VOLUME 4 AIRCRAFT EQUIPMENT AND OPERATIONAL AUTHORIZATIONS

CHAPTER 15 ELECTRONIC FLIGHT BAG AUTHORIZATION FOR USE

Section 1 Electronic Flight Bag Operational Authorization Process

4-1641 GENERAL. This section contains specific policy, guidance, and procedures to be used by principal operations inspectors (POI) when processing an operator's request for "authorization to use" an Electronic Flight Bag (EFB). The POI should coordinate the review of an operator's EFB program with the principal maintenance inspector (PMI), principal avionics inspector (PAI), cabin safety inspector (CSI), and dispatch safety inspector (DSI), as appropriate. Once the POI has completed the review of an EFB application and determined the request is valid, authorization to use an EFB will be made by issuing the appropriate operations specifications (OpSpecs)/management specifications (MSpecs) or letter of authorization (LOA). The final result will be an authorization to use an EFB without issuing any sort of approval to any particular hardware system or software application. The Federal Aviation Administration (FAA) evaluation process for an EFB follows the general process for approval and acceptance as described in Volume 3, Chapter 1, Section 1, General.

4-1642 APPLICABILITY. This process for EFB authorization is to be used in combination with the current edition of Advisory Circular (AC) 120-76, Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags, and the issuance of an OpSpec, MSpec, or LOA A061, as described in this order. The processes described in this section may also be used to determine if an EFB may be substituted for aeronautical charts and data used within aircraft operated under Title 14 of the Code of Federal Regulations (14 CFR) part 91. No written authorization is required for part 91 operators except those conducted under part 91 subpart K (part 91K).

A. Evaluation Process for Class 1 or 2 EFBs Using Type A and/or B Software Applications. The evaluation process described in this section is applicable to Class 1 or 2 EFBs using Type A and/or B software applications. Aircraft Evaluation Group (AEG) involvement in the authorization to use Class 1 or 2 EFBs is at the AEG's discretion. AEG involvement may be expected when an EFB has new or novel functions not addressed in this guidance and/or when there are concerns about EFB use and standardization. When an AEG report exists for a particular Class EFB or Type A and/or B software application, then the AEG report is controlling for the determination of operational suitability.

B. Evaluation Process for (Class 3) Hardware and/or Approved (Type C) software Applications. Installed (Class 3) hardware and/or approved (Type C) software applications are evaluated by the AEG in conjunction with type certificate (TC), amended TC, Supplemental Type Certificate (STC), or Technical Standard Order Authorization (TSOA) processes. The AEG determines operational suitability and pilot training, checking, and currency requirements. The AEG determination of suitability for installed (Class 3) EFB hardware may be referenced in the Flight Standardization Board (FSB) report for the particular model aircraft or other AEG report of operational suitability. If installed (Class 3) EFB hardware is not addressed in an AEG report, the FSB chairman for the affected aircraft should be contacted to determine if the AEG has accomplished an operational suitability evaluation. Authorization for EFB installed (Class 3)

with approved software (Type C) is subject to existing operator requirements for implementing new or modified certificated equipment, including compliance with FSB reports for differences training, checking, and currency. For approved (Type C) software, operators should seek authorization as they would for any other approved avionics software application.

4-1643 EFB HARDWARE CLASSES. Figure 4-75, Flowchart for Determining Electronic Flight Bag Hardware Class, is provided to aid in the determination of the EFB hardware classes. The EFB must meet the following hardware specifications to be used in an aircraft during flight operations. It is the user's/operator's responsibility to document compliance with these specifications for each EFB and aircraft operating combination.

A. Class 1 "Portable". These EFBs are portable, commercial off-the-shelf (COTS) devices that are part of a pilot/crewmembers flight kit. Class 1 EFBs are *not* mounted to the aircraft, connected to the aircraft systems for data, or connected to a dedicated aircraft power supply. An EFB attached to a kneeboard, suction cup(s), or other temporary securing solution by a means acceptable to the Administrator, is still considered a Class 1 EFB because it is not mounted to the aircraft. For the purposes of this section, mounted is defined as any portable device attached to a permanently installed mounting device. A permanently installed mounting device requires an installation approval (refer to the current edition of AC 20-173, Installation of Electronic Flight Bag Components, for additional information). Class 1 EFBs which have Type B software applications for aeronautical charts, approach charts, or electronic checklists (ECL) must be secured to a temporary securing solution, viewable during critical phases of flight, and must not interfere with flight control movement. This requirement does not preclude a pilot crewmember from temporarily removing the EFB from its secured and viewable location to aid in complying with operational requirements or to review other authorized Type B software applications (e.g., pilot/crewmember temporarily holding the Class 1 EFB to review the electronic Airplane Flight Manual (AFM)). The need for aeronautical charts, approach charts, and ECLs to be immediately available for viewing in all phases of flight is essential for an electronic format to be equivalent to the paper format being replaced. The ability to have departure and arrival charts, approach charts, and airport diagrams continuously in view is essential for situational awareness (SA) during critical phases of flight and very important to runway incursion prevention during takeoff, landing, and taxi operations. This viewability requirement is consistent with current FAA policy stating pilot/crewmembers have approach charts and airport diagrams viewable during those respective operations. For the purposes of this section, critical phases of flight include all ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 ft above ground level (AGL) except cruise flight. Note: taxi is defined as "movement of an aircraft under its own power on the surface of an airport."

B. Class 2 "Portable". These EFBs are portable, COTS devices that are part of a pilot's/crewmember's flight kit. Class 2 EFBs are typically mounted to a permanently installed mounting device and may be connected to a data source (wired or wireless), hardwired power source, or an installed antenna. A permanently installed mounting device requires an installation approval (refer to AC 20-173 for additional information). For 14 CFR parts 25, 27, and 29 aircraft, yoke mounting of an EFB is not recommended and all of the yoke mounting components (e.g., mounts, brackets, clips, etc.) for the EFB must be incorporated into the aircraft type design. To be considered portable, tools must not be required to remove a Class 2 EFB from the

permanently installed mount in the flight deck. Class 2 EFBs which have Type B software applications for aeronautical charts, approach charts, or ECL must be secured and viewable during critical phases of flight, and must not interfere with flight control movement. This requirement does not preclude a pilot crewmember from temporarily removing the EFB from its secured and viewable location to aid in complying with operational requirements or to review other authorized Type B software applications (e.g., pilot temporarily holding the Class 2 EFB to perform quick reference handbook (QRH) operational tasks). Any EFB hardware not accessible to pilot/crewmembers and not considered portable must have an installation approval (refer to AC 20-173 for additional information).

NOTE: Normally, portable EFBs are limited to hosting Type A and B software applications or Technical Standard Order (TSO) functions limited to a minor failure effect classification. However, approved (Type C) software applications associated with the provision of own-ship position on airport moving map displays (AMMD) may be hosted on a Class 2 portable EFB or installed EFB (Class 3).

C. "Installed" EFB (Class 3). These hardware devices are installed with design approval (refer to AC 20-173 for additional information) and are discussed further in subparagraph 4-1646C. The hosted Type A or B software applications are not subject to FAA certification on an installed EFB (Class 3). Type A or Type B software applications must not interfere with aircraft systems or other FAA-approved software applications (Type C) holding design approval by the Aircraft Certification Service (AIR).

4-1644 HARDWARE SPECIFICATIONS—CLASS 1 AND CLASS 2 EFBs. Major components such as motherboards, processors, Random-Access Memory (RAM), video cards, hard drives, power supplies, and connections (modem, wireless, etc.) must be configuration controlled. Any change to these components will require the EFB to be reevaluated to demonstrate the EFB still meets its intended function, non-interference, and reliability requirements. Figure 4-76, Hardware Description Template, is a template provided to facilitate the documentation of these components.

NOTE: For permanently sealed devices, use the manufacturer and model or manufacturer and part number from Figure 4-76 for configuration control of these devices.

A. Display. The following display requirements are specified when a Type B software application is available on an EFB during certain critical phases of flight (e.g., taxi, takeoff, approach, and landing).

1) Legibility. The screen size and resolution must be proven to display information in a comparable manner to the aeronautical charts and data it is intended to replace. The screen must display an approach chart in an acceptable aeronautical chart format similar to a published paper approach chart. The screen must be large enough to show an entire instrument approach procedure (IAP) chart at once with the equivalent degree of legibility and clarity as a paper chart. 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

approach charts will need to be evaluated and approved by the FSB process for functionality and human factors.

2) Brightness. The display must be proven to be readable in all anticipated lighting conditions by each pilot/crewmember and in each aircraft in which it is to be used. The display must have a dimming capability to prevent the EFB from being a distraction or impairment to night vision in a night flight deck environment. The display must also be demonstrated to be readable on the flight deck in direct sunlight. Display brightness must be equally adjustable whether the EFB is operating on battery or aircraft power. Users should be able to adjust the screen brightness of an EFB independently of the brightness of other displays on the flight deck. When automatic brightness adjustment is incorporated, it should operate independently for each EFB on the flight deck. Buttons and labels should be adequately illuminated for night use. All controls must be properly labeled for their intended function.

3) Viewing Angle. The display must be viewable from an offset angle to preclude difficulty in positioning the EFB on the aircraft flight deck. When screen protectors are used, they must be maintained and be proven not to impede viewing of the screen. (Refer AC 120-76 for additional information on viewing angle.)

4) Stylus. For a stylus screen, there must be an easily accessible stowage position for the stylus and an accessible spare stylus (or substitute stylus) must be available.

5) Digitizer Pen. When a digitizer pen is used to operate the EFB, the digitizer pen must have an easily accessible stowage position and be tethered. A spare digitizer must be immediately available and adjusted for use on each EFB.

6) Touch Screen. If a touch screen is used, it must be evaluated for ease of operation. The touch screen must be responsive and not require multiple attempts to make a selection, but not be so sensitive to cause erroneous selections to occur.

B. Rapid Decompression (RD) Testing. RD testing is required to determine an EFB's functional capability when Type B software applications are used in pressurized aircraft where no alternate procedures or paper backup are available. RD testing is not required when only Type A software applications are used on the EFB. The information from the RD test is used to establish the procedural requirements for the use of EFBs in a pressurized aircraft. RD testing should follow the guidelines in RTCA, Inc., (previously Radio Technical Commission for Aeronautics) 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. It is the operator's responsibility to provide the POI with documented results of the RD testing.

NOTE: RD testing must be accomplished on at least one representative sample of each make and model of hardware device used as an EFB. 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.

1) Pressurized Aircraft. RD testing for Class 1 and/or 2 EFBs must be conducted when Type B software applications are used in lieu of paper-based aeronautical charts in

pressurized aircraft in-flight. When a Class 1 or 2 EFB is turned on and operates reliably during the RD test, no mitigating procedures need to be developed beyond redundancy. When a Class 1 or 2 EFB is turned off during the RD test and is fully functional following the RD, then procedures must be in place to ensure one of the two EFBs onboard the aircraft remains off or configured so no damage will be incurred should an RD occur in-flight above 10,000 feet.

