RWANDA
CIVIL AVIATION AUTHORITY

# ADVISORY CIRCULAR
# AC 04-007

## INSTALLATION OF ELECTRONIC FLIGHT BAGS (EFB)

**Purpose—** This advisory circular provides guidance material on the installation of electronic flight bag components including aircraft connectivity provisions.

- This AC is intended to supplement guidance issued by the State of Design or Manufacture related to installation of EFBs in an aircraft.
- It is not intended as stand-alone guidance for EFB designers

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- This AC describes an acceptable means, but not the only means, to comply with Part 3 and Part 4 regarding installation of electronic flight bags.
- This AC is not mandatory and does not constitute a regulation. However, if you use the means described in this AC, you must follow it entirely.
- The term “must” is used to indicate mandatory requirements when following the guidance in this AC. The terms “should” and “recommend” are used when following the guidance is recommended but not required to comply with this AC..

Issue Date: 30 June 2019

# SECTION 1 POLICY & GENERAL INFORMATION

## 1.1 STATUS OF THIS AC

This is issuance [2]2019 of this AC.

## 1.2 BACKGROUND

A. This AC addresses installation of EFB components. In the context of this AC, EFB components are “installed” when they are incorporated into aircraft type design or as a proper modification.

B. All other EFB components are considered "portable," regardless of how often they are removed from the aircraft.

- Design of portable EFB components is outside the scope of this AC. (Refer to AC 10-016)
- There are operational restrictions on the use and capability of portable EFB components.

C. This AC describes certification considerations for individual EFB components and for installing EFB aircraft connectivity provisions by addressing the principal elements, or "components," which comprise a typical EFB device or system.

## 1.3 APPLICABILITY

This AC is applicable to the owners and operators of Rwanda-registered aircraft and the maintenance personnel involved in the installation of an EFB in these aircraft.

## 1.4 RELATED REGULATIONS

- RCAR Part 3 provides the airworthiness requirements relating to aircraft installed components.
- RCAR Part 4 provides the airworthiness requirements relating to installation and modification.
- RCAR Part 6 includes requirements for instruments and equipment for Electronic Flight Bags

## 1.5 RELATED PUBLICATIONS

1) Rwanda Civil Aviation Authority (RCAA)

   - AC 10-016, Process & Application: Electronic Flight Bag Authorization

Copies may be obtained from the RCAA Flight Safety Services.

2) International Civil Aviation Organization (ICAO)

   - Doc 10020 – Manual of Electronic Flight Bags (EFB)
   - Annex 6, Part 1, International Commercial Air Transport – Aeroplanes
   - Annex 6, Part 3, International Operations – Helicopters

Copies may be obtained from Document Sales Unit, ICAO, 999 University Street, Montreal, Quebec, Canada H3C 5H7.

3) See Appendix A for an extensive list of related industry reference documents.

## 1.6 DEFINITIONS & ACRONYMS

### 1.6.1 DEFINITIONS

The following definitions apply to this advisory circular—

1) **Aircraft interface device (AID)**. A device or function that provides an interface between the EFBs and other aircraft systems which protects the aircraft systems and related functions from the undesired effects from non-certified equipment and related functions.

2) **Electronic flight bag (EFB)**. An electronic information system, comprised of equipment and applications for flight crew, which allows for the storing, updating, displaying and processing of EFB functions to support flight operations or duties.

3) **EFB software application**. Software function hosted on an EFB platform.

4) **EFB management**. Contains all procedures related to the operator's EFB management system.

5) **Installed resources.** Hardware/software installed in accordance with airworthiness requirements.

6) **Independent EFB platforms**. Multiple EFB platforms that are designed in such a way that no single failure makes all of them unavailable.

