Certification Management Team (CMT)

Task Specific Team (TST)

Date Raised:	15 Dec 2021		Status:	**Closed**
Initial Release:	15 Dec 2021		Updated:	**N/A**
Raised By:	EASA, FAA			
SME Team (* denotes lead authority):	**ANAC**	**EASA**	**FAA**	**TCCA***
Subject:	**Interpretation differences in addressing Flight Crew Alerting 25.1322**			
Reference Requirements/ Guidance:	**The following regulations will be referred to as "regulation 25.1322" in the remainder of this document:** • **14 Code of Federal Regulations (CFR) 25.1322 Amendment 131** • **Certification Specification (CS) 25.1322 Amendment 11** • **Airworthiness Manual (AWM) 525.1322 Change 525-22** • **Regulamentos Brasileiros de Aviação Civil (RBAC) 25.1322 Amendment 131** **Acceptable Means of Compliance (AMC) 25.1322** **Advisory Circular (AC) 25.1322-1**			
Related Issue(s): (Identify Discussion Paper number, if any)	None			

Description of Issue(s):

(Give a brief description of issue(s))

Despite the fact that the rule and associated guidance material to regulation 25.1322 are harmonized, there are significant differences in interpretation between authorities. Amongst those differences, the task for this TST is to address s the use of failure flags on the Primary Flight Display (PFD). EASA, ANAC, FAA & TCCA disagreed during the previous CATA CWI EASA-006.

Background:

(Give a brief background of issue(s))

The regulation 25.1322 addresses various aspects of flight crew alerting such as warning, caution, and advisory messages, lights, and other alerting methods. A revision of 25.1322 was initiated in 2002 through an FAA Aviation Rulemaking Advisory Committee (ARAC), which included FAA, EASA, TCCA and industry participation. FAA published its final rule and guidance on 02 November 2010 as amendment 25-131 to 14 CFR part 25, and EASA published its final rule and guidance on 27 June 2011 as part of CS-25 Amendment 11.

Despite the fact that the rule and associated guidance material are harmonized, there have been significant differences in interpretation between authorities. On this basis this topic was proposed and accepted to be handled by Certification Authorities for Transport Airplanes (CATA), and a Subject Matter Expert (SME) group was set up. The SME group held regular meetings but failed to converge on harmonized interpretation. EASA then drafted a paper, in the form of a draft certification memorandum, detailing its position and rationale. The paper was distributed to the CMT authorities to comment as a way to better understand the extent of the differences between the authorities.

The primary point of disagreement was the use of red flags on the Primary Flight Display (PFD) to indicate conditions which did not require immediate pilot awareness and immediate pilot action. EASA stated that

this usage was not compliant with the regulation 25.1322(e)(1). ANAC, FAA & TCCA disagreed.

EASA stated that most (if not all) PFD failure flags should be categorised as alerts as per the definition of an alert in the harmonised AMC/AC to 25.1322 (AMC Section 4a /AMC Appendix 5, and AC Section 4a / AC Appendix 5-1). On that team, ANAC, FAA & TCCA stated that it was acceptable to have certain flight deck indications, that meet the broad definition of "failure flags", or "flags" that may not meet the definition of "alert", and could be shown compliant to the regulation 25.1322(f), provided they do not interfere with required compliant alerts and do not adversely affect the alerting scheme. For instance, the guidance states that a "failure of a single sensor in a multi-sensor system may not necessarily result in an alert condition that requires awareness." These failures could result in "flags" that are not alerts, that show, for example:

- an out of range condition or absent navigation parameters, such as a weak signal that does not require a pilot response;
- a value of proximity to flight envelope while in flight protected state.

Comments to the EASA paper highlighted other disagreements, many related to the primary point of disagreement, with others less so. These included, but were not limited to:

- Design Consistency and Flight Deck Philosophy and their validity as compliance justifications, and
- Certification Basis (including CPR), specifically on the question of impracticality (Part 21.A.101 (b)(3)).

TST Objectives and Working Methods:

The original tasking assigned by the CMT was:

> "The purpose and scope will be to seek harmonisation and ultimately to update harmonized policy on the interpretation of section 25.1322 regarding the scope of application of 25.1322(f).
>
> The initial focus will be on addressing the topic of PFD Flags, then the team should address remaining differences.
>
> The group will refine the tasking, clarify the scope and submit a work-plan to the Certification Management Team Secretariat (CMTS)."

