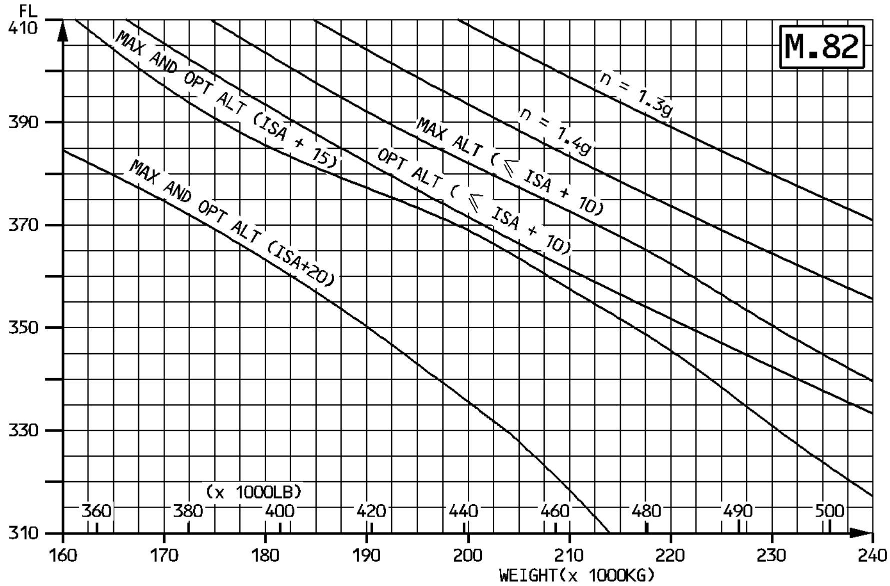
STEP CLIMB FROM/TO	WEIGHT (1000 kg)											
	≤ ISA + 10				ISA + 15				ISA + 20			
	LR	M.80	M.82	M.84	LR	M.80	M.82	M.84	LR	M.80	M.82	M.84
310/350	236	235	232	212	228	224	217	194	216	203	190	162
330/370	215	213	213	194	208	205	199	178	196	186	175	148
350/390	191	193	192	175	187	183	175	157	176	166	155	129
370/410	176	176	175	159	170	167	161	144	161	151	141	126

BLEED CORRECTIONS

	ENG ANTI ICE ON	TOTAL ANTI ICE ON	PACK FLOW HI AND/OR CARGO COOL ON
≤ ISA + 9	– 100 ft	– 300 ft	– 400 ft
ISA + 15	– 1100 ft	– 1300 ft	– 600 ft
ISA + 20	– 1300 ft	– 1700 ft	– 1200 ft

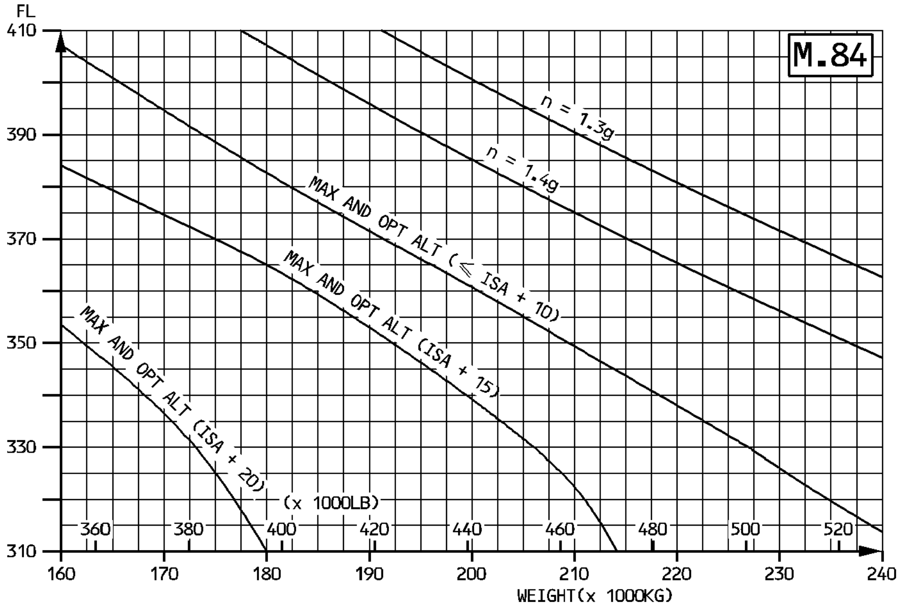
R

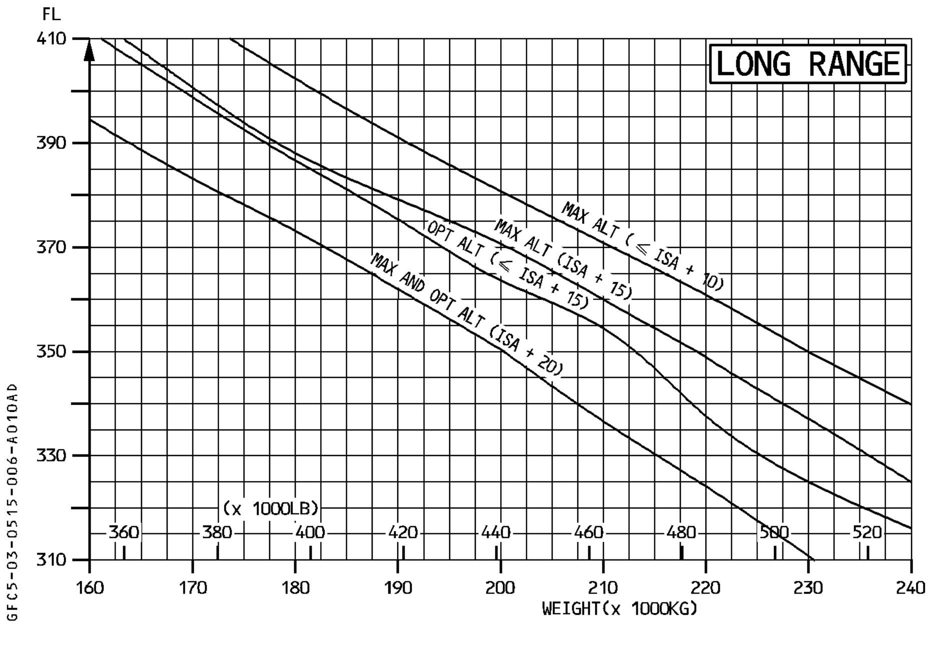




GFC5-03-0515-005-A010AD

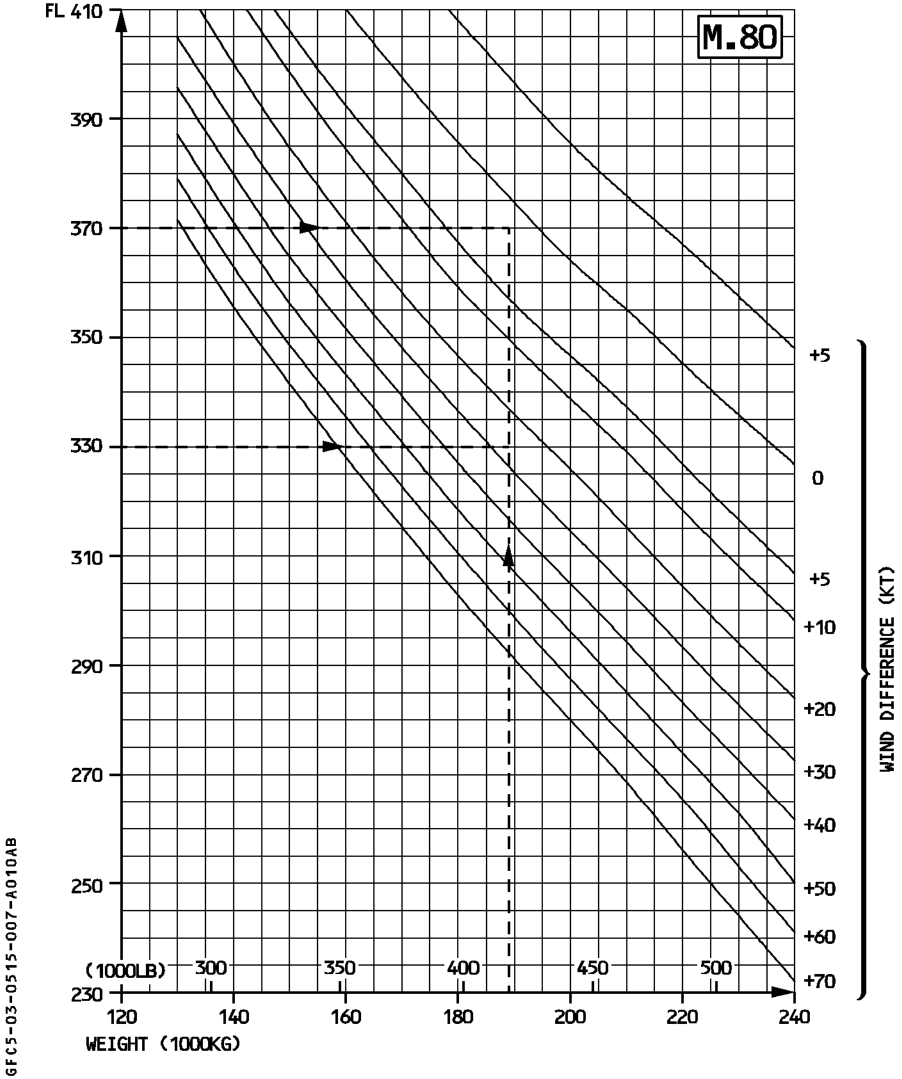
R


FL
410
390
370
350
330
310
M.84
n = 1.3g
n = 1.4g
MAX AND OPT ALT (≤ ISA + 10)
MAX AND OPT ALT (ISA + 15)
MAX AND OPT ALT (ISA + 20)
(x 1000LB)
360 380 400 420 440 460 480 500 520
160 170 180 190 200 210 220 230 240
WEIGHT(x 1000KG)


FL
410
390
370
350
330
310
LONG RANGE
MAX ALT (≤ ISA + 10)
MAX ALT (ISA + 15)
OPT ALT (≤ ISA + 15)
MAX AND OPT ALT (ISA + 20)
(x 1000LB)
360 380 400 420 440 460 480 500 520
160 170 180 190 200 210 220 230 240
WEIGHT(x 1000KG)
GFC5-03-0515-006-A010AD

WIND ALTITUDE TRADE FOR CONSTANT SPECIFIC RANGE

R

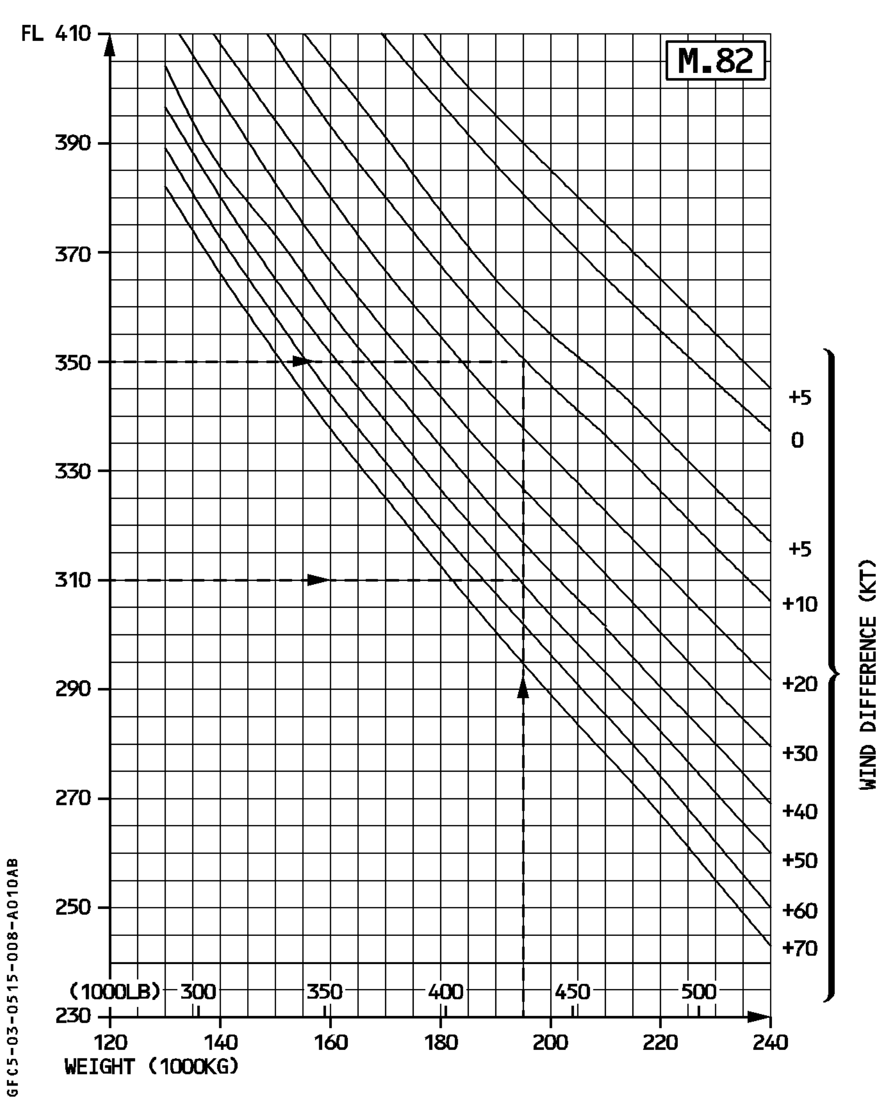


GIVEN : Weight : 188 000 kg (415 000 lb)
Wind at FL370 : 10 kt head

FIND : Minimum wind difference to descend to FL330 : (27– 2) = 25 kt

RESULTS : Descent to FL330 may be considered provided the tailwind at this altitude is more than (25 – 10) = 15 kt.

R

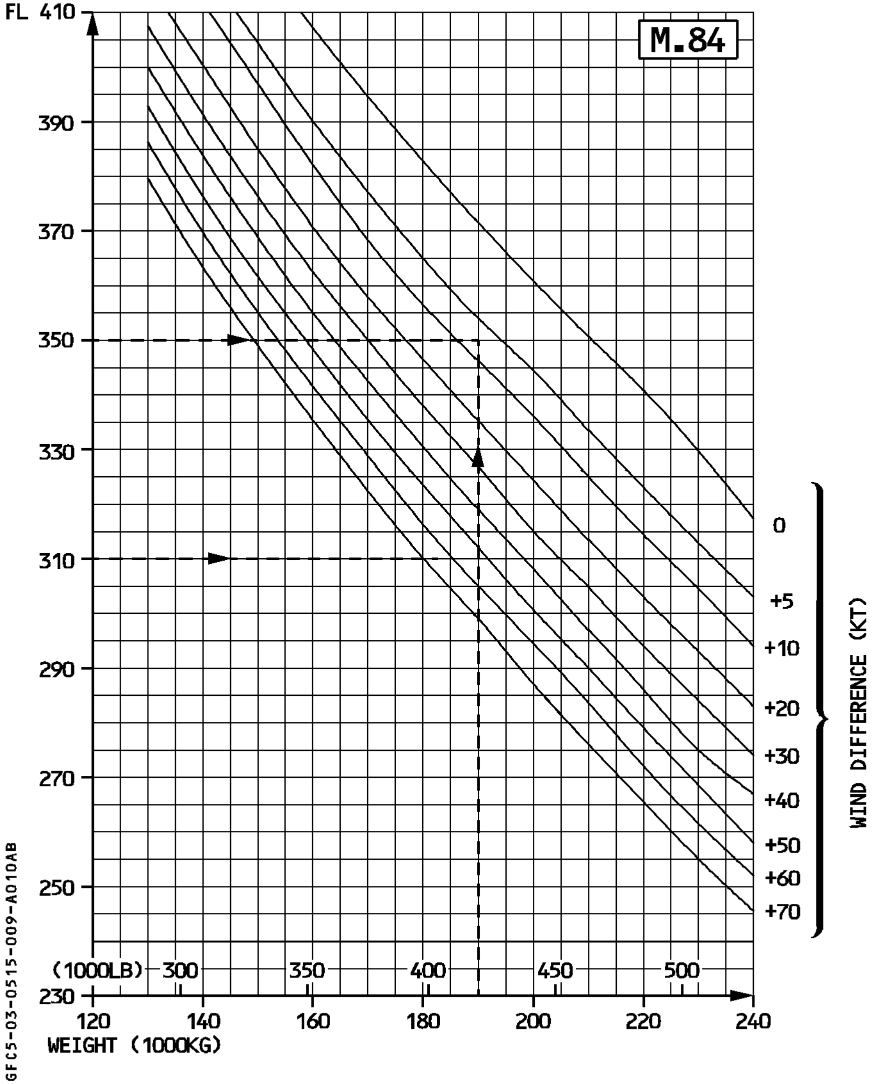


GIVEN : Weight : 195 000 kg (430 000 lb)
Wind at FL350 : 15 kt head

FIND : Minimum wind difference to descend to FL310 : (49 – 11) = 38 kt

RESULTS : Descent to FL310 may be considered provided the tailwind at this altitude is more than (38 – 15) = 23 kt.

R



GIVEN : Weight : 190 000 kg (419 000 lb)
Wind at FL350 : 10 kt head

FIND : Minimum wind difference to descend to FL310 : (53 – 8) = 45 kt

RESULTS : Descent to FL310 may be considered provided the tailwind at this altitude is more than (45 – 10) = 35 kt.

OPTIMUM ALTITUDE ON SHORT STAGE

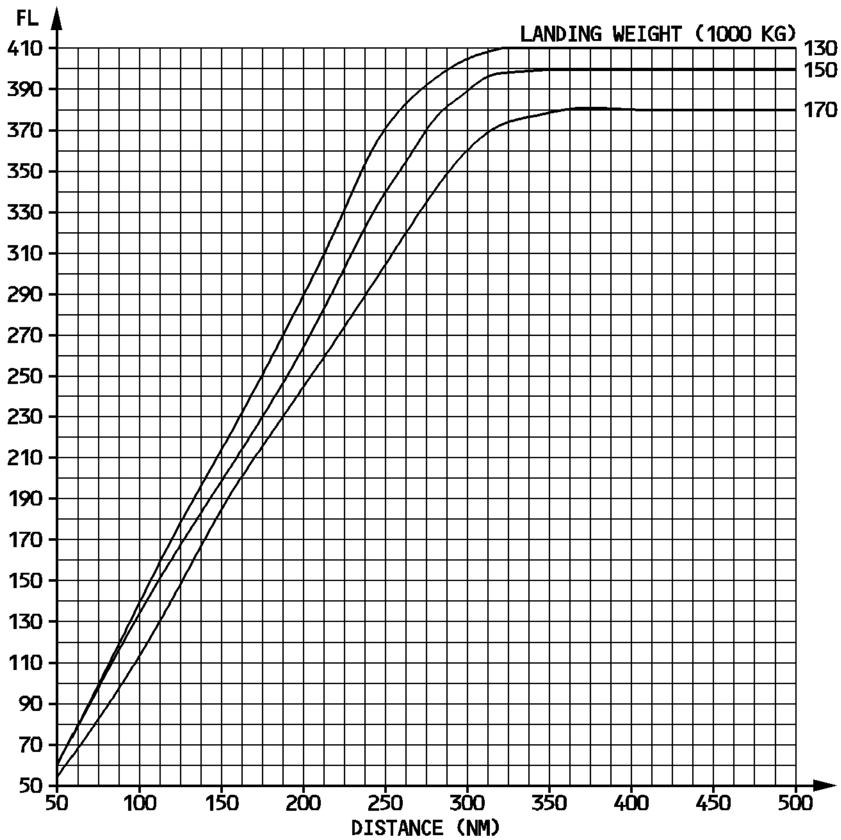
According to the air distance (from brake release point to landing), the cruise flight level is limited by the distance required to perform climb and descent. The graph determines the optimum altitude.

It includes the following profiles :

- Takeoff
- Climb : 250kt/300kt/M.80
- Long range cruise (during at least 5 minutes)
- Descent : M.80/300kt/250kt
- Approach and landing

and it is established for

- ISA
- CG = 37 %
- Normal air conditioning
- Anti ice OFF



CRUISE - M.80

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=37.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	87.8	.800	87.6	.800	87.5	.800	87.5	.800	87.9	.800	88.9	.800	90.1	.800
	2791	311	2594	297	2417	284	2251	272	2116	260	2016	248	1931	237
	84.8	473	90.5	469	96.2	465	102.4	461	108.4	459	113.8	459	118.8	459
140	88.2	.800	88.0	.800	88.0	.800	88.1	.800	88.6	.800	89.7	.800	91.1	.800
	2835	311	2643	297	2465	284	2305	272	2181	260	2087	248	2014	237
	83.5	473	88.8	469	94.4	465	100.0	461	105.2	459	109.9	459	113.9	459
150	88.6	.800	88.5	.800	88.5	.800	88.7	.800	89.3	.800	90.6	.800	92.1	.800
	2884	311	2693	297	2520	284	2370	272	2252	260	2168	248	2108	237
	82.1	473	87.2	469	92.3	465	97.3	461	101.9	459	105.8	459	108.8	459
160	89.0	.800	89.0	.800	89.1	.800	89.3	.800	90.1	.800	91.6	.800	93.5	.800
	2936	311	2747	297	2581	284	2439	272	2328	260	2259	248	2224	237
	80.6	473	85.4	469	90.1	465	94.5	461	98.5	459	101.6	459	103.2	459
170	89.4	.800	89.5	.800	89.7	.800	90.1	.800	91.0	.800	92.6	.800	95.2	.800
	2989	311	2806	297	2651	284	2515	272	2416	260	2361	248	2372	237
	79.2	473	83.7	469	87.8	465	91.7	461	95.0	459	97.2	459	96.7	459
180	89.9	.800	90.1	.800	90.4	.800	90.9	.800	91.9	.800	94.0	.800		
	3047	311	2874	297	2726	284	2598	272	2513	260	2492	248		
	77.7	473	81.7	469	85.4	465	88.8	461	91.3	459	92.1	459		
190	90.4	.800	90.7	.800	91.1	.800	91.6	.800	92.9	.800	95.7	.800		
	3111	311	2948	297	2806	284	2691	272	2624	260	2649	248		
	76.1	473	79.6	469	82.9	465	85.7	461	87.4	459	86.6	459		
200	91.0	.800	91.3	.800	91.8	.800	92.5	.800	94.3	.800				
	3184	311	3027	297	2894	284	2792	272	2762	260				
	74.3	473	77.5	469	80.4	465	82.6	461	83.1	459				
210	91.5	.800	91.9	.800	92.6	.800	93.5	.800	95.9	.800				
	3262	311	3111	297	2992	284	2910	272	2924	260				
	72.6	473	75.4	469	77.8	465	79.2	461	78.5	459				
220	92.1	.800	92.7	.800	93.4	.800	94.7	.800						
	3345	311	3204	297	3097	284	3052	272						
	70.8	473	73.2	469	75.1	465	75.5	461						
230	92.7	.800	93.3	.800	94.3	.800	96.3	.800						
	3432	311	3305	297	3219	284	3217	272						
	69.0	473	71.0	469	72.3	465	71.7	461						
240	93.4	.800	94.1	.800	95.4	.800								
	3529	311	3414	297	3363	284								
	67.1	473	68.8	469	69.2	465								

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .800 .000 .000 0 FCOM-G0-03-05-15-011-015

CRUISE - M.80

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**		**FL410**	
130	89.7	.800	89.6	.800	89.5	.800	89.5	.800	90.0	.800	91.0	.800	92.2	.800
	2871	311	2669	297	2486	284	2315	272	2179	260	2075	248	1989	237
	84.2	484	89.9	480	95.6	476	101.8	472	107.7	469	113.1	469	118.0	469
140	90.1	.800	90.0	.800	90.0	.800	90.1	.800	90.7	.800	91.8	.800	93.2	.800
	2917	311	2719	297	2536	284	2372	272	2245	260	2149	248	2076	237
	82.9	484	88.2	480	93.8	476	99.4	472	104.5	469	109.2	469	113.1	469
150	90.5	.800	90.5	.800	90.6	.800	90.7	.800	91.4	.800	92.7	.800	94.3	.800
	2967	311	2771	297	2592	284	2439	272	2318	260	2232	248	2173	237
	81.5	484	86.5	480	91.7	476	96.7	472	101.2	469	105.1	469	108.0	469
160	91.0	.800	91.0	.800	91.2	.800	91.4	.800	92.2	.800	93.7	.800	95.6	.800
	3021	311	2827	297	2657	284	2511	272	2398	260	2327	248	2294	237
	80.1	484	84.8	480	89.5	476	93.9	472	97.9	469	100.8	469	102.3	469
170	91.4	.800	91.6	.800	91.8	.800	92.1	.800	93.1	.800	94.8	.800	97.3	.800
	3075	311	2888	297	2729	284	2589	272	2489	260	2434	248	2448	237
	78.6	484	83.0	480	87.1	476	91.1	472	94.3	469	96.4	469	95.9	469
180	91.9	.800	92.1	.800	92.4	.800	92.9	.800	94.0	.800	96.1	.800		
	3136	311	2960	297	2806	284	2675	272	2589	260	2570	248		
	77.1	484	81.0	480	84.7	476	88.1	472	90.6	469	91.3	469		
190	92.4	.800	92.7	.800	93.1	.800	93.7	.800	95.1	.800	97.9	.800		
	3203	311	3036	297	2889	284	2772	272	2706	260	2733	248		
	75.5	484	79.0	480	82.3	476	85.1	472	86.7	469	85.9	469		
200	93.0	.800	93.3	.800	93.9	.800	94.6	.800	96.4	.800				
	3279	311	3118	297	2982	284	2876	272	2849	260				
	73.8	484	76.9	480	79.8	476	82.0	472	82.4	469				
210	93.5	.800	94.0	.800	94.6	.800	95.6	.800	98.1	.800				
	3359	311	3205	297	3083	284	3000	272	3017	260				
	72.0	484	74.8	480	77.1	476	78.6	472	77.8	469				
220	94.1	.800	94.7	.800	95.4	.800	96.9	.800						
	3445	311	3302	297	3191	284	3148	272						
	70.2	484	72.6	480	74.5	476	74.9	472						
230	94.8	.800	95.4	.800	96.4	.800	98.4	.800						
	3536	311	3407	297	3319	284	3318	272						
	68.4	484	70.4	480	71.6	476	71.1	472						
240	95.4	.800	96.2	.800	97.6	.800								
	3636	311	3519	297	3469	284								
	66.5	484	68.2	480	68.5	476								

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0-08F0A330-200 CF6-80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .800 .000 .000 10 FCOM-G0-03-05-15-012-015

CRUISE - M.80

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+15 CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**		**FL410**	
130	90.7	.800	90.6	.800	90.5	.800	90.5	.800	91.0	.800	92.0	.800	93.3	.800
	2912	311	2707	297	2522	284	2349	272	2211	260	2106	248	2019	237
	83.9	489	89.5	485	95.3	481	101.5	477	107.3	474	112.6	474	117.5	474
140	91.1	.800	91.0	.800	91.0	.800	91.1	.800	91.7	.800	92.9	.800	94.2	.800
	2959	311	2759	297	2573	284	2407	272	2279	260	2182	248	2107	237
	82.6	489	87.8	485	93.4	481	99.0	477	104.1	474	108.7	474	112.6	474
150	91.5	.800	91.5	.800	91.6	.800	91.8	.800	92.5	.800	93.8	.800	95.3	.800
	3010	311	2812	297	2630	284	2475	272	2353	260	2267	248	2206	237
	81.2	489	86.2	485	91.4	481	96.3	477	100.8	474	104.7	474	107.5	474
160	92.0	.800	92.0	.800	92.2	.800	92.4	.800	93.3	.800	94.7	.800	96.7	.800
	3065	311	2868	297	2696	284	2548	272	2434	260	2363	248	2330	237
	79.7	489	84.5	485	89.1	481	93.5	477	97.5	474	100.4	474	101.8	474
170	92.4	.800	92.6	.800	92.8	.800	93.2	.800	94.1	.800	95.8	.800		
	3120	311	2931	297	2769	284	2628	272	2527	260	2473	248		
	78.3	489	82.7	485	86.8	481	90.7	477	93.9	474	95.9	474		
180	92.9	.800	93.1	.800	93.4	.800	94.0	.800	95.0	.800	97.2	.800		
	3182	311	3004	297	2848	284	2716	272	2629	260	2611	248		
	76.8	489	80.7	485	84.4	481	87.8	477	90.3	474	90.9	474		
190	93.4	.800	93.7	.800	94.1	.800	94.8	.800	96.1	.800				
	3251	311	3081	297	2933	284	2814	272	2748	260				
	75.2	489	78.6	485	82.0	481	84.7	477	86.3	474				
200	94.0	.800	94.3	.800	94.9	.800	95.6	.800	97.5	.800				
	3328	311	3165	297	3027	284	2921	272	2894	260				
	73.4	489	76.6	485	79.4	481	81.6	477	82.0	474				
210	94.5	.800	95.0	.800	95.7	.800	96.7	.800						
	3410	311	3254	297	3129	284	3047	272						
	71.7	489	74.5	485	76.8	481	78.2	477						
220	95.1	.800	95.7	.800	96.5	.800	97.9	.800						
	3497	311	3352	297	3240	284	3198	272						
	69.9	489	72.3	485	74.2	481	74.5	477						
230	95.8	.800	96.4	.800	97.4	.800								
	3590	311	3459	297	3371	284								
	68.1	489	70.1	485	71.3	481								
240	96.4	.800	97.2	.800	98.6	.800								
	3691	311	3573	297	3524	284								
	66.2	489	67.8	485	68.2	481								

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0-08F0A330-200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .800 .000 .000 15 FCOM-G0-03-05-15-013-015

CRUISE - M.80

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+20 CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	91.7	.800	91.5	.800	91.5	.800	91.5	.800	92.0	.800	93.0	.800	94.3	.800
	2954	311	2746	297	2558	284	2384	272	2243	260	2138	248	2050	237
	83.5	494	89.1	490	94.9	486	101.0	482	106.9	480	112.1	480	117.0	480
140	92.1	.800	92.0	.800	92.0	.800	92.1	.800	92.7	.800	93.9	.800	95.3	.800
	3002	311	2799	297	2610	284	2443	272	2312	260	2215	248	2140	237
	82.2	494	87.5	490	93.1	486	98.6	482	103.7	480	108.3	480	112.1	480
150	92.5	.800	92.5	.800	92.6	.800	92.8	.800	93.5	.800	94.8	.800	96.3	.800
	3054	311	2853	297	2668	284	2512	272	2388	260	2302	248	2241	237
	80.8	494	85.8	490	91.0	486	95.9	482	100.4	480	104.2	480	107.0	480
160	92.9	.800	93.0	.800	93.1	.800	93.4	.800	94.3	.800	95.8	.800		
	3110	311	2910	297	2736	284	2587	272	2470	260	2400	248		
	79.4	494	84.1	490	88.8	486	93.1	482	97.1	480	99.9	480		
170	93.4	.800	93.5	.800	93.8	.800	94.2	.800	95.2	.800				
	3166	311	2975	297	2810	284	2668	272	2565	260				
	77.9	494	82.3	490	86.4	486	90.3	482	93.5	480				
180	93.9	.800	94.1	.800	94.4	.800	95.0	.800	96.1	.800				
	3229	311	3049	297	2890	284	2758	272	2669	260				
	76.4	494	80.3	490	84.0	486	87.4	482	89.8	480				
190	94.4	.800	94.7	.800	95.1	.800	95.8	.800						
	3300	311	3128	297	2977	284	2858	272						
	74.8	494	78.3	490	81.6	486	84.3	482						
200	94.9	.800	95.3	.800	95.9	.800	96.7	.800						
	3378	311	3213	297	3072	284	2966	272						
	73.1	494	76.2	490	79.0	486	81.2	482						
210	95.5	.800	96.0	.800	96.7	.800								
	3461	311	3303	297	3177	284								
	71.3	494	74.1	490	76.4	486								
220	96.1	.800	96.7	.800	97.5	.800								
	3550	311	3404	297	3290	284								
	69.5	494	71.9	490	73.8	486								
230	96.8	.800	97.4	.800										
	3645	311	3512	297										
	67.7	494	69.7	490										
240	97.4	.800												
	3748	311												
	65.8	494												

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .800 .000 .000 20 FCOM-G0-03-05-15-014-015

CRUISE - M.82

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=37.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	89.2	.820	89.0	.820	88.8	.820	88.7	.820	89.0	.820	89.9	.820	90.9	.820
	2999	319	2781	306	2581	292	2402	279	2249	267	2129	255	2029	243
	80.9	485	86.5	481	92.4	477	98.4	473	104.6	470	110.4	470	115.9	470
140	89.5	.820	89.4	.820	89.3	.820	89.2	.820	89.6	.820	90.6	.820	91.8	.820
	3041	319	2826	306	2632	292	2454	279	2307	267	2195	255	2114	243
	79.8	485	85.1	481	90.6	477	96.3	473	101.9	470	107.2	470	111.3	470
150	89.9	.820	89.8	.820	89.7	.820	89.7	.820	90.2	.820	91.4	.820	92.9	.820
	3087	319	2877	306	2684	292	2512	279	2371	267	2277	255	2208	243
	78.6	485	83.6	481	88.8	477	94.1	473	99.2	470	103.3	470	106.5	470
160	90.3	.820	90.2	.820	90.2	.820	90.3	.820	91.0	.820	92.3	.820	94.2	.820
	3137	319	2929	306	2742	292	2576	279	2447	267	2369	255	2321	243
	77.4	485	82.1	481	87.0	477	91.8	473	96.1	470	99.3	470	101.3	470
170	90.7	.820	90.7	.820	90.7	.820	90.9	.820	91.8	.820	93.4	.820	95.7	.820
	3190	319	2987	306	2806	292	2646	279	2536	267	2475	255	2451	243
	76.1	485	80.5	481	85.0	477	89.3	473	92.7	470	95.0	470	95.9	470
180	91.1	.820	91.1	.820	91.3	.820	91.7	.820	92.6	.820	94.7	.820		
	3247	319	3050	306	2874	292	2731	279	2633	267	2594	255		
	74.7	485	78.9	481	83.0	477	86.5	473	89.3	470	90.7	470		
190	91.5	.820	91.7	.820	91.9	.820	92.4	.820	93.7	.820	96.3	.820		
	3310	319	3118	306	2950	292	2825	279	2748	267	2737	255		
	73.3	485	77.1	481	80.8	477	83.6	473	85.6	470	85.9	470		
200	92.0	.820	92.2	.820	92.6	.820	93.3	.820	94.9	.820				
	3377	319	3191	306	3043	292	2928	279	2873	267				
	71.9	485	75.4	481	78.4	477	80.7	473	81.9	470				
210	92.5	.820	92.8	.820	93.3	.820	94.3	.820	96.5	.820				
	3449	319	3274	306	3143	292	3049	279	3021	267				
	70.3	485	73.5	481	75.9	477	77.5	473	77.8	470				
220	93.0	.820	93.5	.820	94.1	.820	95.4	.820						
	3526	319	3371	306	3251	292	3177	279						
	68.8	485	71.4	481	73.4	477	74.4	473						
230	93.6	.820	94.1	.820	95.1	.820	96.8	.820						
	3613	319	3475	306	3376	292	3328	279						
	67.2	485	69.2	481	70.6	477	71.0	473						
240	94.2	.820	94.9	.820	96.2	.820								
	3714	319	3586	306	3507	292								
	65.3	485	67.1	481	68.0	477								

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .820 .000 .000 0 FCOM-G0-03-05-15-015-015

CRUISE - M.82

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+10 CG=37.0%	**N1 (%) KG/H/ENG NM/1000KG**	**MACH IAS (KT) TAS (KT)**

WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**		**FL410**	
130	91.2	.820	91.0	.820	90.9	.820	90.8	.820	91.1	.820	92.0	.820	93.1	.820
	3088	319	2862	306	2657	292	2472	279	2316	267	2193	255	2092	243
	80.3	496	85.9	492	91.7	488	97.8	483	103.8	481	109.7	481	115.0	481
140	91.5	.820	91.4	.820	91.3	.820	91.2	.820	91.7	.820	92.7	.820	94.0	.820
	3131	319	2909	306	2710	292	2526	279	2376	267	2260	255	2180	243
	79.2	496	84.5	492	90.0	488	95.7	483	101.2	481	106.4	481	110.3	481
150	91.9	.820	91.8	.820	91.8	.820	91.8	.820	92.3	.820	93.5	.820	95.0	.820
	3178	319	2962	306	2764	292	2586	279	2443	267	2347	255	2278	243
	78.0	496	83.0	492	88.2	488	93.5	483	98.5	481	102.5	481	105.6	481
160	92.3	.820	92.2	.820	92.2	.820	92.4	.820	93.1	.820	94.4	.820	96.4	.820
	3230	319	3016	306	2824	292	2652	279	2522	267	2442	255	2396	243
	76.7	496	81.5	492	86.3	488	91.1	483	95.4	481	98.5	481	100.4	481
170	92.7	.820	92.7	.820	92.8	.820	93.0	.820	93.9	.820	95.6	.820	97.9	.820
	3285	319	3076	306	2890	292	2725	279	2615	267	2552	255	2531	243
	75.4	496	79.9	492	84.4	488	88.7	483	92.0	481	94.2	481	95.0	481
180	93.1	.820	93.2	.820	93.4	.820	93.7	.820	94.8	.820	96.8	.820		
	3345	319	3141	306	2961	292	2814	279	2716	267	2676	255		
	74.1	496	78.3	492	82.3	488	85.9	483	88.6	481	89.9	481		
190	93.6	.820	93.7	.820	94.0	.820	94.5	.820	95.9	.820	98.5	.820		
	3410	319	3212	306	3041	292	2912	279	2836	267	2825	255		
	72.7	496	76.5	492	80.2	488	83.0	483	84.8	481	85.2	481		
200	94.0	.820	94.3	.820	94.7	.820	95.4	.820	97.1	.820				
	3479	319	3288	306	3137	292	3019	279	2965	267				
	71.2	496	74.8	492	77.7	488	80.0	483	81.1	481				
210	94.5	.820	94.9	.820	95.4	.820	96.4	.820	98.7	.820				
	3554	319	3375	306	3240	292	3144	279	3119	267				
	69.7	496	72.8	492	75.2	488	76.9	483	77.1	481				
220	95.1	.820	95.5	.820	96.3	.820	97.6	.820						
	3634	319	3475	306	3353	292	3278	279						
	68.2	496	70.7	492	72.7	488	73.7	483						
230	95.7	.820	96.2	.820	97.3	.820	99.0	.820						
	3725	319	3583	306	3483	292	3435	279						
	66.5	496	68.6	492	70.0	488	70.4	483						
240	96.3	.820	97.0	.820	98.3	.820								
	3830	319	3700	306	3619	292								
	64.7	496	66.4	492	67.4	488								

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .820 .000 .000 10 FCOM-G0-03-05-15-016-015

CRUISE - M.82

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+15 CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**		**FL410**	
130	92.2	.820	92.0	.820	91.9	.820	91.8	.820	92.1	.820	93.0	.820	94.1	.820
	3133	319	2905	306	2696	292	2508	279	2351	267	2226	255	2125	243
	79.9	501	85.5	497	91.4	493	97.4	489	103.4	486	109.3	486	114.5	486
140	92.5	.820	92.4	.820	92.3	.820	92.3	.820	92.7	.820	93.8	.820	95.0	.820
	3177	319	2952	306	2750	292	2564	279	2412	267	2295	255	2214	243
	78.8	501	84.1	497	89.6	493	95.3	489	100.8	486	106.0	486	109.8	486
150	92.9	.820	92.8	.820	92.8	.820	92.8	.820	93.4	.820	94.6	.820	96.1	.820
	3225	319	3006	306	2805	292	2625	279	2480	267	2383	255	2314	243
	77.6	501	82.6	497	87.8	493	93.1	489	98.1	486	102.0	486	105.1	486
160	93.3	.820	93.2	.820	93.3	.820	93.4	.820	94.1	.820	95.5	.820	97.4	.820
	3278	319	3062	306	2866	292	2692	279	2561	267	2480	255	2434	243
	76.4	501	81.1	497	85.9	493	90.7	489	94.9	486	98.1	486	99.9	486
170	93.7	.820	93.7	.820	93.8	.820	94.1	.820	94.9	.820	96.6	.820		
	3334	319	3123	306	2933	292	2766	279	2655	267	2593	255		
	75.1	501	79.5	497	84.0	493	88.3	489	91.6	486	93.8	486		
180	94.1	.820	94.2	.820	94.4	.820	94.8	.820	95.8	.820				
	3395	319	3189	306	3006	292	2857	279	2759	267				
	73.8	501	77.9	497	82.0	493	85.5	489	88.1	486				
190	94.6	.820	94.7	.820	95.0	.820	95.6	.820	96.9	.820				
	3461	319	3261	306	3088	292	2957	279	2880	267				
	72.4	501	76.2	497	79.8	493	82.6	489	84.4	486				
200	95.0	.820	95.3	.820	95.7	.820	96.4	.820	98.2	.820				
	3531	319	3338	306	3186	292	3067	279	3012	267				
	70.9	501	74.4	497	77.3	493	79.7	489	80.7	486				
210	95.5	.820	95.9	.820	96.5	.820	97.5	.820						
	3608	319	3427	306	3291	292	3194	279						
	69.4	501	72.5	497	74.9	493	76.5	489						
220	96.1	.820	96.5	.820	97.3	.820								
	3689	319	3530	306	3406	292								
	67.9	501	70.4	497	72.3	493								
230	96.7	.820	97.2	.820	98.3	.820								
	3783	319	3639	306	3539	292								
	66.2	501	68.3	497	69.6	493								
240	97.3	.820	98.0	.820										
	3890	319	3759	306										
	64.4	501	66.1	497										

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .820 .000 .000 15 FCOM-G0-03-05-15-017-015

CRUISE - M.82

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+20
CG=37.0%

N1 (%) — **MACH**
KG/H/ENG — **IAS (KT)**
NM/1000KG — **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	93.2	.820	93.0	.820	92.9	.820	92.8	.820	93.1	.820	94.0	.820	95.1	.820
	3179	319	2948	306	2736	292	2547	279	2386	267	2260	255	2158	243
	79.6	506	85.1	502	91.0	498	96.9	494	103.0	492	108.8	492	113.9	492
140	93.5	.820	93.4	.820	93.3	.820	93.3	.820	93.7	.820	94.8	.820	96.1	.820
	3225	319	2996	306	2791	292	2603	279	2448	267	2331	255	2249	243
	78.4	506	83.8	502	89.2	498	94.9	494	100.4	492	105.4	492	109.3	492
150	93.9	.820	93.8	.820	93.8	.820	93.8	.820	94.4	.820	95.6	.820		
	3273	319	3052	306	2847	292	2665	279	2517	267	2421	255		
	77.3	506	82.2	502	87.4	498	92.7	494	97.6	492	101.5	492		
160	94.3	.820	94.2	.820	94.3	.820	94.4	.820	95.1	.820				
	3327	319	3108	306	2909	292	2733	279	2601	267				
	76.0	506	80.7	502	85.6	498	90.3	494	94.5	492				
170	94.7	.820	94.7	.820	94.8	.820	95.1	.820	96.0	.820				
	3385	319	3170	306	2977	292	2808	279	2697	267				
	74.7	506	79.2	502	83.6	498	87.9	494	91.1	492				
180	95.1	.820	95.2	.820	95.4	.820	95.8	.820						
	3446	319	3237	306	3051	292	2902	279						
	73.4	506	77.5	502	81.6	498	85.1	494						
190	95.5	.820	95.7	.820	96.0	.820	96.6	.820						
	3513	319	3311	306	3136	292	3004	279						
	72.0	506	75.8	502	79.4	498	82.2	494						
200	96.0	.820	96.3	.820	96.7	.820								
	3585	319	3389	306	3235	292								
	70.6	506	74.0	502	77.0	498								
210	96.5	.820	96.9	.820										
	3663	319	3481	306										
	69.1	506	72.1	502										
220	97.1	.820	97.6	.820										
	3746	319	3585	306										
	67.5	506	70.0	502										
230														
240														

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 1.5 %	ΔFUEL = + 3 %	ΔFUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .820 .000 .000 20 FCOM-G0-03-05-15-018-015

CRUISE - M.84

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=37.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	91.4	.840	91.1	.840	90.8	.840	90.6	.840	90.8	.840	91.6	.840	92.6	.840
	3335	328	3082	314	2851	300	2641	287	2461	274	2325	262	2206	250
	74.5	497	80.0	493	85.7	489	91.7	484	97.9	482	103.6	482	109.2	482
140	91.7	.840	91.4	.840	91.2	.840	91.0	.840	91.4	.840	92.3	.840	93.5	.840
	3375	328	3125	314	2897	300	2689	287	2519	274	2391	262	2293	250
	73.7	497	78.9	493	84.3	489	90.0	484	95.6	482	100.7	482	105.1	482
150	92.0	.840	91.8	.840	91.6	.840	91.5	.840	91.9	.840	93.1	.840	94.8	.840
	3418	328	3172	314	2946	300	2745	287	2585	274	2470	262	2407	250
	72.7	497	77.7	493	82.9	489	88.2	484	93.2	482	97.5	482	100.1	482
160	92.3	.840	92.1	.840	92.0	.840	92.0	.840	92.6	.840	94.1	.840	96.6	.840
	3465	328	3221	314	3000	300	2811	287	2659	274	2577	262	2566	250
	71.7	497	76.5	493	81.4	489	86.1	484	90.6	482	93.5	482	93.9	482
170	92.6	.840	92.5	.840	92.5	.840	92.6	.840	93.5	.840	95.5	.840		
	3514	328	3275	314	3064	300	2883	287	2753	274	2706	262		
	70.7	497	75.2	493	79.7	489	84.0	484	87.5	482	89.0	482		
180	93.0	.840	93.0	.840	93.0	.840	93.3	.840	94.5	.840				
	3568	328	3335	314	3136	300	2965	287	2872	274				
	69.7	497	73.9	493	77.9	489	81.6	484	83.9	482				
190	93.4	.840	93.4	.840	93.6	.840	94.2	.840	95.9	.840				
	3627	328	3406	314	3214	300	3072	287	3012	274				
	68.5	497	72.4	493	76.0	489	78.8	484	80.0	482				
200	93.8	.840	94.0	.840	94.3	.840	95.2	.840						
	3692	328	3483	314	3305	300	3197	287						
	67.3	497	70.8	493	73.9	489	75.7	484						
210	94.3	.840	94.5	.840	95.1	.840	96.5	.840						
	3769	328	3566	314	3421	300	3346	287						
	66.0	497	69.1	493	71.4	489	72.4	484						
220	94.8	.840	95.2	.840	96.1	.840								
	3850	328	3664	314	3551	300								
	64.6	497	67.3	493	68.8	489								
230	95.3	.840	96.0	.840	97.3	.840								
	3938	328	3785	314	3706	300								
	63.1	497	65.1	493	65.9	489								
240	95.9	.840	96.9	.840										
	4040	328	3920	314										
	61.5	497	62.9	493										

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .840 .000 .000 0 FCOM-G0-03-05-15-019-015

CRUISE - M.84

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+10
CG=37.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	93.5	.840	93.1	.840	92.9	.840	92.7	.840	92.9	.840	93.8	.840	94.7	.840
	3437	328	3175	314	2938	300	2721	287	2536	274	2397	262	2276	250
	73.9	508	79.3	504	85.0	499	91.0	495	97.2	493	102.8	493	108.2	493
140	93.7	.840	93.5	.840	93.3	.840	93.1	.840	93.5	.840	94.4	.840	95.7	.840
	3477	328	3219	314	2986	300	2771	287	2598	274	2466	262	2367	250
	73.0	508	78.2	504	83.6	499	89.4	495	94.8	493	99.9	493	104.1	493
150	94.0	.840	93.8	.840	93.7	.840	93.6	.840	94.1	.840	95.2	.840	97.0	.840
	3522	328	3268	314	3036	300	2829	287	2666	274	2548	262	2485	250
	72.1	508	77.1	504	82.2	499	87.5	495	92.4	493	96.7	493	99.1	493
160	94.3	.840	94.2	.840	94.1	.840	94.2	.840	94.7	.840	96.3	.840	98.9	.840
	3571	328	3319	314	3093	300	2898	287	2743	274	2659	262	2651	250
	71.1	508	75.9	504	80.7	499	85.4	495	89.8	493	92.7	493	93.0	493
170	94.7	.840	94.6	.840	94.6	.840	94.8	.840	95.6	.840	97.6	.840		
	3622	328	3375	314	3160	300	2972	287	2841	274	2794	262		
	70.1	508	74.6	504	79.0	499	83.3	495	86.7	493	88.2	493		
180	95.0	.840	95.0	.840	95.1	.840	95.4	.840	96.7	.840				
	3677	328	3438	314	3234	300	3059	287	2964	274				
	69.0	508	73.2	504	77.2	499	80.9	495	83.1	493				
190	95.5	.840	95.5	.840	95.7	.840	96.3	.840	98.0	.840				
	3739	328	3512	314	3316	300	3170	287	3110	274				
	67.9	508	71.7	504	75.3	499	78.1	495	79.2	493				
200	95.9	.840	96.0	.840	96.4	.840	97.4	.840						
	3808	328	3592	314	3410	300	3299	287						
	66.7	508	70.1	504	73.2	499	75.0	495						
210	96.4	.840	96.6	.840	97.3	.840	98.7	.840						
	3888	328	3679	314	3531	300	3454	287						
	65.3	508	68.5	504	70.7	499	71.7	495						
220	96.9	.840	97.3	.840	98.3	.840								
	3972	328	3780	314	3666	300								
	63.9	508	66.6	504	68.1	499								
230	97.4	.840	98.1	.840	99.5	.840								
	4064	328	3906	314	3827	300								
	62.5	508	64.5	504	65.3	499								
240	98.0	.840	99.0	.840										
	4169	328	4046	314										
	60.9	508	62.2	504										

