Proposed Temporary Deviation on Primary Flight Parameters related Alerts

Applicable to A400M

Introductory note:

The hereby presented Temporary Deviation has been classified as important and as such shall be subject to public consultation, in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) of which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

Statement of issue

During A400M certification flight testing, two inappropriate alerts were identified:

1. NAV VERTICAL SPEED OR FPA DISAGREE

In case of self-detected loss of two ADRs (Air Data Reference) in flight, in addition to the correct caution “NAV ADR 1+2 FAULT” or “NAV ADR 1+3 FAULT” or “NAV ADR 2+3 FAULT”, the following ECAM (Electronic Centralized Aircraft Monitoring) incorrect caution is displayed:

“NAV VERTICAL SPEED OR FPA DISAGREE”

This message is not correct as no difference can be detected between CM1 (Crew Member 1) and CM2 V/S or FPA (Flight Path Angle) both using the same ADR source sensor.

2. NAV ALL AIR DATA DISAGREE

In case of DC1+DCEss failure in flight, in addition to the correct caution ”DC BUS 1+ESS FAULT” the following incorrect ECAM warning is triggered:

“NAV ALL AIR DATA DISAGREE”.

The message is not correct as ADR1, ADR3 and ISIS (Integrated Standby Instrument System) are lost i.e. a single source (ADR2) remains available for air data, which is not affected by the failure.

EASA CS 25.1309 (c) requires that:

“(c) Information concerning unsafe system operating conditions must be provided to the crew to enable them to take appropriate corrective action. A warning indication must be provided if immediate corrective action is required. Systems and controls, including indications and annunciations must be designed to minimise crew errors, which could create additional hazards”.

EASA AMC 25.1309 9 c further specifies that:

“(2) […] Reliable failure monitoring and indication should utilise current state of the art technology to maximise the probability of detecting and indicating genuine failures while minimising the probability of falsely detecting and indicating non-existent failures. Any indication should be timely, obvious, clear, and unambiguous”.

EASA CS25.1322 requires that:

"If warning, caution, or advisory lights are installed in the cockpit, they must, unless otherwise approved by the Agency, be –

(a) Red, for warning lights (lights indicating a hazard, which may require immediate corrective action);

(b) Amber, for caution lights (lights indicating the possible need for future corrective action);

(c) …..

(d) *……"*

EASA AMC 25.1322 paragraph 8.2 further specifies that:

"*The alerting system should be designed to avoid false and nuisance alerts. The possible effects of a false alert should be assessed for each function and taken into account in establishing the required Safety Objectives. In addition, the occurrence rate of false and nuisance alerts should be low enough to maintain crew confidence in the alerting system*".

EASA AMC 25.11 paragraph 4 (a) 3 specifies that:

"(ii) Airspeed. Display of airspeed in the cockpit is a critical function. […]

(iii) Barometric Altitude. Display of altitude in the cockpit is a critical function. […]

(iv) Vertical Speed. Display of vertical speed in the cockpit is an essential function. […]"

EASA A400M Interpretative Material (IM) CRI K-04 section 8 (d) specifies that:

"[…] The FPV information should have the same integrity level as the attitude information in PFD. […]"

The alerts referenced under 1 and 2 above are therefore not compliant with CS 25.1309(c) and CS25.1322 as they are falsely referring to non-existent discrepancies between primary flight parameters and may mislead the flight crew into taking inappropriate action, which could create additional hazards. Additionally, they unnecessarily lead to a further increase in workload in high workload situations.

Due to this identified non-compliance, Airbus has requested EASA a Temporary Deviation to allow the A400M aircraft being certified.

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The applicant agrees to improve the A400M Primary Flight Control System (PFCS) by increasing the robustness of the monitoring in differentiating failures: those self detected by other systems and those detected solely by the PFCS, so the alerts referenced under 1 and 2 above in Statement of Issue will no longer be displayed to the flight crew under the specific conditions observed during the certification flight testing. This design improvement will be implemented after initial EASA A400M certification.

The applicant has identified the following mitigations for the particular scenarios described on the statement of issue:

1. In both cases, the associated procedure ("PFD/HUD X-Check" Cross Check for the alert case number 1 and the QRH procedure for the alert case number 2) should lead to the flight crew to take appropriate actions: to identify the valid air data sources, AND

2. From the safety point of view, with the current TC design, the misleading alerts although increasing the crew workload do not worsen functional hazard analysis and associated failure condition classifications.

Supported by these considerations, Airbus SAS request EASA to grant a Temporary Deviation with regards compliance with CS25.1309(c) and CS25.1322 as interpreted by AMC 25.1322 par 8.2 requirements.

As EASA conclusion, a Temporary Deviation for the A400M can be granted by EASA associated to the following condition:

> This EASA Temporary Deviation will be valid since initial A400M certification until 31st December 2012 or until first A400M aircraft entry into service, whichever will occur first.