NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

October 28, 2014

Attachment 18 – AirbusWorld Article

OPERATIONAL FACTORS

DCA14MA081

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Operations Group Chariman on October 28, 2014

Flight Warning Computer (FWC) - RETARD call-out during T.O. acceleration

Reference: **31.50.00046** First Issue Date: **14-AUG-2008** Last Publication Date: **28-DEC-2013**

ATA: **31-50**	A/C Type : **A318 ; A319 ; A320 ; A321**

Old Wise Ref:
engsup-1686

↘Engineering Support

First Issue Date: **14-AUG-2008** Last Publication Date: **28-DEC-2013**

Description

Several operators performed Rejected Take-Off due to "RETARD" call-out during acceleration.

Solution

The auto call out "RETARD" is normally triggered on landing phase (flight phase 8) when the following conditions are gathered:

- aircraft speed is above 80kts,
- AND both thrust levers are not set to idle,
- AND TOGA or FLEX MODE not engaged (GO AROUND operation).

However, a call out "RETARD" may be unduly generated during TO roll due to a wrong flight phase computation by the FWC. Wrong flight phase computation may be due to an abnormal thrust setting (i.e. no engines recognized at TO power by the FWC).

Flight phase 2 is computed as soon as one engine is started.
Flight phase 3 is calculated whether one or another TLA is at "TO POWER" condition
Flight phase 4 is calculated if A/C speed is > 80 kts.

Logics for triggering "TO POWER" condition of the engines depend on the type of TO realised:

- for a normal TO: Thrust Lever Angle (TLA) is at TOGA position (i.e. above 43.3 degrees) OR N1 is above 95%
- for a FLEX or DERATED TO: TLA is at MCT position (i.e. from 33.33 to 36.67 degrees)

So, if the take-off is initiated with an abnormal thrust setting (i.e. no engines at TO power), during the acceleration phase, FWC stay in flight phase 2 and does not enter into flight phase 3 because of too low TLA and too low N1. When over 80 kts, the FWC leaves the flight phase 2 for excessive speed and computes the flight phase 8 corresponding to a landing roll.

The "RETARD" call out is therefore triggered at around 80 kts. Please note that the "RETARD" call out is NOT associated with Master Caution or Master Warning lights. This scenario can be confirmed by DFDR data analysis with N1 and thrust lever position parameters. Similar events were confirmed by other operators through data analysis.

Hence the "RETARD" call out experienced during TO roll is supposed to be linked to a wrong aircraft flight phase computation by FWCs due to throttles position not set in TO POWER condition (TO/GA or FLX/MCT TLA positions). Finally, if confirmed, this FWC behavior does not correspond to a failure

but is a normal operation due to the TLA configuration. So, there is no troubleshooting procedure to be applied at FWC level.

In order to confirm above scenario, Airbus would like to be provided with the following additional data:

- DFDR or DAR or QAR data (format as specified in SIL 00-086 enclosed)
- LRU ident of FWS as per AMM 31-50-00
- TSDs (TroubleShooting Data) of FWS as per AMM 31-50-00
- PFR of the RTO

In addition, please check calibration of the Throttle Control by performing a parameter ALPHA call-up of the TLA (label 133 of the ECU) in order to confirm the throttle position with the input sent to ECU.

EQ SYS LAB SDI:
TLA1 7C 1 133 01 - DEG TLA (THROTTLE RESOLVER ANGLE) SYS.1
TLA2 7C 2 133 10 - DEG TLA (THROTTLE RESOLVER ANGLE) SYS.2

Expected angular values are provided below in degrees:

Idle -> 0
MCL -> 25
MCT -> 35
TO -> 45

These values will then be analysed by Airbus to assess that calibration is good or not based on resolvers measurement tolerances.

In FWC standards prior to H2-F3, the alert "*ENG THR LEVERS NOT SET*" (triggered if the Thrust Levers position is not correct during Take-Off) was displayed only if the Derated Take-Off option was installed. Note that since the H2-F3 standard (available through SB 31-1267), this alert is triggered whatever the Derated Take-Off option is installed or not. Derated Take-Off option is activated through pin-programming at FMCG level and requires minimum standards of FADEC, FMCG and FWC. Since H2-F3P standard, this type of event described would results in "*ENG THR LEVERS NOT SET*" ECAM alert triggering.