### 1.6.2 ACRONYMS & ABBREVIATIONS

The following acronyms apply to this advisory circular—

1) **AC** = Advisory Circular
2) **AEH** = Airborne Electronic Hardware
3) **EFB** = Electronic Flight Bag
4) **ELOS** = Equivalent level of safety
5) **HIRF** = High-Intensity Radiated Fields
6) **ICA** = Continuous Maintenance
7) **OEM** = Original Equipment Manufacturer
8) **RCAA** = Rwanda Civil Aviation Authority
9) **RCAR** = Rwanda Civil Aviation Regulations
10) **RTCA** = Radio Technical Commission on Aeronautics
11) **SAE** = Society of Automotive Engineers (SAE) Aerospace Standard

## 1.7 WHAT IS AN EFB?

A. EFBs provide replacement for the paper reference material pilots typically carry.

B. In order to qualify as an EFB, the system must be capable of displaying information equivalent to the paper products they replace.

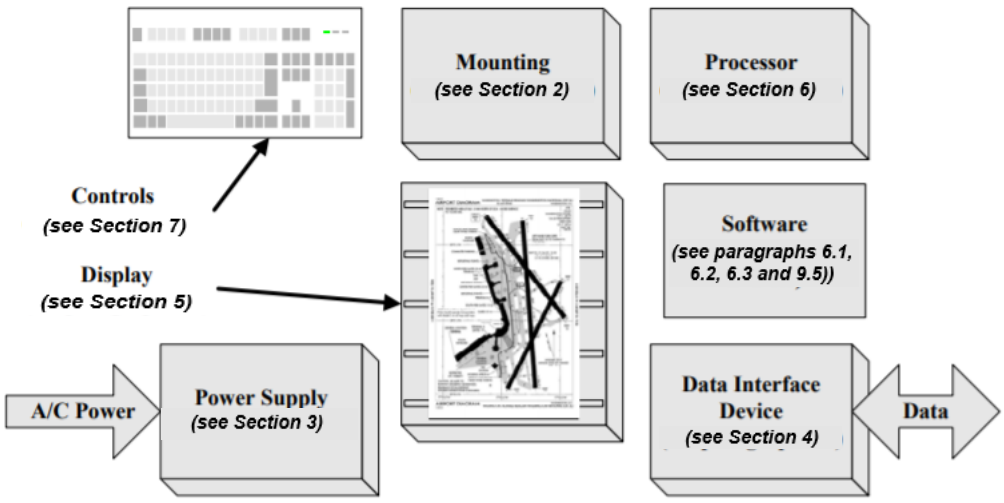
- A list of EFB applications is provided in AC 10-016, *Process & Application: Electronic Flight Bag Authorizatio*n, Appendices A and B.

### 1.7.1 EFB COMPONENTS

A. An EFB consists of several EFB components, which may be portable or installed.

B. The applicant is responsible for identifying what components or provisions are installed as part of their application. (See figure below).

**Figure 1. Typical EFB System Components**



### 1.8 AIRWORTHINESS APPLICABILITY

A. Airworthiness regulations apply to installed EFB components.

B. They do not apply to portable EFB components other than for specifications associated with the installed components (i.e., mounting (size and weight), power (maximum electrical load), and data connectivity (input/output specifications and security)).

### 1.9 EFB OPERATIONAL GUIDANCE UNDER RCAR PART 10, 11, 12 & 19

Guidance on the operational authorization to use an EFB onboard aircraft operating under RCAR Part 10, 11, 12 and 28 is provided in AC 10-016.

## SECTION 2 MOUNTING DEVICES

A. This section applies to mounting devices intended to hold EFB equipment.

B. The design of the EFB display mounting devices must address applicable airworthiness regulations.

- EFB mounting devices (or other securing mechanism) may include arm-mounted, cradle, yoke mounts or clips, or docking-stations.
- Positioning must not obstruct visual or physical access to aircraft controls and displays, flight crew ingress or egress, or external vision.

C. Consider the following design practices for installation:

### 2.1 ACCESSIBILITY

A. The mount and associated mechanism should not impede the flight crew in the performance of any task (normal, abnormal, or emergency) associated with operating any aircraft system and must not compromise the intended function of other installed equipment.