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .840 .000 .000 10 FCOM-G0-03-05-15-020-015

CRUISE - M.84

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+15 CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	94.5	.840	94.1	.840	93.9	.840	93.7	.840	94.0	.840	94.8	.840	95.8	.840
	3489	328	3224	314	2982	300	2762	287	2575	274	2434	262	2313	250
	73.5	513	78.9	509	84.6	505	90.6	501	96.7	498	102.3	498	107.7	498
140	94.7	.840	94.5	.840	94.3	.840	94.2	.840	94.5	.840	95.5	.840	96.8	.840
	3531	328	3269	314	3031	300	2812	287	2639	274	2504	262	2405	250
	72.7	513	77.8	509	83.3	505	89.0	501	94.4	498	99.5	498	103.6	498
150	95.0	.840	94.8	.840	94.7	.840	94.7	.840	95.1	.840	96.3	.840		
	3576	328	3318	314	3083	300	2873	287	2708	274	2588	262		
	71.7	513	76.7	509	81.9	505	87.1	501	92.0	498	96.2	498		
160	95.3	.840	95.2	.840	95.1	.840	95.2	.840	95.8	.840				
	3625	328	3370	314	3140	300	2942	287	2786	274				
	70.8	513	75.5	509	80.4	505	85.0	501	89.4	498				
170	95.7	.840	95.6	.840	95.6	.840	95.8	.840	96.7	.840				
	3678	328	3427	314	3210	300	3019	287	2887	274				
	69.8	513	74.3	509	78.6	505	82.9	501	86.3	498				
180	96.1	.840	96.1	.840	96.2	.840	96.5	.840	97.8	.840				
	3734	328	3492	314	3285	300	3106	287	3012	274				
	68.7	513	72.9	509	76.8	505	80.6	501	82.7	498				
190	96.5	.840	96.5	.840	96.8	.840	97.4	.840						
	3796	328	3568	314	3368	300	3220	287						
	67.6	513	71.3	509	74.9	505	77.7	501						
200	96.9	.840	97.1	.840	97.4	.840								
	3868	328	3649	314	3465	300								
	66.3	513	69.7	509	72.8	505								
210	97.4	.840	97.6	.840	98.3	.840								
	3949	328	3737	314	3588	300								
	65.0	513	68.1	509	70.3	505								
220	97.9	.840	98.3	.840										
	4035	328	3841	314										
	63.6	513	66.3	509										
230														
240														

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .840 .000 .000 15 FCOM-G0-03-05-15-021-015

CRUISE - M.84

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+20 CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**		**FL410**
130	95.4	.840	95.1	.840	94.9	.840	94.7	.840	95.0	.840	95.9	.840	
	3542	328	3273	314	3028	300	2804	287	2616	274	2473	262	
	73.2	518	78.5	514	84.2	510	90.2	506	96.2	504	101.8	504	
140	95.7	.840	95.5	.840	95.3	.840	95.2	.840	95.6	.840			
	3584	328	3319	314	3078	300	2856	287	2680	274			
	72.3	518	77.5	514	82.9	510	88.6	506	93.9	504			
150	96.0	.840	95.8	.840	95.7	.840	95.7	.840	96.2	.840			
	3630	328	3370	314	3130	300	2918	287	2751	274			
	71.4	518	76.3	514	81.5	510	86.7	506	91.5	504			
160	96.3	.840	96.2	.840	96.2	.840	96.2	.840					
	3681	328	3423	314	3189	300	2989	287					
	70.4	518	75.1	514	80.0	510	84.6	506					
170	96.7	.840	96.6	.840	96.7	.840							
	3734	328	3480	314	3260	300							
	69.4	518	73.9	514	78.2	510							
180	97.0	.840	97.1	.840									
	3792	328	3548	314									
	68.3	518	72.5	514									
190													
200													
210													
220													
230													
240													

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12100000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .840 .000 .000 20 FCOM-G0-03-05-15-022-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=30.0%

N1 (%) / MACH
KG/H/ENG / IAS (KT)
NM/1000KG / TAS (KT)

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200		FL220		FL240	
130	64.6	.441	65.5	.449	67.2	.467	68.7	.483	69.8	.496	71.1	.511	73.0	.536	74.6	.557
	1975	244	1912	239	1904	239	1886	238	1852	235	1826	233	1840	235	1830	235
	71.3	282	74.3	284	77.1	294	80.0	302	83.0	307	85.9	314	88.7	327	92.0	337
140	65.8	.449	67.5	.466	69.0	.483	70.1	.496	71.5	.510	73.2	.533	74.9	.554	76.4	.575
	2070	248	2057	248	2040	248	2004	245	1978	242	1987	244	1978	243	1967	243
	69.2	287	71.8	295	74.4	304	77.1	309	79.8	316	82.4	328	85.4	338	88.4	348
150	67.7	.464	69.3	.481	70.3	.493	71.6	.508	73.3	.529	75.0	.551	76.6	.573	78.2	.595
	2211	257	2196	257	2155	253	2128	251	2130	251	2128	252	2122	252	2117	252
	67.0	296	69.4	305	72.0	310	74.4	317	76.9	327	79.5	338	82.3	349	85.0	360
160	69.5	.479	70.5	.491	71.8	.505	73.3	.523	75.0	.546	76.8	.569	78.2	.589	79.9	.615
	2355	265	2313	262	2282	259	2270	258	2278	260	2275	261	2261	259	2269	260
	65.0	306	67.3	311	69.6	318	71.9	326	74.2	338	76.8	350	79.4	359	81.9	372
170	70.7	.489	71.8	.502	73.2	.517	75.0	.542	76.7	.563	78.1	.583	79.8	.608	81.4	.632
	2475	271	2437	268	2412	266	2433	268	2424	268	2409	267	2416	268	2417	268
	63.1	312	65.3	318	67.4	325	69.5	338	71.9	349	74.3	358	76.6	370	79.1	382
180	71.8	.499	73.2	.513	74.9	.535	76.5	.557	78.1	.578	79.7	.600	81.4	.624	82.8	.648
	2594	276	2564	273	2578	275	2575	276	2566	275	2562	275	2566	276	2565	275
	61.3	318	63.3	325	65.3	337	67.5	347	69.7	358	71.9	368	74.1	381	76.4	392
190	73.1	.509	74.6	.527	76.3	.549	78.1	.572	79.4	.592	81.1	.616	82.6	.639	84.4	.674
	2723	282	2716	281	2723	283	2723	283	2709	282	2715	283	2713	283	2755	287
	59.6	325	61.5	334	63.4	345	65.5	357	67.6	366	69.7	378	71.8	390	73.9	407
200	74.3	.519	76.1	.543	77.8	.564	79.2	.584	80.8	.607	82.5	.631	84.0	.659	85.8	.693
	2855	287	2882	290	2876	291	2859	290	2861	290	2864	290	2885	292	2922	295
	58.0	331	59.7	344	61.7	355	63.7	364	65.6	376	67.6	387	69.6	402	71.6	419
210	75.8	.535	77.4	.556	79.1	.577	80.5	.598	82.2	.621	83.6	.644	85.5	.680	86.9	.703
	3024	296	3024	297	3020	297	3010	297	3015	297	3011	296	3067	302	3056	300
	56.4	341	58.2	352	60.1	363	61.9	373	63.8	385	65.7	396	67.6	414	69.5	425
220	77.1	.547	78.8	.569	80.2	.588	81.8	.612	83.3	.634	85.0	.665	86.8	.696	87.9	.715
	3176	304	3177	305	3159	303	3166	304	3163	304	3198	306	3233	309	3203	306
	55.0	349	56.8	361	58.6	370	60.3	382	62.1	393	63.9	408	65.6	424	67.5	432
230	78.3	.560	79.9	.580	81.4	.601	83.1	.625	84.4	.647	86.3	.684	87.6	.705	89.0	.732
	3327	311	3318	311	3314	310	3319	311	3313	310	3381	316	3364	314	3375	313
	53.7	358	55.4	368	57.1	378	58.7	390	60.4	400	62.1	420	63.9	430	65.5	442
240	79.6	.573	80.9	.591	82.5	.613	84.1	.636	85.8	.668	87.5	.699	88.6	.717	90.1	.747
	3484	318	3459	316	3464	317	3465	316	3512	320	3549	323	3514	319	3545	320
	52.5	366	54.1	374	55.7	386	57.3	397	58.9	413	60.5	429	62.1	437	63.7	451

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 0 FCOM-G0-03-05-15-023-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=37.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL270**		**FL290**		**FL310**		**FL330**		**FL350**		**FL370**		**FL390**		**FL410**	
130	77.1	.592	78.9	.618	80.4	.644	82.2	.680	83.5	.703	85.4	.735	88.0	.776	89.9	.794
	1829	235	1832	235	1830	235	1854	238	1838	236	1861	237	1916	240	1909	235
	96.6	353	99.9	366	103.2	378	106.7	395	110.2	405	113.3	422	116.1	445	119.3	455
140	79.0	.613	80.6	.639	82.4	.674	83.8	.699	85.2	.728	87.4	.768	89.4	.790	91.2	.804
	1976	244	1975	243	2003	247	1993	246	1997	245	2040	248	2046	244	2031	238
	92.6	366	95.7	378	98.8	396	102.1	407	105.1	420	107.9	440	110.7	453	113.5	461
150	80.7	.633	82.4	.665	84.0	.695	85.3	.719	87.1	.759	88.8	.786	90.7	.800	92.5	.811
	2121	252	2142	254	2152	255	2140	253	2178	256	2186	254	2170	248	2155	240
	89.0	378	91.9	394	94.8	408	97.7	418	100.4	437	103.1	451	105.8	459	107.9	465
160	82.3	.654	84.2	.689	85.3	.709	86.9	.744	88.6	.780	90.0	.796	91.8	.807	93.9	.815
	2279	261	2309	264	2284	261	2311	263	2340	265	2311	258	2293	250	2293	242
	85.7	390	88.4	408	91.1	416	93.6	433	96.1	450	98.8	457	101.0	463	102.0	468
170	84.1	.681	85.3	.703	86.8	.731	88.6	.772	89.7	.790	91.1	.803	93.0	.812	95.8	.821
	2461	272	2441	270	2449	269	2499	274	2463	268	2434	261	2422	252	2460	244
	82.6	407	85.2	416	87.5	429	89.8	449	92.4	455	94.7	461	96.1	466	95.7	471
180	85.5	.698	86.6	.719	88.5	.760	89.7	.783	90.8	.798	92.2	.809	94.5	.817		
	2613	280	2591	276	2648	281	2630	278	2587	271	2561	263	2574	254		
	79.8	417	82.1	425	84.2	446	86.6	455	88.9	460	90.6	464	91.0	468		
190	86.5	.709	88.2	.744	89.7	.777	90.7	.791	91.8	.804	93.4	.813	96.4	.821		
	2742	284	2782	287	2804	288	2756	281	2716	274	2698	264	2747	255		
	77.2	423	79.2	440	81.2	456	83.4	460	85.3	464	86.4	466	85.7	471		
200	87.8	.727	89.6	.765	90.7	.784	91.8	.799	92.8	.809	94.8	.817				
	2909	292	2960	296	2929	291	2887	284	2846	275	2855	266				
	74.6	434	76.5	453	78.5	460	80.5	464	81.9	466	82.1	469				
210	89.1	.749	90.6	.777	91.6	.791	92.7	.804	93.9	.813	96.6	.821				
	3094	301	3104	301	3057	294	3019	286	2990	277	3033	267				
	72.2	447	74.0	460	75.9	464	77.5	468	78.3	469	77.6	471				
220	90.4	.766	91.5	.783	92.6	.798	93.6	.808	95.3	.817						
	3267	309	3231	303	3191	296	3154	288	3152	278						
	70.0	457	71.7	464	73.3	468	74.6	470	74.7	471						
230	91.3	.776	92.3	.789	93.5	.803	94.7	.812	96.9	.821						
	3413	313	3360	306	3330	299	3303	289	3337	280						
	67.9	463	69.5	467	70.8	471	71.5	472	70.9	473						
240	92.1	.782	93.3	.795	94.3	.807	96.0	.816								
	3542	316	3498	309	3465	300	3469	291								
	65.9	467	67.3	471	68.3	473	68.4	474								

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 0 FCOM-G0-03-05-15-024-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+10
CG=30.0%

N1 (%) / KG/H/ENG / NM/1000KG — MACH / IAS (KT) / TAS (KT)

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200		FL220		FL240	
130	65.8	.440	66.7	.448	68.6	.467	70.0	.482	71.2	.495	72.6	.510	74.6	.536	76.3	.557
	2019	243	1957	238	1951	239	1929	238	1894	235	1874	233	1890	235	1881	235
	70.9	286	73.9	289	76.7	299	79.5	307	82.5	312	85.3	320	88.2	333	91.4	344
140	67.1	.448	68.9	.466	70.4	.482	71.5	.495	72.9	.509	74.7	.533	76.4	.553	78.1	.575
	2116	248	2109	248	2090	247	2052	244	2025	242	2036	243	2027	243	2020	243
	68.8	291	71.4	301	74.0	309	76.7	315	79.3	321	81.9	334	84.9	344	87.8	355
150	69.0	.464	70.6	.481	71.8	.493	73.1	.507	74.8	.529	76.5	.549	78.2	.572	79.9	.595
	2261	256	2248	256	2211	253	2182	251	2185	251	2178	251	2173	251	2172	251
	66.7	301	69.0	310	71.5	316	74.0	323	76.4	334	79.0	344	81.8	355	84.5	367
160	70.8	.479	71.9	.491	73.2	.505	74.8	.523	76.6	.546	78.4	.568	79.8	.588	81.6	.614
	2411	265	2368	262	2337	259	2330	259	2336	260	2331	260	2317	259	2327	260
	64.6	311	66.9	317	69.2	323	71.4	333	73.8	345	76.4	356	78.9	366	81.4	379
170	72.0	.489	73.3	.502	74.7	.516	76.5	.541	78.3	.563	79.8	.583	81.5	.607	83.2	.631
	2533	271	2496	268	2470	265	2491	268	2485	268	2471	267	2480	268	2479	268
	62.7	318	64.9	324	67.0	331	69.1	344	71.5	355	73.9	365	76.1	378	78.5	389
180	73.3	.498	74.6	.512	76.4	.535	78.1	.556	79.7	.577	81.3	.600	83.1	.624	84.6	.648
	2657	276	2627	273	2643	275	2635	275	2628	275	2630	275	2635	276	2633	275
	61.0	324	62.9	331	64.9	343	67.1	353	69.3	364	71.4	376	73.7	388	75.9	400
190	74.5	.508	76.1	.527	77.9	.549	79.6	.571	81.1	.591	82.8	.615	84.4	.639	86.2	.673
	2786	281	2784	281	2790	282	2789	283	2776	282	2784	283	2783	282	2827	287
	59.3	330	61.1	340	63.0	352	65.1	363	67.2	373	69.3	386	71.4	397	73.5	415
200	75.8	.518	77.6	.543	79.4	.564	80.8	.583	82.5	.607	84.2	.630	85.8	.658	87.7	.693
	2922	287	2948	290	2944	290	2930	289	2936	290	2936	290	2956	291	3002	295
	57.7	337	59.4	350	61.4	361	63.3	371	65.2	383	67.2	395	69.2	409	71.2	427
210	77.3	.535	79.0	.555	80.6	.576	82.2	.597	83.9	.621	85.3	.644	87.3	.679	88.7	.703
	3098	296	3094	297	3090	297	3087	297	3092	297	3088	296	3146	301	3139	300
	56.1	348	57.9	358	59.8	369	61.6	380	63.4	392	65.3	403	67.1	422	69.1	434
220	78.6	.547	80.4	.569	81.7	.587	83.4	.611	85.0	.634	86.7	.664	88.6	.697	89.7	.714
	3251	303	3255	305	3231	303	3241	303	3243	303	3279	306	3320	309	3284	305
	54.7	356	56.5	368	58.2	376	59.9	388	61.7	400	63.4	416	65.2	433	67.1	441
230	79.9	.559	81.5	.580	83.0	.601	84.7	.624	86.1	.646	88.1	.683	89.4	.704	90.8	.729
	3404	310	3397	310	3396	310	3399	310	3395	309	3467	315	3449	313	3451	312
	53.4	364	55.1	374	56.7	385	58.4	397	60.1	408	61.7	428	63.5	438	65.1	449
240	81.2	.572	82.5	.590	84.2	.613	85.8	.636	87.5	.666	89.3	.697	90.4	.715	92.0	.744
	3561	318	3541	316	3550	317	3552	316	3595	320	3637	322	3597	318	3629	319
	52.2	372	53.8	381	55.3	393	56.9	404	58.5	421	60.1	437	61.8	444	63.2	459

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 10 FCOM-G0-03-05-15-025-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+10
CG=37.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL270		FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	78.8	.591	80.7	.617	82.1	.642	84.1	.678	85.4	.702	87.5	.739	90.0	.775	91.9	.792
	1878	234	1882	235	1878	234	1903	238	1892	236	1927	238	1968	239	1959	234
	96.0	360	99.2	373	102.5	385	105.9	403	109.4	414	112.4	433	115.5	455	118.6	465
140	80.8	.614	82.4	.638	84.2	.673	85.7	.698	87.2	.727	89.5	.770	91.4	.789	93.3	.803
	2034	244	2031	243	2057	247	2046	245	2054	245	2108	249	2101	244	2089	238
	92.0	374	95.0	386	98.1	404	101.3	415	104.3	428	107.2	452	110.1	463	112.7	471
150	82.4	.632	84.3	.666	85.9	.695	87.3	.719	89.2	.762	90.8	.783	92.7	.800	94.6	.810
	2179	252	2206	255	2212	255	2204	253	2254	258	2240	254	2231	248	2219	240
	88.4	385	91.2	402	94.1	416	96.9	427	99.7	449	102.6	460	105.1	469	107.1	475
160	84.0	.652	86.0	.688	87.3	.711	89.1	.750	90.6	.778	92.0	.794	93.9	.807	96.1	.815
	2336	260	2371	264	2355	261	2398	265	2398	264	2370	257	2361	250	2364	242
	85.1	398	87.8	416	90.5	426	92.9	446	95.6	459	98.2	466	100.3	473	101.1	478
170	85.9	.679	87.2	.701	88.9	.735	90.6	.771	91.7	.788	93.2	.803	95.2	.812	98.0	.821
	2522	271	2505	269	2533	271	2563	273	2528	267	2503	261	2496	252	2538	244
	82.1	414	84.6	424	86.9	440	89.4	458	91.9	465	94.0	471	95.4	476	94.8	481
180	87.3	.697	88.6	.721	90.4	.757	91.7	.781	92.9	.797	94.3	.808	96.7	.817		
	2683	279	2675	277	2710	280	2697	277	2660	271	2634	263	2653	254		
	79.2	425	81.5	436	83.8	454	86.1	464	88.3	470	90.0	474	90.3	479		
190	88.4	.711	90.1	.742	91.6	.773	92.7	.789	93.9	.804	95.5	.813	98.5	.821		
	2825	285	2850	286	2866	286	2828	280	2795	273	2780	264	2834	255		
	76.6	433	78.7	449	80.8	463	82.9	469	84.8	474	85.8	477	84.9	481		
200	89.7	.727	91.4	.763	92.6	.782	93.8	.797	94.9	.809	97.0	.817				
	2989	292	3030	295	3004	290	2964	283	2930	275	2944	266				
	74.1	443	76.1	461	78.0	469	79.9	474	81.3	477	81.4	479				
210	91.0	.745	92.5	.774	93.6	.789	94.7	.804	96.1	.813	98.8	.821				
	3164	300	3181	300	3137	293	3106	286	3082	277	3130	267				
	71.8	454	73.6	468	75.4	473	76.9	478	77.7	479	76.9	481				
220	92.2	.763	93.4	.782	94.6	.796	95.7	.808	97.4	.816						
	3343	308	3318	303	3279	296	3244	287	3250	278						
	69.5	465	71.2	473	72.8	477	74.0	480	74.0	481						
230	93.2	.773	94.3	.788	95.5	.803	96.8	.812	99.1	.820						
	3493	312	3453	305	3427	298	3404	289	3442	280						
	67.4	471	69.0	476	70.2	481	70.9	483	70.2	484						
240	94.1	.780	95.2	.794	96.4	.806	98.1	.815								
	3635	315	3596	308	3568	300	3577	291								
	65.4	476	66.8	480	67.7	483	67.8	485								

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 10 FCOM-G0-03-05-15-026-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA+15 CG=30.0%	N1 (%) KG/H/ENG NM/1000KG			MACH IAS (KT) TAS (KT)
WEIGHT (1000KG)	FL100	FL120	FL140	FL160	FL180	FL200	FL220	FL240
130	66.4 .440	67.4 .448	69.3 .466	70.7 .482	71.9 .495	73.4 .511	75.3 .536	77.1 .557
	2041 243	1978 238	1972 239	1951 238	1919 235	1900 233	1915 235	1904 235
	70.7 289	73.7 292	76.5 302	79.3 309	82.2 315	85.0 323	87.9 337	91.1 347
140	67.7 .448	69.6 .466	71.1 .482	72.2 .494	73.6 .509	75.5 .533	77.2 .553	78.9 .575
	2140 248	2133 248	2113 247	2076 244	2050 242	2063 243	2054 243	2046 243
	68.6 294	71.2 304	73.8 312	76.4 317	79.1 324	81.7 337	84.6 347	87.6 358
150	69.7 .464	71.3 .481	72.5 .493	73.8 .507	75.6 .528	77.3 .549	79.0 .571	80.7 .595
	2288 256	2274 256	2237 253	2207 250	2211 251	2206 251	2198 251	2201 251
	66.5 304	68.8 313	71.3 319	73.8 326	76.2 337	78.8 348	81.5 359	84.2 371
160	71.5 .479	72.6 .491	73.9 .505	75.6 .523	77.3 .546	79.1 .567	80.6 .588	82.5 .613
	2437 265	2395 262	2364 259	2358 259	2364 260	2357 260	2345 259	2355 260
	64.4 314	66.7 320	69.0 326	71.2 336	73.6 348	76.1 359	78.7 369	81.1 382
170	72.7 .489	74.0 .501	75.4 .517	77.3 .541	79.1 .562	80.6 .582	82.4 .607	84.0 .631
	2562 270	2524 267	2502 265	2522 268	2514 268	2500 267	2510 268	2509 267
	62.6 321	64.7 327	66.8 334	68.9 348	71.3 358	73.6 368	75.9 381	78.3 393
180	74.0 .498	75.3 .512	77.2 .535	78.8 .555	80.5 .577	82.2 .600	83.9 .624	85.4 .648
	2687 276	2657 273	2674 275	2667 275	2660 275	2664 275	2666 275	2665 275
	60.8 327	62.8 334	64.7 346	66.9 357	69.1 368	71.2 379	73.4 392	75.7 403
190	75.2 .508	76.9 .527	78.6 .549	80.4 .571	81.9 .591	83.7 .615	85.2 .639	87.1 .673
	2818 281	2817 281	2822 282	2820 283	2810 282	2820 283	2819 282	2863 286
	59.1 333	60.9 343	62.9 355	65.0 366	67.0 377	69.0 389	71.1 401	73.2 419
200	76.5 .518	78.4 .542	80.1 .564	81.6 .583	83.3 .606	85.0 .630	86.6 .658	88.6 .692
	2957 287	2981 290	2979 290	2963 289	2971 290	2973 290	2994 291	3040 295
	57.5 340	59.2 353	61.2 365	63.2 374	65.0 386	67.0 398	69.0 413	70.9 431
210	78.0 .534	79.7 .555	81.4 .576	83.0 .597	84.7 .621	86.2 .643	88.1 .679	89.6 .702
	3132 296	3128 296	3126 297	3124 297	3130 297	3127 296	3185 301	3176 300
	55.9 350	57.7 361	59.6 372	61.4 384	63.2 396	65.1 407	66.9 426	68.9 438
220	79.3 .547	81.1 .569	82.5 .587	84.3 .611	85.9 .634	87.6 .664	89.5 .695	90.6 .713
	3288 303	3289 304	3267 302	3282 303	3283 303	3319 306	3356 309	3323 305
	54.6 359	56.3 370	58.1 379	59.7 392	61.5 404	63.3 420	65.0 436	66.9 444
230	80.6 .559	82.2 .580	83.8 .601	85.6 .624	87.0 .646	89.0 .682	90.3 .703	91.7 .727
	3443 310	3435 310	3435 310	3440 310	3438 309	3507 315	3488 313	3489 311
	53.3 367	54.9 377	56.6 388	58.2 400	59.9 412	61.5 432	63.3 442	64.9 453
240	81.9 .572	83.3 .590	85.0 .613	86.6 .635	88.3 .665	90.1 .696	91.3 .714	92.9 .742
	3602 317	3582 316	3593 316	3591 316	3635 319	3674 322	3641 318	3670 318
	52.1 375	53.6 384	55.2 396	56.8 408	58.3 424	59.9 440	61.5 448	63.0 463

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 15 FCOM-G0-03-05-15-027-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+15
CG=37.0%

N1 (%) **MACH**
KG/H/ENG **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL270		FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	79.6	.591	81.5	.617	83.0	.642	85.0	.679	86.4	.703	88.6	.741	91.0	.773	92.9	.791
	1901	234	1905	235	1904	234	1932	238	1921	236	1963	239	1991	239	1984	234
	95.7	364	98.9	377	102.2	389	105.5	408	109.0	419	112.0	440	115.1	458	118.2	469
140	81.7	.614	83.2	.638	85.1	.672	86.6	.697	88.3	.730	90.5	.769	92.4	.788	94.3	.803
	2060	244	2057	243	2083	246	2073	245	2094	246	2134	249	2129	244	2119	237
	91.7	378	94.7	390	97.8	407	101.0	419	103.9	435	106.9	456	109.7	467	112.3	476
150	83.3	.633	85.2	.665	86.8	.694	88.3	.720	90.2	.760	91.8	.783	93.7	.799	95.6	.810
	2210	252	2234	254	2241	255	2240	254	2277	257	2271	254	2262	248	2251	240
	88.1	390	90.9	406	93.8	420	96.6	433	99.4	453	102.2	464	104.7	474	106.6	480
160	84.9	.653	87.0	.689	88.3	.712	90.0	.747	91.5	.777	93.0	.793	94.9	.806	97.2	.815
	2369	260	2405	264	2394	262	2422	264	2426	263	2401	257	2395	250	2401	242
	84.8	402	87.5	421	90.1	432	92.7	449	95.4	463	97.9	470	99.8	478	100.6	483
170	86.7	.678	88.2	.703	89.8	.734	91.6	.769	92.7	.787	94.2	.802	96.2	.811		
	2553	271	2544	270	2565	271	2594	272	2561	267	2539	260	2534	252		
	81.8	418	84.4	429	86.7	445	89.1	462	91.6	469	93.7	476	95.0	481		
180	88.2	.697	89.5	.719	91.3	.756	92.7	.781	93.8	.796	95.3	.808	97.6	.814		
	2718	279	2700	277	2743	280	2735	277	2695	270	2672	262	2678	253		
	79.0	429	81.3	439	83.5	458	85.8	469	88.0	474	89.6	479	90.1	483		
190	89.3	.709	90.9	.740	92.6	.771	93.7	.789	94.9	.804	96.6	.812				
	2857	284	2877	285	2901	286	2868	280	2836	273	2822	264				
	76.4	437	78.5	452	80.6	467	82.6	474	84.4	479	85.4	482				
200	90.6	.725	92.4	.761	93.6	.781	94.8	.796	95.9	.808	98.0	.817				
	3021	291	3064	294	3042	290	3005	283	2974	275	2990	266				
	73.9	447	75.8	465	77.8	473	79.6	478	81.0	482	81.0	484				
210	91.9	.744	93.4	.773	94.6	.788	95.8	.803	97.1	.813	99.0	.762				
	3200	299	3218	299	3178	292	3150	286	3130	277	2965	246				
	71.5	458	73.3	472	75.1	477	76.6	483	77.4	484	76.2	452				
220	93.2	.762	94.4	.781	95.6	.795	96.7	.807	98.5	.817						
	3385	307	3362	302	3323	295	3292	287	3302	278						
	69.3	469	71.0	477	72.5	482	73.7	485	73.7	487						
230	94.1	.772	95.3	.787	96.5	.802	97.8	.812								
	3537	311	3499	305	3476	298	3456	289								
	67.2	475	68.7	481	69.9	486	70.6	488								
240	95.0	.779	96.2	.793	97.4	.806	98.8	.810								
	3684	315	3645	308	3621	300	3583	288								
	65.1	480	66.5	485	67.4	488	67.9	486								

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = − 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 15 FCOM-G0-03-05-15-028-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA+20 CG=30.0%	**N1 (%)** **KG/H/ENG** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL100	FL120	FL140	FL160	FL180	FL200	FL220	FL240
130	67.0 .440	68.0 .447	69.9 .466	71.4 .482	72.7 .495	74.1 .511	76.1 .536	77.9 .557
	2062 243	1998 238	1994 239	1973 238	1944 235	1922 233	1938 235	1928 235
	70.6 291	73.5 294	76.2 304	79.1 312	82.0 319	84.8 326	87.6 340	90.8 350
140	68.4 .448	70.2 .466	71.7 .481	72.9 .494	74.4 .509	76.3 .533	78.0 .554	79.7 .575
	2164 247	2156 248	2135 247	2099 244	2074 241	2090 243	2081 243	2070 242
	68.5 296	71.0 306	73.6 314	76.2 320	78.9 327	81.4 340	84.3 351	87.3 361
150	70.4 .464	72.0 .480	73.2 .493	74.5 .507	76.3 .528	78.1 .549	79.8 .571	81.5 .595
	2314 256	2300 256	2262 253	2231 250	2236 251	2231 251	2227 251	2230 251
	66.3 307	68.6 316	71.1 322	73.6 328	75.9 340	78.6 351	81.3 362	83.9 374
160	72.1 .478	73.3 .491	74.6 .505	76.3 .523	78.1 .545	79.9 .567	81.4 .587	83.3 .613
	2463 265	2423 262	2393 259	2386 259	2390 259	2385 260	2373 259	2386 260
	64.2 317	66.5 322	68.8 329	71.0 339	73.4 351	75.9 362	78.4 372	80.9 386
170	73.4 .488	74.7 .501	76.2 .517	78.1 .541	79.9 .562	81.3 .581	83.2 .607	84.8 .630
	2589 270	2552 267	2532 266	2552 268	2546 268	2528 266	2540 267	2538 267
	62.4 323	64.5 329	66.6 337	68.7 351	71.1 362	73.4 371	75.7 384	78.1 396
180	74.6 .498	76.0 .512	77.9 .535	79.6 .555	81.3 .576	83.0 .599	84.8 .623	86.3 .647
	2718 276	2686 273	2706 275	2698 275	2691 275	2695 275	2698 275	2698 275
	60.6 330	62.6 336	64.5 349	66.7 360	68.9 371	71.0 383	73.2 395	75.5 407
190	75.9 .508	77.6 .527	79.4 .548	81.2 .570	82.7 .591	84.5 .615	86.1 .639	88.0 .673
	2851 281	2850 281	2854 282	2853 283	2844 282	2855 283	2853 282	2898 286
	58.9 336	60.8 346	62.7 358	64.8 370	66.8 380	68.8 393	70.9 405	73.0 423
200	77.3 .519	79.1 .542	80.9 .563	82.4 .582	84.1 .606	85.8 .630	87.5 .658	89.5 .691
	2992 287	3017 290	3013 290	2996 289	3006 290	3010 290	3031 291	3074 295
	57.3 343	59.1 356	61.0 368	63.0 377	64.8 390	66.8 402	68.7 417	70.7 435
210	78.8 .534	80.5 .554	82.2 .575	83.8 .597	85.6 .620	87.0 .643	89.0 .678	90.5 .701
	3168 296	3164 296	3160 296	3162 297	3166 297	3165 296	3221 301	3213 299
	55.8 353	57.6 364	59.4 376	61.2 387	63.0 399	64.9 411	66.7 430	68.7 441
220	80.1 .546	81.9 .568	83.3 .587	85.1 .611	86.7 .633	88.4 .662	90.3 .694	91.5 .712
	3322 303	3326 304	3305 302	3321 303	3321 303	3353 305	3392 308	3364 304
	54.4 362	56.1 373	57.9 383	59.6 396	61.3 407	63.1 423	64.8 440	66.6 448
230	81.4 .559	83.0 .579	84.6 .600	86.4 .624	87.8 .645	89.8 .680	91.2 .702	92.6 .726
	3480 310	3471 310	3474 310	3481 310	3477 309	3542 314	3527 312	3532 310
	53.1 370	54.8 380	56.4 392	58.0 404	59.7 415	61.3 435	63.1 445	64.6 457
240	82.7 .571	84.1 .590	85.8 .612	87.4 .634	89.1 .663	91.0 .694	92.1 .713	93.7 .741
	3642 317	3621 316	3632 316	3632 316	3670 318	3713 321	3683 317	3712 317
	51.9 378	53.5 387	55.0 400	56.6 411	58.1 427	59.7 443	61.3 452	62.8 466

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 20 FCOM-G0-03-05-15-029-015

LONG RANGE CRUISE

MAX. CRUISE THRUST LIMITS
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA+20
CG=37.0%

N1 (%) / **MACH**
KG/H/ENG / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL270		FL290		FL310		FL330		FL350		FL370		FL390		FL410	
130	80.4	.590	82.3	.616	83.9	.642	85.9	.678	87.4	.703	89.6	.739	91.9	.771	93.9	.790
	1923	234	1929	235	1930	234	1958	238	1950	236	1985	238	2014	238	2010	233
	95.4	367	98.6	380	101.8	393	105.2	412	108.6	423	111.7	443	114.8	462	117.8	474
140	82.5	.613	84.1	.637	86.0	.671	87.5	.697	89.3	.731	91.4	.768	93.4	.787	95.3	.802
	2086	243	2082	243	2107	246	2103	245	2124	246	2159	248	2157	243	2150	237
	91.4	381	94.4	393	97.5	411	100.7	423	103.6	440	106.5	460	109.3	472	111.8	481
150	84.2	.632	86.0	.664	87.8	.694	89.2	.719	91.1	.759	92.8	.783	94.7	.798	96.6	.808
	2239	252	2261	254	2271	255	2267	253	2304	256	2303	253	2293	247	2277	239
	87.8	393	90.6	410	93.5	425	96.3	437	99.1	457	101.9	469	104.3	478	106.3	484
160	85.9	.653	87.9	.689	89.2	.711	90.9	.745	92.5	.775	94.0	.793	96.0	.806	97.4	.760
	2403	261	2440	264	2423	262	2448	263	2455	263	2436	257	2430	250	2283	224
	84.5	406	87.2	425	89.9	435	92.4	453	95.1	467	97.5	475	99.4	483	99.8	456
170	87.7	.679	89.1	.703	90.7	.732	92.5	.767	93.7	.786	95.2	.802	96.7	.794		
	2590	271	2578	270	2594	270	2622	272	2593	267	2575	260	2491	246		
	81.5	422	84.1	434	86.4	448	88.8	466	91.2	473	93.3	481	95.5	476		
180	89.1	.696	90.4	.718	92.3	.755	93.6	.780	94.8	.795	96.3	.807				
	2750	279	2735	276	2776	279	2772	277	2731	270	2711	262				
	78.7	433	81.1	443	83.2	462	85.4	474	87.6	479	89.3	484				
190	90.2	.708	91.8	.738	93.5	.770	94.7	.788	95.9	.803	97.1	.793				
	2888	284	2910	284	2937	285	2907	280	2877	273	2767	257				
	76.2	440	78.2	455	80.3	471	82.3	478	84.0	484	86.0	476				
200	91.5	.723	93.3	.759	94.5	.780	95.8	.796	96.9	.808						
	3053	290	3097	293	3083	289	3050	283	3017	275						
	73.7	450	75.6	468	77.5	478	79.2	483	80.6	487						
210	92.8	.742	94.3	.770	95.5	.787	96.8	.803	97.5	.785						
	3235	298	3254	298	3221	292	3198	286	3039	266						
	71.3	461	73.1	475	74.8	482	76.2	488	77.8	473						
220	94.1	.760	95.3	.780	96.5	.795	97.5	.801								
	3425	307	3405	302	3369	295	3301	285								
	69.0	473	70.7	481	72.2	486	73.7	487								
230	95.1	.770	96.3	.786	97.5	.802	98.0	.770								
	3581	311	3548	305	3526	298	3309	273								
	66.9	479	68.4	485	69.6	491	70.6	468								
240	96.0	.778	97.2	.793	98.0	.791										
	3731	314	3697	307	3577	294										
	64.9	484	66.2	489	67.7	484										

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

11.0–08F0A330–200 CF6–80E1A4 12200000C5KG370 0 018590 0 0 1 1.0 0 .00 0 01 .990 .000 .000 20 FCOM-G0-03-05-15-030-015

GENERAL

The following In Cruise Quick Check tables allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to land.
These tables are established for :
- Cruise Mach number : M.80/M.82/M.84/LR
- Descent profile : Cruise Mach number/300kt/250kt
- Approach and landing : 240 kg or 530 lb – 6 minutes IMC
- ISA
- CG = 37 %
R - Normal air conditioning (Packs NORM/Cargo cooling OFF or Packs LO/Cargo cooling
R NORM)
- Anti ice OFF

Note : *1. In the tables, a "*" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
R *3. For each degree Celsius above ISA apply a fuel correction of*
R *0.010 (kg/°C/NM) × △ISA (°C) × Air Distance (NM)*
R *or 0.022 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)*

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

R The In Cruise Quick Check tables are based on a reference initial weight that may vary from
R page to page.
R The fuel consumption must be corrected when the actual weight is different from the
R reference initial weight.
R If it is lower (or greater) than the reference weight, subtract (or add) the value given in the
R correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

EXAMPLE

In cruise quick check with cruise at M.82
FL390
Actual cruise weight : 200 000 kg
Remaining ground distance : 2500 NM
ISA + 10
Average wind during flight : – 50 kt (head wind)
- Evaluation of air distance to be covered
  - · Using the "Ground Distance Air Distance" conversion table (see 3.05.50 p 3), the corresponding air distance is : 2796 NM (~ 2800 NM)
- Determination of fuel consumption and time for the reference initial weight in cruise.
  - · Enter table on 3.05.20 p 8 with an air distance of 2800 NM and a FL390 for ISA.

  Fuel consumption : 29 486 kg
  Time needed : 6 h 08 min
- Correction due to real in cruise weight of 200 000 kg

  △ fuel consumption : 145 kg per 1000 kg above reference weight

R △ fuel : 143 × (200 – 190) = 1430 kg
- Temperature Correction

  △ fuel consumption : 0.01 (kg/°C/NM) × 10°C × 2800 NM
  △ fuel : + 280 kg

Result :
R Fuel : 29 486 + 1430 + 280 = 31 196 kg
Time : 6 h 08 min

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.80 - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
200	1699 0.36	1594 0.36	1498 0.36	1411 0.36	1332 0.36	1273 0.36	0	0	1
300	2894 0.49	2733 0.49	2588 0.49	2462 0.49	2359 0.49	2301 0.49	2	3	11
400	4087 1.02	3868 1.02	3674 1.02	3510 1.02	3381 1.02	3323 1.02	5	7	16
500	5276 1.14	5000 1.15	4757 1.15	4553 1.15	4398 1.15	4338 1.15	8	11	22
600	6462 1.27	6129 1.28	5836 1.28	5592 1.29	5410 1.29	5346 1.29	11	14	27
700	7645 1.40	7254 1.41	6911 1.41	6628 1.42	6418 1.42	6347 1.42	13	18	33
800	8826 1.53	8376 1.53	7983 1.54	7659 1.55	7421 1.55	7343 1.55	16	21	38
900	10003 2.05	9494 2.06	9052 2.07	8687 2.08	8421 2.08	8332 2.08	18	24	43
1000	11178 2.18	10609 2.19	10117 2.20	9710 2.21	9416 2.21	9316 2.21	21	28	48
1100	12349 2.31	11721 2.32	11178 2.33	10730 2.34	10407 2.34	10293 2.34	23	31	52
1200	13518 2.44	12830 2.45	12236 2.46	11746 2.47	11394 2.47	11264 2.47	26	34	57
1300	14684 2.56	13935 2.58	13291 2.59	12758 3.00	12377 3.00	12230 3.00	28	37	62
1400	15847 3.09	15037 3.11	14343 3.12	13767 3.13	13356 3.13	13190 3.13	31	40	66
1500	17008 3.22	16137 3.24	15391 3.25	14772 3.26	14330 3.26	14144 3.26	33	44	70
1600	18166 3.35	17234 3.36	16436 3.38	15773 3.39	15301 3.39	15093 3.39	36	47	75
1700	19321 3.47	18327 3.49	17479 3.51	16772 3.52	16268 3.52	16037 3.52	38	50	79
1800	20474 4.00	19418 4.02	18518 4.04	17767 4.05	17231 4.05	16977 4.05	40	53	83
1900	21624 4.13	20505 4.15	19554 4.17	18760 4.18	18191 4.18	17913 4.18	42	56	87
2000	22772 4.26	21590 4.28	20587 4.30	19749 4.31	19146 4.31	18845 4.31	45	59	91
2100	23916 4.39	22672 4.41	21616 4.43	20734 4.44	20098 4.44	19771 4.44	47	61	94
2200	25058 4.51	23750 4.54	22643 4.56	21716 4.58	21046 4.58	20692 4.58	49	64	98
2300	26198 5.04	24826 5.07	23667 5.09	22695 5.11	21991 5.11	21609 5.11	51	67	102
2400	27335 5.17	25899 5.19	24687 5.22	23671 5.24	22931 5.24	22521 5.24	53	70	105
2500	28471 5.30	26970 5.32	25705 5.35	24644 5.37	23869 5.37	23429 5.37	55	73	108
2600	29604 5.42	28040 5.45	26720 5.48	25613 5.50	24802 5.50	24332 5.50	57	75	112
2700	30734 5.55	29106 5.58	27733 6.01	26580 6.03	25733 6.03	25231 6.03	59	78	115

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8000 .00000 240 0300350170 0 250169 90179 18590 FCOM–03-05-20-003-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.80 - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 190000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
2800	33113 6.08	31644 6.11	30380 6.14	29447 6.16	28978 6.16	29173 6.16*	75	97	144
2900	34276 6.21	32752 6.24	31440 6.27	30467 6.29	29965 6.29	30151 6.29*	77	100	149
3000	35436 6.34	33857 6.37	32496 6.40	31484 6.42	30947 6.42	31122 6.42*	80	103	153
3100	36593 6.46	34959 6.50	33549 6.53	32496 6.55	31925 6.55	32087 6.55*	82	106	157
3200	37751 6.59	36058 7.03	34598 7.06	33505 7.08	32898 7.08	33046 7.08*	84	109	161
3300	38906 7.12	37153 7.16	35644 7.19	34510 7.21	33866 7.21	34000 7.21*	86	112	165
3400	40058 7.25	38247 7.29	36687 7.32	35511 7.35	34830 7.35	34947 7.35*	89	115	169
3500	41207 7.38	39337 7.41	37728 7.45	36509 7.48	35789 7.48	35890 7.48*	91	117	173
3600	42354 7.50	40424 7.54	38766 7.58	37503 8.01	36745 8.01	36826 8.01*	93	120	176
3700	43497 8.03	41509 8.07	39801 8.11	38495 8.14	37702 8.14	37760 8.14*	95	123	180
3800	44638 8.16	42590 8.20	40833 8.24	39484 8.27	38655 8.27	38690 8.27*	97	126	183
3900	45777 8.29	43668 8.33	41862 8.37	40468 8.40	39604 8.40	39615 8.40*	99	128	187
4000	46912 8.41	44744 8.46	42887 8.50	41450 8.53	40549 8.53	40535 8.53*	101	131	190
4100	48045 8.54	45816 8.59	43910 9.03	42428 9.06	41490 9.06	41450 9.06*	103	134	194
4200	49176 9.07	46886 9.12	44929 9.16	43402 9.19	42427 9.19	42360 9.19*	105	136	197
4300	50306 9.20	47952 9.24	45946 9.29	44374 9.32	43361 9.32	43266 9.32*	107	139	200
4400	51433 9.32	49016 9.37	46959 9.42	45341 9.45	44291 9.45	44167 9.45*	109	141	203
4500	52558 9.45	50077 9.50	47970 9.55	46306 9.58	45216 9.58	45064 9.58*	111	144	206
4600	53680 9.58	51136 10.03	48977 10.08	47268 10.11	46139 10.11	45956 10.11*	113	146	209
4700	54800 10.11	52191 10.16	49982 10.21	48226 10.24	47057 10.24	46844 10.24*	114	148	212
4800	55918 10.23	53244 10.29	50984 10.34	49182 10.37	47972 10.37	47727 10.37*	116	151	215
4900	57033 10.36	54294 10.42	51983 10.47	50135 10.50	48886 10.50	48606 10.50*	118	153	218
5000	58145 10.49	55342 10.55	52980 11.00	51084 11.04	49801 11.04	49482 11.04*	120	155	220
5100	59256 11.02	56387 11.07	53973 11.13	52031 11.17	50713 11.17	50358 11.17*	121	158	223
5200	60363 11.14	57430 11.20	54964 11.26	52975 11.30	51622 11.30	51231 11.30*	123	160	226
5300	61470 11.27	58470 11.33	55953 11.39	53916 11.43	52528 11.43	52099 11.43*	124	162	229

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8000 .00000 240 0300350190 0 250169 90179 18590 FCOM–03-05-20-004-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.80 - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 210000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
5400	65142 11.40	62476 11.46	60243 11.53	58704 11.56	58267 11.55*	58100 11.56*	150	201	262
5500	66274 11.53	63553 11.59	61267 12.06	59688 12.09	59209 12.08*	59028 12.09*	152	203	265
5600	67403 12.06	64627 12.12	62292 12.19	60668 12.22	60147 12.21*	59952 12.22*	154	205	269
5700	68529 12.19	65698 12.25	63313 12.32	61646 12.35	61081 12.35*	60871 12.35*	156	207	272
5800	69652 12.31	66767 12.38	64332 12.45	62622 12.48	62012 12.48*	61786 12.48*	158	209	275
5900	70773 12.44	67833 12.51	65347 12.58	63595 13.01	62947 13.01*	62695 13.01*	160	212	278
6000	71890 12.57	68895 13.04	66360 13.11	64564 13.14	63877 13.14*	63600 13.14*	162	214	281
6100	73005 13.10	69955 13.16	67370 13.24	65530 13.27	64805 13.27*	64500 13.27*	163	216	284
6200	74117 13.22	71012 13.29	68377 13.37	66493 13.40	65728 13.40*	65396 13.41*	165	218	287
6300	75226 13.35	72066 13.42	69380 13.50	67453 13.54	66649 13.53*	66288 13.54*	167	220	290
6400	76339 13.48	73118 13.55	70381 14.03	68409 14.07	67565 14.06*	67176 14.07*	168	223	292
6500	77450 14.01	74166 14.08	71379 14.15	69363 14.20	68479 14.19*	68059 14.20*	170	225	295
6600	78559 14.13	75212 14.21	72374 14.28	70313 14.33	69388 14.32*	68938 14.33*	172	227	297
6700	79665 14.26	76257 14.34	73366 14.41	71260 14.46	70294 14.45*	69813 14.46*	173	229	300
6800	80768 14.39	77299 14.47	74355 14.54	72204 14.59	71197 14.58*	70683 14.59*	175	231	303
6900	81869 14.52	78338 15.00	75342 15.07	73145 15.12	72096 15.11*	71549 15.12*	177	233	305
7000	82967 15.04	79375 15.12	76328 15.20	74083 15.25	72991 15.24*	72414 15.25*	178	235	307
7100	84063 15.17	80409 15.25	77313 15.33	75018 15.38	73884 15.37*	73279 15.38*	180	236	310
7200	85157 15.30	81440 15.38	78294 15.46	75951 15.51	74773 15.50*	74141 15.51*	181	238	312
7300	86249 15.43	82469 15.51	79273 15.59	76881 16.04	75658 16.03*	74999 16.04*	183	240	315
7400	87338 15.56	83496 16.04	80249 16.12	77808 16.17	76548 16.17*	75854 16.17*	184	242	317
7500	88425 16.08	84519 16.17	81222 16.25	78733 16.30	77436 16.30*	76705 16.30*	186	244	319
7600	89510 16.21	85541 16.30	82193 16.38	79654 16.43	78322 16.43*	77552 16.43*	187	246	321
7700	90596 16.34	86561 16.43	83161 16.51	80573 16.56	79204 16.56*	78396 16.56*	188	248	323
7800	91680 16.47	87577 16.55	84127 17.04	81489 17.09	80084 17.09*	79237 17.09*	189	250	326
7900	92762 16.59	88592 17.08	85090 17.17	82402 17.22	80961 17.22*	80074 17.23*	191	252	328