2) Unpressurized Aircraft. RD testing is not required for a Class 1 or 2 EFB used in an unpressurized aircraft. The EFB must be demonstrated to reliably operate up to the maximum operating altitude of the aircraft. If EFB operation at maximum operating altitude is not attainable, procedures must be established to preclude operation of the EFB above the maximum demonstrated EFB operation altitude while still maintaining availability of required aeronautical information.

C. Electromagnetic Interference (EMI)/Non-Interference Testing. It is the aircraft operator's responsibility to determine the operation of a portable electronic device (PED) will not interfere with navigation, communication and other aircraft systems. The current edition of AC 91.21-1, Use of Portable Electronic Devices Aboard Aircraft, addresses non-interference testing for noncritical phases of flight only and is not adequate when Type B software applications are used for all phases of flight. AC 91.21-1 and the additional guidance for EMI/Non-Interference contained in this order are required for Class 1 and 2 EFBs.

1) PEDs. In order to operate a PED in other than a noncritical phase of flight, the aircraft operator is responsible for ensuring the PED will not interfere with navigation, communication and other aircraft systems. The following methods are applicable to Class 1 and 2 EFBs with Type B software applications required for use during all phases of flight. Either Method 1, Method 2, or Method 3 may be used for EMI/Non-Interference Testing. When an aircraft operator elects to use Method 3 to determine PED EMI/non-interference, transmitting and non-transmitting PEDs have been addressed in this method and no further testing or analysis is required for transmitting portable electronic devices (T-PEDs).

a) Method 1 for compliance with PED non-interference testing for all phases of flight is completed in the two following steps.

- Step 1 is to conduct an EMI test in accordance with RTCA DO-160, section 21, paragraph M. This Step 1 test can be conducted for an EFB user/operator by an EFB vendor or other source. The results of the RTCA DO-160 EMI test must be evaluated to determine an adequate margin exists between the EMI emitted by the PED and the interference susceptibility threshold of aircraft equipment. If Step 1 testing determines adequate margins exist for all interference (both "front door" and "back door" susceptibility), then Method 1 is complete. If Step 1 testing identifies inadequate margins for interference (either "front door" or "back door" susceptibility), then Step 2 testing must be completed; and
- Step 2 testing is specific to each aircraft model in which the PED will be operated, but it is testing only the specific equipment and/or equipment operation. Step 2 testing must be conducted in an actual aircraft and may be credited to similarly equipped aircraft of the same make/model as

tested. Step 2 testing must show no interference of aircraft equipment occurs from the operation of the PED.

b) Method 2 for compliance with PED non-interference testing for all phases of flight is a complete test in each aircraft using an industry standard checklist. This industry standard checklist must be of the extent normally considered acceptable for non-interference testing of a PED in an aircraft for all phases of flight. Testing for a particular aircraft make/model may be credited to other similarly equipped aircraft of the same make/model.

NOTE: In support of Method 2, a PED as EFB - Electromagnetic Compatibility Assessment Checklist has been developed and is located in the Flight Standards Information Management System (FSIMS), Publications, Other documents, Electronic Flight Bag Checklists and Job Aids section. The use of this checklist is not mandatory.

c) Method 3 for compliance with PED non-interference testing for all phases of flight is the methodology described in FAA InFO 13010 - *Expanding Use of Passenger Portable Electronic Devices (PED),* and its supplement FAA InFO 13010SUP- *FAA Aid to Operators for the Expanded Use of Passenger PEDS*. This guidance is an acceptable means of assessing and mitigating risk pertaining to the use of PEDs in all phases of flight. If an aircraft has been determined to be eligible for all phases of operation, without restriction, for passenger PEDs, then the same determination of electromagnetic compatibility may apply to PEDs that have been authorized for use as EFBs in accordance with OpSpec/MSpec/LOA A061 - Use of Electronic Flight Bag. InFO 13010SUP can be downloaded from the following hyperlink: http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/.

2) Transmitting Portable Electronic Devices (T-PED). In order to operate a T-PED in other than a noncritical phase of flight, the user/operator is responsible to ensure the T-PED will not interfere with the operation of the aircraft equipment in any way. The following method is applicable to all Class 1 or 2 EFBs with Type B software applications required for use during all phases of flight. Non-interference testing for T-PEDs consists of two separate test requirements.

a) Test Requirement 1. Each T-PED must have a frequency assessment based on the frequency and power output of the T-PED. This frequency assessment must consider Federal Communications Commission (FCC) frequency standards and be in accordance with applicable processes set forth in RTCA DO-294, Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft. This frequency assessment must confirm no interference of aircraft or ground equipment will occur as a result of intentional transmissions from these devices.

b) Test Requirement 2. Once a frequency assessment determines there will be no interference from the T-PED's intentional transmissions, each T-PED must then be tested while operating using either Method 1 or Method 2 for basic non-interference testing requirements described above. This basic non-interference testing is applicable to both a T-PED integrated into an EFB device and a T-PED remote to an EFB. When a T-PED is integrated into an EFB, the basic non-interference testing must be completed both with and without the T-PED function

being operative. If a T-PED is located remote from the EFB, the T-PED basic non-interference testing is independent from the EFB non-interference testing. T-PED position is very critical to T-PED non-interference testing; therefore, the operating/testing locations of a T-PED must be clearly defined and adhered to in T-PED operating procedures.

NOTE: When an aircraft operator elects to use Method 3 in subparagraph 4-1644C1) to determine PED EMI/non-interference, transmitting and non-transmitting PEDs have been addressed in this method and no further testing or analysis is required for T-PEDs.

D. Antennas.

1) Satellite Weather Antennas. A satellite weather antenna may be built into a Class 1 or 2 EFB or external to the EFB. A portable satellite antenna is considered ancillary PED equipment and must be included in EFB evaluation and testing. Installed antennas for satellite weather may be used to provide signal reception for EFB intended functions. When a satellite receiver is installed separate from the portable EFB, it must meet appropriate installation requirements.

2) Global Positioning System (GPS) Antennas. A GPS antenna may be built into a Class 1 or 2 EFB or external to an EFB. A portable GPS antenna is considered ancillary PED equipment and must be included in EFB evaluation and testing. An installed GPS antenna may be used to provide signal reception to an EFB and must support the intended function of the EFB.

NOTE: GPS data may be used for map centering or page turning when en route charts are displayed on an EFB. Map centering may be used as an en route chart feature only and may not be used when an approach chart is displayed. Display of own-ship position on a Class 1 or 2 EFB in-flight is not authorized. If a portable GPS is used to provide position information to an EFB, the portable GPS is subject to the same requirements as the EFB. The EFB must demonstrate its intended functions with the GPS both enabled and disabled. In addition, the EFB must be non-interference tested with the portable GPS attached and operative, as well as with the portable GPS not attached (unless the EFB is considered inoperative without the portable GPS).

E. Power Sources.

1) Battery Primary. Useful battery life must be established and documented for battery powered EFBs. Aircraft operators must be able to determine the useful life of the EFB battery. Each battery powered EFB providing aeronautical information or software applications pertinent to the safe operation of the aircraft must have at least one of the following before departing the gate:

a) An established procedure to recharge the battery from aircraft power during flight operations; or

b) A battery or batteries with a combined useful battery life to ensure EFB is operational during taxi and flight operations to include diversions and expected delays; or

c) An acceptable mitigation strategy, authorized by the principal inspector (PI) with certificate oversight responsibility with concurrence by Flight Standards Air Transportation Division (AFS-200), to ensure products that contain aeronautical charts, checklists, or other data required by the operating rules are available. The certificate holder must submit a plan to the FAA PI assigned with oversight responsibility for subsequent coordination and review with geographically responsible AFS Regional Office (RO) and AFS-200.

2) Battery Maintenance. EFB battery maintenance needs to be addressed as either a maintenance or operating procedure to ensure battery life, change intervals, and safety. EFB batteries, including those carried as spares, must be maintained in an appropriate state of charge. Batteries must be replaced at the EFB manufacturer's recommended interval.

3) Lithium Battery Capacity. EFBs employing rechargeable lithium batteries are more vulnerable to overcharging and over-discharging, which can result in overheating, thermal runaway, and eventually fire. In support of safe aircraft operations, rechargeable lithium batteries should never exceed 300 watt-hours (Wh) in a portable (Class 1 or Class 2) EFB or battery backup device. This 300 Wh limit is the maximum capacity allowed per battery by Department of Transportation (DOT) regulations for carriage in air travel found in Title 49 of the Code of Federal Regulations (49 CFR) part 175, § 175.10. Most rechargeable lithium batteries marketed to consumers are well below 100 Wh, which is generally sufficient for most operational uses. To calculate the number of watt-hours a battery provides, divide the milliamp hours (mAh) by 1000 and multiply the amount of voltage (V) (e.g., 5400 mAh/1000 x 11.1V = 60 Wh). If unsure of the watt-hour rating of a battery, contact the manufacturer.

4) Lithium Battery Testing. The aircraft operator must have documented evidence of required testing for portable (Class 1 or Class 2) EFBs utilizing lithium batteries, as well as procedures for their maintenance, storage, and functional checks. These procedures should meet or exceed Original Equipment Manufacturer (OEM) recommendations. Procedures must address battery lifespan, proper storage, 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. Battery lifespan must be addressed to ensure replacement at proper intervals (i.e., specified time period for replacement, battery no longer holds minimum voltage after charge, minimum percentage of charge retention compared to original capacity, etc.) per the OEM's recommendations. Procedures should include precautions to prevent mishandling of the battery, which could cause a short circuit or other unintentional exposure or damage resulting in personal injury or property damage. All replacements for rechargeable lithium batteries must be sourced from the OEM and repairs must not be made. It is the aircraft operator's responsibility to provide the PI with documentation concerning lithium battery testing compliance, purchase documents linked to each battery to demonstrate battery life compliance, and documented lithium battery maintenance, storage, and functional check procedures meeting or exceeding the OEM recommendations (refer to AC 120-76 for additional information on lithium battery safety, testing standards, maintenance, storage, and functional checks).

5) Aircraft Power Primary (Class 2 Only). When an EFB uses aircraft power as the primary power source, design approval is required for this connection and power source by TC, amended TC, or STC. This type of EFB power source will normally be hardwired to the EFB mounting device or directly to aircraft power source through a connector.

