U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Avionics Human Factors Considerations for Design and Evaluation

Date: 5/1/19 **AC No:** 00-74

Initiated By: AIR-6B0

1 PURPOSE.

This advisory circular (AC) identifies two reports that provide information in the form of "recommended practices" to increase awareness of human factors and facilitate the identification and resolution of human factors/pilot interface issues during the design and evaluation of avionics. The reports may also be applicable to the design and evaluation of unmanned aircraft control stations. These reports are provided for information only as reference material for the aviation industry. This AC is not intended as guidance or policy for showing or finding compliance for airworthiness certification or operational approval.

2 AUDIENCE.

We wrote this AC to assist applicants, design approval holders, and developers of avionics intended for installation on aircraft type certificated pursuant to Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27, and 29. This AC may also be informative to applicants and developers of control stations for unmanned aircraft systems (UAS).

3 RECOMMENDED PRACTICES.

The FAA highlighted the following reports as reference material for designers of avionics systems and UAS. The reports are not intended as guidance material or policy for showing or finding compliance for airworthiness certification or operational approval. Rather, the objective of the reports is to increase human factors awareness by the individuals who are responsible for the design and certification of systems and equipment and related interfaces designed for use by the flightcrew.

3.1 **RTCA DO-372, *Addressing Human Factors/Pilot Interface Issues for Avionics*, dated December 2017.**

This document identifies a recommended process for evaluating the human factors/pilot interface aspects of avionics and identifies some prevalent human factors issues that may aid the early identification and resolution of those issues during the design and evaluation process. The recommended process in this document is not intended as a means of compliance but rather provides steps for identifying and resolving human factors issues related to the pilot interface during both the engineering design and certification process. Additionally, this document provides references of previous issues to consider before and during design and evaluation for six categories of issues:

- Display Hardware Characteristics
- Information Presentation
- Alerting, Annunciations, and System Status Indications
- Controls
- Flight Deck Arrangement
- Automatic Flight Control and Flight Guidance Systems

Each category contains examples of past certification concerns, approved design examples based on the particular certification basis (where applicable), and lessons learned that identify considerations that may help to resolve the issue. The examples and lessons learned are not intended as means of compliance.

3.2 ***Human Factors Considerations in the Design and Evaluation of Flight Deck Displays and Controls, Version 2.0* (DOT/FAA/TC-16/56), dated December 2016.**

This document serves as a single comprehensive reference for all human factors-related regulations and guidance material for flight deck displays and controls, to facilitate the identification and resolution of human factors issues with these systems. The information in this report is accurate as of the publication date. The information contained in the report is not intended as a means of compliance.

This document contains ten chapters focused on key human factors/pilot interface issues seen across multiple FAA Aircraft Certification projects involving flight deck displays and controls, as well as some that are important but are often overlooked, and those for which FAA regulatory and guidance material has been routinely requested:

- Display Hardware
- Electronic Display Information Elements and Features
- Considerations for Alerting
- Organizing Electronic Display Information Elements
- Controls
- Design Philosophy

- Intended Function
- Error Management, Prevention, Detection, and Recovery
- Workload
- Automation

This report is available through the FAA Aviation Safety (AVS) Human Factors internet site at the following address: https://www.faa.gov/aircraft/air_cert/design_approvals/human_factors/

3.3 Unmanned Aircraft Systems.

The two reports noted above identify considerations for manned aircraft, but some of these considerations may also be applicable to UAS control stations, which share many of the same design considerations as avionics in manned aircraft. Therefore, many of the same human factors considerations are applicable to UAS control stations and as such these documents may serve as a starting point for the design and evaluation of UAS control stations. In addition, there will be unique human factors aspects of UAS control station design to consider.

4 RELATED PUBLICATIONS.

A list of regulations where human factors involvement is typical during a certification project is available online at:

https://www.faa.gov/aircraft/air_cert/design_approvals/human_factors/hf-air/cfr/

This is not a comprehensive list of human factors topics applicants must address during aircraft certification; rather, the list identifies examples of common human factors topics in aircraft certification. These regulations also address areas other than human factors and may be applicable to other engineering disciplines.

Other publications with human factors aspects related to aircraft avionics are provided below; however, the list is not exhaustive.

4.1 Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27, 29.

