



EFB Documentation Kit

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The documents contained in this package have been assembled by ForeFlight staff to serve as an aid to Part 91K, 121, 125, or 135 operators seeking FAA approval to use ForeFlight Mobile as their Electronic Flight Bag solution. These documents do not constitute an exhaustive resource for gaining approval. Our supplying of these documents also does not imply a guarantee of further assistance with the approval process; while our Sales team is on hand to answer questions you may have about the documents themselves, they are not able to assist you through the rest of the approval process. Please direct such inquiries or requests to your POI.

**indicates the most recent revision of a section.*

Overview

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AC 120-76E, Guidelines for the Certification, Airworthiness and Operational Use of Electronic Flight Bags (EFB)

What's new in revision "E"

AC 120-76 was recently updated to the "E" revision on 6/12/24 and supersedes version "D", which has been in place since October 2017. Here's a quick summary of the major changes:

1. Aligns FAA guidance with ICAO Doc 10020 and EASA AMC 20-25.
2. Shifts to performance-based requirements rather than prescriptive device categories.
3. Removes outdated Class 1/2/3 distinctions, simplifying compliance for modern tablets and mounts.
4. Streamlines approval processes by reducing reliance on FAA-issued OpSpecs/MSpecs.
5. Expands requirements for battery safety, recordkeeping, and broader crew use.

Key Points from AC 120-76E

The AC starts out with who's required to comply with the guidance and who needs authorization:

- *"This AC applies to certificate holders operating under Title 14 of the Code of Federal Regulations (14 CFR) parts 91 subpart K (part 91K), 121, 125, and 135 who want to replace required paper information, or utilize other select applications as part of EFB functionality."*

EFB Definition:

- *An EFB hosts applications, which are generally replacing conventional paper products and tools, traditionally carried in the pilot's flight bag. EFB applications include natural extensions of traditional flight bag contents, such as replacing paper copies of weather with access to near-realtime weather information.*

Two types of applications:

- **TYPE A:** apps have a failure condition classification considered to be no safety effect and do not substitute for or replace any paper, system, or equipment required by airworthiness or operational regulations; and
 - *Type A application examples: FARs, noise abatement procedures, service bulletins, airworthiness directives, etc.*
- **TYPE B:** apps have a failure condition classification considered minor and may substitute or replace paper products of information required for dispatch or to be carried in the aircraft.
 - *Type B application examples: flight planning apps, electronic charts, checklists, performance data, etc.*

Two types of hardware

- **Installed:** Hardware supporting EFB applications are "installed" when they are incorporated into aircraft type design under 14 CFR part 21, or as a proper alteration under 14 CFR part 43.
- **Portable:** All other components supporting EFB functionality are considered "portable," regardless of how often they are removed from the aircraft. These devices are typically consumer commercial off-the-shelf (COTS) electronic devices functionally capable of communications, data processing (e.g. iPad). Portable EFBs can be temporarily connected to an existing aircraft power port for battery recharging.

Testing/compliance required (this must all be documented and kept on board the aircraft, but is only required for commercial operators when seeking FAA approval and replacing paper with an EFB):

- Interference Testing:
 - The AC provides a process (listed as Method 2) by which you can self-test the device.
- Electrical Power Source:
 - Battery-powered EFBs having aircraft power available for recharging the EFB battery are considered to have a suitable backup power source.
 - Useful battery life must be established and documented for battery-powered EFBs. Each battery-powered EFB providing Type B EFB applications must have at least one of the following before departing:
 - *An established procedure to recharge the battery from aircraft power during flight operations.*
 - *A battery or batteries with a combined useful battery life to ensure operational availability during taxi and flight operations to include diversions and reasonable delays considering duration of flight.*

Lithium-ion battery:

- Requires safety and testing standards to be in the cockpit (UL, IEC)

Decompression testing (pressurized aircraft):

- This is not required to be completed on your actual EFB or iPad; you just need proof that a representative device has successfully completed this testing.

Stowage and mounting of EFB:

- Stowage requires an inherent means to prevent unwanted EFB movement. EFB stowage is required for all portable EFBs not secured in or on a mounting device

Develop operational policies for EFB use:

- They're mainly looking for how you'll use the EFB in all phases of flight, and a documented plan of action in the event of EFB failure

Geo-referencing is allowed, as long as you have another display in the cockpit:

- You may overlay EFB own-ship position on an EFB only when the installed primary flight display, weather display, or map display also depict own-ship position.
- The AC recommends using position data from an installed GNSS source. Portable equipment is more likely to experience signal blockage, signal degradation, and performance degradation.
- For airport map applications, the applicant should choose a database with an accuracy of 5 meters or less (ForeFlight well exceeds this accuracy).

Source: <https://ipadpilotnews.com/2018/05/ipad-legal-briefing-what-pilots-need-to-know/>

AC-120-76E

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ForeFlight
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U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Authorization for Use of Electronic
Flight Bags

Date: 6/12/24

AC No: 120-76E

Initiated by: AFS-400

Change:

1 PURPOSE OF THIS ADVISORY CIRCULAR (AC). This Flight Standards Service (FS) AC contains guidance on the operational use of Electronic Flight Bags (EFB). It is intended for all operators conducting flight operations under Title 14 of the Code of Federal Regulations (14 CFR) part [91](#) subpart [K](#) (part 91K), [121](#), [125](#), or [135](#) who want to replace required paper information or utilize other select applications as part of EFB functionality. This AC sets forth an acceptable means, but not the only means, to obtain Federal Aviation Administration (FAA) authorization for the operational use of EFBs utilizing either portable devices or installed equipment evaluated by the operator as their means to display aeronautical information with an equivalent level of accessibility, usability, and reliability to the means they replace. This AC will assist operators in starting and managing the required elements of an EFB program as a means to support their authorization for use. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way, and the document is intended only to provide information to the public regarding existing requirements under the law or agency policies.

Note: In this AC, “installed equipment” indicates equipment or EFB components, which are installation approved under aircraft type design. For guidance on the installation of EFB components, refer to AC [20-173](#), Installation of Electronic Flight Bag Components.

1.1 EFB Program. Operators seeking authorization under part 91K, 121, 125, or 135 may utilize the language within this AC to develop an EFB program. The program specifics (e.g., operating procedures, pertinent training modules, checklists, operations manuals, flight attendant (F/A) manuals, training manuals, maintenance programs, minimum equipment lists (MEL), other pertinent documents, reporting procedures, and cybersecurity concerns) are developed and incorporated into operator policy before the FAA grants authorization.

1.2 Requirements. This AC describes an acceptable means, but not the only means, for operators conducting flight operations seeking authorization for the operational use of EFB applications under part 91K, 121, 125, or 135. This AC is not mandatory and does not constitute a regulation. However, if you use the means described in this AC, you should follow it in all important respects.

2 AUDIENCE. This AC should be used by system designers, installers, and operators seeking design and use guidance for hosting EFB applications on both portable devices and installed equipment.

3 WHERE YOU CAN FIND THIS AC. You can find this AC on the FAA's website at https://www.faa.gov/regulations_policies/advisory_circulars and the Dynamic Regulatory System (DRS) at <https://drs.faa.gov>.

4 WHAT THIS CANCELS. This AC cancels AC 120-76D, Authorization for Use of Electronic Flight Bags, dated October 27, 2017.

5 SUMMARY OF CHANGES. This revision:

- Clarifies the definition of an EFB to underscore that an authorized device displaying Type A and/or Type B EFB applications is considered an EFB.
- Updates the definition of Type B applications to remove the requirement that Type B EFB applications be listed in an operator's operations specifications (OpSpec), management specifications (MSpec), or Letters of Authorization (LOA).
- Updates phraseology throughout to reflect use by crewmembers other than pilots.
- Adds verbiage to address situations when an EFB battery does not have manufacturer-recommended battery replacement intervals.
- Adds a 3-month retention period for records of change to an operator's EFB program.
- Adds applications to Appendix B, Type B Electronic Flight Bag (EFB) Applications.

6 WHAT IS AN EFB? An EFB is any authorized device, or combination of devices, actively displaying Type A and/or Type B EFB applications as part of an aircraft operator's EFB program. EFBs are characterized by the following:

- An EFB hosts applications, which are generally replacing the conventional paper products and tools traditionally carried in a crewmember's flight bag. EFB applications include natural extensions of traditional flight bag contents, such as applications that replace paper copies of weather reports with access to near-real-time weather information.
- In order to qualify as an EFB application, the failure effect should be considered a minor hazard or have no safety effect.
- Acceptable EFB applications are listed in Appendix A, Type A Electronic Flight Bag (EFB) Applications, and Appendix B. These EFB applications may be overlaid or integrated.
- EFB applications cannot replace any installed equipment required by operational or airworthiness regulations.
- EFB applications have no certification requirements for installation under aircraft type design (refer to AC 20-173).

7 EFBAPPLICATIONTYPES. EFB applications are categorized as Type A or B, and can be hosted on either portable or installed components.

7.1 Type A Applications:

- Are listed in Appendix [A](#);
- Have a failure condition classification considered to be no safety effect;
- Do not substitute for or replace any paper, system, or equipment required by airworthiness or operational regulations; and
- Do not require specific authorization for use (i.e., although the Type A EFB application is part of the operator’s EFB program, Type A EFB applications are not identified or controlled in the OpSpecs, MSpecs, or LOAs).

7.2 Type B Applications:

- Are listed in Appendix [B](#);
- Have a failure condition classification considered minor;
- May substitute or replace paper products of information required for dispatch or to be carried in the aircraft;
- May not substitute for or replace any installed equipment required by airworthiness or operating regulations;
- Are authorized as part of the operator’s FAA-authorized EFB program (Type B EFB applications are no longer identified or controlled in the OpSpecs, MSpecs, or LOAs.); and
- Are listed in the operator’s EFB program catalog.

8 HOW CAN ADDITIONAL APPLICATIONS BE ADDED TO THE EFB APPLICATION LISTING? Appendices A and B identify accepted Type A and B applications. As new applications are developed, they may be qualified as an EFB application as long as their failure condition classification is agreed to by the FAA to be minor, or no safety effect. Proponents should provide their Functional Hazard Assessment (FHA) to the Flight Technologies and Procedures Division for evaluation and coordination.

9 HARDWARE SUPPORTING EFB APPLICATIONS. In the context of this AC, EFB equipment components supporting EFB applications are “installed” when they are incorporated into aircraft type design under 14 CFR part [21](#), or as a proper alteration under 14 CFR part [43](#), § [43.3](#). All other components supporting EFB functionality are considered “portable,” regardless of how often they are removed from the aircraft. In order for portable EFB hardware to support EFB applications, installation of at least some EFB components may be required, depending on requirements for positional integrity (e.g., installed mounts), continuity of power (e.g., dedicated primary power port), and data connectivity (e.g., Wireless Fidelity (WiFi) and Ethernet). Airworthiness regulations

do not apply to portable EFB components other than for specifications associated with the installed components (e.g., mounting (size and weight), power (maximum electrical load, voltage, and current frequency), and data connectivity (input/output (I/O) data specifications and security)). Regardless, this AC is applicable to any portable EFB components (e.g., mount, display, external Global Positioning System (GPS), cables/cords/adapters, and portable wireless transmitters) supporting an applicant's authorization for use. Display of EFB applications on installed displays may require differentiation to enable the flightcrew member to distinguish between information provided by the installed avionics system and by the supplemental or "secondary" EFB system. Differentiation may be accomplished by visual or physical means or by a combination thereof. Visual differentiation may be accomplished by, but not limited to, unique borders, labels, and/or shading. In some cases, similar designs could reside both in an EFB application and in approved functions installed on the aircraft, but the differentiation may rely on other means, like physical differentiation. Physical differentiation may be accomplished by, but not limited to, separate controls for the EFB and/or physical distance. For guidance on the design of installed components supporting EFB functionality, refer to AC 20-173. Crewmember training alone is not a sufficient means of differentiation.

9.1 Portable Electronic Device (PED). These devices are typically consumer commercial off-the-shelf (COTS) electronic devices functionally capable of communications, data processing, and/or utility. Refer to the PED Aviation Rulemaking Committee (ARC) Report, Recommendations on Expanding the Use of Portable Electronic Devices During Flight, September 2013 (available within the file at https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/1062/). Compliance with PED regulations is further explained in AC [91.21-1](#), Use of Portable Electronic Devices Aboard Aircraft. The use of any PED in an aircraft is subject to compliance with PED regulations (part 91, § [91.21](#); part 121, § [121.306](#); part 125, § [125.204](#); and part 135, § [135.144](#)) and must be evaluated by the user/operator prior to use to ensure the PED will not interfere in any way with the operation of aircraft. The definition of a PED is intended to encompass Transmitting Portable Electronic Devices (T-PED).

9.1.1 Portable EFB. Portable components supporting EFB applications are considered PEDs. For a PED to be considered an EFB, the PED must actively display Types A and/or B software application(s) (e.g., when a PED is displaying personal email, the PED is not considered an EFB; when the same PED is authorized and actively displaying a Type B aeronautical chart application, it is then considered an EFB).

Note: Section [121.542\(d\)](#) (effective April 14, 2014) prohibits flightcrew members from using a personal wireless communications device or laptop computer for personal use while at their duty station on the flight deck while the aircraft is being operated, unless it is in accordance with FAA-approved operational procedures. This prohibition is intended to ensure nonessential activities do not affect flight deck task management or cause a loss of situational awareness during aircraft operation (refer to FAA Information for Operators (InFO) [14006](#), Prohibition on Personal Use of Electronic Devices on the Flight Deck).

Additionally, training of crewmembers on the use of portable EFBs should reinforce that when an authorized portable EFB actively displays a software application not covered in Appendices [A](#) and/or [B](#), it is no longer functioning as a portable EFB and is considered a personal PED.

9.1.2 Portable EFB Hardware Components:

- Should be capable of being easily removed from or attached to their mounts by a crewmember without tools or maintenance action.
- Can be temporarily connected to an existing aircraft power port for battery recharging.
- May connect to aircraft power, data ports (wired or wireless), or installed antennas, provided those connections are installed in accordance with AC 20-173 and include provisions to prevent and mitigate Intentional Unauthorized Electronic Interactions (IUEI).

10 EVALUATION OF PORTABLE HARDWARE COMPONENTS.

10.1 Portable EFB Electromagnetic Compatibility (EMC) Demonstration. The certificate holder (CH)/operator must demonstrate that all portable EFB components, including cords/cables for data or power, are electromagnetically compatible with aircraft navigation and communication systems. One of the following three methods in paragraphs 10.1.1, 10.1.2, or [10.1.3](#) may be accomplished to demonstrate portable EFB EMC with aircraft for all phases of flight.

10.1.1 PED-Tolerant Aircraft (Method 1). Aircraft demonstrated as PED-tolerant for both transmitting and nontransmitting PEDs do not require specific aircraft EMC ground or flight tests. Aircraft PED tolerance may be demonstrated using guidance in AC [20-164](#), Designing and Demonstrating Aircraft Tolerance to Portable Electronic Devices. The aircraft PED tolerance determination under AC 20-164 should be based on data approved by a responsible Aircraft Certification Service office. Aircraft operators who have performed a PED Safety Risk Assessment (SRA) in accordance with RTCA [DO-363](#), Guidance for the Development of Portable Electronic Devices (PED) Tolerance for Civil Aircraft, and determined specific aircraft models were certified as PED-tolerant in accordance with RTCA [DO-307](#), Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance, require no further portable EFB EMC ground or flight tests for those aircraft.

10.1.2 Aircraft Operator PED SRA (Method 2). Aircraft operators may choose to expand their policies covering the use of PEDs for all phases of flight in accordance with RTCA DO-363. Aircraft operators who have successfully completed the PED SRA in RTCA DO-363 and allow unrestricted PED use throughout all phases of flight do not have to complete portable EFB EMC-specific ground or flight tests.

10.1.3 Aircraft EMC Tests (Method 3). The CH/operator should use this method if the operator's aircraft are not determined to be PED-tolerant in paragraph [10.1.1](#) above or the aircraft operator's PED SRA in paragraph [10.1.2](#) requires limitations on PED use.

10.1.3.1 Radio Frequency (RF) Emissions. The CH/operator should obtain the RF emissions characteristics of the PED through RTCA ~~DO-160~~, Environmental Conditions and Test Procedures for Airborne Equipment, Section 21, Emission of Radio Frequency Energy; RF emissions tests; or an equivalent RF emissions test standard. The CH/operator should use the emission limits in Categories L, M, or H from RTCA DO-160, Section 21. Tests using the limits in Category B from RTCA DO-160, Section 21 are not sufficient because they provide very little assurance the EFB PED will not interfere with aircraft radios, electrical systems, or electronic systems. Experience has shown successful qualification using these categories provides high assurance the equipment will not interfere with aircraft radios or other aircraft electrical or electronic equipment or systems.

10.1.3.2 Charging Tests. If the aircraft operator intends to allow charging of its portable EFB during flight, then the test setup should include testing under charging conditions. If the aircraft operator intends to allow its portable EFB to charge in flight and does not have RF emissions test data, then the operator will need either to retest the PED under the charging conditions or perform EMC ground tests according to paragraph 10.1.3.3 below.

10.1.3.3 EMC Ground Tests. Perform aircraft EMC ground tests if the PED's RF emissions test data reveals potential for interference or if the operator lacks complete RF emissions data during all intended operating conditions. Configure the aircraft as prepared for taxi with doors and access panels closed and ground-based electrical power disconnected. Power for the aircraft electrical and electronic systems should be from the aircraft generator(s) during testing. A PED as EFB Electromagnetic Compatibility (EMC) Assessment checklist has been developed and is located in DRS at <https://drs.faa.gov/>.

Note: The aircraft EMC ground tests demonstrate portable EFB EMC with aircraft navigation and communication systems for each aircraft make, model, and series (M/M/S) in which the portable EFB will operate. Operate the specific portable EFB equipment on the aircraft to show no interference occurs with aircraft equipment. The aircraft EMC tests should demonstrate RF emissions from the equipment do not interfere with safety-related aircraft systems, particularly aircraft radio receivers, and aircraft systems required by regulations, such as flight data recorders (FDR). These EMC tests are based on a source-victim matrix, where the portable EFB is the potential source of interference and the safety-related aircraft systems and aircraft systems required by regulations are the potential victim systems. The operating modes for the portable EFB and the potential interference victim systems are

defined in the source-victim matrix. Special test equipment might be required to simulate in-flight operating conditions.

- 10.1.3.3.1** If RF emissions tests have been performed using RTCA DO-160, Section 21, select the aircraft radio receiver channels based on inspection of the emissions test results in the aircraft radio receiver frequency bands.
- 10.1.3.3.2** Certain radio receivers with no direct indication of receiver performance, such as transponders and Global Navigation Satellite Systems (GNSS), might require specific procedures or instrumentation to determine acceptable performance.
- 10.1.3.3.3** If the portable EFB includes a transmitter, such as a WiFi, cellular, or Bluetooth® transmitter, demonstrate that the portable EFB transmitter will not adversely affect other aircraft systems during the aircraft EMC ground tests. Configure the portable EFB transmitters to operate at their maximum RF output power during the aircraft EMC ground tests.
- 10.1.3.3.4** If the portable EFB will connect to the aircraft for power or battery charging, then perform the EMC ground tests with the portable EFB connected to the aircraft power source.
- 10.1.3.4 Aircraft EMC Flight Tests.** If EMC ground tests conducted under paragraph [10.1.3.3](#) cannot adequately simulate the in-flight environment, or when the systems being evaluated for susceptibility cannot be operated on the ground, then conduct additional EMC flight-testing.
- Note:** EMC flight-testing, if necessary, should be conducted during visual meteorological conditions (VMC).

10.2 Rapid Decompression Testing.

- 10.2.1 Representative Sample.** To provide some level of assurance of functional capability during a decompression event, decompression testing should be accomplished on representative samples of powered EFB component make and model configurations. It is the responsibility of the operator to provide documentation showing these tests were accomplished on at least one representative sample of each make and model of powered EFB component. Representative testing is an appropriate level of testing for modern solid-state devices. The testing of operational EFBs should be avoided when possible to preclude the infliction of unknown damage to the unit during testing.
- 10.2.2 Rapid Decompression Testing.** Rapid decompression testing should be accomplished for authorization of EFBs in pressurized aircraft in order to confirm the representative sample is safe during a rapid decompression event in close proximity to the flightcrew member and remains available for operational use. The information from the rapid decompression test is used to establish the procedural requirements for the use of the EFB in a pressurized aircraft. Rapid decompression testing should comply with RTCA DO-160, Section 4, Temperature and Altitude, guidelines for rapid decompression testing

up to the maximum operating altitude of the aircraft in which the EFB is to be used. Similarity of a particular EFB make and model to a unit already tested may be used to comply with this requirement. It is the responsibility of the operator to provide the rationale for the similarity.

10.3 Electrical Power Source. EFB design should consider the source of electrical power, the independence of the power sources for multiple EFBs, and the potential need for an independent battery source. Battery-powered EFBs having aircraft power available for recharging the EFB battery are considered to have a suitable backup power source. For recharging, the operator should establish a procedure to ensure safe recharge of the battery. EFBs not having a battery power source may be connected to an aircraft power source. For guidance on the design and installation of aircraft electrical power sources, refer to AC 20-173. If an operator chooses to use portable chargers, or power banks, to charge EFBs during flight operations, additional safety considerations should be taken into account. Portable charger stowage, cord placement, proximity to flammables (e.g., oxygen system components), and power supplied are some potential concerns.

10.3.1 Battery-Powered EFBs. Useful battery life should be established and documented for battery-powered EFBs. Each battery-powered EFB providing Type B EFB applications should have at least one of the following before departing on a flight:

- An established procedure to recharge the battery from aircraft power during flight operations;
- A battery or batteries with a combined useful battery life to ensure operational availability during taxi and flight operations to include diversions and reasonable delays considering duration of flight; or
- An acceptable mitigation strategy providing availability of aeronautical information for the entire duration of flight authorized by the FS office with certificate oversight responsibility.

10.3.2 Battery Replacement. Battery replacement intervals should meet or exceed the Original Equipment Manufacturer (OEM) recommendations. If the EFB manufacturer has not specified a battery replacement interval, then the original battery (or cell) manufacturer's specified replacement interval should be followed. If no recommended battery replacement intervals exist or if the battery is designed to last for the life of the EFB, the operator should continue to monitor the useful battery life for the EFB.

10.3.3 Lithium Batteries. Rechargeable lithium-type batteries are becoming more common as a source of principal power or standby/backup power in EFBs. Lithium-ion or lithium polymer (lithium-ion polymer) batteries are two types of rechargeable lithium batteries commonly used to power EFBs. The word "battery" used in this AC refers to the battery pack, its cells, and its circuitry.

10.3.3.1 Safety Concerns. These types of batteries are vulnerable to internal short circuiting from overcharging, damage, over-discharging, etc. Internal short circuiting may result in thermal runaway, which can cause the release of

smoke, heat, hazardous gases, and flames. Once one cell in a battery pack goes into thermal runaway, it can produce enough heat to cause adjacent cells to go into thermal runaway. The resulting fire can flare repeatedly as each cell ruptures and releases its contents. For guidance on fighting fires caused by lithium-type batteries in PEDs, refer to AC [120-80](#), Firefighting of General and High-Energy In-Flight Fires, and Safety Alert for Operators (SAFO) [09013](#), Fighting Fires Caused by Lithium Type Batteries in Portable Electronic Devices. A lithium battery fire has the potential to damage oxygen system components, causing the release of oxygen gas, which can intensify the fire. Therefore, consideration should be given to the proximity of the EFB and portable chargers to components of the oxygen system, as applicable.

10.3.3.2 Design Recommendation. We recommend the rechargeable lithium-type battery design be compliant with the provisions of Institute of Electrical and Electronic Engineers (IEEE) [1725-2021](#), IEEE Standard for Rechargeable Batteries for Mobile Phones. This standard drives design considerations for system integration, cell, pack, host device, and total system reliability. It also covers how to maintain critical operational parameters with respect to time, environment, extremes in temperature, and the management of component failure.

10.3.3.3 Related Regulations. There are other regulations applicable to the carriage and transport of lithium batteries onboard aircraft, including the Department of Transportation (DOT) regulations found in 49 CFR parts [171 through 180](#) (Hazardous Materials Regulations (HMR)). Specifically, ~~part 175, § 175.10~~ contains exceptions for passengers, crewmembers, and air operators. ~~Those~~ regulations limit the lithium content for lithium metal batteries or Watt-hours (Wh) for lithium-ion batteries offered/carried for air travel. Additional information can be found at <https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I/subchapter-C/part-175/subpart-A/section-175.10>. ~~The HMR apply to the preparation, offer, and transportation of all lithium-ion batteries and lithium metal batteries, including, but not limited to, batteries installed in PEDs. However, if spare batteries are carried, they must be sufficiently protected, in carry-on baggage only, and forbidden in checked baggage. Operators should refer to the current DOT regulations and their own policy manuals for any additional restrictions.~~

10.3.3.4 Lithium Battery Safety and Testing Standards. Due to their proximity to the flightcrew and potential hazard to the safe operation of the aircraft, the use of rechargeable lithium-type batteries in portable EFBs and portable chargers located in the aircraft flight deck calls for the batteries to meet industry safety standards. Operators should obtain evidence of the following testing standards to determine whether rechargeable lithium-type batteries used to power and recharge EFBs are acceptable for use. Operators should obtain evidence of the standards in paragraphs [10.3.3.4.1](#) and either [10.3.3.4.2](#), [10.3.3.4.3](#), or [10.3.3.4.4](#):

10.3.3.4.1 United Nations (UN) Transportation Regulations. UN Manual of Tests and Criteria ([ST/SG/AC.10/11](#)).

10.3.3.4.2 Underwriters Laboratory (UL). UL [1642](#), Standard for Lithium Batteries; UL [2054](#), Standard for Household and Commercial Batteries; and UL [60950-1](#), Information Technology Equipment - Safety - Part 1: General Requirements.

Note: Compliance with UL 2054 indicates compliance with UL 1642.

10.3.3.4.3 International Electrotechnical Commission (IEC). International Standard IEC [62133](#), Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications.

10.3.3.4.4 RTCA DO-311, Minimum Operational Performance Standards for Rechargeable Lithium Batteries and Battery Systems. An appropriate airworthiness testing standard, such as the RTCA DO-311, can be used to address concerns regarding overcharging, over-discharging, and the flammability of cell components. RTCA DO-311 is intended to test permanently-installed equipment; however, these tests are applicable and sufficient to test EFB rechargeable lithium-type batteries. For further guidance on RTCA DO-311 testing, refer to AC [20-184](#), Guidance on Testing and Installation of Rechargeable Lithium Battery and Battery Systems on Aircraft.

10.3.3.5 **Showing Compliance.** The operator should possess records showing compliance to these battery standards during the authorization to use the EFB. These records may be available from the EFB manufacturer or the battery's OEM.

Rechargeable Lithium-Type Battery Maintenance, Storage, and

10.3.3.6

Functional Check. Operators should have documented maintenance procedures for their rechargeable lithium-type batteries. These procedures should meet or exceed the OEM's recommendations. These procedures should address battery life, proper storage and handling, and safety. There should be methods to ensure the rechargeable lithium-type batteries are sufficiently charged at proper intervals and have periodic functional checks to ensure they do not experience degraded charge retention capability or other damage due to prolonged storage. These procedures should include precautions to prevent mishandling of the battery, which could cause a short circuit, damage, or other unintentional exposure, or possibly result in personal injury or property damage. All replacements for rechargeable lithium batteries should be sourced from the OEM and repairs should not be made.

10.4 Use of Aircraft Electrical Power Sources. Appropriate labels should identify the electrical characteristics (e.g., 28 volts direct current (VDC), 1,500 milliamps (mA), 60 or 400 hertz (Hz)) of electrical outlets for portable EFB electrical connections. Conduct an

electrical load analysis (ELA) to replicate a representative EFB device to ensure powering or charging the EFB will not adversely affect other aircraft systems and power requirements remain within power load budgets. Additional actions and application of airworthiness regulations are not applicable to the internal elements of portable EFBs unless specified in this AC. For guidance on the use of aircraft electrical power sources, refer to AC 20-173.