F. Data Connectivity (Class 2 Only). EFB data connections to aircraft data sources require design approval by TC, amended TC, or STC to ensure the aircraft systems are protected from any EFB failure modes. These data connections should be "read only," except for nonessential Airline Administrative Communication (AAC) or Airline Operational Communication (AOC) systems. Data connection from the aircraft navigation system may not be used to display own-ship position on a Class 1 or 2 EFB in-flight. Aircraft navigation system source data or portable GPS sources require evaluation in order to support display of an own-ship symbol limited to the airport surface as a Type B software application.

G. Data Loading/Database Changes. Class 1 or 2 EFBs must have a reliable means for revising the EFB databases. Database currency is determined by what required aeronautical information the EFB is replacing. Each method of data revision must ensure integrity of the data being loaded and not negatively impact the reliability of EFB operation. Procedures must exist to protect the EFB from corruption, especially when Internet and/or wireless means are used. Database revisions must not include software application or operating system changes. Application software and/or operating system program changes must be controlled and tested prior to use in-flight. Database and/or application software changes may not be performed during operations (taxi, takeoff, in-flight, and landing).

NOTE: External drives for data loading are considered ancillary EFB equipment and not subject to specific requirements beyond those identified for data loading/database revision above.

H. Mounting Devices. The EFB, when attached to its appropriately designed mounting device, must be evaluated to ensure operational suitability in all ground and flight operations and conditions. When attached to its mounting device, the EFB must not interfere with pilot/crewmember duties and must be easily and safely stowed when not in use. In addition, the attached EFB must not obstruct the pilot/crewmember primary and secondary fields of view, extensively block any portion of the pilot compartment windows, and must be free of glare and reflection. The attached EFB and provisions must not impede safe egress from the aircraft (refer to AC 120-76).

4-1645 EFB SOFTWARE APPLICATION SPECIFICATIONS. Figure 4-77, Flowchart for Determining Electronic Flight Bag Software Application Type, is provided to aid in the determination of the EFB software application type. A description of failure classifications referenced in this section can be found in the current edition of RTCA DO-178, Software Considerations in Airborne Systems and Equipment Certification.

A. Type A Software Applications. Type A software applications are those paper replacement software applications primarily intended for use on the ground or during noncritical phases of flight when pilot/crewmember workload is reduced. Type A software applications are considered to have a failure condition classified as "minor" or "no safety effect" for all phases of

flight. In the current edition of AC 120-76, Appendix 1 lists examples of Type A software applications.

1) Type A software applications for Weight and Balance (W&B) present existing information found in the applicable AFM or POH. Type A W&B software applications may accomplish basic mathematics but must not use algorithms to calculate results. Type A W&B software applications must retrieve and apply existing published information.

2) Type A software applications for aircraft performance present existing information found in the applicable AFM or POH. Type A software applications for performance may retrieve and apply existing published information. Type A performance software applications must not use algorithms to calculate results.

B. Type B Software Applications. Type B software applications are those paper replacement software applications primarily intended for use during critical phases of flight or have software applications and/or algorithms which must be tested for accuracy and reliability. Type B software applications are considered to have a failure condition classified as “minor” or “no safety effect” for all phases of flight. Type B software applications include miscellaneous, non-required software applications (e.g., aircraft cabin and exterior surveillance video displays, maintenance software applications), as well as software applications with display of own-ship position limited to airport surface operations having a failure condition classified as “minor” or “no safety effect”, and *only as an aid to situational awareness* (i.e., not appropriate for surface navigation, surface alerting, time-based operations, guidance, maneuvering, and control functions, etc.). AC 120-76, Appendix 2, lists examples of Type B software applications.

1) Type B aeronautical chart software applications display aeronautical charts in electronic format. These software applications must be available for use during all phases of flight. These software applications do not require paper printing of aeronautical charts and the viewable electronic format allows chart manipulation.

2) Type B software applications which display own-ship position limited to airport surface operations may be utilized pending successful evaluation of the application software for operational suitability and must be tested and proven accurate by the applicant utilizing the *Type B EFB Software Application(s) Displaying Own-ship Position Limited to Airport Moving Map for Surface Operations: Aircraft Operator Checklist and FAA PI Job Aid* which can be downloaded from the FAA’s Web-based Operations Safety System (WebOPSS) paragraph A061 guidance tab, or FSIMS, Publications, Other documents, Electronic Flight Bag Checklists and Job Aids section. Use of an installed Global Navigation Satellite System (GNSS) position source is recommended to support display of own-ship position limited to airport surface operations. However, a portable (internal or external) GNSS source may be authorized pending completion of an operational evaluation to document and prove its accuracy utilizing the Airport Moving Map Job Aid referenced above.

3) Type B ECL software applications provide cockpit checklists in compliance with regulatory requirements. These software applications must be available for use during all phases of flight. ECL (systems) must be tested for flight operations suitability and must not adversely impact pilot/crewmember workload.

4) Type B W&B software applications use algorithms or approved data to calculate W&B results. Type B W&B software applications are produced for a specific aircraft and, therefore, must be tested and proven accurate by the applicant.

5) Type B aircraft performance software applications use algorithms or approved data to calculate performance results. Type B aircraft performance software applications are produced for a specific aircraft and, therefore, must be tested and proven accurate by the applicant.

C. Approved (Type C) Software Applications. Approved (Type C) software applications are for airborne and surface functions with a failure condition categorized as "major", "hazardous" or "catastrophic". These are "non-EFB" software applications found in avionics and include intended functions for communications, navigation, and surveillance requiring FAA design, production, and installation approval. Type C software applications for airborne and surface functions with a failure condition classification of "major" or higher must be installed on equipment as part of aircraft type design by TC, amended TC, or STC.

4-1646 OPERATIONAL SUITABILITY REQUIREMENTS. The user/operator is responsible for ensuring a Class 1 or 2 EFB, along with Type A and B software applications, will reliably perform its intended function while not interfering with other aircraft equipment or operations.

A. Application Documentation. The user/operator must present application documentation to the POI demonstrating the EFB meets its intended function. The attached flowcharts illustrated in Figure 4-75 and Figure 4-77 will assist the user/operator with the identification and documentation of EFBs. Determining the operational suitability of a particular EFB is the responsibility of the user/operator and may be subject to specific guidelines from the applicable AEG reports.

1) When an operator has completed the evaluation of a Class 1 or 2 EFB, the operator must submit an application requesting authorization to use the EFB. The POI will review the application submitted by the operator and authorize/not authorize the use of the EFB based on the findings of the POI Review Checklist 3, illustrated in Figure 4-78, Principal Operations Inspector Review Checklist.

2) When a new aircraft model is added to an existing EFB authorization, the suitability of the EFB for the aircraft must be addressed as part of aircraft conformity using this evaluation process. When a new EFB is added to an existing EFB authorization, the suitability of the new EFB must be addressed using this same evaluation process.

B. Operational Evaluation of Class 1 or 2 Hardware/Type A or B Software Applications. The user/operator must evaluate the EFB for suitability of intended functions in each aircraft model.

1) The user/operator must use the checklist as illustrated in Figure 4-79, Checklist 1—Tabletop Electronic Flight Bag Evaluation, to evaluate the operational suitability of the proposed EFB intended functions and aircraft model suitability. The intended functions of software applications must be appropriate to the individual aircraft make and model.

- Electronic documents,
- ECL software applications,
- W&B software applications,
- Performance software applications,
- Electronic aeronautical chart software applications,
- Display of own-ship position limited to airport surface operations; and
- Weather information.

2) For Type B software applications which display own-ship position limited to airport surface operations, the user/operator must utilize the *Type B EFB Software Application(s) Displaying Own-ship Position Limited to Airport Moving Map for Surface Operations: Aircraft Operator Checklist and FAA PI Job Aid* which can be downloaded from the FAA's WebOPSS paragraph A061 guidance tab, or FSIMS, Publications, Other documents, EFB Checklists and Job Aids section to conduct a 6-month operational validation testing and evaluation of the application software functionality, intended database accuracy, and/or use of a portable GNSS position source to test and prove its accuracy. Use of an installed GNSS position source will require no evaluation.

3) The user/operator should use the checklist shown in Figure 4-80, Checklist 2—Electronic Flight Bag Operational Evaluation, to develop a flight scenario for final EFB testing when initial EFB use is being evaluated. Operators requesting initial EFB authorization must include their POI in the flight/simulator evaluation of an initial EFB implementation. Operational evaluations for subsequent additions of EFBs or aircraft models need not conduct flight/simulator evaluations, provided intended functions remain substantively the same as previously evaluated EFBs.

C. Operational Suitability of Installed EFB Hardware (Class 3)/Approved Software (Type C) Applications. Installed EFB (Class 3) hardware and/or approved software (Type C) applications are evaluated by the AEG in conjunction with a TC, amended TC, or STC certification process. The AEG determines operational suitability and pilot training, checking, and currency requirements. The AEG determination of suitability for installed EFB (Class 3) hardware may be referenced in the FSB report for the particular model aircraft or other AEG report of operational suitability (FSB reports are located in the FAA's FSIMS) via the following hyperlink: http://fsims.avs.faa.gov). If installed EFB (Class 3) hardware is not addressed in an AEG report, the FSB Chairman for the aircraft should be contacted to determine if the AEG has completed an operational suitability evaluation. Installed EFB (Class 3) and approved software (Type C) application authorization is subject to existing operator requirements for certified equipment. For AC 20-159 approved software (Type C) applications, the operator must address the development of procedures and training associated with EFB use prior to receiving authorization. For approved software (Type C) applications not associated with AC 20-159, operators should seek authorization as they would for any other approved avionics software application.

4-1647 EFB PROCEDURES. The operator's operations and maintenance procedures must be specific to each EFB and the operations conducted. The operator's manual must identify each model of EFB authorized and each model of aircraft.

A. EFB Configuration Control. Standard EFB configuration control must be established and baselined (i.e., initial hardware and software application version at time of application) along with procedures to ensure the EFB configuration control is maintained during system updates/revisions. Class 1 or 2 EFB configuration affects usability and battery life through setup of suspend/sleep modes. All classes of EFBs must have established standard operating procedures (SOP) to ensure reliable use of hardware and software applications. Procedures must be established for EFB database revision. This should include verification of continued intended function prior to use in-flight operations following an EFB database revision.

NOTE: Software application updates, especially in the EFB operating system, must have extensive test procedures prior to use in-flight operations. Software application revision procedures must be comprehensive to ensure continued reliability of the EFB and verification of reliable intended function.

B. Normal and Abnormal Operating Procedures.

1) Normal procedures for flight operations must be developed for all flight operations with EFBs. Preflight must address battery charging, EFB database revision and data currency, EFB configuration control, and SOP for EFB setup. In-flight procedures must include standard application operating procedures and EFB standard flight operating procedures for use.

2) Abnormal procedures must be established to address likely EFB function failures. Procedures for single and dual EFB failure must be established.