The TST refined the tasking to focus initially on failure flags on the PFD.

Fifteen meetings, including one in-person meeting were conducted.

The TST used multiple inputs, including:

- Current regulatory and guidance materials, including AMC 25.1322, AC 25.1322-1, preamble to 14 CFR 25.1322 Amendment 131 and EASA Comment Response Document to NPA
- EASA Draft Proposed Certification Memorandum (CM) on Flightcrew Alerting, Authority comments to the draft CM, and EASA disposition of comments
- Multiple examples of failure flags on PFDs
- Technical Standard Orders (TSOs) with use of failure flags or use of colors red or yellow/amber

As a result, this TST recommends harmonized policy below on how to address failure flags on the PFD in showing compliance to regulation 25.1322, together with recommended next steps to address remaining differences.

SME Team Project Plan:

Milestone	Deadline	Status
Phase 1. Provide work program and Statement of Issue	March 23, 2022	Completed
<interim milestones as appropriate>		
Phase 2. Understand CMT authority differences	April 6, 2022	Completed
<interim milestones as appropriate>		
Phase 3. Develop initial proposition of harmonized practice	June 22, 2022	Completed
Develop and agree on content and analyze results of 1322 Status Table	In-person meeting (September 27-29), 2022	Completed
Phase 4. Finalize proposition and submit to CMTS	January 27, 2023	Completed

SME Recommendation (Phase 4 Completion)

The Subject Matter Expert (SME) Team focused the discussion on the use of failure flags on the Primary Flight Display (PFD) and whether or not, and under which conditions, they should be considered as part of the flightcrew alerting function. Several examples were reviewed by the team. Based on the examples, the material in the preamble and on the content of the guidance material, the team members agreed that, moving forward, any failure flag presented in the PFD is to be considered as part of the alerting function.

The interpretation above will help maintain consistency of the PFD indications with the other displays, especially with the central alerting system (if present). It will also preserve the use of colors in the PFD (especially the red color), which is of high importance since it is placed in the primary field of view of the pilots. A much better alignment with the latest regulation 25.1322 Amendment's purpose is foreseen. Also, this will help reduce interpretation differences among applicants and authorities.

In summary, it is recommended that all CMT Authorities adopt the following policy in finding compliance with CFR 25.1322 Amendment 131 and CS-25 Amendment 11, AWM 525.1322 Change 525-22 and RBAC 25.1322 Amendment 131:

Moving forward, for programs with regulation 25.1322, the amendments listed above, regarding failure flags on Primary Flight Displays:

- **Any visual indication identifying to the flightcrew a non-normal operational or airplane system condition (including but not limited to Failure Flags) on the Primary Flight Display (PFD) is considered part of the alerting function and must be compliant with the regulatory requirements of regulation 25.1322 (a) through (e). It is assumed that the applicant has followed the categorisation of alerts outlined in AC 25.1322-1/AMC 25.1322 Sections 5 and 6 in meeting the requirements of 25.1322(b) in terms of the prioritization hierarchy and 25.1322(e) in terms of the use of colors.**

Remaining differences with respect to the initial task:

None. The team reached consensus on the policy for Failure Flags on the Primary Flight Display.

Remaining potential differences identified include but are not limited to:

- Failure indications on other displays beyond the Primary Flight Display and on areas of the flight deck that are not displays (e.g. pushbutton captions).

- For non-alerting functions, what is allowed to be red or amber (e.g. red building on airport moving maps, flashing red runways for Runway Overrun Awareness and Alerting System).

- Alert hierarchy for loss of guidance during approach, e.g. EASA has imposed warning level alert for this failure on some projects.

- Topics below recommended for an authority/industry harmonization group.

Regarding "next steps" the team recommends:

Convene an authority/industry working group (such as an Aviation Rulemaking Committee (ARC) or Aviation Rulemaking Advisory Committee (ARAC)) to support the reviews and clarifications described below and provide recommendations to the authorities, to support harmonized interpretations.