4.2 FAA Advisory Circulars.

All references made to FAA documents in this AC refer to the latest revision.

- AC 20-175, *Controls for Flight Deck Systems*
- AC 23-23, *Standardization Guide for Integrated Cockpits in Part 23 Airplanes*
- AC 23.1309-1 *System Safety Analysis and Assessment for Part 23 Airplanes*
- AC 23.1311-1, *Installation of Electronic Display in Part 23 Airplanes*
- AC 23.1523, *Minimum Flight Crew*

- AC 25-11, *Electronic Flight Displays*
- AC 25.773-1, *Pilot Compartment View Design Considerations*
- AC 25.1302-1, *Installed Systems and Equipment for Use by the Flightcrew*
- AC 25.1309-1, *System Design and Analysis*
- AC 25.1322-1, *Flightcrew Alerting*
- AC 25.1329-1, *Approval of Flight Guidance Systems*
- AC 25.1523-1, *Minimum Flightcrew*
- AC 27 MG 19 *Guidance on Electronic Display Systems (EDS) for Rotorcraft Installations* (included in AC 27-1, *Certification of Normal Category Rotorcraft*)
- AC 27 MG 20 Human Factors (HF) (included in AC 27-1, *Certification of Normal Category Rotorcraft*)
- AC 29 MG 19 *Guidance on Electronic Display Systems (EDS) for Rotorcraft Installations* (included in AC 29-2, *Certification of Transport Category Rotorcraft*)
- AC 29 MG 20 Human Factors (HF) (included in AC 29-2, *Certification of Transport Category Rotorcraft*)

4.3 **FAA Policy Statements.**

- PS-ANM100-01-03A: Subject: Factors to Consider when Reviewing an Applicant's Proposed Human Factors Methods of Compliance for Flight Deck Certification, February 7, 2003.
- PS-ANM111-1999-99-2: Subject: Guidance for Reviewing Certification Plans to Address Human Factors for Certification of Transport Airplane Flight Decks, September 29, 1999.
- PS-ACE100-2001-004: Subject: Guidance for Reviewing Certification Plans to Address Human Factors for Certification of Part 23 Small Airplanes, August 29, 2002.

4.4 **Industry Documents.**

- SAE ARP 4033, Pilot System Integration
- SAE ARP 4102, Flight Deck Panels, Controls, and Displays
- SAE ARP 4102-7, Electronic Displays
- SAE ARP 5289A, Electronic Aeronautical Symbols
- SAE ARP 5364, Human Factor Considerations in the Design of Multifunction Display Systems for Civil Aircraft
- SAE AS 8034, Minimum Performance Standard for Airborne Multipurpose Electronic Displays

4.5 **Additional Reference Materials.**

- General Aviation Manufacturers Association (GAMA) Publication 10, Recommended Practices and Guidelines For Part 23 Cockpit/Flight Deck Design
- GAMA Publication 12, Recommended Practices and Guidelines for an Integrated Cockpit /Flight Deck in a 14 CFR/Part 23 Certificated Airplane (Version 2.0)
- Military Standard (MIL-STD) 1472G, (2012), Department of Defense Design Criteria Standard: Human Engineering
- Small Airplane Issues List. Retrieved from: https://www.faa.gov/aircraft/air_cert/design_approvals/small_airplanes/small_airplanes_regs/
- Transport Airplane Issues List. Retrieved from: https://www.faa.gov/aircraft/air_cert/design_approvals/transport/transport_intl/

5 DEFINITION OF KEY TERMS.

"Human Factors" is defined as "a multidisciplinary field that generates and compiles information about human capabilities and limitations and applies it to design, development, and evaluation of equipment, systems, facilities, procedures, jobs, environments, staffing, organizations, and personnel management for safe, efficient, and effective human performance, including people's use of technology."

6 WHERE TO FIND THIS AC.

6.1 You may find this AC at http://www.faa.gov/regulations_policies/advisory_circulars/.

6.2 If you have suggestions for improving this AC, you may use the Advisory Circular Feedback form at the end of this AC.

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Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) emailing this form to 9-AWA-AVS-AIR-DMO@faa.gov or (2) faxing it to (202) 267-1813.

Subject: AC 00-74 Date: _____

Please check all appropriate line items:

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