3) Class 1 or 2 EFB operating procedures and limitations must be established if the EFB being used has not demonstrated RD testing while on and operating.
(See subparagraph 4-1644B.)

4) Checklists must be established or revised to include normal and abnormal EFB procedures to be used by pilots/crewmembers in-flight. This may be accomplished by amending checklists when approved operator-customized cockpit checklists are used or by creating an EFB checklist supplement when aircraft manufacturer cockpit checklists are used.

C. Minimum Equipment List (MEL). When MEL relief is requested, the MEL must be amended in compliance with the aircraft's Master Minimum Equipment List (MMEL). An inoperative Class 1 EFB may be removed from the aircraft without MEL relief being utilized, provided redundancy is maintained or paper backups for all Type B software applications are available.

D. Maintenance. Regular maintenance procedures are required for Class 1 and 2 EFBs, including measures to ensure the continued readability of the viewing screen. EFB battery maintenance needs to be addressed to ensure battery life, change intervals, and safety. Installed EFB (Class 3)/approved (Type C) software application maintenance must comply with the aircraft instructions for continued airworthiness (ICA).

E. Risk Mitigation. Procedures must be established for a transition to paperless authorization. Initial procedures establish an independent backup during the EFB validation period. Procedures must be established for continuous reporting of problems with EFBs. There

must be procedures in place for the user/operator to review these reports periodically to mitigate potential unreliability issues and correct operating procedures where necessary. Procedures must be established to notify pilot/crewmembers of EFB problems or use issues. (For more information on risk mitigation, see Volume 10, Chapter 1.)

NOTE: When certain Type B software applications (e.g., approach charts, aeronautical charts, ECLs, and flight manuals) are utilized on Class 1 or 2 EFBs to replace aeronautical charts or data required by regulation, risk mitigation is required per AC 120-76. Such mitigation methods may be satisfied by use of multiple EFB hardware and software applications or backup paper aeronautical charts and data. Two or more operational EFBs are required to remove paper products that contain Type B software applications for in-flight use (e.g., aeronautical charts, checklists, emergency procedures, etc.) Type A software applications are not subject to this requirement. When determining the need for redundancy, take into consideration no single failure or common mode error can cause the loss of required aeronautical information or data. The need for redundancy should also consider independent power sources or battery backup for the EFB. (Refer to AC 120-76, paragraph 9.) The AFS field office with oversight responsibility (FSDO/CMO) is ultimately responsible to determine if the EFB backup mitigation strategy proposed by the aircraft operator is acceptable to the Administrator.

F. Training. The operator must develop EFB training for all personnel involved with EFB use, database servicing, and maintenance. EFB training must comply with training identified in AC 120-76 and be FAA-approved where applicable.

4-1648 AIRWORTHINESS REQUIREMENTS. This paragraph outlines the airworthiness and return to service requirements for installed components or provisions of Class 1 or 2 EFBs. These airworthiness requirements are applicable to all installed provisions capable of supporting EFB functions at crewmember stations, regardless of any other stated intended function. The installer remains responsible to ensure all certification and airworthiness requirements are met for each installation. For provisional installations, each installer remains responsible for compliance with EFB airworthiness requirements, and each operator is responsible for EFB operational use requirements of the installed provisions capability. All installed EFB (Class 3) installation approvals require certification under TC, amended TC, or STC.

A. EFB Power Source.

1) Battery Primary Power Source. This is defined as utilizing an EFB battery only or aircraft power being used to recharge the EFB battery during flight operation, but the EFB battery remains the primary EFB power supply. Airworthiness criteria for Class 1 or Class 2 EFB aircraft power sources are accomplished in accordance with existing airworthiness requirements for PED outlets installation. Such outlets, if installed, must be labeled to enable use of the EFB by identifying the electrical characteristics (e.g., 28 volts direct current (VDC), 115 volts alternating current (VAC), 60 or 400 hertz (Hz), etc.) in order to address equipment sensitivity to voltage, current, or frequency parameters and to provide awareness to the crewmember or

maintenance personnel, reducing the likelihood of connecting incompatible devices to the power port (refer to the current edition of AC 20-173 for additional guidance).

NOTE: Special consideration must be given to the type of electrical power provided for the recharging of lithium batteries. Lithium batteries pose a safety hazard if overcharged or excessively discharged. Operators should have lithium battery charging procedures that are in total accordance with the battery manufacturer's charging instructions and prevent aggravation of lithium ion battery thermal hazards (refer to AC 120-76 for guidance on lithium battery authorization).

2) Aircraft Power Primary EFB Power Source (Class 2 EFB Only). This is aircraft power used as the primary EFB power supply and requires the power supply to be hardwired or connected with certified connectors to ensure reliability. This is an EFB continuously depending on connection to aircraft power to perform its intended function (no sustaining battery power). The aircraft power for Class 2 EFB power supplies must be designed to remain available, at an acceptable level for required flight information, in the event of aircraft electrical malfunctions. Class 2 EFB power supplies require installation approval addressing applicable airworthiness regulations (refer to AC 20-173 for additional information), and the power port must be appropriately labeled to enable use of the EFB by identifying the electrical characteristics (e.g., 28 VDC, 115 VAC, 60 or 400 Hz, etc.) in order to address equipment sensitivity to voltage, current, or frequency parameters and to provide awareness to the crewmember or maintenance personnel to reduce the likelihood of connecting incompatible devices to the power port.

B. EFB Data Connectivity. This read-only data is provided to an EFB from the aircraft's systems (e.g., flight management system (FMS), GPS, air data, fuel system) through a certified ARINC 429, RS-232, RS-485, or other compatible interfaces or certified router. EFB data connectivity does not include raw antenna reception data from an installed antenna going directly to the EFB. EFB data connectivity must include partition/protection to preclude the EFB from interfering with any aircraft system, and all associated wiring must be protected from damage and secured. EFB data connectivity requires design approval accomplished under TC, amended TC, or STC by AIR and excludes the installation from eligibility for field approval (refer to AC 20-173, for additional information).

NOTE: Data converters (e.g., ARINC 429 to RS-232) capable of supporting EFB functions at crewmember stations must have design approval issued by the FAA.

C. EFB Mounting Devices.

1) Yoke-mounted EFBs must be certificated by a design approval by AIR under TC, amended TC, or STC. All the structural and dynamic, as well as wiring protection and security requirements affecting the flight controls (including autopilot, stall warning, stick pusher, crashworthiness, human factors, etc.), must be addressed prior to installation. Field approval or Designated Engineering Representative (DER) approval without a design approval from AIR by TC, amended TC, or STC is not permitted for yoke-mounted EFBs (refer to AC 20-173, for additional information).

2) Cockpit-mounted EFBs are Class 2 EFBs mounted in the cockpit other than on the control yoke. The EFB mounting device requires installation approval (refer to the current edition of AC 20-173, for additional information).

D. Installed Antennas. Installed antennas are those antennas permanently installed in the aircraft. Portable antennas attached to a portable EFB, but not attached to the aircraft, are not subject to these airworthiness requirements. Portable antennas and temporary antenna holders, like suction cups, are subject to EFB evaluation requirements only. Installation of antennas capable of supporting EFB functions at pilot/crewmember stations must be accomplished using existing guidance for antenna airworthiness considerations.

1) Antennas combining reception for both aircraft navigation and EFB must be TSO approved for this intended function, providing isolation to preclude the EFB from interfering with antenna reception for aircraft navigation.

2) TSO- or STC- approved antennas may be used to independently provide GPS and/or satellite weather for an EFB in accordance with existing installation airworthiness requirements.

3) Portable EFB-only antennas without a TSO may be used to provide a GPS or satellite weather signal for EFB-only use. Non-interference testing by the installer is required.

E. Installed Satellite Receivers (e.g., Weather Radar (WX) Worx, XM Weather, WSI In-flight). If any component of a weather receiver is installed in an aircraft separate from a portable EFB on the flight deck, it is subject to avionics installation requirements and may not be considered a PED. If the result of the received weather data is capable of being displayed on an EFB, the individual components of the weather receiver system cannot be installed as STC provisions only because the installation cannot meet 14 CFR part 43 requirements for testing of non-interference without performing its intended function. (Refer to the current edition of FAA Order 8110.4, Type Certification, for more information on this subject.) The weather receiver must be non-interference tested with the intended EFB installed and operative even though the installation only applies to the weather receiver. The airworthiness for the weather receiver installation is independent of EFB/PED suitability responsibility of the user/operator. The user/operator is responsible for EFB non-interference as a PED and the installer is responsible for non-interference for the weather receiver as part of installation requirements. This installation requires design approval under TC, amended TC, or STC, which excludes the installation from eligibility for field approval.

4-1649 AUTHORIZATION PROCESSES. The operator is responsible for ensuring all operational requirements are met for an EFB. The operator must submit documentation demonstrating compliance with all operational requirements for EFBs to their POI. The FAA evaluation process for an EFB follows the general process for approval and acceptance as described in Volume 3, Chapter 1.

A. Phase One—Initiation. Phase one of the process begins when the operator requests authorization to use the EFB from the FAA. During this phase, the FAA and the operator reach a

common understanding of the role of the FAA and what documents and actions the operator is responsible for during each phase of the authorization process.

B. Phase Two—Required Application Information. Phase two begins when the operator submits a formal EFB plan to the POI for evaluation. The plan is reviewed for completeness, and the POI facilitates coordination with other inspectors and FAA offices, as necessary. During phase two, the POI may coordinate with the appropriate AEG for guidance on EFBs having functions not addressed in this guidance. Once the plan is accepted, the operator follows the plan to produce a complete EFB program. The operator must submit the following information in the application package:

- EFB hardware and application specification (Figure 4-76 and Figure 4-81, Evaluation Report Information Template),
- EFB operator procedures/manual revisions,
- EFB cockpit procedures checklists,
- EFB training program,
- EFB evaluation report (Figure 4-79 and Figure 4-80),
- RD test data (when required),
- Completed non-interference test results, and
- Airworthiness documents for Class 2 equipment (mounting device, aircraft data connection, aircraft power primary, and remote antenna).

C. Phase Three—PI Review. The POI must use the checklist found in Figure 4-78 to conduct a review of the application submitted by an operator. The PIs (POI, PAI, PMI) should coordinate the review of an operator's EFB program with Cabin Safety and Dispatch Inspectors as appropriate. The POI should participate in the simulator evaluation or flight evaluation of an EFB when a user/operator is requesting initial EFB authorization. Additional simulator/flight evaluations are not required for adding a new EFB to an existing authorization unless there is a substantial change in EFB intended functions. When a new aircraft is added to a certificate with existing EFB authorization, the suitability of the EFB for the aircraft must be addressed as part of aircraft conformity and configuration control process. Inspectors should examine the technical content and quality of the proposed EFB program and other supporting documents and procedures. The user's/operator's program for EFB management is critical to EFB reliability and must be well-documented for EFB users.