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8000 .00000 240 0300350210 0 250169 90179 18590 FCOM–03-05-20-005-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.82 - DESCENT : M.82/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
200	1729 0.36	1617 0.36	1515 0.36	1425 0.36	1346 0.36	1278 0.36	0	0	0
300	2971 0.48	2793 0.48	2634 0.49	2503 0.49	2396 0.49	2318 0.49	1	3	5
400	4210 1.01	3967 1.01	3750 1.01	3576 1.01	3441 1.01	3351 1.01	4	7	10
500	5446 1.13	5137 1.14	4862 1.14	4645 1.14	4482 1.14	4379 1.14	7	10	21
600	6679 1.26	6304 1.26	5970 1.27	5709 1.27	5517 1.27	5400 1.27	9	13	26
700	7909 1.38	7468 1.39	7076 1.39	6770 1.40	6547 1.40	6415 1.40	11	17	31
800	9136 1.50	8629 1.51	8179 1.52	7827 1.52	7573 1.52	7425 1.52	14	20	36
900	10360 2.03	9787 2.04	9278 2.05	8879 2.05	8595 2.05	8430 2.05	16	23	40
1000	11581 2.15	10942 2.16	10374 2.17	9928 2.18	9612 2.18	9429 2.18	19	26	45
1100	12800 2.28	12094 2.29	11467 2.30	10973 2.31	10625 2.31	10423 2.31	21	29	49
1200	14015 2.40	13243 2.41	12557 2.43	12014 2.43	11633 2.43	11411 2.43	23	32	54
1300	15228 2.53	14389 2.54	13644 2.55	13052 2.56	12637 2.56	12394 2.56	26	35	58
1400	16438 3.05	15532 3.07	14728 3.08	14085 3.09	13636 3.09	13372 3.09	28	38	62
1500	17646 3.18	16673 3.19	15809 3.21	15115 3.22	14632 3.22	14345 3.22	30	41	67
1600	18852 3.30	17811 3.32	16887 3.33	16141 3.34	15623 3.34	15313 3.34	32	44	71
1700	20055 3.42	18947 3.44	17963 3.46	17165 3.47	16611 3.47	16277 3.47	34	47	75
1800	21255 3.55	20079 3.57	19035 3.59	18184 4.00	17597 4.00	17239 4.00	37	49	79
1900	22452 4.07	21209 4.09	20105 4.11	19200 4.13	18578 4.13	18196 4.13	39	52	83
2000	23647 4.20	22336 4.22	21172 4.24	20213 4.25	19556 4.25	19148 4.25	41	55	86
2100	24839 4.32	23460 4.35	22236 4.37	21222 4.38	20530 4.38	20097 4.38	43	57	90
2200	26029 4.45	24582 4.47	23297 4.49	22228 4.51	21501 4.51	21041 4.51	45	60	93
2300	27217 4.57	25701 5.00	24355 5.02	23230 5.04	22467 5.04	21981 5.04	47	62	97
2400	28403 5.10	26818 5.12	25410 5.15	24229 5.16	23430 5.16	22916 5.16	49	65	101
2500	29586 5.22	27932 5.25	26463 5.27	25225 5.29	24390 5.29	23848 5.29	51	67	104
2600	30768 5.35	29043 5.37	27513 5.40	26218 5.42	25346 5.42	24775 5.42	53	69	107
2700	31947 5.47	30153 5.50	28561 5.53	27211 5.55	26298 5.55	25699 5.55	55	72	111

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8200 .00000 240 0300350170 0 250169 90179 18590 FCOM–03-05-20-007-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.82 - DESCENT : M.82/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 190000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
2800	34285 6.00	32562 6.03	31104 6.06	30079 6.08	29486 6.08	29566 6.08*	67	96	143
2900	35496 6.12	33708 6.15	32190 6.19	31123 6.20	30500 6.20	30558 6.20*	69	98	147
3000	36704 6.25	34852 6.28	33271 6.31	32164 6.33	31509 6.33	31544 6.33*	71	101	151
3100	37910 6.37	35992 6.40	34350 6.44	33200 6.46	32513 6.46	32525 6.46*	74	104	155
3200	39114 6.50	37130 6.53	35424 6.57	34232 6.59	33514 6.59	33501 6.59*	76	106	159
3300	40314 7.02	38266 7.06	36495 7.09	35261 7.11	34510 7.11	34471 7.11*	78	109	163
3400	41512 7.14	39399 7.18	37569 7.22	36286 7.24	35502 7.24	35438 7.24*	80	112	166
3500	42707 7.27	40529 7.31	38641 7.35	37308 7.37	36489 7.37	36402 7.37*	82	114	170
3600	43899 7.39	41657 7.43	39709 7.47	38326 7.49	37470 7.49	37361 7.49*	84	117	174
3700	45089 7.52	42781 7.56	40775 8.00	39341 8.02	38447 8.02	38317 8.02*	86	119	177
3800	46276 8.04	43903 8.08	41837 8.13	40353 8.15	39420 8.15	39267 8.15*	88	121	181
3900	47460 8.17	45021 8.21	42897 8.25	41361 8.28	40389 8.28	40213 8.28*	90	124	184
4000	48641 8.29	46137 8.33	43953 8.38	42365 8.40	41354 8.40	41155 8.40*	92	126	187
4100	49822 8.42	47251 8.46	45007 8.51	43366 8.53	42314 8.53	42093 8.53*	93	128	191
4200	51000 8.54	48361 8.59	46057 9.03	44364 9.06	43271 9.06	43025 9.06*	95	131	194
4300	52175 9.06	49470 9.11	47105 9.16	45358 9.19	44224 9.19	43954 9.19*	97	133	197
4400	53348 9.19	50577 9.24	48150 9.29	46349 9.31	45173 9.31	44879 9.31*	99	135	200
4500	54518 9.31	51681 9.36	49194 9.41	47336 9.44	46118 9.44	45799 9.44*	101	137	203
4600	55687 9.44	52783 9.49	50236 9.54	48321 9.57	47060 9.57	46715 9.57*	102	139	206
4700	56852 9.56	53882 10.01	51276 10.07	49302 10.10	47998 10.10	47629 10.10*	104	141	209
4800	58016 10.09	54978 10.14	52313 10.19	50281 10.22	48934 10.22	48539 10.22*	106	143	212
4900	59176 10.21	56073 10.27	53348 10.32	51256 10.35	49872 10.35	49445 10.35*	108	145	215
5000	60335 10.34	57165 10.39	54380 10.45	52229 10.48	50807 10.48	50347 10.48*	109	147	218
5100	61493 10.46	58254 10.52	55410 10.57	53198 11.01	51738 11.01	51246 11.01*	111	149	221
5200	62649 10.58	59341 11.04	56437 11.10	54164 11.13	52666 11.13	52140 11.13*	113	151	223
5300	63803 11.11	60425 11.17	57462 11.23	55128 11.26	53591 11.26	53032 11.26*	114	153	226

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8200 .00000 240 0300350190 0 250169 90179 18590 FCOM–03-05-20-008-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.82 - DESCENT : M.82/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 210000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
5400	67321 11.24	64148 11.30	61617 11.36	59872 11.39	59346 11.38*	58919 11.39*	135	200	257
5500	68501 11.36	65264 11.42	62667 11.48	60872 11.52	60314 11.51*	59867 11.52*	137	202	261
5600	69679 11.49	66378 11.55	63714 12.01	61875 12.05	61279 12.04*	60810 12.05*	139	204	264
5700	70855 12.01	67490 12.07	64758 12.14	62877 12.17	62240 12.17*	61750 12.17*	141	206	267
5800	72027 12.14	68598 12.20	65799 12.26	63875 12.30	63197 12.29*	62685 12.30*	142	208	270
5900	73197 12.26	69704 12.32	66837 12.39	64871 12.43	64150 12.42*	63616 12.43*	144	210	273
6000	74364 12.38	70807 12.45	67872 12.52	65863 12.56	65100 12.55*	64542 12.56*	146	212	276
6100	75529 12.51	71908 12.58	68904 13.04	66852 13.08	66045 13.07*	65465 13.08*	147	214	280
6200	76693 13.03	73005 13.10	69933 13.17	67838 13.21	66987 13.20*	66384 13.21*	149	215	282
6300	77854 13.16	74100 13.23	70958 13.30	68820 13.34	67925 13.33*	67299 13.34*	151	217	285
6400	79012 13.28	75193 13.35	71981 13.42	69799 13.46	68860 13.46*	68210 13.47*	152	219	288
6500	80168 13.41	76284 13.48	73000 13.55	70775 13.59	69791 13.58*	69117 13.59*	154	220	290
6600	81322 13.53	77373 14.00	74016 14.08	71748 14.12	70719 14.11*	70020 14.12*	155	222	293
6700	82473 14.06	78459 14.13	75030 14.20	72718 14.25	71643 14.24*	70919 14.25*	157	224	295
6800	83622 14.18	79543 14.25	76050 14.33	73685 14.37	72563 14.37*	71815 14.37*	158	225	298
6900	84768 14.30	80624 14.38	77072 14.46	74648 14.50	73483 14.49*	72707 14.50*	160	227	300
7000	85913 14.43	81703 14.51	78090 14.58	75609 15.03	74406 15.02*	73595 15.03*	161	229	303
7100	87055 14.55	82779 15.03	79106 15.11	76567 15.16	75325 15.15*	74479 15.16*	163	230	305
7200	88194 15.08	83853 15.16	80119 15.24	77522 15.28	76242 15.28*	75360 15.28*	164	232	308
7300	89331 15.20	84925 15.28	81130 15.37	78474 15.41	77155 15.40*	76237 15.41*	166	234	310
7400	90470 15.33	85994 15.41	82138 15.49	79423 15.54	78065 15.53*	77111 15.54*	167	235	312
7500	91606 15.45	87061 15.53	83144 16.02	80370 16.07	78973 16.06*	77981 16.07*	168	237	315
7600	92739 15.58	88126 16.06	84147 16.15	81313 16.19	79877 16.19*	78848 16.19*	169	238	317
7700	93871 16.10	89188 16.18	85148 16.27	82254 16.32	80778 16.31*	79712 16.32*	171	240	319
7800	95000 16.22	90251 16.31	86147 16.40	83191 16.45	81676 16.44*	80572 16.45*	172	241	321
7900	96127 16.35	91312 16.44	87143 16.53	84126 16.58	82571 16.57*	81429 16.58*	173	243	323

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
ΔFUEL = – 0.5 %	ΔFUEL = + 1 %	ΔFUEL = + 1.5 %	ΔFUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8200 .00000 240 0300350210 0 250169 90179 18590 FCOM–03-05-20-009-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.82 - DESCENT : M.82/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 230000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 37.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
8000	100810 16.48	96345 16.57	92991 17.06	91093 17.09*	89933 17.09*	89455 17.09*	204	297	353
8100	101959 17.00	97430 17.09	94006 17.18	92064 17.21*	90865 17.22*	90357 17.21*	205	299	356
8200	103104 17.13	98512 17.22	95018 17.31	93033 17.34*	91793 17.34*	91256 17.34*	207	301	358
8300	104247 17.25	99592 17.34	96027 17.44	93999 17.47*	92718 17.47*	92151 17.47*	208	302	361
8400	105388 17.37	100670 17.47	97033 17.56	94961 18.00*	93639 18.00*	93042 18.00*	209	304	363
8500	106527 17.50	101745 17.59	98036 18.09	95921 18.12*	94557 18.13*	93929 18.12*	210	306	365
8600	107666 18.02	102817 18.12	99036 18.22	96877 18.25*	95472 18.25*	94813 18.25*	211	307	368
8700	108803 18.15	103887 18.24	100034 18.34	97830 18.38*	96384 18.38*	95693 18.38*	212	309	370
8800	109938 18.27	104954 18.37	101029 18.47	98781 18.51*	97292 18.51*	96569 18.51*	214	311	372
8900	111070 18.40	106019 18.50	102021 19.00	99729 19.03*	98197 19.04*	97442 19.03*	215	312	374
9000	112199 18.52	107084 19.02	103011 19.12	100674 19.16*	99099 19.16*	98312 19.16*	216	314	376
9100	113327 19.05	108147 19.15	103997 19.25	101617 19.29*	99999 19.29*	99179 19.29*	217	316	378
9200	114452 19.17	109208 19.27	104981 19.38	102556 19.42*	100895 19.42*	100043 19.42*	215	318	380
9300	115574 19.29	110267 19.40	105962 19.50	103493 19.54*	101788 19.54*	100903 19.54*	216	319	382
9400		111323 19.52	106947 20.03	104427 20.07*	102681 20.07*	101762 20.07*	233	320	384
9500		112377 20.05	107931 20.16	105358 20.20*	103575 20.20*	102619 20.20*	234	322	386
9600		113428 20.17	108914 20.28	106286 20.33*	104466 20.33*	103474 20.33*	235	323	388
9700		114477 20.30	109893 20.41	107212 20.45*	105354 20.45*	104325 20.45*	229	324	389
9800		115524 20.43	110871 20.54	108136 20.58*	106240 20.58*	105173 20.58*	230	325	391
9900			111845 21.06	109057 21.11*	107123 21.11*	106018 21.11*		326	393
10000			112818 21.19	109976 21.23*	108003 21.24*	106860 21.24*		313	395
10100			113787 21.32	110892 21.36*	108880 21.36*	107700 21.36*		314	397
10200			114755 21.44	111806 21.49*	109754 21.49*	108536 21.49*		315	399
10300			115719 21.57	112717 22.02*	110626 22.02*	109369 22.02*		313	401
10400				113625 22.14*	111495 22.15*	110200 22.14*		354	403
10500				114531 22.27*	112362 22.27*	111027 22.27*		355	397

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8200 .00000 240 0300350230 0 250169 90179 18590 FCOM–03-05-20-010-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.84 - DESCENT : M.84/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 37.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
200	1796 0.35	1674 0.36	1567 0.36	1472 0.36	1398 0.36		0	0	0
300	3126 0.48	2929 0.48	2757 0.48	2613 0.48	2517 0.48		1	3	5
400	4453 1.00	4180 1.00	3945 1.00	3749 1.01	3630 1.01		3	7	10
500	5778 1.12	5429 1.12	5128 1.13	4880 1.13	4737 1.13		6	10	30
600	7099 1.24	6673 1.25	6308 1.25	6006 1.25	5837 1.25		8	13	36
700	8418 1.36	7915 1.37	7485 1.38	7129 1.38	6932 1.38		10	17	41
800	9734 1.48	9153 1.49	8658 1.50	8247 1.50	8022 1.50		13	20	46
900	11047 2.01	10388 2.01	9827 2.02	9362 2.03	9106 2.03		15	23	51
1000	12357 2.13	11620 2.14	10994 2.15	10473 2.15	10185 2.15	10467 2.15*	17	26	71
1100	13664 2.25	12849 2.26	12156 2.27	11579 2.28	11259 2.28	11533 2.28*	19	29	77
1200	14969 2.37	14075 2.38	13316 2.39	12681 2.40	12327 2.40	12589 2.40*	21	32	82
1300	16271 2.49	15297 2.50	14472 2.52	13780 2.53	13390 2.53	13637 2.53*	23	35	86
1400	17571 3.01	16517 3.03	15625 3.04	14874 3.05	14448 3.05	14675 3.05*	25	38	91
1500	18869 3.13	17736 3.15	16775 3.17	15965 3.17	15501 3.17	15705 3.17*	27	41	96
1600	20164 3.26	18952 3.27	17922 3.29	17054 3.30	16550 3.30	16727 3.30*	29	43	100
1700	21456 3.38	20165 3.39	19067 3.41	18140 3.42	17594 3.42	17749 3.42*	31	46	104
1800	22746 3.50	21375 3.52	20208 3.54	19223 3.55	18633 3.55	18766 3.55*	33	49	108
1900	24033 4.02	22582 4.04	21345 4.06	20302 4.07	19668 4.07	19776 4.07*	35	51	108
2000	25318 4.14	23787 4.16	22480 4.18	21377 4.20	20697 4.20	20780 4.20*	37	54	112
2100	26600 4.26	24989 4.28	23612 4.31	22449 4.32	21723 4.32	21779 4.32*	39	56	116
2200	27880 4.38	26188 4.41	24740 4.43	23518 4.44	22743 4.44	22772 4.44*	40	58	120
2300	29157 4.51	27386 4.53	25866 4.55	24583 4.57	23760 4.57	23759 4.57*	42	60	124
2400	30433 5.03	28581 5.05	26989 5.08	25645 5.09	24772 5.09	24741 5.09*	44	63	127
2500	31706 5.15	29774 5.18	28110 5.20	26705 5.22	25779 5.22	25717 5.22*	46	65	131
2600	32977 5.27	30965 5.30	29228 5.33	27763 5.34	26782 5.34	26689 5.34*	47	67	135
2700	34245 5.39	32153 5.42	30343 5.45	28819 5.47	27782 5.47	27660 5.47*	49	69	138

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
ΔFUEL = – 0.5 %	ΔFUEL = + 1 %	ΔFUEL = + 1.5 %	ΔFUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8400 .00000 240 0300350170 0 250169 90179 18590 FCOM–03-05-20-011-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.84 - DESCENT : M.84/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 190000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
2800	36544 5.52	34583 5.55	32920 5.58	31805 5.59	31808 5.59*	31763 5.59*	64	108	157
2900	37842 6.04	35802 6.07	34074 6.10	32900 6.12	32870 6.11*	32820 6.12*	66	110	162
3000	39137 6.16	37018 6.19	35224 6.22	33990 6.24	33925 6.24*	33869 6.24*	68	113	167
3100	40430 6.28	38232 6.31	36371 6.35	35075 6.37	34975 6.36*	34910 6.37*	70	115	171
3200	41720 6.40	39443 6.44	37517 6.47	36156 6.49	36025 6.48*	35944 6.49*	72	118	176
3300	43007 6.52	40651 6.56	38660 7.00	37234 7.02	37071 7.01*	36970 7.02*	74	120	180
3400	44291 7.05	41856 7.08	39801 7.12	38310 7.14	38112 7.13*	37990 7.14*	75	123	189
3500	45573 7.17	43058 7.20	40938 7.24	39382 7.26	39149 7.26*	39003 7.26*	77	125	193
3600	46851 7.29	44256 7.33	42072 7.37	40449 7.39	40181 7.38*	40010 7.39*	79	127	198
3700	48127 7.41	45452 7.45	43202 7.49	41512 7.51	41209 7.51*	41009 7.51*	81	129	201
3800	49402 7.53	46645 7.57	44330 8.01	42571 8.04	42231 8.03*	42002 8.04*	82	132	205
3900	50675 8.05	47834 8.09	45454 8.14	43626 8.16	43250 8.15*	42988 8.16*	84	134	209
4000	51946 8.17	49022 8.22	46575 8.26	44677 8.29	44264 8.28*	43975 8.29*	85	136	213
4100	53214 8.30	50210 8.34	47693 8.38	45724 8.41	45273 8.40*	44959 8.41*	87	137	216
4200	54480 8.42	51395 8.46	48808 8.51	46767 8.53	46278 8.53*	45938 8.53*	88	139	220
4300	55743 8.54	52577 8.59	49923 9.03	47806 9.06	47279 9.05*	46912 9.06*	90	141	224
4400	57004 9.06	53756 9.11	51034 9.16	48845 9.18	48276 9.18*	47881 9.18*	91	143	227
4500	58263 9.18	54933 9.23	52143 9.28	49890 9.31	49270 9.30*	48845 9.31*	93	145	230
4600	59519 9.30	56108 9.35	53248 9.40	50932 9.43	50259 9.43*	49804 9.43*	94	146	233
4700	60773 9.42	57280 9.48	54351 9.53	51970 9.56	51244 9.55*	50759 9.56*	96	148	236
4800	62027 9.55	58449 10.00	55452 10.05	53005 10.08	52225 10.07*	51709 10.08*	97	150	239
4900	63278 10.07	59616 10.12	56549 10.17	54037 10.20	53202 10.20*	52654 10.20*	98	151	242
5000	64527 10.19	60781 10.24	57644 10.30	55066 10.33	54175 10.32*	53595 10.33*	100	153	245
5100	65774 10.31	61948 10.37	58736 10.42	56091 10.45	55145 10.45*	54532 10.45*	101	154	248
5200	67018 10.43	63112 10.49	59826 10.55	57114 10.58	56111 10.57*	55466 10.58*	102	156	251
5300	68260 10.55	64275 11.01	60913 11.07	58134 11.10	57073 11.10*	56398 11.10*	103	157	253

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8400 .00000 240 0300350190 0 250169 90179 18590 FCOM–03-05-20-012-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : M.84 - DESCENT : M.84/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 230000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	310	**330**	**350**	**370**	**390**	**410**	**FL310 FL330**	**FL350 FL370**	**FL390 FL410**
8000	106975 16.24	101896 16.33	98699 16.39*	96418 16.42*	95525 16.42*	94899 16.42*	210	318	383
8100	108209 16.36	103044 16.45	99782 16.52*	97436 16.55*	96489 16.54*	95832 16.55*	211	319	385
8200	109439 16.48	104189 16.57	100862 17.04*	98450 17.07*	97449 17.07*	96760 17.07*	212	321	387
8300	110667 17.00	105332 17.09	101940 17.16*	99461 17.20*	98405 17.19*	97685 17.20*	213	322	389
8400	111893 17.13	106472 17.22	103015 17.29*	100470 17.32*	99359 17.32*	98606 17.32*	214	323	391
8500	113116 17.25	107613 17.34	104086 17.41*	101475 17.44*	100308 17.44*	99523 17.44*	215	325	393
8600	114337 17.37	108752 17.46	105156 17.53*	102477 17.57*	101254 17.56*	100437 17.57*	211	326	395
8700	115555 17.49	109887 17.58	106222 18.06*	103476 18.09*	102210 18.09*	101346 18.09*	212	327	397
8800		111020 18.11	107292 18.18*	104481 18.22*	103165 18.21*	102255 18.22*	252	329	398
8900		112150 18.23	108359 18.31*	105490 18.34*	104117 18.34*	103161 18.34*	253	330	400
9000		113278 18.35	109424 18.43*	106495 18.47*	105065 18.46*	104065 18.47*	215	331	402
9100		114403 18.47	110486 18.55*	107498 18.59*	106011 18.59*	104965 18.59*	216	332	403
9200		115526 19.00	111545 19.08*	108499 19.11*	106954 19.11*	105861 19.12*	217	333	405
9300			112602 19.20*	109497 19.24*	107894 19.23*	106754 19.24*		335	407
9400			113656 19.32*	110492 19.36*	108831 19.36*	107643 19.36*		333	409
9500			114708 19.45*	111484 19.49*	109765 19.48*	108530 19.49*		335	411
9600			115757 19.57*	112474 20.01*	110696 20.01*	109413 20.01*		325	413
9700				113462 20.14*	111625 20.13*	110292 20.14*		340	415
9800				114447 20.26*	112550 20.26*	111168 20.26*		341	414
9900				115429 20.38*	113473 20.38*	112042 20.39*		342	406
10000					114393 20.50*	112911 20.51*			406
10100					115311 21.03*	113778 21.03*			406
10200						114641 21.16*			420
10300						115502 21.28*			420
10400									
10500									

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 1.5 %	△FUEL = + 3 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8400 .00000 240 0300350230 0 250169 90179 18590 FCOM–03-05-20-014-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
200	1648 0.37	1570 0.37	1490 0.36	1413 0.36	1340 0.36	1280 0.36	1	0	1
300	2786 0.51	2680 0.50	2569 0.50	2466 0.49	2377 0.49	2321 0.49	5	5	7
400	3920 1.05	3786 1.03	3644 1.03	3515 1.02	3408 1.02	3355 1.02	10	9	13
500	5049 1.20	4887 1.17	4714 1.16	4560 1.15	4434 1.15	4383 1.14	14	13	18
600	6173 1.34	5984 1.30	5780 1.29	5600 1.28	5454 1.28	5404 1.27	19	18	24
700	7291 1.48	7075 1.44	6842 1.43	6635 1.41	6469 1.41	6418 1.40	23	22	29
800	8405 2.02	8160 1.58	7900 1.56	7665 1.55	7480 1.54	7425 1.53	27	26	34
900	9513 2.17	9240 2.11	8954 2.09	8691 2.08	8486 2.07	8426 2.05	32	30	39
1000	10617 2.31	10315 2.25	10004 2.22	9713 2.21	9487 2.19	9420 2.18	36	34	45
1100	11715 2.45	11385 2.39	11050 2.36	10730 2.34	10484 2.32	10407 2.31	40	38	50
1200	12809 3.00	12450 2.53	12093 2.49	11742 2.47	11476 2.45	11389 2.44	44	43	55
1300	13898 3.14	13510 3.07	13131 3.02	12750 3.00	12463 2.58	12364 2.57	49	47	60
1400	14983 3.29	14566 3.21	14166 3.16	13754 3.13	13446 3.11	13334 3.09	53	51	65
1500	16063 3.44	15617 3.35	15197 3.29	14754 3.27	14425 3.24	14298 3.22	57	55	70
1600	17138 3.58	16665 3.50	16224 3.42	15750 3.40	15399 3.37	15256 3.35	61	59	75
1700	18207 4.13	17708 4.04	17241 3.56	16742 3.53	16369 3.50	16208 3.48	65	63	80
1800	19272 4.28	18747 4.18	18255 4.09	17731 4.06	17334 4.03	17159 4.01	69	67	84
1900	20333 4.42	19782 4.32	19264 4.23	18715 4.20	18295 4.16	18105 4.14	74	71	89
2000	21389 4.57	20812 4.47	20268 4.36	19696 4.33	19252 4.29	19046 4.27	78	74	93
2100	22440 5.12	21839 5.01	21269 4.50	20672 4.46	20205 4.42	19982 4.40	82	78	97
2200	23487 5.27	22861 5.15	22265 5.04	21645 4.59	21154 4.55	20913 4.52	86	82	102
2300	24530 5.42	23879 5.30	23257 5.17	22614 5.13	22098 5.08	21839 5.05	90	86	106
2400	25569 5.57	24893 5.45	24246 5.31	23580 5.26	23039 5.21	22761 5.18	94	90	110
2500	26604 6.12	25903 5.59	25230 5.45	24542 5.39	23976 5.35	23678 5.31	98	94	114
2600	27636 6.27	26906 6.14	26210 5.58	25500 5.53	24908 5.48	24590 5.44	101	98	118
2700	28664 6.42	27906 6.28	27188 6.12	26453 6.06	25837 6.01	25498 5.57	105	102	121

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8001 .00000 240 0300350170 0 250169 90179 18590 FCOM–03-05-20-015-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 190000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
2800	31905 6.35	31093 6.21	30253 6.17	29589 6.13	29283 6.10	29404 6.10*	108	112	148
2900	33003 6.50	32165 6.35	31298 6.31	30607 6.27	30280 6.23	30391 6.23*	112	115	153
3000	34097 7.04	33234 6.48	32339 6.44	31620 6.40	31272 6.36	31372 6.36*	116	119	157
3100	35186 7.19	34298 7.02	33376 6.57	32630 6.53	32259 6.49	32348 6.49*	120	123	162
3200	36272 7.34	35358 7.15	34410 7.11	33635 7.06	33241 7.02	33319 7.02*	124	126	166
3300	37350 7.48	36415 7.29	35439 7.24	34636 7.19	34219 7.15	34285 7.14*	128	130	170
3400	38423 8.03	37462 7.43	36465 7.37	35633 7.32	35192 7.28	35245 7.27*	132	133	174
3500	39492 8.18	38505 7.57	37483 7.51	36626 7.45	36160 7.40	36200 7.40*	136	137	178
3600	40557 8.33	39544 8.11	38498 8.04	37616 7.59	37124 7.53	37149 7.53*	140	140	182
3700	41618 8.48	40579 8.25	39509 8.18	38603 8.12	38084 8.06	38094 8.06*	144	143	186
3800	42675 9.02	41610 8.39	40515 8.31	39585 8.25	39039 8.19	39034 8.19*	148	147	190
3900	43728 9.17	42637 8.53	41518 8.45	40564 8.38	39990 8.32	39969 8.32*	153	150	194
4000	44776 9.32	43660 9.07	42518 8.58	41540 8.51	40936 8.45	40899 8.45*	156	153	198
4100	45821 9.47	44679 9.22	43513 9.12	42511 9.04	41878 8.58	41824 8.57*	160	157	202
4200	46862 10.02	45694 9.36	44505 9.25	43479 9.18	42816 9.11	42744 9.10*	164	161	205
4300	47899 10.18	46706 9.50	45493 9.39	44443 9.31	43750 9.24	43659 9.23*	168	164	209
4400	48930 10.33	47713 10.04	46478 9.53	45404 9.44	44680 9.37	44572 9.36*	172	167	212
4500	49953 10.48	48717 10.19	47459 10.06	46361 9.57	45606 9.50	45479 9.49*	175	171	216
4600	50971 11.03	49714 10.33	48437 10.20	47314 10.10	46528 10.03	46383 10.02*	179	174	219
4700	51986 11.18	50708 10.48	49415 10.33	48264 10.24	47446 10.16	47282 10.15*	183	178	223
4800	52997 11.33	51699 11.03	50390 10.47	49209 10.37	48360 10.29	48176 10.28*	187	181	226
4900	54004 11.48	52685 11.18	51362 11.00	50150 10.50	49274 10.42	49067 10.41*	190	184	229
5000	55008 12.04	53668 11.33	52331 11.14	51087 11.04	50185 10.56	49953 10.54*	194	188	232
5100	56008 12.19	54648 11.48	53297 11.27	52021 11.17	51092 11.09	50835 11.07*	198	191	235
5200	57005 12.34	55625 12.03	54260 11.41	52951 11.31	51996 11.22	51713 11.20*	201	194	239
5300	57998 12.50	56598 12.18	55219 11.54	53878 11.44	52896 11.35	52587 11.33*	205	198	242

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8001 .00000 240 0300350190 0 250169 90179 18590 FCOM–03-05-20-016-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 210000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
5400	63170 12.21	61688 12.01	60153 11.55	59089 11.48	58805 11.46*	58631 11.43*	204	224	263
5500	64226 12.36	62722 12.15	61160 12.08	60068 12.02	59757 11.59*	59568 11.56*	207	227	267
5600	65279 12.51	63751 12.28	62166 12.22	61042 12.15	60704 12.11*	60501 12.09*	211	230	270
5700	66329 13.06	64778 12.42	63168 12.35	62015 12.28	61647 12.24*	61429 12.21*	215	233	273
5800	67374 13.21	65801 12.56	64167 12.49	62984 12.41	62586 12.37*	62352 12.34*	218	236	277
5900	68416 13.36	66821 13.10	65163 13.02	63950 12.54	63521 12.50*	63270 12.47*	222	239	280
6000	69455 13.52	67837 13.23	66156 13.16	64912 13.07	64452 13.03*	64184 13.00*	225	242	283
6100	70489 14.07	68849 13.37	67145 13.29	65871 13.21	65378 13.16*	65093 13.13*	229	245	286
6200	71521 14.23	69858 13.51	68131 13.43	66827 13.34	66302 13.30*	65998 13.26*	232	247	290
6300	72548 14.38	70864 14.05	69114 13.56	67779 13.47	67220 13.43*	66899 13.39*	236	250	293
6400	73573 14.54	71866 14.19	70093 14.10	68727 14.00	68136 13.56*	67795 13.52*	240	253	296
6500	74593 15.09	72865 14.33	71069 14.23	69673 14.13	69052 14.09*	68687 14.05*	244	255	299
6600	75608 15.25	73861 14.47	72042 14.37	70614 14.27	69964 14.22*	69575 14.18*	248	258	302
6700	76614 15.40	74854 15.01	73012 14.50	71553 14.40	70873 14.35*	70458 14.31*	252	261	305
6800	77617 15.56	75837 15.15	73978 15.04	72488 14.53	71778 14.48*	71336 14.44*	255	264	308
6900	78616 16.11	76812 15.29	74942 15.17	73420 15.06	72679 15.01*	72211 14.57*	259	266	310
7000	79612 16.27	77784 15.44	75897 15.31	74348 15.20	73578 15.14*	73081 15.10*	263	269	313
7100	80605 16.42	78753 15.58	76846 15.45	75274 15.33	74472 15.27*	73947 15.23*	267	272	316
7200	81594 16.58	79719 16.13	77792 15.58	76195 15.46	75363 15.41*	74810 15.36*	270	274	319
7300	82580 17.13	80681 16.28	78734 16.12	77112 16.00	76251 15.54*	75668 15.49*	273	277	322
7400	83562 17.29	81640 16.42	79674 16.26	78026 16.13	77136 16.07*	76523 16.02*	276	280	324
7500	84542 17.45	82596 16.57	80610 16.40	78937 16.26	78017 16.20*	77374 16.15*	280	282	327
7600	85518 18.01	83548 17.12	81544 16.53	79845 16.39	78895 16.33*	78221 16.28*	283	285	330
7700	86492 18.16	84498 17.26	82474 17.07	80750 16.53	79770 16.47*	79065 16.41*	286	288	332
7800	87462 18.32	85445 17.41	83402 17.21	81652 17.06	80641 17.00*	79905 16.54*	289	290	334
7900	88429 18.48	86389 17.56	84326 17.35	82551 17.19	81509 17.13*	80741 17.07*	293	293	337

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8001 .00000 240 0300350210 0 250169 90179 18590 FCOM–03-05-20-017-015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING
CRUISE : LONG RANGE - DESCENT : M.80/300KT/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 230000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG = 37.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 310	330	350	370	390	410	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL310 FL330	FL350 FL370	FL390 FL410
8000	95301 18.00	93075 17.41	91115 17.30	89880 17.24*	89075 17.19*	88872 17.16*	288	314	358
8100	96320 18.15	94082 17.55	92087 17.43	90821 17.37*	89987 17.33*	89758 17.29*	292	317	361
8200	97336 18.30	95086 18.08	93056 17.57	91758 17.51*	90895 17.46*	90639 17.42*	295	319	363
8300	98349 18.46	96087 18.22	94023 18.10	92693 18.04*	91800 17.59*	91517 17.55*	298	322	366
8400	99360 19.01	97085 18.35	94986 18.24	93624 18.17*	92701 18.12*	92391 18.08*	301	324	369
8500	100367 19.16	98080 18.49	95945 18.37	94552 18.30*	93599 18.25*	93260 18.21*	304	327	371
8600	101371 19.31	99072 19.02	96902 18.51	95476 18.44*	94493 18.38*	94125 18.34*	307	329	374
8700	102372 19.47	100062 19.16	97856 19.04	96397 18.57*	95384 18.51*	94987 18.47*	311	331	376
8800	103370 20.02	101048 19.29	98807 19.18	97316 19.10*	96272 19.04*	95845 19.00*	314	334	379
8900	104365 20.17	102032 19.43	99755 19.31	98231 19.23*	97156 19.17*	96699 19.13*	317	336	381
9000	105356 20.33	103013 19.57	100701 19.45	99143 19.37*	98037 19.30*	97549 19.26*	320	339	383
9100	106344 20.48	103991 20.10	101643 19.58	100053 19.50*	98915 19.43*	98396 19.39*	323	341	385
9200	107320 21.04	104966 20.24	102583 20.12	100959 20.03*	99790 19.57*	99239 19.52*	326	343	388
9300	108292 21.20	105939 20.37	103519 20.25	101863 20.17*	100661 20.10*	100079 20.05*	329	346	390
9400	109261 21.36	106899 20.51	104453 20.39	102763 20.30*	101530 20.23*	100921 20.19*	333	348	392
9500	110227 21.52	107851 21.05	105384 20.53	103661 20.43*	102396 20.36*	101761 20.32*	336	350	394
9600	111190 22.08	108800 21.20	106312 21.06	104555 20.57*	103258 20.49*	102598 20.45*	340	353	396
9700	112150 22.25	109746 21.34	107233 21.20	105445 21.10*	104118 21.02*	103431 20.58*	343	355	398
9800	113107 22.41	110689 21.48	108151 21.34	106329 21.24*	104974 21.16*	104262 21.11*	347	357	400
9900	114061 22.57	111629 22.02	109066 21.48	107211 21.37*	105828 21.29*	105089 21.24*	351	359	402
10000	115013 23.13	112566 22.16	109978 22.01	108090 21.51*	106678 21.42*	105913 21.37*	354	362	404
10100	115961 23.30	113501 22.31	110887 22.15	108966 22.04*	107526 21.56*	106733 21.50*	361	364	406
10200		114433 22.45	111794 22.29	109839 22.18*	108371 22.09*	107551 22.03*	362	366	408
10300		115362 22.59	112698 22.43	110709 22.31*	109212 22.22*	108366 22.16*	366	365	411
10400			113600 22.57	111577 22.45*	110051 22.35*	109177 22.29*		366	413
10500			114498 23.10	112442 22.58*	110887 22.49*	109986 22.42*		365	415

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1.5 %	△FUEL = + 3 %	△FUEL = + 5 %

FLIP23D A330–200 CF6–80E1A4 3610 03701.000011 0250300 .8001 .00000 240 0300350230 0 250169 90179 18590 FCOM–03-05-20-018-015

LEFT INTENTIONALLY BLANK

LEFT INTENTIONALLY BLANK

GENERAL

Holding tables contain information about the engine fuel flow that allows the flight crew to plan holding and reserve fuel requirements.
They are established for flight in a race track holding pattern for two different configurations.
· Clean configuration at 210 knots and green dot speed.
· Configuration 1 at 170 knots and S speed.
Green dot speed in clean configuration and S in CONF 1 are speeds between the minimum fuel speed and the minimum drag speed.
R These charts are established with air conditioning in normal mode (Packs NORM/Cargo
R cooling OFF or Packs LO/Cargo cooling NORM) and the center of gravity at 30 %.

R

RACE TRACK HOLDING PATTERN - GREEN DOT SPEED

MAX. CRUISE THRUST LIMITS CLEAN CONFIGURATION NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=30.0%	**N1 (%)** **FF (KG/H/ENG)**

WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200	FL250
130	52.0 1725	54.9 1684	59.5 1646	61.3 1635	63.0 1628	64.8 1623	66.5 1621	68.2 1619	72.7 1620
140	53.9 1837	57.0 1797	61.5 1765	63.2 1758	65.0 1752	66.7 1749	68.5 1749	70.1 1745	74.6 1748
150	55.8 1949	59.0 1918	63.4 1889	65.2 1882	66.8 1879	68.6 1879	70.2 1875	71.9 1873	76.5 1880
160	57.8 2065	60.9 2037	65.2 2013	66.9 2010	68.6 2009	70.3 2006	71.9 2003	73.7 2002	78.2 2018
170	59.5 2185	62.6 2158	66.9 2141	68.5 2139	70.3 2138	71.9 2134	73.6 2133	75.3 2133	79.9 2161
180	61.2 2305	64.1 2283	68.4 2271	70.1 2270	71.7 2266	73.5 2265	75.2 2264	76.9 2266	81.6 2307
190	62.8 2426	65.7 2409	69.9 2403	71.6 2399	73.2 2396	75.0 2396	76.7 2397	78.5 2402	83.1 2460
200	64.2 2551	67.2 2537	71.3 2532	72.9 2529	74.7 2529	76.4 2529	78.2 2532	79.9 2545	84.5 2611
210	65.6 2678	68.6 2668	72.6 2662	74.3 2661	76.0 2661	77.7 2663	79.6 2672	81.3 2691	85.9 2763
220	67.0 2806	69.8 2801	73.9 2794	75.6 2794	77.3 2795	79.1 2800	80.8 2816	82.7 2840	87.2 2917
230	68.3 2937	71.1 2933	75.2 2928	76.9 2928	78.6 2931	80.4 2942	82.1 2964	84.0 2993	88.5 3080
240	69.5 3069	72.3 3065	76.4 3062	78.1 3064	79.9 3070	81.6 3089	83.4 3115	85.2 3151	89.7 3246

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**	**per 1° above ISA**
△FF = – 0.4 %	△FF = + 1.5 %	△FF = + 3 %	△FF = + 6 %	△FF = + 0.3 %

<u>Note</u> : Correction for straight line holding : – 4 %

R

RACE TRACK HOLDING PATTERN - 210KT

MAX. CRUISE THRUST LIMITS
CLEAN CONFIGURATION
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=30.0%

N1 (%)
FF (KG/H/ENG)

WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200	FL250
130	53.9 1840	56.8 1795	61.3 1755	63.0 1744	64.7 1734	66.4 1726	68.0 1720	69.6 1716	73.9 1708
140	55.2 1913	58.2 1870	62.6 1835	64.3 1826	66.0 1820	67.7 1813	69.3 1809	70.9 1805	75.3 1800
150	56.5 1993	59.6 1956	63.9 1925	65.7 1920	67.3 1914	69.0 1909	70.6 1906	72.3 1903	76.7 1902
160	58.0 2082	61.1 2050	65.4 2026	67.1 2024	68.8 2020	70.4 2016	72.0 2013	73.8 2011	78.3 2022
170	59.5 2187	62.6 2160	66.9 2143	68.6 2141	70.3 2139	71.9 2135	73.6 2134	75.3 2133	79.9 2156
180	61.1 2301	64.1 2280	68.4 2266	70.1 2267	71.7 2264	73.5 2263	75.2 2263	77.0 2266	81.7 2303
190	62.8 2428	65.7 2414	70.0 2403	71.7 2404	73.3 2404	75.1 2404	76.8 2406	78.7 2414	83.4 2472
200	64.4 2571	67.4 2557	71.6 2549	73.2 2551	75.0 2552	76.7 2553	78.6 2559	80.3 2577	85.2 2649
210	66.0 2722	69.0 2708	73.1 2703	74.9 2706	76.6 2707	78.4 2711	80.2 2727	82.1 2748	87.0 2836
220	67.8 2882	70.6 2868	74.8 2866	76.5 2868	78.2 2870	80.0 2882	81.9 2905	83.8 2934	88.6 3025
230	69.3 3048	72.3 3036	76.4 3037	78.1 3039	79.9 3045	81.7 3066	83.6 3093	85.5 3131	90.0 3192
240	70.9 3222	73.8 3215	77.9 3216	79.7 3218	81.5 3235	83.3 3258	84.9 3256	86.6 3273	91.3 3361

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	per 1° above ISA
ΔFF = – 0.3 %	ΔFF = + 1.5 %	ΔFF = + 3 %	ΔFF = + 5.5 %	ΔFF = + 0.3 %

Note : Correction for straight line holding : – 3 %

R

RACE TRACK HOLDING PATTERN - S SPEED

MAX. CRUISE THRUST LIMITS
CONFIGURATION 1
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG=30.0%

N1 (%)
FF (KG/H/ENG)

WEIGHT (1000KG)	**FL 15**	**FL 50**	**FL100**	**FL120**	**FL140**	**FL150**	**FL160**	**FL180**	**FL200**
130	55.4 1914	58.6 1877	63.1 1867	65.1 1870	66.9 1871	67.8 1870	68.7 1870	70.5 1873	72.4 1881
140	57.7 2047	60.9 2023	65.5 2027	67.2 2029	69.1 2028	70.0 2028	70.9 2031	72.7 2039	74.4 2038
150	59.8 2189	63.0 2179	67.5 2187	69.4 2185	71.1 2188	72.0 2192	72.9 2197	74.6 2195	76.4 2193
160	61.9 2336	64.9 2338	69.5 2343	71.2 2345	73.0 2354	73.9 2352	74.8 2351	76.4 2349	78.3 2349
170	63.7 2494	66.9 2501	71.3 2502	73.0 2511	74.8 2508	75.6 2507	76.4 2506	78.2 2504	79.9 2510
180	65.4 2654	68.6 2662	73.0 2668	74.7 2664	76.3 2662	77.2 2661	78.1 2660	79.8 2663	81.6 2671
190	67.2 2817	70.2 2819	74.5 2821	76.2 2818	77.8 2816	78.8 2815	79.6 2817	81.3 2824	83.1 2832
200	68.7 2981	71.8 2978	75.9 2970	77.5 2968	79.3 2966	80.1 2968	81.0 2971	82.7 2976	84.5 2994
210	70.2 3138	73.2 3131	77.2 3122	78.9 3120	80.6 3121	81.5 3125	82.3 3126	84.1 3135	85.8 3156
220	71.6 3297	74.4 3281	78.5 3274	80.3 3271	81.9 3275	82.7 3276	83.6 3279	85.3 3298	87.1 3316
230	72.9 3445	75.7 3434	79.8 3428	81.4 3427	83.1 3429	84.0 3432	84.8 3441	86.5 3462	88.3 3479
240	74.1 3598	76.9 3592	81.0 3583	82.6 3583	84.3 3589	85.2 3598	86.0 3610	87.8 3626	89.5 3650

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**	**per 1° above ISA**
ΔFF = – 0.3 %	ΔFF = + 1 %	ΔFF = + 3 %	ΔFF = + 5 %	ΔFF = + 0.3 %

Note : Correction for straight line holding : – 3 %

R

RACE TRACK HOLDING PATTERN - 170KT

MAX. CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=30.0%	**N1 (%)** **FF (KG/H/ENG)**

WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL150	FL160	FL180	FL200
130	55.8 1938	58.9 1900	63.4 1890	65.3 1889	67.1 1887	67.9 1883	68.8 1879	70.4 1874	72.2 1871
140	57.7 2051	60.9 2026	65.5 2028	67.2 2026	69.1 2027	69.9 2023	70.7 2020	72.4 2017	74.1 2016
150	59.8 2185	62.9 2176	67.4 2180	69.3 2179	71.0 2182	71.8 2181	72.7 2179	74.4 2177	76.1 2174
160	61.9 2337	64.9 2339	69.5 2345	71.3 2347	73.1 2356	74.0 2355	74.8 2354	76.5 2352	78.3 2352
170	63.9 2515	67.1 2522	71.6 2526	73.3 2535	75.2 2546	76.0 2546	76.9 2546	78.7 2546	80.4 2552
180	66.0 2705	69.1 2710	73.6 2727	75.5 2738	77.3 2753	78.2 2754	79.1 2756	80.8 2761	82.6 2770
190	68.2 2912	71.3 2915	75.8 2942	77.5 2960	79.5 2982	80.4 2986	81.2 2989	83.0 2998	84.9 3019
200	70.2 3129	73.3 3140	77.8 3183	79.8 3205	81.6 3233	82.6 3238	83.5 3244	85.3 3262	87.2 3285
210	72.4 3363	75.4 3382	80.0 3433	81.8 3460	83.8 3492	84.7 3501	85.6 3512	87.5 3535	89.5 3567
220	74.3 3607	77.5 3636	82.1 3704	84.0 3736	86.0 3784	86.9 3798	87.9 3811	89.8 3844	91.9 3890
230	76.4 3877	79.5 3918	84.2 4001	86.2 4046	88.2 4102	89.2 4119	90.2 4136	92.2 4182	94.6 4238
240	78.4 4162	81.6 4209	86.3 4307	88.3 4362	90.4 4428	91.4 4452	92.4 4477	94.7 4534	97.6 4623

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**	**per 1° above ISA**
△FF = – 0.3 %	△FF = + 1 %	△FF = + 3 %	△FF = + 5 %	△FF = + 0.3 %

Note : Correction for straight line holding : – 3 %

GENERAL

Descent tables are established for normal descent speed M.80/300kt/250kt and emergency descent at MMO/VMO with airbrakes extended down to 1500 feet with:

R · Normal air conditioning (Packs NORM/Cargo cooling OFF or Packs LO/Cargo cooling
R NORM).

· CG = 30 %

· Anti ice OFF

For normal descent cabin vertical speed is limited to 350 feet/minute.

