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A318/A319/A320/A321

ATA 71
Power Plant

Ground Operations

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ATA 71–00 POWER PLANT

ATA 71 POWER PLANT

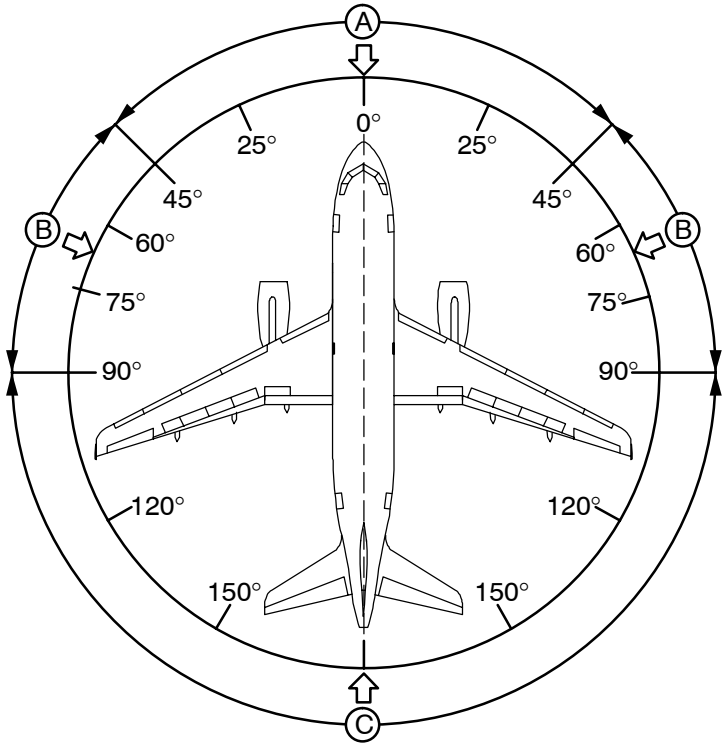
71–00 ENGINE GROUND OPERATION

WIND DIRECTION AND VELOCITY

N1 rpm limitations for ground operations are given in referenced figure. Whenever possible, the aircraft should be turned directly into the wind in addition to observing these maximum wind velocities.

CAUTION: POWER ASSURANCE RUNS ARE RESTRICTED IF WIND VELOCITY VARIATION EXCEEDS 5 KNOTS.

Tail winds, or winds with tail wind components, adversely affect ground operation of the engines. During starting, and at idle or low power settings, excessive EGT can result. At high power settings or approximately 90% N1 rpm and above, fan tip stall can be caused. The onset of fan tip stall during steady state operation may be recognized by unstable N1 rpm manifested by rapidly increasing excursions, airplane vibration and a pulsating blowtorch type of sound. Whenever a fan tip stall is imminent or has occurred, rapid retardation of the thrust lever will prevent or permit recovery from the stall.



WIND DIRECTION	VELOCITY	MAX N1
A	ALL	TAKE OFF
B	UP TO 10 KNOTS	90%
B	10 TO 20 KNOTS	85%
C	UP TO 2 KNOTS	90%
C	2 TO 5 KNOTS	85%
C	5 TO 10 KNOTS	70%

NOTE: ENGINE OPERATION ABOVE IDLE IS NOT RECOMMENDED

⇨ RELATIVE WIND DIRECTION

NOTE: IN ADDITION TO OBSERVING THE MAXIMUM WIND VELOCITIES POWER ASSURANCE RUNS ARE RESTRICTED IF WIND VELOCITY VARIATION EXCEEDS 5 KNOTS

Figure 1 Wind Direction and Velocity

SAFETY PRECAUTIONS

General

This description gives the safety precautions you must obey when you go near an engine that operates.

Also included are precautions for aircraft handling to make sure the airplane does not move during engine operation on ground.

Engine Air Inlet and Exhaust

- The operation of power plants is dangerous
- There is a very strong suction at the front of the engine that can pull persons and unwanted materials into the air inlet
- Very hot high speed gases go rearward from the turbine exhaust nozzle
- Exposure to noise can damage your ability to hear and gives vibrations to your body (see figure in AMM)

WARNING: ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS THAT ARE FORWARD AND TO THE SIDES OF THE INLET COWL. ALL PERSONS MUST STAY AWAY FROM THE ENGINE SAFETY BARRIER WHEN THE ENGINE IS IN OPERATION. DURING ENGINE OPERATION, THERE IS SUFFICIENT SUCTION AT THE INLET COWL TO PULL A PERSON INTO THE ENGINE INLET. A FATAL INJURY COULD OCCUR.

