ENGINE FAILURE ON TAKEOFF

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AIRBUS A330

Engine Damage Indications
N1 & N2 are proportional to TAS. N2 may be zero at low speeds and low altitudes without engine damage. N2 takes time to wind down - should not stop immediately (engine damage if it does)
N1 should not be zero. If it is, the engine is damaged (seized main rotor)
N1 and N2 may still be spinning with engine damage present.
High EGT and/or vibration may indicate engine damage.
A visual nacelle check is also a valuable assessment.

Notes:* TOGA may not be adviseable on the ground on the T/O roll as V1 and/or VR can be limited by VMCG or VMCA repsectively. Control problems may ensue. This does not preclude the option of taking TOGA at any time.
With engine-out, TOGA is approved to 10 minutes (5 minutes at other times)
During ECAM procedures:
* PF controls thrust levers. PNF controls all other switches.
PF must confirm actions relating to:
- guarded switches
- engine master switches
- fire bottles
- NAV IR switches
- any other irreversible action

* FADEC will attempt an auto-relight in the event of engine failure. This attempt is confirmed by the pilot selecting IGN/START in the ECAM checklist.

Only after an engine is re-lit should you select *EO CLR in the MCDU

At STATUS PAGE

PF: STOP ECAM AFTER TAKE-OFF CHECKLIST

DO NOT consider relight in the case of engine fire or damage

PF: CONTINUE ECAM

PNF: continue ECAM actions

CONSIDER re-light, resets, OEBs

FLIGHT MANAGEMENT

- Return plan
  - airports
  - fuel on board (balance issues also)
  - terrain
  - weathers
  - landing weight

COMMUNICATIONS

- ATC
- Company (via ATC if required)
- Cabin Crew
- Passenger address

After completion of the "after take-off" checklist

PF: CONTINUE ECAM

(STATUS PAGE)

NAVIGATION

Consider position:
- Climb to altitude (MSA, terrain)

FLY ENGINE-OUT SID/PROFILE

* When the checklist says consider APU usage ..... USE IT. It provides backup electrical power and bleed air at low altitudes to unload the remaining engine if desired.

If OP CLB is selected AT green dot speed - the IAS will overshoot by up to 20 kts before returning to green dot.

2. Thrust lever: - From TOGA to MCT
Or (if still in FLEX) - CLB then MCT
FMA: "THR MCT"

1. 10 kts prior to GREE DOT: ALT PULL
... FMA: "OP CLB"

* QF policy now: when ECAM checklist says "engine relight consider" (note: sim says "engine relight initiate") crew are to assess engine for damage and look to a restart or not. But the restart is not to be done here. If desired, it is done at STATUS (along with OEB, resets and normal checklists) Use the QRH inflight start checklist.

COMMUNICATIONS

During acceleration
PF: PAN call to ATC with situation and initial intentions

RETRACT FLAPS ON SCHEDULE

After take-off the yaw damper deploys a small amount of spoiler on live engine side to maintain yaw control with no pilot input.
The aircraft incurs a bank angle of 7-9 degrees. Heading diverges by about 1 degree per second.
Note also: Pitch left untouched causes speed to slowly bleed below SRS target.

* If speed is below SRS be vary careful of lowering the nose to attain SRS such that V/S becomes negative.
Monitor V/S > 0 and PNF to call "sink rate" if required.
Same in E/O go-around.

SRS pitches for:
V2 if current speed less than V2
Current speed if between V2 and V2+15
V2+15 if current speed greater than V2+15

Rotate Attitudes
FLEX take-off: 10 degrees NU
(sit box just ON the 10 degree AI line)
TOGA take-off: 12 degrees NU

press ALT

(normally 1,500' HAT/AGL)

At flap lever zero, BETA target disappears and the yellow slip ball appears. Centre with rudder trim.

above ENGINE OUT ACCELERATION ALTITUDE and At:
- ECAM "consider engine relight"
- engine fire out (or both bottles discharged)
- damaged engine secured (1 bottle discharged)

PF: STOP ECAM

* The E/O acceleration altitude in the MCDU PERF page is text. In practice it does nothing.

PF: I HAVE CONTROL
I HAVE THE RADIOS
ECAM ACTIONS

ROTATE at 2.5 to 3 degrees/second to 10-12 degrees NU

MAINTAIN RUNWAY CENTRELINE WITH RUDDER

SYSTEMS MANAGEMENT

At minimum 400' HAT, or earlier if the flight path is under control and urgency warrants (eg. engine fire)

PNF carries out ECAM actions

PAN call may be made here if intending to depart from cleared SID

* Bank angle is limited by the FMGEC to 15 degrees if the IAS is less than manoeuvring speed (F, S or green dot) for the configuration in use.

On detection of engine loss

PNF: ENGINE FAILURE

(do not identify which engine yet)

PNF Cancel any aural warnings

FLY THE AIRCRAFT

1. Adjust pitch to 10-12 degrees. Maintain V2 to V2+5 or follow SRS
2. Neutralise B-target with rudder. Trim rudder until pedal movement under foot
3. When rudder trimmed: PF: ENGAGE AUTOPILOT 1/2 Engaging AP without trimming rudder can be done but is very untidy as AP catches up with rudder control
4. NAVIGATION:E/O SID or escape profile;*INSERT in MCDU (and press NAV or fly in HDG)

PNF: ROTATE

PNF: POSITIVE CLIMB
PF: GEAR UP

PNF: MORE THRUST AVAILABLE (as applicable)

No other calls until gear is up

PNF: (disarm ground spoilers)

If not ON the TMPY FLT PLAN then a DIR TO is required after *INSERT

NAVIGATION

AFTER LIFT OFF ROUTINE
T - TOGA
P - PITCH (MAINTAIN SPEED)
R - RUDDER (MAINTAIN DIRECTION)
T - TRIM RUDDER
A - AUTOPILOT
N - NAVIGATION (ESCAPE ROUTE)

The BETA target (blue) is not a slip ball. It trades off a little sideslip to minimise drag with less deflection of the flight surfaces (rudder, spoiler, aileron). BETA target is computed by the PRIM. It comes on in take-off configuration with 1 engine at least 80% N1 and the other at least 30% less.

* Noise Abatement procedures do not apply with engine failure on take off