3

DESCENT - M.80/300KT/250KT

IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF	ISA CG=30.0%	MAXIMUM CABIN RATE OF DESCENT 350FT/MIN

WEIGHT (1000KG)	150				200				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
410	20.7	367	128	IDLE					237
390	19.8	354	121	IDLE	23.0	410	141	IDLE	248
370	18.9	341	114	IDLE	22.1	396	134	IDLE	260
350	18.1	329	108	IDLE	21.2	384	127	IDLE	272
330	17.4	318	103	IDLE	20.4	372	121	IDLE	284
310	16.8	309	98	IDLE	19.7	361	115	IDLE	297
290	16.0	297	91	IDLE	18.7	346	108	IDLE	300
270	15.1	283	85	IDLE	17.7	331	100	IDLE	300
250	14.2	269	78	IDLE	16.6	314	92	IDLE	300
240	13.7	262	75	IDLE	16.1	306	88	IDLE	300
220	12.8	248	69	IDLE	15.0	288	81	IDLE	300
200	11.9	232	63	IDLE	13.9	270	73	IDLE	300
180	11.0	216	56	IDLE	12.7	251	66	IDLE	300
160	10.0	200	50	IDLE	11.6	231	58	IDLE	300
140	9.0	182	44	IDLE	10.4	210	51	IDLE	300
120	8.1	164	38	IDLE	9.2	188	44	IDLE	300
100	7.1	146	33	IDLE	8.0	165	37	IDLE	300
50	2.6	56	11	IDLE	2.9	64	13	IDLE	250
15	.0	0	0	IDLE	.0	0	0	IDLE	250

CORRECTIONS	PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	per 1° above ISA
TIME	–	–	+ 10 %	+ 10 %	-
FUEL	– 2 %	+ 4.5 %	+ 60 %	+ 70 %	+ 0.4 %
DISTANCE	–	+ 1 %	+ 13 %	+ 13 %	+ 0.4 %

11.0-08F0A330–200 CF6–80E1A4 23100000C5KG300 0 018590 0 0-1-350 .0 .15 .0 00 0 03 .800300.000250 .000 0 FCOM-G0–03–05–30–002–015

EMERGENCY DESCENT - M.86/330KT									
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=30.0%		**AIRBRAKES EXTENDED**				
WEIGHT (1000KG)	**150**				**200**				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
410	5.6	97	40	IDLE					257
390	5.4	93	38	IDLE	7.0	121	49	IDLE	269
370	5.1	89	35	IDLE	6.7	116	46	IDLE	282
350	4.9	86	34	IDLE	6.4	112	44	IDLE	295
330	4.7	83	32	IDLE	6.1	108	42	IDLE	308
310	4.5	81	31	IDLE	5.9	105	40	IDLE	322
290	4.3	78	29	IDLE	5.6	102	38	IDLE	330
270	4.1	74	27	IDLE	5.3	97	35	IDLE	330
250	3.8	70	25	IDLE	4.9	91	32	IDLE	330
240	3.6	67	24	IDLE	4.7	88	31	IDLE	330
220	3.3	63	21	IDLE	4.4	82	28	IDLE	330
200	3.1	58	19	IDLE	4.0	76	25	IDLE	330
180	2.8	53	17	IDLE	3.6	69	22	IDLE	330
160	2.4	48	15	IDLE	3.2	62	20	IDLE	330
140	2.1	42	13	IDLE	2.8	55	17	IDLE	330
120	1.8	36	11	IDLE	2.4	47	14	IDLE	330
100	1.5	30	9	IDLE	1.9	39	11	IDLE	330
50	.6	13	4	IDLE	.8	17	5	IDLE	330
15	.0	0	0	IDLE	.0	0	0	IDLE	330

11.0-08F0A330–200 CF6–80E1A4 23310000C5KG300 0 018590 0 0-1 .0 .0 .00 0 02 .860330.000 .000 0 FCOM-G0–03–05–30–003–015

GENERAL

In the go around configuration corresponding to the all engine procedure, the minimum steady gradient one engine inoperative required by the regulations is 2.1 % at a speed not exceeding 1.4 Vs. This requirement is also called approach climb performance by regulations.
The following tables allow to determine the go around limiting weight which satisfies the required gradient with the certified go around configurations 3 and 2.
The required gradient of 2.1 % is considered at the airport reference altitude. The power setting is "GO AROUND" thrust with the air conditioning ON. The speed is 1.23 Vs of the specified configuration. For the occasional cases where approach climb performance is found restrictive, a correction is given for an increased speed up to 1.4 Vs.

Note : Landing climb performance (2 engines running) is never limiting.

PROCEDURE

According to airport pressure altitude and temperature determine if the slats/flaps setting must be restricted as a function of the landing weight, in order to meet the go around gradient requirement of 2.1 %.
Establish the final approach configuration with one more step of flaps. If the approach is interrupted, retract the flaps by one step during the go-around.
In case of category II approach, JAR-OPS requires a regulatory approach climb gradient of 2.5 % to be maintained.
Use the tables for CAT II approach to determine the maximum approach climb limiting weight according to airport pressure altitude and temperature.

Note :
1. *If circumstances dictate, landing may be made at a weight corresponding to the maximum structural takeoff weight. (Refer to overweight landing procedure 3.02).*
2. *When icing conditions are predicted during the flight and TAT is less than 10° C and there is evidence of significant ice accretion, to take into account ice formation on the non heated structure :*
   - *decrease the approach climb limiting weight by 5 %.*
   - *increase approach and landing speeds by 5 knots and multiply landing distance by 1.1.*

R 3. *In the following tables corrections for anti-ice are only valid for OAT lower than*
R *10°C.*

APPROACH CLIMB LIMITING WEIGHT (1000 KG) ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Gradient : 2.1% High Air Conditioning Anti Ice OFF V = 1.23 Vs	CONF 2

	PRESSURE ALTITUDE (FT)										
OAT	–2000	0	200	400	600	800	1000	1500	2000	5000	10000	14600
≤ 10	249.3	249.8	248.8	247.8	246.8	245.8	244.7	241.8	238.9	219.0	184.4	150.1
20	248.5	249.0	248.0	247.0	246.0	245.0	244.0	241.1	238.2	218.5	174.5	138.8
22	248.4	248.9	247.9	246.9	245.9	244.9	243.9	241.0	238.1	216.6	171.6	136.9
24	248.2	248.7	247.8	246.8	245.8	244.8	243.7	240.9	238.0	214.7	168.3	135.2
26	248.1	248.6	247.6	246.7	245.7	244.7	243.6	240.7	237.9	212.3	165.1	133.6
28	247.9	248.5	247.5	246.5	245.5	244.5	243.4	239.1	234.7	209.2	162.3	
30	247.7	248.3	246.7	245.0	243.3	241.6	239.8	235.4	230.8	205.8	159.4	
32	247.6	244.8	243.1	241.4	239.7	237.9	236.1	231.6	227.1	202.2	156.5	
34	247.4	241.2	239.4	237.7	235.9	234.2	232.4	227.9	223.3	198.1	153.5	
36	245.4	237.5	235.7	234.0	232.3	230.5	228.7	224.1	219.4	194.7		
38	243.5	234.0	232.2	230.5	228.6	226.8	225.0	220.7	216.6	192.1		
40	241.7	230.4	228.5	226.7	225.0	223.2	221.6	217.5	213.5	189.3		
42	240.1	226.3	224.6	222.9	221.2	219.5	217.9	214.0	209.7	185.8		
44	238.4	222.1	220.4	218.8	217.1	215.5	213.8	209.6	205.3	182.3		
46	233.3	217.7	216.0	214.4	212.7	211.0	209.3	205.1	200.9			
48	228.1	213.3	211.7	210.0	208.3	206.7	205.0	200.6	196.2			
50	223.2	209.0	207.2	205.4	203.6	201.9	200.1	195.8	191.6			
52	218.8	203.9	202.2	200.4	198.7	197.0	195.3	191.1				
54	214.2	198.8	197.0	195.4								
55	211.6	196.2										

AIR CONDITIONING OFF ADD 3700 kg	ENGINE ANTI ICE ON SUBTRACT 2100 kg	TOTAL ANTI ICE ON SUBTRACT 6700 kg	SPEED INCREASE PER 0.01 Vs ADD 300 kg

OCTO 13.0.1 AB202A01

APPROACH CLIMB LIMITING WEIGHT (1000 KG) ONE ENGINE OUT ONE ENGINE AT GO AROUND THRUST	Gradient : 2.1% High Air Conditioning Anti Ice OFF V = 1.23 Vs	CONF 3

PRESSURE ALTITUDE (FT)												
OAT	**–2000**	**0**	**200**	**400**	**600**	**800**	**1000**	**1500**	**2000**	**5000**	**10000**	**14600**
≤ 10	235.8	236.0	235.0	234.0	233.0	232.0	230.9	228.1	225.3	206.3	173.7	141.5
20	235.0	235.2	234.3	233.3	232.3	231.3	230.3	227.5	224.7	205.9	164.5	131.3
22	234.9	235.1	234.1	233.2	232.2	231.2	230.1	227.4	224.6	204.1	161.7	129.9
24	234.7	235.0	234.0	233.0	232.1	231.1	230.0	227.3	224.5	202.3	158.7	128.7
26	234.6	234.8	233.9	232.9	232.0	231.0	229.9	227.2	224.4	200.1	155.7	127.6
28	234.4	234.7	233.7	232.8	231.8	230.8	229.8	225.6	221.3	197.3	153.0	
30	234.2	234.5	232.9	231.3	229.7	228.0	226.3	222.1	217.7	194.0	150.3	
32	234.1	231.2	229.5	227.9	226.2	224.5	222.8	218.4	214.1	190.6	147.5	
34	233.9	227.6	226.0	224.3	222.6	220.9	219.2	214.9	210.5	186.8	144.7	
36	232.0	224.1	222.5	220.8	219.1	217.4	215.6	211.2	206.8	183.5		
38	230.2	220.8	219.1	217.4	215.6	213.9	212.1	208.0	204.2	181.1		
40	228.4	217.3	215.5	213.8	212.1	210.5	208.9	205.0	201.3	178.4		
42	226.9	213.4	211.8	210.1	208.5	207.0	205.4	201.7	197.7	175.2		
44	225.2	209.4	207.8	206.3	204.7	203.2	201.6	197.6	193.6	172.0		
46	220.4	205.3	203.7	202.2	200.6	199.0	197.4	193.4	189.4			
48	215.4	201.2	199.6	198.1	196.5	194.9	193.3	189.2	185.1			
50	210.7	197.2	195.5	193.8	192.1	190.4	188.8	184.7	180.8			
52	206.6	192.4	190.8	189.1	187.5	185.9	184.3	180.4				
54	202.4	187.6	186.0	184.4								
55	200.0	185.2										

AIR CONDITIONING OFF ADD 3000 kg	**ENGINE ANTI ICE ON SUBTRACT** 2000 kg	**TOTAL ANTI ICE ON SUBTRACT** 6300 kg	**SPEED INCREASE PER 0.01 Vs ADD** 200 kg

OCTO 13.0.1 AB202A01

LEFT INTENTIONALLY BLANK

APPROACH CLIMB LIMITING WEIGHT (1000 KG)	Gradient : 2.5%	CAT II
ONE ENGINE OUT	Normal Air Conditioning	
ONE ENGINE AT GO AROUND THRUST	Anti ice OFF	CONF 2

	PRESSURE ALTITUDE (FT)											
OAT	–1000	0	200	400	600	800	1000	1500	2000	5000	8000	9200
≤ 10	242.2	241.7	240.7	239.7	238.7	237.7	236.7	233.9	231.1	212.1	192.1	184.2
20	241.4	240.9	240.0	239.0	238.0	237.0	236.0	233.3	230.5	211.6	186.1	176.0
22	241.3	240.8	239.8	238.9	237.9	236.9	235.9	233.1	230.4	209.8	183.9	173.8
24	241.1	240.6	239.7	238.7	237.8	236.8	235.8	233.0	230.3	208.0	181.5	170.8
26	241.0	240.5	239.6	238.6	237.6	236.7	235.6	232.9	230.2	205.7	178.6	167.7
28	240.8	240.4	239.4	238.5	237.5	236.5	235.5	231.3	227.1	202.8	175.5	164.6
30	240.7	240.2	238.6	237.0	235.4	233.7	232.0	227.8	223.4	199.5	172.3	161.9
32	240.5	236.9	235.2	233.6	231.9	230.2	228.5	224.2	219.9	196.1	169.4	159.0
34	237.7	233.3	231.7	230.0	228.3	226.7	225.0	220.7	216.3	192.2	166.4	156.1
36	234.9	229.8	228.2	226.5	224.8	223.1	221.4	217.0	212.5	188.9	163.4	153.2
38	232.3	226.5	224.8	223.1	221.4	219.6	217.8	213.7	209.8	186.4	160.4	
40	229.6	223.0	221.3	219.5	217.8	216.2	214.6	210.7	206.9	183.7		
42	227.0	219.1	217.5	215.9	214.2	212.6	211.1	207.3	203.3	180.4		
44	222.6	215.1	213.5	211.9	210.4	208.8	207.2	203.2	199.1	177.1		
46	218.1	210.9	209.3	207.7	206.2	204.6	203.0	198.9	194.9			
48	213.6	206.7	205.2	203.6	202.0	200.4	198.8	194.5	190.4			
50	209.4	202.7	200.9	199.2	197.5	195.8	194.1	190.0	186.0			
52	205.3	197.8	196.1	194.4	192.8	191.1	189.5	185.5				
54	200.4	192.9	191.2	189.6								
55	197.9	190.4										

AIR CONDITIONING OFF ADD	ENGINE ANTI ICE ON SUBTRACT	TOTAL ANTI ICE ON SUBTRACT
3800 kg	400 kg	4100 kg

OCTO 13.0.1 AB202A01

APPROACH CLIMB LIMITING WEIGHT (1000 KG)	Gradient : 2.5%	CAT II
ONE ENGINE OUT	High Air Conditioning	
ONE ENGINE AT GO AROUND THRUST	Anti ice OFF	CONF 3

	PRESSURE ALTITUDE (FT)										
OAT	–1000	0	200	400	600	800	1000	1500	2000	5000	8000	9200
≤ 10	231.1	230.5	229.6	228.6	227.7	226.7	225.7	222.9	220.2	201.9	182.7	175.2
20	230.4	229.8	228.9	227.9	227.0	226.1	225.0	222.3	219.6	201.4	177.2	167.5
22	230.2	229.7	228.8	227.8	226.9	225.9	224.9	222.2	219.5	199.8	175.0	165.4
24	230.1	229.6	228.6	227.7	226.8	225.8	224.8	222.1	219.4	198.0	172.7	162.5
26	230.0	229.4	228.5	227.6	226.7	225.7	224.7	222.0	219.3	195.8	169.9	159.6
28	229.8	229.3	228.4	227.4	226.5	225.6	224.5	220.5	216.3	193.1	167.0	156.7
30	229.7	229.1	227.6	226.0	224.4	222.8	221.2	217.0	212.8	190.0	164.0	154.0
32	229.5	225.9	224.3	222.7	221.1	219.4	217.8	213.5	209.4	186.7	161.2	151.2
34	226.8	222.5	220.8	219.2	217.6	216.0	214.3	210.1	205.9	183.0	158.3	148.4
36	224.1	219.0	217.4	215.8	214.2	212.5	210.8	206.6	202.3	179.8	155.4	145.7
38	221.6	215.8	214.2	212.5	210.8	209.1	207.4	203.5	199.8	177.4	152.6	
40	219.0	212.5	210.7	209.1	207.5	205.9	204.4	200.6	197.0	174.8		
42	216.4	208.7	207.1	205.6	204.0	202.5	201.0	197.5	193.6	171.7		
44	212.1	204.9	203.4	201.9	200.4	198.8	197.3	193.5	189.6	168.6		
46	207.8	200.9	199.4	197.9	196.4	194.8	193.3	189.4	185.5			
48	203.6	196.9	195.4	193.9	192.4	190.8	189.3	185.3	181.3			
50	199.6	193.0	191.4	189.7	188.1	186.5	184.9	181.0	177.1			
52	195.7	188.4	186.8	185.2	183.6	182.1	180.5	176.7				
54	191.0	183.8	182.2	180.7								
55	188.7	181.4										

AIR CONDITIONING OFF ADD 3600 kg	ENGINE ANTI ICE ON SUBTRACT 300 kg	TOTAL ANTI ICE ON SUBTRACT 3900 kg

OCTO 13.0.1 AB202A01

GENERAL

The alternate planning tables allow the flight crew to determine the fuel consumption and time required to cover a given air distance from go-around at destination airport to landing at alternate airport.

These tables are established for :

- Go around : 500 kg or 1100 lb
- Climb profile : 250kt/300kt/M.80
- R Long range cruise
- Descent profile : M.80/300kt/250kt
- Approach and landing at alternate airport : 160 kg or 350 lb (4 min)
- ISA
- CG = 30%
- Normal air conditioning (Packs NORM/Cargo cooling OFF or Packs LO/cargo cooling NORM)
- Anti ice OFF

Note : 1. In the tables, a "" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celsius above ISA temperature apply a fuel correction of 0.01 (kg/°C/NM) × △ISA (°C) × Air Distance (NM) or 0.022 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The alternate planning tables are based on a reference landing weight at destination.

The fuel consumption must be corrected when the actual weight is different from the reference landing weight.

If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 500 KG - CLIMB : 250/300KT/M.80 - CRUISE : LONG RANGE
DESCENT : M.80/300/250KT - VMC PROCEDURE : 160 KG (4MIN)

REF. LDG WT AT DEST. = 140000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 30.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 100	120	140	160	180	200	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL120	FL140 FL160	FL180 FL200
50	1529 0.14						3		
100	2256 0.25	2230 0.25	2230 0.24	2236 0.24	2248 0.23	2266 0.23	5	5	5
150	2984 0.35	2933 0.35	2908 0.34	2890 0.33	2881 0.33	2879 0.32	7	7	8
200	3713 0.46	3637 0.45	3588 0.44	3546 0.43	3516 0.42	3494 0.41	10	10	10
250	4445 0.56	4344 0.55	4269 0.54	4204 0.53	4152 0.52	4110 0.50	12	12	12
300	5178 1.06	5051 1.05	4952 1.04	4863 1.02	4790 1.01	4727 0.59	14	14	15
350	5913 1.17	5761 1.15	5636 1.13	5524 1.12	5429 1.11	5346 1.08	17	17	17
400	6650 1.27	6472 1.25	6322 1.23	6186 1.22	6070 1.20	5966 1.17	19	19	19
450	7388 1.37	7184 1.35	7009 1.33	6850 1.31	6712 1.29	6588 1.26	21	21	22
500	8129 1.48	7899 1.45	7698 1.43	7515 1.41	7356 1.39	7210 1.35	24	24	24
550	8871 1.58	8614 1.55	8388 1.53	8182 1.51	8001 1.48	7835 1.44	26	26	27
600	9614 2.08	9332 2.05	9080 2.02	8850 2.00	8647 1.57	8460 1.53	29	29	29
650	10360 2.18	10051 2.15	9774 2.12	9520 2.10	9296 2.07	9087 2.02	31	31	31
700	11107 2.29	10772 2.25	10469 2.22	10192 2.19	9945 2.16	9716 2.11	33	33	34
750	11856 2.39	11495 2.35	11165 2.32	10865 2.29	10597 2.25	10345 2.20	36	36	36
800	12607 2.49	12219 2.44	11863 2.41	11539 2.38	11250 2.35	10977 2.29	38	38	39
850	13360 2.59	12945 2.54	12563 2.51	12216 2.48	11904 2.44	11609 2.38	41	41	41
900	14114 3.09	13673 3.04	13264 3.01	12894 2.57	12560 2.53	12243 2.47	43	43	43
950	14870 3.19	14402 3.14	13967 3.10	13573 3.07	13217 3.02	12879 2.56	46	46	46
1000	15628 3.29	15133 3.24	14672 3.20	14254 3.16	13877 3.11	13516 3.05	48	48	48
1050	16387 3.39	15866 3.33	15378 3.30	14936 3.26	14537 3.21	14154 3.14	50	50	50
1100	17149 3.49	16600 3.43	16086 3.39	15620 3.35	15199 3.30	14792 3.23	53	53	53
1150	17912 3.59	17336 3.53	16795 3.49	16306 3.45	15863 3.39	15432 3.31	55	55	55
1200	18677 4.09	18074 4.03	17506 3.59	16993 3.54	16528 3.48	16073 3.40	58	58	57

PACK FLOW LO	PACK FLOW HI OR/ AND CARGO COOL ON	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 3 %	△FUEL = + 4 %

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT
GO-AROUND : 500 KG - CLIMB : 250/300KT/M.80 - CRUISE : LONG RANGE
DESCENT : M.80/300/250KT - VMC PROCEDURE : 160 KG (4MIN)

REF. LDG WT AT DEST. = 140000 KG
NORMAL AIR CONDITIONING
ANTI-ICING OFF

ISA
CG = 30.0 %

FUEL CONSUMED (KG)
TIME (H.MIN)

AIR DIST. (NM)	FLIGHT LEVEL 230	270	310	350	390	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL230 FL270	FL310 FL350	FL390
150	2885 0.31	2919 0.30				8		
200	3468 0.40	3465 0.38	3490 0.36	3515 0.36		10	11	
250	4053 0.48	4013 0.46	4005 0.44	4000 0.43	4008 0.42	12	13	14
300	4638 0.57	4562 0.54	4520 0.52	4486 0.50	4470 0.49	14	15	16
350	5225 1.06	5112 1.02	5037 0.59	4972 0.57	4932 0.55	17	18	18
400	5814 1.14	5664 1.11	5554 1.07	5460 1.04	5395 1.02	19	20	20
450	6403 1.23	6216 1.19	6073 1.14	5949 1.11	5859 1.09	21	22	23
500	6994 1.32	6770 1.27	6593 1.22	6439 1.19	6324 1.15	23	24	25
550	7586 1.40	7325 1.35	7113 1.29	6930 1.26	6790 1.22	26	27	27
600	8180 1.49	7881 1.43	7635 1.37	7422 1.33	7257 1.29	28	29	29
650	8775 1.58	8438 1.51	8159 1.44	7915 1.40	7725 1.35	30	31	32
700	9371 2.06	8997 1.59	8683 1.52	8409 1.47	8194 1.42	33	33	34
750	9968 2.15	9557 2.07	9208 1.59	8905 1.54	8663 1.48	35	36	36
800	10567 2.23	10118 2.15	9735 2.07	9401 2.01	9134 1.55	37	38	38
850	11167 2.32	10680 2.23	10262 2.14	9899 2.08	9606 2.02	39	40	41
900	11768 2.40	11244 2.31	10791 2.21	10397 2.15	10078 2.08	42	42	43
950	12371 2.49	11808 2.39	11321 2.29	10897 2.22	10551 2.15	44	44	45
1000	12975 2.58	12374 2.47	11852 2.36	11398 2.29	11026 2.21	47	47	48
1050	13580 3.06	12942 2.55	12384 2.44	11900 2.36	11501 2.28	49	49	50
1100	14187 3.14	13510 3.03	12917 2.51	12403 2.43	11978 2.35	51	51	52
1150	14795 3.23	14080 3.11	13452 2.58	12907 2.50	12455 2.41	54	53	55
1200	15404 3.31	14651 3.19	13987 3.06	13413 2.56	12934 2.48	56	56	57

PACK FLOW LO	**PACK FLOW HI OR/ AND CARGO COOL ON**	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**
△FUEL = – 0.5 %	△FUEL = + 1 %	△FUEL = + 3 %	△FUEL = + 4 %

GENERAL

The ground distance/air distance conversion tables are used to calculate the air distance for a given ground distance due to the influence of the wind.
Tables are given for :
- M.80
- M.82
- M.84
- LONG RANGE SPEED
  up to FL250
  above FL250

M.80

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	-50	-100	-150
10	8	8	9	**10**	11	13	15
20	15	16	18	**20**	22	26	30
30	23	25	27	**30**	34	38	44
40	30	33	36	**40**	45	51	59
50	38	41	45	**50**	56	64	74
100	75	82	90	**100**	112	128	148
200	151	164	180	**200**	224	255	296
300	226	247	271	**300**	336	383	445
400	302	329	361	**400**	449	511	593
500	377	411	451	**500**	561	638	741
1000	755	822	902	**1000**	1122	1277	1482
1500	1132	1233	1353	**1500**	1682	1915	2223
2000	1509	1644	1804	**2000**	2243	2554	2964
2500	1886	2054	2255	**2500**	2804	3192	3705
3000	2264	2465	2707	**3000**	3365	3831	4446
3500	2641	2876	3158	**3500**	3926	4469	5187
4000	3018	3287	3609	**4000**	4486	5108	5928
4500	3395	3698	4060	**4500**	5047	5746	6669
5000	3773	4109	4511	**5000**	5608	6385	7411
5500	4150	4520	4962	**5500**	6169	7023	8152
6000	4527	4931	5413	**6000**	6730	7661	8893
6500	4905	5342	5864	**6500**	7290	8300	9634
7000	5282	5753	6315	**7000**	7851	8938	10375
7500	5659	6163	6766	**7500**	8412	9577	11116
8000	6036	6574	7217	**8000**	8973	10215	11857
8500	6414	6985	7669	**8500**	9534	10854	12598
9000	6791	7396	8120	**9000**	10095	11492	13339
9500	7168	7807	8571	**9500**	10655	12131	14080
10000	7546	8218	9022	**10000**	11216	12769	14821

M.82

GROUND DIST (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	-50	-100	-150
10	8	8	9	**10**	11	13	15
20	15	17	18	**20**	22	25	29
30	23	25	27	**30**	34	38	44
40	30	33	36	**40**	45	51	59
50	38	41	45	**50**	56	63	73
100	76	83	90	**100**	112	127	146
200	152	165	181	**200**	224	254	293
300	228	248	271	**300**	335	381	439
400	304	330	362	**400**	447	507	586
500	380	413	452	**500**	559	634	732
1000	759	825	904	**1000**	1118	1268	1465
1500	1139	1238	1357	**1500**	1677	1903	2197
2000	1518	1651	1809	**2000**	2237	2537	2930
2500	1898	2063	2261	**2500**	2796	3171	3662
3000	2277	2476	2713	**3000**	3355	3805	4395
3500	2657	2889	3165	**3500**	3914	4439	5127
4000	3036	3302	3617	**4000**	4473	5073	5860
4500	3416	3714	4070	**4500**	5032	5708	6592
5000	3795	4127	4522	**5000**	5591	6342	7324
5500	4175	4540	4974	**5500**	6151	6976	8057
6000	4555	4952	5426	**6000**	6710	7610	8789
6500	4934	5365	5878	**6500**	7269	8244	9522
7000	5314	5778	6330	**7000**	7828	8878	10254
7500	5693	6190	6783	**7500**	8387	9513	10987
8000	6073	6603	7235	**8000**	8946	10147	11719
8500	6452	7016	7687	**8500**	9506	10781	12451
9000	6832	7428	8139	**9000**	10065	11415	13184
9500	7211	7841	8591	**9500**	10624	12049	13916
10000	7591	8254	9043	**10000**	11183	12683	14649

M.84

GROUND DIST (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	-50	-100	-150
10	8	8	9	**10**	11	13	14
20	15	17	18	**20**	22	25	29
30	23	25	27	**30**	33	38	43
40	31	33	36	**40**	45	50	58
50	38	41	45	**50**	56	63	72
100	76	83	91	**100**	112	126	145
200	153	166	181	**200**	223	252	290
300	229	249	272	**300**	335	378	435
400	305	332	363	**400**	446	504	580
500	382	414	453	**500**	558	630	724
1000	763	829	906	**1000**	1115	1260	1449
1500	1145	1243	1360	**1500**	1673	1890	2173
2000	1527	1658	1813	**2000**	2230	2521	2898
2500	1909	2072	2266	**2500**	2788	3151	3622
3000	2290	2486	2719	**3000**	3345	3781	4347
3500	2672	2901	3172	**3500**	3903	4411	5071
4000	3054	3315	3626	**4000**	4461	5041	5795
4500	3436	3730	4079	**4500**	5018	5671	6520
5000	3817	4144	4532	**5000**	5576	6301	7244
5500	4199	4559	4985	**5500**	6133	6932	7969
6000	4581	4973	5438	**6000**	6691	7562	8693
6500	4963	5387	5892	**6500**	7249	8192	9417
7000	5344	5802	6345	**7000**	7806	8822	10142
7500	5726	6216	6798	**7500**	8364	9452	10866
8000	6108	6631	7251	**8000**	8921	10082	11591
8500	6490	7045	7704	**8500**	9479	10712	12315
9000	6871	7459	8158	**9000**	10036	11343	13040
9500	7253	7874	8611	**9500**	10594	11973	13764
10000	7635	8288	9064	**10000**	11152	12603	14488

LONG RANGE SPEED UP TO FL250

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	-50	-100	-150
10	7	8	9	**10**	12	14	17
20	14	16	18	**20**	23	27	33
30	22	24	27	**30**	35	41	50
40	29	32	35	**40**	46	54	66
50	36	40	44	**50**	58	68	83
100	72	79	88	**100**	115	136	165
200	143	158	177	**200**	230	271	330
300	215	238	265	**300**	345	407	495
400	287	317	354	**400**	461	543	660
500	359	396	442	**500**	576	678	825
1000	717	792	884	**1000**	1151	1357	1651
1500	1076	1188	1326	**1500**	1727	2035	2476
2000	1434	1584	1768	**2000**	2303	2713	3302
2500	1793	1980	2210	**2500**	2878	3391	4127
3000	2152	2376	2652	**3000**	3454	4070	4953
3500	2510	2772	3093	**3500**	4030	4748	5778
4000	2869	3167	3535	**4000**	4605	5426	6604
4500	3227	3563	3977	**4500**	5181	6105	7429
5000	3586	3959	4419	**5000**	5757	6783	8254
5500	3945	4355	4861	**5500**	6332	7461	9080
6000	4303	4751	5303	**6000**	6908	8139	9905
6500	4662	5147	5745	**6500**	7484	8818	10731
7000	5021	5543	6187	**7000**	8059	9496	11556
7500	5379	5939	6629	**7500**	8635	10174	12382
8000	5738	6335	7071	**8000**	9210	10853	13207
8500	6096	6731	7513	**8500**	9786	11531	14033
9000	6455	7127	7955	**9000**	10362	12209	14858
9500	6814	7523	8397	**9500**	10937	12887	15684
10000	7172	7919	8838	**10000**	11513	13566	16509

LONG RANGE SPEED ABOVE FL250

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	-50	-100	-150
10	8	8	9	10	11	13	15
20	15	16	18	20	22	25	29
30	23	25	27	30	34	38	44
40	30	33	36	40	45	51	59
50	38	41	45	50	56	64	74
100	76	82	90	100	112	127	147
200	151	165	181	200	224	254	295
300	227	247	271	300	336	382	442
400	303	330	361	400	448	509	589
500	379	412	452	500	560	636	736
1000	757	824	903	1000	1120	1272	1473
1500	1136	1236	1355	1500	1680	1908	2209
2000	1514	1648	1807	2000	2240	2544	2945
2500	1893	2059	2258	2500	2799	3180	3681
3000	2271	2471	2710	3000	3359	3817	4418
3500	2650	2883	3162	3500	3919	4453	5154
4000	3028	3295	3613	4000	4479	5089	5890
4500	3407	3707	4065	4500	5039	5725	6627
5000	3785	4119	4517	5000	5599	6361	7363
5500	4164	4531	4968	5500	6159	6997	8099
6000	4542	4943	5420	6000	6719	7633	8836
6500	4921	5354	5872	6500	7279	8269	9572
7000	5299	5766	6324	7000	7839	8905	10308
7500	5678	6178	6775	7500	8398	9541	11044
8000	6056	6590	7227	8000	8958	10177	11781
8500	6435	7002	7679	8500	9518	10814	12517
9000	6813	7414	8130	9000	10078	11450	13253
9500	7192	7826	8582	9500	10638	12086	13990
10000	7570	8238	9034	10000	11198	12722	14726

06.00 CONTENTS

06.10 GENERAL
– INTRODUCTION 1
– FLIGHT PREPARATION 1
– STRATEGY 1

06.20 CEILINGS

06.30 STANDARD STRATEGY
– PROCEDURE 1
– EXAMPLE 2
– DESCENT M.82/300KT 3
– LONG RANGE CRUISE 4
R – IN CRUISE QUICK CHECK AT LONG RANGE SPEED 12

06.40 OBSTACLE STRATEGY
– PROCEDURE 1
– EXAMPLE 2
– GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED 3

06.50 FIXED SPEED STRATEGIES
– PROCEDURE 1
– EXAMPLE 2
– DESCENT M.82/330KT MCT 3
– DESCENT M.82/310KT MCT 4
– CRUISE MCT/330 KT 5
– CRUISE MCT/310 KT 9
– IN CRUISE QUICK CHECK AT FIXED SPEEDS 13
– IN CRUISE QUICK CHECK 330 KT 14
– IN CRUISE QUICK CHECK 310KT 15

06.55 HOLDING

06.60 DESCENT TO LANDING

06.70 GROUND DISTANCE/AIR DISTANCE
– GENERAL 1
– LONG RANGE SPEED 2
– FIXED SPEEDS 3

INTRODUCTION

This chapter provides the single engine performance data to be used for the conduct and monitoring of the flight following an engine failure.
The diversion strategy (descent and cruise speed schedules) shall be selected, and specified in the operator's routes specifications, as a function of the prevailing operational factors (e.g. obstacles clearance requirements and/or ETOPS operation).

FLIGHT PREPARATION

In readiness for a possible engine failure occurring during the flight, any flight shall be planned so as to comply with any of the following requirements, as applicable :
· obstacle clearance,
· oxygen,
· maximum diversion distance (ETOPS operation).
The following FCOM sections provide flight preparation and fuel planning information :
· 2.05.10 thru 2.05.60, for Standard Fuel Planning,
· 2.04.40, for Extended Range Operation (ETOPS) and associated fuel requirements.

STRATEGY

Depending on the prevailing operational constraints, the most appropriate diversion strategy shall be selected, out of the following options :

R

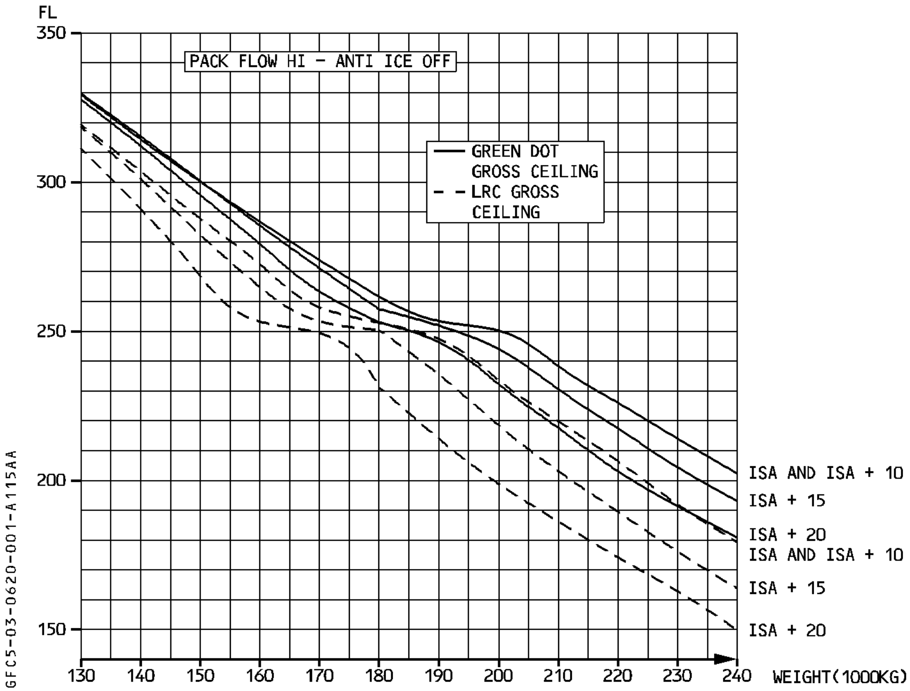
	STANDARD STRATEGY	OBSTACLE STRATEGY	FIXED SPEED STRATEGIES	
			310KT	VMO
DESCENT TO CEILING	. M.82/300KT . MCT	. Green Dot Speed . MCT	. M.82/310KT . MCT	. M.82/330KT . MCT
CRUISE	LR ceiling LR speed	– Obstacle not cleared: Maintain Green Dot Speed at MCT – Obstacle cleared : Revert to standard strategy	FL per 2.04.40 MCT/310KT	FL per 2.04.40 MCT/330KT
DESCENT TO LANDING	IDLE/M.82/300KT/250KT			
Approx. increase in fuel consumption compared with both engines operative	+ 30 %			

For ETOPS operations, any of the above diversion strategies can be used provided that the selected strategy and speed schedule is used in :

· establishing the area of operation (maximum diversion distance), as described in Section 2.04.40,
· calculating the diversion fuel requirements for the single engine ETOPS critical scenario, as provided in section 2.04.40,
· demonstrating the applicable obstacle clearance requirements (net flight path and net ceiling).

During the diversion, the flight crew is expected to use the planned speed schedule. However, based on the evaluation of the actual situation, the pilot in command has the authority to deviate from this planned one engine inoperative speed.

GROSS CEILINGS AT LONG RANGE AND GREEN DOT SPEEDS



Note : If severe icing conditions are encountered, ice formation may build up on non heated structure and therefore the ceiling will be reduced by 2500 feet.

	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
LONG RANGE	– 700 FT	– 1800 FT
GREEN DOT	– 400 FT	– 1500 FT

NET CEILING AT GREEN DOT SPEED

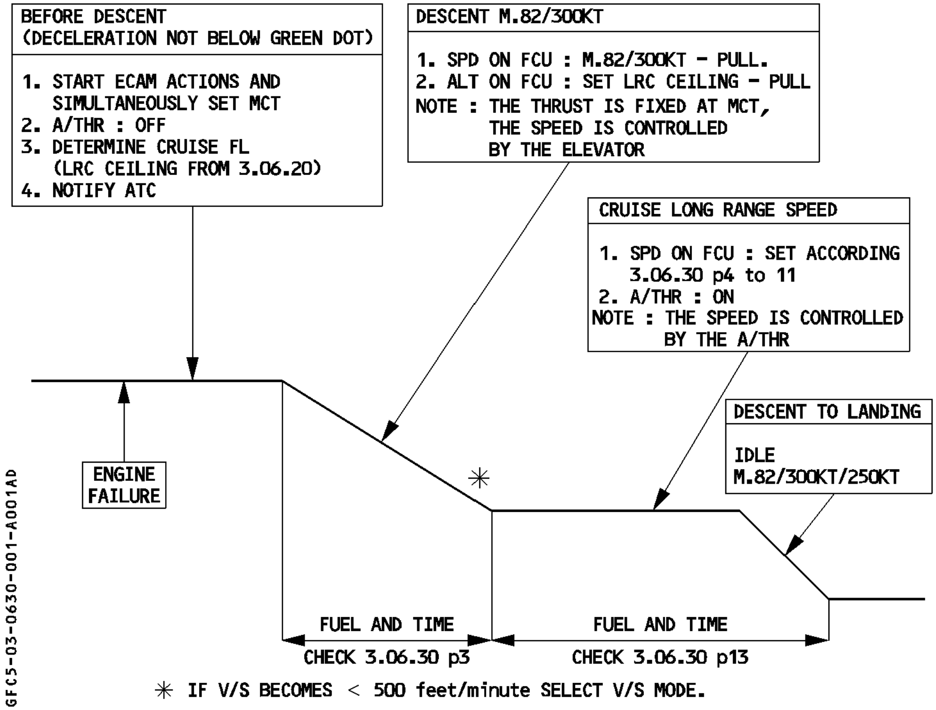
To obtain the net ceiling at green dot speed, apply the following corrections to the gross ceiling at green dot speed :

	WEIGHT (1000 KG)					
	130	**150**	**170**	**190**	**210**	**230**
≤ ISA + 10	– 4900 FT	– 4700 FT	– 4400 FT	– 5300 FT	– 6200 FT	– 6400 FT
ISA + 20	– 5500 FT	– 5000 FT	– 5600 FT	– 6800 FT	– 7100 FT	– 9200 FT

PROCEDURE

Unless a specific procedure has been established before dispatch (ETOPS, mountainous areas) the recommended procedure is as follows :

R



✳ IF V/S BECOMES < 500 feet/minute SELECT V/S MODE.

EXAMPLE

Given :

GW at engine failure	= 200 000 kg
FL at engine failure	= 350
Temperature	= ISA
Distance to diversion airport	= 450 NM
No wind	

Find :

LRC ceiling : (see 3.06.20 page 1)	FL230
Descent to cruise level : (FL230)	Distance = 297 – 165 = 132 NM
(see 3.06.30 page 3)	Fuel = 3514 – 2081 = 1433 kg
	Time = 43.6 – 26 = 17.6 min

Cruise at long range speed (FL230) to landing.
(Weight = 200 000 – 1433 = 198 567 kg : Distance = 450 – 132 = 318 NM)
Determine on (3.06.30 p 13) time and fuel consumption at ISA conditions for a reference weight of 170 000 kg. Interpolate the remaining air distance of 318 NM at FL230.
Fuel : 3771 kg
Time : 1 h 01 min
Correction due to actual in cruise weight
ΔFuel = + 13 kg per 1000 kg above reference weight
ΔFuel = + 13 kg × (198.6 – 170) ~ 372 kg

Result :

Total Fuel = 1433 + 3771 + 372 = 5576 kg
Time = 1 h 01 min + 18 min = 1 h 19 min

DESCENT - M.82/300KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=30.0%	MINIMUM RATE OF DESCENT 500FT/MIN					
WEIGHT (1000KG)	150				200				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
410	49.9	3789	346	MCT					243
390	48.1	3701	332	MCT	46.7	3699	321	MCT	255
370	46.3	3599	318	MCT	45.2	3613	309	MCT	267
350	44.5	3490	304	MCT	43.6	3514	297	MCT	279
330	42.9	3377	291	MCT	42.0	3407	284	MCT	292
310	40.9	3230	275	MCT	40.0	3258	269	MCT	300
290	37.9	2991	251	MCT	37.3	3044	247	MCT	300
270	34.0	2670	222	V/S	33.9	2762	222	MCT	300
250	30.0	2343	193	V/S	30.0	2420	193	V/S	300
240	28.0	2181	179	V/S	28.0	2249	179	V/S	300
220	24.0	1861	151	V/S	24.0	1913	151	V/S	300
200	20.0	1544	124	V/S	20.0	1582	124	V/S	300
180	16.0	1230	98	V/S	16.0	1258	98	V/S	300
160	12.0	920	72	V/S	12.0	938	72	V/S	300
140	8.0	611	47	V/S	8.0	622	47	V/S	300
120	4.0	305	23	V/S	4.0	310	23	V/S	300
100	.0	0	0	V/S	.0	0	0	V/S	300

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	per 1° above ISA
TIME	–	–	–
FUEL	+ 1.5	+ 3.5	+ 0.25
DISTANCE	–	–	+ 0.3 %

11.0–08F0A330–200 CF6–80E1A4 23200010C6KG300 0 018590 0 0 3 .0 .0 500.00 0 02 .820300.000 .000 0 FCOM-G0–03–06–30–003–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA
CG=30.0%

N1 (%) **MACH**
KG/H **IAS (KT)**
NM/1000KG **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
130	81.1	.418	82.7	.433	83.6	.440	85.0	.453	86.8	.472	88.6	.492
	3620	231	3598	230	3511	225	3487	223	3512	224	3546	224
	73.8	267	76.3	274	78.8	277	81.1	283	83.2	292	85.3	302
140	83.1	.432	84.1	.440	85.5	.453	87.3	.472	89.0	.491	90.7	.507
	3886	239	3802	234	3770	232	3802	233	3831	233	3828	231
	71.0	276	73.4	279	75.5	285	77.5	295	79.4	304	81.4	312
150	84.5	.440	85.7	.450	87.7	.471	89.3	.488	90.9	.505	92.3	.517
	4097	243	4043	240	4090	241	4109	241	4115	240	4078	236
	68.5	281	70.6	285	72.3	296	74.1	305	76.0	313	77.9	318
160	85.9	.448	87.8	.467	89.4	.485	91.0	.501	92.5	.514	94.1	.529
	4319	247	4365	249	4386	249	4397	248	4368	244	4365	241
	66.2	286	67.8	296	69.5	305	71.2	313	72.9	318	74.4	325
170	87.8	.463	89.5	.481	91.1	.497	92.6	.511	94.1	.525	95.9	.540
	4637	256	4671	256	4675	255	4661	253	4649	250	4660	247
	63.7	295	65.3	305	66.8	313	68.5	319	69.9	325	71.2	332
180	89.5	.477	91.0	.493	92.7	.508	94.0	.520	95.7	.535	97.8	.554
	4951	264	4960	263	4961	261	4920	257	4929	254	4998	254
	61.5	304	62.9	312	64.4	320	65.9	324	67.1	331	68.1	341
190	90.9	.487	92.5	.503	93.9	.515	95.6	.530	97.3	.545	100.0	.575
	5234	270	5242	268	5211	265	5213	262	5238	259	5428	264
	59.4	311	60.8	319	62.2	324	63.4	330	64.4	338	65.1	353
200	92.4	.498	93.9	.511	95.3	.524	97.1	.540	99.4	.566	102.2	.593
	5527	275	5512	273	5495	269	5515	267	5671	270	5843	272
	57.5	318	58.8	324	60.0	330	61.0	337	61.8	350	62.3	364
210	93.8	.507	95.1	.518	96.7	.533	98.6	.549	101.3	.579	104.2	.604
	5817	281	5769	276	5783	274	5831	272	6053	276	6206	277
	55.7	324	56.9	328	57.9	335	58.8	343	59.3	359	59.8	371
220	94.9	.514	96.4	.527	98.1	.542	100.6	.571	103.4	.597	106.4	.615
	6077	285	6073	281	6097	279	6305	283	6503	285	6601	282
	54.0	328	55.0	334	55.9	341	56.5	356	56.9	370	57.2	378
230	96.0	.520	97.7	.535	99.6	.552	102.2	.580	105.2	.605	107.6	.604
	6347	288	6365	286	6431	284	6656	288	6838	289	6747	277
	52.3	332	53.2	339	53.9	347	54.4	362	54.8	375	55.0	371
240	97.3	.529	99.0	.543	101.5	.572	104.4	.600	107.2	.616	108.2	.565
	6653	293	6687	290	6920	295	7155	298	7248	294	6657	259
	50.7	337	51.5	344	52.0	360	52.3	374	52.6	381	52.2	347

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-G0–03–06–30–004–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA CG=30.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL210**		**FL220**		**FL230**		**FL240**		**FL250**		**FL260**	
130	89.5	.501	90.3	.509	91.0	.515	91.9	.523	92.7	.530	93.7	.539
	3553	224	3544	223	3526	221	3528	220	3522	218	3530	217
	86.3	307	87.5	310	88.6	312	89.6	316	90.6	319	91.5	323
140	91.3	.513	92.1	.520	93.0	.528	93.9	.536	94.9	.544	96.3	.561
	3806	229	3799	228	3801	227	3804	225	3817	224	3889	227
	82.4	314	83.4	317	84.3	320	85.1	324	85.9	328	86.4	336
150	93.2	.525	94.0	.532	95.0	.540	95.9	.549	97.6	.569	98.9	.581
	4083	235	4078	233	4087	232	4103	231	4214	235	4262	235
	78.7	321	79.5	324	80.2	328	80.8	332	81.3	342	81.7	348
160	95.0	.536	95.9	.544	97.3	.560	98.7	.574	100.3	.591	101.7	.602
	4363	240	4377	239	4455	241	4525	242	4620	245	4654	244
	75.2	328	75.8	332	76.3	340	76.7	347	77.0	356	77.5	361
170	96.8	.548	98.4	.568	99.7	.579	101.5	.599	102.5	.601	104.3	.611
	4676	246	4800	250	4841	249	4975	253	4935	249	4987	248
	71.8	336	72.2	346	72.5	351	72.8	362	73.3	362	73.4	366
180	99.3	.573	100.6	.585	102.3	.601	103.4	.603	105.2	.612	104.5	.566
	5117	257	5179	257	5286	260	5242	255	5309	254	4871	229
	68.5	350	68.8	356	69.0	365	69.5	364	69.4	369	69.6	339
190	101.5	.589	103.0	.602	104.3	.608	106.1	.613	108.4	.621		
	5516	265	5580	265	5592	262	5625	259	5722	258		
	65.4	361	65.7	367	66.0	369	65.9	371	65.4	374		
200	103.6	.602	105.1	.611	106.7	.613	108.4	.611	108.9	.573		
	5889	271	5932	269	5937	265	5911	259	5587	237		
	62.6	369	62.8	372	62.7	372	62.5	369	61.7	345		
210	105.8	.613	107.4	.615	108.4	.600						
	6268	276	6271	271	6103	259						
	59.9	375	59.7	375	59.7	364						
220	107.7	.612	108.3	.588								
	6545	275	6281	259								
	57.2	374	57.1	359								
230	108.2	.577										
	6466	259										
	54.6	353										
240												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 0 FCOM-G0–03–06–30–005–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+10
CG=30.0%