10.5 EFB Stowage. Stowage requires an inherent means to prevent unwanted EFB movement. EFB stowage is required for all portable EFBs, cables, cords, portable batteries, and other EFB accessories not secured in or on a mounting device. If an EFB mounting device is not provided (via viewable stowage or installed mounts), then designate an area to securely stow the EFB. Do this in a manner to prevent the device and/or EFB accessories from jamming flight controls, damaging flight deck equipment, interfering with cabin safety equipment, or injuring crewmembers should the device move about because of turbulence, maneuvering, or other action. The stowage area should not obstruct visual or physical access to controls, emergency equipment, and/or displays, crewmember ingress or egress, or external vision. An acceptable stowage location for a portable EFB, cables, cords, portable batteries, and other EFB accessories with no mount includes the inside compartments of the crewmember's stowed flight bag.

10.5.1 Viewable Stowage Devices and Components. A viewable stowage device is a portable device or component used to secure portable EFB hardware, which allows the crewmember to continue viewing the EFB display (e.g., kneeboards, suction cups, and removable trays). Viewable stowage solutions should not interfere with flight control movement, obstruct visual or physical access to controls and/or displays, interfere with cabin safety equipment, or obstruct ingress or egress. Viewable stowage should minimize blockage of the windshields and windows to allow crewmembers to maintain a clear view of critical outside references (e.g., during ground operations, taxiing, takeoff, approach, landing, and emergency evacuation). Training and procedures should address specific and acceptable placement of viewable stowage devices. Cables, cords, portable batteries, and other EFB accessories should also not interfere with flight control movement, obstruct visual or physical access to controls and/or displays, interfere with cabin safety equipment, obstruct ingress or egress, or obstruct visibility outside of the aircraft. For further guidance on pilot compartment visibility, refer to AC [25.773-1](#), Pilot Compartment View Design Considerations.

11 EFB DESIGN CONSIDERATIONS.

11.1 Integrity Considerations. Information contained in the data files should be of sufficient integrity to perform the intended use without producing false or hazardously misleading information. It is subsequently maintained through data updates, software revision procedures, crewmember feedback, and operational oversight. A process for continuous fault or anomaly reporting by the users is essential to an effective EFB program. This is initially accomplished through the evaluation process and the demonstration period.

11.2 Usability. It is necessary to evaluate the human factors (HF)/crewmember interface characteristics of the EFB. Special attention should be paid to new or unique features

affecting crewmember performance. The EFB user interface should be consistent and intuitive within and across various EFB applications. The interface design (including, but not limited to, data entry methods, color-coding philosophies, terminology, and symbology) should be consistent across the EFB applications. The information displayed on the EFB should be provided in a clear and unambiguous manner. EFB applications should not cause a distraction (through visual or audible notifications) to the crewmember. EFB applications should be evaluated on the specific EFB platform intended for use by an operator to verify the presentation of the information is consistent.

11.3 Legibility. Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected on an aircraft, to include daytime use in direct sunlight and night operations. This is especially important when night operations require night vision goggle (NVG) compatible light sources. Users should be able to adjust the screen brightness of an EFB independently of the brightness of other displays on the flight deck. Brightness should be adjustable in fine increments. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB on the flight deck. Consideration should be given to long-term display degradation because of abrasion and aging. The EFB should not produce objectionable glare or reflections that adversely affect the crewmember's visual environment. When using an EFB in NVG operations, use of filters (temporary or permanent) for night vision compatibility is acceptable, as long as they do not degrade the EFB functionality in other lighting conditions. For further guidance on NVG compatibility, refer to AC [27-1](#), Certification of Normal Category Rotorcraft (Miscellaneous Guidance (MG) 16, Certification Guidance for Rotorcraft Night Vision Imaging System (NVIS) Aircraft Lighting Systems); AC [29-2](#), Certification of Transport Category Rotorcraft (MG 16); and/or RTCA [DO-275](#), Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment.

11.4 Responsiveness of Application. The EFB should provide clear, unambiguous, and positive feedback to the user to indicate when user input is accepted. If the EFB is busy for an atypical time with internal tasks precluding immediate processing of user input (e.g., calculations, self-test, or data refresh), the EFB should display a "system busy" indicator (e.g., clock icon) to inform the user the system is occupied and cannot process inputs immediately. The timeliness of system response to user input should be consistent with an application's requirements for operational use and the associated crew task. The feedback and system response times should be predictable to avoid crewmember distractions and/or uncertainty.

11.5 Off-Screen Text and Content for Cursor Control Devices. If the document segment is not visible in its entirety in the available display area, such as during "zooming" or "panning" operations, the existence of off-screen content should be clearly indicated in a consistent way. For some applications, it may be unacceptable if certain portions of documents are not visible. The basis of this evaluation should be on the application and intended operational use. If there is a cursor, it should be visible on the screen at all times while in use. The default position should be easily accessible after any active manipulation (e.g., zooming, panning, or decluttering).

11.6 Active Regions. Active regions are regions to which special user commands apply. The active region can be text, a graphic image, a window, a frame, or another document object. If the display uses active regions, these regions should be clearly indicated.

11.7 Managing Multiple Open Applications and Documents. The EFB application should provide continuous indication of which application and/or document is active if the system supports multiple open documents, or if the system allows multiple open applications. The active application/document is the one currently displayed and responding to user actions. Under nonemergency, normal operations, the user should be able to select which of the open applications or documents is currently active. In addition, the user should be able to find which open applications are running and switch to any one of these open applications easily. The user should also be able to open a new application quickly and easily. When the user returns to an application running in the background, it should appear in the same state as when the user left the application, other than differences associated with the progress or completion of processing performed in the background.

11.8 Controls. All controls required for the operation of the EFB in flight should be within reach and view of the appropriate flightcrew member from their normally seated position on the flight deck. The EFB should not visually obstruct other controls and instruments. In choosing and designing input devices, such as keyboards, touch screens, or cursor-control devices, operators should consider the type of entry to be made and flight deck environmental factors, such as turbulence and other normal vibrations affecting the usability of the input device. For touch screens, pilots may need physical locations or structures (e.g., armrests) to stabilize their arm, hand, and fingers in order to make accurate inputs. Ensure touch screens do not result in unacceptable levels of pilot workload and error rates. The performance parameters of cursor-control devices are typically tailored for the application requirements as well as for the flight deck environment. Input devices should provide feedback to indicate when they are operational. Since touch screens provide little or no tactile feedback or control motion, visual and/or aural or other touch activation feedback is especially important. Other touch screen considerations include selecting the touch technology (e.g., resistive or capacitive), controlling screen contaminants which may reduce readability (e.g., skin oils or perspiration), and mitigating inadvertent operation. For further guidance on EFB controls, refer to [AC 20-175](#), Controls for Flight Deck Systems.

11.9 System Error Messages. If an application is fully or partially disabled, or is not visible or accessible to the user, it may be desirable to have a positive indication of its status to the user upon request. Messages should be operationally relevant and limited to minimize the adverse effects on crewmember workload. EFB status and fault messages should be prioritized, and the message prioritization scheme evaluated and documented. When displaying messages, and there are additional messages in the queue not currently displayed, there should be an indication of additional messages.

11.10 Data Entry Screening and Error Messages. If user-entered data is not of the correct format or type needed by the application, the EFB should not accept the data. The EFB should provide an error message clearly communicating to the crewmember which entry

is suspect and specifying what type of data it expects. The EFB and application software should incorporate input error checking to detect input errors at the earliest possible point during entry, rather than on completion of a possibly lengthy invalid entry.

11.11 Error and Failure Modes.

- 11.11.1** Crewmember Error. The system should be designed to minimize the occurrence and effects of crewmember error and enable the crewmember to detect and manage errors when they occur. For example, terms for specific types of data or the format for entry of latitude/longitude should be the same across systems. Data entry methods, color-coding philosophies, and symbology should be as consistent as possible across the various hosted EFB applications. The possible effects of undetected errors in each EFB application should be evaluated. The evaluation should address the adequacy of the user interface, accessibility of controls, ability to view controls, annunciations, displays and printers, and the effect on flightcrew workload and head-down time. The evaluation should also consider the effects of crewmember (procedural) errors determined by feedback from crewmembers.
- 11.11.2** Identifying Failure Modes. The EFB should be capable of alerting the crewmember of probable EFB application/system failures.

11.12 Crewmember Workload. The EFB software design should minimize crewmember workload and flightcrew head-down and/or eyes-in time. The positioning (e.g., location and viewing angle), use, and stowage of the EFB should not result in unacceptable crewmember workload. Avoid complex, multi-step data entry tasks during taxi, takeoff, descent, approach, landing, and non-cruise phases of flight. An evaluation of EFB applications should include a qualitative assessment of incremental pilot workload, related to the use of the EFB applications in isolation, as well as the use of those applications concurrent with other aircraft system interfaces and their safety implications. If EFB functionality includes use during taxi, takeoff, descent, approach, landing, non-cruise phases of flight, or abnormal and emergency operations, its use should be evaluated during simulated or actual aircraft operations under those conditions.

11.13 Electronic Display of Aeronautical Charts.

- 11.13.1** Similarity to Paper. Electronic aeronautical charts should provide a level of information comparable to paper charts.
- 11.13.2** Legibility. Visual, instrument, and aerodrome charts (refer to International Civil Aviation Organization (ICAO) Annex 4, Aeronautical Charts) should contain the information necessary, in appropriate form, to conduct the operation at a level of safety at least equivalent to the reliability provided by paper charts. As Type B applications, the screen size and resolution should be demonstrated to display information in a comparable manner to paper aeronautical charts and the data it is intended to replace. The information should be equally readable to the paper chart it is replacing, in both light and dark conditions.

11.13.3 Screen Size Considerations. As Type B applications, the screen should be large enough to show the instrument approach procedure (IAP) chart with a degree of legibility and clarity equivalent to the paper chart being replaced. This requirement is not meant to preclude panning and zooming features, but is intended to prevent a workload increase during the approach phase of flight. Alternate representations of IAP charts will need to be evaluated for operational suitability by the Aircraft Evaluation Division for functionality and HFs.

11.13.4 Aeronautical Charts. Aeronautical navigation charts (e.g., visual flight rules (VFR) navigation charts, low- and high-altitude en route charts, and terminal procedure publications) require evaluation for operational suitability. Panning, scrolling, zooming, rotating, or other active manipulation is permissible for these Type B applications for meeting legibility requirements. An EFB display might not be capable of presenting an entire aerodrome chart (airport diagram) if the chart is the expanded detail (fold over) type. In this case, a moving map-centering feature may be desirable. As Type B applications, aerodrome charts should include all information useful for airport operation. Any active manipulation (e.g., zooming, panning, or decluttering) should be easily returned to the default position.

11.14 Flight Standardization Board Reports (FSBR)/Operational Suitability Reports (OSR). FSBRs/OSRs addressing the use of various EFB applications may be available.

11.15 Applications Supported by Data Link.

11.15.1 Meteorological Information (MET)/Aeronautical Information Service (AIS) Products. Data link-supported EFB applications may display approved sources of weather for strategic/flight planning purposes. Weather and aeronautical information, such as data-linked MET and AIS products, are for advisory use only. These products are intended to enhance situational awareness, but lack the service delivery reliability and updating necessary for tactical maneuvering/use. Data-linked MET and AIS products are not intended for making tactical in-flight decisions regarding flight safety when avoiding adverse weather, airspace, or obstacle hazards (e.g., negotiating a path through a weather hazard area). Instead, current data-linked MET and AIS products support strategic decision making (e.g., route selection to avoid a weather hazard area in its entirety) and flight planning. For further guidance on the use of MET and AIS products, refer to [AC 00-63](#), Use of Flight Deck Displays of Digital Weather and Aeronautical Information.

11.15.2 Graphical Weather Information. Data link graphical weather from sources such as XM radio and Next Generation Weather Radar (NEXRAD) may be from approved sources of advisory weather information and are only intended to be used for strategic/flight planning purposes. Data link graphical weather information is not intended to be used for tactical decisions because data quality is uncontrolled for aviation use. Data link graphical weather data is not intended to be used as a substitute for airborne weather radar or thunderstorm detection equipment. To qualify as a Type B application, graphical weather information should include a clear indication to the crew about the age of the information.

11.16 Database Accuracy and Quality. Database errors can have a significantly greater impact on the crewmember than other elements of the EFB. With this in mind, the EFB should have a database with appropriate quality control (QC) systems, and should be based on accuracy standards to avoid the potential presentation of hazardously misleading information. When developing the database and data quality requirements, we recommend the use of RTCA [DO-200, Standards for Processing Aeronautical Data](#). A means to identify the database version, effective date, and valid operating period should be provided. For Type B applications displaying EFB own-ship position intended for airport surface operations, the airport map database should have an accuracy of 5 meters or less. However, if more accurate data is not available, the database accuracy should not exceed 30 meters. Combined with a maximum position source error, which is equivalent to an installed GNSS source, the total error budget for position source is 50 meters. The 50-meter accuracy value is approximately half of the separation of taxiways at aerodrome code letter E, as specified in ICAO Annex 14, Aerodromes. A statement of the QC processes applied and database accuracy by the database manufacturer should suffice for determination of database error contribution to the total error budget.

11.17 Display of EFB Own-Ship Position. EFB own-ship position on an EFB should only be displayed when the installed flight display, weather display, traffic display, or map display also depict own-ship position. For installed EFB displays, refer to AC 20-173 for additional guidance.

11.17.1 Proper Use of EFB Own-Ship. Operators should ensure flightcrew members understand the proper use of EFB own-ship position, including the need for concurrent use with certified avionics own-ship depiction. Operators should also ensure that flightcrew members understand the means of differentiation in order to distinguish between information provided by the certified avionics system and information provided by the supplemental or “secondary” EFB system. The flightcrew’s reference for maneuvering the aircraft in the air is the certified primary flight and navigational displays. Therefore, flightcrew members should be able to resolve own-ship conflicts between the EFB information depicted by the “secondary” system and the primary, certified avionics system during in-flight use. For EFB own-ship position use in ground operations, the use of external visual references (e.g., airport signs and markings) is sufficient for maneuvering the aircraft.

EFB Own-Ship Display Supporting Recommendations.

11.17.2 11.17.2.1 Position Source Selection. Use position data from an installed GNSS source.

Portable equipment is more likely to experience signal blockage, signal degradation, and performance degradation. Position data from a portable GNSS source may be acceptable, but for consistency of availability, we recommend the operator select an external GNSS source rather than the GNSS internal to the portable EFB.

11.17.2.2 EFB Own-Ship Directionality. Change own-ship to a nondirectional (circular) depiction when track or heading is not available.

11.17.2.3 EFBOwn-ShipGNSS DataStream. Remove EFB own-ship if the position becomes unavailable or is insufficient for the application. This will guard against a “frozen” own-ship condition caused by position source signal or power loss and removal should take no more than 3 seconds.

11.17.2.4 EFBOwn-ShipSurface Use Accuracy. For airport map applications, choose a database with an accuracy of 5 meters or less. For airports where such data is not currently available, a database accuracy of up to 30 meters can still be operationally useful. If the database accuracy exceeds 30 meters, do not display EFB own-ship position.

Note 1: Applicants should contact their EFB airport map application provider to obtain the accuracy of their database. This information is usually found in documentation supporting the EFB airport map application.

Note 2: To qualify as a Type B EFB application, the use of own-ship position on the airport surface display is based on compliance with the operational guidelines in AC [120-74](#), Parts 91, 121, 125, and 135 Flightcrew Procedures During Taxi Operations.

11.17.2.5 MapZoom. Design the application to indicate the current level of zoom or scale of the display. The design should ensure the zoom level is compatible with the position accuracy of the own-ship symbol.

11.18 Performance/Weight and Balance (W&B) Applications.

11.18.1 W&B. Type B applications for W&B are based on the existing information found in the FAA-approved Airplane Flight Manual (AFM), pilot’s operating handbook (POH), or W&B manual for an aircraft. Type B W&B applications use data management software to provide data reference and mathematical calculations to simplify determination of aircraft W&B. To qualify as a Type B application, W&B applications should adhere to existing approved data and be validated for accuracy in the entire aircraft-operating envelope. Type B W&B applications may use algorithms to calculate W&B results or use basic mathematics combined with data spreadsheets to determine W&B results. Algorithms may have the ability to interpolate within approved data, but should not extrapolate, and therefore should be tested and proven accurate by the manufacturer or operator to represent the approved data. Type B W&B applications are produced for a specific aircraft and based on FAA-approved AFM data.

11.18.2 Performance Applications. Type B applications for performance are based on existing published data found in the FAA-approved AFM, POH, or performance manual for an aircraft. Type B performance applications use data management software to provide data reference and mathematical calculations to simplify the determination of applicable aircraft performance data. To qualify as a Type B application, performance applications should adhere to this published data and be validated for accurate determination of aircraft performance for the entire operating envelope. Type B aircraft performance

applications may use algorithms to calculate results or use basic mathematics combined with data spreadsheets to determine results. Algorithms may have the ability to interpolate within approved data, but should not extrapolate beyond the information contained in the current published data. These algorithms should be tested and verified to meet existing FAA-approved AFM performance data. Type B performance applications should not extrapolate or project results not represented by the FAA-approved AFM data point's envelope of conditions including, but not limited to, pressure, altitude, temperature, and weight. Type B aircraft performance applications are produced for a specific aircraft type based on FAA-approved AFM data.

- 11.18.3** Testing Performance and W&B Applications. To qualify as a Type B application, W&B and/or performance applications require demonstration testing prior to EFB operational use. Applications using data spreadsheets where each data point is entered into software data and then referenced for output should be verified for accurate data selection. Applications based on algorithms calculating their output should be verified to accurately represent the AFM data they replace. Creation of a new algorithmic method to replace AFM data is not allowed in Type B applications. Type B algorithms should adhere to the same data methodology as the FAA-approved AFM data. The Type B application should always be demonstrated to be traceable to the FAA-approved AFM data. These Type B applications should not perform calculations or provide output when the user makes an entry input which is outside the AFM data envelope(s). Sufficient data points based on application architecture should be tested and documented to show the applications accurately adhere to and are limited to the FAA-approved AFM data envelope segments and, for performance, should represent net climb gradients with considerations including, but not limited to, level-off, acceleration, transitions, and engine takeoff power time limits. Type B applications for performance should accurately address engine inoperative gradients and obstacle clearance plane and/or weight limits. Transition from airport area performance to en route climb performance and obstacle clearance should be addressed. Type B applications are suitable only insofar as they accurately reproduce the AFM data.

12 EFBPROGRAM COMPONENTS. A part 91K, 121, 125, or 135 operator seeking authorization to use EFB applications on either portable or installed equipment should obtain OpSpec/MSpec/LOA A061, Electronic Flight Bag (EFB) Program. EFB program specifics (e.g., operating procedures, maintenance procedures, administrative procedures, and training modules) should be developed, as applicable, and be available to the FAA. FAA authorization for an EFB program will be granted upon successful evaluation of an applicant's program operation.

- 12.1 Paper Removal.** If an operator has an EFB program authorized with adequate mitigations or develops adequate mitigations as a modification to an existing program, it is possible to remove some or all paper products from the aircraft using an equivalent level of safety (ELOS). An operator proposing to remove paper from the aircraft should have program mitigations in place to prevent an EFB failure resulting in the loss of any aeronautical information required for the operation of the flight. Although this AC categorizes EFB applications into Types A and B, required aeronautical information is defined by regulation and legal interpretations outside the scope of this AC. This requirement applies to paper removal for any crewmember, not only the pilot or copilot.

Note: Electronic checklists (ECL), including normal, abnormal, and emergency, may be presented as an EFB function; however, a current paper backup checklist may be required by an aircraft equipment manufacturer to be carried on board the aircraft and be readily accessible to the crew.

12.2 Operational Procedures.

12.2.1 Operational Procedures for EFB Hardware and EFB Applications. EFB programs should contain operational procedures for the use of EFB hardware and EFB applications in the aircraft. These procedures should define the roles of the flightcrew, cabin crew, and dispatch/flight following, including but not limited to:

- Procedures defining expectations of how the crewmember should use each EFB application during ground operations and under all flight conditions.
- Procedures defining how the crewmember will report irregularities of EFB hardware or EFB applications and how the operator will modify those existing policies and procedures based on crewmember feedback.
- Procedures for normal, abnormal, and emergency use by crewmembers.
- Procedures for notifying crewmembers and dispatch/flight following of any changes to the EFB program.

Note 1: Normal procedures should address an EFB's preflight and/or flight planning use, in-flight use/stowage/power assurance, and shutdown procedures.

Note 2: Normal procedures should include preflight inspection of a portable and/or battery-powered EFB's physical condition, including bulging, dents, cracks, or other damage that may indicate a potential EFB failure or, if applicable, a potential lithium-type battery fire.

12.2.2 Procedures and Training for Using EFBs with Other Flight Deck Systems. Procedures and training should address the actions to take when information provided by an EFB does not agree with other flight deck sources or when one EFB disagrees with another. Procedures and training should address applicable aircraft type design considerations when an EFB is simultaneously displaying information with existing avionics displays and procedures should identify which information source will be primary and which source will be secondary. Ultimately, procedures and training should ensure the flightcrew member understands which system to use for a given purpose, especially when installed avionics and EFBs (either portable or installed) are providing similar information.

12.2.3 Crewmember Awareness of EFB Software/Database Revisions. The operator should have a procedure in place to allow crewmembers to confirm the revision numbers and/or dates of EFB flight databases and software installed on their units for each flight. An example of a date sensitive revision is an aeronautical chart database on a 28-day revision cycle. Procedures should specify what action to take if the applications or databases loaded on an EFB are out of date.

Note: Databases not adversely affecting aircraft operations, such as maintenance log forms, a list of airport codes, or a captain's atlas, do not require the confirmation of revision dates by crewmembers.

12.2.4 Procedures to Mitigate and/or Control Workload. Procedures should mitigate and/or control additional workloads created by using an EFB.

12.2.5 Defining Responsibilities for Performance/W&B Calculations. The operator should develop procedures defining any new roles the flightcrew member and dispatch may have in creating, reviewing, and using performance/W&B calculations supported by EFBs.

12.3 Administrative Procedures.

12.3.1 EFB Program Modifications. An EFB program should have processes in place to identify and evaluate minor hardware and software modifications in accordance with the guidelines described in this AC. Minor program changes include:

- Adding/updating Type A EFB applications.
- Updating Type B EFB applications.
- Incorporating Operating System (OS) updates.

Note 1: EMC testing may need to be performed depending on the portable EFB EMC demonstration method utilized.

Note 2: Type B EFB application updates and EFB OS updates may warrant significant changes to crewmember training, procedures, and use. If any doubt exists about whether or not a program modification is considered minor or significant, the operator should consider it significant unless they determine, through contact with the FAA principal inspector (PI) and/or cabin safety inspector (CSI), that it is minor.

12.3.2 EFB Program Catalog. The EFB program catalog is a reference of the EFB hardware ~~(make and model)~~ and EFB applications used by crewmembers on each aircraft M/M/S and maintains configuration management of EFB program elements. An EFB program should have a process defined to keep the catalog current and readily available for PIs and CSIs. A record should be maintained for any change to the EFB program catalog; this record should be retained by the operator for 3 months. The catalog should also include:

- Current EFB OS, to include current version.
- EFB applications, to include current version.

Note: Multiple EFB applications may be bundled or integrated. Regardless, the program catalog identifies and tracks both the bundled grouping and those applications listed in Appendices [A](#) and [B](#) supporting the bundled group.

12.3.3 Software Revision. It is the responsibility of the operator to ensure the OS and EFB applications perform as intended. Other applications (i.e., non-EFB applications) hosted on a portable EFB should not adversely affect the EFB applications. To continue to qualify as Type A or B applications, unauthorized modification of, or the loading of, any new or additional software intended for operational use is not permitted unless the software can be demonstrated to perform as originally intended. Application software, OS program changes, and system configuration settings should be controlled and tested prior to use in flight. In addition to the operator's responsibilities described above, it is the responsibility of the pilot in command (PIC) to verify that any EFB depiction of an en route, terminal area, approach, airport map, or sectional is current and up-to-date. One means is to ensure each PIC becomes familiar with all available information concerning the flight, to include receipt of appropriate Notices to Air Missions (NOTAM) prior to departure and prior to arrival.

12.3.4 Database Update Process.

12.3.4.1 Databases. The operator should establish a method for revising EFB databases and establishing system verification with each update. The method of data revision should ensure the integrity of the data the operator loads and not negatively affect the integrity of the EFB operation. Especially when using internet and/or wireless means, procedures should exist to protect the EFB data from corruption and/or IUEI. Database revisions do not include application software or OS changes. Operators should not perform database and/or application software changes during operations (e.g., taxi, takeoff, in-flight, and landing). MET and AIS data link services, as described in AC 00-63, may receive updates for overlay information during operations (e.g., graphical weather).

12.3.4.2 Revision Control. Operators should also establish revision control procedures so crewmembers and others can ensure the contents of the database are current and complete. These revision control procedures may be similar to the revision control procedures used for paper or other storage media. For data subject to a revision cycle control process, it should be readily evident to the user which revision cycle is currently loaded into the EFB.

12.3.5 Data Storage and Retrieval Considerations.

12.3.5.1 Archive Data. If archiving data is required, operators should establish procedures to archive or retain old data. For archived data, the length of time data is kept depends on the kind of information being archived. Some information, such as maintenance historical data, may be required to be kept for the life of the aircraft. The information (data) archived should be retrievable for the data retention period. This may include a need to convert data from older formats to ensure it is accessible by currently used tools. Operators should download maintenance discrepancy logs into a permanent record at least weekly.

12.3.5.2 Retrieval Considerations. The EFB should permit any authorized representative of the Administrator or the National Transportation Safety Board (NTSB) to retrieve, view, or print the information contained in any EFB upon receipt of a reasonable request. If the FAA or NTSB requires an operator to provide information, the operator should provide the data in a format a requesting agency can use.

12.4 Maintenance Procedures. EFB programs should include processes to ensure all EFB hardware (e.g., viewable stowage, batteries, and displays) is properly maintained for its planned life cycle.

12.5 Security Procedures.

12.5.1 Malicious Intent. The operator is responsible for ensuring security controls are in place to mitigate against the risk of IUEI to an EFB's OS architecture, its specific hosted applications, and any of the databases or data links used to enable its hosted applications (i.e., security risk assessment; refer to National Institute of Standards and Technology (NIST) Special Publication 800-53, Security and Privacy Controls for Information Systems and Organizations, as one example). The operator is also responsible for protecting the EFB from possible contamination from malware. Evidence should be provided, through analysis, testing, or a combination of both, to ensure EFB security is effective. The operator should define the processes and procedures to maintain the security level of the EFB during its entire operational life cycle.

12.5.2 Level of EFB Security. The appropriate level of EFB security depends on the criticality of the usage of the EFB application (e.g., an EFB which only holds a list of fuel prices may require less security than an EFB used for performance calculations). Beyond the level of security to ensure the EFB can properly perform as intended, the appropriate level of security ultimately depends on the capabilities of the EFB, including connections to other systems. Security impacts of connections to aircraft systems should be addressed, and special conditions may need to be addressed (refer to AC 20-173 for additional guidance).

Security Considerations. The following nonexhaustive list contains some examples of safety and security defense layers an operator should consider:

- 12.5.3**
1. ~~Individual system~~ firewalls.
 2. Clustering of systems with similar safety standards into domains.
 3. Data encryption and authentication.
 4. Virus scans.
 5. Keeping the OS up-to-date.
 6. Initiating air/ground connections only when required and always from the aircraft.
 7. "Whitelists" for allowed internet domains.
 8. "Whitelists" for allowed applications.

9. Virtual private networks (VPN).
10. Granting of access rights on a need-to-have basis.
11. Prohibiting “rooting” or “jailbreaking” of devices by employees.
12. Troubleshooting procedures should consider security threats as a potential root cause of EFB misbehavior, and responses should be developed to prevent future successful attacks, when relevant.
13. Virtualization.
14. Forensic tools and procedures.
15. Remote management applications.
16. Periodically inspecting devices for compliance with the company’s EFB program.
17. Requiring passcodes for device access.

12.6 Operator Training. An EFB program should incorporate a means to train crewmembers when EFBs are introduced into an operation and when any changes to EFB hardware or EFB applications are made. EFB training should be integrated and incorporated into existing training modules during initial, transition, and recurrent training, when appropriate. Training should emphasize, but is not limited to, the following subjects and any other areas emphasized in this AC:

- The operation and controls of applicable EFB hardware, to include components and peripherals.
- The operation of the available applications and their use in the operation of the aircraft.
- The awareness of new EFB program procedures.
- The differences between a PED and an EFB.
- Limitations of EFB information, to include the relationship between the use of an EFB with traditional installed avionics and conditions (including phases of flight) when information on the EFB should be tempered or terminated.
- A description of EFB failures and applicable operational procedures, to include procedures for obtaining a backup.
- A description of security concerns and security procedures, such as operational or security procedures.
- Crew Resource Management (CRM) training in EFB procedures and use, preflight checks of the system, the use of each application on the EFB (to include display and application management), and procedures for cross-checking data entry and computed information.

