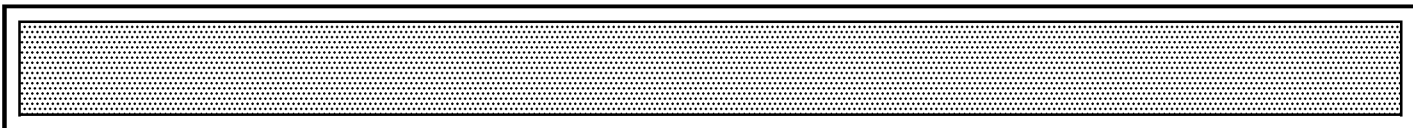




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**1. GENERALITIES**

Aircraft and system limitations in this section include the limitations required by the regulations and contained in the FLIGHT MANUAL.

IMPORTANT

ALL THE LIMITATIONS OF THE DGAC APPROVED FLIGHT MANUAL ARE REPRODUCED HERE IN BOXES.

- THE ADDITIONAL LIMITATIONS ARE INDICATED AS A GUIDE IN ORDER TO HAVE AN OPTIMIZED UTILIZATION OF THE AIRCRAFT.
- ALL REFERENCES TO AIRSPEED OR MACH RELATE TO INDICATED AIRSPEED OR INDICATED MACH UNLESS OTHERWISE NOTED.
- ALL REFERENCES TO ALTITUDE RELATE TO PRESSURE ALTITUDE UNLESS OTHERWISE NOTED.

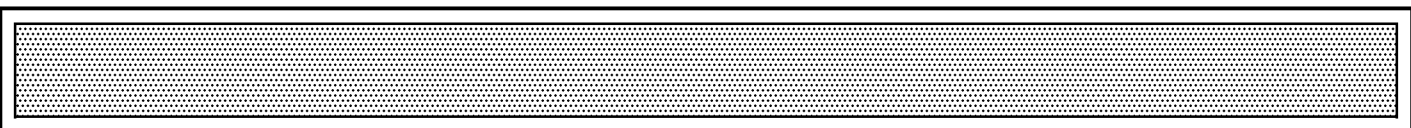
2. KINDS OF OPERATIONS

This airplane is certificated in the transport category for the following kinds of operation when the appropriate instruments and equipment required by the airworthiness and/or operating regulations are approved, installed and in operable condition.

- Carriage of passengers (maximum number of passengers seats : 275)
- Carriage of cargo
- Icing conditions
- Extended over water flight and ditching
- Day and night VFR
- IFR
- For operation with AFS, limitations are given in the Auto Flight System section.

Note : The airworthiness regulations do not allow CAT II and CAT III operations unless the operator has received the agreement from his national appropriate authorities.

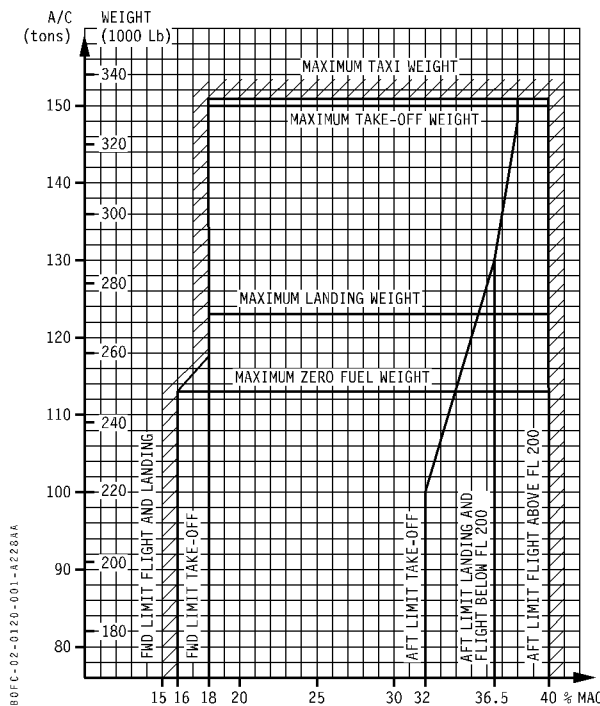
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1 – WEIGHTS/CENTER OF GRAVITY

A – CENTER OF GRAVITY LIMITS

The limits of the center of gravity are given in percentage of the mean aerodynamic chord, landing gear extended. The MAC is 5.8287 meters long (229.48 inches). Station 0 is located 6.3825 meters (251.28 inches) forward of fuselage nose.



Note : Aircraft Center of gravity must always be within presented limits regardless of fuel load.

B – WEIGHT LIMITATIONS

	KG	POUNDS
MAXIMUM TAXI WEIGHT	150 900	332 735
MAXIMUM TAKE-OFF WEIGHT (BRAKES RELEASE)	150 000	330 750
MAXIMUM LANDING WEIGHT	123 000	271 215
MAXIMUM ZERO FUEL WEIGHT	113 000	249 165
MINIMUM WEIGHT	80 000	176 400

Under exceptional conditions following a takeoff at any weight within max takeoff weight and max landing weight an immediate landing is permitted provided overweight landing procedure is adhered to.

