SE 21 (22)

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**Approach and Landing Accident Reduction
Joint Safety Implementation Team**

**Implementation Plan
For
Flight Deck Equipment Upgrade/Installation to Improve
Altitude Awareness and Checklist Completion**

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Statement of Work:

The purpose of this project is to ensure altitude awareness and accomplishment of checklist items. This will be accomplished through the development of guidelines and procedures for flight deck smart alerting system design and supporting operational procedures and training based upon:

- The installation of equipment to provide automatic aural altitude alert call outs on final approach or other such altitude alerting systems.
- The installation of automated or mechanical checklist devices to provide a positive means for checklist completion.
- Research and assessment of existing technology in flight deck smart-alerting system design.

Lead Organization for Overall Project Coordination (LOOPC):

AIR-1

Outcome:

A reduction in approach and landing accidents through refinement of guidance for automated or mechanical checklist devises, and automatic altitude call outs (including arrival at MDA/DH) and checklist design.

New Type Design Aircraft
Applies to Type Certificates (TC's) (new and amended) and Supplemental Type Certificates (STC's) as required for smart alerting.

OUTPUT #1/SE 21. Implement interactive electronic checklist and smart alerting systems that address issues: such as:

- Reduced nuisance alerts
- Reduced redundant alerts

- Flight-phase sensitive alerts (e.g., some alerts attenuated on takeoff roll, others on short final approach)
- Built-in logic prompting the flightcrew to appropriate actions

Resources: AIR-1 (LOOC), AFS, Manufacturers, Airlines/Operators (training)

Timeline: 1) FAA: 24 months, 2) Manufacturers: with each new type design aircraft following issuance of advisory material, 3) Operators: with delivery of new type design aircraft.

Actions: 1) FAA and Industry: Develop advisory material defining the characteristics of interactive checklist and smart alerting systems for all new type designs. Develop compatible operational guidance. 2) Manufacturers: Design and Install on new Type Design aircraft. 3) Operators: Develop training syllabi and procedures for use.

OUTPUT #2/SE 21. Manufactures evaluate/consider during checklist design, the principles contained in the FAA *Human Performance Considerations in the Use and Design of Aircraft Checklists*, the *NASA Contract Report on Design of Flight-Deck Procedures* and the *NASA Human Factors of Flight-Deck Checklist: The Normal Checklist*.

Resources: AIA (LOOC), FAA, Airlines/Operators, ALPA, APA, ATA, RAA, NACA

Timeline: During development of new type design after issuance of advisory material.

Actions: Analyze the FAA *Human Performance Considerations in the Use and Design of Aircraft Checklists*, the *NASA Contract Report on Design of Flight-Deck Procedures*, NASA *Human Factors of Flight-Deck Checklist: The Normal Checklist*, and evaluate/consider during design of checklist.

OUTPUT #3/SE 21. Manufacturers should provide automatic aural altitude call outs on final approach for all new type design aircraft (including arrival at MDA/DH).

Resources: AIR-1 (LOOC), AFS, Manufacturers, Airlines/Operators (training)

Timeline: 1) FAA and Industry: 24 months, 2) Manufacturers: with each new type design aircraft following issuance of advisory material, 3) Operators: with delivery of new type design aircraft.

Actions: 1) FAA: Develop advisory material defining the standards for automatic aural altitude call outs on final approach (including arrival at MDA/DH) for all new type design designs. 2) Manufacturers: Design and Install on new type design aircraft. 3) Operators: Develop training syllabi.

SE 22: Outputs: Existing Aircraft Type Designs

OUTPUT #4. / SE22 Reassess checklists used in the existing fleet by considering the principles contained in the FAA *Human Performance Considerations in the Use and Design of Aircraft Checklists*, the *NASA Contract Report on Design of Flight-Deck Procedures* and the *NASA Human Factors of Flight-Deck Checklist: The Normal Checklist,* and revising as necessary.

Resources: AFS-1 (LOOC), Airlines/Operators, ALPA, APA, ATA, RAA, NACA, Manufacturers

Timeline: 1) FAA; 12 months, 2) Manufacturers and airlines/operators; 12 months after issuance of advisory material and policy guidance.

Actions: Manufactures and airlines analyze the FAA *Human Performance Considerations in the Use and Design of Aircraft Checklists*, the *NASA Contract Report on Design of Flight-Deck Procedures*, NASA *Human Factors of Flight-Deck Checklist: The Normal Checklist*, review checklists and revise as necessary.

OUTPUT #5. / SE 22 Until TAWS is fully implemented, altitude reminder systems (such as altimeter bugs for MDA/DH) should be installed to improve altitude awareness on final approach.