12.6.1 Training of Non-Flightcrew Members. EFB training may be required for non-flightcrew members if they are using similar devices and applications and are interacting with flightcrew members using the same devices and applications. Examples are maintenance

personnel, loading personnel, and dispatchers. Training should emphasize the coordinated procedures with flightcrew members.

12.6.2 Training Considerations for Installed Equipment. For EFB applications displayed on installed equipment, there may be additional training required. Additional conditions, limitations, and procedures defined in an AFM, Airplane Flight Manual Supplement (AFMS), Rotorcraft Flight Manual (RFM), Rotorcraft Flight Manual Supplement (RFMS), FSBR, OSR, or another form of documentation may be required to be included in an operator's training program. The following nonexhaustive list contains some examples of this additional documentation, which should be addressed in training:

- Descriptions of authorized special flight maneuvers, operations, and procedures the operator conducts when using an EFB.
- Differentiation between EFB-derived information and certified avionics information.
- Any special pilot/controller procedures when using EFB-based information.
- Geographical areas authorized for specific EFB operations, if applicable.
- Authorized methods to defer inoperative EFB equipment.

12.6.3 Practical Training. Training should provide an opportunity for instruction, demonstration, and practice using the actual or simulated EFB equipment and displays. Flight simulation training devices (FSTD) and other approved training devices (e.g., procedures trainers) may be used as a tool to train crewmembers on the use of EFBs. If an EFB program is authorized, EFB use and performance in the full flight simulator (FFS) should represent actual flight operations.

12.7 Minimum Equipment Lists (MEL).

12.7.1 Portable EFBs. The Master Minimum Equipment List (MMEL) and MEL are not applicable to portable EFB hardware, or EFB applications.

Note: While not covered by an operator's MEL, the loss of certain Type B EFB applications affecting operational regulatory requirements should be addressed in company procedures and establish mitigation means.

12.7.2 Installed EFBs. Installed hardware is subject to MMEL/MEL requirements.

12.8 Safety Management System (SMS). Part 121 operators should, under 14 CFR part 5, implement a formal process, using the SMS, for gathering feedback on the EFB program, to include any irregularities, malfunctions, or lessons learned. Use this process during design, installation, modifications, or improvements to procedures and/or training. Parts 91K and 135 operators are recommended to implement a similar process under the Safety Management System Voluntary Program (SMSVP) described in FAA Order [8900.1](#), Volume 17, Safety Management System.

13 EFBPROGRAM AUTHORIZATION. An operator under part 91K, 121, 125, or 135 seeking to develop an EFB program must submit an application for the applicable OpSpec/MSpec/ LOA A061. FAA inspectors will use the following guidance in addition to this AC to evaluate and process the application for an initial A061 issuance and program modifications:

- FAA Order 8900.1, Volume 4, Chapter 15, Electronic Flight Bag Program Evaluation and Authorization;
- FAA Order 8900.1, Volume 3, Chapter 1, The General Process for Approval or Acceptance of Air Operator Applications; and
- FAA Order 8900.1, Volume 3, Chapter 18, Section 3, Part A Operations Specifications—General.

13.1 Modifying an Authorized Program.

13.1.1 Minor Program Modifications. OpSpec/MSpec/LOA A061 authorizes operators to evaluate and incorporate minor modifications to their authorized EFB program without FAA review or assessment. Minor program modifications include:

- Adding/updating Type A EFB applications.
- Updating Type B EFB applications.
- Incorporating OS updates.

Note 1: Type B EFB application upgrades and EFB OS upgrades may incorporate significant changes to crewmember training, procedures, and use. If any doubt exists about whether or not a program modification is considered minor or significant, the operator should consider it significant, unless they determine, through contact with the FAA PI/CSI, that it is minor.

Note 2: EMC testing may need to be performed, depending on the portable EFB EMC demonstration method utilized.

13.1.2 Significant Program Modifications. Modifications determined to be greater than minor program modifications require formal FAA review and evaluation before they can be authorized for incorporation into an EFB program. Unlike an evaluation of an initial EFB program application, applications for modifications to an authorized EFB program can be tailored at the discretion of the FAA inspector.

13.1.3 Non-EFB Applications and Other Proposals Not Addressed in This AC. Proposed EFB program modifications for the addition of applications not listed in Appendix [A](#) or [B](#), or means of compliance not addressed in this AC, must be routed by the responsible Flight Standards office to the Flight Technologies and Procedures Division for further evaluation, as specified in paragraph [8](#) of this AC.

13.2 Authorization Process for EFB Applications as Approved Software. Software with an airworthiness approval performing an EFB application may be utilized to support operational requirements without further PI evaluation of the software. OpSpec/MSpec/LOA A061 is issued when all applicable EFB program requirements are considered satisfied.

13.3 Operator Coordination Responsibilities. Use and performance of portable EFB hardware and EFB applications is the responsibility of the operator. An operator should coordinate closely with the responsible Flight Standards office. It is the operator's responsibility to consider all applicable sections of this AC when designing their EFB program.

14 AC FEEDBACK FORM. For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.



Hugh Thomas for
Lawrence Fields
Executive Director, Flight Standards Service

APPENDIX A. TYPE A ELECTRONIC FLIGHT BAG (EFB) APPLICATIONS**A.1 Type A EFB Applications.**

1. Airport diversion policy guidance, including a list of special designated airports and/or approved airports with Emergency Medical Service (EMS) support facilities.
2. Flight management system (FMS)/Flight Management Guidance System (FMGS) problem report forms.
3. Aircraft parts manuals.
4. Airlines for America (A4A) 100-format maintenance discrepancy write-up codes.
5. Required Very High Frequency Omnidirectional Range (VOR) check records.
6. Minimum equipment lists (MEL).
7. Configuration Deviation Lists (CDL).
8. Nonessential Equipment and Furnishings (NEF) lists.
9. Federal, state, and airport-specific rules and regulations.
10. Chart Supplements (formerly the Airport/Facility Directory (A/FD)) data (e.g., fuel availability, land-and-hold-short operations (LAHSO) distances for specific runway combinations).
11. Noise abatement procedures for arriving and departing aircraft.
12. International Operations Manuals, including regional supplementary information and International Civil Aviation Organization (ICAO) differences.
13. Aeronautical Information Publications (AIP).
14. Aeronautical Information Manual (AIM).
15. Pilot flight and duty-time logs.
16. Crewmember-required rest logs.
17. Flightcrew member qualification logs (such as aircraft qualifications, Class II flightcrew member qualifications, Category (CAT) III qualifications, high minimums logs, night currency logs, pilot-in-command (PIC) qualifications for special areas, routes, and airports for Title 14 of the Code of Federal Regulations (14 CFR) part [121](#) certificate holders (CH) and special airports qualifications).
18. Flightcrew member qualifications recordkeeping, including aircraft qualifications, landing currency, flight time and duty-time, PIC currency requirements, etc.
19. Captain's report (i.e., captain's incident reporting form).
20. Crewmember survey forms (various).
21. EMS reference library (for use during medical emergencies).
22. Trip scheduling and bid lists.
23. Aircraft captain's logs.

24. Antiterrorism profile data.
25. Hazardous materials (HAZMAT)/oxidizer lookup tables.
26. Customs declaration and United States Department of Agriculture (USDA) agriculture inspection/clearance form.
27. Special reporting forms, such as near midair collision (NMAC) reports, National Aeronautics and Space Administration's (NASA) Aviation Safety Reporting System (ASRS), bird and wildlife encounters, owner-initiated Service Difficulty Reports (SDR), etc.
28. Incidents of interference to aircraft electronic equipment from devices carried on board aircraft.
29. Current fuel prices at various airports.
30. Computer-based training modules, check pilot, and flight instructor records.
31. Airline Policy and Procedures Manuals (PPM).
32. Title 14 CFR.
33. Lookup and completion of various reporting forms (e.g., company-specific forms, NASA's ASRS reports, NMAC reports, and wildlife strike and hazard reports).
34. Passenger information requests—some are directed to the gate or to the agent meeting the flight (e.g., special meal requests, wheelchair requirements, unaccompanied minors, gate information for connecting flights, and flights being held for connecting passengers).
35. Service Bulletins (SB)/published Airworthiness Directives (AD), etc.

APPENDIX B. TYPE B ELECTRONIC FLIGHT BAG (EFB) APPLICATIONS**B.1 Type B EFB Applications.**

1. Airplane Flight Manuals (AFM) (or Rotorcraft Flight Manuals (RFM)) and Airplane Flight Manual Supplement (AFMS) (or Rotorcraft Flight Manual Supplement (RFMS)).
2. Flight attendant (F/A) manuals.
3. Flight Operations Manuals (FOM).
4. For smaller aircraft, pilot's operating handbooks (POH), including POH section IX supplements.
5. Company General Operations Manuals (GOM).
6. Maintenance manuals.
7. Aircraft maintenance reporting manuals.
8. Company standard operating procedures (SOP).
9. Aircraft operating and information manuals (performance information, Weight and Balance (W&B), systems, limitations, etc.).
10. Aircraft performance data manuals (fixed non-interactive material).
11. Airport performance restrictions manual (e.g., a reference for takeoff and landing performance calculations).
12. W&B manual, if a separate manual (fixed non-interactive material).
13. W&B calculations.
14. Takeoff, en route, approach and landing, missed approach, go-around, etc., performance calculations. Data derived from algorithmic data or performance calculations based on software algorithms.
15. Other aircraft performance data manuals, including specialized performance data for use in conjunction with advanced wake vortex modeling techniques, and land-and-hold-short operations (LAHSO) predictions, etc. (fixed, non-interactive material for planning purposes).
16. Operations specifications (OpSpecs), management specifications (MSpecs), or Letters of Authorization (LOA).
17. Power settings for reduced thrust settings.
18. Runway limiting performance calculations.
19. Cost index modeling/flight optimization planning software.
20. Master flight plan/updating.
21. Interactive plotting for oceanic and remote navigation.

Note: A depiction of EFB own-ship may be included on this EFB application if the aircraft has a navigation moving map display (navigation display) providing concurrent display of the active flight plan, aircraft position, and aircraft trajectory (e.g., heading if a heading is selected). The EFB application may display additional, unique data elements, such as other oceanic routes, but should have sufficient common data to allow the crewmember to resolve discrepancies to qualify as a Type B EFB application.

22. Maintenance discrepancy signoff logs (maintenance discrepancy logs need to be downloaded into a permanent record at least weekly).
23. Cabin maintenance discrepancy reporting forms/location codes (maintenance discrepancy logs need to be downloaded into a permanent record at least weekly).
24. Electronic aeronautical charts (e.g., arrival, departure, en route, area, approach, and airport charts) which may be static/pre-composed (raster), or dynamic/data-driven (vector).

Note: A depiction of EFB own-ship may be included on this EFB application if the aircraft has a navigation moving map display (navigation display) providing concurrent display of the active flight plan, aircraft position, and aircraft trajectory (e.g., heading if a heading is selected). The EFB application may display additional, unique data elements, such as airspace boundaries, but should have sufficient common data to allow the crewmember to resolve discrepancies to qualify as a Type B EFB application.

25. Electronic checklists (ECL), including normal, abnormal, and emergency. EFB ECLs cannot be interactive with other aircraft systems.

Note: A current paper backup checklist may be required by the aircraft equipment manufacturer to be carried on board the aircraft and to be readily accessible to the crew.

26. Applications making use of the internet and/or other Aeronautical/Airline Operational Control (AOC) or company maintenance-specific data links to collect, process, and then disseminate data for uses such as spare parts and budget management, spares/inventory control, and unscheduled maintenance scheduling, etc. (maintenance discrepancy logs need to be downloaded into a permanent record at least weekly).
27. Weather and aeronautical information.

Note: A depiction of EFB own-ship may be included on this EFB application if the aircraft has a weather radar display providing concurrent display of proximate weather hazards. The EFB application may display additional, unique data elements, such as turbulence or data outside the range of the weather radar, but should have sufficient common data to allow the crewmember to resolve discrepancies to qualify as a Type B EFB application.

28. Aircraft cabin and exterior video surveillance displays.

29. Aircraft's Category (CAT) II/CAT III landing records.
30. Aircraft flight log and servicing records.
31. Autopilot approach and autoland records.
32. Cockpit observer briefing cards.
33. Oceanic navigation progress logs.
34. Approved electronic signature using Public Key Infrastructure (PKI) or private key technology.
35. Cabin maintenance write-ups (maintenance discrepancy logs need to be downloaded into a permanent record at least weekly).
36. Maintenance personnel signoff of discrepancy form (maintenance discrepancy logs need to be downloaded into a permanent record at least weekly).
37. Aircraft Maintenance Manuals (AMM).
38. Notices to Air Missions (NOTAM).
39. Required dispatch or flight release documentation.
40. Icing holdover time tables.
41. International Civil Aviation Organization (ICAO) Doc [9481](#), Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods.
42. Audio transcription (intended for use only as a supplemental reference for voice communications).
43. Basic Airborne and Surface Traffic Information.

Note: A depiction of EFB own-ship may be included on this EFB application if the aircraft has an installed Traffic Display System (TDS) (i.e., at a minimum, either an Automatic Dependent Surveillance-Broadcast (ADS-B) In system with a basic airborne application display or Traffic Alert and Collision Avoidance System (TCAS) II) providing concurrent display of the active traffic, aircraft position, and aircraft trajectory. The EFB application may display additional, unique data elements, such as data outside the reliable surveillance range of TCAS II, but should have sufficient common data to allow the crewmember to resolve discrepancies to qualify as a Type B EFB application.

44. Supplemental oxygen supply calculations for supply duration and/or supply range which are specific to the aircraft being operated.

Note 1: This EFB function is intended to support strategic decision making only. Pilots should rely on the aircraft's oxygen pressure gauge (analog or digital) for tactical decision making.

Note 2: A depiction of EFB own-ship may be included on this EFB application if the aircraft has a navigation moving map display (navigation

display) providing concurrent display of the active flight plan, aircraft position, and aircraft trajectory (e.g., heading if a heading is selected). The EFB application may display additional, unique data elements, such as other oceanic routes, but should have sufficient common data to allow the flightcrew member to resolve discrepancies.

45. Voice and/or video communication with emergency medical assistance services.

APPENDIX C. ADDITIONAL RESOURCES**C.1 Related Reading Materials.****C.1.1 Advisory Circulars (AC) (current editions).**

- 1.AC [00-63](#), Use of Flight Deck Displays of Digital Weather and Aeronautical Information.
- 2.AC [20-115](#), Airborne Software Development Assurance Using EUROCAE ED-12() and RTCA DO-178().
- 3.AC [20-140](#), Guidelines for Design Approval of Aircraft Data Link Communication Systems Supporting Air Traffic Services (ATS).
- 4.AC [20-164](#), Designing and Demonstrating Aircraft Tolerance to Portable Electronic Devices.
- 5.AC [20-173](#), Installation of Electronic Flight Bag Components.
- 6.AC [20-175](#), Controls for Flight Deck Systems.
- 7.AC [20-184](#), Guidance on Testing and Installation of Rechargeable Lithium Battery and Battery Systems on Aircraft.
- 8.AC [21-40](#), Guide for Obtaining a Supplemental Type Certificate.
- 9.AC [23.1309-1](#), System Safety Analysis and Assessment for Part 23 Airplanes.
- 10.AC [23.1311-1](#), Installation of Electronic Display in Part 23 Airplanes.
- 11.AC [25-11](#), Electronic Flight Displays.
- 12.AC [25-16](#), Electrical Fault and Fire Prevention and Protection.
- 13.AC [25.773-1](#), Pilot Compartment View Design Considerations.
- 14.AC [25.1523-1](#), Minimum Flightcrew.
- 15.AC [25.1581-1](#), Airplane Flight Manual.
- 16.AC [27-1](#), Certification of Normal Category Rotorcraft, Miscellaneous Guidance (MG) 16, Certification Guidance for Rotorcraft Night Vision Imaging System (NVIS) Aircraft Lighting Systems.
- 17.AC [29-2](#), Certification of Transport Category Rotorcraft, MG 16, Certification Guidance for Rotorcraft Night Vision Imaging System (NVIS) Aircraft Lighting Systems.
- 18.AC [91-78](#), Use of Electronic Flight Bags.
- 19.AC [91.21-1](#), Use of Portable Electronic Devices Aboard Aircraft.
- 20.AC [120-64](#), Operational Use and Modification of Electronic Checklists.
- 21.AC [120-71](#), Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers.

22. AC [120-74](#), Parts 91, 121, 125, and 135 Flightcrew Procedures During Taxi Operations.
23. AC [120-80](#), Firefighting of General and High-Energy In-Flight Fires.

C.1.2 FAA Orders, Policy Statements (PS), and Technical Standard Orders (TSO) (current editions).

1. FAA Order [8110.4](#), Type Certification.
2. FAA Order [8150.1](#), Technical Standard Order Program.
3. FAA Order [8260.3](#), United States Standard for Terminal Instrument Procedures (TERPS).
4. FAA Order [8900.1](#), Flight Standards Information Management System.
5. [PS-ANM100-01-03A](#), Factors to Consider When Reviewing an Applicant's Proposed Human Factors Methods of Compliance for Flight Deck Certification.
6. [PS-ANM111-1999-99-2](#), Guidance for Reviewing Certification Plans to Address Human Factors for Certification of Transport Airplane Flight Decks.
7. [TSO-C113](#), Airborne Multipurpose Electronic Displays.
8. [TSO-C165](#), Electronic Map Display Equipment for Graphical Depiction of Aircraft Position (Own-Ship).

C.1.3 Industry Documents (current editions).

1. RTCA [DO-160](#), Environmental Conditions and Test Procedures for Airborne Equipment.
2. RTCA DO-199, Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard (Vols I and II).
3. RTCA DO-200, Standards for Processing Aeronautical Data.
4. RTCA DO-201, User Requirements for Navigation Data.
5. RTCA DO-208, Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS).
6. RTCA DO-233, Portable Electronic Devices Carried Onboard Aircraft.
7. RTCA DO-242, Minimum Aviation System Performance Standards for Automatic Dependent Surveillance-Broadcast (ADS-B).
8. RTCA DO-249, Development and Implementation Planning Guide for Automatic Dependent Surveillance-Broadcast (ADS-B) Applications.
9. RTCA DO-254, Design Assurance Guidance for Airborne Electronic Hardware.
10. RTCA DO-255, Requirements Specification for Avionics Computer Resource (ACR).

11. RTCA DO-260, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B).
12. RTCA DO-264, Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications.
13. RTCA DO-267, Minimum Aviation System Performance Standards (MASPS) for Flight Information Service-Broadcast (FIS-B) Data Link.
14. RTCA DO-272, User Requirements for Aerodrome Mapping Information.
15. RTCA DO-275, Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment.
16. RTCA DO-276, User Requirements for Terrain and Obstacle Data.
17. RTCA DO-282, Minimum Operational Performance Standards for Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B).
18. RTCA DO-294, Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDS) on Aircraft.
19. RTCA DO-307, Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance.
20. RTCA DO-311, Minimum Operational Performance Standards for Rechargeable Lithium Batteries and Battery Systems.
21. RTCA DO-363, Guidance for the Development of Portable Electronic Devices (PED) Tolerance for Civil Aircraft.
22. ARINC [424](#), Navigation System Database.
23. ARINC 653P(), Avionics Application Software Standard Interface.
24. ARINC 653P1, Avionics Application Software Standard Interface Part 1 – Required Services.
25. ARINC 653P2, Avionics Application Software Standard Interface Part 2 – Extended Services.
26. ARINC 653P3, Avionics Application Software Standard Interface Part 3 – Conformity Test Specifications for ARINC 653 Extended Services.
27. ARINC 660, CNS/ATM Avionics Architectures Supporting NextGen/SESAR Concepts.
28. ARINC 661, Cockpit Display System Interfaces to User Systems.
29. ARINC 828, Electronic Flight Bag (EFB) Standard Interface.
30. ARINC 834, Aircraft Data Interface Function (ADIF).
31. ARINC 840, Electronic Flight Bag (EFB) Application Control Interface (ACI) Standard.

32. Aerospace Recommended Practice ([ARP](#)) [4754](#), Guidelines for Development of Civil Aircraft and Systems.
33. ARP4761, Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.
34. ARP5289, Electronic Aeronautical Symbols.
35. ARP5621, Electronic Display of Aeronautical Information (Charts).
36. United Nations (UN) Transportation Regulations, Manual of Tests and Criteria ([ST/SG/AC.10/11](#)).
37. UN [ST/SG/AC.10/11/Rev.5/Amend.2](#), Amendments to the Fifth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.
38. National Institute of Standards and Technology (NIST) Special Publication [800-30](#), Guide for Conducting Risk Assessments.
39. Institute of Electrical and Electronic Engineers (IEEE) [1725-2021](#), IEEE Standard for Rechargeable Batteries for Mobile Phones.

C.1.4 Additional Guidance.

1. [DOT/FAA/TC-16/56](#), Human Factors Considerations in the Design and Evaluation of Flight Deck Displays and Controls, Version 2. Yeh, M.; Swider, C.; Donovan, C.; and Jo, Y.J., December 2016.
2. The FAA and Industry Guide to Product Certification, Third Edition, May 2017. Available at https://www.faa.gov/sites/faa.gov/files/licenses_certificates/aircraft_certification/design_approvals/CPI_guide.pdf.
3. DOT/FAA/RD-93/5, Human Factors for Flight Deck Certification Personnel, July 1993. Available at <https://rosap.ntl.bts.gov/view/dot/8679>.
4. A Report from the Portable Electronic Devices Aviation Rulemaking Committee to the Federal Aviation Administration: Recommendations on Expanding the Use of Portable Electronic Devices During Flight, September 30, 2013. Available within the file at https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/1062/.
5. International Civil Aviation Organization (ICAO) Doc [10020](#), Manual on Electronic Flight Bags (EFBs).
6. ICAO Annex [6](#), Operation of Aircraft, Part I, International Commercial Air Transport—Aeroplanes.
7. ICAO Annex [6](#), Operation of Aircraft, Part II, International General Aviation—Aeroplanes.
8. ICAO Annex [6](#), Operation of Aircraft, Part III, International Operations—Helicopters.

Notice 8900.441

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NOTICE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8900.441

National Policy

Effective Date:
10/27/17

Cancellation Date:
10/27/18

SUBJ: OpSpec/MSpec/LOA A061, Electronic Flight Bag (EFB) Program

1. Purpose of This Notice. This notice announces changes to the requirements for issuing operations specification (OpSpec)/management specification (MSpec)/letter of authorization (LOA) A061 and revises the templates for the affected Title 14 of the Code of Federal Regulations (14 CFR) operations: parts 91 subpart K (part 91K), 121, 125 (including part 125 Letter of Deviation Authority (LODA) holders), and 135. EFB programs are now being authorized rather than specific EFB hardware and EFB software.

2. Audience. The primary audience for this notice is the Federal Aviation Administration (FAA) responsible Flight Standards offices and principal inspectors (PI) assigned oversight of operators conducting operations under parts 91K, 121, 125 (including part 125 LODA holders), and 135. The secondary audience includes all other Flight Standards divisions, branches, and offices.

3. Where You Can Find This Notice. You can find this notice on the MyFAA employee website at https://employees.faa.gov/tools_resources/orders_notices. Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at <http://fsims.avs.faa.gov>. Operators can find this notice on the FAA's website at <http://fsims.faa.gov>. This notice is available to the public at http://www.faa.gov/regulations_policies/orders_notices.

4. Background. FAA policy for EFBs has been updated. The operator will no longer list specific authorized EFB hardware and EFB software in the OpSpec A061 Table 1, Aircraft Authorized Under an EFB Program. The table has been updated to reflect the general EFB authorization with limitations and remarks noted, as applicable. FAA Flight Standards PIs may authorize an operator's EFB program once the authorization process described in FAA Order 8900.1, Volume 4, Chapter 15, Section 1, Evaluation and Authorization, is satisfied.

5. Guidance. This notice contains the following:

- The sample OpSpec A061 template in Appendix A applies to part 121.
- The sample OpSpec A061 template in Appendix B applies to part 125.
- The sample OpSpec A061 template in Appendix C applies to part 135.
- The sample OpSpec A061 template in Appendix D applies to part 121/135.

- The sample MSpec A061 template in Appendix E applies to part 91K.
- The sample LOA A061 template in Appendix F applies to part 125 A125LODA holders.

6.Action.This is a mandatory change to A061. Principal operations inspectors (POI),principal maintenance inspectors (PMI),aviation safety inspectors (ASI), and cabin safety inspectors (CSI)should review the guidance in Order 8900.1, Volume4, Chapter 15, Electronic Flight Bag Program Evaluation and Authorization, and reissue A061 to the affectedoperators within 180calendar-days from the A061 headquarters (HQ)control date in the Web-based Operations Safety System (WebOPSS).

7.Disposition.The information in this notice has been incorporated into Order8900.1.Direct questions or comments concerning this notice to the Flight Technologies and Procedures Division (AFS-400) at 202-267-8415.

ORIGINAL SIGNED by

/s/ John Barbagallo

Deputy Executive Director, Flight Standards Service

**Appendix A. Sample OpSpec A061, Electronic Flight Bag (EFB) Program:
14CFR Part 121**

a. The certificate holder is authorized to conduct aircraft operations using an Electronic Flight Bag (EFB) in the aircraft listed in Table 1, below, as part of an authorized EFB program, and in accordance with the limitations and provisions of this operations specification.

Table 1 – Aircraft Authorized Under an EFB Program

Aircraft M/M/S	Remarks/Limitations

b. Training Program. The certificate holder's approved training program must include appropriate crew member training on the use of authorized EFBs.

c. Database Management. The certificate holder must specify in its manual the procedures for updating and maintaining any databases necessary to perform the intended functions of each EFB.

d. Functionality. The certificate holder is responsible to ensure that each EFB and associated software will provide the necessary data, information, functionality, and solutions to perform the intended flight functions and, if not, provide substitute information in non-electronic form.

e. EFB Maintenance. The certificate holder's maintenance program must include and document the required maintenance for each authorized EFB.

**AppendixB.Sample OpSpec A061, Electronic Flight Bag (EFB)Program:
14CFRPart 125**

a. The certificate holder is authorized to conduct aircraft operations using an Electronic Flight Bag (EFB) in the aircraft listed in Table 1, below, as part of an authorized EFB program, and in accordance with the limitations and provisions of this operations specification.

Table 1 –AircraftAuthorized Under an EFB Program

AircraftM/M/S	Remarks/Limitations

b. Training Program. The certificate holder’s approved training program must include appropriate crewmember training on the use of authorized EFBs.

c. Database Management. The certificate holder must specify in its manual the procedures for updating and maintaining any databases necessary to perform the intended functions of each EFB.

d. Functionality. The certificate holder is responsible to ensure that each EFB and associated software will provide the necessary data, information, functionality, and solutions to perform the intended flight functions and, if not, provide substitute information in non-electronic form.

e. EFB Maintenance. The certificate holder’s maintenance program must include and document the required maintenance for each authorized EFB.

**Appendix C. Sample OpSpec A061, Electronic Flight Bag (EFB) Program:
14CFR Part 135**

a. The certificate holder is authorized to conduct aircraft operations using an Electronic Flight Bag (EFB) in the aircraft listed in Table 1, below, as part of an authorized EFB program, and in accordance with the limitations and provisions of this operations specification.

Table 1 – Aircraft Authorized Under an EFB Program

Aircraft M/M/S	Remarks/Limitations

b. Training Program. The certificate holder’s approved training program must include appropriate crewmember training on the use of authorized EFBs.

c. Database Management. The certificate holder must specify in its manual the procedures for updating and maintaining any databases necessary to perform the intended functions of each EFB.

d. Functionality. The certificate holder is responsible to ensure that each EFB and associated software will provide the necessary data, information, functionality, and solutions to perform the intended flight functions and, if not, provide substitute information in non-electronic form.

e. EFB Maintenance. The certificate holder’s maintenance program must include and document the required maintenance for each authorized EFB.