N1 (%) / **MACH**
KG/H / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
130	82.7	.418	84.3	.432	85.2	.439	86.7	.453	88.7	.473	90.5	.492
	3702	231	3679	230	3589	225	3574	223	3613	224	3637	224
	73.4	272	75.8	279	78.4	281	80.6	288	82.7	299	84.8	308
140	84.8	.432	85.7	.439	87.1	.452	89.1	.472	90.7	.489	92.5	.506
	3978	239	3888	234	3856	231	3896	232	3915	232	3918	231
	70.6	281	73.0	284	75.1	289	77.0	300	78.9	309	80.9	317
150	86.1	.439	87.4	.450	89.4	.470	90.9	.486	92.7	.503	94.1	.515
	4191	243	4141	239	4188	241	4197	240	4207	239	4174	235
	68.1	286	70.1	290	71.9	301	73.7	309	75.5	318	77.4	323
160	87.6	.447	89.5	.467	91.1	.483	92.8	.500	94.3	.513	95.9	.527
	4422	247	4470	248	4481	248	4498	247	4470	243	4466	241
	65.7	291	67.4	301	69.1	309	70.7	318	72.4	324	73.9	330
170	89.5	.462	91.1	.479	92.8	.496	94.4	.510	95.9	.523	97.7	.538
	4740	255	4766	255	4786	254	4774	252	4761	249	4770	246
	63.3	300	64.9	309	66.4	318	68.0	324	69.4	330	70.7	337
180	91.2	.475	92.7	.491	94.4	.507	95.8	.519	97.5	.533	99.5	.550
	5053	263	5071	262	5076	260	5045	256	5051	253	5099	251
	61.1	309	62.5	317	64.0	325	65.4	330	66.6	336	67.5	344
190	92.6	.485	94.3	.502	95.7	.514	97.4	.528	99.2	.543	101.8	.571
	5349	269	5370	268	5335	264	5343	261	5371	258	5549	262
	59.0	316	60.3	324	61.7	329	62.9	336	63.9	343	64.5	358
200	94.1	.496	95.6	.510	97.1	.523	98.9	.537	101.2	.562	104.1	.590
	5657	275	5649	272	5631	269	5649	266	5796	268	5998	270
	57.0	323	58.3	329	59.5	335	60.5	342	61.2	355	61.6	370
210	95.5	.506	96.8	.517	98.5	.531	100.4	.547	103.1	.575	106.2	.602
	5954	280	5916	276	5927	273	5973	271	6187	274	6395	276
	55.2	329	56.4	334	57.4	340	58.2	348	58.7	363	59.0	377
220	96.6	.512	98.2	.526	99.9	.540	102.4	.567	105.4	.597	108.4	.613
	6222	284	6226	281	6252	278	6448	281	6701	285	6798	282
	53.5	333	54.5	339	55.4	346	55.9	361	56.2	377	56.5	384
230	97.8	.519	99.4	.532	101.3	.549	104.1	.578	107.2	.604	109.6	.601
	6506	288	6518	284	6582	282	6833	287	7045	288	6936	276
	51.9	337	52.7	344	53.4	352	53.8	368	54.1	381	54.3	377
240	99.1	.527	100.8	.541	103.3	.569	106.4	.599	109.3	.614	110.2	.560
	6820	292	6850	289	7086	293	7379	298	7470	294	6836	256
	50.2	343	51.0	349	51.4	365	51.7	381	51.9	388	51.3	351

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 10 FCOM-G0–03–06–30–006–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+10
CG=30.0%

N1 (%) / **MACH**
KG/H / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL210		FL220		FL230		FL240		FL250		FL260	
130	91.3	.500	92.1	.508	92.8	.513	93.7	.521	94.5	.528	95.5	.536
	3637	223	3628	222	3608	220	3610	219	3603	217	3610	216
	85.9	312	87.0	316	88.1	318	89.1	322	90.0	324	90.9	328
140	93.2	.512	94.0	.519	94.9	.527	95.7	.534	96.7	.542	98.0	.555
	3899	229	3897	227	3898	226	3893	224	3905	223	3959	224
	81.9	319	82.8	323	83.7	326	84.5	329	85.2	333	85.8	340
150	95.0	.524	95.9	.530	96.8	.539	97.9	.547	99.4	.566	100.8	.577
	4182	234	4178	232	4194	232	4210	230	4313	234	4361	234
	78.1	327	78.9	330	79.6	334	80.2	338	80.6	348	81.0	353
160	96.8	.534	97.8	.542	99.1	.556	100.5	.571	102.1	.587	103.7	.599
	4466	239	4484	238	4555	239	4637	241	4730	243	4782	243
	74.6	333	75.2	337	75.6	345	76.0	352	76.3	361	76.6	366
170	98.6	.546	100.2	.564	101.4	.574	103.2	.594	104.5	.599	106.3	.608
	4783	244	4901	248	4947	247	5083	251	5082	248	5129	247
	71.2	341	71.5	351	71.9	356	72.1	366	72.5	368	72.5	372
180	101.1	.568	102.3	.578	104.2	.598	105.5	.602	107.3	.611		
	5227	255	5275	254	5426	258	5410	255	5474	253		
	67.8	355	68.2	360	68.3	370	68.6	371	68.5	375		
190	103.3	.585	105.0	.600	106.4	.607	108.1	.611	110.4	.619		
	5642	263	5752	264	5774	262	5795	258	5887	257		
	64.7	365	64.9	373	65.1	376	65.0	377	64.6	380		
200	105.6	.602	107.2	.611	108.9	.612	110.4	.608	110.8	.567		
	6073	271	6130	269	6129	264	6080	257	5737	234		
	61.8	375	61.9	380	61.8	379	61.7	375	60.7	348		
210	107.9	.613	109.6	.615	110.4	.597						
	6472	276	6486	271	6271	257						
	59.1	382	58.9	382	58.9	370						
220	109.7	.609	110.3	.584								
	6731	274	6452	257								
	56.5	380	56.3	363								
230	110.2	.572										
	6641	257										
	53.8	357										
240												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 10 FCOM-G0–03–06–30–007–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA+15 CG=30.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
130	83.4	.417	85.1	.432	86.0	.439	87.6	.453	89.6	.473	91.3	.491
	3741	230	3718	230	3629	225	3621	223	3657	224	3677	224
	73.2	274	75.6	281	78.2	284	80.4	291	82.5	302	84.5	311
140	85.6	.432	86.5	.439	87.9	.451	89.9	.471	91.6	.489	93.4	.505
	4023	239	3930	234	3900	231	3937	232	3961	232	3966	230
	70.4	283	72.8	286	74.8	292	76.8	302	78.7	312	80.6	320
150	86.9	.439	88.2	.449	90.2	.469	91.8	.485	93.5	.502	95.0	.515
	4237	243	4186	239	4227	240	4239	239	4254	238	4228	235
	68.0	288	69.9	293	71.7	303	73.5	312	75.3	320	77.1	326
160	88.3	.447	90.3	.466	91.9	.482	93.6	.499	95.1	.512	96.8	.526
	4469	247	4514	248	4527	247	4549	246	4522	243	4520	240
	65.6	293	67.2	303	68.8	312	70.4	320	72.1	326	73.6	333
170	90.2	.461	92.0	.478	93.7	.495	95.2	.509	96.8	.522	98.6	.537
	4786	255	4817	255	4843	254	4830	252	4816	248	4825	245
	63.1	302	64.6	311	66.1	320	67.7	327	69.1	333	70.4	339
180	91.9	.473	93.6	.490	95.3	.506	96.7	.518	98.4	.531	100.4	.548
	5102	262	5130	261	5138	260	5108	256	5108	253	5159	251
	60.9	311	62.3	319	63.7	327	65.1	333	66.3	339	67.2	347
190	93.4	.485	95.1	.501	96.6	.513	98.3	.527	100.1	.542	102.7	.569
	5407	268	5432	267	5401	264	5411	261	5437	258	5610	261
	58.8	318	60.1	326	61.4	332	62.6	339	63.6	346	64.2	360
200	94.9	.496	96.5	.510	98.0	.522	99.8	.537	102.1	.560	105.1	.590
	5725	274	5717	272	5701	268	5723	265	5865	267	6088	270
	56.8	325	58.1	332	59.2	338	60.2	345	60.9	357	61.3	373
210	96.3	.505	97.7	.516	99.4	.530	101.3	.545	104.0	.574	107.2	.602
	6027	280	5990	276	5999	272	6048	270	6273	274	6490	276
	55.0	331	56.1	336	57.1	343	57.9	350	58.3	366	58.7	381
220	97.5	.512	99.1	.525	100.8	.539	103.3	.566	106.4	.597	107.9	.587
	6299	283	6306	280	6330	277	6530	280	6804	285	6544	269
	53.3	336	54.2	342	55.1	349	55.6	363	55.9	380	56.7	371
230	98.7	.518	100.3	.532	102.2	.548	105.1	.577	107.9	.599	108.4	.552
	6587	287	6601	284	6669	282	6927	286	7085	286	6490	253
	51.6	340	52.5	346	53.1	354	53.5	370	53.9	382	53.8	349
240	99.9	.526	101.7	.541	104.2	.568	107.4	.599	108.2	.578		
	6903	292	6943	289	7181	293	7491	298	7055	275		
	50.0	345	50.7	352	51.2	367	51.4	385	52.2	368		

ENGINE ANTI ICE ON △FUEL = + 1.5 %	**TOTAL ANTI ICE ON** △FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 15 FCOM-G0–03–06–30–008–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA+15 CG=30.0%	**N1 (%)** **MACH** **KG/H** **IAS (KT)** **NM/1000KG** **TAS (KT)**

WEIGHT (1000KG)	**FL210**		**FL220**		**FL230**		**FL240**		**FL250**		**FL260**	
130	92.2	.500	93.0	.507	93.7	.512	94.6	.520	95.5	.527	96.4	.535
	3678	223	3669	222	3649	220	3651	219	3645	217	3652	216
	85.6	315	86.7	318	87.8	320	88.8	324	89.7	327	90.5	331
140	94.1	.511	94.9	.518	95.8	.525	96.6	.532	97.6	.540	98.9	.553
	3947	228	3943	227	3941	226	3939	224	3951	223	3998	223
	81.6	322	82.5	325	83.4	329	84.2	332	84.9	335	85.5	342
150	95.9	.523	96.8	.530	97.8	.538	98.8	.546	100.3	.564	101.6	.574
	4237	234	4231	232	4243	231	4261	230	4358	233	4398	232
	77.8	330	78.6	332	79.3	336	79.8	340	80.3	350	80.7	355
160	97.7	.533	98.7	.542	100.0	.555	101.4	.569	103.0	.585	104.7	.598
	4525	239	4543	238	4612	239	4689	240	4784	242	4854	242
	74.3	336	74.8	340	75.3	347	75.6	355	75.9	363	76.1	370
170	99.5	.544	101.1	.562	102.4	.573	104.2	.593	105.6	.599	105.6	.579
	4840	244	4959	247	5007	247	5159	251	5165	248	4917	234
	70.9	343	71.2	353	71.5	358	71.7	370	72.0	372	72.8	358
180	101.9	.565	103.2	.576	105.2	.598	106.5	.602	108.3	.610		
	5278	254	5338	254	5510	258	5499	255	5557	253		
	67.5	356	67.8	362	67.9	374	68.2	375	68.1	378		
190	104.2	.583	106.0	.600	107.5	.607	108.8	.606	109.4	.583		
	5712	262	5837	264	5863	262	5827	256	5589	241		
	64.4	368	64.5	376	64.7	379	64.8	377	64.7	362		
200	106.6	.601	108.2	.610	108.8	.594	109.4	.565				
	6163	270	6215	269	5999	256	5749	238				
	61.5	379	61.6	383	61.9	372	61.3	352				
210	108.1	.599	108.7	.581	109.4	.544						
	6384	269	6164	256	5902	234						
	59.1	377	59.2	365	57.6	340						
220	108.5	.567										
	6328	255										
	56.5	358										
230												
240												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 15 FCOM-G0-03-06-30-009-015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=30.0%	**N1 (%)** **MACH** **KG/H** **IAS (KT)** **NM/1000KG** **TAS (KT)**

WEIGHT (1000KG)	FL100		FL120		FL140		FL160		FL180		FL200	
130	84.2	.417	85.9	.431	86.9	.439	88.5	.453	90.4	.472	92.2	.490
	3779	230	3759	229	3672	225	3665	223	3692	224	3717	223
	73.0	276	75.4	283	77.9	286	80.1	294	82.2	304	84.3	313
140	86.3	.431	87.3	.438	88.7	.451	90.7	.470	92.5	.488	94.2	.505
	4065	238	3970	233	3942	231	3980	232	4008	232	4013	230
	70.2	286	72.6	288	74.6	294	76.5	305	78.4	314	80.3	322
150	87.7	.438	89.0	.448	90.9	.467	92.6	.484	94.4	.502	95.9	.515
	4279	242	4225	239	4266	239	4286	239	4307	238	4282	235
	67.8	290	69.7	295	71.5	305	73.2	314	75.0	323	76.7	329
160	89.1	.446	91.1	.464	92.7	.481	94.5	.498	96.0	.511	97.7	.526
	4511	246	4557	247	4573	247	4600	246	4575	243	4580	240
	65.4	295	67.0	305	68.6	314	70.2	323	71.9	329	73.3	336
170	91.0	.460	92.7	.477	94.5	.495	96.1	.508	97.7	.522	99.5	.536
	4834	254	4867	254	4899	254	4887	251	4875	248	4888	245
	62.9	304	64.4	314	65.9	323	67.4	329	68.8	336	70.0	342
180	92.7	.472	94.4	.490	96.1	.505	97.6	.517	99.3	.530	101.3	.547
	5155	261	5190	261	5199	259	5172	256	5169	252	5222	250
	60.6	313	62.0	322	63.4	330	64.8	335	66.0	341	66.9	349
190	94.2	.484	96.0	.500	97.4	.513	99.1	.527	101.0	.541	103.6	.567
	5465	268	5498	267	5470	263	5477	260	5503	257	5676	260
	58.5	320	59.8	329	61.2	335	62.3	341	63.2	348	63.8	362
200	95.8	.495	97.3	.509	98.9	.522	100.7	.536	103.0	.559	106.1	.589
	5792	274	5784	271	5775	268	5797	265	5933	266	6174	270
	56.5	328	57.8	334	58.9	340	59.9	347	60.6	359	60.9	376
210	97.2	.505	98.6	.516	100.3	.529	102.2	.545	105.0	.573	106.3	.567
	6102	279	6065	275	6076	272	6129	270	6358	273	6138	260
	54.7	334	55.9	339	56.8	345	57.6	353	58.0	369	59.0	362
220	98.4	.511	100.0	.524	101.7	.538	104.3	.565	106.5	.581	106.5	.532
	6379	283	6383	280	6413	277	6623	280	6676	277	6070	243
	53.0	338	54.0	345	54.8	351	55.3	366	55.9	373	56.0	340
230	99.5	.518	101.2	.531	103.2	.547	106.0	.576	106.7	.557		
	6674	287	6687	284	6762	282	7024	286	6636	265		
	51.3	343	52.2	349	52.8	357	53.2	374	54.0	359		
240	100.8	.525	102.6	.541	105.2	.567	107.0	.574	107.0	.523		
	6987	291	7044	289	7278	292	7218	285	6575	249		
	49.7	348	50.4	355	50.9	370	51.6	372	51.2	337		

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 20 FCOM-G0–03–06–30–010–015

LONG RANGE CRUISE - 1 ENGINE OUT

MAX. CONTINUOUS THRUST LIMITS
PACK FLOW HI
ANTI-ICING OFF

ISA+20
CG=30.0%

N1 (%) / **MACH**
KG/H / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL210		FL220		FL230		FL240		FL250		FL260	
130	93.1	.499	93.9	.506	94.6	.511	95.5	.519	96.4	.526	97.4	.534
	3719	223	3711	221	3691	219	3695	218	3692	217	3701	215
	85.3	317	86.4	321	87.5	323	88.4	327	89.3	330	90.2	334
140	94.9	.510	95.8	.517	96.6	.524	97.5	.531	98.5	.539	99.8	.551
	3994	228	3989	227	3987	225	3983	223	3996	222	4043	222
	81.3	325	82.2	328	83.1	331	83.9	334	84.5	338	85.1	344
150	96.8	.523	97.7	.529	98.7	.537	99.7	.545	101.2	.561	102.5	.571
	4289	234	4283	232	4295	230	4313	229	4403	232	4438	231
	77.5	332	78.2	335	78.9	339	79.5	343	79.9	352	80.3	356
160	98.6	.533	99.6	.541	100.9	.553	102.3	.567	103.9	.583	104.5	.578
	4584	238	4602	237	4662	238	4738	239	4836	241	4719	234
	73.9	339	74.5	343	74.9	349	75.2	357	75.5	365	76.4	361
170	100.5	.544	102.0	.561	103.3	.571	105.3	.593	106.6	.599	104.8	.537
	4906	244	5020	246	5069	246	5241	251	5245	248	4660	217
	70.5	346	70.8	355	71.1	361	71.2	373	71.6	375	71.9	335
180	102.8	.564	104.2	.576	106.2	.597	106.7	.589	107.1	.570		
	5344	253	5416	253	5593	258	5434	249	5224	236		
	67.2	359	67.4	365	67.4	377	68.2	371	68.4	357		
190	105.2	.583	106.4	.591	106.8	.577	107.2	.554				
	5795	262	5816	260	5605	249	5390	233				
	64.0	371	64.4	375	65.0	364	64.6	348				
200	106.4	.581	106.7	.563	107.3	.536						
	5985	261	5769	247	5546	230						
	61.7	369	61.9	357	61.0	338						
210	106.7	.548										
	5925	246										
	58.9	349										
220												
230												
240												

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

11.0–08F0A330–200 CF6–80E1A4 12200010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01 .990 .000 .000 20 FCOM-G0–03–06–30–011–015

IN CRUISE QUICK CHECK AT LONG RANGE SPEED

The following in cruise quick check tables allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to landing with one engine inoperative.
These tables are established for :
- Cruise Mach number : long range
- Descent profile : M.82/300kt/250kt
R – Approach and landing : 240 kg or 530 lb – 6 minute IMC
- ISA
- CG = 30 %
- Pack flow HI
- Anti ice OFF

<u>Note</u> : *1. In the tables, a "*" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celsius above ISA apply a fuel correction of
0.015 (kg/°C/NM) × △ISA (°C) × Air Distance (NM)
or 0.033 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

R The in cruise quick check tables are based on a reference initial weight that may vary from page to page.
The fuel consumption must be corrected when the actual weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight
R (see example 3.06.30).

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : LONG RANGE - DESCENT : M.82/300/250KT
IMC PROCEDURE : 240 KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG PACK FLOW HI ANTI ICING OFF	ISA CG = 30.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 100	150	200	220	240	260	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL150	FL200 FL220	FL240 FL260
200	3051 0.46	2603 0.45	2305 0.43	2206 0.42	2111 0.41	2018 0.40	8	6	5
250	3827 0.57	3336 0.54	3001 0.52	2895 0.50	2793 0.49	2695 0.48	10	9	9
300	4602 1.07	4067 1.04	3696 1.01	3580 0.59	3473 0.57	3369 0.56	13	12	12
350	5374 1.17	4797 1.13	4388 1.10	4264 1.08	4150 1.06	4039 1.05	16	15	15
400	6144 1.28	5524 1.23	5079 1.19	4945 1.17	4824 1.14	4707 1.13	19	18	18
450	6912 1.38	6249 1.32	5767 1.28	5623 1.26	5496 1.23	5373 1.21	22	21	21
500	7678 1.48	6972 1.42	6452 1.38	6299 1.34	6165 1.31	6035 1.30	24	25	25
550	8442 1.59	7694 1.52	7136 1.47	6973 1.43	6832 1.40	6696 1.38	27	28	28
600	9203 2.09	8413 2.01	7818 1.56	7645 1.52	7497 1.48	7353 1.46	30	31	31
650	9963 2.20	9131 2.11	8498 2.05	8314 2.02	8159 1.57	8009 1.55	33	34	34
700	10720 2.30	9846 2.21	9176 2.14	8981 2.11	8819 2.06	8661 2.03	35	37	38
750	11475 2.41	10560 2.30	9851 2.24	9646 2.20	9477 2.14	9312 2.11	38	40	41
800	12228 2.51	11271 2.40	10525 2.33	10308 2.29	10133 2.23	9960 2.20	41	43	44
850	12978 3.02	11981 2.50	11197 2.42	10969 2.38	10786 2.32	10605 2.28	43	46	47
900	13727 3.12	12688 3.00	11866 2.52	11627 2.47	11437 2.41	11248 2.37	46	49	50
950	14473 3.23	13394 3.09	12534 3.01	12283 2.57	12086 2.49	11889 2.45	49	51	54
1000	15217 3.34	14097 3.19	13200 3.10	12938 3.06	12734 2.58	12531 2.53	51	54	57
1050	15959 3.44	14799 3.29	13865 3.20	13591 3.15	13380 3.07	13171 3.02	54	57	60
1100	16699 3.55	15499 3.39	14527 3.29	14241 3.24	14024 3.16	13808 3.10	57	60	63
1150	17437 4.06	16196 3.49	15187 3.38	14890 3.33	14665 3.24	14444 3.18	59	63	67
1200	18173 4.17	16892 3.59	15846 3.47	15537 3.42	15305 3.33	15078 3.27	62	66	70
1250	18908 4.27	17587 4.08	16503 3.57	16181 3.51	15943 3.42	15710 3.35	64	69	73
1300	19640 4.38	18279 4.18	17157 4.06	16824 4.01	16579 3.51	16340 3.44	67	72	76
1350	20370 4.49	18969 4.28	17811 4.16	17465 4.10	17213 3.59	16968 3.52	69	75	80
1400	21098 5.00	19658 4.38	18462 4.25	18104 4.19	17845 4.08	17595 4.00	72	77	83

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

FLIP23D A330–200 CF6–80E1A4 3610 03001.001011 0250300 .5831 .00100 240 0300350170 0 230180100168 18590 FCOM-G0–03–06–30–013–015

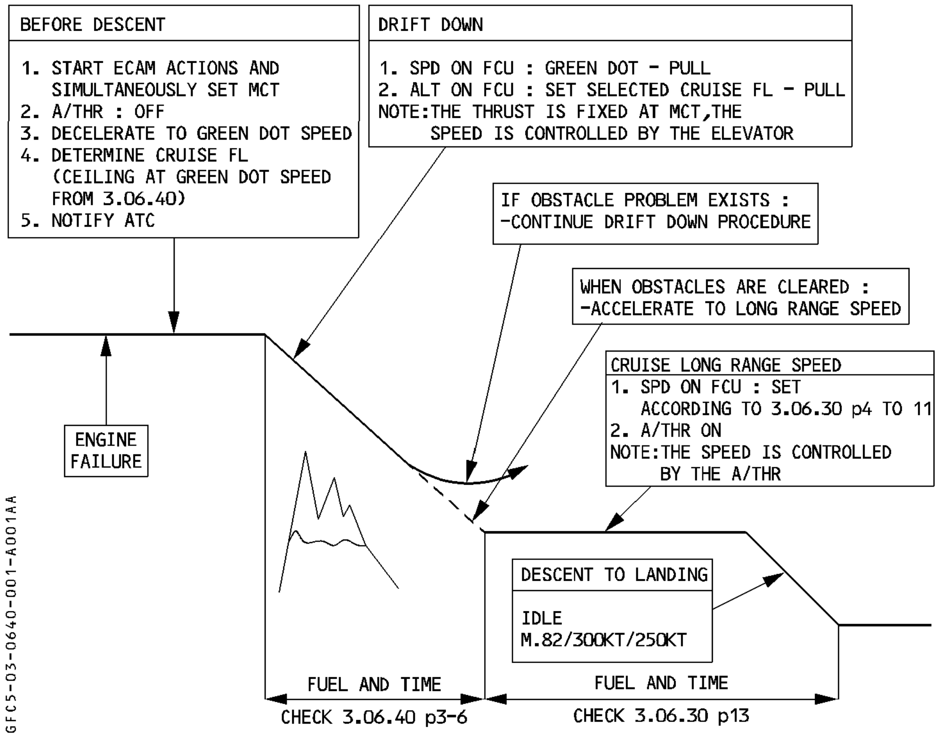
PROCEDURE

In order to maintain the highest possible level, the drift down procedure must be adopted. This requires maximum continuous thrust on the remaining engine at green dot speed.

- If, having reached drift down ceiling altitude, an obstacle problem remains the drift down procedure must be maintained so as to fly an ascending cruise profile.
- If, after drift down, no obstacle problem remains, the speed should be allowed to increase to long range speed and maintained. The subsequent cruise should be made using either the long range speed by adjusting it as a function of aircraft weight or by maintaining the initial cruise speed.

Note : Due to the fact that the long range speed is higher than the green dot speed, the cruise will be made at an altitude lower than the drift down ceiling.

R



EXAMPLE

Given :

GW at engine failure	=	190 000 kg
FL at engine failure	=	390
Temperature	=	ISA
Distance to destination airport	=	1500 NM
No wind		

Find :

Level off (drift down ceiling) : 25 700 ft
(see 3.06.40 p3)
Distance : 422 NM
Fuel : 5500 kg
Time : 75 min
LRC ceiling : (see 3.06.20 p1) FL240
Cruise at long range speed (FL240) to landing
(weight = 190 000 – 5500 = 184 500 kg : Distance = 1500 – 422 = 1078 NM)
Determine on (3.06.30 p13) time and fuel consumption at ISA conditions for a reference weight of 170 000 kg. Interpolate the remaining air distance of 1078 NM at FL240.
Fuel : 13 740 kg
Time : 3 h 12 min
Correction due to actual in-cruise weight
ΔFuel = + 62 kg per 1000 kg above reference weight
ΔFuel = + 62 kg $\times$ (184.5 – 170) $\sim$ 899 kg

Result :

Total Fuel = 5500 + 13 740 + 899 = 20 139 kg
Time = 3 h 12 min + 75 min = 4 h 27 min

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA CG=30.0%	**DISTANCE (NM) TIME (MIN)** **INITIAL SPEED(KT) FUEL(1000KG)** **LEVEL OFF (FT)**

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 250	270	290	310	330	350	370	390	410
130						228 42 190 2.3 33400	290 54 192 2.8 33500	329 60 194 3.1 33500	358 65 196 3.3 33500
140					202 38 194 2.2 31900	276 51 196 2.9 32000	318 58 198 3.3 32000	349 64 200 3.5 32100	375 68 202 3.7 32100
150				160 30 198 1.9 30400	258 48 200 3.0 30500	306 57 202 3.4 30600	339 62 204 3.7 30600	366 66 206 3.9 30700	388 70 208 4.0 30700
160			68 13 202 .9 28900	236 44 204 2.9 29200	291 54 206 3.5 29200	329 61 208 3.9 29300	356 65 210 4.1 29300	382 69 212 4.3 29300	402 72 214 4.4 29400
170			204 38 208 2.7 27800	276 51 210 3.6 27900	318 59 212 4.0 28000	348 64 214 4.3 28000	373 68 216 4.5 28100	396 71 218 4.7 28100	416 74 220 4.8 28100
180		151 29 212 2.2 26500	256 48 214 3.6 26700	304 56 216 4.1 26700	339 62 218 4.5 26800	366 67 220 4.7 26800	389 70 222 4.9 26800	409 73 224 5.1 26900	428 76 226 5.2 26900
190		211 39 218 3.1 25400	288 53 220 4.2 25500	327 60 222 4.6 25600	357 65 224 4.9 25600	380 69 226 5.1 25600	401 72 228 5.3 25700	422 75 230 5.5 25700	437 77 232 5.5 25700
200		149 27 224 2.3 25100	197 36 226 2.9 25100	231 41 228 3.3 25100	261 46 230 3.6 25100	284 50 232 3.8 25100	304 53 234 4.0 25100	324 56 236 4.2 25100	
210	178 33 228 3.0 24300	237 43 230 3.9 24400	271 49 232 4.3 24400	298 53 234 4.6 24500	321 57 236 4.8 24500	340 59 238 5.0 24500	357 62 240 5.1 24500	374 64 242 5.2 24500	
220	245 44 234 4.3 23200	291 52 236 4.9 23300	321 57 238 5.3 23300	348 62 240 5.6 23300	368 65 242 5.8 23400	389 68 244 6.0 23400	406 70 246 6.1 23400		
230	285 51 240 5.1 22100	322 58 242 5.6 22100	351 62 244 6.0 22200	375 66 246 6.2 22200	396 69 248 6.4 22200	414 72 250 6.6 22200	431 74 252 6.7 22300		
240	315 56 246 5.8 21000	349 62 248 6.3 21000	374 66 250 6.6 21100	396 69 252 6.8 21100	413 72 254 7.0 21100	433 75 256 7.1 21100			

CORRECTIONS	**DISTANCE**	**TIME**	**FUEL**	**LEVEL OFF**
ENGINE ANTI ICE ON	+ 4 %	–	+ 4 %	– 100 FT
TOTAL ANTI ICE ON	+ 5 %	+ 5 %	+ 5 %	– 400 FT

11.0–08F0A330–200 CF6–80E1A4 23500010C6KG300 0 018590 0 0 3 .0 .0 .00 0 02 1.000 1.000 .000 0 FCOM-G0–03–06–40–003–015

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+10 CG=30.0%	**DISTANCE (NM)** **TIME (MIN)** **INITIAL SPEED(KT)** **FUEL(1000KG)** **LEVEL OFF (FT)**

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 250	270	290	310	330	350	370	390	410
130						236 43 190 2.4 33300	299 54 192 3.0 33400	339 61 194 3.3 33500	370 65 196 3.5 33500
140					211 39 194 2.3 31800	284 52 196 3.1 31900	328 59 198 3.4 32000	361 64 200 3.7 32000	387 68 202 3.9 32000
150				170 32 198 2.1 30300	265 49 200 3.1 30500	314 57 202 3.6 30600	350 63 204 3.9 30600	377 67 206 4.1 30600	401 71 208 4.2 30600
160			76 14 202 1.0 28800	244 45 204 3.1 29100	301 55 206 3.7 29200	339 61 208 4.0 29300	368 66 210 4.3 29300	393 69 212 4.5 29300	416 73 214 4.6 29300
170			209 39 208 2.8 27800	284 52 210 3.7 27900	328 59 212 4.2 28000	358 64 214 4.5 28000	385 68 216 4.7 28000	407 72 218 4.9 28100	428 75 220 5.0 28100
180		159 29 212 2.3 26500	261 48 214 3.7 26600	312 57 216 4.3 26700	347 62 218 4.6 26700	376 67 220 4.9 26800	401 71 222 5.1 26800	421 74 224 5.3 26800	442 76 226 5.4 26800
190		205 38 218 3.1 25400	296 54 220 4.3 25500	337 61 222 4.8 25500	367 66 224 5.1 25600	392 69 226 5.3 25600	412 72 228 5.5 25600	433 75 230 5.7 25600	453 78 232 5.8 25700
200		153 28 224 2.4 25100	202 36 226 3.0 25100	238 42 228 3.4 25100	267 46 230 3.8 25100	291 50 232 4.0 25100	313 53 234 4.2 25100	334 56 236 4.3 25100	
210	183 33 228 3.2 24200	245 44 230 4.1 24300	280 49 232 4.5 24400	309 54 234 4.8 24400	332 57 236 5.0 24500	351 60 238 5.2 24500	371 63 240 5.3 24500	388 65 242 5.5 24500	
220	251 45 234 4.4 23100	300 53 236 5.1 23200	332 58 238 5.5 23300	358 62 240 5.8 23300	381 66 242 6.0 23300	400 68 244 6.2 23400	419 71 246 6.4 23400		
230	294 52 240 5.3 22000	333 58 242 5.9 22100	363 63 244 6.2 22100	386 67 246 6.5 22200	407 70 248 6.7 22200	426 72 250 6.9 22200	443 75 252 7.0 22200		
240	325 57 246 6.1 20900	359 63 248 6.5 21000	385 67 250 6.8 21000	408 70 252 7.1 21100	428 73 254 7.3 21100	446 75 256 7.4 21100			

CORRECTIONS	**DISTANCE**	**TIME**	**FUEL**	**LEVEL OFF**
ENGINE ANTI ICE ON	+ 4 %	+ 2 %	+ 4 %	– 300 FT
TOTAL ANTI ICE ON	+ 10 %	+ 10 %	+ 10 %	– 1100 FT

11.0–08F0A330–200 CF6–80E1A4 23500010C6KG300 0 018590 0 0 3 .0 .0 .00 0 02 1.000 1.000 .000 10 FCOM-G0–03–06–40–004–015

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+15 CG=30.0%	**DISTANCE (NM) TIME (MIN)** **INITIAL SPEED(KT) FUEL(1000KG)** **LEVEL OFF (FT)**

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 250	270	290	310	330	350	370	390	410
130						233 42 190 2.4 33300	297 53 192 3.0 33400	338 60 194 3.3 33500	368 64 196 3.5 33500
140					206 37 194 2.3 31900	281 51 196 3.1 32000	325 58 198 3.4 32000	356 63 200 3.7 32100	385 67 202 3.9 32100
150				171 31 198 2.1 30400	271 49 200 3.2 30600	320 57 202 3.7 30700	354 63 204 4.0 30700	382 67 206 4.2 30700	406 71 208 4.3 30800
160			106 20 202 1.4 28800	257 47 204 3.3 29100	316 57 206 3.9 29200	353 63 208 4.2 29200	385 68 210 4.5 29300	410 72 212 4.7 29300	432 75 214 4.8 29300
170			228 42 208 3.1 27600	300 54 210 4.0 27700	344 62 212 4.4 27800	376 67 214 4.7 27800	403 71 216 5.0 27900	426 74 218 5.1 27900	447 77 220 5.3 27900
180		190 35 212 2.8 26100	280 51 214 3.9 26300	331 60 216 4.5 26400	366 66 218 4.9 26400	395 70 220 5.2 26500	418 73 222 5.4 26500	440 77 224 5.5 26500	459 79 226 5.6 26500
190		168 31 218 2.5 25200	235 42 220 3.4 25300	280 50 222 3.9 25300	315 56 224 4.3 25300	344 60 226 4.6 25300	367 63 228 4.8 25300	391 67 230 5.0 25300	
200	127 23 222 2.1 24700	195 35 224 3.1 24800	229 40 226 3.5 24900	255 45 228 3.7 24900	275 48 230 3.9 24900	293 50 232 4.0 24900	307 52 234 4.0 24900	325 54 236 4.2 25000	
210	230 41 228 3.9 23600	283 50 230 4.7 23700	319 56 232 5.1 23700	348 61 234 5.4 23800	371 64 236 5.6 23800	392 67 238 5.8 23800	411 70 240 6.0 23800		
220	284 51 234 4.9 22400	324 57 236 5.5 22500	357 63 238 5.9 22500	383 67 240 6.2 22500	406 70 242 6.4 22600	424 72 244 6.5 22600	444 75 246 6.7 22600		
230	322 57 240 5.8 21200	357 63 242 6.2 21200	384 67 244 6.5 21300	409 71 246 6.8 21300	430 74 248 7.0 21400	448 76 250 7.2 21400			
240	353 62 246 6.5 20000	383 67 248 6.9 20000	409 71 250 7.2 20100	431 74 252 7.4 20100	451 77 254 7.6 20100	469 80 256 7.7 20200			

CORRECTIONS	**DISTANCE**	**TIME**	**FUEL**	**LEVEL OFF**
ENGINE ANTI ICE ON	+ 4 %	+ 4 %	+ 4 %	– 400 FT
TOTAL ANTI ICE ON	+ 10 %	+ 10 %	+ 10 %	– 1400 FT

11.0–08F0A330–200 CF6–80E1A4 23500010C6KG300 0 018590 0 0 3 .0 .0 .00 0 02 1.000 1.000 .000 15 FCOM-G0–03–06–40–005–015

GROSS FLIGHT PATH DESCENT AT GREEN DOT SPEED

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=30.0%	**DISTANCE (NM)** **TIME (MIN)** **INITIAL SPEED(KT)** **FUEL(1000KG)** **LEVEL OFF (FT)**

INIT. GW (1000KG)	INITIAL FLIGHT LEVEL 250	270	290	310	330	350	370	390	410
130					59 11 188 .6 32900	245 44 190 2.5 33200	305 54 192 3.0 33300	343 60 194 3.3 33300	372 65 196 3.5 33400
140					226 41 194 2.5 31600	294 53 196 3.2 31700	336 60 198 3.6 31800	367 64 200 3.8 31800	393 68 202 3.9 31900
150				207 38 198 2.5 30000	292 53 200 3.4 30200	339 60 202 3.9 30300	371 66 204 4.1 30300	397 70 206 4.3 30300	419 73 208 4.4 30400
160			176 32 202 2.3 28300	282 51 204 3.6 28500	336 61 206 4.1 28600	372 66 208 4.5 28700	401 71 210 4.7 28700	424 74 212 4.8 28800	445 77 214 5.0 28800
170		132 25 206 1.8 26700	265 49 208 3.6 26900	326 59 210 4.3 27100	364 65 212 4.7 27100	396 70 214 4.9 27200	422 74 216 5.2 27200	444 78 218 5.3 27200	464 80 220 5.4 27200
180		208 38 212 3.0 25400	312 57 214 4.3 25500	356 64 216 4.8 25600	392 70 218 5.2 25600	418 74 220 5.4 25600	440 78 222 5.6 25700	460 80 224 5.7 25700	481 83 226 5.9 25700
190	88 16 216 1.4 24800	161 29 218 2.4 25000	213 38 220 3.0 25000	251 44 222 3.5 25000	281 49 224 3.8 25000	305 53 226 4.0 25000	327 56 228 4.1 25000	348 59 230 4.3 25000	
200	221 40 222 3.6 23700	276 50 224 4.3 23800	313 56 226 4.7 23900	343 61 228 5.1 23900	368 65 230 5.3 24000	390 68 232 5.5 24000	410 71 234 5.6 24000	427 73 236 5.7 24000	
210	284 51 228 4.7 22400	326 59 230 5.3 22500	358 64 232 5.6 22600	385 68 234 5.9 22600	408 71 236 6.1 22700	428 74 238 6.3 22700	448 77 240 6.5 22700		
220	329 59 234 5.6 21100	365 65 236 6.1 21200	394 70 238 6.4 21200	417 73 240 6.6 21300	439 77 242 6.8 21300	457 79 244 7.0 21300	475 81 246 7.1 21300		
230	358 64 240 6.3 19800	392 70 242 6.7 19900	420 74 244 7.1 19900	446 78 246 7.3 19900	466 81 248 7.5 20000	487 84 250 7.7 20000			
240	356 63 246 6.4 18800	385 68 248 6.7 18800	407 71 250 7.0 18800	431 75 252 7.2 18800	451 78 254 7.4 18900	469 80 256 7.6 18900			

CORRECTIONS	**DISTANCE**	**TIME**	**FUEL**	**LEVEL OFF**
ENGINE ANTI ICE ON	+ 5 %	+ 5 %	+ 5 %	– 500 FT
TOTAL ANTI ICE ON	+ 15 %	+ 15 %	+ 15 %	– 1500 FT

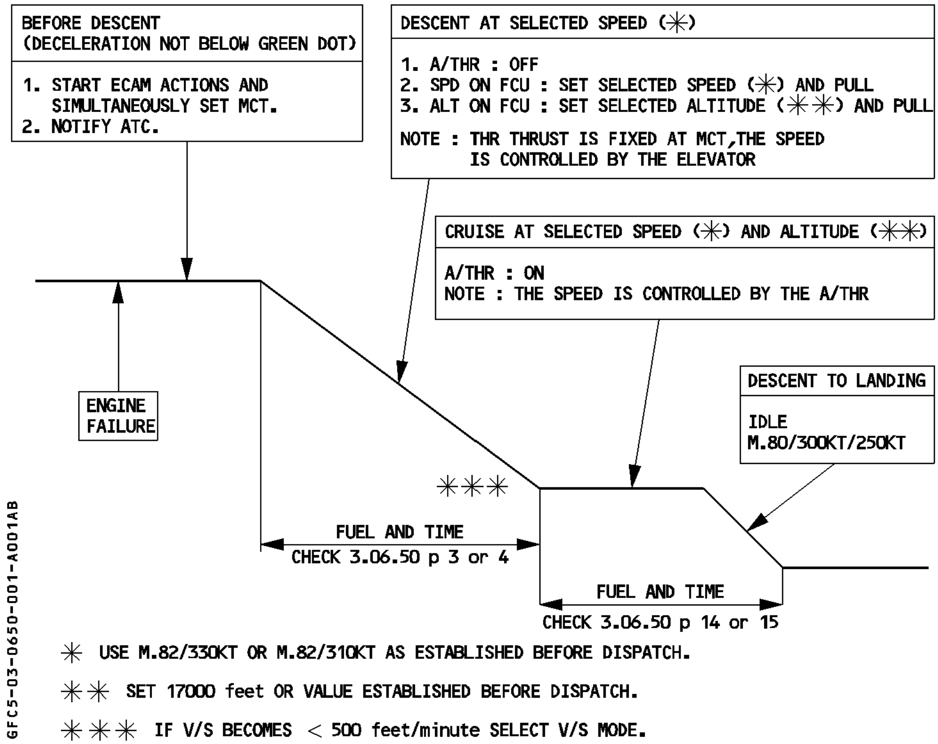
11.0–08F0A330–200 CF6–80E1A4 23500010C6KG300 0 018590 0 0 3 .0 .0 .00 0 02 1.000 1.000 .000 20 FCOM-G0–03–06–40–006–015

- For LONG RANGE CRUISE table. (Refer 3.06.30 p 4 to 11)
- For IN CRUISE QUICK CHECK table. (Refer to 3.06.30 p 13)

PROCEDURE

This section provides single engine performance data for two fixed speed diversion strategies (fixed descent and cruise speed schedules) recommended for ETOPS operation, provided that the requirements set forth in section 3.06.10, GENERAL, are complied with.

R



✳ USE M.82/330KT OR M.82/310KT AS ESTABLISHED BEFORE DISPATCH.

✳✳ SET 17000 feet OR VALUE ESTABLISHED BEFORE DISPATCH.

✳✳✳ IF V/S BECOMES < 500 feet/minute SELECT V/S MODE.

EXAMPLE

Given :

GW at engine failure	=	175 000 kg
FL at engine failure	=	370
Temperature	=	ISA
Distance to diversion airport	=	500 NM
Speed selected before dispatch	=	330 kt
Cruise level for diversion selected before dispatch	=	FL180

Find :

Descent to cruise level : Distance = 294 – 107 = 187 NM
(see 3.06.50 p 3) Fuel = 3760 – 1552 = 2208 kg
Time = 40.3 – 16 = 24.3 min

Cruise
Weight = 175 000 – 2208 = 172 798 kg
Distance = 500 – 187 = 313 NM
Determine (3.06.50 p 14) time and fuel consumption at ISA conditions for a reference weight of 170 000 kg.
Interpolate the remaining distance of 313 NM at FL180.
Fuel = 4800 kg
Time = 54 min
Correction due to actual in cruise weight
$\triangle$Fuel = 0 kg per 1000 kg above reference weight
$\triangle$Fuel = 0 kg × (172.8 – 170) ~ 0 kg

Result

Total Fuel = 2208 + 4800 + 0 = 7008 kg
Time = 0 h 24 min + 54 = 1 h 18 min

DESCENT - M.82/330KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF		ISA CG=30.0%		**MINIMUM RATE OF DESCENT 500FT/MIN**					
WEIGHT (1000KG)	**150**				**200**				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
410	44.0	3946	323	MCT					243
390	42.2	3857	309	MCT	41.7	3852	305	MCT	255
370	40.4	3755	295	MCT	40.1	3765	292	MCT	267
350	38.6	3646	281	MCT	38.5	3667	280	MCT	279
330	37.0	3534	268	MCT	36.9	3560	267	MCT	292
310	35.3	3415	255	MCT	35.3	3441	255	MCT	306
290	33.8	3292	242	MCT	33.8	3316	242	MCT	319
270	32.2	3155	229	MCT	32.1	3173	229	MCT	330
250	29.8	2935	210	MCT	29.6	2947	209	MCT	330
240	28.0	2750	196	MCT	27.9	2775	196	MCT	330
220	24.0	2343	166	V/S	24.0	2366	166	V/S	330
200	20.0	1944	136	V/S	20.0	1958	136	V/S	330
180	16.0	1548	107	V/S	16.0	1556	107	V/S	330
160	12.0	1157	79	V/S	12.0	1161	79	V/S	330
140	8.0	769	52	V/S	8.0	770	52	V/S	330
120	4.0	383	26	V/S	4.0	383	26	V/S	330
100	.0	0	0	V/S	.0	0	0	V/S	330

CORRECTIONS	**ENGINE ANTI ICE ON**	**TOTAL ANTI ICE ON**	**per 1° above ISA**
TIME	–	–	–
FUEL	+ 1.5 %	+ 3.5 %	+ 0.3 %
DISTANCE	–	–	+ 0.25 %

11.0–08F0A330–200 CF6–80E1A4 23200010C6KG300 0 018590 0 0 3 .0 .0 500.00 0 02 .820330.000 .000 0 FCOM-G0–03–06–50–003–015

DESCENT - M.82/310KT - 1 ENGINE OUT									
MAX. CONTINUOUS THRUST LIMITS PACK FLOW HI ANTI-ICING OFF			ISA CG=30.0%		MINIMUM RATE OF DESCENT 500FT/MIN				
WEIGHT (1000KG)	150				200				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	TIME (MIN)	FUEL (KG)	DIST. (NM)	MODE	IAS (KT)
410	47.7	3842	338	MCT					243
390	46.0	3753	324	MCT	44.9	3738	316	MCT	255
370	44.2	3652	310	MCT	43.4	3652	303	MCT	267
350	42.4	3543	296	MCT	41.8	3553	291	MCT	279
330	40.7	3430	283	MCT	40.2	3446	278	MCT	292
310	39.1	3311	270	MCT	38.6	3327	266	MCT	306
290	37.0	3138	252	MCT	36.4	3155	248	MCT	310
270	33.9	2878	229	MCT	33.5	2911	226	MCT	310
250	30.0	2537	199	V/S	30.0	2593	199	V/S	310
240	28.0	2361	185	V/S	28.0	2409	185	V/S	310
220	24.0	2014	156	V/S	24.0	2049	156	V/S	310
200	20.0	1670	128	V/S	20.0	1695	128	V/S	310
180	16.0	1331	101	V/S	16.0	1348	101	V/S	310
160	12.0	995	75	V/S	12.0	1005	75	V/S	310
140	8.0	661	49	V/S	8.0	667	49	V/S	310
120	4.0	329	24	V/S	4.0	332	24	V/S	310
100	.0	0	0	V/S	.0	0	0	V/S	310

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	per 1° above ISA
TIME	–	–	–
FUEL	+ 1.5 %	+ 3.5 %	+ 0.3 %
DISTANCE	–	–	+ 0.25 %

11.0–08F0A330–200 CF6–80E1A4 23200010C6KG300 0 018590 0 0 3 .0 .0 500.00 0 02 .820310.000 .000 0 FCOM-G0–03–06–50–004–015

CRUISE - MCT/330KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF									ISA CG=30.0%		**N1 (%) KG/H NM/1000KG**				**MACH IAS (KT) TAS (KT)**	
WEIGHT (1000KG)	**FL100**		**FL150**		**FL160**		**FL170**		**FL180**		**FL190**		**FL200**		**FL210**	
130	97.6	.594	101.7	.650	102.8	.662	103.8	.674	104.8	.687	105.8	.696	105.7	.696	106.0	.699
	6879	330	7023	330	7080	330	7112	330	7148	330	7114	328	6858	322	6677	317
	55.1	379	58.0	407	58.4	413	58.9	419	59.5	425	60.3	429	62.3	428	64.0	428
140	97.8	.594	102.0	.650	103.1	.662	104.1	.674	105.2	.687	105.8	.693	105.8	.692	106.1	.694
	6914	330	7083	330	7140	330	7172	330	7217	330	7110	326	6853	320	6670	314
	54.8	379	57.5	407	57.9	413	58.5	419	58.9	425	60.1	427	62.0	425	63.7	425
150	98.0	.594	102.3	.650	103.4	.662	104.4	.674	105.7	.687	105.9	.688	105.9	.687	106.2	.689
	6967	330	7162	330	7220	330	7250	330	7309	330	7104	324	6846	317	6662	312
	54.4	379	56.9	407	57.2	413	57.8	419	58.2	425	59.8	425	61.7	422	63.3	421
160	98.3	.594	102.8	.650	103.8	.662	104.9	.674	106.0	.685	106.0	.684	106.0	.682	106.3	.683
	7044	330	7264	330	7310	330	7344	330	7358	329	7098	322	6839	315	6653	309
	53.8	379	56.1	407	56.5	413	57.1	419	57.6	424	59.4	422	61.2	419	62.8	418
170	98.6	.594	103.3	.650	104.3	.662	105.4	.674	106.1	.680	106.1	.678	106.1	.676	106.5	.676
	7129	330	7372	330	7407	330	7450	330	7352	326	7091	319	6832	312	6643	306
	53.2	379	55.2	407	55.8	413	56.3	419	57.2	421	59.0	418	60.8	415	62.3	414
180	98.9	.594	103.8	.650	104.8	.662	106.0	.674	106.2	.674	106.3	.672	106.3	.669	106.6	.668
	7221	330	7485	330	7511	330	7573	330	7345	324	7084	316	6824	308	6631	302
	52.5	379	54.4	407	55.0	413	55.4	419	56.8	417	58.5	414	60.2	411	61.6	409
190	99.3	.594	104.3	.650	105.3	.662	106.3	.670	106.3	.668	106.4	.665	106.4	.661	106.8	.658
	7320	330	7594	330	7624	330	7605	328	7338	320	7076	313	6815	305	6615	297
	51.8	379	53.6	407	54.2	413	54.8	417	56.3	413	57.9	410	59.5	406	60.9	403
200	99.7	.594	104.8	.650	106.0	.662	106.4	.664	106.5	.661	106.6	.657	106.6	.651	107.0	.646
	7425	330	7709	330	7761	330	7598	325	7331	317	7067	309	6805	300	6597	292
	51.1	379	52.8	407	53.2	413	54.3	413	55.8	409	57.3	405	58.8	400	59.9	395
210	100.1	.594	105.3	.650	106.5	.660	106.6	.657	106.7	.653	106.8	.647	106.9	.640	107.3	.632
	7538	330	7832	330	7861	329	7590	321	7323	313	7058	304	6791	294	6576	285
	50.3	379	52.0	407	52.4	412	53.8	408	55.2	404	56.6	399	57.9	393	58.8	387
220	100.6	.594	106.0	.650	106.6	.653	106.7	.649	106.9	.643	107.0	.636	107.2	.625	107.7	.612
	7661	330	7975	330	7850	325	7582	317	7314	308	7046	299	6772	287	6545	275
	49.5	379	51.1	407	51.9	407	53.2	403	54.5	398	55.7	392	56.7	384	57.2	374
230	101.1	.594	106.4	.645	106.8	.644	106.9	.639	107.1	.632	107.3	.621	107.6	.604	108.2	.577
	7793	330	8033	328	7838	321	7574	312	7304	303	7028	291	6747	277	6466	259
	48.7	379	50.3	404	51.3	402	52.5	397	53.6	392	54.5	383	55.0	371	54.6	353
240	101.6	.594	106.5	.637	107.0	.635	107.2	.629	107.4	.618	107.8	.600	108.2	.565		
	7933	330	8020	323	7827	316	7565	307	7288	295	7003	281	6657	259		
	47.8	379	49.8	399	50.6	396	51.7	391	52.5	382	52.8	370	52.2	347		
ENGINE ANTI ICE ON △FUEL = + 1 %									**TOTAL ANTI ICE ON** △FUEL = + 3 %							