D. Phase Four—Temporary Authorization to Use an EFB. An interim EFB authorization is granted to allow the certificate holder/operator/program manager to proceed with the required EFB 6-month operational validation testing. During validation testing, the certificate holder/operator/program manager must maintain a paper backup of all electronic information. For tracking and standardization purposes, the Flight Standards Service (AFS) field office principal inspector (PI) assigned oversight responsibility will temporarily issue the certificate holder/operator/program manager OpSpec/MSpec/letter of authorization (LOA) A061. The "Restrictions and Limitations" column in Table 1 of A061 should include the remark "Temporary Authorization to conduct 6-month operational validation testing." All text added to OpSpec/MSpec/LOA A061 through the use of nonstandard text entered in the nonstandard text block (sometimes referred to as "Text 99") must be approved by the appropriate headquarters

(HQ) policy division. For detailed guidance on the process for obtaining HQ approval for nonstandard authorizations, PIs must read the guidance contained in Volume 3, Chapter 18, Section 2, Automated Operations Safety System. A reduction to the required EFB 6-month operational validation testing may be considered if the certificate holder has previous experience with EFBs. A request to reduce the 6-month operational validation testing requires approval from AFS-200. The certificate holder must submit a plan with justification to reduce the 6-month operational validation testing to the FAA PI assigned with oversight responsibility for subsequent coordination and review with the geographically responsible AFS RO and AFS-200.

NOTE: The 6-month validation test formally begins when the certificate holder/operator/program manager is issued this A061 temporary authorization. Use Figure 4-82, Checklist 4—Electronic Flight Bag Line Evaluation Job Aid, for data collection during the validation phase. Validation testing should follow the guidelines in AC 120-76.

1) Unacceptable Validation Results. If the PI finds the proposed EFB reliability and/or function to be unacceptable by the conditions of this EFB guidance, then the PI should contact the operator for corrective action. EFB deficiencies must be corrected and the EFB function revalidated before proceeding to phase five.

2) Acceptable Validation Results. If at the completion of the EFB 6-month validation test, the PI finds the proposed EFB reliability and/or function to be acceptable based on validation data, then the certificate holder/operator/program manager can proceed to phase five of the EFB A061 authorization process.

E. Phase Five—Authorization to Use an EFB. The certificate holder/operator/program manager subject to regulations under 14 CFR parts 91K, 121, 125 (including 125 Letter of Deviation Authority (LODA) holders (125M)), and 135 is granted authorization to use an EFB through OpSpec/MSpec/LOA A061 after acceptable completion of validation testing in phase four. The PI will remove the “temporary authorization” annotated in the restrictions and limitations column of Table 1. Any subsequent change to EFB hardware or intended functions must be validated at a level appropriate to the effect of the change on the EFB program.

Figure 4-75. Flowchart for Determining Electronic Flight Bag Hardware Class

NOTE: If you wish to print this diagram, A3 size paper must be used.

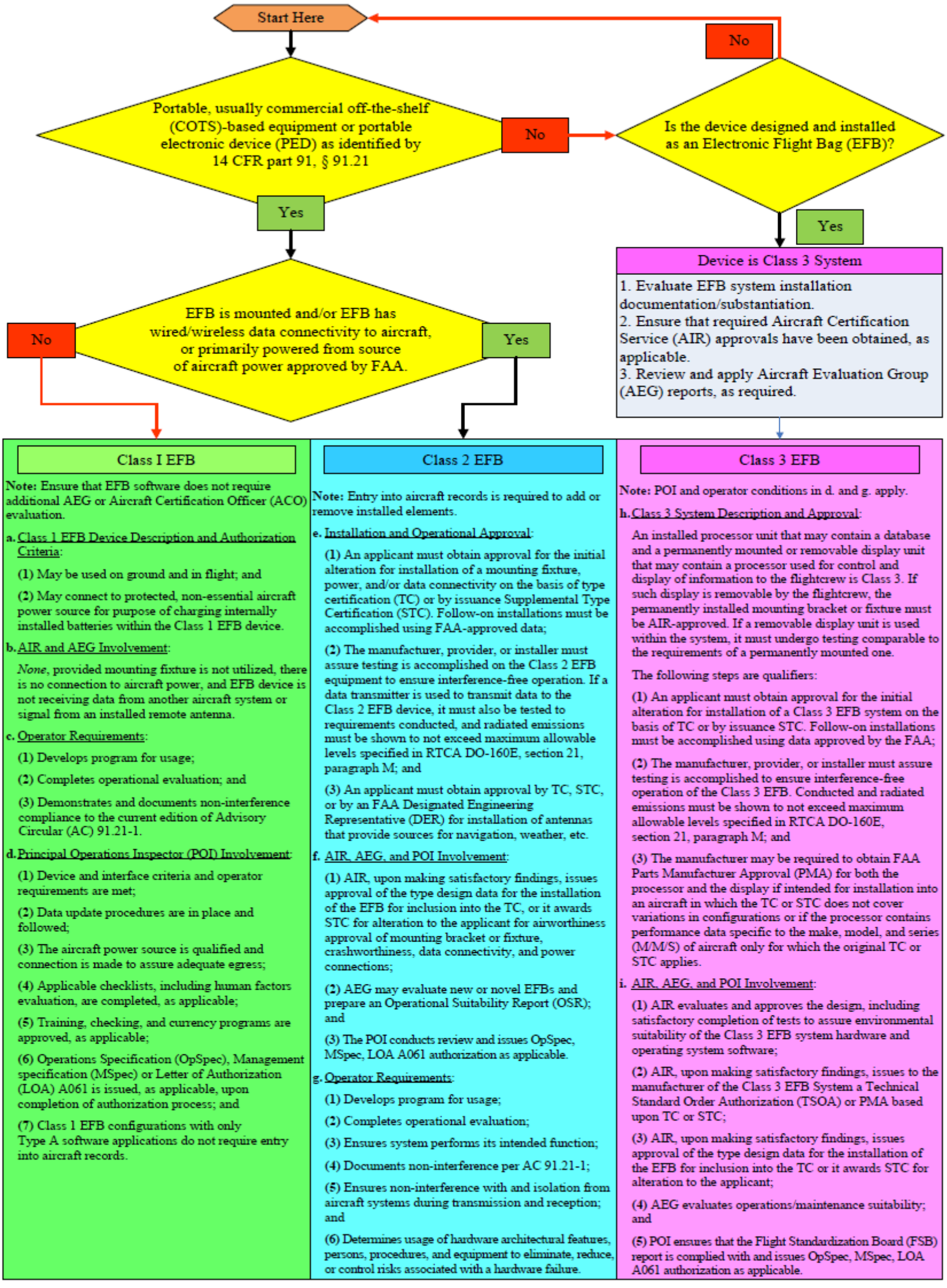


Figure 4-76. Hardware Description Template

Major components such as a motherboard, processor, Random-Access Memory (RAM), video card, hard drive, power supply, and connections (modem, wireless, etc.) must be identified. Any change to these components subsequent to initial evaluation and authorization will require the Electronic Flight Bag (EFB) device to be evaluated again to demonstrate the EFB still meets all requirements, including reliability. The template below has been provided to facilitate the documentation of these components.

a) Aircraft Owner or Applicant's Name:

b) Aircraft Make/Model:

c) Operating Rule Title 14 of the Code of Federal Regulations (14 CFR) parts 121, 125, 129, 135, and 91 Subpart K (Part 91K), 91 Subpart F, and Other Applicable Part 91 Subparts:

d) EFB Manufacturer/Model/Part Number:

e) The following major components are included with this make/model of EFB:

NOTE: Identify the manufacturer and model or manufacturer and part number for configuration control of these devices. This table is not applicable to permanently sealed devices (e.g., e-readers, tablets etc.).

Component	Manufacturer	Model	Part Number
Motherboard			
BIOS			
Processor			
Video Card			
Hard Drive			
CD-ROM			
DVD Drive			
Wireless Connection			
Power Supply			

f) Operating System and Version: (insert operating system name), version (insert version number), service pack (insert service pack number), build (insert build number):

g) Identify the classification of hardware proposed (Class 1, 2, or 3):

h) List all proposed Type A, Type B, and Type C software applications on this EFB device:

i) EFB Mounting System:

- Has the mounting device or system been certificated under 14 CFR part 23, 25, 27, or 29: ☐ Yes ☐ No (check one)
- Type certificate (TC), amended TC, or Supplemental Type Certificate (STC) number:

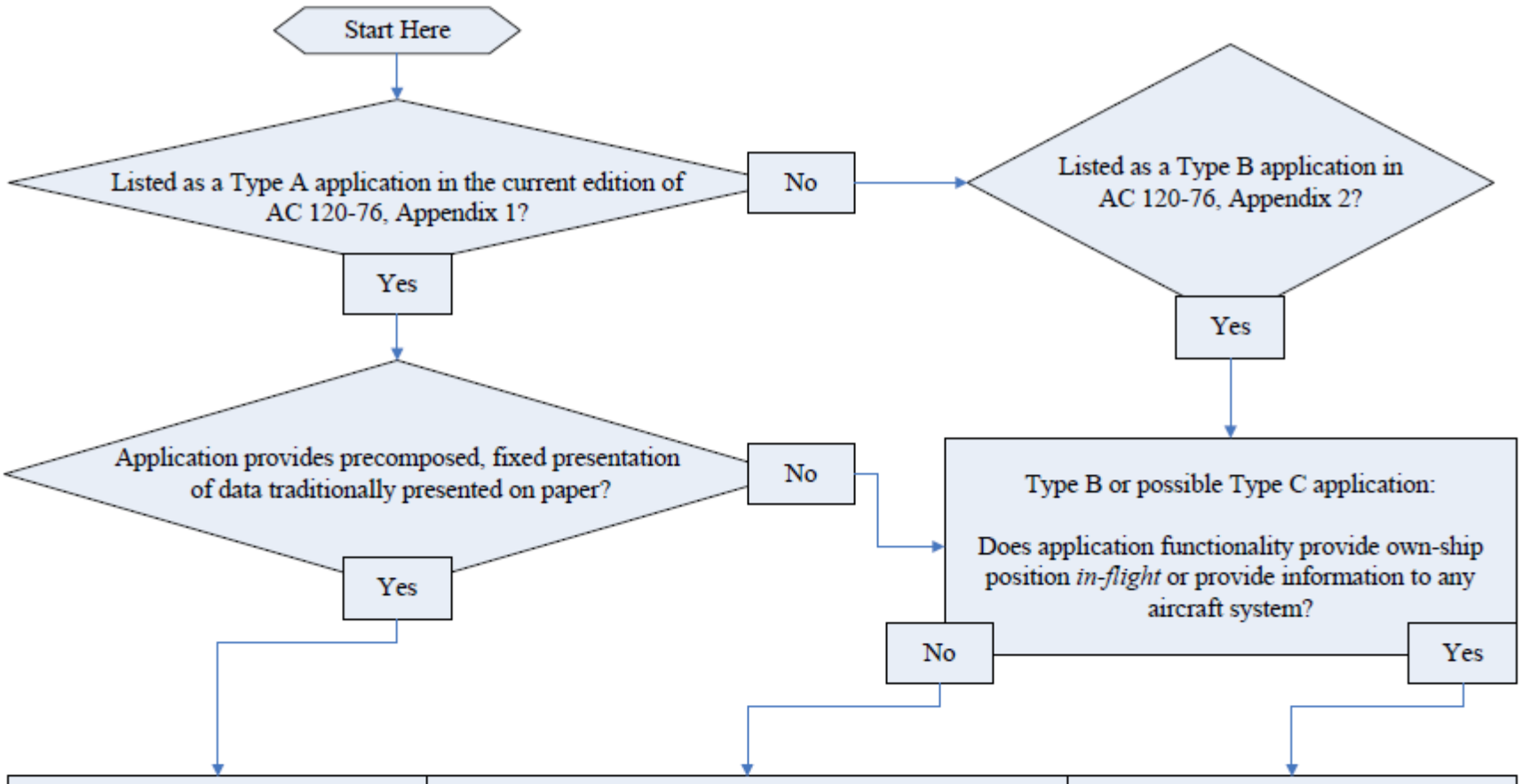
- Manufacturer and model number of mounting device or system:
- Mounting description:

j) Identify if the EFB will use the aircraft as the primary power supply:

k) Identify any/all aircraft systems connected to the EFB device:

Figure 4-77. Flowchart for Determining Electronic Flight Bag Software Application Type

NOTE: If you wish to print this diagram, A3 size paper must be used.



Type A	Type B	Type C
j. Aircraft Certification Service (AIR) and Aircraft Evaluation Group (AEG) Involvement: NONE. **k.** Operator Requirements: **(1)** Determines usage, architectural features, people, procedures, and equipment to eliminate, reduce, or control risks associated with an identified failure in a system; and **(2)** Provides evidence to the principal operations inspector (POI) that: **(a)** The Electronic Flight Bag (EFB) operating system and hosted application software meet the criteria for the appropriate intended functions and do not provide false or hazardously misleading information; and **(b)** Software revision loading won't corrupt data integrity of original software. **l.** POI Involvement: Verifies that: **(1)** Application criteria and operator requirements are met; **(2)** Data updates follow maintenance manual and inspection program procedures; **(3)** Applicable job aids, including human factors evaluation, are completed; **(4)** Training, checking, and currency programs are approved; **(5)** Operational evaluation report from operator is appropriately reviewed; and **(6)** Operations specification (OpSpec) or management specification (MSpec) A061 is issued upon completion of authorization process, as applicable.	**m.** Type B Applications: **(1)** May be hosted by any device/system class; does not require AIR design approval or AEG evaluation; does not require compliance with RTCA, Inc. DO-178B; operator and POI requirements of note **l.** and **n.** are met; may display precomposed information such as navigation or approach charts; required flight information should be presented for each applicable phase of flight; pending human factors evaluation, panning, scrolling, zooming, rotating, or other active manipulation is permissible; electronic navigation charts should provide a level of information integrity equivalent to paper charts; ensure application functions (such as display of own-ship position) do not require AIR approval; **(2)** Flight Standards Service (AFS) initial operational authorization granted for hosted performance applications based on AIR recommendations and AEG determination of flightcrew training, checking, and currency requirements; and **(3)** Hosted interactive performance/Weight and Balance (W&B) applications procedures should be developed per 14 CFR part 121, § 121.133. These procedures should define the roles that the flightcrew and dispatch/flight following have in creating, reviewing, and using performance calculations supported by EFBs. **(a)** Authorization for use is placed in OpSpec or Mspec A061, as applicable; and **(b)** OpSpec E096 lists EFB as an approved method for W&B calculation, as applicable. **n.** Operator Requirements: Demonstrates EFB meets operational and certification requirements: **(1)** Determines usage, architectural features, people, procedures, and equipment to eliminate, reduce, or control risks associated with an identified failure in a system; **(2)** Performs 6-month operational validation per authority granted in OpSpec or Mspec A061, as applicable; **(3)** Uses both EFB device/system and conventional paper copies during evaluation period; **(4)** Submits final evaluation report to the POI, as appropriate, after evaluation; **(5)** Operating system and hosted application software meet criteria for appropriate intended functions and do not provide false or hazardously misleading information; and **(6)** Software revision loading won't corrupt data integrity of original software.	**o.** Type C Applications: **(1)** Primary flight displays are examples of Type C applications; **(2)** A means for obtaining AIR design approval is a Technical Standard Order Authorization (TSOA), which is a dual FAA certification design and production approval with a streamlined approval process; **(3)** An index of Technical Standard Order (TSO) standards is published in the current edition of AC 20-110; and **(4)** The regulatory basis for TSOA is defined in 14 CFR part 21 subpart O. **p.** AIR and AEG Involvement: **(1)** AIR design approval required, except for user-modifiable software, which may be utilized to host Type A and B applications. No user-modifiable application may affect any Type C application software. RTCA DO-178B, and the current edition of FAA Order 8110.49 detail user-modifiable software applications; **(2)** Manipulation of dynamic performance or load data requires AIR review; and **(3)** AEG determines operational suitability during certification process. **q.** Operator Requirements: **(1)** Applies for a TSOA for certain Type C application software; and **(2)** Follows airworthiness determination for installation and operational approvals.

Figure 4-78. Principal Operations Inspector Review Checklist

Used by POI for Review of Electronic Flight Bag (EFB) Applications

This section contains questions for use by POIs to review an EFB application. In general, these questions are specific to initial installations and training for a given aircraft. References to other checklists of this document may be helpful in understanding the intent of specific subject areas of this checklist.

Before using this checklist, the POI will review the results of Checklist 1 and Checklist 2 with the operator to ensure the operator has conducted a complete evaluation of the proposed EFB.

I. GENERAL EFB.

A. General Considerations.

Research if any of the EFB hardware or software applications are covered by an existing Aircraft Evaluation Group (AEG) report.

Workload:

1. Is an in-flight evaluation necessary? (An in-flight evaluation may be necessary if you are not able to adequately evaluate each function intended for this specific operation while on the ground.) If so, verify the in-flight evaluation confirms the overall workload is acceptable.

2. Review user/operator responses to evaluation questions for "Workload" from Figure 4-80, Checklist 2—Electronic Flight Bag Operational Evaluation.

3. Verify procedures are published and available to all EFB users and maintainers.

4. Verify preflight procedures and checklists are revised to include EFB.

5. Verify procedures are established for single and dual failure of EFB.

B. Physical Placement.

Design and Placement of Structural Cradle:

1. Verify user/operator procedures specify locations for both EFB stowage and use.

2. Verify EFB specified locations do not obstruct visual or physical access to flight controls and/or displays.

3. Verify EFB locations do not obstruct the emergency egress path.

4. Verify EFB locations provide for security in-flight.

5. Does mounting device have appropriate airworthiness documentation per EFB requirements?

6. Does mounting device lock in position easily?

7. Is the mounting device adjustable enough to accommodate a range of pilot/crewmember preferences and does range of adjustment accommodate the expected range of user's physical abilities?

8. Locking mechanisms should be durable enough to minimize slippage after extended periods of normal use.

9. Crashworthiness considerations must be addressed as well as appropriate restraint of EFB when in use.

C. Training/Procedures Considerations.

EFB Documentation and Policy:

1. Verify written policy adequately addresses each specific EFB application and any published AEG recommendations have been incorporated into the operator's EFB program.

2. Verify procedures are in place to communicate upgrades or malfunctions of EFBs to users in a timely manner.

3. Verify the EFB information from the manufacturer is incorporated into operating procedures.

EFB Training:

1. Verify the initial EFB training includes evaluation of knowledge and skill requirements. The training should include demonstration of key tasks.

2. Verify the recurrent training includes evaluation of proficiency with the EFB.

3. Verify minimum training, checking, and currency requirements are specified in training programs.

4. Verify EFB training is customized to EFB applications being used.

D. Validation Phase and Continued Data Collection.

Validation Phase Data Collection:

1. Verify the EFB 6-month operational validation testing phase requires pilots/crewmembers to document evaluations and there is a formal process for gathering feedback about the EFB and its performance.

2. Verify procedures specify personnel responsible for maintenance and database management.

3. Ensure the operator has an ongoing data collection and feedback/correction process ensures the suitability/reliability of the data. The data collection processes in place should be factored into the operator's Safety Management System (SMS).

E. SMS Interface.

Currently no regulatory requirement exists for any aviation certificate holder in the United State to have a Safety Management System (SMS). The FAA's SMS Program Office does provide a Voluntary Program for eligible Certificate Holders who wish to establish an SMS in their organization. When Certificate Holders are required by regulation to have an SMS they will no longer be eligible for the FAA Voluntary Program

1. Verify the hazards associated with the use and integration of the EFB have been identified, eliminated, or controlled to an acceptable level throughout the life cycle. Consider such hazards as: misuse, hazardous misleading information due to failure or malfunction, loss of information when needed, miscalculation, masking of information, confusion, corruption of data, excessive complexity of use, accidental damage, and human error in use, setup, and operation.

2. Verify the applicant's SMS has procedures to mitigate identified hazards availability, and reliability of design, cross-checking of calculation/data, crew training, and misuse potential.

3. Verify the applicant's SMS incorporates EFB hazard analysis, risk assessment, and related safety reports.

F. Software Applications Considerations.

1. Verify procedures are established for testing of each software applications revision or database update prior to operational use.

G. Hardware Considerations.

1. Verify display lighting and reflectivity has been evaluated for acceptability in each aircraft model.

2. Verify EFB maintenance procedures are in place for batteries, displays, display interaction devices (pens, etc.), display pixel burnout, and component condition.

II. ELECTRONIC DOCUMENTS.

1. Verify electronic documents are easily accessed and clearly controlled as to revision and currency.

2. Verify use of electronic documents is incorporated in training program for initial qualification (initial new-hire, initial equipment, transition, and upgrade) and recurrent.

III. ELECTRONIC CHECKLIST (ECL) SYSTEMS.

1. Verify the ECL system is customized to aircraft being operated.

2. If checklist is "interactive," verify the checklist is subject to a 6-month validation phase.

3. If checklist is "automatically linked," ensure AEG involvement and concurrence is obtained.

4. Verify the use of ECL system is incorporated into the training program for initial qualification (initial new-hire, initial equipment, transition, and upgrade) and recurrent.