Exceptional conditions are :

- . emergencies
- . abnormalities wherein continuance of flight to destination is not possible.

2 – SPEEDS

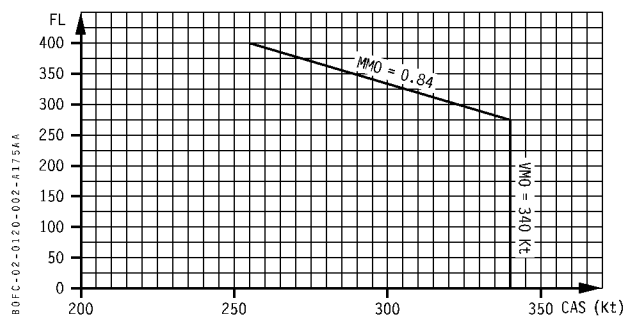
A – VMCA-VMCG

VMCG 111 KT CAS (113 KT IAS)

VMCA 115 KT CAS (117 KT IAS)

B – MAXIMUM OPERATING SPEEDS (V_{MO})

The maximum operating limit speed V_{MO} may not be deliberately exceeded in any regime of flight (climb, cruise or descent).



C – MAXIMUM SLATS/FLAPS SPEEDS (V_{FE})

(1) Maximum slats/flaps extended speeds or operating speeds for takeoff, approach and landing :

Maximum operating altitude : 20000 ft

	SLATS	FLAPS	SPEED (IAS)
TAKEOFF	15	0	245 KT
TAKEOFF AND APPROACH	15	15	210 KT
TAKEOFF, APPROACH AND LANDING	20	20	195 KT
LANDING	20	20	195 KT
	30	40	180 KT

(2) Maximum slats extended speed for holding and en route :

HOLDING AND « EN ROUTE »	15	0	245 KT/M 0.54
--------------------------	----	---	---------------

D – GEAR OPERATING SPEEDS

Maximum speed at which the landing gear may be extended or retracted :
V_{Lo} = 270 KT or M 0.59

Maximum speed with landing gear locked down :
V_{LE} = 270 KT or M 0.65

E – KRUGER

If Kruger cannot be retracted :
do not exceed 300 KT/M0.65

F – MANUAL PITCH TRIM

When operating with manual pitch trim only :
do not exceed 285 KT/M0.78

3 – MISCELLANEOUS

A – MINIMUM FLIGHT CREW

The minimum flight crew consists of 2 pilots.

B – DISPATCHIBILITY

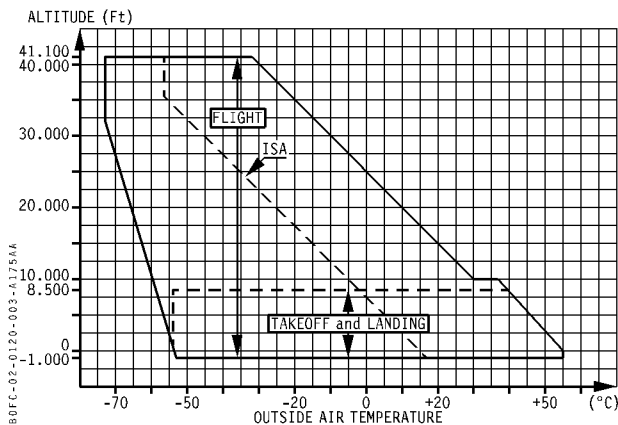
For dispatch in the event of equipment failure or missing parts, refer to MEL/CDL.

C – FLIGHT MANEUVERING LOAD ACCELERATION LIMITS

Clean configuration : + 2.5 g to - 1 g
 Slats extended configuration : + 2 g to 0 g

D – OPERATING PERFORMANCE LIMITATIONS

(1) Environmental envelope



(2) Airport Operation limitations

Runway slope (mean) ± 2 %

Runway altitude 8,500 ft

Wind :
 . Tail wind component (Takeoff and landing) 15 kt

- Cross wind (takeoff and landing) :
 maximum demonstrated on dry runway 28 kt
- Computed crosswind capability on dry and wet runway 37 kt
- Max wind for passenger and cargo doors operation 60 kt

E – TIRES

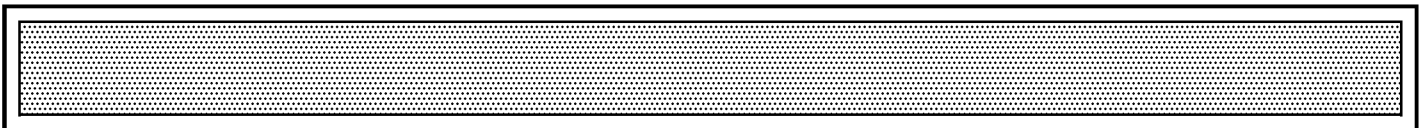
MAXIMUM TIRE SPEED
 GROUND SPEED = 195.5 kt (225 mph)