Aircraft Handling Summary

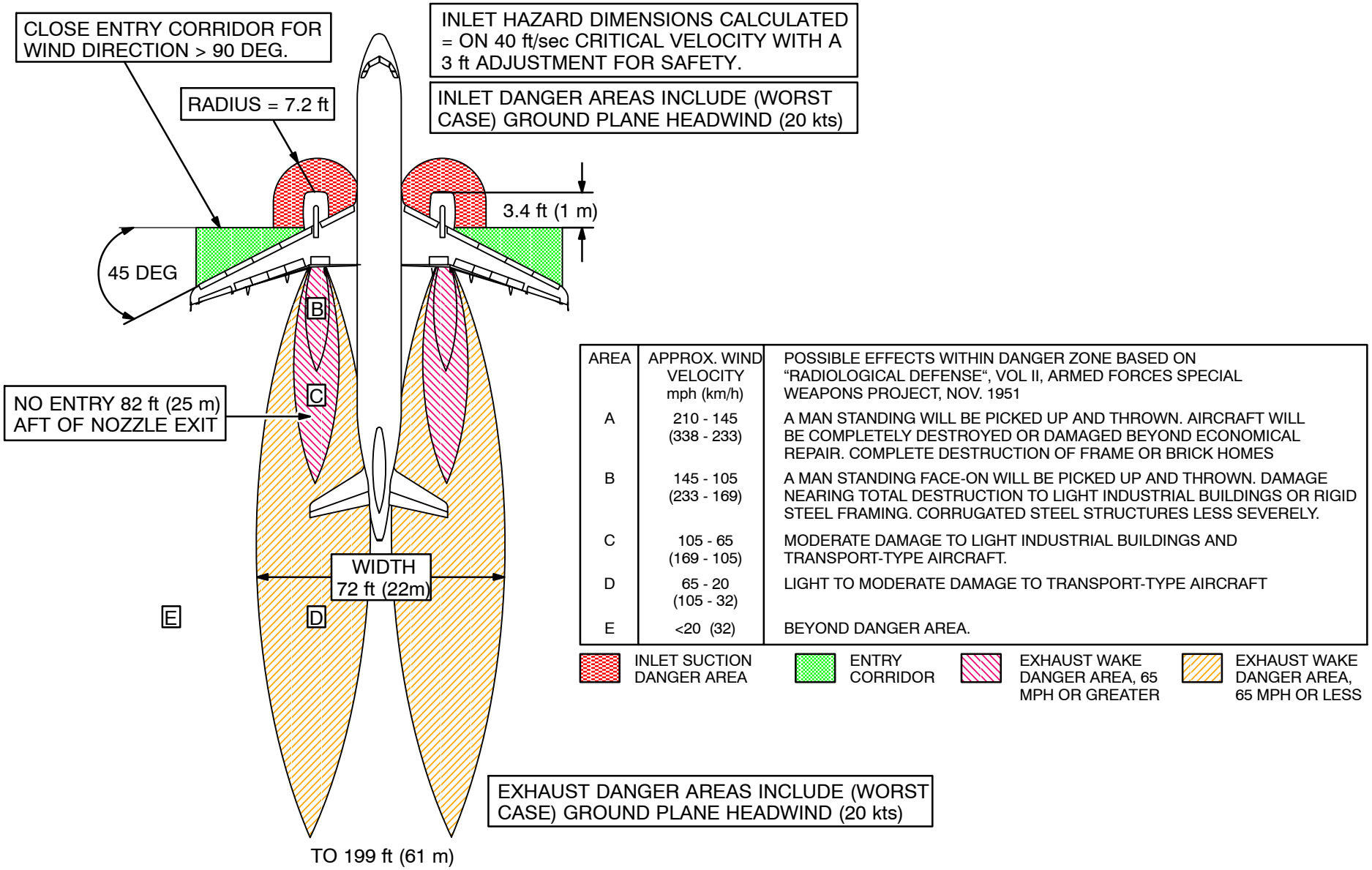
- The aircraft is parked on a clean dry flat area with enough distance to other objects or use a blast fence.

