

**Loss of Control
Joint Safety Implementation Team
Implementation Plan
for
Display and Alerting Features in New Airplane Designs**

Statement of Work:

To reduce fatal accidents due to loss of control, display and alerting systems in new airplane designs should include:

- Graphic speed trend information
- A pitch limit indication
- Bank angle limits to buffet
- Barber poles and amber bands on primary airspeed indications
- Detection and annunciation of conflicting attitude, airspeed and altitude data information
- Detection and removal of invalid attitude, airspeed and altitude data information (i.e., from an internal fault)
- Detection and removal of misleading attitude, airspeed and altitude data information (e.g., from an external sensor fault) to the extent feasible
- Information to perform effective manual recovery from unusual attitudes using chevrons, sky pointers, and/or permanent ground-sky horizon on all attitude indications
- Salient annunciation of autoflight mode changes and engagement status changes (e.g., blinking/colored/boxed mode information)
- Effective sideslip information and alerting of excessive sideslip (e.g., split trapezoid on attitude indicator)
- Clear annunciation of engine limit exceedances and significant thrust loss

Lead Organization for Overall Project Coordination (LOOPC):

AIA

Safety Enhancement:

New airplane designs include several display and alerting system features that improve flight crew situational awareness and assist in identifying situations that could lead to loss of control.

Score: 2007-(0.0) 2020-(1.6) 100%-(8.2)

Outputs:

Output 1:

Guidance materials are in place that adopt principles embodied in the final report of the ARAC Avionics Systems Harmonization Working Group that address the following display features:

- Graphic speed trend information
- A pitch limit indication
- Bank angle limits to buffet
- Barber poles and amber bands on primary airspeed indications
- Detection and annunciation of conflicting attitude, airspeed and altitude data information
- Detection and removal of invalid attitude, airspeed and altitude data information (i.e., from an internal fault)
- Detection and removal of misleading attitude, airspeed and altitude data information (e.g., from an external sensor fault) to the extent feasible
- Information to perform effective manual recovery from unusual attitudes using chevrons, sky pointers, and/or permanent ground-sky horizon on all attitude indications
- Salient annunciation of autoflight mode changes and engagement status changes (e.g., blinking/colored/boxed mode information)
- Effective side slip information and alerting of excessive sideslip (e.g., split trapezoid on attitude indicator)
- Clear annunciation of engine limit exceedances and significant thrust loss

Resources: ANM-100 (LOOC), ARAC Avionics Harmonization Working Group

Total government/industry resources: \$6.7M (see separate worksheet for details)

Timeline: 180 days for FAA to task ARAC (completed), 2 years for ARAC to report recommendations from date of tasking, 4 years to amend the AC from date of tasking

Actions:

1. The FAA tasks the ARAC Avionics Systems Harmonization Working Group to elevate the priority of their AC25-11 revision, and to include the JSIT display and alerting features in the scope of this task.
2. ARAC provides its recommendations to the FAA and the JAA.
3. FAA develops guidance material as appropriate.
4. JAA develops guidance material as appropriate.

Relationship to Current Aviation Community Initiatives:

- ARAC Avionics Harmonization Working Group
- Industry activity on display standards
- NTSB Recommendation A-96-16, A-96-18 and A-97-19 relative to Birgen Air 757

Performance Goals & Indicators for Outcomes/outputs:

Goal: Revised AC 25-11 and ACJ 25-11 that provides guidance for future airplanes to include identified display system features to improve pilot situational awareness relative to recognition of, and recovery from, upsets and low energy conditions.

- Indicator: Published revision to AC 25-11
- Indicator: Published revision to ACJ 25-11

Programmatic Approach:

Organizational Strategy

The LOC JSIT identified Bob Robeson, AIA, as the JSIT project lead for Display and Alerting Features in New Airplane Designs. The project lead will assist with the implementation of the activities outlined in this Implementation Plan and will, when requested, provide progress reports to the CAST. Implementation of this project is viewed as a shared responsibility and tasks will be divided between the FAA and organizations/persons in industry. The Lead Organization for Overall project Coordination (LOOPC) is AIA. The Lead Organizations for Output Coordination (LOOC) are identified in each Output of this Implementation Plan. The roles and responsibilities of the LOOPC and LOOC are described in the CAST approved JSIT Process Document.

Implementation Activities

Several loss-of-control accidents involved cockpit displays of engine parameters, flight information and autoflight system mode status as contributory factors. The problems centered on not having sufficient, obvious and unambiguous information available to the pilot to adequately assess the aircraft status and then to accomplish the appropriate action to resolve problems. The objective of this project is to enhance the guidance in AC 25-11 by including additional recommendations for information to be displayed and modality of display logic.

Current state of the art glass cockpit airplanes address most of these issues. New aircraft and cockpit display designs will be evaluated with reference to the guidance provided in the amended AC25-11.

Key Products and Milestones:

- FAA tasks ARAC Avionics Systems Harmonization Working Group to include display system guidance in scope of their work – 90 days (completed)
- ARAC recommendations on display system guidance– 2 years from receipt of FAA tasking request
- Amended AC/ACJ 25-11 – 2 years from receipt of ARAC recommendations

Plan and Execution Requirements:

Changes to certification guidance materials only affect new airplane designs. Design changes, by nature, take a long time and require significant resources. Incorporating new safety features into new airplane designs is technically feasible and desirable. However, it takes many years for these changes to have a significant impact on overall fleet safety, given the time it takes to develop a new airplane and for these airplanes to become a significant part of the fleet.

Risk Description:

- Normal policy process and timeframe (e.g., ARAC, harmonization, etc.)
- Potential failures to implement advisory material
- New airplanes will represent a miniscule part of fleet in 2007
- Potential economic burden on manufacturers and operators
- Potential inadequate resource availability for manufacturers and operators and FAA
- Potential unwillingness to voluntarily implement project outputs
- Difficulty to incorporate a list of recommended display features into AC 25-11 without constraining manufacturer's ability to develop an integrated pilot interface design

Risk Mitigation Plan:

- CAST will support timely and successful completion of ARAC activity
- Ensure manufacturer and human factors input to AC 25-11 revision process

Impact on Non - Part 121 or International Applications:

All operators of the airplane will be impacted by changes to the design.