

## Appendix 6

### Airbus "Unreliable speed indication" procedure

<b>A330</b> <b>AIR FRANCE</b> FLIGHT CREW OPERATING MANUAL	<b>ABNORMAL AND EMERGENCY</b>	3.02.34	P 17
	NAVIGATION	SEQ 001	REV 22

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#### UNRELIABLE SPEED INDIC/ADR CHECK PROC

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. If all ADRs provide unreliable data, keep one ADR on to keep the stall warning protection. 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/steady 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.



R **UNRELIABLE SPEED INDIC/ADR CHECK PROC (CONT'D)**

● If the safe conduct of the flight is impacted :

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**MEMORY ITEMS :**

- AP/FD.....OFF
  - A/THR.....OFF
  - PITCH/THRUST :
    - Below THRUST RED ALT.....15°/TOGA
    - Above THRUST RED ALT and Below FL 100.....10°/CLB
    - Above THRUST RED ALT and Above FL 100.....5°/CLB
  - FLAPS.....Maintain current CONFIG
  - SPEEDBRAKES.....Check retracted
  - L/G.....UP
- When at, or above MSA or Circuit Altitude: Level off for troubleshooting

- GPS ALTITUDE ..... Display on MCDU

● To level off for troubleshooting :

- R - AP/FD ..... OFF
- R - A/THR ..... OFF

*Note : Check the actual slat/flap config. on ECAM, as flap auto-retraction may occur.*

R **PITCH/THRUST FOR INITIAL LEVEL OFF**

SLATS/FLAPS EXTENDED				
		Above 190 t	190 t – 160 t	Below 160 t
CONF	Speed	Pitch (°)/Thrust (% N1)		
3	F	7.5/76.6	7.5/70.7	7/64.3
2	F	9/75	9/69.2	8.5/62.4
1 + F	S	6/72.7	6/66.9	6/60.5
1	S	9/71.6	9/65.7	9/59.5
CLEAN				
FL	Speed	Pitch (°)/Thrust (% N1)		
Below FL 250	240 kts	5/75.7	4/72.6	2.5/68.1
FL 250 - FL 370	260 kts	3.5/90	3/87.9	2/83.9
Above FL 370	M 0.80	3/94.3	2.5/93.4	2/90



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**UNRELIABLE SPEED INDIC/ADR CHECK PROC (CONT'D)**

**Flying technique to stabilize speed :**

- Adjust pitch in order to fly the required flight path.
- When target pitch is reached, flying intended flight path, adjust thrust to target.
  - If the aircraft pitch tends to increase, aircraft is slow, then increase thrust ;
  - If the aircraft pitch tends to decrease, aircraft is fast, then decrease thrust.

**WHEN FLIGHT PATH IS STABILIZED**

- PROBE/WINDOW HEAT ..... ON

**Technical recommendations :**

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- Respect Stall Warning, and disregard the "RISK OF UNDUE STALL WARNING" STATUS message, if displayed on ECAM.
- To monitor speed, refer to IRS Ground Speed, or GPS Ground Speed variations.
- **If remaining altitude indication is unreliable :**
  - Do not use FPV and/or V/S, which are affected.
  - ATC altitude is affected. Notify the ATC.
  - Refer to GPS altitude : altitude variations may be used to control level flight, and is an altitude cue.
  - Refer to Radio altimeter.

**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 %.



R    **UNRELIABLE SPEED INDIC/ADR CHECK PROC (CONT'D)**

R    **Affected ADR identification :**

    – Crosscheck all speed indications and refer to QRH 4.01 (for F, S speeds) or 5.01 (for speed in clean conf):

R    **■ If at least one ADR is reliable :**

    – Faulty ADR(s) ..... OFF

    – REMAINING AIR DATA ..... CONFIRM

*Alternates sources may be used to evaluate the air data :*

R        – GPS altitude

R        – GPS and IRS Ground Speeds, taking into account altitude and wind effect.

R    **■ If affected ADR(s) cannot be identified or all ADRs are affected:**

R        – ONE ADR ..... KEEP ON

R        *Keep one ADR ON to maintain the STALL WARNING protection.*

R        – TWO ADR(s) ..... OFF

R        *This prevents the flight control laws from using two coherent but unreliable ADR data.*

R        – EFIS DMC switching ..... AS RQRD

R        – LDG CONF ..... USE FLAP 3

R        – APP SPD ..... VLS+10

R        – LDG DIST PROC ..... APPLY

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

R    **■ To return to departure airport :**

    Keep takeoff configuration preferably.