F – WINDSHIELD WIPERS IN USE

Maximum operating speed 230 kt

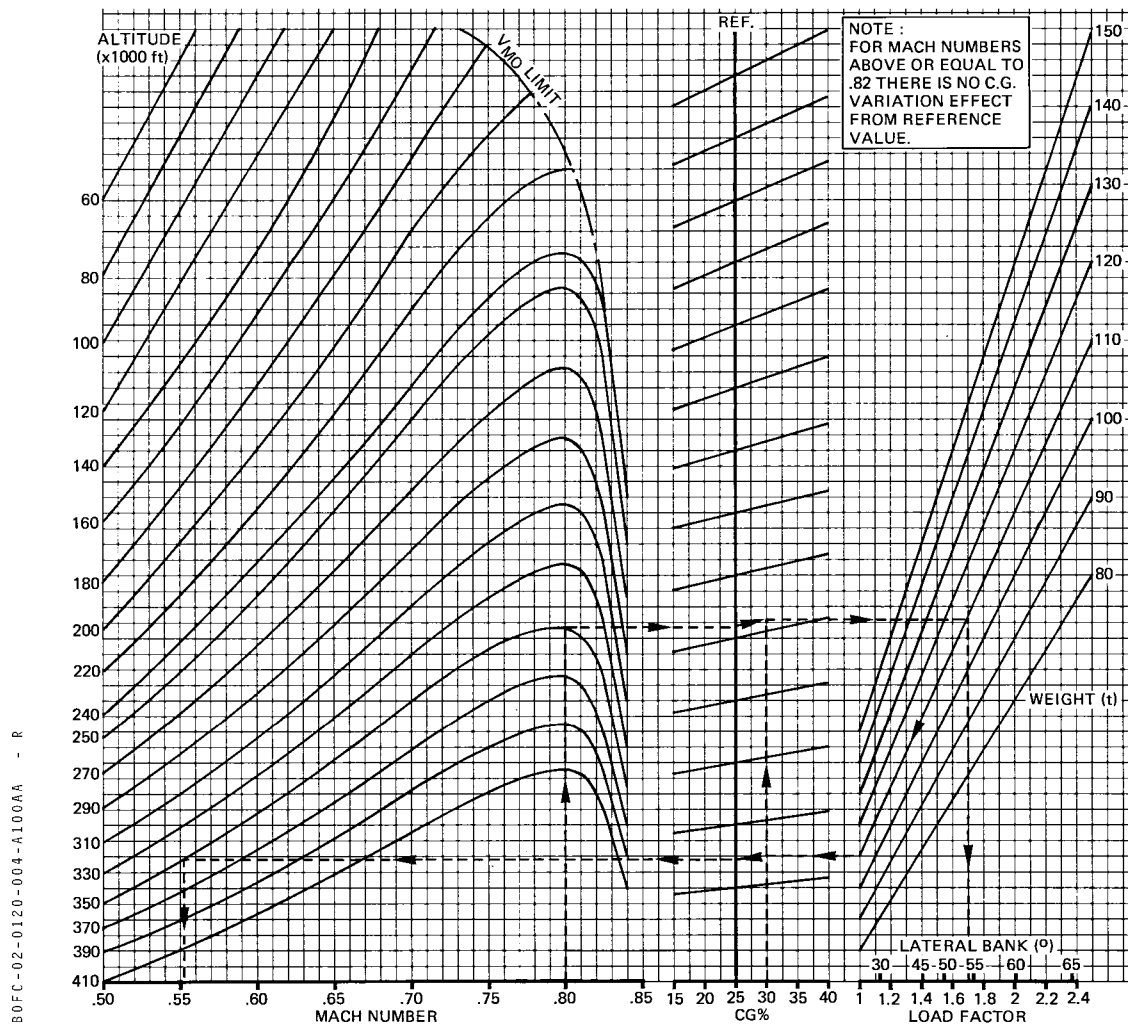
G – COCKPIT WINDOWS OPEN

Maximum speed 225 kt



4. BUFFET ONSET

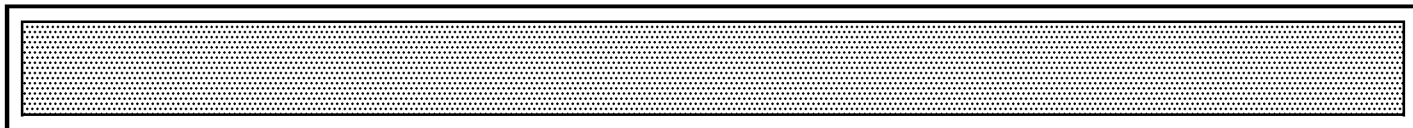
BUFFET ONSET
 clean configuration



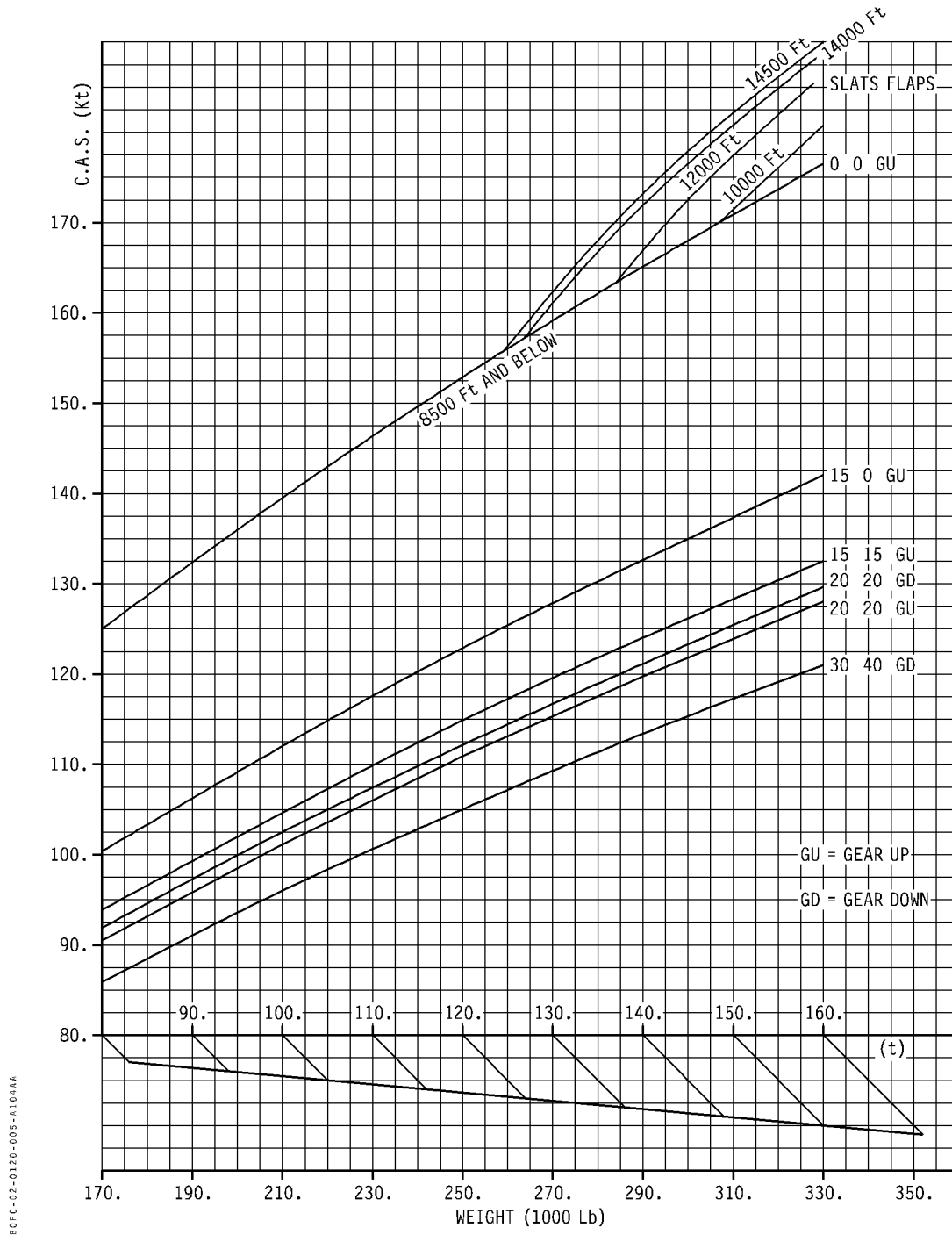
Data : M = .80
 FL = 350
 Weight = 110 tons
 CG = 30 %

Results : Buffet onset at
 - M = .80 with 54° bank angle or at 1.7 g
 - Low speed (1 g) : M = .555
 - High speed : Above M.84

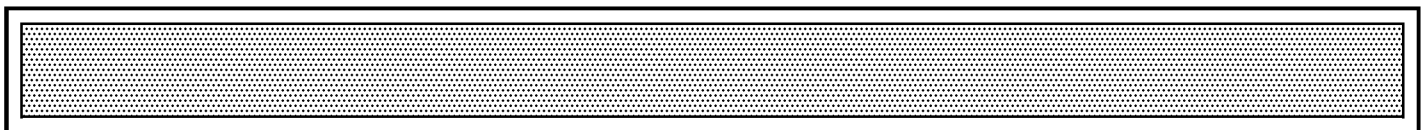
Mod : 4863



5. VS MINIMUM

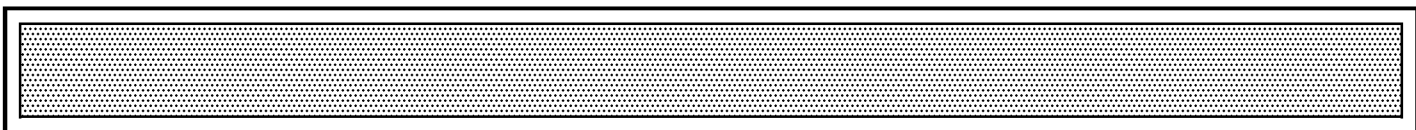


Mod : 4863



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STD or Mod : 4863



AUTOPILOT :

- R – Minimum altitude for use of the autopilot in a
- R cruise mode : 500 ft.
- R – Minimum altitude for use of VERTICAL SPEED
- R mode in approach : 200 ft.

AUTOLAND

- R AIRPLANE CONFIGURATION :
- R Certified configuration : slats 30°/flaps 40°.

The approach speed (Vapp) is Vref + 5 kt + CDU WIND CORR.

