

Submitted for recognition as an American National Standard

AIRBORNE WINDSHEAR SYSTEMS

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CANCELLED

1. SCOPE: This document recommends criteria for Airborne Windshear Systems, including operational objectives, characteristics and functional requirements.

The recommendations of this document apply to transport aircraft, and describe the operational objectives of windshear warning devices, situational displays, guidance systems and detection/avoidance systems.

2. REFERENCES:

- 2.1 Applicable Documents:

ARP 450D - Flight Deck Alerting System

- 2.2 Definitions:

- 2.2.1 Airborne Windshear Alerting System: A device or system which identifies the presence of windshear after the phenomenon is encountered. Alerting devices of this type do not provide guidance information to the pilot.
 - 2.2.2 Airborne Windshear Flight Guidance System: A device or system which provides the pilot with flight guidance to improve recovery probability in an inadvertent windshear encounter.
 - 2.2.3 Airborne Windshear Automatic Recovery System: A device or system which integrates or couples autoflight systems of the aircraft with an Airborne Windshear Flight Guidance System.
 - 2.2.4 Airborne Windshear Detection and Avoidance System: A device or system which detects a severe windshear phenomenon far enough in advance of the encounter in both the takeoff/climbout profile and the approach/landing profile to allow the pilot to avoid the windshear.

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- 2.2.5 Airborne Windshear Situational Display: A display which presents pertinent windshear information such as flight path and stall margins. May be available in conjunction with alerting, guidance and/or detection/avoidance systems. Windshear severity information may be supplied to the pilot on a continuous basis. Does not provide guidance information.
- 2.2.6 Recovery Procedure: A flight path control technique used to escape from an inadvertent encounter with windshear.
- 2.2.7 Avoidance Procedure: A procedure which attempts avoidance of an area of known or predicted windshear (not yet penetrated).
- 2.2.8 False Alert: An alert which occurs when the design windshear threshold conditions do not exist.
- 2.2.9 Nuisance Alert: An alert which occurs at too low a level of windshear to warrant a windshear alert.
- 2.2.10 Windshear Cautionary Alert: An alert which is set at a windshear level requiring pilot awareness and may require pilot action.
- 2.2.11 Windshear Warning Alert: An alert which is set at a windshear level requiring immediate corrective or compensatory action by the pilot.

3. OPERATIONAL REQUIREMENTS:

3.1 Airborne Windshear Alerting Systems:

- 3.1.1 Windshear alerting systems shall function in initial climb and landing approach, and are desirable in takeoff roll and rotation.
- 3.1.2 Windshear alerting systems shall function below approximately 1000 feet AGL.
- 3.1.3 Measurement of the level of a windshear encounter should be a measure of the energy change from the horizontal and/or vertical winds of a shear, in whatever combination they appear.
- 3.1.4 Windshear alerting systems may be designed to interface with other required systems.
- 3.1.5 Windshear alerting systems shall not adversely affect the functioning of other aircraft systems.
- 3.1.6 The probability of a false alert shall be 10^{-5} per flight hour or less.
- 3.1.7 The probability of an unannounced failure shall be 10^{-5} per flight hour or less.
- 3.1.8 Windshear alerting systems shall be designed with suitable monitoring capability of sensor inputs to the system. Automatic and continuous monitoring should be implemented. As a minimum, a self-test feature with pass/fail criteria and suitable failure annunciations shall be required.

3.1.9 Windshear alerting systems should function independently of windshear guidance system (autopilot or flight director modes of operation).

3.1.10 Windshear Warning Alert:

3.1.10.1 A windshear Warning Alert shall occur no later than the annunciation and presentation of windshear guidance (if installed).

3.1.10.2 Windshear Warning Alerts should activate at the lesser of 1) a shear magnitude resulting in a 0.15 "g" performance loss filtered for normal turbulence, or 2) upon critical degradation of performance capability (less than level flight) for measured conditions and configuration.

3.1.10.3 Windshear Warning Alerts shall cease when adverse conditions no longer exist. Adverse conditions include, but are not limited to, the conditions which initiate the alert. Additional criteria, e.g., attainment of a minimum altitude, may be applicable to the cessation of alerts. See Section 6, Displays, for specific details of aural, visual, and voice features.

3.1.11 Windshear Cautionary Alert:

3.1.11.1 A windshear Cautionary Alert may precede a windshear Warning Alert of decreasing performance or may provide an alert of increasing performance shear.

3.1.11.2 Windshear Cautionary Alerts shall cease when the alerting conditions no longer exist. Alerting conditions are limited to those conditions which trigger the Cautionary Alert.

3.2 Airborne Windshear Flight Guidance System and Automatic Recovery Systems:

3.2.1 Recovery guidance should utilize the available kinetic and potential energy of the aircraft. If terrain contact is a consideration, recovery guidance should provide commands to take advantage of all usable aircraft energy.

3.2.2 Recovery guidance should consider such things as height above the ground, vertical speed, shear severity, aircraft climb capability, and rate of performance degradation.

3.2.3 For each aircraft type in which windshear flight guidance systems are installed, adequate controllability shall be demonstrated within the envelope of the system commands.

3.2.4 The probability of misleading guidance commands shall be 10^{-5} per flight hour or less.

3.2.5 Windshear flight guidance systems shall be designed to interface with other required systems.