**AppendixD. SampleOpSpec A061, Electronic Flight Bag (EFB)Program:
14CFRPart 121/135**

a. The certificate holder is authorized to conduct aircraft operations using an Electronic Flight Bag (EFB) in the aircraft listed in Table 1, below, as part of an authorized EFB program, and in accordance with the limitations and provisions of this operations specification.

Table 1 –AircraftAuthorized Under an EFB Program

AircraftM/M/S	Remarks/Limitations

b. Training Program. The certificate holder’s approved training program must include appropriate crewmember training on the use of authorized EFBs.

c. Database Management. The certificate holder must specify in its manual the procedures for updating and maintaining any databases necessary to perform the intended functions of each EFB.

d. Functionality. The certificate holder is responsible to ensure that each EFB and associated software will provide the necessary data, information, functionality, and solutions to perform the intended flight functions and, if not, provide substitute information in non-electronic form.

e. EFB Maintenance. The certificate holder’s maintenance program must include and document the required maintenance for each authorized EFB.

**Appendix E. Sample MSpec A061, Electronic Flight Bag (EFB) Program:
14CFR Part 91K**

a. The program manager is authorized to conduct aircraft operations using an Electronic Flight Bag (EFB) in the aircraft listed in Table 1, below, as part of an authorized EFB program, and in accordance with the limitations and provisions of this management specification.

Table 1 – Aircraft Authorized Under an EFB Program

Aircraft M/M/S	Remarks/Limitations

b. Training Program. The program manager's approved training program must include appropriate crew member training on the use of authorized EFBs.

c. Database Management. The program manager must specify in its manual the procedures for updating and maintaining any databases necessary to perform the intended functions of each EFB.

d. Functionality. The program manager is responsible to ensure that each EFB and associated software will provide the necessary data, information, functionality, and solutions to perform the intended flight functions and, if not, provide substitute information in non-electronic form.

e. EFB Maintenance. The program manager's maintenance program must include and document the required maintenance for each authorized EFB.

**Appendix F. Sample LOA A061, Electronic Flight Bag (EFB) Program:
14CFR Part 125 (A125 LODA Holder)**

1. The operator/company, authorized to conduct aircraft operations in accordance with the Letter of Deviation Authority (LODA) A125, is authorized to conduct operations using an Electronic Flight Bag (EFB) in the aircraft listed in Table 1, below, as part of an authorized EFB program, and in accordance with the limitations and provisions of this letter of authorization.

Table 1 – Aircraft Authorized Under an EFB Program

Aircraft M/M/S	Remarks/Limitations

2. Training Program. The operator/company's approved training program must include appropriate crew member training on the use of authorized EFBs.

3. Database Management. The operator/company must specify in its manual the procedures for updating and maintaining any databases necessary to perform the intended functions of each EFB.

4. Functionality. The operator/company is responsible to ensure that each EFB and associated software will provide the necessary data, information, functionality, and solutions to perform the intended flight functions and, if not, provide substitute information in non-electronic form.

5. EFB Maintenance. The operator/company's maintenance program must include and document the required maintenance for each authorized EFB.

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VOLUME 3 GENERAL TECHNICAL ADMINISTRATION

CHAPTER 1 THE GENERAL PROCESS FOR APPROVAL OR ACCEPTANCE OF AIR OPERATOR APPLICATIONS

Section 1 General

3-1 GENERAL.

A. Generic Process. The general process of approval or acceptance of certain operations, programs, documents, procedures, methods, or systems is an orderly method used by Flight Standards (FS) inspectors to ensure that such items meet regulatory standards and provide for safe operating practices. Applying a modular, generic process to many types of approval or acceptance tasks can help this process. The process consists of five distinct, yet related, phases and can result in approving or not approving, accepting or not accepting, an operator's proposal. It is important for an inspector to understand that the process described in this section is not all-inclusive but rather a tool to use with good judgment in conducting day-to-day duties and responsibilities (see Figure 3-1, Approval/Acceptance Process Flow Diagram).

B. Understanding Terms. This guidance explains the terms "acceptable to," "accepted by," "approved," and "authorized." In addition, it explains the term "substantial change" as it relates to methods, programs, systems, and processes. These terms are used in or in conjunction with Federal Aviation Administration (FAA) regulations and guidance material to address whether an action, procedure, process, etc., satisfies the FAA's regulations, and whether the FAA must affirmatively make a determination to that effect. The terms, as explained below, are used across FS.

1) "Acceptable to" the FAA or the Administrator. This term means that the item at issue must be submitted to the FAA with reference to some standard or publication as the basis for the intended application, procedure, method, etc. Assessment of the item at issue by the FAA prior to use is normally not required. In exercising its oversight responsibilities, the FAA may make case-specific determinations as to a particular item's acceptability. A person or certificate holder should be able to reference some standard or publication as the basis for the acceptability of the intended application, procedure, method, etc. The standard or publication used should be an accepted industry practice previously found acceptable by the FAA, or, at a minimum, the person using it should be able to articulate a clear and reasonable basis for the action taken being an acceptable practice or procedure. This could include, but is not limited to, a practice or procedure contained in an FAA-issued advisory circular (AC) or other published guidance, information contained in the Original Equipment Manufacturer (OEM) published procedures for performing a maintenance task, or relevant information from an ASTM International standard. When a regulation requires that a submission must be "acceptable to" the FAA as a precondition for the FAA to act, the FAA may exercise discretion as to whether the determination must be made before or after the FAA acts. For example, operations specifications (OpSpec), which contain authorizations, typically necessitate an item to be acceptable to the FAA before the FAA issues the authorization.

NOTE: A person should be able to demonstrate, if called upon to do so, that the method, technique, practice, etc., would in fact be acceptable to the FAA. For example, it would not be an acceptable practice for a maintenance provider to torque bolts by “feel” when Title 14 of the Code of Federal Regulations (14 CFR) part 43, § 43.13(a) states that each person performing aircraft maintenance must use “methods, techniques, and practices acceptable to the Administrator.” Instead, an acceptable industry practice is to use a properly calibrated torque wrench to ensure the required torque values are achieved. The practice of failing to use a torque wrench and hoping for the best would be a practice the FAA would not find acceptable.

2) “Accepted by” the FAA or the Administrator. This term appears infrequently in the FAA’s regulations. Where the term is used, it means that the item at issue must be submitted to the FAA for review and acceptance prior to use. By whatever means the FAA’s acceptance of an item is communicated to the submitter, the acceptance means that the item meets the FAA’s applicable criteria, and that the FAA has no objection to the submitted item. Unless the context of the situation clearly provides otherwise, “accepted by” the FAA does not simply mean receipt by the FAA (i.e., that the item was given to a representative of the FAA and that person received (accepted) it on behalf of the FAA).

NOTE: If an operator implements an item that should have been submitted for FAA review and acceptance, but was not submitted, that circumstance alone does not mean the person would be in violation of the underlying regulation requiring the item to be “acceptable.” That determination would require an independent analysis of acceptability. At a minimum, however, the person may be in violation of a regulation requiring that the item be submitted.

3) FAA “Approved.” Title 14 CFR part 1, § 1.1 defines “approved” as “unless used with reference to another person, means approved by the FAA or any person to whom the FAA has delegated its authority in the matter concerned, or approved under the provisions of a bilateral agreement between the United States and a foreign country or jurisdiction.”

NOTE: The FAA affirms approval by letter, stamp of approval, issuance of OpSpecs, or some other official means. This affirmation signifies the FAA’s or an FAA-delegated person’s assessment of the “item at issue” is complete and the FAA accepts and authorizes its incorporation and use.

4) FAA “Authorization.” This term refers to the Issuance of OpSpecs, training specifications (TSpec), management specifications (MSpec), Letters of Authorization (LOA) and Letters of Deviation Authority (LODA) that identify acceptable methods of compliance adapted to a specific certificate holder or operator’s class, size of aircraft, and type and kinds of operations.

5) “Substantial Change.” This is a change that materially alters the content of an established procedure that qualifies for a particular operation. Determining whether a change is substantial is a fact-specific inquiry.

C. Understanding the Process. The following guidance provides aid in understanding and applying this process. It is essential to understand that this process may result in a decision to not approve or not accept an operator's proposal. This process will assist in making either positive or negative determinations.

D. Supplemental Procedures. This general process applies to many tasks described throughout the order. Each section describing an approval or acceptance task supplements the general process by outlining specific requirements for each phase.

E. Tracking Operational Applications. The FAA principal inspector (PI) will provide status reports at certain milestones to applicants for operational approvals (OpSpecs, TSpecs, MSpecs, LOAs, and Special Areas of Operation (SAO)). At a minimum, the PI must provide a status report to the applicant:

- Within 5 days of a request for status by the applicant;
- Upon a change in status of the application (e.g., return to the applicant for correction, resubmission to the FAA after correction, or prolonged delays in an application due to a user demonstration phase); and
- Upon providing final decision.

3-2 PHASE ONE. The first phase starts when an operator, a person, an aviation interest group, or the FAA inquires about or states a need for a change in some aspect of an aviation activity. Phase one is initiated by one of the following actions:

A. Applicant Initiation. A person or operator conveys to the FAA a need that is related to its operation. This need may be a requirement for FAA approval or acceptance. The operator initiates the process by inquiring about the correct procedures to receive approval or acceptance from the FAA for the change. During initial inquiries, it is important for the FAA and the operator to become familiar with the subject matter. If, for example, an operator requests an operational approval, the PI must take the following actions:

- 1) Become thoroughly familiar with existing FAA policy and approval requirements;
- 2) Become familiar with the appropriate technical material;
- 3) Accurately assess the character and scope of the proposal;
- 4) Determine if a demonstration is required;
- 5) Determine the need for any coordination requirements;
- 6) Ensure that the operator has a clear understanding of the minimum requirements that constitute an acceptable submission, including that the submission should be in digital format;

- 7) Determine the date the operator intends to implement the proposal; and
- 8) Provide all references and access to applicable job aids and/or electronic Learning Management System (eLMS) course transcripts.

B. FAA Initiation. Phase one may also begin when the FAA conveys to the operator or person the required approval or acceptance related to its operation. For example, a PI may require an operator to publish, in the approved company aircraft operating manual, information on low-speed buffet. The operator must research and understand that subject area before submitting a proposal to the FAA for evaluation. The PI should act in an advisory capacity to the operator during the preparation of the submission. Such advice may include:

- The necessity for a deviation, authorization, waiver, or exemption;
- The necessity for required demonstrations;
- Clarification of 14 CFR parts or order information;
- Sources of specific technical information; and
- Acceptable standards for submission.

C. Operator Responsibility. The common element, regardless of whether the initiated action comes from an operator or the FAA, is the effort expended by the operator.

NOTE: It is essential (particularly in phase one) for the operator to have a clear understanding that, although the PI may provide advice and guidance to the company, the development of the final product submitted to the FAA is solely the responsibility of the operator.

D. FAA/Applicant Communication. In phase one, the PI must ensure that the operator clearly understands the form, content, and documents required for the submission to be acceptable to the FAA. The PI is required to inform the operator of the need and benefits of submitting required documents as early as possible, and of their responsibility to advise the FAA of any significant changes in the proposal within the timeframe defined by the responsible Flight Standards office, certification project manager (CPM), or PI. Illustrated below is phase one of the process:

- 1) The operator makes an inquiry or request to the FAA, or the FAA requires the operator to take an action.
- 2) The FAA and operator develop understanding of subject area.
- 3) The operator understands form, content, and documents required for acceptable submission, preferably in an electronic submission.

3-3 PHASE TWO. Phase two begins when the operator formally submits a proposal for FAA evaluation.

A. Operator's Proposal. The PI's first action in phase two is to review the operator's proposal to ensure it is clear and that they provided all the specified documentation from phase one. The required information must be complete and detailed enough to permit a

thorough evaluation of the operator's capability and competence to fully satisfy the applicable regulations, national policy, and safe operating practices. Phase two does not include a detailed operational and technical evaluation, or analysis of the submitted information (see phase three in paragraph 3-4). However, the PI must examine the submission in sufficient detail to assess the completeness of the required information.

B. Incomplete or Unacceptable Proposal. If the operator's submission is not complete or the quality is obviously unacceptable, the PI must notify the operator in writing of the unacceptable submission and return it to the operator immediately with a written explanation of the deficiencies before conducting any further review or evaluation. In complex cases, a meeting with the operator and their key personnel may be necessary to resolve issues and agree on a mutually acceptable solution. If there is no mutually acceptable solution, the PI must terminate the meeting, inform the operator that the submission is unacceptable, and return the submission. If all parties are able to reach an agreement on measures to correct omissions or deficiencies, and the applicable PIs determine the submission is acceptable, the PI must notify the operator officially in writing, and phase three will begin. Illustrated below is phase two of the process:

- 1) The operator submits the proposal.
- 2) The FAA makes an initial examination of the documents for completeness (with respect to requirements established in phase one).
- 3) The FAA either:
 - Determines the submission is unacceptable and returns the submitted proposal, or
 - Advances the application to phase three.

C. Online Posting. The PI who receives the application will upload an electronic version in accordance with subparagraph 3-4D.

3-4 PHASE THREE.

A. Detailed Analysis. Phase three is the FAA's detailed analysis, review, and evaluation of the operator's proposal. These actions may take place entirely within a responsible Flight Standards office, at the site of operations, or at both facilities. Phase three of the FAA evaluation focuses on the form, content, and technical quality of the submitted proposal to determine if the information meets the following criteria:

- Is not contrary to any applicable 14 CFR,
- Is not contrary to the direction provided in this order or other safety-related documents, and
- Provides for safe operating practices.

B. Evaluation Criteria. Criteria for evaluating the formal submission are available in the applicable chapters of this order. The PI must ensure that the documents adequately establish

the operator's capability and competence to safely conduct operations in accordance with the submitted proposal.

C. Addressing Deficiencies. During phase three, the FAA PI must address any deficiencies in the submitted material before proceeding to subsequent phases. Discussion with the operator may be sufficient to resolve certain discrepancies or questions, or to obtain additional information. It may be necessary to return certain sections of the submission to the operator for specific changes. However, when a PI determines that, for specific reasons, the material is deficient or unacceptable, the PI must immediately terminate this phase and officially notify the operator in writing and return the submission with an appropriate explanation. If the results of the evaluation are acceptable and a demonstration is required, the PI may need to grant some form of conditional, initial, or provisional approval to the proposal before continuing with the process. The PI must officially address this in writing to the operator.

D. Online Posting of Application. The Operations Approval Portal System (OAPS) is designed to increase the speed and efficiency of the application process by utilizing online capabilities. It allows for instantaneous posting, tracking, and updating of operational applications. It also provides FS with a mechanism to determine the status of an application more rapidly and accurately. For operational approval applications that require higher level concurrence, the PI who received the application will upload an electronic version to <https://oaps.faa.gov>. This site includes guidance on the use of the applications tracker and the levels of concurrence required for each type of Next Generation Air Transportation System (NextGen) application.

E. Online Updates. The PI will update (to include date of notification) the Operational Approval Coordination. At a minimum, these updates will be whenever the PI notifies the applicant as listed in subparagraph 3-1E.

NOTE: It is important for the PI involved to keep the operator advised of the status of their proposal. If the PI takes no other action, or if the submission is deficient and not returned in a preestablished timeframe, the applicant may wrongly assume that the FAA has tacitly accepted the submission and is continuing with the process. The PI must officially notify the applicant in writing of significant events such as return of deficient submissions or the applicant meeting in the criteria of an evaluation process.

F. Phase Four Planning. An important aspect of phase three is for the FAA PI to begin planning the conduct of phase four. While evaluating the operator's formal submission, PIs should begin to formulate and finalize plans to observe and evaluate the operator's ability to perform before the actual demonstrations begin. Illustrated below is phase three of the process:

1) The FAA evaluates the formal submission for compliance with 14 CFR, the directions provided in this order, other safety-related documents, and safe operating practices.

2) When results of the FAA evaluation are unsatisfactory, return the submission to the operator for correction and/or terminate the phase.

3) Begin planning phase four (if required).

4) When results of the FAA evaluation are satisfactory, either:

- Proceed with phase four if a demonstration is required, or
- Proceed to phase five if there is no required demonstration.

3-5 PHASE FOUR.

A. Operator's Demonstration. In phase four, the FAA finalizes plans to observe and evaluate the operator's demonstration of their ability to perform in accordance with the procedures, guidelines, and parameters described in the formal proposal. Phase four is an operational evaluation of the operator's ability to function in accordance with the proposal evaluated in phase three. Some examples of required demonstrations include:

- Training and qualification programs,
- Proving tests,
- Emergency evacuation demonstration,
- All-weather terminal operations, and
- Air navigation operations.

B. Evaluation of Demonstration. The applicable chapters of this order describe the criteria and procedures for evaluating an operator's demonstrated ability. The PI must plan for the conduct and observation of the demonstration to include such factors as participants, evaluation criteria, and sequence of events.

1) During these demonstrations, it is normal for minor discrepancies to occur. Discrepancies are often resolved during the demonstration by obtaining commitments from responsible company officials. The PI responsible for overseeing a demonstration must evaluate each discrepancy in terms of its overall impact on the operator's ability and competence to conduct the proposed operation. The PI must stop the demonstration in phase four if they observe deficiencies or unacceptable levels of performance. The PI must identify the phase of the general process for approval or acceptance, to which the applicant must return, or decide to terminate the process entirely when it is clear that continuation would not result in approval or acceptance.

2) For example, if an emergency evacuation demonstration is unsatisfactory due to equipment failure (e.g., a slide fails to inflate), it may be appropriate to require the operator to reenter the process at phase four and conduct another demonstration. If the demonstration is unacceptable because crewmembers were unable to perform their assigned duties, it may be appropriate to advise the operator that the process is now terminated pending review and evaluation of the operator's emergency training, and that the operator may need to reenter the process at phase two (submit a new proposal).

C. Acceptable Demonstration. If the FAA evaluation of the operator's demonstrated ability is acceptable, the process continues. Illustrated below is phase four of the process:

- 1) The FAA plans for the conduct and observation of the demonstration.
- 2) The operator demonstrates ability, so either:

- The demonstration is unsatisfactory, or
- The demonstration is satisfactory.

NOTE: An operator must not be authorized to conduct any particular operation until all airworthiness and operational requirements are met, and the operator is clearly capable of conducting a safe operation in compliance with FAA regulations and safe operating practices.

3-6

PHASE FIVE.

A. Approvator Acceptance. In phase five, the FAA approves or accepts the operator's proposal. The operator is notified in phase three or four if the proposal is not approved or accepted.

B. Indicating Approval. Approval is granted by letter, by a stamp of approval, by the issuance of OpSpecs/MSpecs/TSpecs/LOA, or by some other official means of conveying approval. Each section of this order that discusses a requirement for approval provides specific guidance concerning approval procedures and documentation. The following are examples of approvals granted by the FAA:

- All-weather terminal operations;
- Training and qualification programs;
- Minimum equipment list (MEL);
- Cockpit checklist (14 CFR part 121);
- Company aircraft operating manual (limitations, performance, and operating procedures); and
- Air navigation operations.

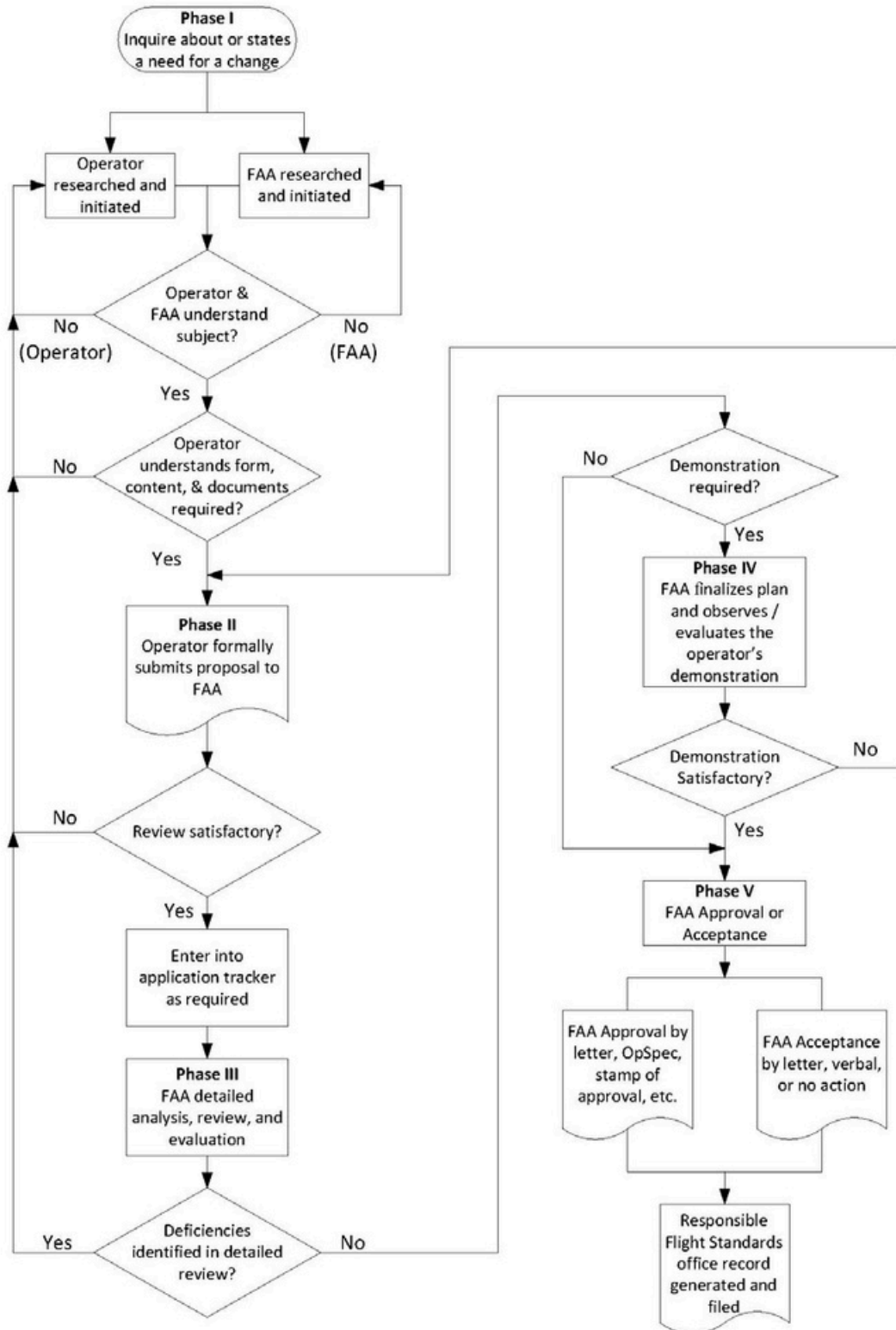
C. Acceptances. Other proposals, submissions, or requests not requiring specific FAA approval but required to be submitted to the FAA are items that are presented for acceptance. Acceptance of an operator's proposal may be accomplished by various means, including a letter, or by taking no action, which indicates there is no FAA objection to the proposal. Methods and procedures used to accept operator proposals or submissions, when appropriate, are discussed in the applicable chapters of this order. Illustrated below is phase five of the process:

- 1) The FAA approves submission, or
- 2) The FAA accepts submission.

NOTE: Sometimes FAA approval or acceptance of an operator's proposal may be conditional in nature.

3-7 SUMMARY OF PROCESS. The general operational approval or acceptance process, as described, is referenced (in terms of the five phases) with the specific task requirements for each applicable job function. It is important for the PI to understand the modular concepts inherent in the process, the overall interrelationship of the phases, and that this general process is not all-inclusive, but a tool to be used in the PI's day-to-day duties and responsibilities.

Figure 3-1. Approval/Acceptance Process Flow Diagram



RESERVED. Paragraphs 3-8 through 3-25.

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VOLUME 4 AIRCRAFT EQUIPMENT AND OPERATIONAL AUTHORIZATIONS**CHAPTER 15 ELECTRONIC FLIGHT BAG PROGRAM EVALUATION AND AUTHORIZATION****Section 1 Evaluation and Authorization**

4-1641 REPORTINGSYSTEM(S). The following tracking codes are used to document inspector activities during the evaluation of an Electronic Flight Bag (EFB) program.

A. Program Tracking and Reporting Subsystem (PTRS). Use the following PTRS activity codes to record EFB-related oversight activities: 1443, 3443, and 5443.

B. Safety Assurance System (SAS). For Title 14 of the Code of Federal Regulations (14 CFR) parts 121 and 135 operations, the principal inspector (PI) or aviation safety inspector (ASI) will utilize this guidance related to SAS Elements 1.2.2 (OP) Manual Management, 2.1.1 (OP) Training of Flight Crewmembers, 2.2.1 (OP) Airman Duties/Flight Deck Procedures, and 5.2.1 (OP) Crewmember Duties/Cabin Procedures.

4-1642 PURPOSE. This section provides references, information, and guidance to be used to evaluate an operator's initial application for operations specification (OpSpec)/management specification (MSpec)/Letter of Authorization (LOA) A061 or to evaluate a significant modification to an existing EFB program.

4-1643 APPLICABILITY. This guidance applies to 14 CFR parts 91 subpart K (part 91K), 121, 125, and 135 PIs in coordination with the appropriate cabin safety inspector (CSI) and dispatch safety inspector (DSI).

4-1644 BACKGROUND.

A. EFB Program. An EFB is any device, or combination of devices, running EFB software applications. Operators seeking EFB program authorization will utilize the language within Advisory Circular (AC) 120-76, Authorization for Use of Electronic Flight Bags, to develop an EFB program. The program specifics (i.e., operating procedures, pertinent training modules, checklists, operations manuals, training manuals, maintenance programs, minimum equipment lists (MEL), other pertinent documents, and reporting procedures) are developed and incorporated into operator policy before the Federal Aviation Administration (FAA) grants authorization. FAA authorization for an EFB program is granted through the issuance of OpSpec/MSpec/LOA A061.

B. EFB Program Authorization. The initial authorization for an EFB program establishes a baseline for an operator's authorized use of EFB hardware and software. The authorization recognizes the operator's ability to manage their EFB program with an appropriate level of FAA involvement. PIs are given authority to tailor the formality and process of an assessment appropriate to the scope of the modifications proposed by the operator.

4-1645 RESOURCES. The following are resources to be referenced in the evaluation process.

A. AC 120-76. This Flight Standards (FS) AC addresses considerations for EFB hardware, EFB software applications, and all the required and applicable elements that should be incorporated into an EFB program. AC 120-76 provides a means of addressing many elements that an operator may incorporate into an EFB program. Some elements are necessary to every program (e.g., EFB program catalog), and others are optional elements (e.g., electronic charts). An operator may elect to provide an alternate means; however, such action may require further FAA evaluation at the discretion of the Principal Operations Inspector (POI).

B. Aircraft Evaluation Division. The Aircraft Evaluation Division evaluates installed EFB equipment and approved EFB software applications for operational suitability and may recommend additional training, checking, and currency considerations. Evaluation of portable EFB hardware or nonapproved commercial off-the-shelf (COTS) EFB software applications will be at the discretion of the division.

C. Flight Standardization Board (FSB) Reports and Operational Suitability Reports (OSR). FSB Reports and OSRs may contain information that can help an inspector evaluate an EFB program application. FSB Reports or OSRs containing recommendations pertaining to EFBs for a particular model aircraft are controlling. FSB Reports and OSRs are published on the FAA's Flight Standards Information Management System (FSIMS) (<http://fsims.faa.gov>) "Publications" tab under the "MMEL & AEG Guidance Documents," "Flight Standardization Board (FSB) Reports" section.

D. Letter of Operational Suitability (OSL). An OSL may be issued by the Aircraft Evaluation Division to a hardware manufacturer or Type B software developer. These letters do not grant operational authorization, but indicate some previous FAA evaluation of performance. OSLs are not published on FSIMS because they are not complete operational evaluations. Normally, these letters are distributed by the manufacturer, but can also be obtained directly from the division.

E. FS Assistance. The following FS divisions can be contacted regarding EFB policy:

- Air Transportation Division at 202-267-8166.
- Aircraft Maintenance Division at 202-267-1675.
- Flight Technologies and Procedures Division at 202-267-8790.
- General Aviation and Commercial Division at 202-267-1100.

F. OpSpec Guidance. Volume 3, Chapter 18, Section 3 provides administrative guidance for the issuance of A061.

4-1646 INITIAL EFB PROGRAM EVALUATION. An operator seeking to use EFBs in its flight operations must develop an EFB program and submit an application for OpSpec/MSpec/LOA A061. PIs must use the five-phase process described in Volume 3, Chapter 1, Section 1 as a guideline for the evaluation and authorization of initial EFB program applications. PIs may also utilize the checklists within Volume 4, Chapter 15, Section 2 to

validate an operator's initial EFB program application. The following is additional guidance for initial EFB program evaluation.