ALTITUDE EFFECT :

The altitude effect on Autoland above 2 500 ft has not been evaluated.

Therefore, for autoland operation above 2 500 ft elevation, it is recommended that each operator assesses the autoland capability in good visibility conditions for each runway prior to performing CAT 2 or CAT 3 operation.

This should be done in the frame of each operator operational approval and does not preclude complying with other applicable local operational regulations.

AUTOLAND ON A CAT 1 ILS BEAM :

Automatic landing system performance has been demonstrated on CAT 2 and CAT 3 ILS runways. However automatic landing in CAT 1 or better weather conditions is possible on CAT 1 ground installations or when ILS critical areas are not protected provided the following precautions are taken :

- the airline has checked that the ILS beam quality and the effect of the terrain profile before the runway has no adverse effect on A.P. guidance. In particular the effect of terrain discontinuities within 300 m before runway threshold must be assessed.
- the crew is aware that LOC or GS beams fluctuations independent of the aircraft system may occur and the PF is prepared to immediately disconnect the AP and to take the appropriate action, should unsatisfactory guidance occur.
- at least CAT 2 capability is displayed on FMA and CAT 2/3 procedures are used.

- visual references are obtained at a DA/DH appropriate for the CAT 1 approach being flown or a go-around is performed.

CATEGORY II APPROACH AND AUTOMATIC LANDING

- Minimum decision height : 100 ft.
- AP in CMD at least.
- Certified capability : CAT 2, CAT 3.

R
R
R

CATEGORY III APPROACH AND AUTOMATIC LANDING WITH DECISION HEIGHT

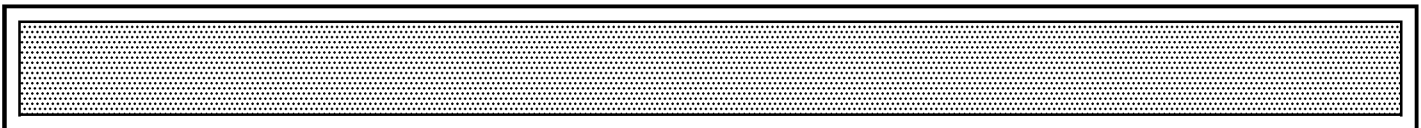
- Minimum decision height : 15 ft.
- 2 AP in CMD and 1 autothrottle at least.
- Certified capability : CAT 3.

R
R
R

CATEGORY III APPROACH AND AUTOMATIC LANDING WITH NO DECISION HEIGHT

- 2 AP in CMD and 1 autothrottle at least.
- Certified capability : CAT 3.
- Minimum runway visual range : 75 m.
- Minimum height demonstrated for approach interruption : 15 ft.

R
R
R
R



**MAXIMUM WIND CONDITIONS FOR
 AUTOMATIC LANDING AND ROLL OUT**

R
R
R
R
R
R
R

- DEMONSTRATED WIND CONDITIONS :
- Head wind 30 kt
- Cross wind 20 kt
- Tail wind 10 kt
- Performance of ROLL OUT mode has been demonstrated on dry and wet runway.
- Performance of ROLL OUT mode on snow covered or icy runway has not been demonstrated.

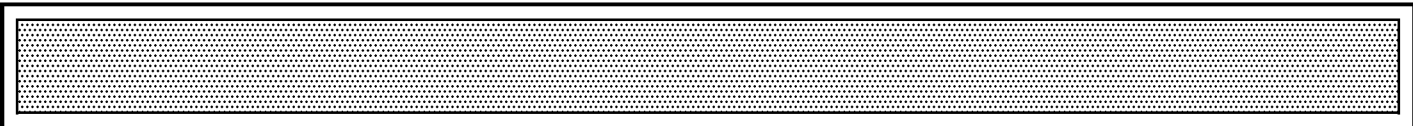
FMS

The FMS can be used in the RADIO mode for advisory purpose only.

NAV + PROF modes may be used for non precision approaches only. PROF mode use in approach below 1000 ft AGL is not allowed. Respect of obstacle clearance and constraints remain normal crew responsibility.

An approach procedure cannot be conducted if the associated nav aids are unserviceable.

Mod : 5757



1 – AIR CONDITIONING AND PRESSURIZATION

A – AIR CONDITIONING WITH LP GROUND UNIT

When aircraft is supplied by external LP air, air conditioning supply from the packs should not be used simultaneously.

B – RAM AIR INLET

OPEN ONLY IF DIFFERENTIAL PRESSURE IS LOWER THAN 1 PSI.

C – MAXIMUM CABIN DIFFERENTIAL PRESSURE

– Positive differential pressure limitation . 8.40 PSI

– MAXIMUM NEGATIVE DIFFERENTIAL PRESSURE MINUS 1 PSI
 – SAFETY RELIEF MAXIMUM DIFFERENTIAL PRESSURE 8.85 PSI

- Maximum cabin differential pressure for landing 1 PSI
- Cabin signs « ON » 11,300 ± 500 ft
- Passengers oxygen mask drop . 14,000 $\left\{ \begin{array}{l} + 0 \text{ ft} \\ - 500 \text{ ft} \end{array} \right.$

D – WARNINGS

– Maximum cabin altitude (CAB ALT) . 9,550 ± 350 ft

2 – APU

A – STARTING

- In flight APU starting is allowed up to :
 - 41 000 ft within the whole flight envelope when electric supply is by engine generator(s).
 - 20 000 ft when electric supply is by batteries only.
- Minimum oil quantity indication before start . 1/4
- Minimum oil quantity indication when APU operates at 100 % N (stabilized conditions) MIN
- Minimum cooling intervals between start cycles 1 min

Notes : 1 – These minimum oil indication requirements allow a normal APU operation for further 60 hours.