IV. WEIGHT AND BALANCE (W&B).

1. Verify EFB procedures provide means to comply with load manifest recordkeeping requirements.

2. Verify procedures clearly identify if the EFB W&B program is for "planning purposes only" when not an approved means for calculating W&B.

3. Verify the use of W&B is incorporated into the training program for initial qualification (initial new-hire, initial equipment, transition, and upgrade) and recurrent.

V. FLIGHT PERFORMANCE CALCULATIONS.

1. Verify EFB procedures provide means to comply with load manifest/flight plan recordkeeping requirements.

2. Verify procedures clearly identify if EFB aircraft performance program is for "planning purposes only" when not an approved means for calculating aircraft performance.

3. Verify the use of aircraft performance is incorporated into the training program for initial qualification (initial new-hire, initial equipment, transition, and upgrade) and recurrent.

VI. ELECTRONIC CHARTS.

1. Verify the Electronic Charts Application does not display “own-ship position” except when properly evaluated for use on the ground.

2. Verify preflight procedures are established to ensure currency of electronic chart information.

3. Verify EFB display. The screen must be large enough to show an entire instrument approach procedure (IAP) chart at once, with the equivalent degree of legibility and clarity as a paper chart.

4. Verify the use of electronic charts is incorporated into training program for initial qualification (initial new-hire, initial equipment, transition, and upgrade) and recurrent.

VII. VALIDATION PHASE.

1. Verify procedures are established to collect user data for both normal and abnormal EFB functions during the validation phase and to provide a written report of reliability and problem resolution prior to authorization for paperless operation.

Figure 4-79. Checklist 1—Tabletop Electronic Flight Bag Evaluation

Checklist 1 contains a list of questions for operators to use during a tabletop evaluation of the Electronic Flight Bag (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 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."

After the operator has completed this checklist, the results should be documented so the principal operations inspector (POI) can review the results with the operator.

EFB Hardware

1. If the EFB is to be used outside of the flight deck, can the EFB display be read under direct sunlight?	❑ No	❑ Yes
2. Is the display brightness and contrast adjustable?	❑ No	❑ Yes
3. Is the display brightness acceptable when it adjusts automatically?	❑ No	❑ Yes
4. Are there any display artifacts such as jagged lines impairing functionality?	❑ No	❑ Yes
5. Are controls labeled appropriately to describe their intended function?	❑ No	❑ Yes
6. Are buttons and labels visible and readable under all flight deck illumination conditions?	❑ No	❑ Yes
7. Can EFB inputs be made quickly and accurately in any operational environment?	❑ No	❑ Yes
8. Does the input device provide sufficient tactile feedback in all environmental conditions?	❑ No	❑ Yes
9. Are inadvertent or multiple activation of controls minimized?	❑ No	❑ Yes
10. Does the EFB start up in a predictable state?	❑ No	❑ Yes
11. Can the EFB be rebooted when power is cut to the EFB?	❑ No	❑ Yes
12. Does the EFB function correctly when rebooted?	❑ No	❑ Yes
13. Are all the EFB failure modes easy to see and identify?	❑ No	❑ Yes
14. Is the failure annunciation/message appropriate for the EFB function which failed?	❑ No	❑ Yes
15. Are EFB recovery means easy to remember and apply when the EFB fails?	❑ No	❑ Yes

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

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General User Interface

16. Is the revision information and currency expiration date available and presented clearly?	❑ No	❑ Yes
17. Does the device respond immediately to user inputs?	❑ No	❑ Yes
18. Is the processing speed always appropriate for normal use?	❑ No	❑ Yes
19. Are appropriate busy or progress indicators displayed when processing is delayed?	❑ No	❑ Yes
20. Is the user interface, including functions and navigation, consistent throughout the EFB?	❑ No	❑ Yes
21. Is all information needed displayed and easily accessible? Is there missing or difficult to find information?	❑ No	❑ Yes
22. Are common actions and time-critical functions easy to access?	❑ No	❑ Yes

23. Are there standard ways to perform common actions?	❑ No	❑ Yes
24. Are the displays and controls used on the EFB similar across applications? Are a common set of controls and graphical elements used?	❑ No	❑ Yes
25. Can all colors be distinguished under the various lighting conditions?	❑ No	❑ Yes
26. Is color coding implemented with a secondary code such as shading or highlighting when used to display critical information?	❑ No	❑ Yes
27. Are the colors red and yellow used appropriately only for warnings and cautions?	❑ No	❑ Yes
28. Is the text easily readable?	❑ No	❑ Yes
29. Do the characters stand out against the display background?	❑ No	❑ Yes
30. Are upper case and italic text used infrequently?	❑ No	❑ Yes
31. Is text used in low-visibility conditions appropriate in size and easy to read?	❑ No	❑ Yes
32. Is it easy to zoom in on text or graphics when they are too small?	❑ No	❑ Yes
33. Is it obvious when information is out of view and can it easily be brought into view?	❑ No	❑ Yes
34. Is the spacing between characters appropriate?	❑ No	❑ Yes
35. Is the vertical spacing between lines appropriate?	❑ No	❑ Yes
36. Are icons and symbols legible?	❑ No	❑ Yes
37. Are icon and symbol functions obvious?	❑ No	❑ Yes
38. Are the icons and symbols distinguishable from one another?	❑ No	❑ Yes
39. Is each icon's meaning explained by a label or other means?	❑ No	❑ Yes
40. Are the EFB icons and symbols consistent with their paper equivalents?	❑ No	❑ Yes
41. Do EFB alerts and reminders meet the requirements in the appropriate regulations as noted in the current edition of Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76, Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags, paragraph 10 (i.e., The Human Factors Considerations for EFBs)?	❑ No	❑ Yes
42. Are alerts and reminders consistent across all applications?	❑ No	❑ Yes
43. Are alerts and reminders implemented so as not to distract?	❑ No	❑ Yes
44. Is there control over when, and whether, the audio or video is activated?	❑ No	❑ Yes
45. Is it easy to reset parameters to their default when they have been customized?	❑ No	❑ Yes
46. 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."

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General Software Applications

47. Can required information be found quickly and accurately within all applications?	❑ No	❑ Yes
48. Is the information within applications organized consistently?	❑ No	❑ Yes
49. Is information layout consistent with the paper equivalent?	❑ No	❑ Yes
50. Is the layout of information appropriate for all applications?	❑ No	❑ Yes

51. Is high priority information easy to read?	❑ No	❑ Yes
52. Is it easy to tell which application is currently open/active?	❑ No	❑ Yes
53. Is it easy to switch between applications?	❑ No	❑ Yes
54. Is extra acknowledgement required to open applications when not flight related?	❑ No	❑ Yes
55. Do all open applications function as intended on an individual basis?	❑ 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
59. Is printing supported, and if so, is the hard copy usable?	❑ No	❑ Yes
60. Can a portion of a document be selected to be printed?	❑ No	❑ Yes
61. Can a print job be terminated immediately?	❑ No	❑ Yes

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

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Electronic Documents (If Applicable)

62. Is it easy to tell where one is in relation to the full document?	❑ No	❑ Yes
63. Is it easy to move between documents quickly?	❑ No	❑ Yes
64. Is it easy to tell what document is currently in view?	❑ No	❑ Yes
65. Is there a list of available documents to choose from?	❑ No	❑ Yes
66. Is the document search function appropriate?	❑ No	❑ Yes
67. Are tables, especially complex ones, readable and usable?	❑ No	❑ Yes
68. Are figures readable and usable?	❑ No	❑ Yes

Electronic Charts (If Applicable)

69. Is there a way to pre-select specific charts for easy access during a particular flight?	❑ No	❑ Yes
70. Is there more than one way to search for a chart?	❑ No	❑ Yes
71. Is it easy to access charts when a last-minute change is necessary?	❑ No	❑ Yes
72. If the chart application uses aircraft location to facilitate access to charts, is this function appropriate (i.e., either approved by Aircraft Certification or explicitly allowed by AC 120-76)?	❑ No	❑ Yes
73. Is it easy to switch between a decluttered and normal display if decluttering is supported?	❑ No	❑ Yes
74. Is there a clear indication when any chart elements are suppressed?	❑ No	❑ Yes

Provide the Number and a Comment for Each Electronic Documents and Charts Question Checked as "No."

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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. Does the active item change to the next after an item is completed?	❑ No	❑ Yes
99. 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."

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_____
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Performance Calculations (If Applicable)

100. Does the device identify entries having an incorrect format or type and does it generate an appropriate error message?	❑ No	❑ Yes
101. Does the error message clarify the type and range of data expected?	❑ No	❑ Yes
102. Are units for performance data clearly labeled?	❑ No	❑ Yes
103. Do the labels used in the EFB match the language of other operator documents?	❑ No	❑ Yes
104. Is all the information necessary for a given task presented together or easily accessible?	❑ No	❑ Yes
105. Can the crews modify performance calculations easily, especially when making last-minute changes?	❑ No	❑ Yes
106. Are outdated results of performance calculations deleted when modifications are entered?	❑ No	❑ Yes
107. Does the display and/or crew training provide information to the crew on the assumptions on which the calculations are based?	❑ No	❑ Yes
108. Are crews trained to identify and review default values and assumptions about the aircraft status or environmental conditions?	❑ No	❑ Yes
109. 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."

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Figure 4-80. Checklist 2—Electronic Flight Bag Operational Evaluation

Checklist 2 contains a list of questions for operator consideration during an operational evaluation of the Electronic Flight Bag (EFB), its documentation, procedures, and training. The first four pages contain questions to be answered in a training or operational environment by pilots/crewmembers, instructor/evaluators, or other operational personnel. The last page contains 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."

After the operator has completed this checklist, the principal operations inspector (POI) will review the results with the operator.