B. If the EFB display is installed, the display must be easily viewed and the controls easily reached without requiring major adjustments to body position.

### 2.2 LOCKING

- Adjustable mounting devices should be able to lock in position easily.
- When designing locking positions, accommodate the expected range of users' sizes and physical abilities (e.g., anthropometric constraints).
- Locking mechanisms should be of the low-wear type, which minimizes slippage after extended periods of normal use.

### 2.3 CRASHWORTHINESS

- The mounting design must address applicable crashworthiness regulations.
- This includes the appropriate restraint of any device, when in use or in designated stowage mounts.

### 2.4 YOKE MOUNTS & CLIPS

A. Applicants and operators should be aware of unsafe conditions potentially created

Yoke mounting of an EFB is not recommended

when attaching a portable EFB component to the control yoke with an attachment mechanism, mounting device, or clip.

- For example, the weight of both the EFB and mounting bracket may affect flight control system dynamics or warning indications, such as aerodynamic disturbances or from artificial stall-warning devices (e.g., stick shaker); even though the mount alone may be light enough to be insignificant.
- The mass, moment of inertia, as well as the physical size of the combined mount and EFB, can all contribute to potential unsafe conditions which may require design changes to flight controls and additional flight testing upon installation.

B. All of the yoke mounting components (e.g., mounts, brackets, clips, etc.) for the EFB must be incorporated into the aircraft type design.

C. When the EFB mounting device is not intended for a specific EFB model, document the demonstrated performance parameters for the mounting device (e.g., weight parameters) in the airplane or rotorcraft flight manual (AFM/RFM), airplane or rotorcraft flight manual supplement (AFMS/RFMS), operating manual, or instructions for continued airworthiness (ICAs), as appropriate.

## 2.5 USE OF HOOK-AND-LOOP FASTENERS

A. Use of hook-and-loop fasteners, such as Velcro®, is not recommended for mounting or securing EFB components to a mount, or the aircraft, because the closure strength of hook-and-loop fasteners degrades with each use.

> The cycle life, which is the number of times the hooks and loops can be engaged and disengaged before the closure strength is reduced to 50% of original values, cannot be accurately tracked without a maintenance action.

B. However, if using hook-and-loop fasteners for installed EFB mounts to ensure crashworthiness:

1) The ICAs must identify inspection intervals, inspection process, and replacement intervals to ensure the installed hook-and-loop fastener material is able to perform its intended function (e.g., retain a portable EFB component of specific size and weight) when the hook-and-loop fastener material has reached its maximum inspection interval.

2) Document the procedure for properly fastening the hook-and-loop fasteners to restrain a portable EFB component.

> The use of a label or placard may be appropriate to address proper fastening of the hook-and-loop fasteners.

# SECTION 3 POWER PROVISIONS

This section applies to design considerations for installing dedicated power port and cabling provisions for portable EFB components. Installed EFB power provisions must address applicable airworthiness regulations. Design EFB power provisions to include:

## 3.1 INSTALLED SWITCH

A. A means, reachable by the pilot seated at the controls, should be provided for de-powering the EFB or power port (e.g., access to unplug the EFB, or a separate switch clearly labeled for the power port).

B. The use of a circuit breaker as a means of de-powering a function is not acceptable, unless designed to be a switch, since the repeated use of circuit breakers as switches can degrade their performance and prevent them from actuating at the rated current trip point.

## 3.2 FAULT PROTECTION

A. An appropriate means of fault protection (e.g., circuit breaker) for the power port circuit should be provided.

B. Ensure the circuit protective device requirements under the applicable State of Design or Manufacture, as applicable, guard against inadvertent contact with energized parts of the system.

C. If a fault is detected, the power port should be automatically deactivated.

Automatic reset features should not be permitted.

## 3.3 POWER SOURCE

Connect EFB power provisions to a non-essential or the least critical power bus so failure or malfunction of the device, or power supply, will not affect safe operation of critical or essential systems.

- Connection to more critical aircraft power buses is permitted if the intended function of the EFB warrants.