1. Regarding definitions in AC/AMC 25.1322:

- Propose revisions to guidance material to discontinue the use of the terms "flag" and "failure flags", including in AC/AMC 25.1322 and in AC/AMC 25-11. These terms are concepts associated with legacy, single instrument displays and their use may lead to misinterpretation of guidance material when dealing with highly integrated avionics systems and flight deck displays.

- Review the definitions of "Alert message", "Visual alert information" and "Failure flag" as they are ambiguous and potentially overlapping; and propose alternative terms and definitions.

- Propose clarifications of the definition of "alert" regarding the following part: "Alert indications also include non-normal range markings (for example, exceedances on instruments and gauges).

2. Regarding regulation 25.1322 paragraph (f):

- Propose further guidance, criteria and examples on what is acceptable or not with respect to regulation 25.1322 paragraph (f) and AC/AMC section 11 paragraphs f) and g) "Color standardization".

- Enhance the guidance in AC/AMC in section 11 for use of red/amber/yellow for non-alerting functions with the additional examples provided below. The guidance in the AC/AMC in section 11, paragraphs f) and g) "Color standardization", describe guidance for using red, amber and yellow for functions other than flight crew alerting when "…there is an operational need to use these colors to provide safety related information" and provided that such uses are "…limited and must not adversely affect flight crew alerting." The guidance cites only Weather Radar and TAWS. Below is an example that would also be considered acceptable:

  > Airspeed tape markings (e.g., the amber and red areas of the airspeed or altitude tapes that appear on the tape while the aircraft is still in the normal airspeed operating range) are not considered as alerts that need to comply with regulation 25.1322 (a) through (e), and are instead allowable under regulation 25.1322(f). However, exceeding the maximum and minimum airspeed thresholds should generate alerts that comply with regulation 25.1322 (a) through (e) and FAA Policy PS-ANM-25-16 "Low-Speed Alerting and Protection". If exceeding specific limits requires immediate pilot attention and immediate or possible subsequent action, then these events should generate alerts that are classified as Warnings or Cautions respectively.

- Consider the following non-exhaustive list of examples for discussion:
  - Yellow VSPEED on the ground
  - Instrument approach minima
  - Pitch or Angle of Attack limit indications
  - Middle Marker (MM) (Ref: RTCA DO-143, Section 1.6)
  - Consider also FAA Policy PS-ANM-25-16 "Low-Speed Alerting and Protection" for further examples

3. Review the Technical Standard Orders (TSOs) related to the use of red/yellow/amber for potential conflicts with aircraft level requirements of regulation 25.1322 and recommend updates to align them. Based on this information, all Authorities should contact TSO Design Approval holders (if applicable) to raise awareness on the need for their designs to support aircraft-level regulations.

4. Review and propose updates to AC/AMC 25.1322 to clarify that in case of conflict, the regulation supersedes any TSO specification as part of the installation requirements.

5. Review the regulations in Part 25/CS-25 and related AC/AMCs that are potentially conflicting with regulation 25.1322 alerting requirements and propose amendments as required.

6. Review other regulations and AC/AMCs (e.g. CS-AWO, CS-ACNS, AC 20-191, AC 120-28D, AC 120-29A, Part 23, 27 and 29) that are potentially conflicting with regulation 25.1322 alerting requirements and definitions (e.g. definition of “warning”) and propose amendments as required.

7. Recommend additional policy on centralized EICAS and master aural/master visual alerts, e.g. intended function of the master aural/master visual alerts in terms of drawing the crew’s attention to a particular location and consistency of color usage.

8. Review and potentially update the "alerting" and "color" sections of Advisory Circular (AC/AMC) 25.1302 and 25-11B. This should include but not be limited to providing recommendations on flight deck philosophy for alerting and how that philosophy should be evaluated in the context of complying with current amendment of regulation 25.1322. Clarify that the flight deck philosophy should not supersede the regulations.

9. Review and provide recommendations for addressing issues with the Certification Basis (including CPR), specifically on the question of impracticality (Part 21.A.101 (b)(3)).

Final CMTS Position (Phase 5 Completion Target: <Phase 4 + 2 Months>)

(Explain agreement, dissent or conclusion on the SME recommendation)

Report approved by the CMTS on 9th February 2023