General EFB Hardware

1. Is there a backup source in the flight deck for EFB information?	❑ No	❑ Yes
2. Is the EFB display readable under all typical flight-deck lighting conditions?	❑ No	❑ Yes
3. Does each type of EFB failure have minimum impact to crew tasks and workload?	❑ No	❑ Yes
4. Is the EFB installation appropriate for use in high-workload phases of flight?	❑ No	❑ Yes
5. Are there appropriate Master Minimum Equipment List (MMEL)/minimum equipment list (MEL) items to handle EFB failures?	❑ No	❑ Yes
6. Have EFB failure items been incorporated into Federal Aviation Administration (FAA) – required/accepted checklists?	❑ No	❑ Yes
7. Does the EFB mount allow appropriate access to flight controls and displays?	❑ No	❑ Yes
8. Does the EFB mount allow appropriate access to the emergency egress path?	❑ No	❑ Yes
9. Are crews able to adjust and lock the EFB for optimal viewing?	❑ No	❑ Yes
10. Is there appropriate access to all flight controls during both ground and in-flight operations when the EFB is positioned for optimal viewing?	❑ No	❑ Yes
11. Is there appropriate room to manipulate the EFB controls and to view its display?	❑ No	❑ Yes
12. Are all routinely used EFB hardware components easy to access?	❑ No	❑ Yes
13. Are the EFB hardware components usable and suitably durable for the flight deck?	❑ No	❑ Yes

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

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Stowage (If Applicable)

14. Is there a stowage area for the EFB?	❑ No	❑ Yes
15. Is the stowage securing mechanism simple to operate?	❑ No	❑ Yes
16. Is the stowage securing mechanism unobtrusive when not in use?	❑ No	❑ Yes
17. Does the stowage system allow appropriate access to flight controls/displays and egress routes?	❑ No	❑ Yes
18. Is the design of the stowage area acceptable?	❑ No	❑ Yes
19. Can the EFB be moved easily to and from the stowage area without blocking access to flight displays/controls?	❑ No	❑ Yes

20. Are the device and/or the stowage area unlikely to be damaged under normal use?	❑ No	❑ Yes

Unsecured EFB (If Applicable)

21. Is there appropriate access to flight controls/displays when the unsecured EFB is in use?	❑ No	❑ Yes
22. Is there an acceptable place to put an unsecured EFB when in use?	❑ No	❑ Yes
23. Is there an acceptable place to put an unsecured EFB when not in use?	❑ No	❑ Yes
24. Can the kneeboard EFB be positioned so the pilot has full control authority?	❑ No	❑ Yes
25. Is the kneeboard EFB comfortable for the pilot to wear under normal conditions?	❑ No	❑ Yes

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

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General User Interface

26. Is the workload using the EFB the same or less than the current process?	❑ No	❑ Yes
27. Is the workload acceptable when there is an EFB failure?	❑ No	❑ Yes
28. Are other than critical EFB messages inhibited during high workload phases of flight?	❑ No	❑ Yes
29. Is the EFB user interface consistent with other flight deck systems?	❑ No	❑ Yes
30. Does the EFB use terms, icons, colors and symbols consistent with other flight deck systems?	❑ No	❑ Yes

Software Applications

31. Is the workload acceptable when configuring electronic charts while flying a procedure?	❑ No	❑ Yes
32. Does using the electronic checklist (ECL) produce the same crew actions the paper equivalent would?	❑ No	❑ Yes

Provide the Number and a Comment for Each User Interface and Application Question Checked as "No."

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_____
_____

EFB Procedures

33. Are there procedures for starting up and shutting down the EFB?	❑ No	❑ Yes
34. Are there appropriate procedures for all the EFB failure modes?	❑ No	❑ Yes
35. Are there EFB procedures for when other aircraft system failures could render the EFB unusable?	❑ No	❑ Yes
36. Are there procedures for using EFB backup information?	❑ No	❑ Yes
37. Are there procedures to mitigate EFB workload?	❑ No	❑ Yes
38. Are there procedures for establishing which source of information is primary?	❑ No	❑ Yes
39. Are there appropriate procedures for using EFB in high workload phases of flight?	❑ No	❑ Yes
40. Are there procedures specifying what data to use when data is redundant or different from	❑ No	❑ Yes

the EFB?

41. Are there procedures for removal of a kneeboard EFB during emergency landing or egress (If Applicable)?	❑ No	❑ Yes

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

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Procedures for Keeping EFB Content/Data Current

42. Are there procedures to ensure data is accurate and current for each software application?	❑ No	❑ Yes
43. Are changes to content/data appropriately documented?	❑ No	❑ Yes
44. Are there procedures to notify crews of EFB updates?	❑ No	❑ Yes
45. Are there procedures to ensure the correct information is installed when EFBs use information specific to the aircraft type or tail number?	❑ No	❑ Yes
46. Are operational control procedures consistent with regulations concerning preventative maintenance?	❑ No	❑ Yes
47. Is there a procedure to avoid corruption/errors during changes to the EFB device?	❑ No	❑ Yes
48. 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
49. Is there a procedure to ensure EFB data in use is approved for use in-flight?	❑ No	❑ Yes
50. Is there a procedure for when the database is not approved for use in-flight?	❑ No	❑ Yes
51. Is there a procedure to ensure all customized values are cleared from the EFB?	❑ No	❑ Yes

Procedures for User Feedback

52. Is there a procedure for EFB users to provide feedback?	❑ No	❑ Yes
53. Is there a procedure for the operator to monitor feedback, correct EFB deficiencies, and/or notify the EFB manufacturer?	❑ No	❑ Yes
54. Are there procedures or built-in limits preventing the setting of customized color schemes conflicting with flight deck color conventions?	❑ No	❑ Yes
55. Is there a policy regarding the use of supplemental audio and/or video in-flight?	❑ No	❑ Yes
56. Is the EFB audio set to minimize any interference with higher priority communications?	❑ No	❑ Yes

Procedures for Specific Applications (If Applicable)

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

applications?

63. Are there procedures to maintain required W&B records?	❑ No	❑ Yes
64. Is there a procedure to ensure EFB performance data can be stored outside the EFB?	❑ No	❑ Yes

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

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_____
_____

EFB Training

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

Training for Charts (If Applicable)

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

Training for ECL Systems (If Applicable)

81. Is there appropriate training on how to use ECLs?	❑ No	❑ 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)?	❑ No	❑ Yes
83. Is there training on which checklists are supported electronically and which are not?	❑ No	❑ Yes
84. Is there training on the limitations of ECL automation when it uses aircraft status data?	❑ No	❑ Yes

Training for Flight Performance Calculations (If Applicable)

85. Is there appropriate training on how and when to use the flight performance software	❑ No	❑ Yes

application?		
86. Is there training on critical performance calculation assumptions (e.g., runway length, W&B)?	❑ No	❑ Yes
87. Is there training to review default values for aircraft status and environmental conditions?	❑ No	❑ Yes
88. Is there training on how to enter information required by the performance software applications?	❑ No	❑ Yes
89. Is there training on how to interpret and use results of the flight performance calculations?	❑ No	❑ Yes
90. Is there training on where to obtain values when their normal sources are not available?	❑ No	❑ Yes
91. Is there training on coordinating the roles of dispatchers and pilot/crewmember?	❑ No	❑ Yes

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

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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 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 and Takeoff Question Checked as "No."

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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 runway 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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Figure 4-81. Evaluation Report Information Template

This outline is used by the user/operator to ensure the minimum content requirements of the evaluation report have been met. The format of the report is optional, however, the information below must be included, as a minimum:

1. Electronic Flight Bag (EFB) evaluation identified by EFB make/model and aircraft make/model.
2. The manufacturer's name and model number of the mounting system evaluated.
3. EFB location and stowage suitability.
4. EFB display lighting and reflectivity.
5. Suitability of procedures for EFB use during all phases of flight.
6. Suitability of procedures to follow when one unit fails and when both units fail to include alternate means of accessing data.
7. A revision process procedure/method ensuring appropriate database accuracy and currency.
8. Training effectiveness and typical acceptable training course completion.
9. Usability of each software application (for example):
    a. Electronic documents' functional suitability;
    b. Aircraft performance, Weight and Balance (W&B), and speeds reference functional suitability;
    c. Electronic charts' functional suitability; and
    d. Display of own-ship position limited to airport surface operations functional suitability.
10. Usability of multiple software applications at one time.
11. Crew workload and currency for proficient use.
12. Effectiveness of procedures governing the distribution of application software updates to the aircraft and confirmation of the aircraft EFB configuration.
13. Flight report—when and how reports of malfunctions or anomalies are reported and resolved.

Figure 4-82. Checklist 4—Electronic Flight Bag Line Evaluation Job Aid

USED FOR DATA COLLECTION DURING VALIDATION PERIOD

This tool provides a starting point for Electronic Flight Bag (EFB) line operations evaluations. The questions are primarily designed to aid the principal operations inspector (POI) but may also be useful to the operator for the collection of a structured set of observations about the use of the EFB before and during the 6-month operational validation phase. 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 description and flight conditions:

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

1.	Was training adequate to ensure the pilot/crewmember(s) could perform in a safe and efficient manner? Were individual pilot/crewmember knowledge and skills adequate to allow normal coordinated flight deck activities? Was pilot/crewmember knowledge regarding observed software applications adequate?	☐ No ☐ Yes
2.	Are adequate procedures in place to ensure the EFB is integrated into the crew's/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 pilot/crewmember(s) recover from usage errors without undue distraction or discussions? If usage errors were frequent or a distraction, describe in notes 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? 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 noted as "No" above:

III. General.

6.	Was each pilot/crewmember able to use the cursor, track ball, touch screen, etc., 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.	Was the device free of significant limitations in regard to display (e.g., off-axis view angles or various different lighting conditions)? The device had easy and adequate dimming functions in low-light (nighttime) conditions? The device was adequately backlit and/or was viewable by flight deck lighting in low-light (nighttime) conditions? The device was 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 pilot/crewmember(s) ensure proper stowage and security (i.e., between flights, etc.) of the EFB 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.	Normal functions (e.g., shutdown, startup) are adequate and do not require undue pilot/crewmember attention or concern?	☐ No	☐ Yes
13.	Were procedures adequate for identifying currency of EFB data?	☐ No	☐ Yes
14.	Could the pilot/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.	If multiple software applications are supported, could the pilot/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.	The time to complete normal tasks was appropriate?	☐ No	☐ Yes
19.	The audio features did not cause pilot/crewmember distraction and/or were adjustable and appropriate for the flight deck or cabin environment?	☐ No	☐ Yes ☐ N/A

Describe any problems noted 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 pilot/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 pilot/crewmember knowledge of chart/document/checklist selection and viewing adequate?	☐ No ☐ Yes
23.	Could the pilot/crewmember(s) easily rearrange content on the screen to meet needs (e.g., by zooming, panning, or otherwise customizing the view)?	☐ No ☐ Yes
24.	If printers are used, are printouts acceptable?	☐ No ☐ Yes
25.	Did the pilot/crewmember(s) exhibit adequate knowledge of EFB functions to efficiently brief and fly required procedures?	☐ No ☐ Yes
26.	Did the pilot/crewmember(s) exhibit adequate knowledge of the software applications revision process procedure/method ensuring appropriate database accuracy and currency?	☐ No ☐ Yes
27.	Did the pilot/crewmember(s) exhibit adequate knowledge of contingency procedures? In the event of a failure of a single device? In the event both devices fail?	☐ No ☐ Yes
28.	Were pilots/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 noted as "No" above:

V. Flight Performance Data/Calculations.

31.	Could the pilot/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 noted 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: _____ Print Observer Name:_____

Observer Signature: _____ Certificate Number: _____

RESERVED. Paragraphs 4-1650 through 4-1665.