11.0–08F0A330–200 CF6–80E1A4 12300001OC6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 0 FCOM-G0–03–06–50–005–015

CRUISE - MCT/330KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+10
CG=30.0%

N1 (%) — **MACH**
KG/H — **IAS (KT)**
NM/1000KG — **TAS (KT)**

WEIGHT (1000KG)	FL100		FL150		FL160		FL170		FL180		FL190		FL200		FL210	
130	99.5	.594	103.7	.650	104.8	.662	105.8	.674	107.0	.687	107.7	.694	107.7	.694	108.0	.697
	7086	330	7257	330	7314	330	7347	330	7388	330	7311	327	7049	321	6865	316
	54.5	386	57.2	415	57.6	421	58.2	427	58.7	434	59.7	437	61.7	435	63.4	435
140	99.7	.594	104.0	.650	105.1	.662	106.1	.674	107.3	.687	107.8	.691	107.8	.690	108.1	.692
	7124	330	7318	330	7377	330	7408	330	7461	330	7306	326	7044	319	6858	314
	54.2	386	56.7	415	57.1	421	57.7	427	58.1	434	59.5	435	61.4	433	63.0	432
150	99.9	.594	104.4	.650	105.5	.662	106.5	.674	107.8	.687	107.9	.687	107.9	.685	108.2	.687
	7181	330	7400	330	7455	330	7488	330	7556	330	7300	323	7037	317	6850	311
	53.8	386	56.1	415	56.5	421	57.1	427	57.4	434	59.2	432	61.0	429	62.6	429
160	100.2	.594	104.8	.650	105.9	.662	107.0	.674	107.9	.683	108.0	.682	108.0	.680	108.3	.681
	7260	330	7505	330	7548	330	7585	330	7560	328	7294	321	7030	314	6841	308
	53.2	386	55.3	415	55.8	421	56.3	427	57.0	431	58.8	429	60.6	426	62.1	425
170	100.5	.594	105.3	.650	106.3	.662	107.5	.674	108.0	.678	108.1	.676	108.1	.674	108.4	.674
	7348	330	7616	330	7647	330	7700	330	7554	325	7287	318	7023	311	6831	305
	52.5	386	54.5	415	55.1	421	55.5	427	56.7	428	58.4	425	60.1	422	61.6	421
180	100.8	.594	105.8	.650	106.8	.662	108.1	.674	108.2	.672	108.2	.670	108.2	.667	108.6	.666
	7444	330	7725	330	7755	330	7820	330	7547	323	7279	315	7015	308	6818	301
	51.9	386	53.7	415	54.3	421	54.6	427	56.2	424	57.9	421	59.6	418	61.0	416
190	101.2	.594	106.3	.650	107.4	.662	108.2	.668	108.3	.666	108.4	.663	108.4	.659	108.8	.656
	7546	330	7837	330	7874	330	7813	327	7539	319	7271	312	7006	304	6802	296
	51.2	386	53.0	415	53.5	421	54.2	424	55.8	420	57.3	417	58.9	413	60.2	409
200	101.6	.594	106.8	.650	108.1	.662	108.4	.662	108.4	.659	108.5	.655	108.6	.649	109.0	.644
	7654	330	7956	330	8017	330	7806	324	7531	316	7262	308	6997	299	6784	291
	50.4	386	52.2	415	52.5	421	53.8	420	55.2	416	56.7	412	58.2	407	59.3	402
210	102.0	.594	107.4	.650	108.4	.658	108.5	.655	108.6	.650	108.7	.645	108.9	.638	109.3	.630
	7771	330	8082	330	8073	328	7797	320	7523	312	7253	303	6981	293	6762	284
	49.7	386	51.3	415	51.9	419	53.2	415	54.6	411	55.9	406	57.2	399	58.1	393
220	102.5	.594	108.1	.650	108.6	.651	108.7	.647	108.8	.641	109.0	.634	109.2	.622	109.7	.609
	7897	330	8235	330	8062	324	7789	316	7514	307	7241	297	6962	286	6731	274
	48.9	386	50.4	415	51.4	414	52.6	410	53.9	405	55.1	399	56.0	390	56.5	380
230	103.0	.594	108.3	.644	108.7	.643	108.9	.637	109.0	.630	109.3	.619	109.6	.601	110.2	.572
	8032	330	8248	327	8051	320	7781	311	7504	302	7222	290	6936	276	6641	257
	48.1	386	49.8	411	50.8	409	51.9	404	53.0	398	53.9	389	54.3	377	53.8	357
240	103.5	.594	108.4	.635	108.9	.633	109.1	.626	109.4	.615	109.7	.597	110.2	.560		
	8177	330	8234	322	8039	315	7771	306	7486	294	7191	279	6836	256		
	47.2	386	49.2	405	50.1	403	51.1	397	51.9	388	52.2	375	51.3	351		

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 10 FCOM-G0–03–06–50–006–015

CRUISE - MCT/330KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+15
CG=30.0%

N1 (%) — **MACH**
KG/H — **IAS (KT)**
NM/1000KG — **TAS (KT)**

WEIGHT (1000KG)	FL100		FL150		FL160		FL170		FL180		FL190		FL200		FL210	
130	100.4	.594	104.8	.650	105.8	.662	106.9	.674	106.8	.676	106.8	.676	106.7	.676	106.9	.677
	7194	330	7374	330	7432	330	7464	330	7215	324	6954	318	6696	312	6507	306
	54.2	390	56.8	419	57.2	425	57.8	431	59.7	431	61.7	429	63.8	427	65.6	427
140	100.6	.594	105.0	.650	106.1	.662	107.0	.672	106.9	.672	106.8	.672	106.7	.671	107.0	.672
	7234	330	7435	330	7495	330	7478	329	7209	323	6946	316	6686	309	6497	304
	53.9	390	56.3	419	56.7	425	57.5	430	59.4	429	61.4	427	63.5	424	65.2	423
150	100.8	.594	105.4	.650	106.5	.662	107.0	.669	107.0	.668	106.9	.667	106.8	.665	107.0	.666
	7292	330	7518	330	7572	330	7471	327	7200	320	6937	314	6676	307	6485	301
	53.4	390	55.7	419	56.1	425	57.3	428	59.1	426	61.0	423	63.0	421	64.7	420
160	101.1	.594	105.9	.650	106.9	.662	107.1	.664	107.0	.663	107.0	.661	106.9	.659	107.2	.659
	7372	330	7625	330	7666	330	7462	325	7190	318	6927	311	6662	304	6472	298
	52.8	390	54.9	419	55.4	425	56.9	425	58.8	422	60.6	420	62.5	417	64.1	415
170	101.4	.594	106.3	.650	107.3	.661	107.2	.659	107.1	.657	107.0	.655	107.0	.651	107.3	.651
	7461	330	7737	330	7742	329	7452	322	7180	315	6914	308	6647	300	6459	294
	52.2	390	54.1	419	54.8	424	56.6	422	58.3	419	60.1	416	62.0	412	63.5	410
180	101.8	.594	106.8	.650	107.3	.656	107.2	.653	107.2	.651	107.1	.648	107.1	.643	107.4	.642
	7557	330	7845	330	7732	327	7440	319	7167	312	6900	304	6634	296	6445	290
	51.6	390	53.4	419	54.5	421	56.2	418	57.9	415	59.6	411	61.4	407	62.7	404
190	102.2	.594	107.2	.648	107.4	.650	107.3	.647	107.3	.644	107.3	.640	107.2	.634	107.6	.631
	7660	330	7918	329	7720	324	7429	316	7157	309	6887	300	6619	292	6429	284
	50.9	390	52.8	418	54.1	417	55.7	414	57.4	411	59.0	406	60.6	401	61.8	398
200	102.6	.594	107.2	.643	107.5	.644	107.4	.640	107.4	.636	107.4	.630	107.4	.622	107.8	.618
	7770	330	7908	326	7711	321	7420	313	7144	304	6871	295	6601	286	6410	278
	50.1	390	52.4	414	53.6	414	55.2	410	56.7	405	58.2	400	59.6	394	60.7	389
210	103.0	.594	107.3	.637	107.6	.637	107.5	.632	107.5	.626	107.6	.618	107.6	.608	108.1	.599
	7888	330	7897	323	7701	317	7407	309	7128	299	6852	290	6578	279	6384	269
	49.4	390	52.0	410	53.1	409	54.6	405	56.0	399	57.3	393	58.4	384	59.1	377
220	103.5	.594	107.4	.630	107.7	.629	107.7	.623	107.7	.615	107.8	.603	107.9	.587	108.5	.567
	8016	330	7884	319	7689	313	7392	304	7109	294	6829	283	6544	269	6328	255
	48.6	390	51.5	406	52.6	404	53.9	398	55.1	392	56.1	383	56.7	371	56.5	358
230	103.9	.594	107.5	.621	107.8	.620	107.8	.611	107.9	.599	108.1	.582	108.4	.552		
	8153	330	7870	315	7675	308	7373	298	7085	286	6796	272	6490	253		
	47.8	390	50.9	400	51.9	398	53.0	391	53.9	382	54.4	370	53.8	349		
240	104.3	.591	107.6	.612	108.0	.609	108.1	.596	108.2	.578	108.6	.548				
	8230	328	7855	310	7656	302	7351	290	7055	275	6745	255				
	47.1	388	50.2	394	51.0	391	51.9	381	52.2	368	51.5	348				

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = + 1 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 15 FCOM-G0–03–06–50–007–015

CRUISE - MCT/330KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=30.0%	N1 (%) KG/H NM/1000KG	MACH IAS (KT) TAS (KT)

WEIGHT (1000KG)	FL100		FL150		FL160		FL170		FL180		FL190		FL200		FL210	
130	101.4	.594	105.8	.650	106.2	.656	106.0	.655	105.9	.654	105.7	.653	105.6	.652	105.7	.653
	7304	330	7490	330	7371	327	7086	320	6820	314	6560	307	6305	300	6113	295
	53.8	393	56.4	423	57.6	425	59.7	423	61.7	421	63.8	419	66.0	416	68.0	415
140	101.5	.594	106.0	.650	106.2	.653	106.0	.651	105.9	.650	105.8	.648	105.6	.646	105.7	.647
	7343	330	7552	330	7364	325	7077	318	6809	311	6549	304	6294	298	6101	292
	53.5	393	56.0	423	57.4	423	59.4	420	61.4	418	63.4	415	65.6	413	67.5	412
150	101.7	.594	106.1	.647	106.3	.649	106.1	.647	105.9	.645	105.8	.643	105.7	.640	105.8	.641
	7401	330	7559	329	7355	323	7068	316	6799	309	6538	302	6281	295	6089	289
	53.1	393	55.7	421	57.2	420	59.1	418	61.0	415	63.0	412	65.1	409	66.9	408
160	102.0	.594	106.1	.643	106.3	.644	106.1	.642	106.0	.639	105.9	.637	105.7	.634	105.9	.633
	7482	330	7550	326	7346	321	7058	313	6787	306	6525	299	6268	291	6076	285
	52.5	393	55.4	418	56.8	418	58.7	414	60.6	411	62.5	408	64.5	405	66.3	403
170	102.4	.594	106.2	.639	106.3	.639	106.2	.636	106.1	.633	105.9	.630	105.8	.626	106.0	.624
	7571	330	7540	324	7336	318	7047	311	6775	303	6512	295	6252	288	6060	281
	51.9	393	55.1	415	56.5	414	58.3	411	60.1	407	62.0	404	63.9	400	65.5	397
180	102.7	.594	106.2	.634	106.4	.634	106.2	.630	106.1	.626	106.0	.622	105.9	.616	106.1	.613
	7669	330	7528	321	7325	315	7034	307	6761	300	6496	291	6234	283	6041	276
	51.2	393	54.7	412	56.1	411	57.8	407	59.6	403	61.3	398	63.1	393	64.6	390
190	103.1	.594	106.3	.628	106.5	.628	106.3	.623	106.2	.618	106.1	.612	106.0	.604	106.2	.600
	7773	330	7516	318	7313	312	7021	304	6745	295	6477	287	6213	277	6019	270
	50.6	393	54.3	408	55.6	407	57.3	402	58.9	397	60.5	392	62.1	386	63.4	382
200	103.5	.594	106.3	.621	106.5	.620	106.4	.614	106.3	.608	106.2	.600	106.1	.589	106.4	.581
	7885	330	7503	315	7299	308	7005	299	6727	290	6456	281	6182	270	5985	261
	49.8	393	53.8	404	55.1	402	56.6	397	58.1	391	59.6	385	60.9	376	61.7	369
210	103.8	.593	106.4	.614	106.6	.612	106.5	.604	106.4	.596	106.3	.585	106.3	.567	106.7	.548
	7969	329	7486	311	7283	304	6986	294	6705	285	6426	274	6138	260	5925	246
	49.2	392	53.3	399	54.4	396	55.9	390	57.2	384	58.3	375	59.0	362	58.9	349
220	103.8	.586	106.5	.605	106.7	.602	106.6	.593	106.5	.581	106.5	.562	106.5	.532		
	7948	326	7469	306	7266	299	6965	288	6676	277	6383	262	6070	243		
	48.8	388	52.6	393	53.7	390	54.9	383	55.9	373	56.4	360	56.0	340		
230	103.8	.579	106.6	.594	106.8	.590	106.7	.577	106.7	.557	106.8	.527				
	7925	322	7447	301	7245	293	6937	280	6636	265	6317	246				
	48.4	383	51.9	386	52.8	382	53.7	372	54.0	359	53.5	338				
240	103.8	.571	106.7	.581	107.0	.574	107.0	.554	107.0	.523						
	7898	317	7421	294	7218	285	6899	269	6575	249						
	47.8	378	50.9	378	51.6	372	51.8	358	51.2	337						

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 20 FCOM-G0–03–06–50–008–015

CRUISE - MCT/310KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA
CG=30.0%

N1 (%) / **MACH**
KG/H / **IAS (KT)**
NM/1000KG / **TAS (KT)**

WEIGHT (1000KG)	FL100		FL170		FL180		FL190		FL200		FL210		FL220		FL230	
130	94.3	.559	100.0	.635	101.0	.647	102.2	.659	103.2	.672	104.5	.685	106.0	.698	106.6	.702
	6029	310	6173	310	6217	310	6274	310	6300	310	6351	310	6424	310	6299	306
	59.2	357	64.0	395	64.5	401	64.8	407	65.5	413	66.0	419	66.2	425	67.6	426
140	94.6	.559	100.4	.635	101.5	.647	102.6	.659	103.7	.672	105.1	.685	106.4	.696	106.7	.696
	6089	310	6254	310	6316	310	6364	310	6392	310	6456	310	6483	309	6289	303
	58.6	357	63.1	395	63.4	401	63.9	407	64.6	413	64.9	419	65.4	424	67.2	422
150	94.9	.559	100.8	.635	102.1	.647	103.1	.659	104.3	.672	105.8	.685	106.5	.690	106.8	.689
	6164	310	6344	310	6422	310	6458	310	6497	310	6570	310	6472	306	6274	300
	57.9	357	62.2	395	62.4	401	63.0	407	63.5	413	63.8	419	64.9	420	66.7	418
160	95.3	.559	101.4	.635	102.6	.647	103.7	.659	105.0	.672	106.3	.683	106.7	.683	107.0	.681
	6248	310	6458	310	6534	310	6562	310	6618	310	6653	309	6459	303	6257	296
	57.1	357	61.1	395	61.3	401	62.0	407	62.4	413	62.8	418	64.4	416	66.1	413
170	95.7	.559	102.0	.635	103.2	.647	104.3	.659	105.8	.672	106.5	.676	106.8	.674	107.1	.672
	6337	310	6581	310	6642	310	6676	310	6751	310	6643	306	6443	299	6238	292
	56.3	357	60.0	395	60.3	401	60.9	407	61.1	413	62.3	414	63.8	411	65.3	408
180	96.1	.559	102.6	.635	103.8	.647	105.1	.659	106.3	.669	106.6	.668	107.0	.665	107.3	.660
	6432	310	6713	310	6758	310	6814	310	6824	308	6631	302	6426	294	6215	286
	55.4	357	58.8	395	59.3	401	59.7	407	60.2	411	61.6	409	63.0	405	64.5	401
190	96.5	.559	103.3	.635	104.4	.647	105.9	.659	106.4	.661	106.8	.658	107.2	.653	107.6	.646
	6535	310	6838	310	6882	310	6963	310	6815	305	6615	297	6406	289	6189	280
	54.6	357	57.7	395	58.2	401	58.4	407	59.5	406	60.9	403	62.1	398	63.4	392
200	97.0	.559	103.9	.635	105.3	.647	106.6	.657	106.6	.651	107.0	.646	107.5	.639	107.9	.628
	6648	310	6972	310	7040	310	7067	309	6805	300	6597	292	6381	283	6154	272
	53.6	357	56.6	395	56.9	401	57.3	405	58.8	400	59.9	395	61.0	390	62.0	381
210	97.5	.559	104.7	.635	106.2	.647	106.8	.647	106.9	.640	107.3	.632	107.8	.620	108.4	.600
	6770	310	7118	310	7211	310	7058	304	6791	294	6576	285	6348	274	6103	259
	52.7	357	55.5	395	55.6	401	56.6	399	57.9	393	58.8	387	59.5	378	59.7	364
220	98.1	.559	105.6	.635	106.9	.643	107.0	.636	107.2	.625	107.7	.612	108.3	.588		
	6906	310	7299	310	7314	308	7046	299	6772	287	6545	275	6281	259		
	51.6	357	54.1	395	54.5	398	55.7	392	56.7	384	57.2	374	57.1	359		
230	98.6	.559	106.6	.635	107.1	.632	107.3	.621	107.6	.604	108.2	.577				
	7050	310	7489	310	7304	303	7028	291	6747	277	6466	259				
	50.6	357	52.7	395	53.6	392	54.5	383	55.0	371	54.6	353				
240	99.2	.559	107.2	.629	107.4	.618	107.8	.600	108.2	.565						
	7201	310	7565	307	7288	295	7003	281	6657	259						
	49.5	357	51.7	391	52.5	382	52.8	370	52.2	347						

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 0 FCOM-G0–03–06–50–009–015

CRUISE - MCT/310KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+10 CG=30.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL170**		**FL180**		**FL190**		**FL200**		**FL210**		**FL220**		**FL230**	
130	96.2	.559	102.0	.635	103.1	.647	104.2	.659	105.3	.672	106.6	.685	108.2	.698	108.6	.700
	6203	310	6373	310	6428	310	6485	310	6512	310	6569	310	6646	310	6482	305
	58.6	363	63.2	403	63.6	409	64.0	415	64.6	421	65.1	427	65.3	434	66.9	434
140	96.5	.559	102.4	.635	103.6	.647	104.7	.659	105.8	.672	107.2	.685	108.4	.694	108.7	.694
	6266	310	6457	310	6530	310	6575	310	6606	310	6678	310	6668	308	6470	302
	58.0	363	62.3	403	62.6	409	63.1	415	63.7	421	64.0	427	64.7	431	66.5	430
150	96.8	.559	102.9	.635	104.1	.647	105.2	.659	106.4	.672	107.9	.685	108.5	.688	108.8	.687
	6344	310	6556	310	6639	310	6672	310	6719	310	6796	310	6656	305	6455	299
	57.3	363	61.4	403	61.5	409	62.2	415	62.7	421	62.9	427	64.3	428	65.9	426
160	97.1	.559	103.4	.635	104.7	.647	105.8	.659	107.1	.672	108.3	.681	108.6	.681	109.0	.679
	6430	310	6674	310	6749	310	6779	310	6844	310	6841	308	6643	302	6438	295
	56.5	363	60.3	403	60.5	409	61.2	415	61.5	421	62.1	425	63.7	423	65.3	421
170	97.5	.559	104.0	.635	105.3	.647	106.4	.659	107.9	.672	108.4	.674	108.8	.673	109.1	.670
	6522	310	6801	310	6860	310	6902	310	6980	310	6831	305	6627	298	6418	291
	55.7	363	59.2	403	59.6	409	60.1	415	60.3	421	61.6	421	63.1	418	64.6	415
180	97.9	.559	104.7	.635	105.9	.647	107.2	.659	108.2	.667	108.6	.666	109.0	.663	109.3	.658
	6621	310	6933	310	6979	310	7044	310	7015	308	6818	301	6609	293	6395	285
	54.9	363	58.1	403	58.5	409	58.9	415	59.6	418	61.0	416	62.3	412	63.7	408
190	98.4	.559	105.3	.635	106.5	.647	108.0	.659	108.4	.659	108.8	.656	109.2	.651	109.6	.644
	6728	310	7060	310	7112	310	7197	310	7006	304	6802	296	6589	288	6368	279
	54.0	363	57.0	403	57.5	409	57.6	415	58.9	413	60.2	409	61.4	405	62.7	399
200	98.9	.559	106.0	.635	107.4	.647	108.5	.655	108.6	.649	109.0	.644	109.4	.637	109.9	.626
	6845	310	7198	310	7275	310	7262	308	6997	299	6784	291	6564	282	6331	271
	53.1	363	55.9	403	56.2	409	56.7	412	58.2	407	59.3	402	60.3	396	61.2	388
210	99.4	.559	106.7	.635	108.3	.647	108.7	.645	108.9	.638	109.3	.630	109.8	.618	110.4	.597
	6973	310	7353	310	7451	310	7253	303	6981	293	6762	284	6530	273	6271	257
	52.1	363	54.7	403	54.8	409	55.9	406	57.2	399	58.1	393	58.8	384	58.9	370
220	100.0	.559	107.7	.635	108.8	.641	109.0	.634	109.2	.622	109.7	.609	110.3	.584		
	7114	310	7539	310	7514	307	7241	297	6962	286	6731	274	6452	257		
	51.1	363	53.4	403	53.9	405	55.1	399	56.0	390	56.5	380	56.3	363		
230	100.5	.559	108.7	.635	109.0	.630	109.3	.619	109.6	.601	110.2	.572				
	7263	310	7735	310	7504	302	7222	290	6936	276	6641	257				
	50.0	363	52.0	403	53.0	398	53.9	389	54.3	377	53.8	357				
240	101.1	.559	109.1	.626	109.4	.615	109.7	.597	110.2	.560						
	7420	310	7771	306	7486	294	7191	279	6836	256						
	49.0	363	51.1	397	51.9	388	52.2	375	51.3	351						

ENGINE ANTI ICE ON △FUEL = + 1 %	**TOTAL ANTI ICE ON** △FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 10 FCOM-G0–03–06–50–010–015

CRUISE - MCT/310KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST
PACK FLOW HI
ANTI-ICING OFF

ISA+15
CG=30.0%

N1 (%) — **MACH**
KG/H — **IAS (KT)**
NM/1000KG — **TAS (KT)**

WEIGHT (1000KG)	FL100		FL170		FL180		FL190		FL200		FL210		FL220		FL230	
130	97.1	.559	103.0	.635	104.1	.647	105.3	.659	106.3	.672	106.9	.677	107.1	.678	107.3	.679
	6292	310	6473	310	6532	310	6588	310	6617	310	6507	306	6312	301	6115	295
	58.2	366	62.8	406	63.1	412	63.5	419	64.2	425	65.6	427	67.5	426	69.4	425
140	97.4	.559	103.4	.635	104.6	.647	105.7	.659	106.7	.671	107.0	.672	107.2	.673	107.4	.673
	6357	310	6558	310	6636	310	6680	310	6686	309	6497	304	6302	298	6106	292
	57.6	366	62.0	406	62.2	412	62.7	419	63.5	424	65.2	423	67.0	422	68.9	421
150	97.7	.559	103.9	.635	105.2	.647	106.2	.659	106.8	.665	107.0	.666	107.3	.666	107.5	.665
	6436	310	6662	310	6746	310	6778	310	6676	307	6485	301	6292	295	6095	289
	56.9	366	61.0	406	61.1	412	61.8	419	63.0	421	64.7	420	66.4	418	68.3	416
160	98.1	.559	104.4	.635	105.7	.647	106.8	.659	106.9	.659	107.2	.659	107.4	.658	107.6	.657
	6524	310	6782	310	6855	310	6887	310	6662	304	6472	298	6280	291	6084	285
	56.2	366	59.9	406	60.2	412	60.8	419	62.5	417	64.1	415	65.8	413	67.5	411
170	98.5	.559	105.1	.635	106.3	.647	107.0	.655	107.0	.651	107.3	.651	107.5	.649	107.8	.647
	6618	310	6910	310	6968	310	6914	308	6647	300	6459	294	6266	287	6072	280
	55.4	366	58.8	406	59.2	412	60.1	416	62.0	412	63.5	410	65.1	408	66.6	405
180	98.9	.559	105.7	.635	106.9	.647	107.1	.648	107.1	.643	107.4	.642	107.7	.639	108.0	.635
	6718	310	7042	310	7088	310	6900	304	6634	296	6445	290	6253	282	6058	275
	54.6	366	57.7	406	58.2	412	59.6	411	61.4	407	62.7	404	64.2	401	65.6	397
190	99.3	.559	106.3	.635	107.3	.644	107.3	.640	107.2	.634	107.6	.631	107.9	.626	108.3	.619
	6827	310	7170	310	7157	309	6887	300	6619	292	6429	284	6236	277	6037	268
	53.7	366	56.7	406	57.4	411	59.0	406	60.6	401	61.8	398	63.1	393	64.1	387
200	99.8	.559	107.0	.635	107.4	.636	107.4	.630	107.4	.622	107.8	.618	108.2	.610	108.8	.594
	6946	310	7310	310	7144	304	6871	295	6601	286	6410	278	6215	269	5999	256
	52.8	366	55.6	406	56.7	405	58.2	400	59.6	394	60.7	389	61.6	383	61.9	372
210	100.3	.559	107.5	.632	107.5	.626	107.6	.618	107.6	.608	108.1	.599	108.7	.581	109.4	.544
	7077	310	7407	309	7128	299	6852	290	6578	279	6384	269	6164	256	5902	234
	51.8	366	54.6	405	56.0	399	57.3	393	58.4	384	59.1	377	59.2	365	57.6	340
220	100.9	.559	107.7	.623	107.7	.615	107.8	.603	107.9	.587	108.5	.567				
	7221	310	7392	304	7109	294	6829	283	6544	269	6328	255				
	50.8	366	53.9	398	55.1	392	56.1	383	56.7	371	56.5	358				
230	101.5	.559	107.8	.611	107.9	.599	108.1	.582	108.4	.552						
	7371	310	7373	298	7085	286	6796	272	6490	253						
	49.7	366	53.0	391	53.9	382	54.4	370	53.8	349						
240	102.1	.559	108.1	.596	108.2	.578	108.6	.548								
	7529	310	7351	290	7055	275	6745	255								
	48.7	366	51.9	381	52.2	368	51.5	348								

ENGINE ANTI ICE ON	TOTAL ANTI ICE ON
△FUEL = + 1 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 15 FCOM-G0–03–06–50–011–015

CRUISE - MCT/310KT - 1 ENGINE OUT

MAX. CONTINUOUS THRUST PACK FLOW HI ANTI-ICING OFF	ISA+20 CG=30.0%	**N1 (%)** **KG/H** **NM/1000KG**	**MACH** **IAS (KT)** **TAS (KT)**

WEIGHT (1000KG)	**FL100**		**FL170**		**FL180**		**FL190**		**FL200**		**FL210**		**FL220**		**FL230**	
130	98.0	.559	104.0	.635	105.1	.647	105.7	.653	105.6	.652	105.7	.653	105.8	.654	105.8	.654
	6384	310	6573	310	6637	310	6560	307	6305	300	6113	295	5916	289	5718	283
	57.9	370	62.4	410	62.7	416	63.8	419	66.0	416	68.0	415	70.0	414	72.2	413
140	98.3	.559	104.4	.635	105.6	.647	105.8	.648	105.6	.646	105.7	.647	105.8	.647	105.9	.647
	6450	310	6660	310	6741	310	6549	304	6294	298	6101	292	5904	286	5707	280
	57.3	370	61.6	410	61.7	416	63.4	415	65.6	413	67.5	412	69.5	410	71.5	408
150	98.6	.559	104.9	.635	105.9	.645	105.8	.643	105.7	.640	105.8	.641	105.9	.640	106.0	.639
	6530	310	6767	310	6799	309	6538	302	6281	295	6089	289	5893	283	5696	277
	56.6	370	60.6	410	61.0	415	63.0	412	65.1	409	66.9	408	68.8	406	70.8	403
160	99.0	.559	105.4	.635	106.0	.639	105.9	.637	105.7	.634	105.9	.633	106.0	.632	106.1	.629
	6619	310	6889	310	6787	306	6525	299	6268	291	6076	285	5879	279	5682	272
	55.9	370	59.5	410	60.6	411	62.5	408	64.5	405	66.3	403	68.1	400	69.9	397
170	99.4	.559	106.1	.635	106.1	.633	105.9	.630	105.8	.626	106.0	.624	106.1	.621	106.3	.617
	6715	310	7019	310	6775	303	6512	295	6252	288	6060	281	5863	274	5664	267
	55.1	370	58.4	410	60.1	407	62.0	404	63.9	400	65.5	397	67.2	394	68.8	389
180	99.8	.559	106.2	.630	106.1	.626	106.0	.622	105.9	.616	106.1	.613	106.3	.609	106.5	.601
	6817	310	7034	307	6761	300	6496	291	6234	283	6041	276	5845	268	5641	259
	54.2	370	57.8	407	59.6	403	61.3	398	63.1	393	64.6	390	66.0	386	67.3	379
190	100.2	.559	106.3	.623	106.2	.618	106.1	.612	106.0	.604	106.2	.600	106.4	.591	106.8	.577
	6928	310	7021	304	6745	295	6477	287	6213	277	6019	270	5816	260	5605	249
	53.4	370	57.3	402	58.9	397	60.5	392	62.1	386	63.4	382	64.4	375	65.0	364
200	100.7	.559	106.4	.614	106.3	.608	106.2	.600	106.1	.589	106.4	.581	106.7	.563	107.3	.536
	7049	310	7005	299	6727	290	6456	281	6182	270	5985	261	5769	247	5546	230
	52.4	370	56.6	397	58.1	391	59.6	385	60.9	376	61.7	369	61.9	357	61.0	338
210	101.3	.559	106.5	.604	106.4	.596	106.3	.585	106.3	.567	106.7	.548				
	7183	310	6986	294	6705	285	6426	274	6138	260	5925	246				
	51.5	370	55.9	390	57.2	384	58.3	375	59.0	362	58.9	349				
220	101.8	.559	106.6	.593	106.5	.581	106.5	.562	106.5	.532						
	7326	310	6965	288	6676	277	6383	262	6070	243						
	50.5	370	54.9	383	55.9	373	56.4	360	56.0	340						
230	102.4	.559	106.7	.577	106.7	.557	106.8	.527								
	7478	310	6937	280	6636	265	6317	246								
	49.4	370	53.7	372	54.0	359	53.5	338								
240	103.0	.559	107.0	.554	107.0	.523										
	7639	310	6899	269	6575	249										
	48.4	370	51.8	358	51.2	337										

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1 %	△FUEL = + 3 %

11.0–08F0A330–200 CF6–80E1A4 12300010C6KG300 0 018590 0 0 3 1.0 .0 .00 0 01100.000 .000 .000 20 FCOM-G0–03–06–50–012–015

IN CRUISE QUICK CHECK AT FIXED SPEEDS

The following in cruise quick check tables allow the flight crew to determine the fuel consumption and the time required to cover a given air distance from any moment in cruise to landing with one engine inoperative.
These tables are established for :
- Cruise speed MCT/330kt, MCT/310kt.
- Descent profile : M.80/300kt/250kt
- Approach and landing : 240 kg or 530 lb – 6 minutes IMC
- ISA
- CG = 30 %
- Pack flow HI
- Anti ice OFF

Note : 1. In the tables, a "" means that a step climb of 4000 feet has been made to reach the corresponding flight level.*
2. The flight level shown on the top of each column is the final flight level.
3. For each degree Celsius above ISA apply a fuel correction of
0.010 (kg/°C/NM) × △ISA (°C) × Air Distance (NM)
or 0.022 (lb/°C/NM) × △ISA (°C) × Air Distance (NM)

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The in cruise quick check tables are based on a reference initial weight that may vary from page to page.
The fuel consumption must be corrected when the actual weight is different from the reference initial weight.
If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight (see example 3.06.50).

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : MCT/330KT - DESCENT : M.80/300/250KT
IMC PROCEDURE : 240KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG PACK FLOW HI ANTI ICING OFF	ISA CG = 30.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 100	140	180	190	200	210	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL140	FL180 FL190	FL200 FL210
200	3564 0.38	3117 0.38	2824 0.38	2704 0.38	2589 0.38	2490 0.38	2	0	0
250	4502 0.46	4023 0.46	3698 0.45	3553 0.45	3414 0.45	3295 0.45	3	0	0
300	5438 0.54	4927 0.53	4573 0.52	4402 0.52	4237 0.52	4098 0.52	4	0	0
350	6374 1.02	5830 1.01	5447 0.59	5250 0.59	5060 0.59	4902 1.00	5	0	1
400	7309 1.10	6733 1.08	6320 1.06	6098 1.06	5883 1.07	5704 1.07	6	1	1
450	8242 1.18	7634 1.16	7193 1.13	6945 1.13	6704 1.14	6506 1.14	7	1	2
500	9175 1.26	8534 1.23	8065 1.20	7791 1.21	7526 1.21	7307 1.21	9	2	2
550	10106 1.34	9432 1.31	8937 1.27	8637 1.28	8346 1.28	8108 1.28	10	2	3
600	11036 1.42	10330 1.38	9808 1.34	9483 1.35	9167 1.35	8909 1.36	11	3	4
650	11966 1.49	11227 1.46	10679 1.41	10328 1.42	9986 1.42	9708 1.43	12	3	4
700	12894 1.57	12123 1.53	11549 1.48	11172 1.49	10805 1.50	10507 1.50	13	4	5
750	13822 2.05	13018 2.01	12419 1.55	12016 1.56	11624 1.57	11306 1.57	14	5	5
800	14749 2.13	13913 2.08	13289 2.03	12860 2.03	12442 2.04	12104 2.04	15	5	6
850	15674 2.21	14807 2.15	14159 2.10	13704 2.10	13260 2.11	12902 2.11	16	6	7
900	16599 2.29	15699 2.23	15027 2.17	14547 2.17	14078 2.18	13699 2.19	17	7	7
950	17523 2.37	16591 2.30	15896 2.24	15389 2.24	14895 2.25	14496 2.26	18	7	8
1000	18446 2.45	17482 2.38	16764 2.31	16231 2.31	15711 2.32	15293 2.33	19	8	8
1050	19368 2.53	18372 2.45	17631 2.38	17073 2.39	16527 2.40	16088 2.40	20	9	9
1100	20288 3.01	19261 2.53	18499 2.45	17914 2.46	17343 2.47	16884 2.47	21	9	9
1150	21209 3.09	20148 3.00	19365 2.52	18754 2.53	18158 2.54	17678 2.54	21	10	10
1200	22128 3.16	21035 3.08	20231 2.59	19594 3.00	18972 3.01	18473 3.01	22	11	10
1250	23046 3.24	21922 3.15	21097 3.06	20434 3.07	19787 3.08	19266 3.08	23	11	11
1300	23964 3.32	22807 3.23	21963 3.13	21273 3.14	20600 3.15	20060 3.16	24	12	11
1350	24880 3.40	23691 3.30	22829 3.20	22112 3.21	21413 3.22	20852 3.23	25	13	12
1400	25796 3.48	24574 3.38	23694 3.27	22951 3.28	22226 3.29	21645 3.30	26	14	12

ENGINE ANTI ICE ON △FUEL = + 1.5 %	**TOTAL ANTI ICE ON** △FUEL = + 3.5 %

FLIP23D A330–200 CF6–80E1A4 3611 03001.001011 0250300 .8000 .00100 240 0300 350 170 0 230 180 100 168 18590 FCOM-G0–03–06–50–014–015

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - ONE ENGINE FAILURE
CRUISE : MCT/310KT - DESCENT : M.80/300/250KT
IMC PROCEDURE : 240KG (6MIN)

REF. INITIAL WEIGHT = 170000 KG PACK FLOW HI ANTI ICING OFF	ISA CG = 30.0 %	**FUEL CONSUMED (KG)** **TIME (H.MIN)**

AIR DIST. (NM)	FLIGHT LEVEL 100	150	200	210	220	230	CORRECTION ON FUEL CONSUMPTION (KG/1000KG) FL100 FL150	FL200 FL210	FL220 FL230
200	3384 0.40	2882 0.39	2573 0.38	2490 0.38	2395 0.38	2303 0.38	2	0	0
250	4270 0.48	3725 0.47	3389 0.45	3295 0.45	3180 0.45	3069 0.45	3	1	0
300	5154 0.57	4566 0.55	4205 0.52	4098 0.52	3964 0.53	3835 0.53	5	2	0
350	6037 1.05	5407 1.03	5018 1.00	4902 1.00	4748 1.00	4599 1.00	6	3	1
400	6920 1.14	6246 1.11	5831 1.07	5704 1.07	5531 1.07	5363 1.07	7	4	2
450	7801 1.22	7084 1.19	6642 1.14	6506 1.14	6314 1.14	6127 1.15	8	5	3
500	8681 1.30	7921 1.26	7452 1.22	7307 1.21	7096 1.22	6890 1.22	10	7	3
550	9560 1.39	8757 1.34	8261 1.29	8108 1.28	7877 1.29	7652 1.29	11	8	4
600	10438 1.47	9592 1.42	9068 1.36	8909 1.36	8658 1.36	8413 1.37	12	9	5
650	11314 1.56	10426 1.50	9874 1.43	9708 1.43	9438 1.43	9174 1.44	13	10	6
700	12190 2.04	11259 1.58	10679 1.51	10507 1.50	10217 1.50	9934 1.51	15	11	6
750	13065 2.13	12091 2.05	11482 1.58	11306 1.57	10996 1.58	10694 1.58	16	13	7
800	13939 2.21	12921 2.13	12285 2.05	12105 2.04	11774 2.05	11453 2.06	17	14	8
850	14811 2.29	13751 2.21	13086 2.12	12904 2.11	12552 2.12	12211 2.13	18	15	8
900	15683 2.38	14580 2.29	13886 2.20	13704 2.19	13330 2.19	12969 2.20	19	16	9
950	16554 2.46	15408 2.37	14685 2.27	14503 2.26	14107 2.26	13727 2.27	21	18	10
1000	17423 2.55	16234 2.45	15482 2.34	15301 2.33	14884 2.34	14484 2.34	22	19	10
1050	18292 3.03	17060 2.52	16279 2.41	16100 2.40	15660 2.41	15241 2.42	23	20	11
1100	19159 3.11	17884 3.00	17074 2.49	16898 2.47	16435 2.48	15997 2.49	24	21	12
1150	20026 3.20	18708 3.08	17868 2.56	17696 2.54	17210 2.55	16752 2.56	25	23	12
1200	20891 3.28	19530 3.16	18661 3.03	18493 3.02	17984 3.02	17507 3.03	26	24	13
1250	21756 3.37	20352 3.24	19452 3.10	19290 3.09	18758 3.09	18261 3.10	27	25	13
1300	22619 3.45	21172 3.31	20242 3.18	20087 3.16	19532 3.16	19015 3.18	28	26	14
1350	23482 3.53	21992 3.39	21032 3.25	20883 3.23	20304 3.24	19768 3.25	30	28	15
1400	24343 4.02	22810 3.47	21820 3.32	21680 3.30	21077 3.31	20520 3.32	31	29	15

ENGINE ANTI ICE ON	**TOTAL ANTI ICE ON**
△FUEL = + 1.5 %	△FUEL = + 3.5 %

FLIP23D A330–200 CF6–80E1A4 3611 03001.001011 0250300 .8000 .00100 240 0300 350 170 0 230 180 100 168 18590 FCOM-G0–03–06–50–015–015

HOLDING

R

RACE TRACK HOLDING PATTERN - GREEN DOT SPEED - 1 ENGINE OUT								
MAX. CONTINUOUS THRUST LIMITS CLEAN CONFIGURATION PACK FLOW HI ANTI-ICING OFF					ISA CG=30.0%		**N1 (%)** **FF (KG/H)**	
WEIGHT (1000KG)	**FL 15**	**FL 50**	**FL100**	**FL120**	**FL140**	**FL160**	**FL180**	**FL200**
130	69.9 3114	73.0 3111	77.4 3141	79.2 3154	80.9 3158	82.7 3163	84.5 3181	86.4 3202
140	72.2 3364	75.2 3373	79.7 3410	81.4 3413	83.1 3418	84.9 3435	86.7 3458	88.6 3487
150	74.2 3618	77.3 3642	81.7 3667	83.4 3673	85.2 3687	87.0 3712	88.9 3742	90.9 3784
160	76.2 3884	79.3 3914	83.5 3927	85.3 3938	87.1 3965	89.0 3993	90.9 4036	93.1 4092
170	78.1 4155	81.1 4176	85.4 4189	87.1 4216	89.0 4244	90.8 4286	92.9 4340	95.2 4414
180	79.9 4429	82.8 4431	87.0 4465	88.8 4496	90.7 4534	92.7 4588	94.9 4660	97.5 4751
190	81.5 4685	84.3 4691	88.7 4745	90.5 4780	92.4 4834	94.6 4903	96.9 4992	99.9 5117
200	83.0 4939	85.9 4952	90.3 5026	92.1 5078	94.2 5142	96.4 5228	99.0 5336	102.6 5528
210	84.4 5197	87.4 5218	91.8 5319	93.7 5383	95.9 5465	98.2 5568	101.3 5718	105.4 5968
220	85.8 5458	88.7 5498	93.3 5621	95.3 5696	97.5 5796	100.1 5919	103.8 6140	108.4 6422
230	87.1 5722	90.1 5781	94.7 5932	96.9 6025	99.2 6139	102.2 6306	106.4 6586	111.6 6914
240	88.5 5993	91.4 6067	96.2 6251	98.4 6361	101.0 6494	104.5 6735	109.1 7047	114.9 7444
ENGINE ANTI-ICE ON △FUEL = + 2 %			**TOTAL ANTI-ICE ON** △FUEL = + 4 %			**per 1° above ISA** △FUEL = + 0.3 %		

Note : Correction for straight line holding : – 5 %

DESCENT TO LANDING

DESCENT - M.82/300KT/250KT - 1 ENGINE OUT									
IDLE THRUST PACK FLOW HI ANTI-ICING OFF		ISA CG=30.0%							
WEIGHT (1000KG)	150				200				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
410	19.8	275	122	IDLE					243
390	19.0	264	116	IDLE	22.2	308	136	IDLE	255
370	18.2	255	110	IDLE	21.4	298	129	IDLE	267
350	17.5	246	104	IDLE	20.6	288	123	IDLE	279
330	16.9	238	100	IDLE	19.9	280	118	IDLE	292
310	16.3	230	94	IDLE	19.1	270	111	IDLE	300
290	15.4	220	88	IDLE	18.1	257	104	IDLE	300
270	14.6	209	82	IDLE	17.1	244	96	IDLE	300
250	13.8	198	76	IDLE	16.1	231	89	IDLE	300
240	13.3	192	72	IDLE	15.6	224	85	IDLE	300
220	12.5	181	66	IDLE	14.6	211	78	IDLE	300
200	11.6	169	61	IDLE	13.5	197	71	IDLE	300
180	10.7	158	55	IDLE	12.5	183	64	IDLE	300
160	9.8	145	49	IDLE	11.4	168	57	IDLE	300
140	8.9	133	43	IDLE	10.3	153	50	IDLE	300
120	8.0	120	38	IDLE	9.2	137	44	IDLE	300
100	7.1	106	33	IDLE	8.0	121	37	IDLE	300
50	2.6	41	11	IDLE	3.0	46	13	IDLE	250
15	.0	0	0	IDLE	.0	0	0	IDLE	250

CORRECTIONS	ENGINE ANTI ICE ON	TOTAL ANTI ICE ON	per 1° above ISA
TIME	–	+ 10 %	–
FUEL	+ 5 %	+ 60 %	+ 0.5 %
DISTANCE	–	+ 10 %	+ 0.5 %

11.0–08F0A330–200 CF6–80E1A4 23100010C6KG300 0 018590 0 0–1 .0 .0 .00 0 03 .820300.000250.000 0 FCOM-G0–03–06–60–001–015

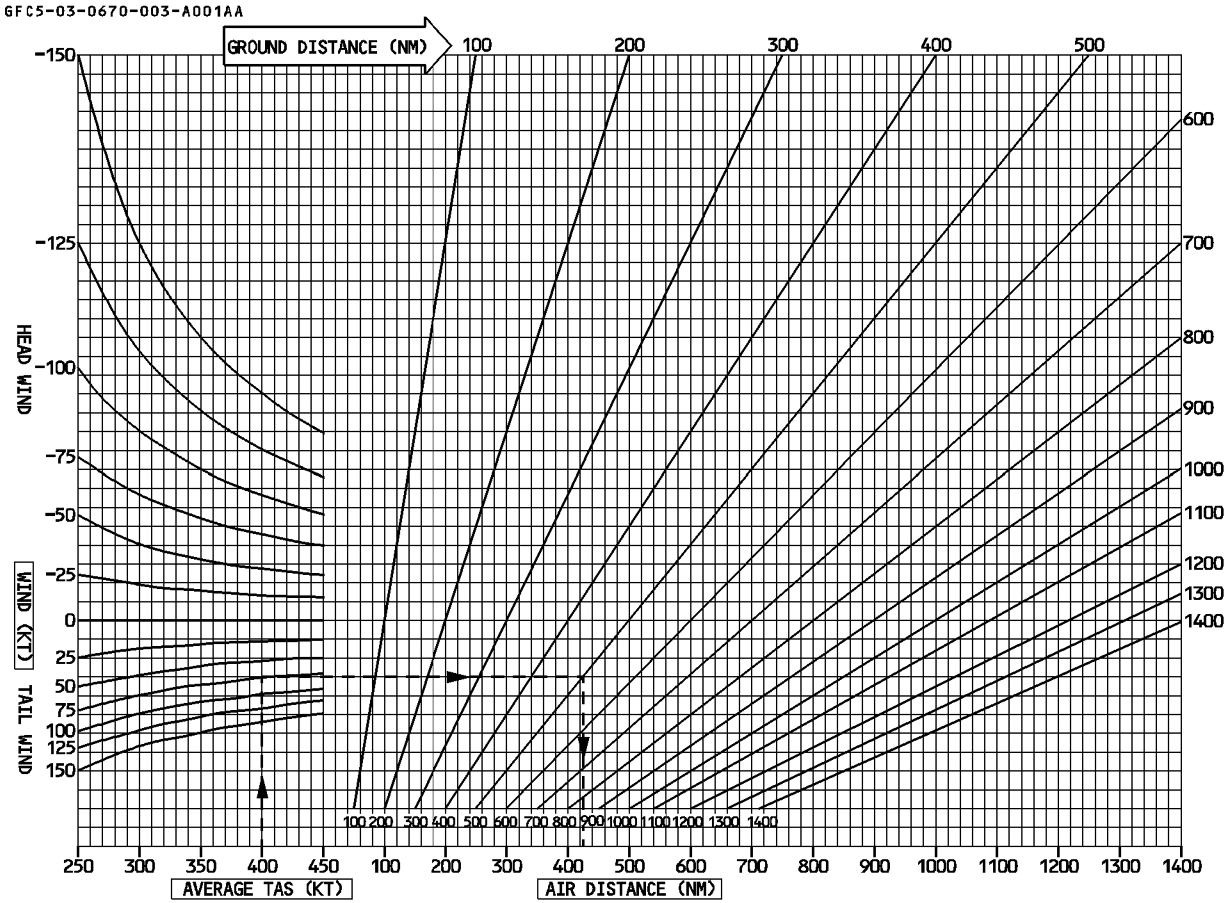
GENERAL

The ground distance/air distance conversion tables are used to calculate the air distance for a given ground distance due to the influence of the wind.
Tables are given for :
- LONG RANGE SPEED
- FIXED SPEEDS

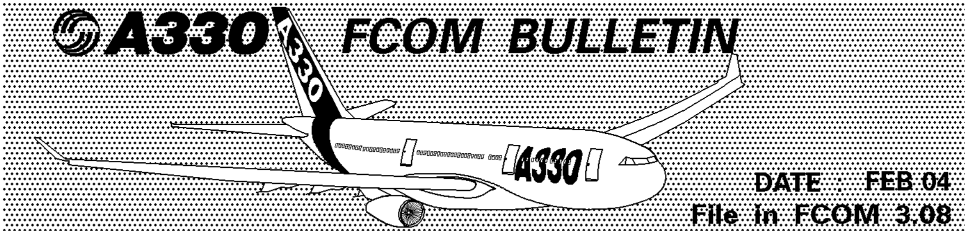
LONG RANGE SPEED

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+150	+100	+ 50	0	-50	-100	-150
10	7	8	9	**10**	12	14	17
20	14	16	18	**20**	23	28	35
30	21	23	26	**30**	35	42	52
40	28	31	35	**40**	47	56	69
50	35	39	44	**50**	58	70	87
60	42	47	53	**60**	70	84	104
70	49	55	61	**70**	81	98	121
80	56	62	70	**80**	93	111	139
90	63	70	79	**90**	105	125	156
100	70	78	88	**100**	116	139	173
200	141	156	175	**200**	233	279	347
300	211	234	263	**300**	349	418	520
400	281	312	351	**400**	466	557	694
500	351	390	438	**500**	582	697	867
600	422	468	526	**600**	699	836	1040
700	492	546	613	**700**	815	975	1214
800	562	624	701	**800**	931	1114	1387
900	632	702	789	**900**	1048	1254	1561
1000	703	780	876	**1000**	1164	1393	1734
1100	773	858	964	**1100**	1281	1532	1907
1200	843	936	1052	**1200**	1397	1672	2081
1300	913	1014	1139	**1300**	1514	1811	2254
1400	984	1092	1227	**1400**	1630	1950	2428
1500	1054	1170	1315	**1500**	1746	2090	2601
1600	1124	1248	1402	**1600**	1863	2229	2774
1700	1194	1326	1490	**1700**	1979	2368	2948
1800	1265	1404	1577	**1800**	2096	2508	3121
1900	1335	1482	1665	**1900**	2212	2647	3294
2000	1405	1560	1753	**2000**	2329	2786	3468

FIXED SPEEDS



N°	TITLE
"To be filled by the operator, if needed"	



INTRODUCTION

FCOM Bulletins were created to provide complementary technical/operational explanations related to the information included in the Flight Crew Operating Manuals (FCOMs).