## 3.4 PORT LABELING

A. Labeling of aircraft power ports should be provided to identify the electrical characteristics (e.g., 28 VDC, 115 VAC, 60 or 400 Hz, etc.) in order to address equipment sensitivity to voltage, current, or frequency parameters and to provide awareness to the flight crew or maintenance personnel, reducing the likelihood of connecting incompatible devices to the power source.

B. Given the variety of outlet and connector types used for various power sources and the variety of plug adapters available, outlet type alone is not considered to be sufficient.

- The labeling placard must be legible, easy to see, and as close as practicable to the power port.
- The labeling placard should not impose any limitations on the portable EFB component itself, which is the operator's responsibility.

## 3.5 MOUNT CABLING

A. If cabling is installed to mate aircraft systems with an EFB, the cable should not hang loosely and provisions should be made to easily secure any exposed cables out of the way during aircraft operations (e.g., cable tether straps).

- Cables external to the mount should be of sufficient length to perform the intended tasks.
- Cables too long or short must not present an operational or safety hazard.

B. Installed cables are considered electrical wiring interconnection systems and therefore need to comply with the aircraft certification regulations of the State of Design or Manufacture, as applicable.

# SECTION 4 DATA CONNECTIVITY WITH AIRCRAFT SYSTEMS (WIRED OR WIRELESS)

A. This section applies to interfacing with portable and installed EFBs.

- Typically, installed EFBs will have the interface protection built into the installed EFB component.
- Portable EFB components must have a separate data connectivity provision installed in the aircraft.

B. All EFBs using data connectivity provisions to aircraft systems must incorporate an interface protection device (e.g., physical partitioning, read-only access, etc.) to ensure data connection required by the device, and its software applications, have no adverse effects on other aircraft systems, including installed antennas, installed data servers, data storage devices, and memory.

- EFBs having data connectivity to aircraft systems; either wired or wireless, may read or transmit data to and from aircraft systems, provided the connection and interface protection device is incorporated into the aircraft type design.
- This connectivity includes data bus and communication systems access (e.g., through an avionics data bus, server, network interface device, or wireless network).

C. Use the following guidance for read-only and transmit-receive data interface protection devices—

### 4.1 READ-ONLY ACCESS

The design of interface protection devices providing read-only access must ensure protection by using one-way communication of data.

### 4.2 TRANSMIT-RECEIVE ACCESS

The design of interface protection devices providing transmit (talk) and receive (read) capability must include:

### 4.3 PARTITION

The design must provide a means to partition applications which are not installed from installed systems on the aircraft.

### 4.4 NON-INTERFERENCE

A. The design must include a means to ensure EFB operation, malfunction, or failure does not adversely affect safe and continued operation of other installed aircraft systems to which connection is made.

B. Design interface protection devices enabling connection of EFBs to existing aircraft equipment, systems, memory, data storage, data buses, or networks to address any likely vulnerability and threats in terms of computer viruses, worms, unauthorized access, and malicious access.

## SECTION 5 DISPLAY

This section provides design guidance for the installation of EFB displays, including installation of shared displays, supporting both portable EFBs and installed systems.

Guidance on portable displays is not covered in this AC, but is addressed in AC 10-016.

### 5.1 PLACEMENT

A. Placement for EFB displays must meet the aircraft certification regulations of the State of Design or Manufacture, as applicable.

- Placement also needs to consider many other factors: accessibility, workload effects, and potential pilot fatigue effects from use, etc.
- Pilot compartment view considerations include glare, reflection, and visual field.

- For applicants seeking compliance for installed displays, flight testing in day and night conditions is the acceptable method to find compliance for these issues.

B. Applicants may develop equivalent level of safety (ELOS) justifications for alternative means of compliance, provided they are formally requested and agreed to by the RCAA in advance.

C. Analysis, simulation, and demonstration of previously completed ground, flight testing, or service history on a similar platform may be considered when developing an alternative means of compliance.