Code : 0411

- 2 – *On ground :*
 After 3 start attempts separated by 1 min cool down a 60 min cooling period must be allowed for.
- 3 – *In flight :*
 Within any one hour period
 – 3 start attempts are permitted below 37,000 ft
 – 5 start attempts are permitted above 37,000 ft
 Best starting capability is ensured up to 37,000 ft
- 4 – Use of JET B may impair APU capability to perform high altitude air start.

B – OPERATIONS

- AIR BLEED EXTRACTION :
 Allowed for AIR COND or/and WING ANTI ICE or ENG START up to 20 000 ft
Note : APU air bleed allows to supply either :
 - 2 air conditioning packs or
 - 1 air conditioning pack + wing anti ice system
- ELEC POWER EXTRACTION :
 - At or below 35 000 ft 1 (90 kVA)
 - Above 35 000 ft up to 41 000 ft :
 ISA and below 1 (90 kVA)
 ISA + 20 0.83 (75 kVA)
 ISA + 35 0.44 (40 kVA)

C – ROTOR SPEED

Maximum N 109 %

D – EGT

Maximum EGT 585° C

3 – COMMUNICATIONS

No limitations.

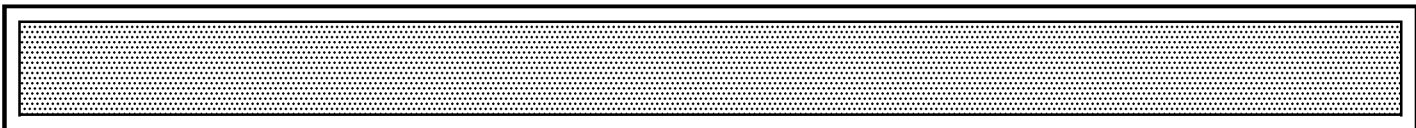
4 – ELECTRICAL

A – AC POWER

NOMINAL LOAD PER GENERATOR :
 (CONTINUOUS) 1 (90 KVA)

B – DC POWER

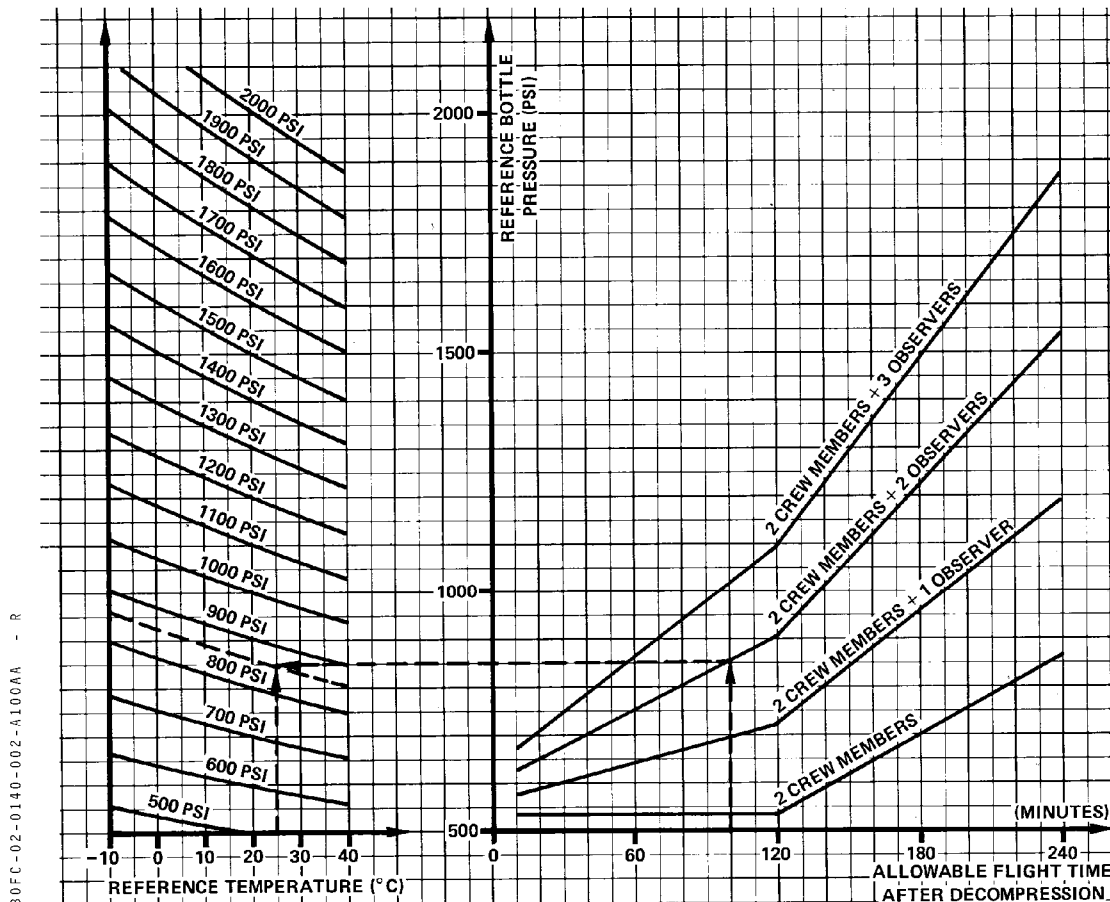
NOMINAL LOAD PER T.R. (CONTINUOUS) . 150 AMP