The objective of FCOM Bulletins differs from that of Operations Engineering Bulletins (OEBs). OEBs are issued to rapidly address specific problems that have an operational impact. They are created, as needed, in order to quickly transmit technical and procedural information, and are normally issued in response to a detected irregularity or an abnormal aircraft/system behavior.

FCOM Bulletins are periodically issued to address one or several subjects and include supplementary explanations concerning procedures, system descriptions, performance, and regulations.

They are updated as the need arises, and are filed in Section 8 of the FCOM Volume 3.

LIST OF EFFECTIVE FCOM BULLETINS

	BULLETIN N°	SUBJECT
	01	AVOID DISORDER IN THE COCKPIT
	02	HIGH BRAKE TEMPERATURE
	03	ELECTRONIC INTERFERENCE FROM PORTABLE EQUIPMENT CARRIED ON BY PASSENGERS
	04	PREVENTING UNNECESSARY IN-FLIGHT SHUTDOWNS
	05/4	AVOIDING TAILSTRIKES AT TAKEOFF
	06	MMEL AND MEL USE
	07/1	PUBLICATION OF ONE ATTENDANT INFORMATION BULLETIN
	08/2	EGPWS DATABASE
	09	ERRONEOUS AIRSPEED/ALTITUDE INDICATIONS
	10/2	USE OF FINAL APP MODE AND NAV DATABASE VALIDATION
	11	IDLE FACTOR
R	12/2	AIRCRAFT HANDLING IN FINAL APPROACH
R	13/1	USE OF RUDDER ON TRANSPORT CATEGORY AIRPLANES

A330 FCOM BULLETIN
N° 01
DATE : APR 93
file in FCOM 3.08

AVOID DISORDER IN THE COCKPIT

1. REASON FOR ISSUE

The purpose of this FCOM Bulletin topic is to remind pilots of the importance of maintaining an orderly cockpit environment and highlight the hazards caused by misplaced objects.

2. BACKGROUND INFORMATION

Many hazards are caused by placing objects in improper places in the cockpit. The most common being the following.

- Coffee cups placed on the glareshield or pedestal, unexpected turbulence or unintentional knocking by the crew may cause fluid to be spilled onto the cockpit control panels causing damage to the equipment which may have an immediate effect on the flight or at best lead to an early and expensive overhaul of the equipment.
- Books placed on the glareshield. These may fall off and operate some switches/pushbuttons or even damage equipment.
- Books placed on the pedestal. These may cause switches or pushbuttons to be activated, especially if they have to be pushed around while operating other controls. At worst the rudder trim might be activated or even a fuel lever pushed off, at best a radio selection could be deselected.

3. RECOMMENDATIONS

It is highly recommended that all objects are placed and stored at their designated place in the cockpit.
Cups should be placed in the cupholders provided.
Books should be kept in the library space provided and put back as soon as you have finished using them.
A rubbish sack should be provided behind the crew seating and used for all rubbish.
Meal trays should be collected by flight attendants as soon as possible, or be placed on the floor behind the crew when finished.

A330 FCOM BULLETIN

N° 02

DATE : APR 93

file in FCOM 3.08

HIGH BRAKE TEMPERATURE

1. REASON FOR ISSUE

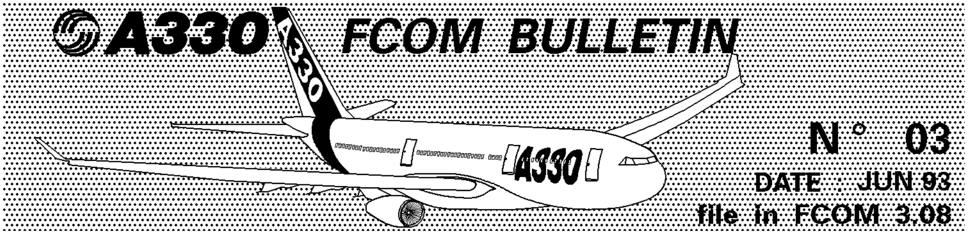
The purpose of this FCOM Bulletin topic is to provide background information to flight crews on the consequences of HIGH BRAKE TEMPERATURES which may lead to a fire.

2. BACKGROUND INFORMATION

A small number of cases of permanent braking application at one brake position have occured. This may be due to either improper maintenance action, or brake system failure. With permanent braking application the brake temperature will quickly increase and will continue to increase while the aircraft is moving. If the brake temperature becomes excessive, as well as causing possible tyre deflation, it may cause a fire hazard, particularly if there are any hydraulic leaks in the area of the brakes.

3. RECOMMENDATIONS

If a BRAKE HOT warning occurs, monitor the BRAKE TEMPERATURES carefully. BRAKE FANS should be switched ON if fitted.
If the difference between brake temperatures on one gear is greater than 150° and any one brake temperature is greater than TEMP LIMIT 600° this is a clear sign of brake binding/permanent brake application.
In this case the aircraft should be stopped to avoid a possible fire, taxi back should not be done as long as the BRAKE OVERHEAT warning is present. Maintenance action is due.
Note : The BRAKE HI TEMP procedure in the FCOM has been updated to reflect these limits.



SUBJECT : ELECTRONIC INTERFERENCE FROM PORTABLE EQUIPMENT CARRIED ON BY PASSENGERS

- Airlines often wonder whether they should allow passengers to operate electronic devices in the cabin without any limit.

  Federal Aviation Regulation (FAR) section 91.19 allows passengers to operate :

  " – Portable voice recorders
  – Hearing aids
  – Heart pacemakers
  – Electric shavers
  – Any other portable electronic device that the operator of the aircraft has determined will not cause interference with the navigation or communication system of the aircraft on which it is to be used."

  It is obvious that the myriad portable devices that now exists or that may be available in the future cannot be tested.

- As far as aircraft specific electrical flight controls and engine control computers on Airbus aircraft are concerned, there is no chance of their operation being affected by passenger-operated electronic devices, due to the high level of protection applied to these systems.

- Nevertheless, this question arises for navigation and communication receivers and is applicable to any aircraft.
  A study has been conducted by an RTCA (Radio Technical Commission for Aeronautics) special commitee.

- The conclusion is that the probability of a passenger-operated device interfering with the ILS localizer during a typical flight is about one in a million.
  Airbus Industrie recommendations is that no portable device should be used during take-off and landing.

- Concerning radio phones Airbus Industrie recommends to prohibit the use of those devices.

A330 FCOM BULLETIN

N° 04

DATE : MAR 94

file in FCOM 3.08

SUBJECT : PREVENTING UNNECESSARY IN-FLIGHT SHUTDOWNS

1 – GENERAL

The concept of ETOPS is closely linked to the continued demonstration of an acceptable level of **operational reliability**, and particularly to the demonstration of an **IFSD rate** being and remaining compatible with the ETOPS objectives.

Managing the IFSD rate related to each individual operator's engine fleet or to the overall engine fleet is therefore **vital in maintaining the ETOPS approval** for a particular operator and for the overall fleet.

Reducing and/or maintaining the IFSD rate of a given engine model is a continuous industry effort involving :

– the engine and airframe manufacturers,

– the operator's engineering, maintenance and flight operations departments, as well as flight crews.

However, managing the IFSD rate should not be an effort specific to ETOPS or non-ETOPS twins operators but should be equally considered by A340 operators.

As far as flight operations and flight crews are concerned, the concept of **preventing unnecessary in-flight shutdowns** has been actively promoted by Airbus over the past years. This FCOM Bulletin summarizes the guidelines and recommendations developed to support this concept.

2 – CREATING THE REQUIRED INDUSTRY MINDSET

With the above considerations in mind, the decision-making process in deciding a precautionary engine shutdown has been re-evaluated to consider the particular aspects of ETOPS flights as compared to four-engine, three-engine or non-ETOPS twin-engine operations.

However, before proceeding any further, it should be emphasized that the concept of preventing unnecessary precautionary in-flight shutdowns is **not** intended to :

– encourage flight crews to deviate from the published operational procedures, recommendations and guidelines,

– restrict, in any manner, the flight crew's authority to take a precautionary decision, depending on the prevailing circumstances and/or available clues.

Creating the required industry mindset was achieved and supported by :

– providing airlines management and flight crews with an **enhanced understanding** of **normal** and **abnormal engine operation,**

– providing flight crews with an **enhanced awareness** and **understanding** of engine-related indications and their relation to engine malfunctions,

– providing flight crews with **amplified guidelines** for **fault validation** through cross-checking and/or monitoring of other engine parameters,

– providing flight crews with **enhanced procedures** to **maximize the engine recovery or restart ability**, as applicable.

The above material has been released through various revisions to the FCOM, through FCOM Bulletins and through various symposium presentations and briefings, for the A300, A310 and A300-600.

Preventing unnecessary in-flight shutdowns has been a leading design aim when developing the ECAM and FCOM procedures for the newer A320/A321/A330 and A340 models.

3 – UNDERSTANDING THE ENGINE-RELATED ABNORMAL PROCEDURES

All flight crews involved in ETOPS should make sure to maintain an updated understanding of the engine normal and abnormal operations and associated procedures.

Particularly, the differences and hierarchy between the following concepts should be fully understood :

– warning and caution messages :
  · associated with a procedure : emergency and abnormal procedures,
  or
  · not associated with a procedure : crew awareness messages,

– system advisories.

The fault conditions requiring specific crew action(s) are covered by the published **ECAM** and/or **QRH emergency** and **abnormal** procedures.

The procedures calling for a **positive** or **conditional engine shutdown** should be clearly individually understood.

Whenever envisaged by the procedure and deemed eligible, based on the prevailing circumstances and available clues, the following options should be carefully considered :

– **continued engine operation at idle,**

– **engine restart.**

It is worth recalling the main features of the **Advisory** concept :

– the advisory concept is meant as an **attention-getter,**

– the activation of an advisory condition **only** calls for **crew monitoring** of the affected parameter/system,

– the guidelines associated with **advisory conditions** are meant to **assist rather than direct** the crew in its monitoring and possible decision-making and action.

Conversely, a **crew awareness message** is intended to inform the flight crew regarding system faults not requiring a specific action or monitoring, but which may affect the further conduct of the flight.

4 – FLIGHT CREW TRAINING

So as to be fully efficient, the concept of preventing unnecessary precautionary in-flight shutdowns (and the various associated operational procedures, recommendations and guidelines) should be **highlighted to flight crews at all the stages of their training** :

– transition training,

– line training,

– recurrent training/proficiency checks,

and, particularly,

– ETOPS training.

This concept has been fully adopted and integrated by the Airbus training department – Aeroformation – in the various training syllabuses.

All operators are encouraged to incorporate this concept into their company training syllabus, along with the following suggestions offered for consideration :

– the existing Simulator Drill Briefing Notes (or equivalent document) could be expanded to address and comment on additional scenarios related to abnormal engine conditions,

– the simulator instructor's and training captain's briefings could be expanded to address and comment on the overall concept of preventing unnecessary in-flight shutdowns (while confirming the flight crew authority to take a conservative precautionary decision, should the prevailing circumstances and/or available clues so dictate),

– in addition to the above suggestions, a particular emphasis could be placed on the management of the advisory conditions.

5 – SPREADING THE WORD TO ALL FLIGHT CREWS

The following summarizes the various tools used by several ETOPS operators to spread the message to all flight crews and provide periodic updating and/or refresher information :

- monthly company newsletters or bulletins,
- recurrent training bulletins,
- briefings to ground school instructors and check airmen,
- flight safety meetings,
- adjustments to the transition and recurrent training simulator syllabus (e.g. simulator training based on real scenarios experienced during the airline's own operation).

All Fleet Captains, Training Captains as well as individual flight crews involved in ETOPS flights should consider and promote the concept of preventing unnecessary in-flight shutdowns by thoroughly reviewing all the published engine-related operational procedures, recommendations and guidelines, in the light of the considerations addressed in this Bulletin.

A330 FCOM BULLETIN

N° 05/5
DATE : FEB 04
File in FCOM 3.08

SUBJECT : AVOIDING TAILSTRIKES

Note : This FCOM Bulletin supersedes Bulletin N° 05/4 dated March 1998. It has been revised for harmonization with the A320 and A340 FCOM bulletins.

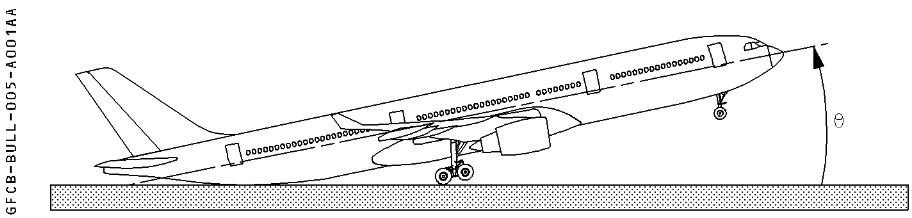
Tailstrikes are infrequent events, but they can cause expensive structural damage. They most often occur in such adverse conditions as crosswind, turbulence, windshear, etc.

The objective of this Bulletin is to provide information on the factors that may reduce tail clearance during takeoff and landing, and to provide guidance on the way in which tailstrikes may be avoided.

A/C GEOMETRY LIMITS

Two limits need to be considered :

- The geometry limit, corresponding to the main gear oleo, (fully-extended).
- The geometry limit, corresponding to the main gear oleo, (fully-compressed).



	Pitch attitude θ		
Main Gear Oleo Position	A330-300 GE	A330-300 RR/PW	A330-200
Fully extended	14.2°	14.4°	16.0°
Fully compressed	10.1°	10.1°	11.5°

CLEARANCE AT TOUCHDOWN

The following table provides the ground clearance in degrees for the A330-200 and A330-300 (all numbers are mean values).

Aircraft	Geometry limit at touchdown	Pitch attitude at VAPP (VREF + 5) (1)	Pitch attitude at touchdown	Clearance (2)
A330-200	16.0°	4.5°	6.8°	9.2°
A330-300	14.2°	4.3°	6.6°	7.6°

Note : (1) Flight path in approach = −3°
(2) Clearance = Geometry limit − Pitch attitude at touchdown

TAILSTRIKE FACTORS AT TAKEOFF

An excessive rotation rate, and a early rotation, are two factors that significantly increase the risk of tailstrike at takeoff. The thrust-to-weight ratio also has an influence, with an increased risk at low thrust/weight ratios : A condition which typically occurs with high Flex Temp settings, or during a continued takeoff with one engine failed.

1) ROTATION RATE

A fast rotation rate increases the risk of tailstrike, but a slow rate increases the takeoff distance. The recommended rate is between 2 and 3 degrees per second, which reflects the average rates achieved during flight tests, and is also the rate upon which performance calculations are based.

2) EARLY ROTATION

Early rotation occurs, when the rotation is initiated below the scheduled VR. The potential reasons for this are :

– The calculated VR is incorrect for the aircraft weight or flap configuration.
– The rotation occurs below VR due to gusts, windshear, or an obstacle on the runway.

Whatever the cause of the early rotation, the result will be an increased pitch attitude at lift-off and, consequently, a reduced, tail-clearance.

3) ROTATION TECHNIQUE

The A330 has a large inertia, and the rotation rate produced by a given sidestick input takes time to build up. But, once it has developed, it remains relatively constant for a given sidestick position. Therefore, it is important to initiate the rotation with a positive backward stick input (typically 2/3 backstick). Subsequent changes to the commanded rate should be made smoothly. Rapid variations in stick position will cause sharp changes in the rate of cockpit movement.

A small or slow movement of the sidestick will give a sluggish rotation. If, to increase the rotation rate, a further aft movement of the sidestick is made around the time of lift-off, the possibility of tailstrike increases significantly.

Recommendation : At VR, initiate a prompt and positive rotation to achieve the desired rotation rate. Avoid making further rearward sidestick inputs around the point of lift-off.

Rotation should be continued towards a typical all-engine attitude of about 15°. After lift-off, follow the SRS command bar.

Note : *The SRS command bar does not give orders to obtain the correct pitch rate during the rotation on ground, but to reach and maintain the SRS speed after lift-off. Therefore, do not attempt to follow the SRS pitch order during the rotation phase before the lift-off. Pitch targets are given only as an initial objective, particularly in the event of the loss of the FDs. Pilots should adjust the pitch attitude to achieve the desired speed.*

When airborne, and as the attitude changes and stabilizes, the pitch flight control laws is gradually phase in allowing the sidestick to be released to the neutral position to maintain 1 g at the chosen attitude. Pitch trim begins to work at 50 feet.

4) CONFIGURATION AND SPEED

For a given aircraft weight and configuration, a variety of takeoff speeds are possible, depending on such factors as runway length and obstacles. In general, the higher the VR, the greater the tailstrike margin. The minimum VR is determined by the VMU. So, when the VMU appears as the influence in the computed takeoff speeds, it can also be taken as an indication of reduced tailstrike margin.

Similarly, for certain conditions (aircraft weight and runway length), a variety of flap configurations are possible. The tailstrike margin benefit of selecting a higher flap setting can be lessened by the effect of the computed takeoff speed. But, in general, the highest flap configuration gives the greatest tailstrike margin (i.e. Conf 3 gives a greater margin than Conf 1 + F).

5) TAKEOFF TRIM SETTING

The main purpose of the pitch trim setting for takeoff is to provide consistent rotation characteristics. The pitch trim setting is automatic for A330 Enhanced (with specific aircraft definition). It is manually set on other A330 models.

Flight tests have demonstrated that whatever the aircraft CG position, as long as the trim setting lies within the certified limits (green band of the trim wheel), the aircraft can perform a safe takeoff.

Nevertheless, it is a fact that a wrong pitch trim setting (for the takeoff CG) will change the feel of the aircraft during the rotation :

- With a forward CG, and the pitch trim set to the nose-down limit, pilots will feel a "heavy to rotate" aircraft, and aircraft rotation will be very slow, in responding to the normal takeoff stick displacement.
- With an aft CG, and the pitch trim set to the nose-up limit, pilots will feel a "light to rotate" aircraft, or may even experience an early autorotation.

In either case, pilots may have to modify the normal control input, in order to achieve the desired rotation rate. However, they should be cautious not to overreact.

Note 1 : *On A330s equipped with at least the FWC K7 Standard the "PITCH TRIM/MCDU/CG DISAGREE" warning is triggered when there is a difference of more than 1.5° degrees between the theoretical pitch trim value (based on the CG value determined by the FCMC), and the real pitch trim position. On aircraft additionally equipped with a specific FMS 2P2 Standard, the warning is triggered when there is a disagreement between any of the following : The real pitch trim position, the theoretical pitch trim value (based on the CG value determined by the FCMC), the pitch trim value entered in the MCDU.*

6) CROSSWIND TAKEOFF

For crosswind takeoffs, routine use of into-wind aileron is not recommended. In strong crosswind conditions, some lateral control may be used, but care should be taken to avoid using large deflection, resulting in excessive spoiler deployment which increases the tendency to turn into wind, reduces lift, and increases drag. Spoiler deflection starts to become significant with more than half sidestick deflection. As the aircraft lifts off, any lateral control applied will result in a roll rate demand. A direct effect of the reduction in lift, due to the extension of the spoilers on one wing, will be a reduction in tail-clearance and an increased risk of tailstrike.

7) OLEO INFLATION

The correct extension of the main landing gear shock absorber (and thus the nominal increase in tail-clearance during the rotation) relies on the correct inflation of the oleos. An under-inflated oleo will delay the start of the bogie rotation and reduce tail-clearances.

TAILSTRIKE AT LANDING

Although most tailstrikes at landing are due to deviations from normal landing techniques, some are associated with such external conditions as turbulence and wind gradient.

1) DEVIATION FROM NORMAL LANDING TECHNIQUES

Deviations from normal landing techniques are the most common causes of tailstrike. The main reasons for this are due to :

a) Allowing the speed to decrease well-below the Vapp before flare.

Flying at a too low speed means high a AOA and a high pitch attitude, thus reducing ground clearance. When reaching the flare height, the pilot will have to significantly increase pitch to reduce the sink rate. This may cause the pitch to go beyond the critical angle.

b) Prolonged hold-off for a smooth touchdown

As the pitch attitude increases, the pilot needs to focus further ahead to assess the aircraft's position in relation to the ground. The attitude and distance relationship can lead to a pitch attitude increase beyond the critical angle.

c) Too-high flare

A high flare can result in a combined decrease in airspeed and a long float. Since both lead to an increase in pitch attitude, the result is reduced tail-clearance.

d) Too high a sink rate, just prior to reaching the flare height.

In case of a too-high sink rate close to the ground, the pilot may attempt to avoid a firm touchdown by commanding a high-pitch rate.
This action will significantly increase the pitch attitude and, as the resulting lift increase may be insufficient to significantly reduce the sink rate, a firm touchdown may occur. In addition, the high-pitch rate may be difficult to control after touchdown, particularly in case of bounce.

e) Bouncing at touchdown

In case of bouncing at touchdown, the pilot may be tempted to increase the pitch attitude to ensure a smooth second touchdown. If the bounce results from a firm touchdown, associated with a high pitch rate, it is important to control the pitch so that it does not further increase beyond the critical angle.

2) APPROACH AND LANDING TECHNIQUES

A stabilized approach is essential for achieving successful landings. It is imperative that the flare height be reached at the appropriate airspeed and flight path angle. A/THR and FPV are effective aids to the pilot.

The Vapp should be determined with the wind corrections, (provided in the FCOM/QRH), by using FMGS functions.

As a reminder, when the aircraft is close to the ground, the wind intensity tends to decrease and the wind direction to turn (direction in degrees decreasing in northern latitudes).

Both effects may reduce the headwind component close to the ground, and the wind correction to Vapp is there to compensate for this effect.

When the aircraft is close to the ground, high sink rates should be avoided, even in an attempt to maintain a close tracking of the glideslope. Priority should be given to the attitude and sink rate. If a normal touchdown distance is not possible, a go-around should be performed.

If the aircraft has reached the flare height at Vapp, with a stabilized flight path angle, the normal SOP landing technique will lead to repetitive touchdown attitude and airspeed.

During flare, the pilot should not concentrate on the airspeed, but only on the attitude with external cues.

<u>Note</u> : *Airspeed indication during flare is influenced by the static error, due to the ground effect.*

Specific PNF callouts have been reinforced for excessive pitch attitude at landing.

After touchdown, the pilot must "fly" the nosewheel smoothly, but without delay, on to the runway, and must be ready to counteract any residual pitch up effect of the ground spoilers.

<u>Note</u> : *The main part of the spoilers' pitch up effect is compensated by flight control laws.*

3) BOUNCING AT TOUCHDOWN

In case of light bounce, maintain the pitch attitude and complete the landing, while keeping thrust at idle.

Do not allow the pitch attitude to increase, particularly following a firm touchdown with a high pitch rate.

In case of a high bounce, maintain the pitch attitude and initiate a go-around.
Do not try to avoid a second touchdown during the go-around. Should it happen, it would be soft enough to prevent damage to the aircraft, if pitch attitude is maintained.
Only when safely established in the go-around, retract flaps one step and the landing gear.
A landing should not be attempted immediately after a high bounce, as thrust may be required to soften the second touchdown, and the remaining runway length may be insufficient to stop the aircraft.

CUMULATIVE EFFECTS

No single factor should result in a tailstrike, but accumulation of several can significantly reduce the margins.

ACTION IN CASE OF TAILSTRIKE

If a tailstrike occurs at takeoff, flight at altitudes requiring a pressurized cabin must be avoided, and a return to the originating airport should be immediately performed for damage assessement.

A330 FCOM BULLETIN

N° 06
DATE : APR 96
file in FCOM 3.08

MMEL AND MEL USE

REASON FOR ISSUE

To provide Airbus operators with a simple explanation of the relationship between the MMEL and MELs, and how to use an MEL.

PURPOSE OF THE MMEL

The main purpose of the MMEL is to **permit the dispatch** of an airplane with pieces of equipment or functions inoperative, when a failure has been detected in the previous flight or in transit, and to avoid as much as possible delays and cancellations.
The MMEL is issued by Airbus Industrie and approved by JAA for non US operators and issued and approved by FAA for US operators.

FROM THE MMEL TO AN MEL

Regulation requires that each operator prepares and keeps current an MEL using the MMEL as a guide line. **The MMEL cannot in any case be used as an MEL.**
A MEL cannot be less restrictive than the MMEL and should **cover all the items depending on National Regulations.** In particular, conditions indicated "as required by regulations" in the MMEL should be fully identified in the MEL.
The MEL is agreed/approved by National Authorities.

CONTENTS OF THE MEL

An airline's MEL should contain the four following sections :

- The list, agreed/approved by National Authorities of all pieces of equipment or functions which may be inoperative for dispatch.
  This list is established using the JAA approved section 01 of the MMEL.
- The operational procedures extracted from the MMEL Section 02
- The maintenance procedures extracted from the AMM. (Aircraft Maintenance Manual), or the ADPM (Aircraft Deactivation Procedures Manual).
- The list of the ECAM warnings, associated with the corresponding dispatch conditions, extracted from the MMEL Section 03.

HOW TO USE AN MEL

When a failure is detected and identified, the crew must enter in the airline's MEL **to determine if a subsequent dispatch is allowed and under which conditions.**

- The agreed/approved section of the MEL indicates the conditions which must be fulfilled for dispatch.
  All items are listed following ATA (Air Transport Association) classification (see below).
  All items not listed in this section are NO-GO (dispatch prohibited) except equipment or functions which are obviously not affecting airworthiness or flight safety.
- If a (o) is associated with the item, an operational procedure must be applied.

  Either on ground or/and in flight, crew actions are required and described in the operational procedures section of the MEL.
- If a (m) is associated with the item, a maintenance procedure must be applied.

  On ground, before dispatch, maintenance people actions are required and described in the maintenance procedures section of the MEL or in the AMM or in the ADPM.
  If approved by National Authorities, other personnel may be qualified and authorized to perform certain functions. Procedures requiring specialized knowledge or skill, or requiring the use of tools or test equipment should be accomplished by maintenance personnel.

ATA 100 BREAKDOWN

The ATA (Air Transport Association) breakdown represents the official reference for the classification of airplanes systems and / or functions.

This is achieved using 6 digits (ex : 21-23-00 LAVATORY/GALLEY VENTILATION).

The two first digits for the ATA chapter (ex : 21 – AIR CONDITIONING), and remaining digits for system and function classification in the ATA chapter.

The four first digits are used in the A320, A330 and A340 MMEL, while only the two first digits are used in the A300, A300-600 and A310 MMEL.

SUBJECT : PUBLICATION OF ONE ATTENDANT INFORMATION BULLETIN

REASON FOR REVISION

This FCOM Bulletin has been revised to cancel the second part of the previous issue referring to a Cabin Attendant Information Bulletin entitled : "Passenger Oxygen Mask Deployment". This Cabin Attendant Information Bulletin was issued to provide Operators with interim operational recommendations before accomplishing the required actions of AOT 35-04 (issued in October 95).

This AOT requested affected Operators (last affected A/C delivered in mid 95) to perform a cabin check within the following 500 flight hours, and to apply corrective actions (if necessary) within the following 18 months.

DELIBERATE INHIBITION OF AMBIENT LAVATORY SMOKE DETECTORS

REASON FOR ISSUE :

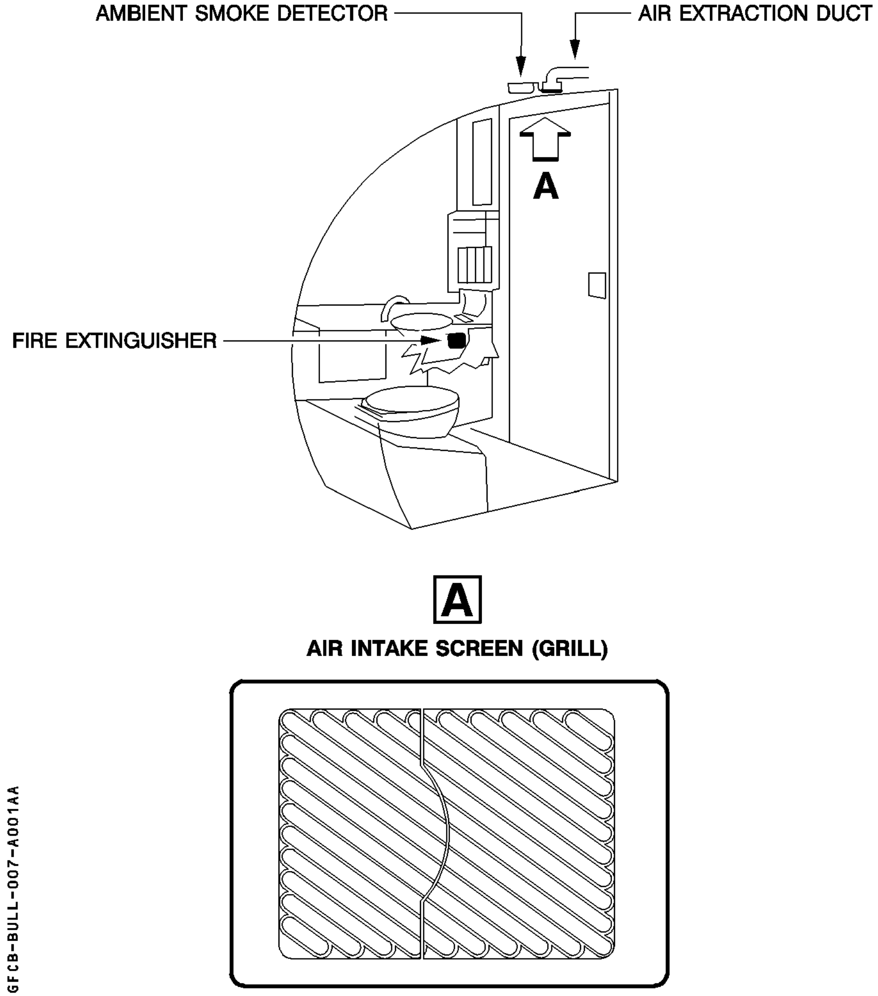
There have been reports of tampering with ambient lavatory smoke detectors on some aircraft.

EXPLANATION :

This tampering involved the removal of the smoke detector grill, and the packing of foreign objects (such as tissue paper and plastic bags) around the detector (see graphics overleaf). This seriously affects the detection capabilities of the lavatory smoke detection system. In this condition, the detector cannot "sample" air from the lavatory.

PROCEDURE

It is recommended that, prior to each flight, the cabin crew inspect the lavatory smoke detectors for similar types of tampering. If foreign bodies, or signs of tampering are found, line maintenance should be informed.



This grill is a cover for the ambient smoke detector and the air extraction duct. The view shows how the grill would appear when looked at from below.
This grill can be removed. Foreign objects (tissues, plastic bags) have been found packed around the ambient smoke detector.

A330 FCOM BULLETIN

N° 8/2

DATE : JAN 00

file in FCOM 3.08

SUBJECT : EGPWS DATABASE

Purpose

Airbus Industrie has received some reports of EGPWS warnings that were unduly triggered due to airport data missing from the database.
It is the Airlines responsibility to identify the airport(s) where the terrain data is missing from the database. During operation around such airports, the enhanced function must be switched off (TERR pushbutton OFF on overhead panel) when the aircraft position is less than 15NM from the runway.

The purpose of this bulletin is to provide the operators and the flight crews with additional information regarding the EGPWS database and the EGPWS system reaction when the airport/terrain data is not included in the database.
The FCOM 3.01.34 and the Aircraft Flight Manual (AFM) refer, providing limitations of the system.

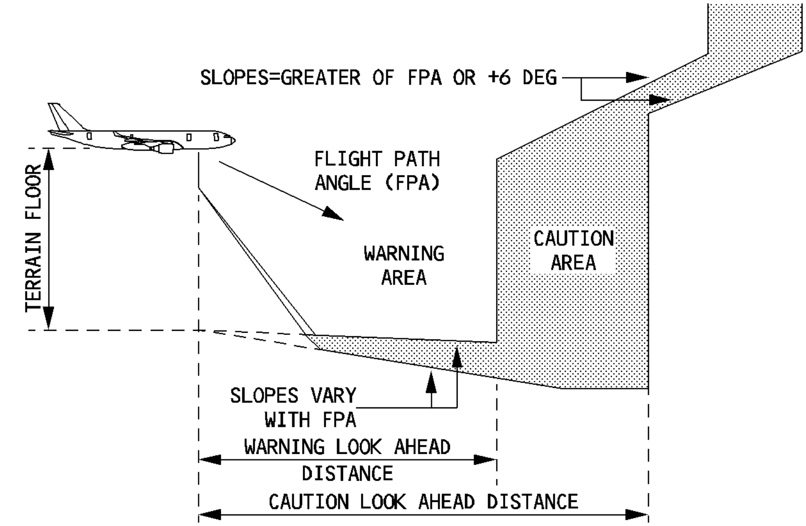
1. The Enhanced GPWS functions

The purpose of the Enhanced Ground Proximity Warning System (EGPWS) is to alert the crew of potential hazardous conditions with regards to Controlled Flight into Terrain (CFIT).

Two enhanced functions have been added to the basic modes of the GPWS. These functions are the following :

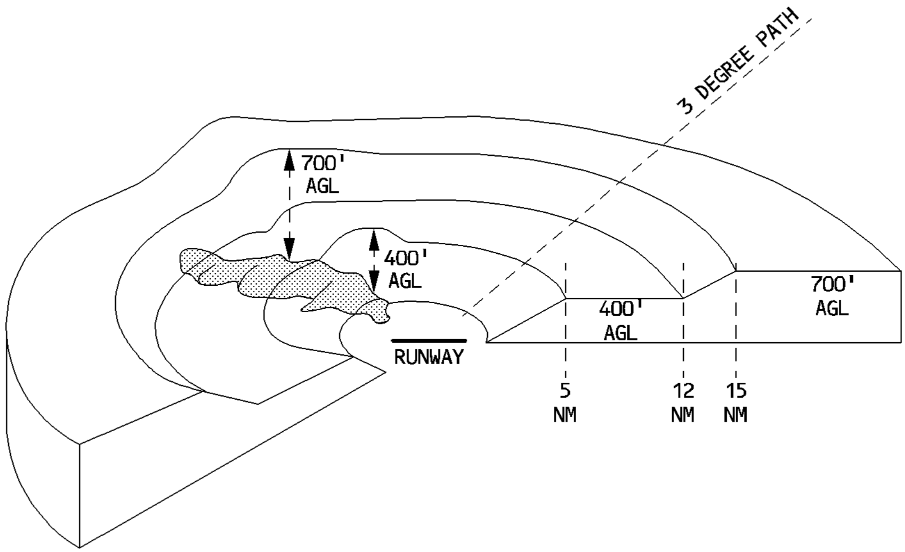
– Terrain Awareness and Display (TAD)
– Terrain clearance Floor (TCF)

- The Terrain Awareness and Display (TAD) function compares the aircraft FMS position with the local terrain in the database. It also computes two envelope boundaries ahead of the aircraft. When terrain data conflicts with one of these envelopes, specific aural and visual alerts are triggered.
  This function also provides terrain data display on the Navigation Display (ND)



GFC5-BULL-008-A001AA

- The Terrain Clearance Floor (TCF) function computes a terrain clearance envelope around the airport runway. It is based on current aircraft location, nearest runway center point position included in the database and radio height. When the aircraft enters this envelope, an alert "TOO LOW TERRAIN" is produced even if the aircraft is in landing configuration. This alert protects against an attempt to land where there is no airfield. This can be the case for example when descending by mistake on a wrong vertical path during a non-precision approach. This function operates during any flight phase.



GFC5-BULL-008-A002AA

2. The EGPWS database

The terrain database divides the Earth surface into grid cells. These cells are recorded upon the WGS-84 geographic coordinate system for longitude and latitude data. Each cell records the highest terrain altitude in the respective terrain area.
The resolution of the grid varies upon the geographic location ranging from :

- 0.25 NM x 0.25 NM
- 0.5 NM x 0.5 NM
- 1 NM x 1 NM
- 2 NM x 2 NM
- 5 NM x 5 NM

The highest resolution (0.25NMx0.25NM) is used around the airports. This is to avoid producing alerts during normal procedures (the terrain database has to reflect as closely as possible the actual terrain). The lowest resolution (5NMx5NM) is used outside airports where such a coarse terrain database cannot interfere with normal en-route trajectories. The database also contains the position of the airport runway center point. This concerns all hard surface runways whatever the surface type is longer than or equal to 3500 ft.

Additionally, the database gives the possibility of incorporating data regarding man-made obstacles in the vicinity of the major airports.

3. EGPWS reaction when airport data is missing from the database.

When an airport/terrain data is not yet covered by the database, the TCF envelope cannot be defined. The system uses the lowest map resolution (5NMx5NM) as no airport is detected. Therefore, early and unexpected TAD cautions and warnings are triggered. The red EGPWS legend of the GPWS/G/S pushbutton comes on, the aural warnings "TERRAIN AHEAD" and "TERRAIN AHEAD, PULL-UP" sound and the terrain image pops up on the Navigation Display. When within 15NM, it is recommended to switch off the enhanced functions (EGPWS TERR pushbutton switched to OFF on overhead panel) for operations from/to runways not incorporated in the database (FCOM 3.01.34 refers).

4. The EGPWS database update

The database update is under the responsibility of the vendor.
The vendor may use one or more sources of data for a particular airport :

1) Data from in-country government and/or regulatory agencies.
2) Data from airlines that have surveyed an airport while establishing layout, approach/departure procedures, etc.
3) Data from commercial vendors who also produce data sets for FMS and other navigational systems.
4) Data from commercial and military surveying agencies that make such information publicly available.
5) Airport layout and physical properties from high-resolution maps and/or digitized data sources.
6) Airport layout and physical properties from imagery.

Some difficulties may be encountered in some areas to compile and validate airport data.

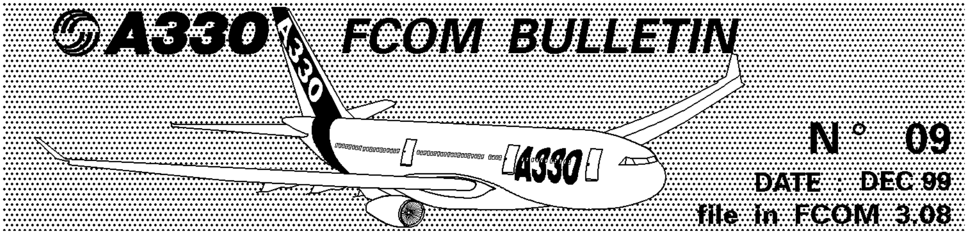
For an official indication of the latest EGPWS database, as weel as a list of covered airports, please review the manufacturer document EGPWS Terrain Database Airport Coverage list. This document can be acquired by contacting :

Christine STAHL, Database Manager,
Allied Signal – 1500 NE 36th Street
REDMOND WA USA 98073
Telephone : (1)(425) 885-8847
Fax : (1)(425) 885-2994
Email : christine.stahl@allied.signal.com
Internet : www . egpws . com

5. Conclusion

The enhanced functions of the EGPWS are not reliable when operating around airports which are not included in the database. In this case, these functions must be switched off (TERR pushbutton off on the overhead panel).
It is the airlines responsibility to identify with the database manufacturer the airports where terrain data is missing.

Airbus Industrie strongly recommends to the airline to report to the database manufacturer and to their local airworthiness authorities any EGPWS warning occurence due to airport data missing from the database. It is also recommended that airlines request that their national authorities publish the necessary data in order that the database manufacturer can extend the database coverage to all operated airports.



ERRONEOUS AIRSPEED/ALTITUDE INDICATIONS

BACKGROUND

Two recent fatal accidents on non-Airbus aircraft and several reported incidents attributed to unreliable speed and/or altitude indications have prompted the need to improve flight crew awareness to identify and tackle the failures described in this bulletin.

Most failure modes of the airspeed/altitude system are detected by the ADIRS and lead to the loss of the corresponding cockpit indications and the triggering of the associated ECAM drills.

However, there may be some cases where the airspeed or altitude output is erroneous without being recognized as such by the ADIRS. In these cases, the cockpit indications appear normal, but are false, and pilots must rely on their basic flying skills to identify the faulty source and take the required corrective actions. When only one source provides erroneous data, the straightforward crosscheck of the parameters provided by the 3 ADRs allows the faulty system to be identified. This identification becomes more difficult in extreme situations when two, or even all three, sources provide erroneous information.

This FCOM Bulletin provides the following information :

1 – Recall of pitot/static system layout ;

2 – Situations which may lead to erroneous, airspeed/altitude indications ;

3 – Consequences of various failure cases ;

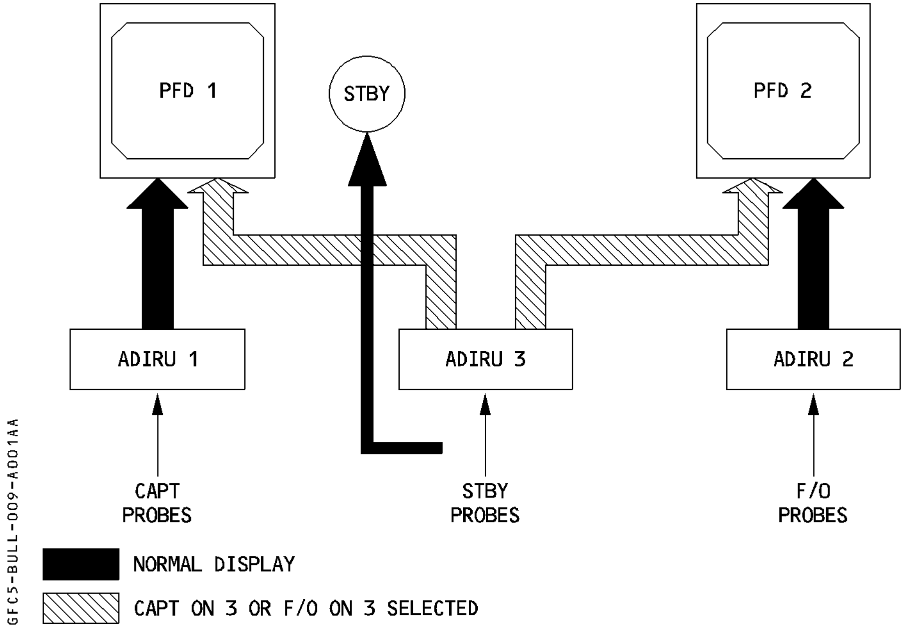
4 – Recall of AI recommended operational procedures.

DISPLAY ARCHITECTURE

The CAPT side pitot and static probes supply the ADIRU 1 which is normally used for display on the CAPT PFD.

The F/O side pitot and static probes supply the ADIRU 2 which is normally used for display on the F/O PFD.

The STBY pitot and static probes supply the ADIRU 3, which can be used for display on either PFD in case of failure. They also directly supply the standby instruments.



MAIN REASONS FOR ERRONEOUS AIRSPEED-ALTITUDE DATA

The most probable reason for erroneous airspeed and altitude information is obstructed pitot tubes or static sources. Depending on the level of obstruction, the symptoms visible to the flight crew will be different. However, in all cases, the data provided by the obstructed probe will be false. Since it is highly unlikely that the aircraft probes be obstructed at the same time, by the same amount, and in the same way, the first indication of erroneous airspeed-altitude data available to flight crews, will most probably be a discrepancy between the various sources.

CONSEQUENCES OF OBSTRUCTED PITOT TUBES OR STATIC PORTS

All aircraft systems using anemometric data have built-in fault accommodation logics. The fault accommodation logics are not the same for the various systems ; but, all rely on voting principles whereby when one source diverges from the average value, it is automatically rejected and the system continues to operate normally with the remaining two sources. This principle applies to flight controls and flight guidance systems.

Normal situation

Each PRIM receives the speed information from all ADIRUs.
It compares the 3 values.
Pressure altitude information is not used by the PRIM.

Each FE (Flight Envelope computer) receives the speed and pressure information from all ADIRUs.
For each of these two parameters, it compares the 3 values.

If one ADR output is erroneous and the two remaining ADRs are correct :

The PRIM and the FE eliminate it without any cockpit effect (no caution ; normal operation is continued), except that one display is wrong and CATIII dual can no longer be available on the FMA.

If two ADR outputs are erroneous, but different, and the remaining ADR is correct, or if all three are erroneous, but different :

The autopilot and the autothrust are disconnected by the FE (whichever autopilot is engaged).

If the disagree lasts for more than 10 seconds, the PRIM triggers the ADR DISAGREE ECAM caution.
It reverts to Alternate 2 law (without high and low speed protection).
On both PFD, "SPD LIM" flag is shown, no V_{LS} and no V_{SW} is displayed.

This situation is latched, until a PRIM reset is performed on the ground without any hydraulic pressure.
However, if the anomaly was only transient, the autopilot and the autothrust can be re-engaged when the disagree has disappeared.

If one ADR is correct but the other two ADRs provide the same erroneous output or if all three ADRs provide consistent and erroneous data :

The systems will reject the "good" ADR and will continue to operate normally using the two "bad" ADRs. This condition can be met when, for example, two or all three pitot tubes are obstructed at the same time, by the same amount, and in the same way. (Flight through cloud of volcanic ash, takeoff with two pitots obstructed by foreign matter (mud, insects)).

Human beings (the pilot) tend to use the same type of "fault accommodation" principles to detect an erroneous IAS/altitude indication. Flight crews will tend to reject the outlier information, if the other two outputs are consistent. This choice is, in the great majority of cases, correct ; but, all flight crews should be aware of very extreme and unlikely situations where two (or even three) speed/altitude indications can be consistent and wrong.