CAUTION: FOR POWER RUNS THE AIRCRAFT MUST PARKED ON CONCRETE PAVEMENT, ASPHALT PAVEMENT CAN MELT.

- Fan cowls must be closed when you operate the engine at power higher than idle
- Reverse cowls must be always closed
- Passenger and cargo doors are closed, stairs and loading equipment are removed when one engine is above idle
- Cargo doors closed and equipment removed when engine 2 is operated

Abnormal and Emergency Procedures Summary

- For Hot Start conditions abort the start if EGT goes to 725 °C (usual <500 °C). Dry motor the engine for 30 sec
- For Hung Start prevention check air press and fuel flow
- For Stall and Overspeed pull thrust lever to idle to correct the problem
- The Limits for N1 is 102% and for N2 105%
- For oil system abnormals follow ECAM instructions
- For internal fire after shutdown (EGT increase) dry motor the engine
- For external fire follow the ECAM instruction. If fire is not extinguishable use external fire extinguisher
- After an engine fire refer to AMM for necessary follow up inspections
- Do the inspection Hydraulic Pump starvation or cavitation when engine has operated more than 5 min.
- The use of dry chemical agents is not recommended



AREA	APPROX. WIND VELOCITY mph (km/h)	POSSIBLE EFFECTS WITHIN DANGER ZONE BASED ON "RADIOLOGICAL DEFENSE", VOL II, ARMED FORCES SPECIAL WEAPONS PROJECT, NOV. 1951
A	210 - 145 (338 - 233)	A MAN STANDING WILL BE PICKED UP AND THROWN. AIRCRAFT WILL BE COMPLETELY DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR. COMPLETE DESTRUCTION OF FRAME OR BRICK HOMES
B	145 - 105 (233 - 169)	A MAN STANDING FACE-ON WILL BE PICKED UP AND THROWN. DAMAGE NEARING TOTAL DESTRUCTION TO LIGHT INDUSTRIAL BUILDINGS OR RIGID STEEL FRAMING. CORRUGATED STEEL STRUCTURES LESS SEVERELY.
C	105 - 65 (169 - 105)	MODERATE DAMAGE TO LIGHT INDUSTRIAL BUILDINGS AND TRANSPORT-TYPE AIRCRAFT.
D	65 - 20 (105 - 32)	LIGHT TO MODERATE DAMAGE TO TRANSPORT-TYPE AIRCRAFT
E	<20 (32)	BEYOND DANGER AREA.

Figure 2 Engine Hazardous Areas

ENGINE OPERATION LIMITS

Abnormal and Emergency Procedures Summary

- For Hot starts abort the start if EGT goes to 725°C (usual <500°C). Dry motor the engine for 30 sec.
- For hung starts check air pressure and fuel flow
- For stall and overspeed conditions retard thrust lever to idle to correct the problem
- The limit for N1 is 102%, the limit for N2 is 105%
- For oil system malfunctions refer to ECAM instructions
- The minimum oil pressure limit is13 psi. Oil pressure fluctuations more than 5 psi are unusual. An oil pressure advisory is established at more than 90 psi
- The oil temperature limit is 140°C for continuous operation, the maximum oil temperature is reached at 155°C
- The EGT limit is 890°C
- For internal fire after shutdown (EGT increase) dry motor the engine
- For external fire follow the ECAM instruction. If the fire is not extinguishable use external fire extinguisher
- After an engine fire follow the AMM tasks for necessary inspections or demanding engine removal
- If possible, dry chemical agents should not be used to extinguish a fire

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ENGINE TESTS

MINIMUM IDLE CHECK

The minimum idle check gives instructions to make sure that the engine connections do not leak. It also permits you to make sure that noise from engine operation is normal and that all engine instruments give the correct indications.

Method Summary

- Start the engine
- N2 speed must not be below 58.3 percent N2
- Oil pressure is within the limits. (13 psi - 33 psi in idle)
- Make a leak inspection

POWER ASSURANCE CHECK

This procedure gives instructions to make sure the engine can produce the necessary takeoff thrust in agreement with EGT and N2 limits when setting N1.