5 – EMERGENCY EQUIPMENT

CREW OXYGEN

Minimum flight crew oxygen pressure.



Reference temperature (°C) :
 = $\frac{\text{OAT} + \text{Cabin temp}}{2}$ (on ground)
 = Cabin temp – 10°C (in flight)

Minimum bottle pressure required to provide :
 . Crew protection after loss of cabin pressure (100 % O₂ during emergency descent + diluted O₂ during cruise at FL between 100 and 150)

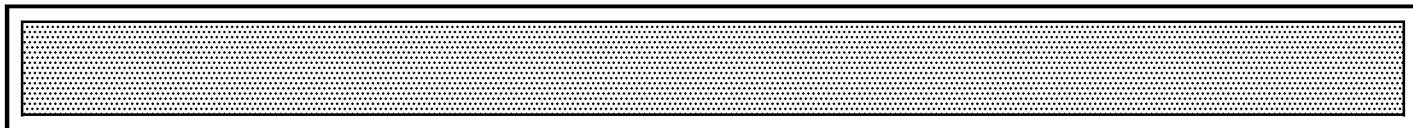
Provision is made to cover :
 . unusable quantity
 . normal system leakage
 . reference temp. errors
 . pre-flight checks
 . usage of O₂ when only 1 pilot is in cockpit.

Minimum required oxygen for dispatch depends on the local Airworthiness Authorities.

For example, JAR OPS requires that there must be enough oxygen do supply each cockpit crew member for :

- the entire flight time when the cabin altitude exceeds 13,000 ft and
- the flight time less the first 30 minutes when cabin altitude is between 10,000 ft and 30,000 ft and
- not less than 2 hours

Mod : 2965



6 – FUEL

A – FUEL AND FUEL ADDITIVES (ENGINES AND APU)

Refer to : – P and W Service Bulletin n 2016
 – A310 Flight Manual chapter 2-04

B – USABLE FUEL TANK CAPACITY

TANK	LITER	US GAL
OUTER TKS	7 400	1 955
INNER TKS	27 900	7 371
CTR	19 640	5 189
TRIM	6 150	1 625
Total	61 090	16 140

C – FUEL QUANTITY INDICATIONS

Tank fuel remaining when the respective quantity indicator reads zero, cannot be safely used in flight.

D – FUEL LOADING

Maximum refueling pressure . . . 50 psi (3.5 bar)
Maximum defueling pressure . . 11 psi (0.75 bar)

Maximum allowed unbalanced fuel :

- at take-off : 2000 kg (4410 lb) in "inner"
- at landing : 11000 kg (24250 lb) in "inner" or 3000 kg (6615 lb) in "outer".

Dispatch with fuel in CTR TK and wing tanks not full is allowed provided the sum of ZFW plus fuel in CTR TK does not exceed MAX ZFW (fuel in CTR TK usable).

E – FUEL TEMPERATURE IN TANKS

- Do not take-off with a fuel tank temperature lower than :
 - the actual fuel freezing point + 2°C if an appropriate anti-icing additive is used as per PW SB 2016.
- or
- the highest of the fuel freezing point + 2°C or – 47°C, if an appropriate anti-icing additive is not used,
- Do not fly with a tank fuel temperature lower than the :
 - Actual fuel freezing point – 1°C when fuel is fed from INR or CTR tanks.
 - Actual fuel freezing point + 2°C when fuel is fed from OTR tanks.

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

JETA	JP 5	JETA1	JP 8	JET B	RT	JP 4	TS-1
–40°C	–46°C	–47°C	–47°C	–50°C	–55°C	–58°C	–60°C

F – FUEL MANAGEMENT

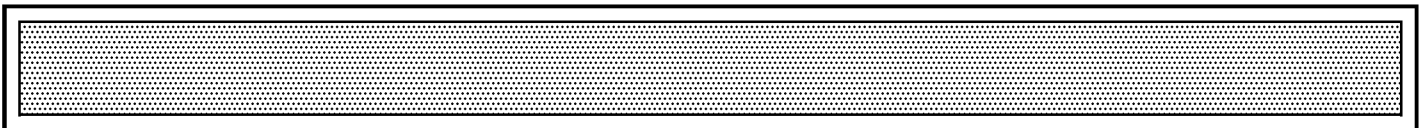
- Operations with outer tank empty are not allowed.