- Portable displays should also be evaluated for external vision considerations with the intended EFB.

## 5.2 SCREEN SIZE & RESOLUTION

When utilizing the EFB to replace paper products, the screen size and resolution should be designed to display information in a comparable manner to paper aeronautical charts and the data it is intended to replace.

Alternate representations of IAP and other navigation charts will need to be evaluated by the State of Design or Manufacture.

- For example, the screen should be able to display a standard instrument approach procedure (IAP) chart in an acceptable aeronautical chart format similar to a published paper chart.

The screen should be large enough to show the entire IAP chart at once, with the equivalent degree of legibility and clarity as a paper chart.

This is not meant to preclude panning and zooming features, but is intended to prevent a workload increase during the approach phase of flight.

## 5.3 RECOMMENDED DISPLAY STANDARDS

Installed EFB displays are multipurpose display devices. The documents listed in the adjacent note provide guidance for display characteristics that are compatible with most State of Design or Manufacture regulations.

Recommended References—
- Society of Automotive Engineers (SAE) Aerospace Standard (AS) 8034B, Minimum Performance Standard for Airborne Multipurpose Electronic Displays
- FAA AC 25-11, Electronic Flight Deck Displays

# SECTION 6 PROCESSOR & PARTITIONING

A. Installed EFBs may be packaged in various configurations, including a single processor, or a partitioned architecture with multiple operating systems (OS) and multiple processors.

- Partitioning for installed EFBs should be done via means enforcing controlled access to system resources (e.g., memory, processors, I/O, mass storage, etc).

B. One means to partition an EFB is to create two physically separate systems feeding into a common installed display with a commercial-off-the-shelf (COTS) processor and OS hosting EFB Type A/B applications, and a certified processor and OS environment for approved software applications.

These Type A/B applications are typically considered as “hosted” because they have no requirement to be installed as part of aircraft type design or as a modification.

C. In this instance, both environments may reside in the same equipment and feed into a common display device with a certified integration capability between the separate environments to integrate display of application data.

- Other means of partitioning may be acceptable; however, partitioning must guarantee required throughput and resources (memory, hard drive, avionics data, etc.) for approved applications.
- Specifically, the design must ensure Type A/B applications have no adverse effect on the safe and continued operation of approved software and other aircraft systems.

D. EFB configurations include—

## 6.1 EFBs Hosting Only Type A/B Applications

A. Installed EFBs may be designed with the intent to host only EFB Type A/B applications. Such equipment would usually identify the hardware installed as miscellaneous, non-required equipment.

B. The host environment OS and Type A/B applications are not installed, and may be loaded by the manufacturer or operator.

FAA AC 20-159, *Obtaining Design and Production Approval for Airport Moving Map Display and Airport Surface Situational Awareness Applications Hosted In Electronic Flight Bags (EFBs)*, provides a means to obtain a software-only technical standard order (TSO) authorization for airport moving map display (AMMD) and surface cockpit display of traffic information (CDTI) applications designed to reside with the hosted Type A/B applications.

## 6.2 EFBs Hosting Type A/B Applications & Approved Software

A. Installed EFBs may be designed with the ability to host EFB Type A/B applications and approved software as part of aircraft type design.

B. Approved software applications are those found in avionics, including intended functions for communications, navigation, and surveillance requiring State of Design or Manufacture design, production, and installation approval.

C. This EFB configuration must include means of partitioning or protection to prevent the hosted Type A/B applications from having any adverse effects on the approved software and other aircraft systems.

## 6.3 Type A/B Applications Installed as Approved Software

A. Historically, operators have used Type A/B applications on portable EFBs.

B. However, it is acceptable to develop approved software to perform as Type A and B applications.

- For example, provided the intended function has been evaluated specifically for replacement of paper products, software with an airworthiness approval performing an aeronautical charting application should require no further evaluation by the State of Design or Manufacture to be authorized for use in an EFB.