BEWARE OF INSTINCTIVELY REJECTING AN OUTLIER ADR

The following chart provides a non-exhaustive list of the consequences of various cases of partially or totally obstructed pitot tubes and static ports on airspeed and altitude indications. It should be noted that the cases described below cover extreme situations (e.g. totally obsctructed or unobstructed drain holes) and that there could be multiple intermediate configurations with similar, but not identical, consequences.

FAILURE CASE	CONSEQUENCES
Water accumulated due to heavy rain Drain holes unobstructed	Transient speed drop until water drains IIAS fluctuations IAS step drop and gradual return to normal
Water accumulated due to heavy rain Drain holes obstructed	Permanent speed drop
Ice accretion due to pitot heat failure or transient pitot blocked due to severe icing Unobstructed drain holes	Total pressure leaks towards static pressure IAS drop until obstruction cleared/fluctuation if transient erratic ATHR if transient
Ice accretion due to pitot heat failure or pitot obstruction due to foreign objects Obstructed drain holes	Total presure blocked Constant IAS in level flt until obstruction cleared In climb IAS increases In descent IAS decreases Abnormal AP/FD/ATHR behavior : a) AP/FD pitch up in OPN CLB to hold target IAS b) AP/FD ptich down in OPN DES to hold target IAS
Total obstruction of static ports on ground	Static pressure blocked at airfield level Normal indications during T/O roll After list-off altitude remains constant IAS decreases after lift-off IAS decreases when aircraft climbs IAS increases when aircraft descends

Based on the information given in the preceding chart, it is clear that no single rule can be given to conclusively identify all possible cases of erroneous airspeed/altitude indications. However, any case of erroneous speed/altitude indications will always be associated to one (or more) of the following cues :

a) Fluctuations of airspeed indications.
b) Abnormal correlation of the basic flight parameters (IAS, pitch, attitude, thrust, climb rate) :
   - IAS increasing with large nose-up pitch attitude ;
   - IAS decreasing with large nose down pitch attitude ;
   - IAS decreasing with nose down pitch attitude and aircraft descending ;

c) Abnormal AP/FD/ATHR behavior ;
d) Undue stall warning or overspeed warnings ;
d) Reduction of aerodynamic noise with increasing IAS ;
e) Increase of aerodynamic noise with decreasing IAS.

RECOMMENDED PROCEDURES

GENERAL REMARKS

The procedures described below are intended to provide flight crews with general guidelines to be applied in case of suspected erroneous airspeed/altitude indications.

FOLLOW ECAM ACTIONS
If failure undetected :
CROSSCHECK ALL IAS/ALTITUDE SOURCES :
ADR1, ADR2, ADR3 AND STANDBY INSTRUMENTS

If it is obvious that the outlier is wrong, select the corresponding ADR OFF and reconfigure the PFD indications accordingly, by applying the ECAM drill which will be automatically displayed.

Flgith crews should, however, be aware that in very extreme circumstances, it may happen that two, or even all three ADRs may provide identical and erroneous data. Therefore, the suspect ADR should only be switched OFF, if it is positively confirmed that the two other ADR's are correct. If in doubt :

DISCONNECT AP, FD AND ATHR
FLY TARGET PITCH ATTITUDE AND THRUST SETTING

The initial pitch attitude and thrust values given in the QRH should be considered as "Memory Items", since they allow "safe flight conditions" to be rapidly established in all flgiht phases (takeoff, climb, cruise) and aircraft configurations (Weight and slat/flaps).
Once the target pitch attitude and thrust values have been stabilized, the expanded data of the QRH (Flight with Unreliable Speed Indication) should be followed to determine the precise pitch attitude and power setting required, as a function of the aircraft's weight, configuration and desired speed.

After applying the QRH procedure, and when the aircraft is stable, the flight crew should try to identify the faulty ADR (one or more). Once the discrepant ADR has (or have) been positively identified, it (they) should be switched OFF. This will trigger the corresponding ECAM warnings and the associated drills which should be followed to address all the consequences on the various aircraft systems.

This FCOM BULLETIN supersedes bulletin N° 10/2 dated JUL 01.

SUBJECT : USE OF MANAGED GUIDANCE IN APPROACH AND NAV DATABASE VALIDATION

1. BACKGROUND

The purpose of this FCOM Bulletin is to highlight SOP recommendations on the use of managed guidance in approach.

The current body of published Instrument Approach Procedures, (IAP) includes "old style" procedures, in overlay to radio navaid-based procedures, which cannot always be coded in the navigation database, in a suitable manner for satisfactory FMGS guidance in approach.

Note : RNAV procedures are usually designed and coded for optimum FMGS guidance in FINAL APP mode.

Validation of the navigation database should ensure that the IAP is of an eligible type, and is correctly coded, so that the aircraft in FINAL APP mode will fly a constant flight path angle from the FAF to the runway with the required obstacle margins.

Different methods or processes can be used to validate the IAP that is coded in the navigation database.

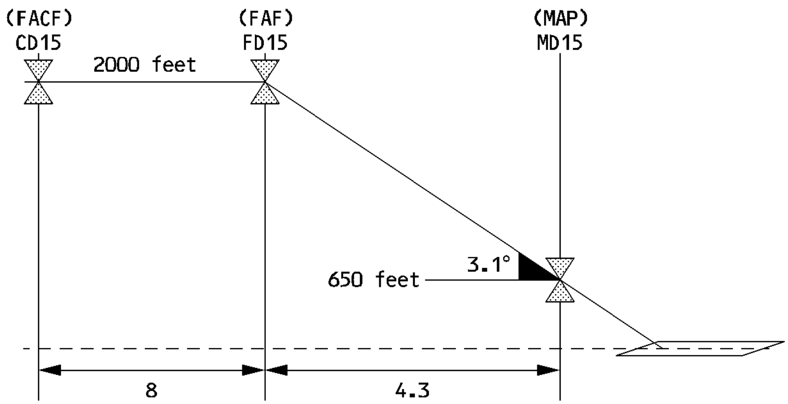
One method is to fly each approach in a simulator (or equivalent device), or with the aircraft when weather conditions are good. An IAP that is regularly and correctly flown in FINAL APP mode can be considered as validated.

Another method is to use a dedicated software to read the navigation database diskette. The listing or display of the coded IAP is then assessed by comparing it with the approach chart. The airline should keep an up-to-date record of the IAPs that are approved for the use of FINAL APP mode.

All RNAV (GPS) IAP should be validated, even if they are not flown in FINAL APP mode, but in NAV/FPA for example, since no navaid raw data is available for monitoring.

2. IAP AND CODING REQUIREMENTS

R A number of FMGC coding guidance requirements have been identified, and must be
R considered, when performing navigation database validation for the use of managed guidance
R in approach. As an example, the following drawings show the coding of an IAP (with the MAP before the runway), and the associated MCDU display.



FACF = Final Approach Course Fix
FAF = Final Approach Fix
MAP = Missed Approach Point

= Waypoints with associated altitude constraints

	UTC	SPD / ALT	
.....	....	....	....
C144°			
CD15L	....	....*	2000
C144°	TRK144°	8	
MD15L	....	....*	2000
C144°		4	-3.1°
MD15L	....	....	650
....			

GFC5-BULL-010-A001AA

The final approach consists of a sequence of at least two waypoints. However, it more often consists of 3, or 4, waypoints.
In the above example, the 3 waypoints are the FACF, the FAF, and the MAP. Sometimes, the MAP is located at, or after, the runway threshold. We will see that it is important for the crew to identify the MAP position. Sometimes, a Step Down Fix (SDF) is added on the approach final descent, between the FAF and the MAP.
The SDF is not necessarily identical to the waypoints published on the approach chart. The identification of the waypoints shown on the MCDU often differs from the identification shown on the approach chart.

The lateral F-PLN coding requirements

The FACF and the FAF must be aligned with the approach course.
If the FACF and the FAF are collocated, the course change at the FAF should be small. A sharp turn would prevent the aircraft from overflying the FAF, and the final descent would start before the FAF, without the aircraft being established on the final approach course.

Approach procedures, including a PI-CF leg (PROC T displayed between 2 approach waypoints of the MCDU F-PLN page), are not permitted with AP or FD managed guidance. These approaches must be flown in selected guidance, using published approach chart and navaid raw data.

The vertical F-PLN coding requirements

An altitude constraint must be coded at each approach waypoint.
Any waypoint of the approach should not be common to a STAR or a VIA waypoint with different altitude constraints. Combining altitude constraints may lead to erroneous vertical flight path guidance.
An AT or ABOVE constraint can be used for an SDF.
When the **MAP is located at, or before, the runway threshold, an FPA (≠0°) must be coded at the MAP, or at the runway threshold (RW). This FPA will appear on the MCDU, between the MAP and the FAF, or any previous SDF in the final approach.**

Note : The MAP of RNAV approaches must be located at the runway threshold.

When the **MAP is located after the runway threshold, an FPA=0° must be coded at the MAP.**
For these "old style IAP", with the MAP after the runway threshold, and depending on the position of the approach axis relative to the runway, FMGC guidance may start the final approach descent slightly before the FAF. In most cases, the crossing altitude difference at the FAF is not significant (less than 50 feet). But sometimes, this difference may be higher. Therefore, as it is not acceptable for the use of FINAL APP mode, we recommend validating the IAP with a MAP after the runway threshold, either in a simulator (or equivalent device), or with the aircraft when weather conditions are good.
An FPA (≠0°) must be coded for each SDF that is on the final approach descent.
The MAP of an RNAV IAP must be located at the runway threshold.

Note : The MAP of a GPS IAP can be located before the runway threshold.

3. FLIGHT CREW PROCEDURES

The SOP (FCOM 3.03.19) for Non Precision and RNAV approaches are applicable. The following recommendations are provided to highlight specific vertical navigation aspects, when the FINAL APP mode is used.
As applicable, the crew should first check that the Airline has approved the approach for FINAL APP mode use.

3.1 Approach F-PLN verification

Before starting the approach, the crew must check the FMS F-PLN (on the MCDU, and on the ND in PLAN mode with the CSTR displayed), starting from the beginning of the STAR down to the runway and the missed approach procedure, and verify the profile against the published IAP chart.

For the final approach procedure, the crew should check the :

- Approach course
- Waypoints and associated altitude constraints
- Distance from the FAF to RW, or FAF to MAP
- Approach angle (shown on the MCDU line above the related waypoints) :
  - **If MAP after runway threshold : FPA=0° at MAP**
  - **If MAP before or at runway threshold : FPA≠0° at MAP**
  - **For each Step Down Fix, an FPA≠0° must be defined**
- IAP does not include a PI-CF (PROC T displayed on the MCDU).

R • **IAP does not include a PI-CF leg (PROC T displayed on the MCDU)**

R • **MAP of an RNAV IAP must be located at the runway threshold.**

R *Note : The MAP of a GPS IAP can be located before the runway threshold.*

- Altitude at the MAP, or at the runway threshold
  - If the crossing altitude at MAP is not shown on the approach chart, crosscheck consistency with the distance to the runway and the approach angle

3.2 Limitations to approach F-PLN modifications

When performing an IAP, using NAV and FINAL APP modes, the active F-PLN, extracted from the navigation database, can be modified, provided the following limitations are observed :

1. F-PLN modifications :

   - No lateral modification of the F-PLN from FACF (inclusive) to RW or to MAP.
     A modification is permitted before FACF, provided the resulting change in flight path course will not be so large that it prevents the aircraft from being laterally-stabilized on the final approach course before reaching the FAF.

   - No altitude constraint modification from FACF to MAP. Even in case of a very low OAT, no altitude correction can be entered in this way. This may require that a minimum OAT be defined, so that the vertical flight path will clear obstacles with the required margin. This minimum OAT should be given to the crew, when appropriate. In the future, for RNAV approaches, the minimum OAT will be published on the approach chart itself.

   - When the FAF is the TO waypoint, the FROM waypoint must not be cleared in an attempt to perform a DIR TO/INTERCEPT.

   - To benefit from managed speed, and have a correct location of the DECEL point, it is recommended to enter Vapp as a SPD CSTR at FAF.

2. DIR TO...

- DIR TO FACF is permitted, provided the resulting change in flight path course at FACF is not so large that it prevents the aircraft from being laterally-stabilized on the final approach course before reaching the FAF.
- DIR TO FAF is permitted, provided the resulting change in flight path course at FAF is small.
- DIR TO/INTERCEPT TO FAF is permitted, provided the RADIAL IN corresponding to the final approach course (approach course + 180°) is selected, and that the interception angle is not so large that it prevents the aircraft from being laterally-stabilized on the final approach course at the FAF.

3. Lateral F-PLN interception in HDG/TRK :

- F-PLN must be intercepted before FACF, and the interception angle should not be so large that it prevents the aircraft from being laterally-stabilized on the final approach course before reaching the FAF, or
- Before the FAF, at the latest, provided the interception angle is small.

CAUTION

– Before arming NAV, check that the correct "TO" waypoint is displayed on the ND.
– The intercept path in HDG/TRK must not cause premature sequencing of the FAF. The FAF should be sequenced in NAV mode, when established on the final approach course.

4. Vertical F-PLN interception :

- The crew should manage the descent, so that the vertical F-PLN is intercepted before the FAF, at the latest.

3.3 Approach monitoring

Except for RNAV IAP, approach navaids should be tuned and the associated raw data should be displayed and actively-monitored. This active monitoring should include vertical navigation, using altimeter readings versus DME distances or the equivalent.
For RNAV IAP, vertical navigation can be monitored by using the distance to the RW, or to the MAP displayed on ND and the altimeter reading.
After passing the FAF, when stabilized on the final descent, the crew should check that the X-TRK and V-DEV are correct, and that the FPV is consistent with the approach angle.

When APPR is selected on the FCU, the crew must verify the :

- Correct FMA display (APP NAV green, FINAL blue)
- Correct TO waypoint on the ND
- Blue descent arrow at FAF and the correct F-PLN
- Correct Vertical Flight Path deviation indication

When passing the FAF, the crew must verify :

- Correct altitude indication
- Correct FMA display (FINAL APP green)
- Correct TO waypoint on the ND
- Correct blue track on the ND, armed for Missed Approach
- That the aircraft starts the descent, and follows the correct lateral and vertical flight path.

If HIGH ACCUR is lost during the approach, but active radio navaid monitoring confirms correct navigation, the approach can be continued in FINAL APP mode. Otherwise, the crew should revert to TRK/FPA mode to fly the aircraft with navaids raw data.

The IAP must be discontinued, when one of the following warnings occurs :

- GPS PRIMARY LOST, if GPS accuracy is required.
- NAV ACCUR DOWNGRAD, during an RNAV approach.
- FM/GPS POS DISAGREE, if GPS is installed and is not deselected, and if no navaid raw data is available to revert to selected modes.
- FM1/FM2 POS DIFF, unless navaid raw data is available to revert to selected modes.

3.4 Crew Reporting

The crew must be report any lateral or vertical NAV guidance anomaly to their Flight Operations. The report must be fully-documented to enable further investigation and corrective actions. It should, therefore, include the following information :

- Approach designation and airport
- Aircraft type, MSN, GW, wind/temperature
- Navigation database cycle
- Pilot selections, FMA, ND, MCDU displays
- Description of anomaly, flight path
- DFDR/QAR reading

A330 FCOM BULLETIN

N° 11

DATE : OCT 00

file in FCOM 3.08

IDLE FACTOR

1. REASON FOR ISSUE

The purpose of this FCOM bulletin is to provide airlines with a detailed description of the IDLE factor. This will assist them in optimizing the use of this parameter.

2. DEFINITION

The IDLE factor is used to adjust the idle thrust level (used to compute the descent path) and guide the aircraft along the descent path. It is inserted as a percentage of the basic idle thrust.

The IDLE factor is displayed in the IDLE/PERF factor field on the A/C STATUS MCDU page. Its range is from – 9.9 to + 9.9.
The value is displayed in cyan or green (see paragraph 5) :

- In small font, when it comes from the airline policy file of the navigation database ; it is displayed as the default value.
- In large font, when the pilot has entered it.

Whenever an IDLE factor is entered, this value is used for all descent computations until it is overwritten or cleared by the pilot.
When cleared, it returns to the IDLE factor value of the navigation database.

3. IMPACT OF THE IDLE FACTOR ON THE DESCENT PATH

The FMGS computes a descent profile on which the aircraft is guided when DES (managed descent mode) is active. This profile computation considers :

- Lateral and vertical flight planning (altitude, speed and time constraints),
- The aircraft descent speed profile (speed limit and constraint, ECON speed or selected auto speed),
- The inserted weather data

Basically the descent profile is divided into 2 sets of segments (3 sets when a repressurization segment is necessary) :

- An idle segment
- A geometric segment.

In most cases, the idle segment runs from the Top Of Descent (TOD) down to the first constrained waypoint.

The idle segment is computed assuming that the aircraft will fly at a given speed (as on PERF DES MCDU page), with a given thrust : IDLE + DELTA.

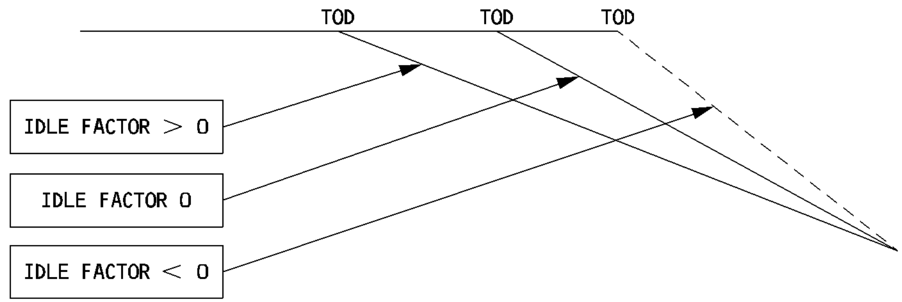
This slight additional thrust value DELTA is internal to the computer. It has been defined to give some flight guidance flexibility and maintain the aircraft on the descent path, should outside weather conditions (such as wind...) vary or should engine anti-ice be selected.

The IDLE factor is used to adjust the value of the DELTA, in order to cope with the airline policy or with the ATC requirement regarding the steepness of the descent profile.

* If the IDLE factor is positive, the idle segment part of the descent profile will be shallower than with IDLE factor 0 ; thus the TOD will be earlier.

* If the IDLE factor is negative, the idle segment part of the descent profile will be steeper than with IDLE factor 0 ; thus the TOD will be later.

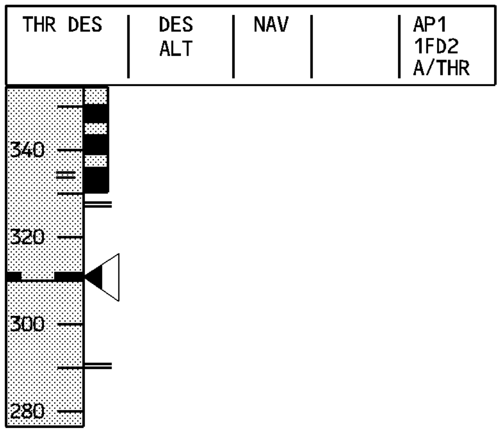
GFCB-BULL-011-A001AA



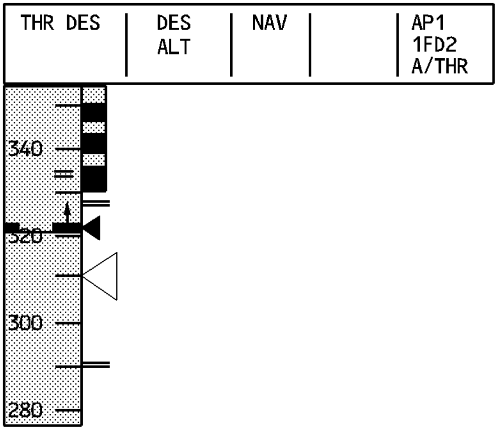
4. GUIDANCE DURING MANAGED DESCENT

Once all required data are inserted in (and for a given IDLE factor), the descent profile is computed. It always includes an idle segment.
Once the descent is initiated along the F-PLN (NAV/DES modes are engaged), and suppose the aircraft is on the path, on the idle segment, the ATHR will command (Idle + DELTA) and THR DES is displayed on FMA

GFCB-BULL-011-A002AA

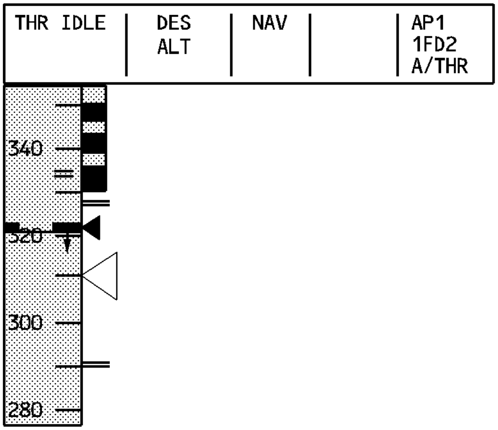


If for any reason the aircraft tends to deviate above the path, the IAS will increase with regards to the target within the speed target range so as to keep VDEV=0.



GFCB-BULL-011-A003AA

If the aircraft still tends to deviate above the path and the IAS gets close from the upper limit of the speed target range, the ATHR commands idle thrust so as to keep VDEV=0. THR IDLE is then displayed on the FMA.



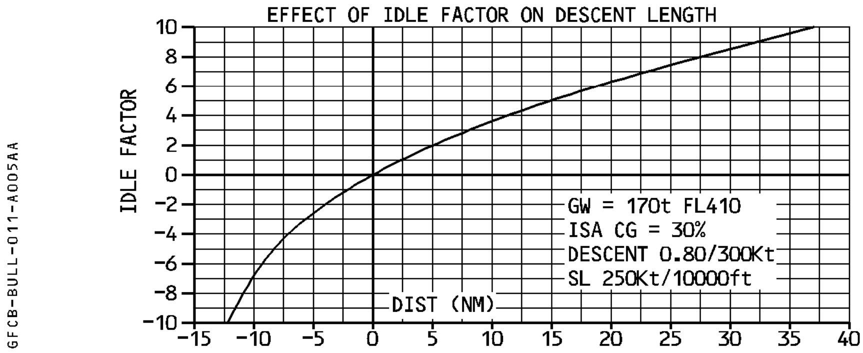
GFCB-BULL-011-A004AA

Consequently, when in managed descent and on idle segment, the flight guidance has 2 parameters to adjust in order to keep the aircraft on path : the IAS, which may vary within the speed target range and, the thrust which may vary between Idle and Idle + DELTA, while the ATHR is in thrust mode.
This gives a great guidance flexibility.
The higher the DELTA, the better the guidance capability, but the earlier the TOD, the longer the descent path.

Note : When a DIRTO is exercized, the FMGC recomputes a descent profile ; an idle segment is computed from the turning point to the TO waypoint.

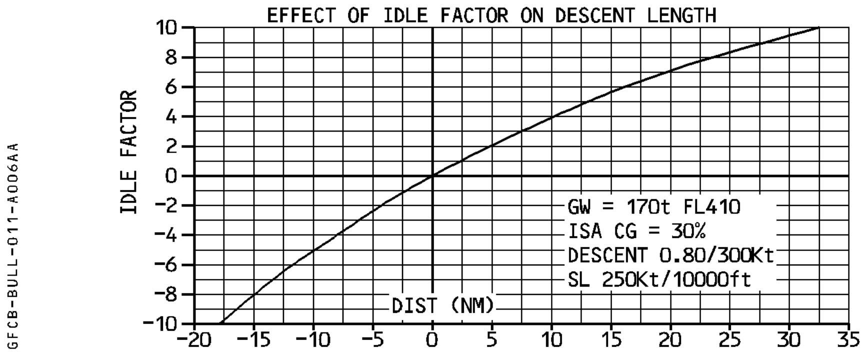
Effect of IDLE factor on descent length :

A330/GE



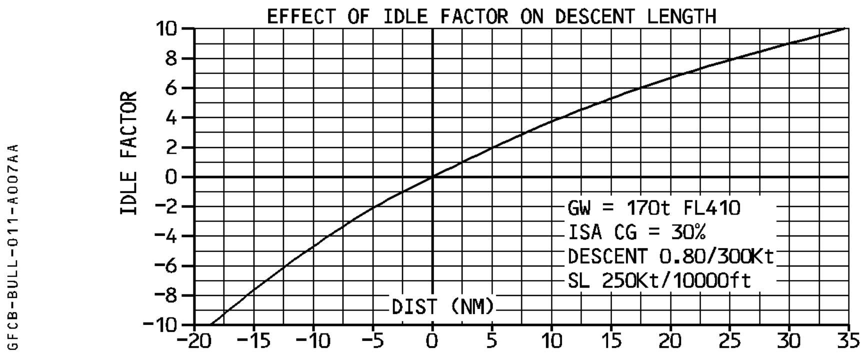
IDLE factor +4 increases the computed descent by 12NM.

A330/PW



IDLE factor +4 increases the computed descent by 10NM.

A330/RR



IDLE factor +4 increases the computed descent by 11NM.

5. IDLE FACTOR INSERTION

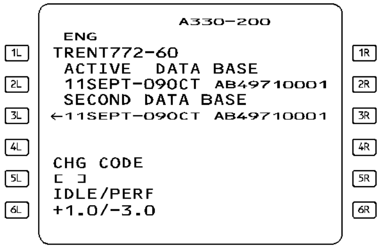
It can be done only on the ground by dedicated people according to airline policy.
It must not be changed by an individual crew at flight initiation.

Procedure :

On the A/C STATUS page :

Enter the performance adjustment code on the CHG CODE line (IDLE factor is displayed in cyan)
Write the new IDLE factor (the font goes from cyan to large green).

Note : The default performance adjustment code is ARM, until it is changed in the navigation database, upon airline request.



GFCB-BULL-011-A008AA

SUBJECT : AIRCRAFT HANDLING IN FINAL APPROACH

General

The purpose of this FCOM Bulletin is to highlight certain aspects of aircraft handling during final approach, and to illustrate that the feedback received from in-service experience merits further attention.

Although approach in turbulence is part of this discussion, windshear in approach is not addressed here. For more details on the subjects of "Windshear in Approach" and "Operations in Windshear or Downburst Conditions", refer to the FCOM 3.04.91.

Approach Stabilization Criteria

The prerequisite for a successful final approach and landing is to stabilize the aircraft on the final approach trajectory in pitch, thrust, airspeed, and bank angle.

This signifies that the :

- Aircraft is established on the :
  - Final approach trajectory, and only minor heading corrections are necessary (except for indirect or curve approaches) to correct the effect of external conditions, acting on the roll axis ;
  - Final approach vertical flight path, and only minor pitch corrections are necessary to correct the effect of external conditions ;
- The target speed is maintained on the desired descent path, with the appropriate thrust (not stabilized at idle).

Airbus policy requires that stabilized conditions be reached at 1,000 feet Height Above Threshold in IMC, and 500 feet in VMC, and that they be kept down to the flare height.

In turbulent conditions, there may be heading, pitch, and thrust corrections of such a magnitude that it could be difficult to determine when to consider the approach stabilization criteria as being lost. Thrust corrections, in particular with the A/THR ON, could lead engines to temporarily reduce thrust to idle, which may not be desirable close to the ground, if the aircraft level of energy is low.

The PNF callout for excessive deviation is certainly an indication for the PF to decide/determine if the approach becomes destabilized. However, the answer to this question is generally a matter of pilot judgement. The pilot must assess whether or not it is possible to return to nominal conditions early enough : That is, at the latest before flare initiation. If the pilot judges that it will not be possible to start the flare at the correct height with the correct attitude, sink rate, and thrust, or if the pilot starts to feel "out of the loop", then it is time to perform a go-around.

PNF Callout

In approach, the PNF is expected to monitor the PFD and to make a callout, when some parameters are exceeded.

The Airbus Standard Operating Procedures (FCOM 3.03.18 and 3.03.19) state that a callout should be made, if :

- Speed becomes lower than the speed target − 5 knots, or greater than the speed target + 10 knots.
- Pitch attitude becomes lower than 0 degrees, or greater than 10 degrees nose up.
- Bank angle becomes greater than 7 degrees.
- Descent rate becomes greater than 1000 feet/minute.
- Excessive LOC or GLIDE deviation occurs (3.03.18 only).

The suitable PF response would be to immediately take appropriate actions to control the exceeded parameter and evaluate whether stabilized conditions will be recovered early enough. Otherwise, a go-around must be initiated. The PF should acknowledge the PNF callout so that crew coordination remains effective.

Aircraft Handling on the Longitudinal Axis

The pilot's objective, with respect to the longitudinal axis, is to control the airspeed and vertical flight path. For thrust and speed control, it is recommended to use FMGS managed speed, in order to benefit from the minimum GS function.

The A/THR is, in particular, best suited to tracking a moving target speed, when flying in managed speed mode. Statistically, the A/THR provides the best protection against airspeed excursions and its use is, therefore, recommended even in turbulent conditions, unless thrust variations become excessive.

A/THR response to airspeed variations is the result of a design compromise between performance and comfort, and it is optimized when the AP is engaged. Therefore, in turbulent conditions and when flying manually, the pilot may sometimes find it to be too slow or lagging. If conditions are such that a large speed decrease with engines at idle is anticipated, the pilot may, above 100 feet RA, move the thrust levers slightly above the CL detent to reduce the A/THR response time. This will temporarily deactivate and arm the A/THR. As soon as positive acceleration is achieved, and before the thrust becomes too high, the pilot should move the thrust levers back to the CL detent to resume A/THR operations.

Note : 1. *Above 100 feet, this possibility should be used in exceptional circumstances, and should not become a routine flying technique.*
2. *Below 100 feet, moving the thrust levers above the CL detent, will result in A/THR disconnection (Refer to the FCOM, 1.22.30, Page 59).*
3. *In an OEI situation, moving the thrust lever(s) above the MCT detent(s) should be done carefully, so as not to trigger the GA mode.*

If conditions are such are that a large speed decrease with engines at idle is anticipated, then the PF may take over thrust manually to recover the speed target and continue the approach in manual thrust.

It is not recommended to use the speedbrakes in the final approach. In final approach, the drag with the Landing Gear down is normally sufficient to cope with all kinds of situations, including a tailwind landing.

The pilot's objective, with respect to vertical navigation, is to maintain a constant flight path angle down to the runway threshold, using the vertical deviation indication of an ILS, the FMGS VDEV indication, the indication of an external lighting system, or visual cues. However, when approaching flare height, the pilot's primary objective will progressively shift from vertical flight path control to safe pitch attitude and vertical speed, to start the flare in good conditions. The PF will primarily control the attitude and the vertical speed to perform a safe flare.

If the vertical speed is too high, prior to starting the flare, the vertical deceleration that can be achieved during flare may be insufficient to avoid a hard landing. The aircraft may touch down with an excessive residual vertical speed and pitch rate, which may lead to bouncing and exposure to tailstrike.

The pilot should also consider that the flare height might vary slightly from one aircraft type to another, depending on aircraft inertia. In the event of turbulence and wind gradient, pitch monitoring is of primary importance when close to the ground. The pilot should react promptly to any uncommanded pitch down tendency, to avoid ducking under, with a risk of premature touchdown.

If vertical speed and pitch attitude become the primary objectives, the touchdown point might occur slightly further ahead on the runway, thereby reducing the available stopping distance. In the large majority of landings, and based on the pilot's judgement, this effect should be acceptable. However, in case of doubt, it is always best to perform a go-around.

Aircraft Handling on the Lateral Axis

Generally speaking, lateral handling of fly-by-wire aircraft is conventional. But, in very gusty conditions, it is necessary to recall the principle of the flight control law in roll. With the sidestick, the pilot can order a roll rate up to a maximum of 15 degrees/second. However, the aerodynamic capacity of the roll surfaces, when fully deflected, is much higher : That is, up to about 40 degrees/second. This means that, if the aircraft is flying through turbulence that produces a roll rate of 25 degrees/second to the right, the aircraft still has the capacity to roll to the left at a rate of 15 degrees/second, with full sidestick command. This is more than what is necessary in the worst conditions.

The sidestick's ergonomical design is such that the stop at full deflection is easily reached. This may give the pilot the impression that the aircraft is limited in roll authority, because there is a time delay before the pilot feels the result of his/her action. On conventional aircraft, due to the control wheel inertia, the pilot needs considerably more time to reach the flight control stop.

The flight control system of Airbus fly-by-wire aircraft partially counteracts roll movements induced by the effect of gust, even with the sidestick in the neutral position. The PF must ensure that the overall corrective orders maintain the desired aircraft lateral axis. He/she will minimize lateral inputs and will resist applying sidestick order from one stop to the other.

Every sidestick input is a roll rate demand, superimposed on the roll corrections already initiated by the fly-by-wire system. The pilot should only apply "longer-term" corrections as needed.

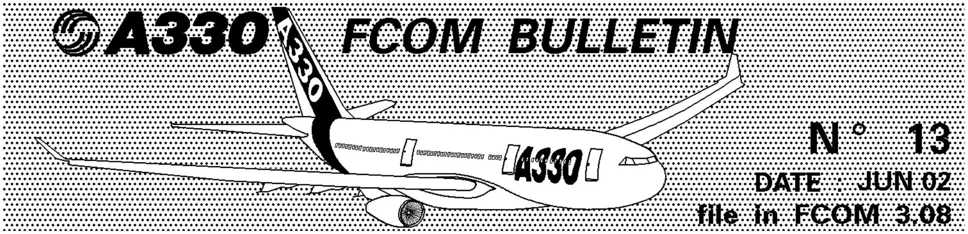
Before flare height, heading corrections should only be made with roll. As small bank angles are possible and acceptable close to the ground, only small heading changes can be envisaged. Otherwise, a go-around should be initiated.

Use of rudder, combined with roll inputs, should be avoided, since this may significantly increase the pilot's lateral handling tasks. Rudder use should be limited to the "de-crab" maneuver in case of crosswind, while maintaining the wings level, with the sidestick in the roll axis. (Refer to the FCOM's SOP, for Crosswind Landing Techniques).

Summary

In summary, the following are the main points addressed by this Bulletin :

- Strictly observe the approach stabilization criteria to decide whether to land, or to perform a go-around.
- Promptly react to any pitch down at low height, to avoid ducking under.
- Reach the flare height with the correct pitch attitude and sink rate.
- R In turbulent conditions, it is recommended to use the A/THR, unless the PF is not satisfied by the A/THR response. R
- Refrain from excessive sidestick roll activity. Order "longer-term" roll corrections.
- Restrict rudder use to "de-crabbing" in crosswind.



SUBJECT : USE OF RUDDER ON TRANSPORT CATEGORY AIRPLANES

REASON FOR ISSUE

On February 8th, 2002, the National Transportation Safety Board (NTSB), in cooperation with the French "Bureau Enquetes Accidents (BEA)", issued recommendations that aircraft manufacturers re-emphasize the structural certification requirements for the rudder and vertical stabilizer, showing how some maneuvers can result in exceeding design limits and even lead to structural failure.

The purpose of this FCOM Bulletin is to re-emphasize proper operational use of the rudder, highlighting certification requirements and rudder control design characteristics.

YAW CONTROL

General

In flight, yaw control is provided by the rudder, and directional stability is provided by the vertical stabilizer.

The rudder and vertical stabilizer are sized to meet the two following objectives :

- Provide sufficient lateral control of the aircraft during crosswind takeoffs and landings, within the published crosswind limits (refer to FCOM's Operating Limitations chapter 3.01.20) ;
- Provide positive aircraft control under conditions of engine failure and maximum asymmetric thrust, at any speed above Vmcg (minimum control speed on ground).

The vertical stabilizer and the rudder must be capable of generating sufficient yawing moments to maintain directional control of the aircraft.

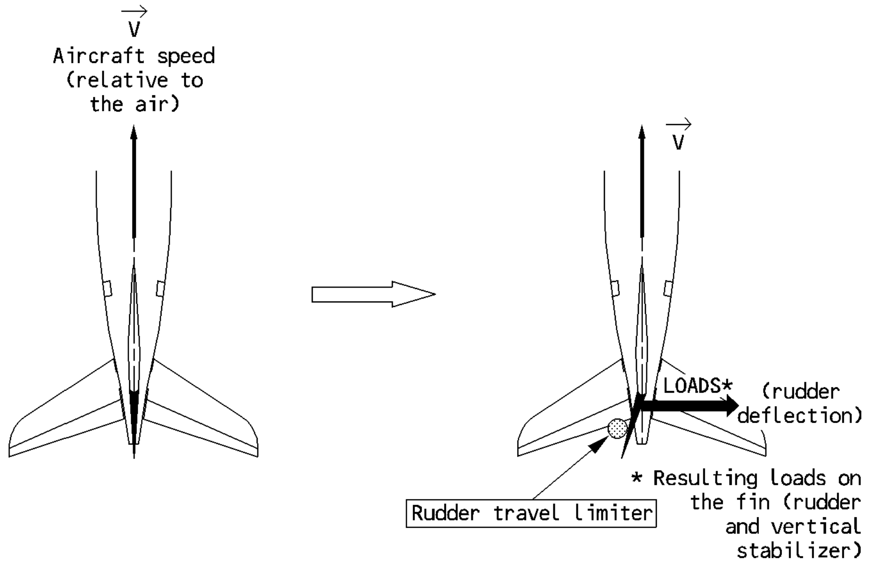
The rudder deflection, necessary to achieve these yawing moments, and the resulting sideslip angles can place significant aerodynamic loads on the rudder and on the vertical stabilizer.

Both vertical stabilizer and rudder are designed to sustain loads as prescribed in the JAR / FAR 25 certification requirements which define several lateral loading conditions (maneuver, gust loads and asymmetrical loads due to engine failure) leading to a required level of structural strength.

Certification requirements

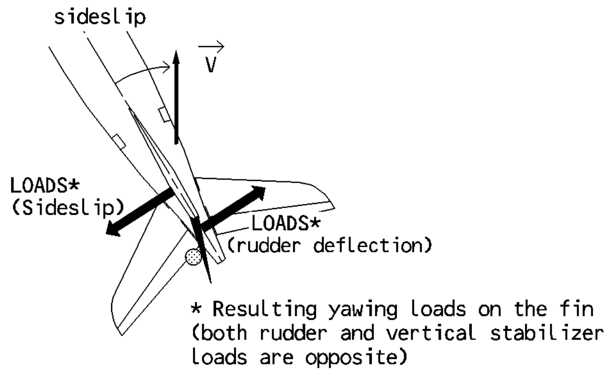
For certification in accordance with JAR / FAR 25.351, loads on the stabilizer and the rudder are defined, considering yawing maneuvers as shown below, for a range of speeds from VMC (minimum control speed) to VD/MD (maximum design speed), from sea level up to maximum altitude, and over the full range of aircraft weights and Center of Gravity limits :

1 - With the aircraft in unaccelerated and stabilized straight flight, the rudder pedal is suddenly displaced to the maximum available deflection at the current aircraft speed.



GFCB-BULL-013-A001AA

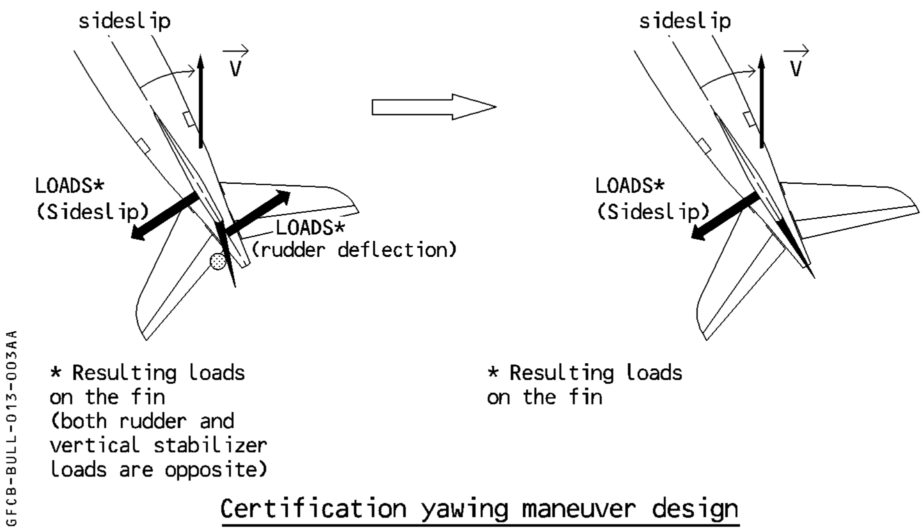
2 - With the rudder deflected as shown above, the aircraft yaws to the resulting overswing sideslip angle, and then stabilizes at a somewhat smaller steady-state slideslip angle.



GFCB-BULL-013-002AA

3 - With the airplane yawed to the steady-state (static) sideslip angle corresponding to the above rudder deflection, the certification regulations assume that the rudder pedal is released to neutral.

Note : *Since the aircraft has natural yaw stability, returning the rudder pedal to neutral will also result in returning the sideslip angle to neutral*



Certification yawing maneuver design

JAR/FAR 25 requires the above yawing maneuver to be analyzed over the full range of specified conditions. The most severe loads imposed on the vertical stabilizer and rudder are identified.

The same analysis is performed for lateral gusts, rolling maneuvers and asymmetrical engine failure conditions. The most severe of all these cases and associated loads provides the design basis for the vertical stabilizer and rudder.

The above loads define the limit loads according to JAR / FAR 25 requirements. These loads correspond to the maximum loads that may be expected in service.

According to JAR / FAR 25 requirements, the ultimate loads are defined as the limit loads multiplied by a prescribed safety factor of 1.5 unless otherwise specified.

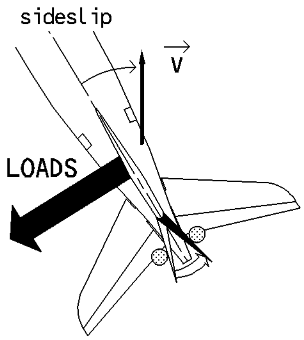
The aircraft structure must be able to sustain limit loads without detrimental permanent deformation and ultimate loads without failure for at least 3 seconds.

Higher loads could lead to structural failure.

CAUTION

Sudden commanded full, or nearly full, opposite rudder movement against a sideslip can generate loads that exceed the limit loads and possibly the ultimate loads and can result in structural failure.

This is true even at speeds below the maximum design maneuvering speed, VA.



GFCB-BULL-013-004AA

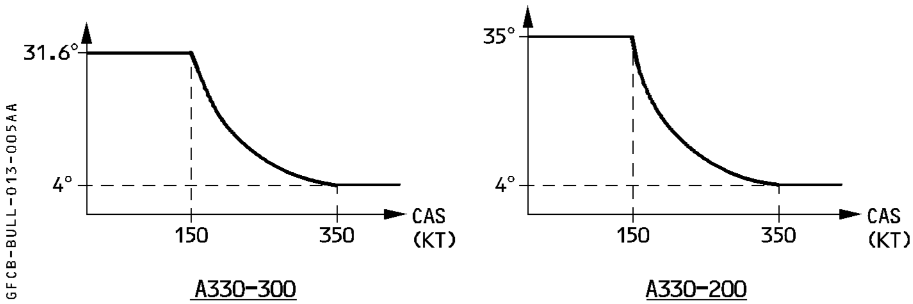
Certification regulations do not consider the loads imposed on the structure when there is a sudden full, or nearly full, rudder movement that is opposite to the sideslip.

Rudder control

The rudder surface is controlled by 3 actuators, commanded by a cable run from the rudder pedals, to which lateral law inputs (including yaw damping and turn coordination functions) are added by the flight control computer (normally PRIM 1).

The rudder travel limiter, controlled by the SECs, is designed to progressively reduce the available total rudder travel depending on aircraft speed.
This provides sufficient yaw control within the entire flight envelope, including engine failure and maximum asymmetric thrust, limiting the lateral loads on the stabilizer and rudder so that they remain within the certification limits.

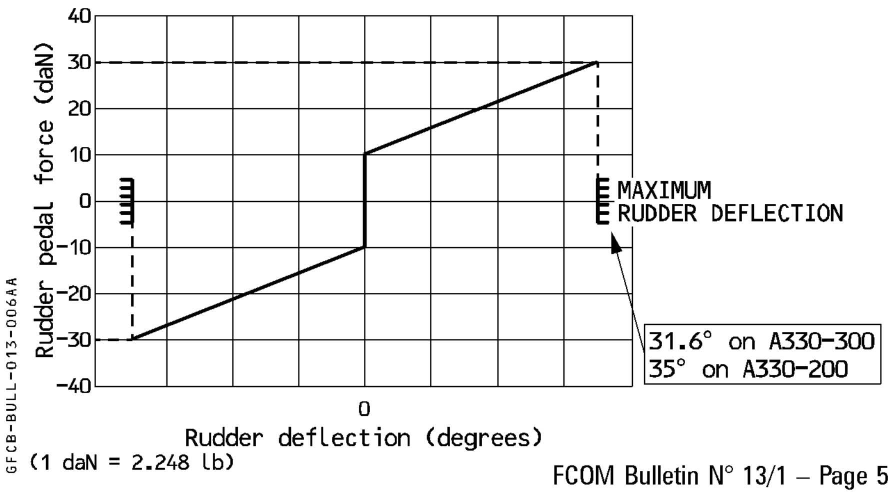
Rudder travel is limited as a function of the aircraft speed, as shown below :



– At low speeds, the rudder deflection required to maneuver the aircraft in yaw is large, and so are the resulting pedal displacement and forces ;

– At high speeds, the rudder authority is limited but the gearing between the pedals and the rudder does not change. Therefore, less force will be required to achieve maximum available rudder deflection.

As speed increases, the rudder deflection required by any yaw maneuver (eg, engine failure and maximum asymmetric thrust) decreases, and consequently, so do rudder pedal displacement and associated forces.
Rudder pedal displacement is almost linearly proportional to rudder deflection.



(1 daN = 2.248 lb)

Thus, to explain the two preceding graphs :

The rudder pedal displacement and the resulting pedal forces required to achieve a given rudder deflection are independent from aircraft speed.

- To start moving the rudder pedals from the neutral position, a minimum force of +/-10 daN must be applied ("breakout force").
- At low speeds, i.e. up to 150 kt, maximum available rudder deflection (31.6 or 35 degrees) is obtained by moving the rudder pedals to their maximum travel which represents a 30 daN force applied on the pedals.
- At higher speeds, for example at 350 kt, the maximum available rudder deflection is reduced to approximately 4 degrees. It is consequently obtained with less rudder pedal displacement which represents approximately a 12 daN force applied on the pedals (40 % of the maximum force to reach full pedal travel).

Operational recommendations

In order to avoid exceeding structural loads on the rudder and vertical stabilizer, the following recommendations must be observed.

1. THE RUDDER IS DESIGNED TO CONTROL THE AIRCRAFT, IN THE FOLLOWING CIRCUMSTANCES :

1.1 In normal operations, for lateral control :

- During the takeoff roll, when on ground, especially in crosswind conditions ;
- During landing flare with crosswind, for decrab purposes.
- During the landing roll, when on ground.

In these circumstances, large and even rapid rudder inputs may be necessary to maintain control of the aircraft.
Rudder corrections should always be applied as necessary to obtain the appropriate aircraft response.

On Airbus aircraft, the rudder control system includes a turn coordination function to achieve acceptable turn coordination.

1.2 To counteract thrust asymmetry :

Full rudder authority can be used to compensate for the yawing moment of asymmetric thrust.

Note : *At high speed (i.e. slats retracted), thrust asymmetry (eg. due to an engine failure) has relatively small effect on yaw control of the aircraft.*
The amount of rudder required to counter an engine failure and center the sideslip is small.

1.3 In some other abnormal situations :

The rudder may also be used in such abnormal situations as :

- Loss of both yaw damper systems. The rudder may be used as deemed necessary, for turn coordination to prevent excessive sideslip.
- Rudder trim runaway. The rudder may be used to return the rudder to neutral.
- Landing with abnormal landing gear position. The rudder can be used for directional control on ground.

In all of the above mentioned normal or abnormal circumstances, proper rudder maneuvers will not affect the aircraft’s structural integrity.

Note : In the event of a rudder travel limit system failure, refer to the relevant RUDDER TRAVEL LIMIT FAULT procedure.

2. THE RUDDER SHOULD NOT BE USED :

- To induce roll, or
- To counter roll, induced by any type of turbulence.

Whatever the airborne flight condition may be, aggressive, full or nearly full, opposite rudder pedal inputs must not be applied. Such inputs can lead to loads higher than the limit, and can result in structural damage or failure.

The rudder travel limiter system is not designed to prevent structural damage or failure in the event of such rudder system inputs.

Note : Rudder pedal reversals must never be incorporated into airline policy, including so-called "aircraft defensive maneuvers" to disable or incapacitate hijackers.

As far as dutch roll is concerned, yaw damper action and natural aircraft damping are sufficient to adequately dampen dutch roll oscillations. The rudder should not be used to complement the yaw damper.

Note : Even if both yaw damper systems are lost, the rudder should not be used to dampen the dutch roll. Refer to the YAW DAMPER FAULT procedure.

3. SPECIAL CASES

Recovery techniques from upset situations

Proper use of the rudder, particularly during maneuvers intended to address upset recovery, are emphasized in the Airbus Training Program, supported by the industry-produced 1998 "UPSET RECOVERY TRAINING AID".