    Refer to initial, intermediate, and final approach tables.

R    **■ To accelerate and clean up after takeoff :**

    Accelerate and clean up the aircraft in level flight :

    – THRUST ..... CLB

    – FLAPS ..... RETRACT

    Retract from 3 or 2 to 1, once CLB thrust is set.

    Retract from 1 to 0, when the aircraft pitch is lower than the pitch for S speed (refer to the "Pitch/Thrust for initial level off" table).

    Once in clean configuration, refer to climb, cruise, descent, approach tables for flight continuation.

R    **■ Other cases :**

    – Refer to climb, cruise, descent, approach tables for flight continuation



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**UNRELIABLE SPEED INDIC/ADR CHECK PROC (CONT'D)**

**CLIMB**

Set the thrust to CL.

CLEAN				
FL	Speed	Above 190 t	190 t - 160 t	Below 160 t
		Pitch (°)/Thrust (%N1)		
Below FL 100	240 kts	10.5/CLB	11/CLB	12.5/CLB
FL 100 - FL 150		9/CLB	9.5/CLB	10.5/CLB
FL 150 - FL 200		8.5/CLB	8.5/CLB	10.5/CLB
FL 200 - FL 250		7.5/CLB	7.5/CLB	7.5/CLB
FL 250 - FL 300	260 kts	5.5/CLB	5/CLB	5.5/CLB
FL 250 - FL 370		4.5/CLB	4/CLB	4/CLB
Above FL 370	M 0.80	3.5/CLB	3.5/CLB	3.5/CLB

**CRUISE**

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.

CLEAN				
FL	Speed	Above 190 t	190 t - 160 t	Below 160 t
		Pitch (°)/Thrust (%N1)		
Below FL 250	240 kts	5/75.7	4/72.6	2.5/68.1
FL 250 - FL 370	260 kts	3.5/90.0	3/87.9	2/83.9
Above FL 370	M 0.80	3/94.3	2.5/93.4	2/90.0

**DESCENT**

Set the thrust to IDLE

CLEAN				
FL	Speed	Above 190 t	190 t - 160 t	Below 160 t
		Pitch (°)/Thrust (%N1)		
Above FL 370	M 0.80	1/IDLE	0/IDLE	- 0.5/IDLE
FL 370 - FL 250	260 kts	1.5/IDLE	0.5/IDLE	- 1/IDLE
FL 250 - FL 100	240 kts	2/IDLE	0.5/IDLE	- 0.5/IDLE
Below FL 100	240 kts	2.5/IDLE	0.5/IDLE	- 0.5/IDLE
Below FL 100	G-DOT	2.5/IDLE	2.5/IDLE	2.5/IDLE



R **UNRELIABLE SPEED INDIC/ADR CHECK PROC (CONT'D)**

**INITIAL AND INTERMEDIATE APPROACH IN LEVEL FLIGHT**

R The approach phase between Green Dot speed (clean configuration) and the landing configuration (CONF 3), is flown in level flight.

LANDING GEAR UP IN LEVEL FLIGHT				
		Above 190 t	190 t - 160 t	Below 160 t
CONF	Speed (kts)	Pitch (°)/Thrust (%N1)		
0	G-DOT	5/67.4	5.5/61.5	5/55.3
1	S	9/71.7	9/65.8	9/59.5
1+F (a)	S	6/72.7	6/66.9	6/60.5
2	F	6/75.0	6/69.2	6/64.0
LANDING GEAR DOWN IN LEVEL FLIGHT (EXPECT GRVTY EXTENSION)				
3	F	6.5/81.5	6.5/75.4	6.5/69.1

(a) Due to the fact that the speed is unreliable, the SFCC may select the 1+F configuration in approach, instead of 1.

**FINAL APPROACH AT STANDARD - 3° DESCENT FLIGHT PATH**

LANDING GEAR DOWN				
		Above 190 t	190 t - 160 t	Below 160 t
CONF	Speed (kts)	Pitch (°)/Thrust (%N1)		
3	VLS + 10	4.5/59.0	4/53.2	4/48.2

**Flying technique to stabilize speed :**

- Adjust pitch in order to fly the required flight path.
- When target pitch is reached, flying intended flight path, adjust thrust to target.
  - If the aircraft pitch tends to increase, aircraft is slow, then increase thrust ;
  - If the aircraft pitch tends to decrease, aircraft is fast, then decrease thrust.