

**SE-36**

**Loss of Control  
Joint Safety Implementation Team  
Implementation Plan  
for  
Minimizing Mode Confusion in New and Existing Airplane Designs**

**DRAFT**

**Statement of Work:**

To reduce fatal accidents due to mode confusion leading to loss of control, information regarding observed instances of flight crew mode confusion on each model should be disseminated to operator training departments, manufacturers, and the aviation human factors research community.

**Lead Organization for Overall Project Coordination (LOOPC):**

NASA

**Safety Enhancement: (SE-36)**

New airplanes and features minimize the potential for automation mode confusion, and operator training programs incorporate best practices and standards to avoid mode confusion. Aviation human factors researchers use in-service data to develop improved design standards and guidance.

**Score:**                      2007-(0.0)                      2020-(0.0)                      100%-(0.0)

**Outputs:**

**Output 1:**

NASA/ALPA survey and report using information from instructors and check airmen relating to mode confusion during training and line operations. This includes looking at past surveys and studies to avoid duplication. The survey should identify specific instances (by airline and model) of mode confusion, systematic error, and inadequate understanding by line crews, as witnessed by the respondents. A de-identified summary report should be sent to CAST and aviation human factors working groups, while specific model and airline comments will be provided to the operators and manufacturers.

**Resources:** NASA (LOOC), ALPA, manufacturers, operators, FAA, pilot associations

Total government/industry resources: \$1.0M (see separate worksheet for details)

**Timeline:** 1 year to complete survey, 180 days to produce report of survey results

**Actions:**

1. CAST will request that NASA work with ALPA, manufacturers and operators to develop the survey, using NAOMS and ALPA electronic survey methodology.
2. NASA and ALPA conduct the survey.
3. NASA and ALPA will work with the manufacturers and operators to analyze the data to identify aircraft and airline specific mode confusion issues and determine the contributions due to training and/or design. NASA will disseminate de-identified results to CAST, and specific results to manufacturers and operators.

**Relationship to Current Aviation Community Initiatives:**

- Industry activity on mode confusion
- ARAC Flight Guidance System Harmonization Working Group
- NTSB Recommendation A-98-5 relative to the Miami A300.

**Performance Goals & Indicators for Outcomes/outputs:**

Output 1:

Goal: Improved data relating to specific instances of mode confusion and systematic error

- Indicator: Published report of completed NASA survey submitted to CAST, manufacturers, operators, and human factors working groups

**Programmatic Approach:**

*Organizational Strategy*

The LOC JSIT identified Mike Lewis, NASA, as the JSIT project lead for Minimizing Mode Confusion in New and Existing Aircraft. 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*

There continues to be anecdotal evidence that systematic error and mode confusion exists in automated aircraft. This element of the project intends to provide a mechanism to conduct an industry-wide survey of pilot groups operating automated aircraft to determine how prevalent systematic error and mode confusion is and specific descriptions of systematic error and mode confusion events, in both the training environment and aircraft operations. The NASA/ALPA survey should identify what constitutes systematic error and mode confusion, systems or displays in aircraft or training program elements that contribute to or eliminate systematic error and mode confusion. The findings of this survey should provide useful information that manufacturers can implement in changes to existing designs and to develop new designs. In addition, the “industry-wide” nature of the survey should provide information for operators and inspectors to use to improve training programs and operations to reduce or eliminate systematic error and mode confusion. Implementation of this element should include:

- Development, conduct and analysis of the survey
- Implementation of the survey findings in system and display design
- Reduction of systematic error and mode confusion events in training programs and aircraft operations

### **Key Products and Milestones:**

- NASA/ALPA study report distributed to manufacturers, operator training departments and human factors working groups – 1.5 years

### **Plan and Execution Requirements:**

Design changes, by nature, take a long time and cost a lot of money. 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.

Incorporating new safety features into existing aircraft or derivatives can have a more immediate impact on overall fleet safety, but these changes are usually expensive, technically complex, and can have significant operational impacts. Often the return on investment is low for retrofits to aging aircraft.

Because changes to certification rules only affect new airplane designs, any near-term benefits to be realized through retrofit of the existing fleet require voluntary implementation by manufacturers and operators.

### **Risk Description:**

- Potential economic burden on manufacturers and operators
- Potential inadequate resource availability for manufacturers and operators and FAA
- Potential unwillingness to voluntarily implement survey recommendations

### **Risk Mitigation Plan:**

- Seek consensus on the use of existing studies and surveys by citing use in industry

### **Impact on Non - Part 121 or International Applications:**

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