

Electronic Displays

RATIONALE

This document has been reaffirmed to comply with the SAE 5-Year Review policy.

FOREWORD

Changes in this reaffirm are format/editorial only.

1. SCOPE:

This document recommends criteria for electronic displays on the flight deck of transport aircraft. Electronic displays include electronic flight instruments, alert displays, aircraft system displays and control/display units for flight management and radio management systems.

2. REFERENCES:

2.1 Documentation:

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

- SAE S-7 ARP4101, Flight Deck Layout and Facilities
- SAE S-7 ARP4105, Nomenclature and Abbreviations for Use on the Flight Deck
- AIR1093, Numeral, Letter, and Symbol Dimensions for Aircraft Instrument Displays
- ARP1874, Design Objectives for CRT Displays for Transport Aircraft
- AS8034, Airborne Multi-Purpose Electronic Displays

3. OPERATIONAL REQUIREMENTS:

- 3.1 Electronic displays shall not cause eye strain or other undesirable physiological effects. Suitable damping shall be provided to ensure display stability and legibility.
- 3.2 Bezel or surface curvature cut-off should not exist within the viewing angles required to satisfy paragraph 6.1.6 of ARP4102 Core Document.
- 3.3 Display elements shall enter and leave the display area smoothly. The last digit of numerical read outs should change without causing distraction (e.g., rolling digit). Digital data of no current value should not be displayed.

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- 3.4 Displays shall be legible under all lighting conditions experienced in the flight deck, including direct sunlight, and throughout the flight envelope. Color degradation under high and low levels of lighting shall not preclude the pilot from interpreting display information. Intensity adjustment controls will be minimized and will have a tactile reference point.
 - 3.5 Displays shall remain legible, stable, and unambiguous when operating in a degraded or monochromatic mode.
 - 3.6 Normal power transfers or other power fluctuation shall not cause a significant interruption of display operation or change in display content. Pilot selected values shall not change as a result of power interruption.
 - 3.7 Adequate electrical power sources shall be provided to assure continued display of attitude, altitude, airspeed, heading and appropriate navigation, power plant, alerting and systems information for completion of the flight.
 - 3.8 Standby navigation information shall be sufficient to cope with the anticipated weather and traffic conditions of a specific aircraft's operational environment.
 - 3.9 Displays on the pilot's panels that a third crew member is required to monitor shall be visible and legible to him from his seated position with the harness condition specified for the phase of flight.
 - 3.10 Manual or automatic deselection of appropriate data may be provided to suppress information not required for a specific flight phase.
4. PANELS:
- Number not used.
5. CONTROLS:
- Number not used.
6. DISPLAYS:
- 6.1 General:
- 6.1.1 Primary flight instruments include Primary Flight Display (PFD)/Electronic ADI (EADI), and Electronic HSI (EHSI)/Navigation Display (ND).
 - 6.1.2 The hysteresis, inertia, and other lag effects of attitude, speed, altitude, vertical speed and flight guidance displays shall be such that the pilot's ability to control the aircraft flight path manually is not degraded.
 - 6.1.3 The lag between pilot selection and subsequent display of primary flight data shall not exceed 0.25 seconds. The lag between format selection and display shall not exceed 1.0 second and the system lag associated with presentation of nonessential data should not exceed 4 seconds.

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6.1.4 Figures and letters should subtend not less than the following vertical angles at the design eye position of the pilot who normally uses the instruments:

Primary data	- 6 milliradians
Nonessential and Secondary data	- 4 milliradians
Minor descriptive legends may be reduced to	- 3 milliradians

6.2 Primary Flight Instruments - EADI/PFD:

6.2.1 The instrument shall provide a clear and unmistakable display of aircraft attitude and/or flightpath relative to the true horizon. The display shall provide unmistakable information of unusual attitudes in all possible combinations of pitch and roll.

6.2.2 Pitch attitude scaling shall be such as to enable the pilot to determine the aircraft attitude with an accuracy of one degree within the range of +30 and -20 degrees.

6.2.3 A horizon reference/ground patch/sky patch shall be visible to 85 degrees of pitch up or pitch down. From 86 to 90 degrees of pitch up or down, only the sky or ground texture will show.

6.2.4 The roll reference scale and pointer should be located at the top of the attitude display and coordinated to minimize incorrect roll direction and should not overlap or blank pitch lines.

6.2.5 The display shall incorporate means for displaying command (director) information and deviation for flight paths and profiles used in normal operation. When command and deviation information for a single function are both included, similar symbols shall not be used for both parameters.

6.2.6 The following information shall be presented:

- (i) Horizon line
- (ii) Aircraft reference symbol
- (iii) Pitch scale
- (iv) Roll pointer and scale
- (v) Flight Director Command (or Equiv.) when selected
- (vi) Speed deviation and scale (F/S) (may be incorporated in an airspeed display)
- (vii) Vertical deviation and scale (when ILS or MLS is selected)
- (viii) Lateral deviation and scale (when ILS or MLS is selected)
- (ix) Lateral acceleration
- (x) DH/MDA warning (when selected)
- (xi) Failure annunciation
- (xii) Flight path angle/flight path vector

6.2.7 When the EADI/PFD is located above the EHSD/ND, the following information shall be presented in the EHSD/ND and may be duplicated in the EADI/PFD:

- (i) Magnetic heading/track and scale
- (ii) Selected heading/track
- (iii) Selected course/desired track