The Power Assurance Check is not a good test for performance analysis of the engine. Do not only use the Power Assurance Check to accept or reject an engine. The Power Assurance run is usually not sufficiently stable to accurately determine the engines health. You can get a more reliable performance analysis by doing a test cell operation or on-wing performance trend monitoring.

Method Summary

- Start the engines
- Set 60 percent N1 balance power
- You have to set the engine to a target N1,
  this is a factor depending on engine type and outside temperature
- You have to record the actual N1, N2, EGT and field elevation
- You have to calculate N2 and EGT if actual N1 is not exactly the target
- For CFM56–5B you have to calculate N2 and EGT according the rating modifier level and field elevation
- After all this calculations you will get an N2 and EGT margin which is a statement about the engine condition

ACCELERATION CHECK

This procedure gives instructions for fast acceleration from the 30 percent N1 setting. This will show that the engine acceleration is smooth and will not cause engine stalls.

Method Summary

- Enter a flexible temperature through the MCDU PERF P/B according outside temperature and subtract 5% from the N1 limit shown on the E/WD as your clock target
- Start the engines
- Set 60 percent N1 balance power
- Set engine to 30 percent N1
- Move quickly the thrust lever to FLX/MCT detent
- Stop the timer when the engine reaches the clock target
  The limit is 7.5 seconds

VIBRATION CHECK

The vibration monitoring system can be used to get vibration data. This task should be performed when a new non pre-tested engine is installed or after FOD/ICING and subsequent fan blade change.

Method Summary

- Start the engines
- Set 60 percent N1 balance power
- Slowly within 2 minutes go to MAX CLIMB detent
- Slowly within 2 minutes go to IDLE stop
- Write down the vibration peaks
- Go back to the rpm where the peak occurred and let the rpm stable for 4 minutes
- Repeat the procedure with the other accelerometer. To do so, stop the engines, and change to TRF-Sensor via MCDU Menu

OAT	N1 (PCT)	N2 (PCT)		EGT (DEG C)	
DEG C	TARGET	MIN.	MAX.	MIN.	MAX.
-19	82.5	87.8	91.0	539	628
-18	82.6	87.9	91.2	542	631
-17	82.8	88.1	91.4	545	634
-16	82.9	88.3	91.6	548	637
-15	83.1	88.5	91.8	550	641
-14	83.2	88.7	92.0	553	644
-13	83.4	88.8	92.2	556	647
-12	83.5	89.0	92.3	559	650
-11	83.7	89.2	92.5	562	654
-10	83.8	89.4	92.7	565	657
-9	84.0	89.5	92.9	568	660
-8	84.1	89.7	93.1	571	663
-7	84.3	89.9	93.3	574	667
-6	84.4	90.1	93.4	577	670
-5	84.6	90.2	93.6	580	673
-4	84.7	90.4	93.8	583	677
-3	84.9	90.6	94.0	586	680
-2	85.0	90.8	94.1	589	683
-1	85.2	90.9	94.3	592	687
0	85.3	91.1	94.5	595	690
1	85.5	91.3	94.7	598	693
2	85.6	91.4	94.9	601	697
3	85.8	91.6	95.0	604	700

NOTES:

1. THESE FIGURES ARE VALID FOR SEA LEVEL
2. THESE FIGURES ARE VALID ONLY WHEN THE GENERATOR AND PNEUMATIC SWITCHES ARE OFF
3. DECREASE WF BY 320 LB/HR (145 KG/HR) FOR EACH 1000 FT (305 M) ABOVE SEA LEVEL
4. FOR EACH 0.1 PERCENT THAT N1 ACTUAL DEVIATES FROM TARGET N1, ADJUST THE DATA AS FOLLOWS
   N2 . . . . 0.05 PERCENT
   EGT . . 1 DEG.C
5. IF THE ACTUAL N1 IS LESS THAN THE TARGET N1, THE ADJUSTMENTS ARE POSITIVE (+)
6. IF THE ACTUAL N1 IS GREATER THAN THE TARGET N1, THE ADJUSTMENTS ARE NEGATIVE (-)

Figure 3 Power Assurance Table

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