# Section 7 Controls

In choosing and designing input devices for installed EFBs, such as keyboards or cursor control devices, designers should consider the type of entry to be made and flight deck environmental factors, such as turbulence and other normal vibrations, which could affect the usability of the input device.

# SECTION 8 RECHARGEABLE LITHIUM BATTERIES

A. Rechargeable lithium batteries (typically lithium-ion and lithium-polymer (lithium-ion polymer)) have higher energy levels than previous rechargeable batteries and also have higher flammability potential, so it is important to take precautions in their use.

If mistreated, or not manufactured and maintained to industry safety standards, rechargeable lithium batteries can become hazardous.

B. Installed EFBs employing rechargeable lithium batteries must ensure the lithium ion batteries meet airworthiness standards appropriate for the battery size and intended function.

- The use of rechargeable lithium batteries in portable devices is the responsibility of the operator (see AC 10-016 for applicable guidance).

# SECTION 9 GUIDANCE APPLICABLE TO ALL INSTALLED COMPONENTS.

## 9.1 AIRBORNE ELECTRONIC HARDWARE (AEH)

A. For installed EFB components including complex custom AEH, if the failure condition classification is major or greater, develop the complex custom AEH to the design assurance level consistent with the failure condition classification.

FAA AC 20-152, RTCA, Inc., Document RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*, may be used to make this determination.

B. If the failure condition classification is minor, or no effect, an existing design assurance practice may be used to develop the complex custom AEH.

## 9.2 ENVIRONMENTAL QUALIFICATION

Ensure the environmental qualification of installed EFB components is appropriate for the installation.

Guidance in FAA AC 21-16, RTCA/DO-160 Versions D, E, F, and G, "Environmental Conditions and Test Procedures for Airborne Equipment," may be used to demonstrate equipment performance in environmental conditions encountered during operation of the EFB components in aircraft.

## 9.3 LIGHTNING PROTECTION

Ensure installed EFB components meet the lightning requirements of the aircraft certification regulations of the State of Design or Manufacture, as applicable.

## 9.4 HIGH INTENSITY RADIATED FIELDS (HIRF)

Ensure installed EFB components meet the HIRF requirements of the State of Design or Manufacture, as appropriate.

FAA AC 20-136, *Aircraft Electrical And Electronic System Lightning Protection*, may be used to demonstrate appropriate lightning protection.

## 9.5 SOFTWARE

Ensure the design assurance level of installed software is consistent with the failure condition classification for the intended function.

FAA AC 20-115, RTCA, Inc., Document RTCA/DO-178B, or FAA AC 20-171, *Alternatives to RTCA/DO-178B for Software in Airborne Systems and Equipment* may be considered.

## 9.6 FAILURE CONDITION CLASSIFICATIONS

Hazards associated with the malfunction of the EFB will depend not only on the EFB hardware, but also on the functionality of the installed software applications running on the EFB.

1) Typically, the failure condition classification of Type A/B applications, as defined in AC 10-016, is considered to be minor or no effect.

   - ♦ AC 10-016 provides allowances for use of these applications on EFBs based on an equivalent level of safety to the paper reference material or operational process.
   - ♦ When the Type A/B application is installed as part of aircraft type design or as an modification, you may consider malfunction of the Type A/B application to be a minor failure condition classification and loss of the Type A/B application to have no safety effect, or you may accomplish a system safety assessment to determine the appropriate failure condition classification.

2) If the EFB supports other applications, the failure classification will be driven by those other applications.

3) If the EFB hosts Type A/B applications, adequate partitioning or protection must be provided to ensure the EFB Type A/B applications have no adverse effects on those other applications.

   - ♦ For primary safety assessment guidance, please refer to the system design documents for each aircraft type:

ARP 4754A, *Guidelines for Development of Civil Aircraft and Systems*, and ARP 4761, *Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment*, may be considered when developing a partitioned installed EFB system and showing compliance with airworthiness regulations.

4) If the installed EFB interfaces with other aircraft systems and equipment, then the minimum design assurance of the installed EFB must consider the impact of any EFB malfunctions on systems to which it is interfaced.