A. Review Published Guidance. FAA personnel responsible for evaluating any part of an A061 application must read AC 120-76; Volume 3, Chapter 18, Section 3 (A061); and this guidance (Volume 4, Chapter 15, Sections 1 and 2) in their entirety to ensure an understanding of the FAA's EFB policy. The AC and the Order 8900.1 sections are complementary documents. Inspectors must use the AC as the primary reference to assess an EFB program application. Inspectors responsible for accepting and evaluating an application can use the checklist in Volume 4, Chapter 15, Section 2 as an additional aid to help identify specific requirements defined in the AC.

NOTE: PIs must contact the Flight Technologies and Procedures Division for assistance with the evaluation of any proposed EFB function not listed in appendix A or B of AC 120-76. The Flight Technologies and Procedures Division may also be contacted to assist in evaluations of applications outlining a means other than what is described in the AC.

B. EFB Program Catalog. The EFB program catalog is one of the most important aspects of an EFB program and PIs should make sure the catalog and the processes associated with it are well-defined and demonstrated. The catalog is a reference of the EFB hardware (make and model (M/M)) and EFB software applications used by crewmembers on each aircraft make, model, and series (M/M/S). An EFB program must have a process defined to keep the catalog current. In addition, a record of all EFB program catalog revisions must be maintained by the operator. PIs must have access to the current catalog, when requested, to facilitate the performance of surveillance and oversight functions.

C. EFB Program Modifications. POIs must verify that an operator's proposed EFB program has the processes in place to identify, incorporate, and evaluate minor EFB program changes, as defined by AC 120-76. POIs must have a reasonable expectation with the process because EFB program authorization is intended to allow operators to manage their EFB program with a limited level of FAA involvement. Operators must demonstrate their ability to autonomously manage minor changes while identifying appropriate times for FAA involvement (i.e., significant changes). Operators must update the program catalog with all minor and significant program changes.

D. Demonstrations.

1) The POI must observe and verify the operator's ability to manage an EFB program and conduct flight operations in a planned demonstration period. The demonstration phase for an initial EFB program must:

- Include at least 6 months of flight operations.
- Allow observation and data collection of the EFB use in actual flight operations.

- Allow observation of EFB program management processes, to include the ability to evaluate program modifications, revise software applications, and manage the EFB program catalog.
- Begin with the issuance of A061 with a temporary authorization condition (see details in subparagraph E below).

2) The demonstration concludes when the POI determines the operator has provided sufficient proof to satisfy the FAA's requirement for meeting all the plan objectives, or when the operator is unable to complete them satisfactorily.

E. Temporary Authorization. Issuance of OpSpec/MSpec/LOA A061 with a temporary authorization condition is required when the POI requires demonstration in actual flight operations. When operations are being conducted with a temporary authorization, the operator must have an additional independent means of acquiring required information in-flight (i.e., a backup) in the event of a failure or common mode error of the evaluated items. The backup strategy and the EFB are not used simultaneously during the demonstration period, but the backup strategy must be available. Once OpSpec/MSpec/LOA A061 is issued without temporary authorization, the backup may be removed.

4-1647 EVALUATING MODIFICATIONS TO EFB PROGRAMS. Once an operator receives authorization for an EFB program, they may elect to modify the hardware, software applications, procedures, or aircraft associated with the program. POIs may also utilize the checklists within Volume 4, Chapter 15, Section 2 to validate, as applicable, an operator's EFB program modification.

A. Minor Modifications. Operators issued A061 are allowed to incorporate and evaluate minor changes into their EFB programs. An authorized EFB program must have a process for the operator to determine if a modification is minor. All minor modifications incorporated by an operator must be recorded in the EFB program catalog, and operators must keep a record of all revisions to the catalog.

B. Significant Modifications. The POI must conduct a formal assessment of any modification to an EFB program that is not considered minor. POIs are encouraged to use Volume 4, Chapter 15, Section 2 as a general outline for the evaluation and authorization of new modifications. Because an operator can seek to modify their authorized EFB program in a variety of ways, it is impracticable to define a standard assessment to fit all possible requests. The POIs must work with the operator to define/develop an assessment with the formality, timeline, and demonstration parameters appropriate to the modification requested. Past operator experience and performance should also be considered.

4-1648 LIMITED EVALUATIONS. An operator may desire to conduct a limited evaluation of a program modification in actual flight operations for business/safety case purposes. POIs can authorize these evaluations by issuing a remark in A061. In general, this should only be a consideration if all other means (e.g., simulator testing) of evaluating an EFB program modification are considered inadequate. These types of evaluations should be small in scope (i.e., approximately 15 percent or less of total pilots and/or flight attendants (F/A)), performed by experienced crewmembers, and have defined test parameters. The FAA and the operator must reach a common understanding of what will be necessary to achieve the goals of the evaluation and define the limitations and conditions (if necessary).

RESERVED. Paragraphs 4-1649 through 4-1652.

EFB Hardware & Software Evaluation

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VOLUME 4 AIRCRAFT EQUIPMENT AND OPERATIONAL AUTHORIZATIONS

CHAPTER 15 ELECTRONIC FLIGHT BAG PROGRAM EVALUATION AND AUTHORIZATION

Section 2 Electronic Flight Bag (EFB) Program Checklist

4-1653 REPORTING SYSTEM(S). The following tracking codes are used to document inspector activities during the evaluation of an Electronic Flight Bag (EFB) program.

A. Program Tracking and Reporting Subsystem (PTRS). Use PTRS activity codes to record EFB-related oversight activities: 1443, 3443, and 5443.

B. Safety Assurance System (SAS). For Title 14 of the Code of Federal Regulations (14 CFR) parts 121 and 135 operations, the principal inspector (PI) or aviation safety inspector (ASI) will utilize this guidance related to SAS Elements 1.2.2 (OP) Manual Management, 2.1.1 (OP) Training of Flight Crewmembers, 2.2.1 (OP) Airman Duties/Flight Deck Procedures, and 5.2.1 (OP) Crewmember Duties/Cabin Procedures.

4-1654 GENERAL. This section contains questions for use by PIs to review an operator's EFB program. In general, these questions are specific to initial installations and training for a given aircraft. When an operator proposes changes to their EFB program, these questions may also be referenced, when applicable.

Figure 4-80. Checklist 1—Electronic Flight Bag (EFB) Hardware & Software Evaluation

NOTE: Checklist 1 contains a list of questions for PIs to use during a tabletop evaluation of the EFB focusing on the EFB hardware and software applications. The checklist starts with EFB hardware questions, then presents general user interface questions, and ends with specific EFB software application questions (if applicable). The checklist is designed so any question answered as "No" requires a comment, and in some cases may be "Not Applicable."

Electronic Flight Bag (EFB) Hardware

1. Is the display brightness and contrast adjustable?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
2. Is the display brightness acceptable when it adjusts automatically?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
3. Are there any display artifacts, such as jagged lines, impairing functionality?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
4. Are controls labeled appropriately to describe their intended function?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
5. Is the display readable under all flight deck illumination conditions?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
6. Are touch-sensitive areas clearly indicated on the touch screen?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
7. Can EFB inputs be made quickly and accurately in any operational environment (e.g., turbulence)?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
8. Can touch screen inputs and selections be made without obscuring critical information on the display?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
9. Is the touch screen resistant to scratching, hazing, or other damage that can occur through normal use and exposure?	<input type="checkbox"/> No	<input type="checkbox"/> Yes

- 10. Are inadvertent or multiple activation of controls minimized? No Yes
- 11. Does the EFB start up in a predictable state? No Yes
- 12. Can the EFB be rebooted when power is cut to the EFB? No Yes
- 13. Does the EFB function correctly when rebooted? No Yes
- 14. Are all the EFB failure modes easy to see and identify? No Yes
- 15. Is the failure annunciation/message appropriate for the EFB function which failed? No Yes
- 16. Are EFB recovery means easy to remember and apply when the EFB fails? No Yes
- 17. Has the operator provided evidence of electromagnetic compatibility (EMC) testing if utilizing portable EFB hardware? No Yes
- 18. Has the operator provided evidence that the device will continue operation after a rapid decompression event? No Yes

Provide the Number and a Comment for Each EFB Hardware Question Checked as “No.”

General User Interface

- 19. Is the revision information and currency expiration date available and presented clearly? No Yes
- 20. Does the device respond immediately to user inputs? No Yes
- 21. Is the processing speed always appropriate for normal use? No Yes
- 22. Are appropriate busy or progress indicators displayed when processing is delayed? No Yes
- 23. Is the user interface, including functions and navigation, consistent throughout the EFB? No Yes
- 24. Is all information needed displayed and easily accessible? Is there missing or difficult to find information? No Yes
- 25. Are common actions and time-critical functions easy to access? No Yes
- 26. Are there standard ways to perform common actions? No Yes
- 27. Are the displays and controls used on the EFB similar across software applications?
Area common set of controls and graphical elements used across software applications? No Yes
- 28. Can all colors be distinguished under the various lighting conditions? No Yes
- 29. Is color coding implemented with a secondary code, such as shading or highlighting, when used to display critical information? No Yes
- 30. Are the colors red and yellow used appropriately—only for warnings and cautions? No Yes
- 31. Is the text easily readable? No Yes
- 32. Do the characters stand out against the display background? No Yes
- 33. Are upper case and italic text used infrequently? No Yes
- 34. Is text used in low-light conditions appropriate in size and easy to read? No Yes
- 35. Is it easy to zoom in on text or graphics when they are too small? No Yes
- 36. Is it obvious when information is out of view and can it easily be brought into view? No Yes
- 37. Is the spacing between characters appropriate? No Yes

- 38. Is the vertical spacing between lines appropriate? No Yes
- 39. Are icons and symbols legible? No Yes
- 40. Are icon and symbol functions obvious? No Yes
- 41. Are the icons and symbols distinguishable from one another? No Yes
- 42. Is each icon’s meaning explained by a label or other means? No Yes
- 43. Are the EFB icons and symbols consistent with their paper equivalents? No Yes
- 44. Are alerts and reminders consistent across all EFB software applications? No Yes
- 45. Are reminders implemented so as not to distract? No Yes
- 46. Is the failure message appropriate for the EFB function that failed? No Yes
- 47. Is it easy to reset parameters to their default when they have been customized? No Yes
- 48. Is EFB customization controlled through an administrative control process? No Yes

Provide the Number and a Comment for Each General User Interface Question Checked as “No.”

General EFB Software Applications

- 49. Can required information be found quickly and accurately within all EFB software applications? No Yes
- 50. Is the information within EFB software applications organized consistently? No Yes
- 51. Is the layout of information appropriate for all EFB software applications? No Yes
- 52. Is required information easy to read? No Yes
- 53. Is it easy to tell which EFB software application is currently open/active? No Yes
- 54. Is it easy to switch between EFB software applications? No Yes
- 55. Does each EFB software application function as intended? No Yes
- 56. Is access or links to related information appropriately supported? No Yes
- 57. Are similar types of information accessed in the same way? No Yes
- 58. Is it easy to return to the place where the user started from? No Yes

Provide the Number and a Comment for Each General EFB Software Applications Question Checked as “No.”

Electronic Documents (If Applicable)

- 59. Is it easy to find the information needed in a document? No Yes
- 60. Is it easy to tell which documents are open? No Yes

- 61. Is it easy to move between documents quickly? No Yes
- 62. Is it easy to tell what document is currently in view? No Yes
- 63. Is there a list of available documents to choose from? No Yes
- 64. Is the document search function appropriate? No Yes
- 65. Are tables readable and usable? No Yes
- 66. Are figures readable and usable? No Yes

Electronic Charts (If Applicable)

- 67. Is there a way to pre-select specific charts for easy access during a particular flight? No Yes
 - 68. Is it easy to search for a chart? No Yes
 - 69. Is it easy to access charts when a last-minute change is necessary? No Yes
 - 70. If the chart application uses aircraft location to facilitate access to charts, is this function appropriate (i.e., either approved by Aircraft Certification Service (AIR) or explicitly allowed by the current edition of Advisory Circular (AC)120-76)? No Yes
 - 71. Is the information layout for fixed charts consistent with the paper equivalent? No Yes
 - 72. Is it easy to switch between a decluttered and normal display if decluttering is supported? No Yes
 - 73. Is there a clear indication when any chart elements are suppressed? No Yes
 - 74. Can the display be easily returned to its default position after zooming, panning, or decluttering? No Yes
- Provide the Number and a Comment for Each Electronic Documents and Charts Question Checked as "No."**
- No Yes

Electronic Checklists (ECL) (If Applicable)

- 75. Are normal checklists available in the appropriate order of use? No Yes
- 76. Can checklists be accessed individually for review or reference? No Yes
- 77. During abnormal conditions, are relevant checklists easy to access? No Yes
- 78. During abnormal conditions, does the device indicate which checklists and/or checklist items are required and which are optional? No Yes
- 79. Is it clear where to find all checklists, whether on the EFB or on paper? No Yes
- 80. Is the location of a paper document provided when it is referred to by the ECL? No Yes
- 81. Does each checklist have a constantly visible title distinct from other checklists? No Yes
- 82. Is it easy to select a checklist from a set of open checklists? No Yes
- 83. Is there a reminder to review incomplete items when closing an incomplete checklist? No Yes
- 84. Can an incomplete checklist be closed after acknowledging it is not complete? No Yes
- 85. Does the ECL discourage two or more checklists from being used simultaneously? No Yes
- 86. Is progress through the ECL clear? No Yes

- 87. It is easy to reset the ECL to start over again? No Yes
- 88. Does the checklist provide appropriate reminders for tasks requiring a delayed action? No Yes
- 89. Does the checklist clearly highlight decision branches? No Yes
- 90. Can you return to the checklist from links or related information in one step? No Yes
- 91. Is there an indicator of which item in the checklist you are working on? No Yes
- 92. Is the checklist's active item clearly indicated? No Yes
- 93. Can the status of an item be easily changed? No Yes
- 94. Does the next item automatically become active when the previous one is complete? No Yes
- 95. Can the current item be deferred without completing it? No Yes
- 96. Is it easy to view other items, even in a long checklist, without changing the active item? No Yes
- 97. Is it easy to move between items within a checklist? No Yes
- 98. Is there a clear indication all items, as well as the whole checklist, are complete when finished? No Yes

Provide the Number and a Comment for Each ECL Question Checked as "No."

Performance Calculations (If Applicable)

- 99. Does the device identify entries having an incorrect format or type and does it generate an appropriate error message? No Yes
- 100. Does the error message clarify the type and range of data expected? No Yes
- 101. Are units for performance data clearly labeled? No Yes
- 102. Do the labels used in the EFB match the language of other operator documents? No Yes
- 103. Is all the information necessary for a given task presented together or easily accessible? No Yes
- 104. Can the crews modify performance calculations easily, especially when making last-minute changes? No Yes
- 105. Are outdated results of performance calculations deleted when modifications are entered? No Yes
- 106. Does the display and/or crew training provide information to the crew on the assumptions on which the calculations are based? No Yes
- 107. Are crews trained to identify and review default values and assumptions about the aircraft status or environmental conditions? No Yes
- 108. Are the assumptions made about any calculation as clear to pilots as similar information would be on a tabular chart? No Yes

Provide the Number and a Comment for Each Performance Calculations Question Checked as "No."

EFB Operational Evaluation

2

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Figure 4-81. Checklist 2—Electronic Flight Bag (EFB) Operational Evaluation

NOTE: Checklist 2 contains a list of questions for PI consideration during an operational evaluation of the EFB program, to include its documentation, procedures, and training. The first five pages contain questions to be answered in a training or operational environment by crewmembers, instructor/evaluators, or other operational personnel. The last two pages contain sample crew performance questions addressed in a simulation environment. The checklist is designed so any question answered as “No” requires a comment and in some cases may be “Not Applicable.”

General Electronic Flight Bag (EFB) Hardware

- | | | |
|---|-----------------------------|------------------------------|
| 1. Is there a backup source in the flight deck for EFB information? 2. Is the EFB display readable under all typical flight-deck lighting conditions? 3. Are there appropriate Master Minimum Equipment Lists (MMEL)/minimum equipment list (MEL) items to handle EFB failures? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 4. Have EFB failure items been incorporated into Federal Aviation Administration (FAA)-required/accepted checklists? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 5. Are crews able to adjust and lock the EFB for optimal viewing? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 6. Are the EFB hardware components usable and suitably durable for the flight deck? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |

Provide the Number and a Comment for Each General EFB Hardware Question Checked as “No.”

EFB Stowage

- | | | |
|--|-----------------------------|------------------------------|
| 7. Is there a stowage area for the EFB? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 8. Is the stowage securing mechanism simple to operate? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 9. Is the stowage securing mechanism unobtrusive when not in use? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 10. Does the EFB stowage allow appropriate visual and physical access to flight controls, displays, and emergency egress path? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 11. Does the viewable stowage allow pilots a sufficiently clear view of critical outside references? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 12. Can the EFB be moved easily to and from the stowage area without blocking access to flight displays/controls? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 13. Are the device and/or the stowage area unlikely to be damaged under normal use? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |

Unsecured EFB (If Applicable)

- | | | |
|---|-----------------------------|------------------------------|
| 14. Is there appropriate access to flight controls/displays when the unsecured EFB is in use? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 15. Is there an acceptable place to put an unsecured EFB when in use? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |
| 16. Is there an acceptable place to put an unsecured EFB when <i>not</i> in use? | <input type="checkbox"/> No | <input type="checkbox"/> Yes |

17. Can the kneeboard EFB be positioned so the pilot has full control authority? 18. Is the kneeboard EFB comfortable for the pilot to wear under normal conditions? No Yes

Provide the Number and a Comment for Each EFB Stowage and Unsecured EFB Question Checked as "No."

Workload

19. Is the EFB installation appropriate for use in high workload phases of flight? No Yes

20. Does stowing the EFB require excessive head-down time or workload? No Yes

21. Is the workload acceptable when there is an EFB failure? No Yes

22. Are other than critical EFB messages inhibited during high workload phases of flight? No Yes

23. Is the workload acceptable when configuring electronic charts while flying a procedure? No Yes

24. Are there procedures to mitigate EFB workload? No Yes

25. Are there appropriate procedures for using EFB in high workload phases of flight? No Yes

Software Applications

26. Does the EFB use terms, icons, colors, and symbols consistent with other flight deck systems? No Yes

27. Does using the electronic checklist (ECL) produce the same crew actions the paper equivalent would? No Yes

28. If the EFB shows own-ship in flight, is there an operationally similar function presented on an installed display? Can the flightcrew differentiate between the information on the EFB and the information on the installed display? 29. Is there a clear indication of the revision date(s) of the software that are on the EFB? No Yes

Provide the Number and a Comment for Each Workload and Software Applications Question Checked as "No."

EFB Cybersecurity

30. Are cybersecurity controls in place to mitigate against the risk of unauthorized modifications to an EFB's operating system architecture, its specific hosted applications, and any of the databases or datalinks used to enable its hosted applications? No Yes

31. Are cybersecurity controls in place to ensure administrative management of portable electronic devices (PED), which have been authorized for use as a portable EFB? (Note: This includes, but is not limited to, identifying the individual or aircraft to which the PED is assigned, as well as ensuring operating system architecture and associated hosted software applications are updated in a timely manner.) No Yes

EFB Procedures

32. Are there procedures for starting up and shutting down the EFB? 33. Are there appropriate procedures for all the EFB failure modes? 34. Are there EFB procedures for when other aircraft system failures could render the EFB unusable? No Yes

35. Are there procedures for using EFB backup information? No Yes

36. Are there procedures for establishing which source of information is primary? No Yes

37. Are there procedures specifying what data to use when data is redundant or different from the EFB? No Yes

38. Are there procedures for removal of a kneeboard EFB during emergency landing or egress (if applicable)? No Yes

39. Are there procedures for updating passwords and for device lockout? No Yes

Provide the Number and a Comment for Each EFB Cybersecurity and Procedures Question Checked as "No."

Procedures for Keeping EFB Content/Data Current

40. Are there procedures to ensure data is accurate and current for each software application? No Yes

41. Are changes to content/data appropriately documented? 42. Are there procedures to notify crews of EFB updates? 43. Are there procedures to ensure the correct information is installed when EFBs use information specific to the aircraft type or tail number? No Yes

44. Are operational control procedures consistent with regulations concerning preventative maintenance? No Yes

45. Is there a procedure to avoid corruption/errors during changes to the EFB device? No Yes

46. Is there a procedure to ensure all EFBs have the appropriate content/data installed when there are multiple EFBs on the flight deck? No Yes

47. Is there a procedure to ensure EFB data in use is approved for use in flight? No Yes

48. Is there a procedure for when the database is not approved for use in flight? No Yes

49. Is there a procedure to ensure all customized values are cleared from the EFB? No Yes

Procedures for User Feedback

50. Is there a procedure for EFB users to provide feedback? No Yes

51. Is there a procedure for the operator to monitor feedback, correct EFB deficiencies, and/or notify the EFB manufacturer? No Yes

52. Are there procedures or built-in limits preventing the setting of customized color schemes conflicting with flight deck color conventions? No Yes

- 53. Is there a policy regarding the use of supplemental audio and/or video in flight? No Yes
- 54. Is the EFB audio set to minimize any interference with higher priority communications? No Yes

Procedures for Specific EFB Software Applications (If Applicable)

- 55. Are there specific policy/procedures for using the electronic charts application? No Yes
- 56. Does the policy specify what other EFB software applications can be used while a procedure using the electronic charts is actively being flown? No Yes
- 57. Are there procedures on how to use the electronic charts when the EFB uses aircraft status data to configure chart elements? No Yes
- 58. Are there procedures to ensure navigation/approach charts required for the flight are installed and available? No Yes
- 59. Is there a procedure to identify the controlling copy of Weight and Balance (W&B)? No Yes
- 60. Is there a procedure to establish responsibility for completion of W&B software applications? No Yes
- 61. Are there procedures to maintain required W&B records? No Yes
- 62. Is there a procedure to ensure EFB performance data can be stored outside the EFB? No Yes
- 63. Are there procedures for crosschecking EFB performance data to identify data entry errors? No Yes

Provide the Number and a Comment for Each EFB Procedure Question Checked as "No."

EFB Training

- 64. Are there appropriate EFB training, checking, and currency requirements? No Yes
- 65. Does the EFB training program address all EFB intended functions and EFB software applications? No Yes
- 66. Is there training on how to use unique features of the software applications? No Yes
- 67. Are crews proficient on the EFB at the completion of EFB training? No Yes
- 68. Is EFB training customized for new users? No Yes
- 69. Is the manufacturer's EFB documentation sufficient? No Yes
- 70. Does the EFB training device provide an appropriate degree of fidelity when the actual EFB is not used? No Yes
- 71. Does the EFB training device simulate the key aspects of the task? No Yes
- 72. Does the EFB training appropriately address the meaning of icons and symbols? No Yes
- 73. Does EFB training address security considerations (e.g., passwords, device lockout)? No Yes

Training for Charts (If Applicable)

74. Is training on the use of electronic charts appropriate?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
75. Is there training on unique features of the electronic charts?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
76. Is there training on differences in map scale, orientation, and data quality between the electronic charts and other flight deck displays?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
77. Is there training on the limitations of own-ship position when it is displayed?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
78. Is there training on policies pertaining to use of the electronic charts?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
79. Can crews use the electronic charts as well as paper charts?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
80. Can crews use the electronic charts to orient themselves and track their progress as they fly required procedures?	<input type="checkbox"/> No	<input type="checkbox"/> Yes

Training for ECL Systems (If Applicable)

81. Is there appropriate training on how to use ECLs?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
82. Is there training on how to use unique features of the ECLs (e.g., how the EFB indicates a checklist item has been deferred)?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
83. Is there training on which checklists are supported electronically and which are not?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
84. Is there training on the limitations of ECL automation when it uses aircraft status data?	<input type="checkbox"/> No	<input type="checkbox"/> Yes

Training for Flight Performance Calculations (If Applicable)

85. Is there appropriate training on how and when to use the flight performance software application?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
86. Is there training on critical performance calculation assumptions (e.g., runway length, W&B)?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
87. Is there training to review default values for aircraft status and environmental conditions?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
88. Is there training on how to enter information required by the performance software applications?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
89. Is there training on how to interpret and use results of the flight performance calculations?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
90. Is there training on where to obtain values when their normal sources are not available?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
91. Is there training on coordinating the roles of dispatchers and crewmember?	<input type="checkbox"/> No	<input type="checkbox"/> Yes
Provide the Number and a Comment for Each Training Question Checked as “No.”	<input type="checkbox"/> No	<input type="checkbox"/> Yes

Crew Performance: Preflight Planning

Do crews with the EFB perform as well or better than crews with paper documents when:

- 92. Calculating aircraft W&B, takeoff, climb, and maneuvering speeds? No Yes
- 93. Crews maintain critical data for immediate reference? No Yes
- 94. There is a runway change and a need to reference deicing fluid requirements or an MEL item? No Yes
- 95. There are time-critical adjustments prior to block out/taxi and takeoff? No Yes

Crew Performance: Takeoff

Do crews with the EFB perform as well or better than crews with paper documents when: 96. There is a takeoff on

- a runway requiring a briefing for a special operator engine-out procedure? No Yes
- 97. There is a complex Standard Instrument Departure (SID) with an abnormal or an emergency during the departure climb-out? No Yes
- 98. There is an emergency requiring a return to the departure or alternate departure airport? No Yes
- 99. One EFB fails, requiring one pilot to rely on the EFB of the other pilot immediately after takeoff? No Yes

Provide the Number and a Comment for Each Preflight Planning and Takeoff Question Checked as "No."

Crew Performance: Cruise

Do crews with the EFB perform as well or better than crews with paper documents when:

- 100. There is an engine failure/fire with possible condition of destination below weather minimums? No Yes
- 101. There is electrical smoke in the cockpit requiring use of smoke mask/goggles while completing checklists or using EFB for approach briefing? No Yes

Crew Performance: Descent

Do crews with the EFB perform as well or better than crews with paper documents when:

- 102. There are conditions requiring reference to Surface Movement Guidance and Control System (SMGCS) taxi routing or a complex clearance? No Yes
- 103. Reported runway conditions require reference to operational limitations? No Yes

Crew Performance: Approach/Landing

Do crews with the EFB perform as well or better than crews with paper documents when:

- 104. There is arunway change or the need to recompute landing weight and V speeds during approach? No Yes
- 105. There are poor weather conditions or airports with complex taxi routes? No Yes
- 106. There is a request for a specific taxiway turn during rollout after landing? No Yes

Crew Performance: Destination Ground Operations

Do crews with the EFB perform as well or better than crews with paper documents when: 107. There is an

EFB partial failure or erroneous output requiring maintenance discrepancy to be entered? No Yes

Provide the Number and a Comment for Each Crew Performance Question Checked as "No."

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EFB Line Evaluation Job Aid

3

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Figure 4-82. Checklist 3—Electronic Flight Bag (EFB) Line Evaluation Job Aid

USED FOR DATA COLLECTION DURING VALIDATION PERIOD

This tool provides a starting point for EFB line operations evaluations. Use of this tool can be customized as appropriate for the situation. This is a final check to ensure there are no problems with the EFB design/interface, training, or procedures prior to the authorization for use.

The questions below encompass the operations and safety evaluation. In cases where a system shows weaknesses or limitations, mitigations must be developed in consultation with the applicant.

In some cases, an EFB may add to the complexity of flight operations. The key questions to be answered are:

- 1) Can the flight be conducted as safely with an EFB as with the methods/products it is intended to replace?
- 2) Does the EFB add an *unacceptable* level of complexity for any critical activity or phase of flight?

In order to answer these questions, it is helpful to consider more specific aspects of EFB usage, which are covered in Sections II through V below. Space is also provided in Section I to record general notes about the system and the evaluation.