G – TAKE-OFF RESTRICTIONS

- 1 – Take-off on center tank is prohibited.
- 2 – Take-off with inner tanks and center tank and trim tank empty is prohibited when the fuel quantity in each outer tank is below 700 kg (1545 lb).

H – LANDING RESTRICTIONS

- Except under abnormal conditions, landing with more than 2000 kg (4400 lb) in trim tank is not allowed.



7 – HYDRAULICS

A – APPROVED FLUIDS

Approved hydraulic fluids are according to specification NSA 307110 :

TYPE IV
HYJET IV and IV-A SKYDROL 500 B4 SKYDROL LD4

Note : The intermixing of these fluids is permitted.

B – PWR TRANSF OPERATION IN FLIGHT

PWR TRANSF operation is possible if green system is powered by 2 engine driven pumps or by 1 engine driven pump and the electric pumps.

C – SYSTEM PRESSURE

Normal pressure range : 2800 to 3300 psi

Note : When PTU is in use, 3500 psi may be reached.

R **D – RAT**

RAT maximum operating speed : 320 kt

8 – ICE AND RAIN PROTECTION

A – ANTI-ICE

It is recommended that extended flight in icing conditions with slats extended should be avoided.

B – RAIN REPELLENT

Approved rain repellent is type 3 repellent RAIN BOE. Rain repellent must be applied only on wet windshields.

Note : Windshield wipers must not be used if rain repellent has been applied to a dry windshield.

9 – LANDING GEAR/BRAKES

A – LANDING GEAR

Towbarless operations on nose landing gear (towing and pushback) are allowed using towbarless towing vehicles that are specifically accepted for Airbus aircraft and are listed in Airbus SIL 09-002.

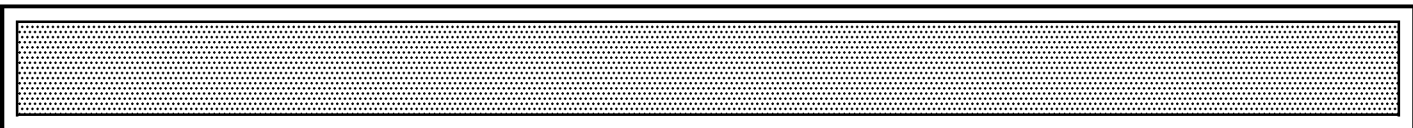
B – BRAKES

Maximum brake temperature allowed for take-off (with brake fans off - if installed) 300°C

10 – NAVIGATION

Operation above latitudes of 72° 30' N and beyond 60° S is not permitted.

Mod : 5443



11 – POWER PLANT

A. THRUST SETTING/EGT LIMITS

CONDITION	TIME (min) LIMITATION	EGT (°C) LIMITATION	NOTE
MAKE TAKE OFF AND GO AROUND	5	625	
	10	625	Only in case of engine failure
MAX CONTINUOUS	Unlimited	600	
ACCELERATION	*	625	
MAX CLIMB	Unlimited	600	
MAX CRUISE	Unlimited	600	
STARTING		535	On ground
	**	625	In flight

* Stabilized EGT must be at or below the operating limit for the applicable operating condition within 2 minutes of advancing the throttle.

** For in flight starts that result in exceedance of the ground start limit, the maximum temperature and duration must be recorded for maintenance action.

B. RPM

N1 MAX	111.4 %
N2 MAX	104 %

C. OIL TYPE

Following type II oils are fully approved for use in PW 4000 engines

- ESSO TURBO OIL 2380/EXXON TURBO OIL 2380
- AERO SHELL TURBO OIL 500
- AERO SHELL TURBO OIL 555
- CASTROL 205/STAUFFER JET II
- MOBIL JET OIL II
- CASTROL 5000
- MOBIL JET OIL 254

Note : Different brands or types of oils should not be mixed except where the same oil formulation is marketed under separate brand names which have been approved by Pratt and Whitney Aircraft.

Note : For possible use other brands of oils, refer to :

P and W SERVICE BULLETIN N 238

D. OIL TEMPERATURE

MAX TRANSIENT (20 MINUTES)	177° C
MAX CONTINUOUS	163° C

MIN FOR STARTING

– 40° C

E. OIL PRESSURE

MIN	70 psi
-----------	--------

NORM

90-400 psi

F. STARTER

- Duty cycle limits :
 - 2 consecutive aborted start attempts may be conducted. R

Note : Engine motoring for 30 seconds is required following an aborted start.

- After 2 aborted start attempts, a 30 minutes starter cooling down period must be observed prior to further starter operation. R

- Re-engagement speed limits :
 - Normal re-engagement speed : 15 % N2,
 - Maximum re-engagement speed : 20 % N2.

G. REVERSE THRUST

THE SELECTION OF THE THRUST REVERSERS IN FLIGHT OR THEIR PRESELECTION BEFORE TOUCHDOWN IS PROHIBITED

BACKING THE AIRCRAFT WITH USE OF REVERSE THRUST IS NOT PERMITTED

Max reverse thrust should not be used below 80 Kt IAS or IAS fluctuations, whichever occurs first.

- If reverse unlocked or reverse stowed is selected do not reselect the opposite position before light indication shows end of transit.

