

FLIGHT DECK PANELS, CONTROLS, AND DISPLAYS

RATIONALE

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

1. SCOPE:

This document recommends criteria for the design, installation and operation of panels, controls, and displays on the flight deck of transport aircraft.

2. REFERENCES:

2.1 Documentation:

- SAE S-7 ARP4101, Flight Deck Layout and Facilities
- SAE S-7 ARP4102, Flight Deck Panels, Controls, and Displays, Annexes
- SAE S-7 ARP4105, Nomenclature and Abbreviations for Use on the Flight Deck
- AS8043, Minimum Performance Standard for Airborne Multipurpose Electronic Displays
- AIR1093, Numeral, Letter, and Symbol Dimensions for Aircraft Instrument Displays
- SAE Committee G-10, ARP4032, Application of Color to Electronic Instrument Systems

2.2 Definitions:

2.2.1 Design Eye Position: (DEP) A point fixed in relation to the aircraft structure (neutral seat reference point) at which the pilots' eyes should be located when seated at the normal position. The DEP is the principal dimensional reference point for the location of flight deck panels, controls, displays, and external vision. (Ref. Fig. 2 of ARP268F or Fig. 1 of ARP4101.)

2.2.2 Accessible: Within the reach of a crew member whose seat is at the position that locates his/her eyes at the DEP, with harness adjusted normally for the flight condition.

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2.2.3 Equipment Designation: Where more than one unit of equipment is installed, they shall be designated as follows:

- Power plant and dependent equipment: Number consecutively from left wing, fuselage, right wing
- Crew station assigned equipment: Left or 1, Right or 2, Center or 3
- Non-assigned equipment: A, B, C or Color Coded (e.g., Blue, Green, Yellow), or 1, 2, 3 (Least preferred)

2.3 Abbreviations: Where abbreviations are used to designate or placard equipment, they should comply with S-7 ARP4105.

3. OPERATIONAL REQUIREMENTS:

3.1 General:

3.1.1 Flight deck controls and displays are the main interface of the aircraft with the flight crew. In order to ensure safe and effective operation, controls and displays should be simple, rational, and user-friendly.

3.1.2 Integration of controls and displays is desirable but should be used only where a sound and proven operational philosophy has been defined early in the design of the flight deck and strictly adhered to (e.g., dark/quiet flight deck).

3.1.3 Integration of controls and displays should be used only where it can be shown that integration will contribute to:

- improved accessibility
- reduced workload
- operational flexibility
- compatibility with other flight deck controls and displays

3.1.4 Flight deck controls and displays shall be designed so that:

- operation is unaffected by abnormal environmental conditions (e.g., lightning, turbulence)
- safety of flight can be maintained under extreme conditions

3.1.5 Control panels and displays shall be designed in an orderly and functionally partitioned manner conducive to error-free operation and comprehension of data displayed.

3.1.6 Operational control panels should not contain test function controls.

4. PANELS:

4.1 Pilot's Primary Instrument Panel:



4.1.1 Location and Function:

- 4.1.1.1 The panel shall be located directly in front of the pilot and shall display the necessary vertical and horizontal situation and command information as well as navigation data.

Areas of the panel that contain displays or controls used during any flight phase shall be visible to the pilot from all eye positions within a sphere whose radius is 32 mm (1.25 in) from the design eye position, assuming binocular vision.

- 4.1.1.2 The panel shall be oriented so as to minimize parallax, while at the same time preventing reflections and glare.
- 4.1.1.3 The top of the panel should be as close to the windshield lower cutoff as possible, so as to minimize vertical scan between head down displays and external vision.

4.1.2 Display Arrangement:

- 4.1.2.1 In each panel, pitch and roll attitude and/or flightpath situation and command information shall be displayed in the central upper area. The Basic T arrangement shall be implemented by locating basic flight data in the positions described in paragraphs 4.1.2.3 - 4.1.2.6.

- 4.1.2.2 Where the primary attitude instrument is located above the primary navigation instrument, the vertical center line of the attitude instrument should not be displaced more than 25 mm (1.0 in) from the vertical plane passing through the DEP and parallel to the longitudinal axis of the aircraft. The instrument shall be located as high in the panel as possible.

Where the primary attitude instrument is located beside the primary navigation instrument, the vertical center line of the attitude instrument should not be displaced more than 63 mm (2.5 in) from the vertical plane passing through the DEP and parallel to the longitudinal axis of the aircraft.

- 4.1.2.3 Airspeed and related parameters such as Mach number shall be displayed on the left side of the vertical center line. The center of a separate circular airspeed indicator shall be less than 25 mm (1.0 in) above or below the extended horizontal center line of the attitude display. Where airspeed is incorporated in an EADI/PFD using a moving scale presentation, the present value shall be aligned with the horizontal center reference line of the attitude/flight path display.

- 4.1.2.4 Altitude and related parameters such as glideslope and vertical speed shall be displayed on the right side of the vertical center line. The center of a separate circular altimeter shall be less than 25 mm (1.0 in) above or below the extended horizontal center line of the attitude display. Where altitude is incorporated in an EADI/PFD using a moving scale presentation, the present value shall be aligned with the horizontal center reference line of the attitude/flight path display.
- 4.1.2.5 Basic navigation information shall be displayed in the lower central area. The present value of heading should be aligned with the vertical center line of the attitude/primary flight display.
- 4.1.2.6 Standby instruments shall be located in a position that enables both pilots to monitor the instruments and that minimizes eye movement between standby instruments.

4.2 Pilot's Center Instrument Panel:

4.2.1 Location and Function:

- 4.2.1.1 The panel should include those system displays that are vital to the safe operation of the aircraft. These may include power plant, configuration, flight control, systems monitoring/status, and warning system displays.
- 4.2.1.2 Controls located on the panel should be accessible to both pilots.
- 4.2.1.3 Areas of the panel that contain displays or controls used during any flight phase shall be visible to both pilots for all eye positions within a sphere whose radius is 32 mm (1.25 in) from the DEP.

4.2.2 Display Arrangement:

- 4.2.2.1 The necessary power plant, configuration, system and warning displays and related controls shall be laid out in an easily identifiable and logical arrangement.
- 4.2.2.2 Power plant indicators or displays shall be aligned by function and power plant position and arranged in the order (a), (b), (c) below, either from top to bottom or from left to right. (If required) for a 3-crew operation, the secondary instruments may be located at a third crew member's station.
- (a) Primary power or thrust parameter indicators, e.g.,
EPR/N1/BHP/torque/manifold pressure/reverser position
 - (b) Primary limitation and function indicators, e.g.,
EGT/TGT/N2/cylinder head temp.
 - (c) Secondary limitation and function indicators, e.g., oil press/oil temp/vibration.