   - ♦ Design of interface protection devices must mitigate the impact of any EFB malfunctions.

## 9.7 DOCUMENTATION

Expected performance information for installed EFB components listed in paragraph 1.7 of this AC should be documented following current flight manual guidance, and be included in the ICAs.

- For example, the components requiring this information include mounting devices (e.g., weight, size, adjustment parameters, and mounting procedures, etc.),power provisions (e.g., port labeling to identify the electrical characteristics (e.g., 28 VDC, 115 VAC, 60 or 400 Hz, etc.) of the power port, and operation of installed power switch, etc.), and data connectivity (e.g., available data provided via wired/wireless means, etc.).

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# APPENDIX A
# Example EFB Installation References

The following documents were cited in this AC as possible references to assist in the evaluation and approval of electronic flight bag installations.

These documents will be applicable for those aircraft for which the United States is the State of Design.

## 1. Obtaining FAA Advisory Circulars

Copies may be obtained from the FAA website at www.faa.gov/regulations_policies/advisory_circulars/.

1) AC 21-16, RTCA Document DO-160 versions D, E, F and G, "Environmental Conditions and Test Procedures for Airborne Equipment."
2) AC 20-115, RTCA, Inc., Document RTCA/DO-178B.
3) AC 20-152, RTCA, Inc., Document RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware.
4) AC 20-159, Obtaining Design and Production Approval for Airport Moving Map Display and Airport Surface Situational Awareness Applications Hosted In Electronic Flight Bags (EFBs).
5) AC 20-171, Alternatives to RTCA/DO-178B for Software in Airborne Systems and Equipment.
6) AC 23.1309-1, System Safety Analysis and Assessment for Part 23 Airplanes.
7) AC 23.1311-1, Installation of Electronic Display in Part 23 Airplanes.
8) AC 25.1309-1, System Design and Analysis.
9) AC 25-11, Electronic Flight Deck Displays.
10) AC 25.773-1, Pilot Compartment View Design Considerations.
11) AC 27-1, Certification of Normal Category Rotorcraft.
12) AC 29-2, Certification of Transport Category Rotorcraft.
13) AC 91.21-1, Use of Portable Electronic Devices Aboard Aircraft.
14) AC 91-78, Use of Class 1 or Class 2 Electronic Flight Bag (EFB).

## 2. Obtaining FAA TSOs

A current list of FAA TSOs may be found on the FAA Internet website at www.airweb.faa.gov/rgl. The TSO Index of Articles is found at the same site.

1) TSO-C165, Electronic Map Display Equipment for Graphical Depiction of Aircraft Position.
2) TSO-C195, Avionics Supporting Automatic Dependent Surveillance – Broadcast (ADS-B) Aircraft Surveillance Applications (ASA).

## 3. Obtaining RTCA, Inc. Documents

Copies of RTCA documents may be ordered from RTCA, Inc., 1150 18th Street NW, Suite 910, Washington, D.C. 20036. Telephone: (202) 833-9339. Also, order copies online at http://www.rtca.org.

1) RTCA/DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment, dated December 18, 2010.
2) RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, dated December 1, 1992.
3) RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware, dated April 19, 2000.
4) RTCA/DO-257A, Minimum Operation Performance Standards for the Depiction of Navigational Information on Electronic Maps, dated June 25, 2003.
5) RTCA/DO-317, Minimum Operational Performance Standards (MOPS) for Aircraft Surveillance Applications System (ASAS), dated April 14, 2009.

## 4. Society of Automotive Engineers (SAE) International Documents

SAE documents may be ordered from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Telephone (724) 776-4970, fax (724) 776-0790. Also, order copies online at http://www.sae.org.

1) ARP 4754A, Guidelines for Development of Civil Aircraft and Systems.
2) ARP 4761, Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.
3) AS 8034B, Minimum Performance Standard for Airborne Multipurpose Electronic Displays.

*End of Advisory Circular*