Resources: AFS-1 (LOOC), Airlines/Operators, ALPA, APA, ATA, RAA, NACA

Timeline: 1) FAA; 12 months 2) Airlines/operators; 12 months after issuance of advisory material and policy guidance for altitude alerting or reminder systems.

Actions: Develop draft advisory material for FAR Part 121 operators and policy guidance for inspectors. Airlines/Operators install equipment and train for its use.

Relationship to Current Aviation Community Initiatives:

- TAWS Rule
- FAA and NASA Checklist Studies previously distributed by FSF, Boeing and Airbus
- Features already incorporated in many current aircraft
- NASA Single Aircraft Accident Prevention Project (manufacturers/human factors survey of existing technologies)

Performance Goals & Indicators for Outcomes/outputs:

- **Goal:** Substantial reduction or elimination of ALAR accidents involving Part 121 carriers worldwide.

- **Indicators:**
  - A reduction in procedural non-compliance.
  - Part 121 ALAR accident rate is reduced.
  - All checklists incorporate the principles within the FAA and NASA checklist studies and other appropriate documents.
  - All aircraft incorporate radio altimeters and audio callouts.
  - All new aircraft incorporate smart alerting systems.

Programmatic Approach:

Organizational Strategy

The CFIT/ALAR JSIT identified Jerry Davis of Airbus Industries (904-322-8186) as the CFIT/ALAR JSIT Project Lead for Flight Deck Equipment Upgrade/Installation. The project lead will assist with implementation activities outlined in the Implementation Plan and will provide progress reports, when requested to do so, to the CFIT/ALAR JSIT. Implementation is viewed as a shared responsibility and tasks will be divided between the FAA and organizations in industry. The Lead Organization for Overall project Coordination (LOOPC) is AVR-1. 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

In collaboration with industry (AIA, Operators, Manufactures, and Employee Groups) the FAA will issue new and revised advisory material and policy guidance to implement interactive electronic checklist and smart alerting systems for all new type design aircraft operated under FAR Part 121. In addition, under existing ARAC tasking the FAA will publish an amendment to Part 25 (25.1322) of the FAA Regulations for smart alerting system requirements. The results of numerous FAA, NASA, and other studies dealing with checklist development will be incorporated in checklist design. Checklist in use by the existing fleets will be re-assessed and enhanced using numerous studies concerning checklist design. The FAA, in collaboration with industry, will issue advisory material and policy guidance for revision, if necessary, of presently used checklist. The implementation of altitude alerting systems for the existing fleets will also be contained in the guidance material.

Key Products and Milestones:

FAA: Draft advisory material for the installation of smart alerting systems in all new designs. Further, FAA will revise and refine existing guidance material for interactive checklists. Develop draft Advisory Circular and policy guidance for inspectors.
  - Manufacturers: Design and Install on new TC aircraft.
  - Airlines/Operators install equipment and train for its use..

FAA: Analyze existing checklist studies and develop draft Advisory Circular and policy guidance for new and existing aircraft.
- Manufacturers and airlines/operators review checklist and revise as necessary.

FAA: Draft advisory material and policy guidance implementing altitude-alerting systems for existing aircraft.
- Manufactures and operators commit to implementation of altitude alerting systems on all existing aircraft.

Plan and Execution Requirements:

The FAA and industry must work in collaboration on the development of the amendment to Part 25 of the FAA Regulations implementing smart alerting systems for new type design aircraft. The guidance material for both smart alerting and interactive checklist design should be user friendly, and clearly written with specific examples, to facilitate the current thoughts on implementation and recommended checklist design for new and existing aircraft. The FAA, NASA, and other studies should be used as a model for checklist development for both new and existing aircraft. Until the TAWS rule mandates altitude alerting systems, the FAA and industry must work together in developing guidance material that implements altitude alerting methods for the existing aircraft.

Risk Description:

- Normal rulemaking process and timeframe.
- Potential failures to implement advisory material.
- Economic burden for low end users.
- Challenging validity of FAA, NASA, and other checklist reports.

Risk Mitigation Plan:
- Pending successful change to Part 25, FAA and Industry will continue with voluntary equipage for all new aircraft.
- Failure to implement advisory material for existing aircraft may require additional rulemaking.
- Seek consensus on the use of existing checklist studies by citing use in Industry.
- Low cost alternatives of altitude alerting systems would be installed voluntarily by operators of existing aircraft until mandated by TAWS.

Impact on Non - Part 121 or International Applications:

Equipment changes already incorporated in existing type design in many new aircraft. Alternative altitude alerting methods, such as altimeter bugs, are used on many existing aircraft. Additional methods of altitude alerting methods of low cost for existing aircraft would be widely accepted by industry.