I. Describe system configuration and flight conditions:

II. Overview. The main aspects to be assessed are encompassed by the following questions:

1.
 - a. Was training adequate to ensure the crewmember(s) could perform in a safe and efficient manner? No Yes
 - b. Were individual crewmember knowledge and skills adequate to allow normal coordinated flight deck activities? No Yes
 - c. Was crewmember knowledge regarding observed software applications adequate? No Yes
2. Are adequate procedures in place to ensure the EFB is integrated into the crew/operator’s system (e.g., normal and abnormal/emergency operations and maintenance functions)? No Yes
3. Were the EFB hardware or software applications adequate and appropriate during the flight? If there were any problems, particularly in a critical phase of flight, describe in the notes space below. No Yes
4. Could the crewmember(s) recover from usage errors without undue distraction or discussions? If usage errors were frequent or a distraction, describe in notes space below. No Yes
5. Was the workload required for completing a task with the EFB equal to or less than the workload for completing the task with the conventional method? Consider the use of the EFB both in isolation as well as with those functions used concurrently with other aircraft systems. If no, specify phase of flight and task for any marginal or unacceptable increases in workload in notes space below. No Yes

Describe any problems checked as “No” above:

III. General.

- 6. Was each crewmember able to use the controls for menu and functionality without frequent errors? No Yes
- 7. Was the device appropriate and operational when exposed to environmental factors (e.g., turbulence, cold weather, vibration)? No Yes
- 8. a. Was the device free of significant limitations in regard to display (e.g., off-axis view angles or various different lighting conditions)? No Yes
- b. Does the device have easy and adequate dimming functions in low-light (nighttime) conditions? No Yes
- c. Is the device adequately backlit and/or viewable by flight deck lighting in low-light (nighttime) conditions? No Yes
- d. Is the device clearly visible in bright sunlight conditions? No Yes
- 9. Was the device display clear (adequate resolution)? Confirm the display was never misinterpreted because of viewing limitations. If so, record issues in notes space below. No Yes
- 10. Did the crewmember(s) ensure proper EFB stowage (including viewable stowage) per standard operating procedures (SOP)? Temperature limitations acknowledged? No Yes
- 11. Does the display continue to be usable after prolonged use in the flight deck environment (if applicable)? No Yes
- 12. Are normal functions (e.g., shutdown, startup) adequate to ensure crewmembers are not required any undue attention or concern? No Yes
- 13. Were procedures adequate for identifying currency of EFB data? No Yes
- 14. Could the crewmember(s) easily find and use required items and functions? No Yes
- 15. Were the abbreviations and/or icons easy to understand? No Yes
- 16. Could the crewmember(s) easily switch between critical software applications? No Yes
- 17. If critical (e.g., abnormal or emergency checklists) software applications are authorized in the EFB configuration basis, is their use at least equal to or better than previously approved methods? No Yes N/A
- 18. Was the time to complete normal tasks appropriate? No Yes
- 19. Were audio features adjustable and appropriate for the flight deck or cabin environment and did they not cause crewmember distraction? No Yes N/A

Describe any problems checked as “No” above:

IV. Electronic Charts, Documents, and Checklists.

- 20. Were all necessary documents (including charts, checklists, and manuals) found, identified, and easily viewed by the crewmember(s) without undue distraction? No Yes
- 21. Was information contained in electronic charts, documents, and checklists complete, equal in quality to previously provided products, and easily accessible and understandable? No Yes
- 22. Was crewmember knowledge of chart/document/checklist selection and viewing adequate? No Yes
- 23. Could the crewmember(s) easily rearrange content on the screen to meet needs (e.g., by zooming, panning, or otherwise customizing the view)? No Yes
- 24. Could the crewmember(s) use the EFB concurrently with an installed display and differentiate the information? No Yes
- 25. Did the crewmember(s) exhibit adequate knowledge of EFB functions to efficiently brief and fly required procedures? No Yes
- 26. Did the crewmember(s) exhibit adequate knowledge of the software applications revision process procedure/method ensuring appropriate database accuracy and currency? No Yes
- 27. a. Did the crewmember(s) exhibit adequate knowledge of contingency procedures? No Yes
 b. In the event of a failure of a single device? No Yes
 c. In the event both devices fail? No Yes
- 28. Were crewmember(s) able to monitor necessary electronic chart displays during critical phases of flight? No Yes
- 29. Did the EFB allow quick entry of updates for last-minute changes (e.g., flight plan/runway changes)? No Yes
- 30. For electronic checklists (ECL), was it easy to track completed items? No Yes N/A

Describe any problems checked as “No” above:

V. Flight Performance Data/Calculations.

- 31. Could the crewmember(s) interpret and use flight performance data/calculations efficiently and accurately? No Yes N/A
- 32. Did the device allow quick entry of updates for last-minute changes (e.g., flight plan/runway changes)? No Yes N/A
- 33. Are crewmembers aware of any software application limitations and do they understand only approved calculation methods may be used as a primary means of computation? No Yes N/A

Describe any problems checked as "No" above:

VI. General Conclusions.

- 34. Were any unique safety issues or events caused or exacerbated by using the EFB during this evaluation? No Yes
- 35. Can the flight be conducted as safely with an EFB as with the methods/products it is intended to replace? No Yes
- 36. Does the EFB add an unacceptable level of complexity for any critical activity or phase of flight? No Yes

Assigned Aircraft: _____ Date: _____

Observer Name(Print): _____ Observer Signature: _____

RESERVED. Paragraphs 4-1655 through 4-1665.

A010

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ForeFlight
Intelligent Apps for Pilots™

Date:

Dear:

requests an evaluation of its Apple iPad based, ForeFlight Mobile in-application, electronic Aeronautical Weather Briefing for approval by the Federal Aviation Administration (FAA) at (location where the evaluation is requested). This device and software combination has been evaluated by the manufacturer and is believed to adequately meet the requirements for acceptance as a certificate holders'/program managers' OpSpecs/MSpecs A010 weather source provider, as outlined in the FAA Order 8900.1, Volume 3, Chapter 26, Section 2. Appropriate hardware and software configuration control procedures have been established and are listed below for your review and approval.

The Apple iPad is a "Portable" (depending on installation) Electronic Flight Bag (EFB) that is used extensively by the aviation community in both commercial and private operations. It has gone through rigorous Rapid Decompression evaluation and has met the Radio Technical Commission for Aeronautics (RTCA) DO-160, Environmental Conditions and Test Procedures for Airborne Equipment, up to the maximum operating altitude of the aircraft in which the EFB is to be used.

ForeFlight Mobile is categorized as a Type B application. The manufacturer believes that ForeFlight Mobile's in-application Aeronautical Weather Briefing information meets the FAA requirements for the following phases of flight:

- Preflight Planning
- Departure,
- En-route,
- and Arrival

In order to meet these high standards, ForeFlight Mobile has sourced all data for each phase of flight from reliable partners, including Weather Decisions Technologies (WDT). WDT and ForeFlight have both been recognized as Qualified Internet Communication Providers (QICP). Although the FAA no longer requires operators to utilize QICP vendors, both of their services continue to meet the previously defined performance criteria established under the QICP program. Data delivered by WDT includes METARs, TAFs, winds aloft and imagery for the entire flight planning process. ForeFlight Mobile's servers automatically check for updated weather information every minute of the day. Likewise, WDT updates airport weather information whenever it changes. If a more current observation is available, it is downloaded immediately and the display is updated. WDT continuously updates Radar and Satellite imagery every 3 minutes in the ForeFlight Mobile application. In addition, WDT provides the best and most accurate commercially available composite radar data there is for pilots. WDT provides the following graphical and textual weather products to ForeFlight Mobile:

- PIREPs/Aircraft Reports
- Composite Reflectivity radar for CONUS and Canada
- Infrared Satellite (Global)
- Visible Satellite Imagery (Global)
- Lightning
- Mesocyclone and Tornado/TVS

The National Weather Service (NWS), one of three FAA approved sources for weather reporting and forecasting, supplies the majority of the textual weather information delivered through ForeFlight Mobile. The weather products and information displayed in ForeFlight Mobile are “repackaged” weather, per the FAA’s definition, and thus suitable for:

- Weather reports and forecasts for origin, destination and alternate airports
- Weather reports and forecasts for airports located along the route of flight
- Field Condition (FICON) reports at origin, destination and alternate airports
- Winds aloft
- PIREPS, and
- AIRMETS, SIGMETS, convective SIGMETS, and Volcanic Ash Advisories (when in effect) for the entire route.

“Repackaged” weather information provided by ForeFlight Mobile is simply the retransmission of weather information obtained directly from the NWS. This retransmission is in the form of an Aeronautical Weather Briefing that must be reviewed within ForeFlight Mobile before a flight plan can be filed from the application. The Weather Briefing itself can be kept electronically for attachment to – and for later review of – the dispatch/flight release.

ForeFlight Weather Briefings and Flight Plan Summaries are stored on the iPad, Web, and emailed to the address shown in the electronic File & Brief form. A copy of each is also emailed to the ForeFlight account holder’s email address, if the two addresses are not the same. Account holder’s emails can either be personal or to an administrator for the company. To show a previous briefing, pilots can tap the Briefing button again when viewing a previously filed flight plan within the application. Also, existing briefings can be refreshed to show the latest data. It is necessary to have an active network connection in order to refresh or obtain a briefing.

ForeFlight Mobile weather information is accessed via the Public Internet. ForeFlight Mobile can be updated via Wi-Fi, 4G, 3G and Edge networks, depending on the device configuration, the carrier and the available network connectivity.

We believe the performance and reliability of the ForeFlight Mobile application has adequately proven to meet the Aeronautical Weather Briefing requirements common to all Air Carrier Flight Departments. We respectfully submit our request for your approval.

Sincerely,

Generic EFB EMI Test

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ForeFlight
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PORTABLE ELECTRONIC DEVICE NON-INTERFERENCE CHECKS

PHASE I - Ground Check

Verify that the Portable Electronic Devices (PEDs) do not interfere with the communication or navigation systems on the aircraft. The PED (or a representative number and various types of PEDs if multiple devices are being approved) should be placed in the location(s) where the devices will be normally be operated. Operation of PEDs should not result in NAV flags, noise on COMM channels, interference over headsets, or other phenomena. A ground check is required prior to flight checks. A qualified pilot or maintenance technician should operate the aircraft systems as listed below and check the operation of any PEDs to be used. If the PED is equipped with a wireless connection that is used in flight, it should be enabled.

(circle one)

COMM Radios:

For each:

*N/A SAT UNSAT

1. With the PED operating, tune to 121.5 to ensure there is no interference caused by the PED.
2. Scan through radio channels to ensure there is no interference caused by the PED.
3. Check local ground and tower frequencies to ensure there is no break in squelch caused by the installation.

NAV Radios:

For each:

*N/A SAT UNSAT

1. With the PED turned OFF, perform a VOR/VOT ground check.
2. Verify that the VOR/VOT ground check is successful.
3. With the PED operating, perform a VOR/VOT ground check.
4. Verify that the VOR/VOT ground check is successful.

GPS/FMS:

For each:

*N/A SAT UNSAT

1. With the PED turned OFF, ensure the correct position is displayed.
2. With the PED operating, ensure the correct position is displayed.

Autopilot:

For each:

*N/A SAT UNSAT

1. Ensure the autopilot self-test passes OK with the PED operating.

Other Aircraft Systems:

For each:

*N/A SAT UNSAT

Verify that there is no adverse effect on flight instruments with the PED operating. If interference or abnormal operation is detected, turn the PED OFF. If interference or abnormal operation goes away, there is likely interference from the PED. If interference or abnormal operation persists with the PED OFF, the cause may be interference from other devices or faulty aircraft systems.

I certify that the above Phase I checks have been completed and any interference have been noted below.

Print Name: _____ Date: _____ No Interference Observed

Signature: _____ Date: _____ Certificate#: _____

Anomalies or Interference Noted:

(*If an item was marked as N/A, please explain below)

(continued, next page)

PHASE II – Flight Check

The PED (ora representative number and various types of PEDs if multiple devices are being approved) should be placed in the location(s) were the devices will be normally be operated. Operation of PEDs should not result in NAV flags, noise on COMM channels, interference over headsets, or other phenomena. A ground check is required prior to flight checks. If the PED is equipped with a wireless connection that is used in flight, it should be enabled. The following items must be checked for non-interference in day-VMC conditions. All applicable equipment must be checked prior to submission:

Normal	FMS	Operations	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Communications,		HF	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Communications,		VHF	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Communications, SATCOM Primary			*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
&Multi-FunctionalDisplays		Airborne	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Radar Enroute	GPS	Operations	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Enroute	VOR	Operations	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
NDB Operations	Enroute	RNAV ILS	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Standard approach,	coupled	ILS	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Standard approach,	uncoupled	ILS	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
Backcourse	Localizer	VOR	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
approach	NDB approach	GPS	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
approach	TCAS	operations	*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
			*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
			*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
			*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
			*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>
			*N/A	<input type="checkbox"/>	SATISFACTORY	<input type="checkbox"/>	UNSATISFACTORY	<input type="checkbox"/>

I certify that the above Phase II checks have been completed and any discrepancies have been noted below.

Print Name: _____ Date: _____ No Interference Observed

Signature: _____ Date: _____ Certificate#: _____

Anomalies or Interference Noted:
 (*If the item was marked N/A, explain below)

iPad Battery Safety Certification

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ForeFlight
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iPad: Battery safety certifications

Learn about battery safety certifications for iPad.

iPad is a portable device designed to be used all day on a single charge from a built-in battery.* iPad uses lithium-ion battery technology to support this capability. Unless otherwise stated, all existing and future iPad models using lithium-ion batteries are designed to meet international safety certification standards. All iPad batteries are tested, certified, and in compliance with the standards listed below. These standards meet the safety and testing criteria set forth in the FAA Advisory Circular AC 120-76D regarding the airworthiness and use of portable electronic flight bags.

- United Nations (UN) Transport Regulations UN38.3: Covers battery safety during air transport
- Underwriters Laboratory (UL) 2054: Covers safety of lithium-ion batteries in general use; UL 60950-1 covers the use of batteries in information technology equipment
- Institute of Electrical and Electronics Engineers (IEEE) 1725: Covers safety of lithium-ion battery packs in cellular devices

* Battery life varies by use and configuration.

Published Date: March 11, 2020

The above information is found at this URL:

<https://support.apple.com/en-us/HT204509>

Letter of Operational Suitability

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ForeFlight
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U.S. Department
of Transportation
**Federal Aviation
Administration**

Northwest Mountain Region
Colorado, Idaho, Montana,
Oregon, Utah Washington,
Wyoming

Seattle Aircraft Evaluation Group
Flight Standards Regional Office
1601 Lind Avenue SW
Renton, Washington 98057-3356

June 30, 2014

Mr. Scott Tidwell
Product Support Team
ForeFlight Mobile
621 E. 6th Street, Suite 100
Austin, TX 78701

Dear Mr. Tidwell:

On June 5, 2014, specialists from the Seattle Aircraft Evaluation Group completed the evaluation of ForeFlight Mobile, an Electronic Flight Bag (EFB) solution for the iPad 2 or newer iPhone 3GS or newer. The evaluation was completed on an iPad 2. ForeFlight Mobile is a full service electronic flight bag comprised of data drawn from the FAA Aeronautical Navigation information as well as many other sources. The mobile application is in an electronic format designed to be a complete flight deck solution for continuous accessibility for the pilot.

ForeFlight Mobile application includes airport flight directory information and instrument departure and arrival procedures and charts for all of the US and Canadian IFR National Airspace System. The Mobile application was evaluated and found to be operationally suitable.

Authorization to use this mobile application and any corresponding EFB hardware and software applications must be approved through the local Federal Aviation Administration (FAA) Certificate Management Office (CMO). Guidance for evaluating specific mounting, EFB hardware and software applications can be found in FAA Order 8900.1, Vol. 4, Ch. 15 and AC 120-76, as revised.

Sincerely,

Stacey Klein
B-737 MAX FSB/FOEB Chairman
Operations Specialist, Electronic Flight Bags
Seattle Aircraft Evaluation Group

ForeFlight EFB Ownership Display Requirements Statement

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ForeFlight
Intelligent Apps for Pilots™

ForeFlight EFB Ownship Display Requirements Statement

ForeFlight, LLC
2323 South Shepherd Drive Suite 912
Houston, TX 77019

RE: EFB Own-Ship Display Supporting Requirements

To Whom it May Concern,

This letter is to support ForeFlight customers seeking approval for the depiction of own-ship symbols on maps and charts in ForeFlight Mobile for all stages of flight. Included is information about ForeFlight's features and database accuracy addressing the supporting requirements listed in AC 120-76D, Chapter 11.17.

Position Source Selection

The FAA recommends using an installed GNSS source for position data in an EFB. ForeFlight can receive position data from a number of installed avionics, including several from Garmin, Appareo, Satcom Direct, L3, Avidyne, FreeFlight, and Dynon for the display of own-ship on ForeFlight's map.

EFB Own-Ship Directionality

When receiving good position and heading data while moving, ForeFlight will display the own-ship as a blue aircraft icon, the style of which can be changed in the Settings menu. If ForeFlight stops receiving accurate heading data it will change the own-ship icon to a stationary blue circle.

EFB Own-Ship GNSS Data Stream

When ForeFlight stops receiving good position data, either because the source of the data lost power or because the data became unacceptably inaccurate, it will remove the ownship icon from the map. The accuracy value above which ForeFlight will remove the ownship from the map is 100 meters.

EFB Own-Ship Surface Use Accuracy

ForeFlight's proprietary airport map database - which is used to create the ForeFlight taxi charts - is designed for an accuracy of 5 meters or better.

ForeFlight creates georeference information for its proprietary taxi charts and FAA provided taxi charts using proprietary GIS software tools. Georeference information enables display of own-ship symbology on a taxi chart. The accuracy of the georeference data is triple verified by analysts using GIS software and proprietary tools. The georeferenced taxi charts are then visually compared to satellite imagery of the aerodrome for additional quality assurance.

ForeFlight Mobile does not display own ship position on any taxi chart that is not georeferenced or does not meet the accuracy requirements. ForeFlight Mobile validates the airport map database files after download from the ForeFlight servers to ensure data integrity.

Map Zoom

ForeFlight provides two features that can be used to gauge the scale of the display: the Ruler and Distance Rings. The ruler can be invoked on the Maps view by placing and holding two fingers on the screen at once, then manipulated by moving the two fingers, and shows the distance covered by the ruler and inflight performance calculations like ETE and fuel burn over that distance.

The Distance Rings setting overlays three concentric rings centered on the ownship icon that each have a label indicating their radius. By default these rings will automatically resize themselves as the map zoom level changes, from a minimum of 2-10 nm to a maximum of 400-2000 nm.



www.foreflight.com
Questions? Email team@foreflight.com

2323 S. Shepherd Drive,
Suite 912
Houston, Texas 77019

ForeFlight SOPs

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ForeFlight
Intelligent Apps for Pilots™

STANDARD OPERATING PROCEDURES / IPAD CONFIGURATION CONTROL

January 3rd, 2018 Version 3.0

Preflight

- All company pilots will use either the company issued Apple iPad (Air, Pro, etc.) or Apple iPad Mini (2,3, or 4th gen) as the approved Electronic Flight Bag (EFB) for flight planning and operational use in-flight.
- All company iPads (both primary and backup) will be fully charged before the first flight of the day. 50% minimum charge before a flight. 75% charge if using continuous ADS-B/in-flight weather. All accessories will be available and charged.
- Pilots are responsible to ensure that the latest updates to both Apple iOS (if cleared by ForeFlight via email) and ForeFlight Mobile software have been installed before each flight.
- Pilots are responsible to ensure that all charts and data required for each leg of the flight are downloaded and current before the flight occurs. ForeFlight's "Pack" feature can be used to identify and download charts and data that are needed before each flight.
- Airport Information, to include METARs, TAFs, Winds Aloft and appropriate imagery for the departure airport, route of flight and alternates are to be reviewed before each flight.
- Current NOTAMS for the departure airport, route of flight, destination and alternates are to be reviewed before each flight leg.
- In-app Flight Notifications and Weather Briefings are to be saved for later review.
- File flight plan
- Screen Rotation Lock on the iPad is to be set ON for each flight.
- An Apple approved charging adapter that delivers 2.1 amps and 10 watts of power is to be kept onboard the aircraft for inflight charging of the iPads.

In-Flight

- iPad use in the cockpit is permitted for display of electronic charts, documents, flight planning, in-flight weather, and Wi-Fi access for obtaining weather information. Wi-Fi use for personal communication or other activities is prohibited.
- Crew members are cautioned to avoid distracting activities.
- Crew members are responsible for securing devices in-flight.
- iPad use during sterile cockpit phases is limited to critical tasks only (e.g. reviewing approach plates).
- We recommend using position data from an installed GNSS source. You may use iPad GPS or GPS Portable Electronic Devices supporting the EFB Application. You may overlay EFB own-ship position on an EFB only when the installed primary flight display, weather display, or map display also depict own-ship position.
- Until approved otherwise, paper charts will remain onboard the aircraft as a backup to the ForeFlight Mobile Electronic Flight Bag. When there is a conflict, current paper charts will have priority.

- In an emergency situation, ensure that the EFB is stowed and secured before landing. Company computer policies apply to iPad usage. iPads are not to be used for entertainment purposes during flight or taxi operations.

Power Management

- iPad battery life is to be monitored while the pilot is on duty. Pilots will proactively recharge the devices if concerns arise about power level.
- Power below 20% is a caution; battery saving actions are advised, including: Reduction of screen brightness to the lowest acceptable setting; brightness is the largest source of power drain.
- Ensure iPad is in Airplane Mode: this will disable all radios and thus preserve battery power. If connected to an external device using Wi-Fi or Bluetooth, the necessary radios can be re-enabled after entering Airplane Mode.

Troubleshooting / Abnormal Procedures

- Operation with a single iPad is considered an abnormal procedure.
- To restore device from abnormal conditions (during non critical phase of flight) restart the iPad by holding down the power button normally found on the top of the device. Then swipe to turn off. Then press the power button to restart the device. If issue continues discontinue use of the iPad and switch to the back up.
- During an in-flight iPad failure, if no backup is available, notify ATC of an EFB failure causing loss of access to charts.
- Consider diverting to an airport with VFR conditions if the destination and alternate are IFR.
- If an approach is required, approach instructions should be obtained from ATC or Flight Operations.

Post-Flight Procedures

- Record squawks for the devices, operating system, application or other.
- Reset airport selections or other information related to the last flight.
- Begin charging iPads and accessories.
- iPads will be removed from the aircraft for overnight stays, used for planning and recharged when out of the aircraft.



ForeFlight
Intelligent Apps for Pilots™

www.foreflight.com
Questions? Email team@foreflight.com

2323 S. Shepherd Drive,
Suite 912
Houston, Texas 77019

BATTERY CHARGING PROCEDURES

December 3rd, 2018 Version 2.0

Introduction

The Apple iPad Mini, iPad Air, and iPad Pro (9.7 Inch, 10.5 Inch, and 12.9 Inch) are permanently sealed Electronic Flight Bags (EFBs). Each device contains rechargeable lithium-polymer batteries rated at 23.8 watt- hours and 32.4 watt-hours respectively. Available battery life will be from 7 - 10 hours of normal use from a fully charged state.

iPad battery life will be monitored by the pilots while they are on duty. Pilots will pro-actively charge the device if concerns arise about available power levels.

Recommendations

1. Use Apple manufactured or approved charging cables and accessories. Use a charging outlet that provides the required 2.1 amps and 10 watts of power. Overnight charging is acceptable as both devices have overcharge protection and will automatically stop charging when complete. If the battery gets too warm, both devices will stop charging automatically (but will still run on external power). Apple's recommended operating temperature range: 32° to 95° F (0° to 35° C). Non-operating temperature range: -4° to 113° F (-20° to 45° C).

Tips

1. iPads do charge slowly, even with the Apple charger. When plugged in and downloading updates to ForeFlight Mobile, iPad charging will take several hours. Plan accordingly.
2. Screen brightness is typically the largest drain on an iPad's battery. Use the following two tips alone or in conjunction to set the screen's brightness as low as possible while retaining visibility.

3. You can adjust screen brightness from within ForeFlight Mobile using the Brightness slider at the top of the global Settings menu or in the settings menus for the Maps, Plates, and Documents views. ForeFlight Mobile includes multiple settings to darken or invert colors for better night vision and less battery consumption: Invert Chart Colors in the Maps view settings, Invert Plate Colors in the Plates view settings, Invert Document Colors in the Documents view settings, and Dark App Theme below the Brightness slider at the top of the global Settings menu. If possible, depending on setup, Turn WiFi and Bluetooth OFF in flight to lower battery usage. To turn WiFi and Bluetooth OFF: Tap Settings on iPad home page > Select WiFi and Bluetooth OFF.
- 4.
- 5.
- 6.

Other suggestions to improve battery life:

1. In the main iPad settings menu use the following settings:
 - Airplane Mode: OFF
 - WiFi: OFF (unless connected to the Portable Electronic Device accessory)
 - Bluetooth: OFF (unless connected to an external Bluetooth GPS device)
 - Cellular Data: OFF
2. Close "all" apps running in the background before your flight.
 - Exit ForeFlight and go to the main iPhone or iPad home screen. Press the button at the bottom of the iPhone/ iPad twice in a row. Small "screen" pictures of the last apps you've used should appear in the middle of the page. If that doesn't appear – please try double-clicking again until they do.
 - Scroll left or right until you find any other open applications, then swipe your finger "up", dragging them off the top of the page.
 - Click the home button at the bottom of the iPhone/iPad to exit.
 - Tap the ForeFlight Mobile icon to re-open the app.

Rapid Decompression Testing

Decompression Tests 2015

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ForeFlight
Intelligent Apps for Pilots™

***ForeFlight LLC Rapid Decompression Test Report
for Apple iPad Air and Apple iPad mini 3 Retina***



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TEST REPORT

CTC C1504

March 19, 2015



Accredited by
American Association for
Laboratory Accreditation (A2LA)



Certified Commercial
Package Testing Laboratory
(ISTA)



MIL-STD Laboratory
Suitability Status by
Defence Logistics Agency (DLA)

LABORATORY LOCATIONS



OREGON

5245-A NE Elam Young Pkwy.
Hillsboro, OR, 97124 • Ph: 503-648-1818



COLORADO

1530 Vista View Drive
Longmont, CO, 80504 • Ph: 720-340-7810

www.cascadetek.com



Cascade Technical Sciences
www.cascadetek.com
1-888-835-9250



TESTING CERT #2582.02

March 19, 2015

Certification No: CTC C1504

Attention: Mr. C. Tvson Weihs
ForeFlight LLC
621 E 6th St, Suite 100
Austin, TX 78701

Reference: a. Cascade Tek Job No.: C1504
b. Cascade Tek Quote No.: CTQ 16075A
c. Client Purchase Order No.: 1009
d. Technical Specification: 1. RTCA DO-160G

Cascade Technical Sciences hereby certifies that Two (2) Electronic Devices, P/N the iPad Air and the iPad mini 3, were subjected to the following test:

1. Rapid Decompression Test per Reference (b) Item 1, and (d1), samples were exposed to a pressure equivalent to 8,000 feet (565 TORR) of altitude to stabilize for a customer specified time and then exposed to a pressure equivalent of 51,000 feet (83 TORR) of altitude with a transition of less than 15 seconds. Samples were left to dwell for a minimum of 10 minutes and then returned to ambient altitude conditions (630 TORR).

Testing was done in accordance with the above references as evidenced and reported in the accompanying data. The testsamples were returned to the customer for evaluation.

The original of this report is on file at Cascade Technical Sciences, Inc. under the above referenced certification number for review by authorized personnel. The results of the testing reported herein relate only to the actual item tested.

Respectfully submitted,



David Bowles
Quality Administrator
Cascade Technical Sciences, Inc.

This test certification shall not be reproduced, except in full, without written authorization from Cascade Technical Sciences Inc.

Total number of pages in this document is 14.

The objective of this test program was to subject customer provided test hardware to environmental simulation in compliance with customer stated specification, including any authorized modification, deviations or concessions to the original requirements. The hardware consisted of items identified in the appropriate sections of this report. In addition to test hardware identification, each section contains information that describes the associated test setup and performance and the resulting data. Cascade TEK, Inc. measuring instruments used in testing were calibrated according to the requirements of ANSI/NCSL Z540-1-1994 and ISO/IEC 17025, 2nd Edition and are NIST traceable. Calibration records are on file and available for inspection by request. Because the test methods are well established and are qualitative or semi-quantitative in nature, Cascade TEK, Inc. does not apply to the corresponding tolerance specifications originated by customer. The customer is responsible to decide whether a test meets the requirements of the specification. Any test hardware operational setups and resulting evaluations or inspections performed by the customer are not included in this report, unless they were explicitly requested. While observations and/or specification compliance statements may be reported, no interpretations or opinions regarding customer product performance are intended. Unless otherwise indicated in the appropriate report section, all contract obligations were met and the test objective achieved.



