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Approach to Landing Guidance System for Transport Aircraft

RATIONALE

This document has been revised to include new information in its contents. The title has also been changed to appropriately reflect the contents.

1. SCOPE

This document specifies requirements for an Approach to Landing Guidance System (ALGS) electronic device. This equipment shall display relative aircraft position and situation information for flight along precision three-dimensional paths within the appropriate coverage area. The precision three-dimensional path may be an ILS straight-in look-alike path or a complex, curved path. The requirements are applicable to electronic devices capable of receiving signals or other information from one or more sources, including but not limited to ILS, GNSS, or IRU inputs.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

This document should be used in conjunction with the ARP4102 Core Document. The following documents may also be applicable.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

ARP4101 Flight Deck Layout and Facilities

ARP4102/4 Flight Deck Alerting System (FAS)

ARP4102/6 Communications and Navigation Equipment

ARP4102/9 Flight Management System (FMS)

ARP4103 Flight Deck Lighting for Commercial Transport Aircraft

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For more information on this standard, visit
https://www.sae.org/standards/content/ARP4102/12B/

ARP4105 Abbreviations, Acronyms, and Terms for Use on the Flight Deck

2.2 Definitions

ALGS ELECTRONIC DEVICE: Airborne electronic equipment that receives radio signals or other information and processes these inputs to attain an accurate position estimate of the airplane and provides lateral and vertical precision path deviation information as an output signal. The LGS electronic device precision path shall at a minimum provide an ILS straight-in look-alike path but may also be able to provide information for complex, curved paths.

3. OPERATIONAL REQUIREMENTS

3.1 General Requirements

Manually Controlled and Automatic Flight: The ALGS shall be capable of providing information that allows appropriate guidance for both manually and automatically controlled flight.

Crew Workload: During critical phases of an approach or departure, the use of ALGS derived guidance shall not increase crew workload above that required using other acceptable guidance sources. During any phase of flight, the workload should not interfere with normal crew vigilance required for safety.

Flight Deck Integration: The ALGS related airborne equipment, installed in the flight deck, shall meet the requirements established by flight deck standards for instrumentation and controls, including human factor considerations.

Information and Guidance Integration: ALGS derived guidance shall be smooth and ALGS situation information shall remain coherent when transitioning from enroute navigation to ALGS signals and throughout the entire approach while within the appropriate ALGS signal coverage.

Display and control of barometric altitude/height as the basic system of altimetry shall not be affected by the availability of ALGS derived altitude. ALGS derived altitude may be used for guidance and control along the portion of the final approach course route in which the final descent has been programmed.

3.2 Functional Requirements

3.2.1 Types of Flight Paths

The ALGS shall be capable of providing information that allows appropriate guidance for straight-in precision (ILS-LOOK-ALIKE) approaches, landings, and missed approaches.

Where the implemented guidance system permits, the ALGS shall be capable of providing information that allows appropriate guidance for the following phases of flight:

- STARs
- Three-dimensional multiple-segment curved path approaches
- Computed centerline aproaches
- Landing roll
- Missed approaches

During the execution of a missed approach, the ALGS system shall provide guidance depicting the appropriate guidance and path information from any point on the approach path to the missed approach point and thence along the appropriate path to the final fix of the missed approach procedure.

If the ALGS uses multiple sensors for different sections of the approach and missed approach, the system should utilize appropriate navigation sources for each section.

Where the implemented guidance system permits, the ALGS may also be capable of providing information that allows appropriate guidance for the following phases of flight:

- Takeoff roll/initial climb
- Departures/SIDs

3.2.2 Approach to Landing Guidance System Electronic Device

The final approach course, the glide path, and the missed approach course may be automatically programmed or manually selected. In either mode, the final approach course and the initial segment of the missed approach course shall be able to be referred to both true and magnetic North, whichever is required for the instrument procedure. The glide path of the final approach course shall be a constant, earth-referenced descent.

If the ALGS is in a manual mode, the crew shall select values for the final approach course, the glide path (if applicable), and the missed approach course. A means shall be provided to prevent selection of values outside of acceptable limits.

If the final approach course, the glide path angle, and/or the missed approach course selected in the receiver are different from the values received through a data link, an alert shall be presented.

3.2.3 Database Requirements

The NAV data base shall contain sufficient data to completely define the approach procedure(s) that shall be used. The crew should not be required to insert additional navigation data to conduct an approach unless modifications are required by air traffic control.

It shall be possible to verify the data used to define the approach and the landing runway. Verification of the data shall not affect navigation and guidance.

For an approach on a given runway, once the aircraft has passed the final approach fix, the final approach path shall not be modifiable by the crew, and, in this case, if the crew attempts to modify the path, the crew shall be clearly informed of the reason why his attempt has failed. Before the final approach fix, the approach path may be modified within applicable ATC constraints.

3.2.4 Safeguards

Tolerance to Electronic Transients: Transients or loss of electrical power usual to normal operations (including generator or bus transfer) shall not erase or alter the flight plan route, display configuration, or operation modes.

3.2.5 System Status and Warning

Signal Reception: When a flight deck alerting system is installed, an indication shall be provided to the crew when a ALGS component required for the approach is not being received by the airborne system.

Airborne Equipment Self-Tests: All self-tests shall be performed automatically. Only test faults should be annunciated.

Signal Quality: The ALGS shall continuously monitor and perform checks on signal quality of sensor inputs used to compute ALGS path guidance.

If the ALGS does not meet the requirements for performing the approach, a timely and distinctive alert shall be given per 14 CFR 25.1322/CS25.1322.

4. PANELS

Not used.