Test Data Log

Job Number: C1504

Customer: ForeFlight LLC

Date Started: 3/4/2015

Date Completed: 3/4/2015

Reviewing Engineer: Meg Talbert

Signature: *Meg Talbert*

Type of Test: Decompression

Responsible Technician: Keefe Hart

Test Specification: RTCA DO-160G Section 4.6.2

Specimen Description: Electronic Devices

Specimen P/Nor Model No.	Specimen S/N
iPad Air Model No. MH322LL/A	DMPND07SG5YQ
iPad mini 3 Retina Model No. MH3N2LL/A	F4KND4DKG5YK

Laboratory Temperature: +71 °F

Laboratory Humidity: 18% RH

Test

Description:

Samples will be stabilized at a pressure equivalent to 8000 feet of altitude. Following a customer specified stabilization time, the samples will be exposed to a pressure equivalent of 51,000 feet of altitude with the transition occurring in less than 15 seconds. Upon achievement of the 51,000 foot level, the unit will dwell at that pressure for a minimum of 10 minutes and then be returned to ambient conditions. Customer will be onsite for the testing and has requested a short video of the test being conducted. Full operation of samples will be confirmed both pre and post testing.

Initials	Date	Time	Notes	Photo
KH	3/4/2015	1000	All altitude readings will be registered in "TORR". Critical values are: 8000 feet of altitude = 565 TORR 51,000 feet of altitude = 83 TORR 75,000 feet of altitude = 26 TORR 78,000 feet of altitude = 22 TORR Test site ambient altitude = 630 TORR	<input type="checkbox"/>
KH	3/4/2015	1030	Customer is on site and advises that they will video the testing.	<input type="checkbox"/>
KH	3/4/2015	1055	Correct operation of test samples is verified and samples are placed in chamber 1208.	<input checked="" type="checkbox"/>
KH	3/4/2015	1055	Chamber 1208 is sealed and set for 8,000 feet altitude (565 TORR).	<input checked="" type="checkbox"/>
KH	3/4/2015	1100	Chamber 1228 is sealed and set for 75,000 feet altitude (26 TORR); this chamber is equipped with a circular chart to verify altitude.	<input type="checkbox"/>
KH	3/4/2015	1100	Both chamber are started. Data collection equipment is started under data file "A".	<input type="checkbox"/>
KH	3/4/2015	1240	Both chamber are at the prescribed set points.	<input type="checkbox"/>
KH	3/4/2015	1245	The connecting valve between chamber 1208 and chamber 1228 is opened allowing the drawdown of pressure in chamber 1208.	<input type="checkbox"/>

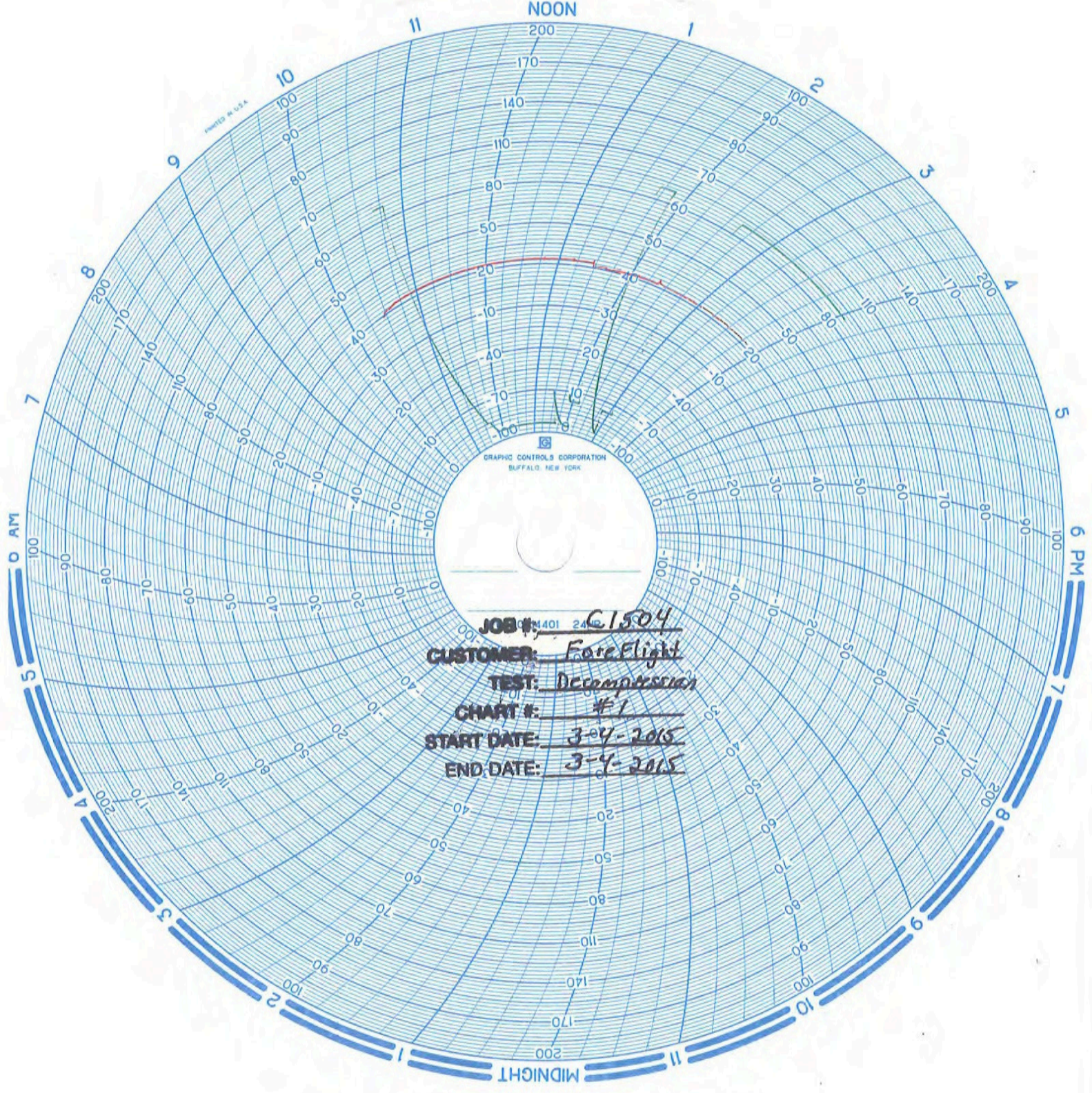
Initials	Date	Time	Notes	Photo
KH	3/4/2015	1245	Upon conclusion of a 15 second period, chamber 1208 has not achieved the required pressure equivalent to 51,000 feet of altitude (83 TORR).	<input type="checkbox"/>
KH	3/4/2015	1247	Chamber 1208 is returned to 8,000 feet of altitude pressure equivalent and held. Chamber 1228 is set for 78,000 feet altitude (22 TORR).	<input type="checkbox"/>
KH	3/4/2015	1308	Chamber 1228 has reached 78,000 feet altitude (22 TORR).	<input type="checkbox"/>
KH	3/4/2015	1310	The connecting valve between chamber 1208 and chamber 1228 is opened allowing the drawdown of pressure in chamber 1208.	<input type="checkbox"/>
KH	3/4/2015	1312	Upon conclusion of a 15 second period, chamber 1208 has again not achieved the required pressure equivalent to 51,000 feet of altitude (83 TORR).	<input type="checkbox"/>
KH	3/4/2015	1313	Customer is advised that test can be better achieved if samples are placed in test vessel 1151 due the smaller internal volume. Customer agrees to allow samples to be moved to 1151.	<input type="checkbox"/>
KH	3/4/2015	1320	Samples have been relocated and are in vessel 1151. Full operation of samples is confirmed.	<input checked="" type="checkbox"/>
KH	3/4/2015	1321	Chamber 1208 is connected to vessel to supply the 8,000 feet altitude (565 TORR) and vessel 1151 is drawn down to proper level.	<input type="checkbox"/>
KH	3/4/2015	1321	Chamber 1228 is set for 75,000 feet (26 TORR) and allowed to achieve set point. Data collection equipment has been connected to CTEK vessel 1151 and disconnected from chamber 1208. Data collection is re-started under data file "B".	<input type="checkbox"/>
KH	3/4/2015	1355	Chamber 1228 is at prescribed set point.	<input type="checkbox"/>
KH	3/4/2015	1405	Valve connecting 1228 and 1151 is opened allowing 1151 pressure to be drawn down below the 51,000 foot altitude equivalent pressure (83 TORR).	<input type="checkbox"/>
KH	3/4/2015	1405	Decompression occurs in less than the prescribed 15 second period and vessel 1151 is held below the prescribed level for a period in excess of 10 minutes.	<input type="checkbox"/>
KH	3/4/2015	1418	Chambers 1208 and 1228 are shut down and vessel 1151 is returned to ambient altitude conditions of 630 TORR.	<input type="checkbox"/>
KH	3/4/2015	1430	Vessel is opened and full operation of both samples is verified by customer.	<input checked="" type="checkbox"/>
KH	3/4/2015	1500	Testing is complete.	<input type="checkbox"/>

DS2- Test Equipment List

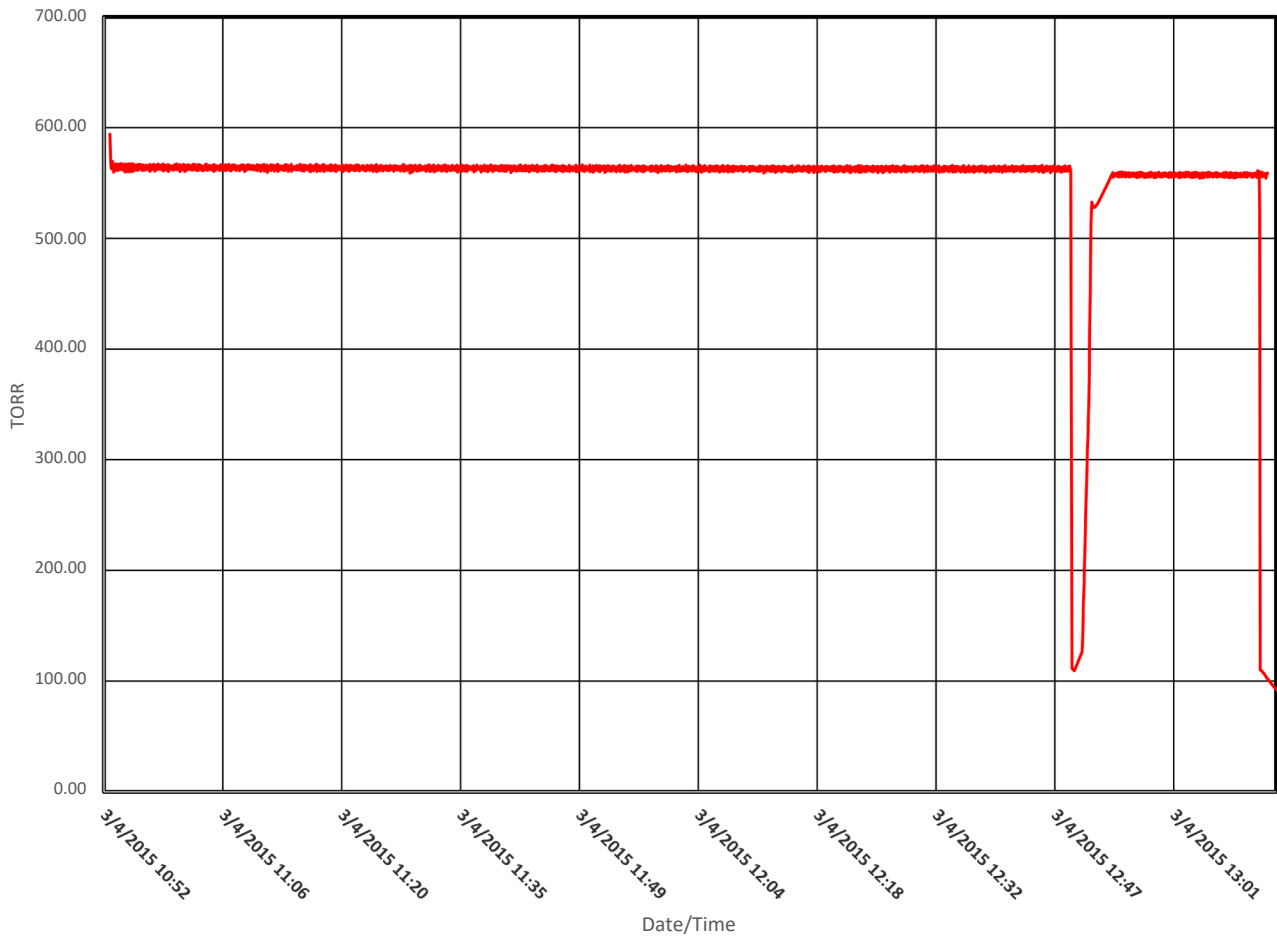


Test: Decompression **Job Number:** C1504 **Date:** 03/04/2015

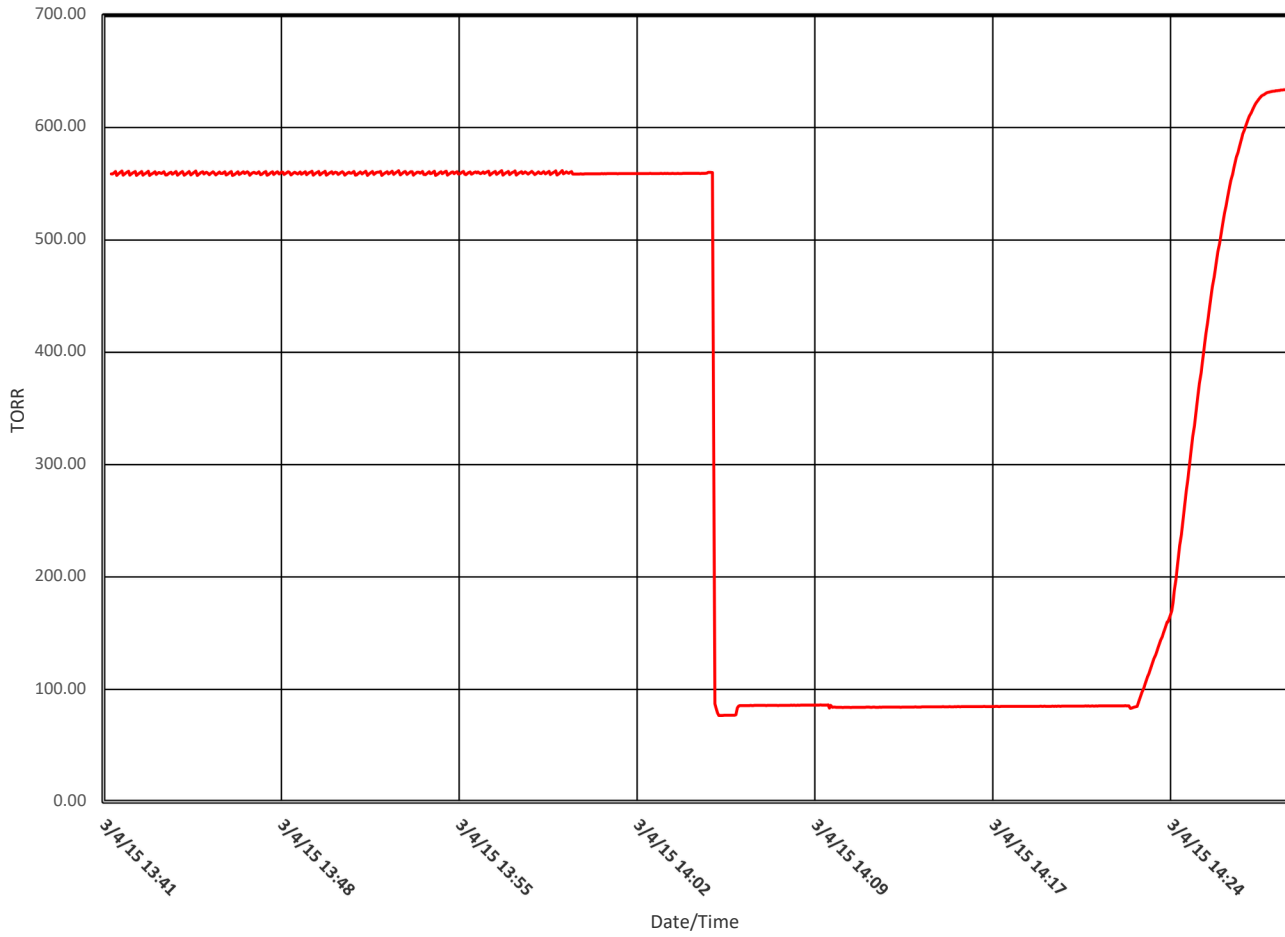
Test Equipment List						
Equipment Description	Manufacturer	Model	S/N	Cal No.	Calibrated Date (mm/dd/yy)	Calibration Due Date (mm/dd/yy)
Altitude Chamber	Tenney	27ST-100400	8190	1208	04/29/14	04/30/15
Small Altitude Chamber	Tenney	8S	25720-02	1228	08/14/14	08/31/15
Digital Temp / RH Meter	Cole-Parmer	90080-03	130033077	FR417	03/27/13	03/31/15
Pressure Vessel	CTEK	NA	1	1151	Reference Only	
Pressure Transducer	Omega	PX303-100A5V	NA	FR332	12/17/14	12/31/15
Data Logger	Agilent	34970A	US37010202	FR411	03/20/14	03/31/15
Data Logger Input Module	Agilent	34901A	US37000277	FR412	03/20/14	03/31/15



ForeFlight LLC, Job# C1504, Rapid Decompression A



Foreflight LLC, Job# C1504, Rapid Decompression B



Rapid Decompression Testing

Decompression Tests 2016

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ForeFlight
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TEST REPORT

CTC C1959

February 3, 2016



Accredited by
American Association for
Laboratory Accreditation (A2LA)
2582.01 & 2582.02



Certified Commercial
Package Testing Laboratory
(ISTA)



MIL-STD Laboratory
Suitability Status by
Defence Logistics Agency (DLA)

LABORATORY LOCATIONS



OREGON

5245-A NE Elam Young Pkwy.
Hillsboro, OR, 97124 • Ph: 503-648-1818



COLORADO

1530 Vista View Drive
Longmont, CO, 80504 • Ph: 720-340-7810

www.cascadetek.com



CascadeTechnicalSciences
www.cascadetek.com
1-888-835-9250



TESTING CERT #2582.02

February 3, 2016

Certification No: CTC C1959

Attention: Ms. Anna Domning
ForeFlight LLC
621 E 6th St, Suite 100
Austin, TX 78701

Reference: a. Cascade Tek Job No.: C1959
b. Cascade Tek Quote No.: CTQ 17964A
c. Client Purchase OrderNo.: 1018
d. Technical Specification: 1. RTCA DO-160G

Cascade Technical Sciences hereby certifiesthat Five (5) Electronic Devices, P/N: iPad Pro, iPad Air, iPad Mini, Stratus 1S, and Stratus 2S, S/N: aslisted in data, were subjected to the following test:

1. Rapid Decompression Test per Reference (b) Item 1 and (d1), Section 4.6.2, the operating samples were stabilized at a pressure of 10.92 psiA corresponding to an altitude of 8,000 feet and then subjected to a reduction in pressure to 1.69 psiA corresponding to an altitude of 50,000 feet within 15 seconds. This altitude of 50,000 feet was then maintained for at least ten minutes.

Testing was done in accordance with the above references as evidenced and reported in the accompanying data. The test samples were returned to the customer for evaluation.

The original of this report is on file at Cascade Technical Sciences, Inc. under the above referenced certification number for review by authorized personnel. The results of the testing reported herein relate only to the actual item tested.

Respectfully submitted,



David Bowles
Quality Administrator
Cascade Technical Sciences, Inc.

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Total number of pages in this document is 13.

The objective of this test program was to subject customer provided test hardware to environmental simulation in compliance with customer stated specification, including any authorized modification, deviations or concessions to the original requirements. The hardware consisted of items identified in the appropriate sections of this report. In addition to test hardware identification, each section contains information that describes the associated test setup and performance and the resulting data. Cascade TEK, Inc. measuring instruments used in testing were calibrated according to the requirements of ANSI/NC SL Z540-1-1944 and ISO/IEC 17025, 2nd Edition and are NIST traceable. Calibration records are on file and available for inspection by request. Because the test methods are well established and are qualitative or semi-quantitative in nature, Cascade TEK, Inc. does not apply measurement uncertainty unless obligated by contract. Measured value related to the corresponding tolerance requirement is used to decide whether a test meets the requirements of the specification. Any test hardware operational setups and resulting evaluations or inspections performed by the customer are not included in this report, unless they were explicitly requested. While observations and/or specification compliance statements may be reported, no interpretations or opinions regarding customer product performance are intended. Unless otherwise indicated in the appropriate report section, all contract obligations were met and the test objective achieved.

GF9FR-10/2015

Cascade Technical Sciences, Inc.

5245-A NE Elam Young Pkwy, Hillsboro OR, 97124
1530 Vista View Drive, Longmont, CO 80504



Test Data Log

Section 1 – Job Information

Job Number: C1959
 Customer: ForeFlight LLC

Date Started: 1/20/2016
 Date Completed: 1/20/2016

QA Reviewer: Meg Talbert
 Signature: *Meg Talbert*

Responsible Technician: Keefe Hart
 Quote Issued By: Michael Bosica

Customer Witness: No Yes Name: NA

Section 2 – Test Parameters

Test Title: Rapid Decompression

Test Specification: RTCA DO-160G Section 4.6.2

Test Description: Samples will be stabilized at a pressure equivalent to 8,000 feet of altitude (10.92 psiA) and then pulled down to a pressure equivalent to 50,000 feet of altitude (1.69 psiA) in less than 15 seconds. Pressure will be maintained at this level for 10 minutes and then returned to site pressure.

Section 3 – Test Sample Information

Sample Description	Sample P/N or Model No.	Sample S/N or Other Identifier	Qty.
Stratus 1S	153510-000007 SSID: Stratus 1S000882	1S0000882	1
Stratus 2S	SSID: Stratus2S000007 PN not listed on device	2S000007	1
iPad Pro	Pro ML3N2LL/A; Model A1652	DLXQM0VNGMW4 (602-00338-A)	1
iPad Mini	Mini 4 MK8A2LL/A; Model A1550	DLXQ701WGHML (602-00388-A)	1
iPad Air	Air 2 MH2N2LL/A; Model A1567	DMPQQ05VG5YM (602-00108-A)	1

Section 4 – Test Equipment

ID No.	Description	Manufacturer	Model No.	Serial No.	Last Cal	Next Cal
1208	Altitude Chamber	Tenney	27ST-100400	8190	04/17/15	04/30/16
1228	Altitude Chamber	Tenney	8S	25720-02	08/05/15	08/31/16
FR447	Temperature/Relative Humidity Meter	Cole-Parmer	90080-03	130743104	03/07/14	03/31/16
FR411	Data Logger	Agilent	34970A	US37010202	03/30/15	03/31/16
FR412	Data Logger Input Module	Agilent	34901A	US37000277	04/10/15	04/30/16
403	Transducer	Omega	PX303-100A5V	NA	12/21/15	12/31/16
1151	Pressure Vessel	CTEK	---	1	Reference Only	
FR446	Stop Watch	Control Company	94460-28	130699687	01/22/14	01/31/16

Section 5 – Test Log

Customer Name: ForeFlight LLC

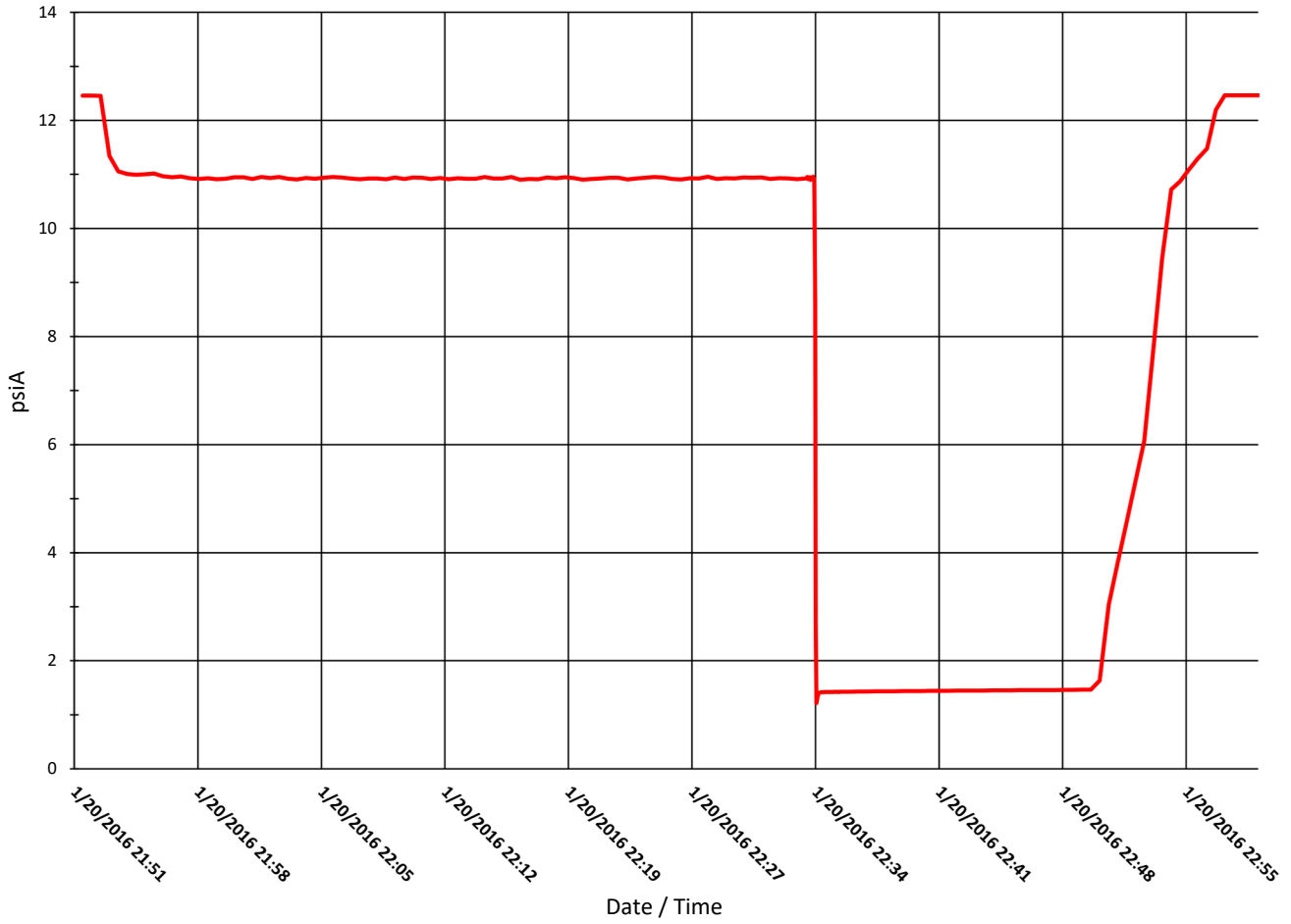
Job Number: C1959

Laboratory Temperature: +72°F

Laboratory Humidity: 22% RH

Initials	Date	Time	Notes	Photo
KH	1/20/2016	2130	Samples are placed in pressure vessel 1151 and vessel is sealed.	<input checked="" type="checkbox"/>
KH	1/20/2016	2200	Internal pressure in vessel is brought to an equivalent to 8,000 feet of altitude using chamber 1228 as a vacuum source.	<input type="checkbox"/>
KH	1/20/2016	2230	Vessel is maintained at 8,000 feet allowing samples time to stabilize. During this period of stabilization, chamber 1208 is brought to a pressure equivalent to 60,000 feet of altitude.	<input type="checkbox"/>
KH	1/20/2016	2232	Vacuum source from 1228 is closed off and vacuum source from 1208 is opened bringing the internal vessel pressure down to an equivalent to 50,000 feet of altitude. Pressure change occurs in about 7 seconds.	<input type="checkbox"/>
KH	1/20/2016	2245	Vessel pressure is maintained for a period greater than 10 minutes.	<input type="checkbox"/>
KH	1/20/2016	2250	Vessel internal conditions are returned to site conditions.	<input type="checkbox"/>
KH	1/20/2016	2300	Samples are removed from chamber.	<input type="checkbox"/>
KH	1/20/2016	2315	Samples are verified operational.	<input checked="" type="checkbox"/>
KH	1/20/2016	2315	Samples will be returned to customer.	<input type="checkbox"/>
KH	1/20/2016	2330	Testing is complete.	<input type="checkbox"/>

Foreflight -J# C1959-Rapid Decompression



Rapid Decompression Testing

Decompression Tests 2017

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element

Element Materials Technology

Portland/Denver/Seattle

Report ETC D2801

January 12, 2017

For: ForeFlight, LLC

Prepared By:	Meg Talbert <small>Digitally signed by Meg Talbert DN: cn=Meg Talbert, o=Element Materials Technology, ou=Quality, email=meg.talbert@element.com, c=US Date: 2017.01.12 17:19:39 -07'00'</small>	January 10, 2017
	_____ Element Denver Quality Administrator	_____ Date
Reviewed By:	Michael Bosica <small>Digitally signed by Michael Bosica DN: cn=Michael Bosica, o=Element Materials Technology, ou=Management - Denver, email=michael.bosica@element.com, c=US Date: 2017.01.12 16:03:26 -07'00'</small>	January 10, 2017
	_____ For Element Denver Laboratory Manager	_____ Date

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Administrative Data

Prepared for: ForeFlight, LLC
 2323 S Shepherd Dr, Suite 1002
 Houston, TX 77019

Test Facility: Element Denver
 1530 Vista View Dr
 Longmont, CO 80504
 (720) 340-7810

Test(s) Performed	Test Specification (Paragraph/Section)
Decompression	ForeFlight SOW Per e-mailREF:RTCADO-160G

Item(s) Tested (Description)	Part Number(s)	Serial Number(s)
Apple iPad	Pro 9.7	DMPRL1HFGXQ5
Apple iPad	Air 2	DMPQV6TBG5YM

Rev.	Reason For Revision	Date	Approval
---	Report Issued.	January10,2017	MJT

Date Test Items Received: 12/28/2016

Testing Initiated Date: 12/29/2016

Testing Completed Date: 12/29/2016



Element – Portland/Denver/Seattle

January 12, 2017

Certification No: ETC D2801

Attention: Mr. Anna Domning
ForeFlight, LLC
2323 S Shepherd Dr, Suite 1002
Houston, TX 77019

- Reference: a. Element Job No.: D2801
b. Element Quote No.: EPO0001909Q
c. Customer Purchase Order No.:161213A
d. Technical Specification: 1.ForeFlight SOW Per E-mail

Element Materials Technology – Portland herebycertifies that the following test sample(s) were subjected to the following test(s).

Table with 4 columns: Quantity, Description, Model/Part Number, Serial Number(s). Rows include Apple iPad Pro 9.7 and Apple iPad Air 2.

- 1. Decompression per Reference (b) and (d1), the operating samples were subjected to an altitude exposure at a pressure of 10.91psiAcorresponding to an altitude of 8,000 feet followed by reduction in pressure to 1.32 psiA correspondingto an altitude of 55,000 feet, within 15 seconds. This pressure was then be maintained for at least10minutes.

Testing was done in accordancewith the above references as evidenced and reported in the accompanying data. The test samples were returnedtothe customer for evaluation.

EAR-Controlled Data

The original of this report is on file at Element Materials Technology, Inc. under the above referenced certification number for review by authorized personnel. The results of the testing reported herein relate only to the actual items tested.

Respectfully submitted,



Meg Talbert

Quality Administrator

Element – Portland/Denver/Seattle

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The objective of this test program was to subject customer provided test hardware to environmental simulation in compliance with customer stated specification, including any authorized modification, deviations or concessions to the original requirements. The hardware consisted of items identified in the appropriate sections of this report. In addition to test hardware identification, each section contains information that describes the associated test setup and performance and the resulting data. Element Materials Technology, Inc. measuring instruments used in testing were calibrated according to the requirements of ANSI/NCSL Z540-1 and ISO/IEC 17025, and are traceable NIST or NMI. Calibration records are on file and available for inspection by request. Because the test methods are well established and are qualitative or semi-quantitative in nature, Element Materials Technology, Inc., Inc. does not apply measurement uncertainty unless obligated by contract. Any test hardware operational setups and resulting evaluations or inspections performed by the customer are not included in this report, unless they were explicitly requested. While observations and/or specification compliance statements may be reported, no interpretations or opinions regarding customer product performance are intended. Unless otherwise indicated in the appropriate report section, all contract obligations were met and the test objective achieved.



Element – Portland/Denver/Seattle
Test Data Log

Section 1 – Job Information

Job Number: D2801
Customer: ForeFlight

Date Started: 12/29/2016
Date Completed: 12/29/2016

Responsible Technician: Steve Milton / Michael Bosica

Customer Witness: No Yes Name: N/A

Section 2 – Test Parameters

Test Title: Decompression

Test Specification: ForeFlight SOW : per e-mail, REF:RTCA DO-160G Section 4.6.2 CAT A1

Test Description: The operating samples will be exposed to an altitude of 8,000 feet or 10.91 psiA allowing the samples to stabilize (2 hours), then reduce the pressure to 55,000 or 1.32 psiA- this transition shall take place within 15 seconds, then this pressure is to be held for a least 10 minutes. The samples will then be checked for functionality at site level pressure.

Section 3 – Test Sample Information

Sample Description	Sample P/N or Model No.	SampleS/NorOther Identifier	Qty.
Apple iPad	Pro 9.7	DMPRL1HFGXQ5	1
Apple iPad	Air 2	DMPQV6TBG5YM	1

Section 4 – Test Equipment

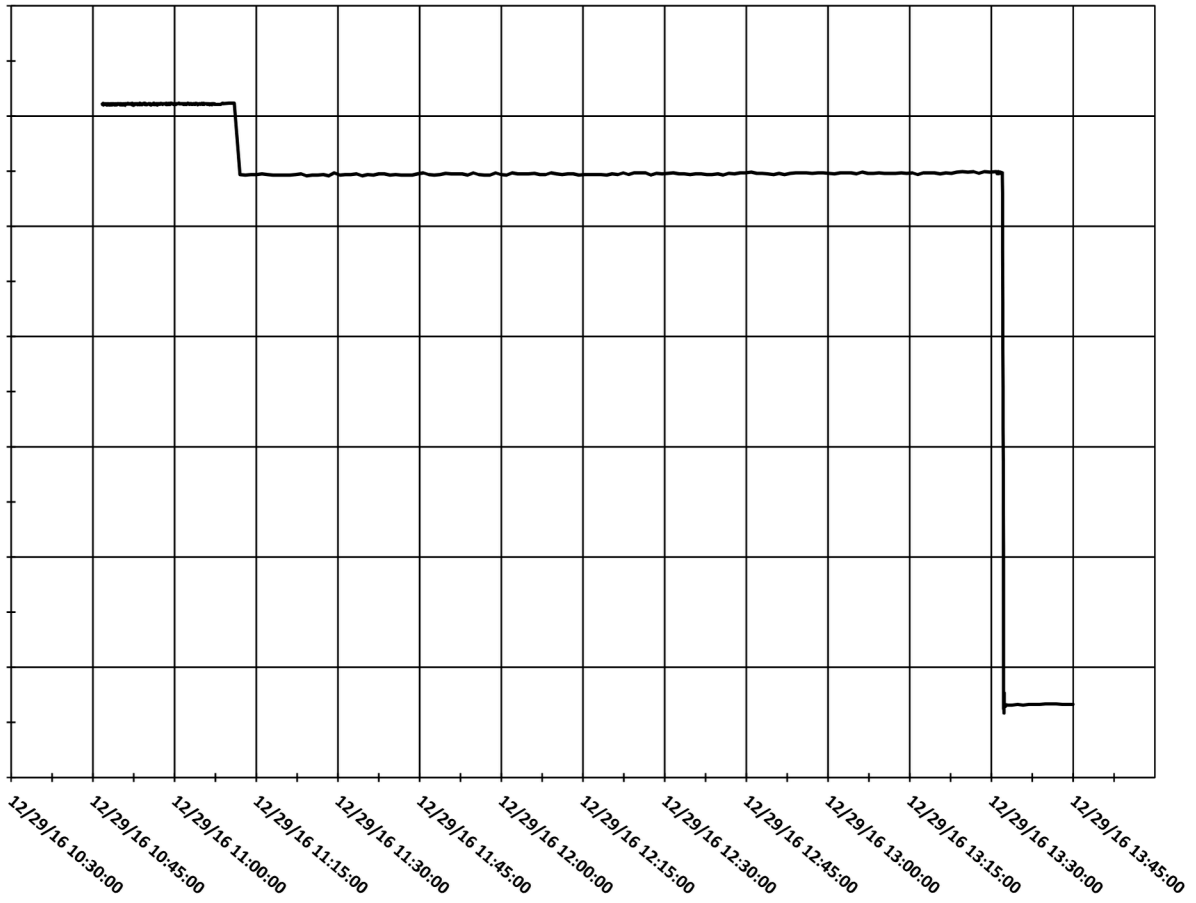
ID No.	Description	Manufacturer	Model No.	Serial No.	Last Cal	Next Cal
FR513	Temperature/Relative Humidity Meter	Cole-Parmer	90080-03	160173038	03/05/16	03/05/18
FR332	Presser Transducer	Omega	PX303-100A5V	N/A	01/19/16	01/19/17
1151	Pressure Vessel	N/A	N/A	N/A	Reference Only	
FR411	Data Acquisition/Switch Unit	Hewlett Packard	34970A	US37010202	04/28/16	04/28/17
FR412	Data acquisition Plug In Module	Hewlett Packard	34901A	US37000277	04/28/16	04/28/17
1228	Pressure Chamber	Tenney	8S	25720-02	Reference Only	
1208	Pressure Chamber	Tenney	27ST-100-400	8190	Reference Only	

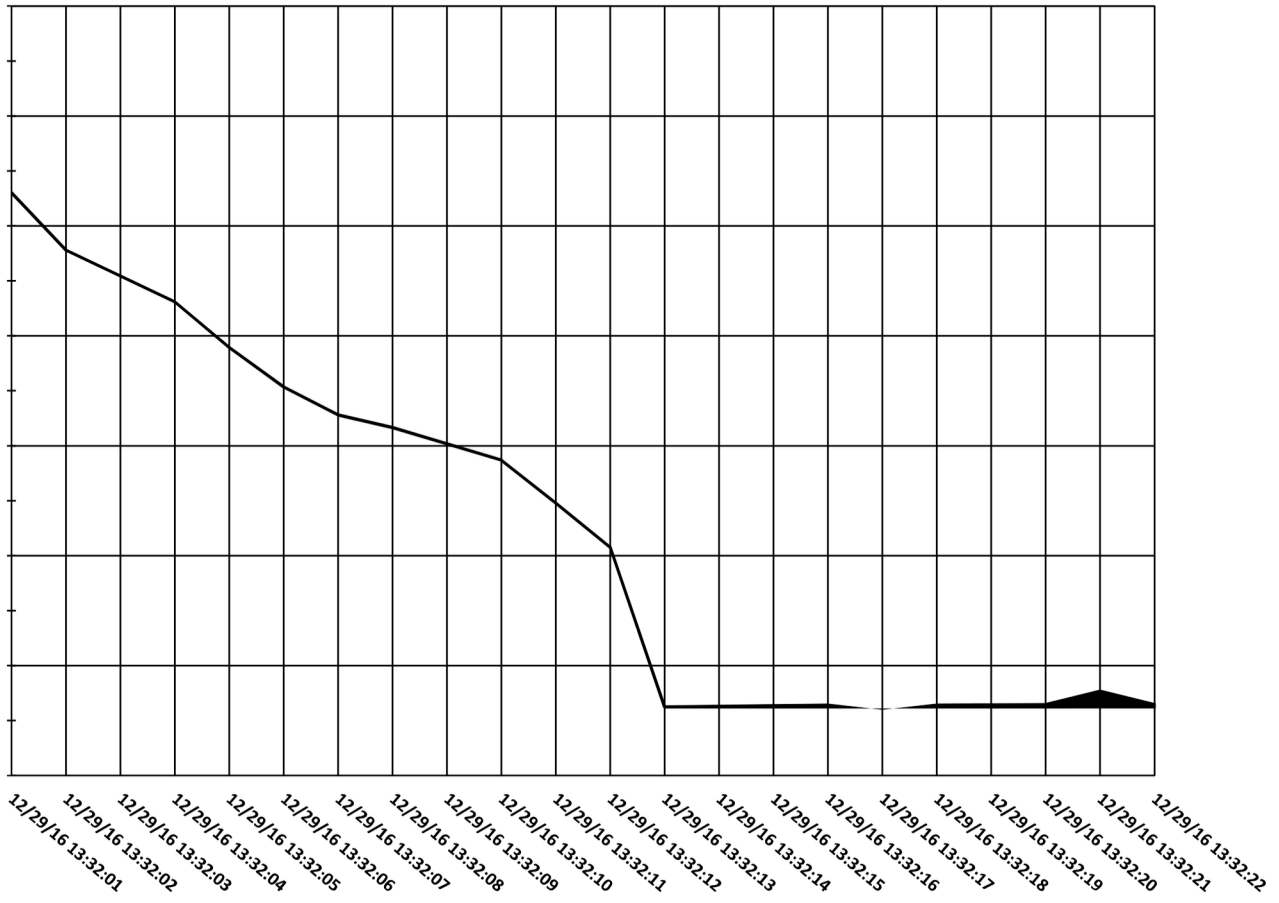
Section 5 – Test Log

Laboratory Temperature: +71°F

Laboratory Humidity: 20%RH

Initials	Date	Time	Notes	Photo
SM	12/29/2016	936	Begin setting up in pressure vessel #1151.	<input type="checkbox"/>
SM	12/29/2016	1108	Take photos of the samples.	<input checked="" type="checkbox"/>
SM	12/29/2016	1110	Seal the vessel and begin the ramp to 8,000 feet 10.91 psiA.	<input type="checkbox"/>
SM	12/29/2016	1115	The vessel pressure is at 8,000 feet. Begin the two hour soak.	<input type="checkbox"/>
SM	12/29/2016	1332	Reduce the pressure to 1.32 PSiA. The transition occurred within 15 seconds.	<input type="checkbox"/>
SM	12/29/2016	1333	Hold for at least 10 minutes then return the vessel to site level pressure.	<input type="checkbox"/>
SM	12/29/2016	1345	The exposure is complete.	
SM	12/29/2016	1349	Remove the samples from the vessel. Take post exposure photos.	
SM	12/29/2016	1400	The testing is complete the samples will be returned to the customer.	





Rapid Decompression Testing

Decompression Tests 2018

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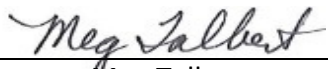
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Intelligent Apps for Pilots™


Decompression Test Report

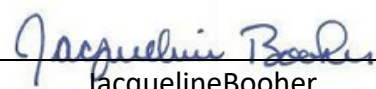
Date: July13, 2018

Report Number: R6716

ForeFlight LLC
233 S Wacker Drive, WHQKT, 5th Floor, Cube 586-A
Chicago, IL 60606
United States

Prepared By:  07/13/2018
Meg Talbert Date
Element Denver Quality Administrator

Reviewed By:  07/13/2018
Michael Bosica Date
Element Denver LabManager

Concurred By:  07/16/2018
Jacqueline Booher Date
EPO Deputy Quality Manager

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ADMINISTRATIVE DATA

Prepared For:	Anna Domning ForeFlight LLC 233 S Wacker Drive, WHQKT, 5th Floor, Cube 586-A Chicago, IL 60606 United States
Test(s) Performed:	Decompression testing per Table 1 on page 5
Test Facility:	Element Materials Technology Denver 1530 Vista View Drive Longmont, CO 80504 720-340-7810
Test Unit Description(s):	Apple iPad
Part Number(s):	A1822
Serial Number(s):	GG7W4X99HLFD
Primary Test Specification(s):	ForeFlight SOW per email dated 6-4-18
Purchase Order Number(s):	PO 180614A
Element Job Number:	6716P
Element Quote Number(s):	EPO006716Q-1
Project Begin Date:	06/28/2018
Project Completion Date:	06/28/2018
Test Report CompletionDate:	July 13, 2018

REVISIONS

Revision	Description	Date	Approval
N/A	OriginalRelease	July13,2018	MJT

1.0 INTRODUCTION

1.1 Scope

This document describes procedures and performance of the Decompression Tests performed in accordance with specification: ForeFlight SOW per email dated 6-4-18. The results described in this report relate only to the specific items tested.

1.2 Purpose

The purpose of this test was to demonstrate that the test specimens met or exceeded the design specification requirements during or upon completion of exposure to the stresses detailed herein.

1.3 Test Sequence

The following tests were conducted during the course of Environmental Testing:

Table 1 – Environmental Test Sequence

Test	Start Date	End Date
Decompression	06/28/2018	06/28/2018

2.0 APPLICABLE DOCUMENTS

2.1 Specification

ForeFlight SOW per email dated 6-4-18, received from Anna Domning, REF: RTCA DO-160G, reference older Quote EPO0001909Q.

3.0 GENERAL INFORMATION

3.1 Test Equipment

All test instrumentation was calibrated in accordance with ANSI/NCSL Z540.3 or ISO 10012, as applicable, and is traceable to a recognized National Metrology Institute (NMI). The following table lists the equipment used during the testing:

Table 2 – Decompression Equipment

Test Dates: 06/28/2018 to 06/28/2018

ID#	Description	Mfg.	Model#	Serial#	Last Cal	Next Cal
FR616	Temperature/Relative Humidity Meter	Digi-Sense	90080 -03	170855567	12/06/17	12/06/19
FR411	Data Acquisition/Switch Unit	HP	34970A	US37010202	04/13/18	04/13/19
1151	Small Pressure Vessel	N/A	N/A	N/A	Reference Only	
FR332	Presser Transducer	Omega	PX303 - 100A5V	N/A	01/11/18	01/11/19
1228	Small Altitude Chamber	Tenney	8S	25720-02	Reference Only	
1208	Large Altitude	Tenney	27ST-100-400	8190	Reference Only	
FR569	Stopwatch	Digi-Sense	94460-28	170093811	04/10/17	04/10/19

3.0 GENERAL INFORMATION (continued)

3.2 Test Conditions

Unless specified herein, all tests and measurements were performed at the room ambient conditions existing at the laboratory during testing:

Temperature: 10°C to 40°C

Relative Humidity: Ambient to 90%

3.3 Test Witnessing/Monitoring

All testing was conducted by a qualified Element Environmental Test Technician under the direction and cognizance of the Lab Manager and Quality Assurance.

3.4 Test Recording

Chronological logs of all significant events are maintained by test lab personnel and indicate date, times and descriptions of conditions. These logs, as listed in Appendix C, are used as reference, retained at Element and available upon request. Test setup photographs are provided in Appendix A, with any additional charts, plots, or graphs provided in Appendix B.

4.0 Decompression Procedures

4.1 Setup

- 4.1.1 One (1) Apple iPad P/N: A1822 with S/N: GG7W4X99HLFD was visually inspected with no signs of deformation, discoloration, or any other anomalies noted.
- 4.1.2 Operating sample was prepared and placed into Vessel 1151.
- 4.1.3 A secondary chamber, 1208, was prepared for the decompression event.

4.2 Steps

- 4.2.1 Began pressure stabilization at 8,000 feet (10.91psiA) and stabilized sample for 2 hours.
- 4.2.2 Valve was opened between the two chambers to subject the sample to a reduction in pressure to 50,000 feet (1.32psiA) within 15 seconds.
- 4.2.3 Exposed sample to 10 minutes at 50,000 feet.
- 4.2.4 Vessel pressure was returned to site level and sample was removed.
 - 4.2.4.1 Post exposure showed sample operational.
- 4.2.5 Upon test completion, at ambient conditions, the sample was visually inspected, then returned to customer for final analysis.

4.3 Results

- 4.3.1 No signs of damage, deformation, discoloration, corrosion or any other anomalies noted.
- 4.3.2 Test photographs provided in Appendix A.
- 4.3.3 Applicable graphs, charts, and/or plots provided in Appendix B.

APPENDIX A – TEST PHOTOGRAPHS

Decompression



Photo 1 – Example of setup within pressure vessel, functional



Photo 2 – Post-Exposure, functional

APPENDIX B – TEST PLOTS, CHARTS, GRAPHS

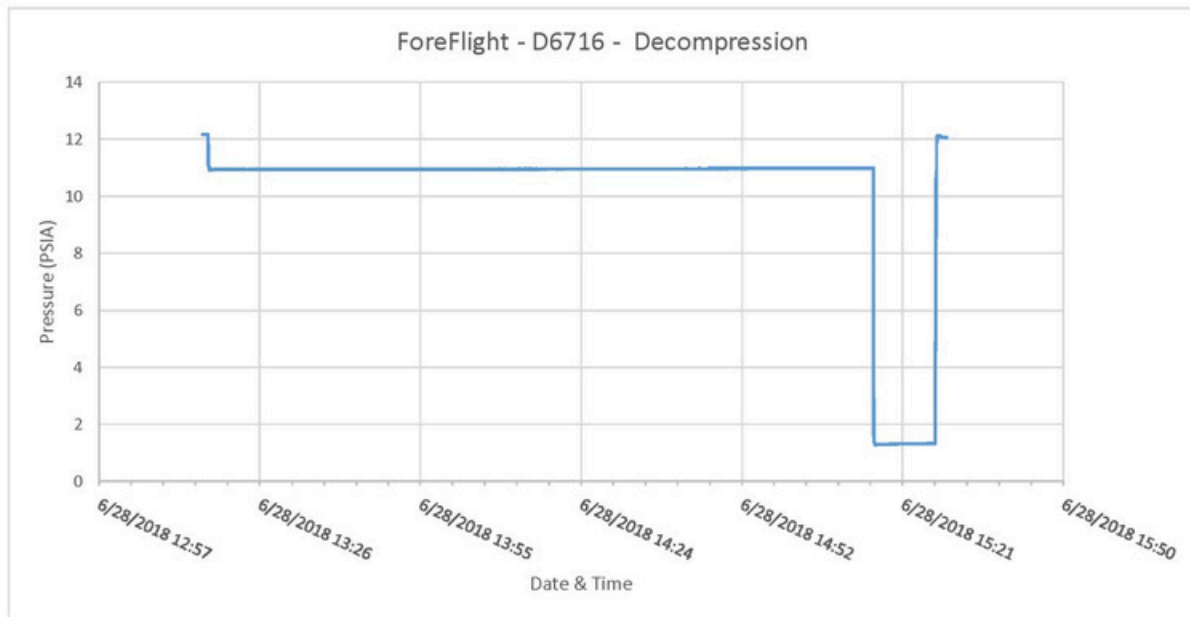


Figure 1 – Decompression (Soak) Chart 1 of 2

APPENDIX B (continued)

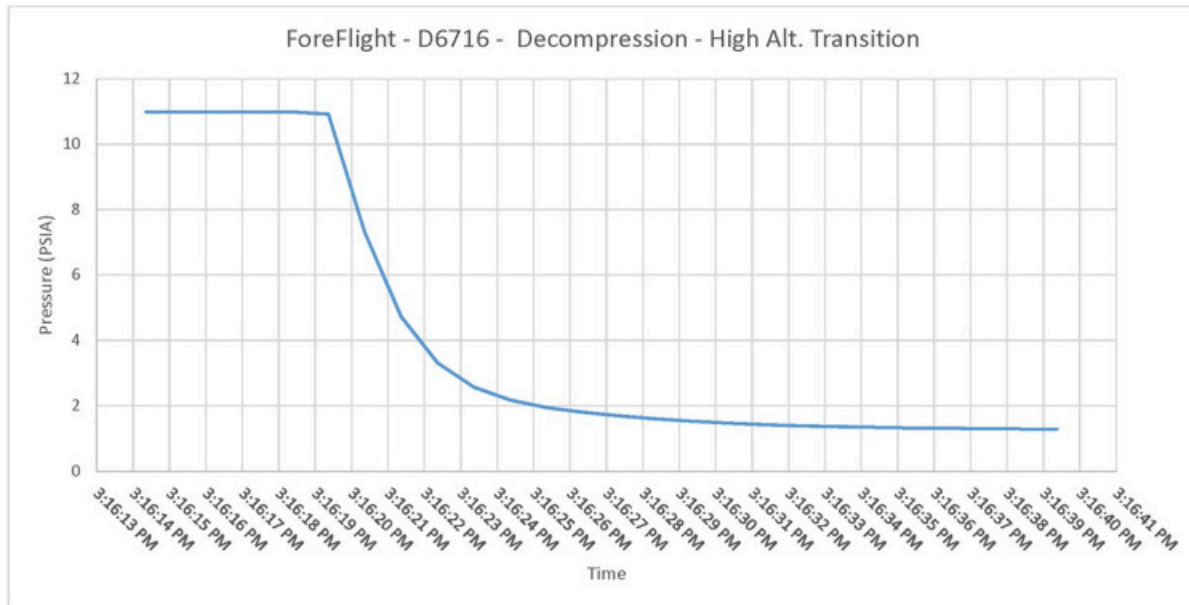


Figure 2 – Decompression (Transition) Chart 2 of 2

APPENDIX C – REFERENCES

1. rev a ForeFlight - D6716 - Decompression.docx


**Element – Portland/Denver/Seattle
 Test Data Log**
Section 1 – Job Information

 Job Number: D6716
 Customer: ForeFlight LLC

 Date Started: 6/28/2018
 Date Completed: 6/28/2018

 Responsible Technician: E. Geneva/M. Bosica
 Customer Witness: No Yes Name: N/A

Section 2 – Test Parameters

 Test Title: Decompression
 Test Specification: ForeFlight SOW : per e-mail, REF:RTCA DO-160G Section 4.6.2 CAT A1
 Test Description: The operating sample will be exposed to an altitude of 8,000 feet or 10.91 psiA allowing the sample to stabilize (2 hours), then reduce the pressure to 55,000 feet or 1.32 psiA- this transition shall take place within 15 seconds, then this pressure is to be held for a least 10 minutes. The sample will then be checked for functionality at site level pressure.

Section 3 – Test Sample Information

Sample Description	Sample P/N or Model No.	Sample S/N or Other Identifier	Qty.
Apple iPad	A1822	GG7W4X99HLFD	1

Section 4 – Test Equipment

ID No.	Description	Manufacturer	Model No.	Serial No.	Last Cal	Next Cal
FR616	Temperature/Relative Humidity Meter	Digi-Sense	90080-03	170855567	12/06/17	12/06/19
FR411	Data Acquisition/Switch Unit	HP	34970A	US37010202	04/13/18	04/13/19
1151	Small Pressure Vessel	N/A	N/A	N/A	Reference Only	
FR332	Presser Transducer	Omega	PX303-100A5V	N/A	01/11/18	01/11/19
1228	Small Altitude Chamber	Tenney	8S	25720-02	Reference Only	
1208	Large Altitude	Tenney	27ST-100-400	8190	Reference Only	
FR569	Stopwatch	Digi-Sense	94460-28	170093811	04/10/17	04/10/19

Section 5 – Test Log

Laboratory Temperature: +80°F

Laboratory Humidity: 28%RH

Initials	Date	Time	Notes	Photo
EG	6/28/2018	1200	Begin setting up in pressure vessel #1151.	<input type="checkbox"/>
EG	6/28/2018	1210	Perform several test runs with sealed empty pressure vessel to dial in the required 15 second transfer time. [Photo 4607]	<input checked="" type="checkbox"/>
EG	6/28/2018	1315	Setup the sample and seal the vessel. Begin the ramp to 8,000 feet 10.91 psiA.	<input type="checkbox"/>
EG	6/28/2018	1318	The vessel pressure is at 8,000 feet. Begin the two hour soak.	<input type="checkbox"/>
EG	6/28/2018	1519	Reduce the pressure to 1.32 psiA. The transition occurred within 15 seconds.	<input type="checkbox"/>
EG	6/28/2018	1519	Begin 10 minute soak.	<input type="checkbox"/>
EG	6/28/2018	1529	The exposure is complete.	<input type="checkbox"/>
EG	6/28/2018	1530	Remove the sample from the vessel. [Photo 4616]	<input checked="" type="checkbox"/>
EG	6/28/2018	1540	The testing is complete the samples will be returned to the customer.	<input type="checkbox"/>

End of Report.



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