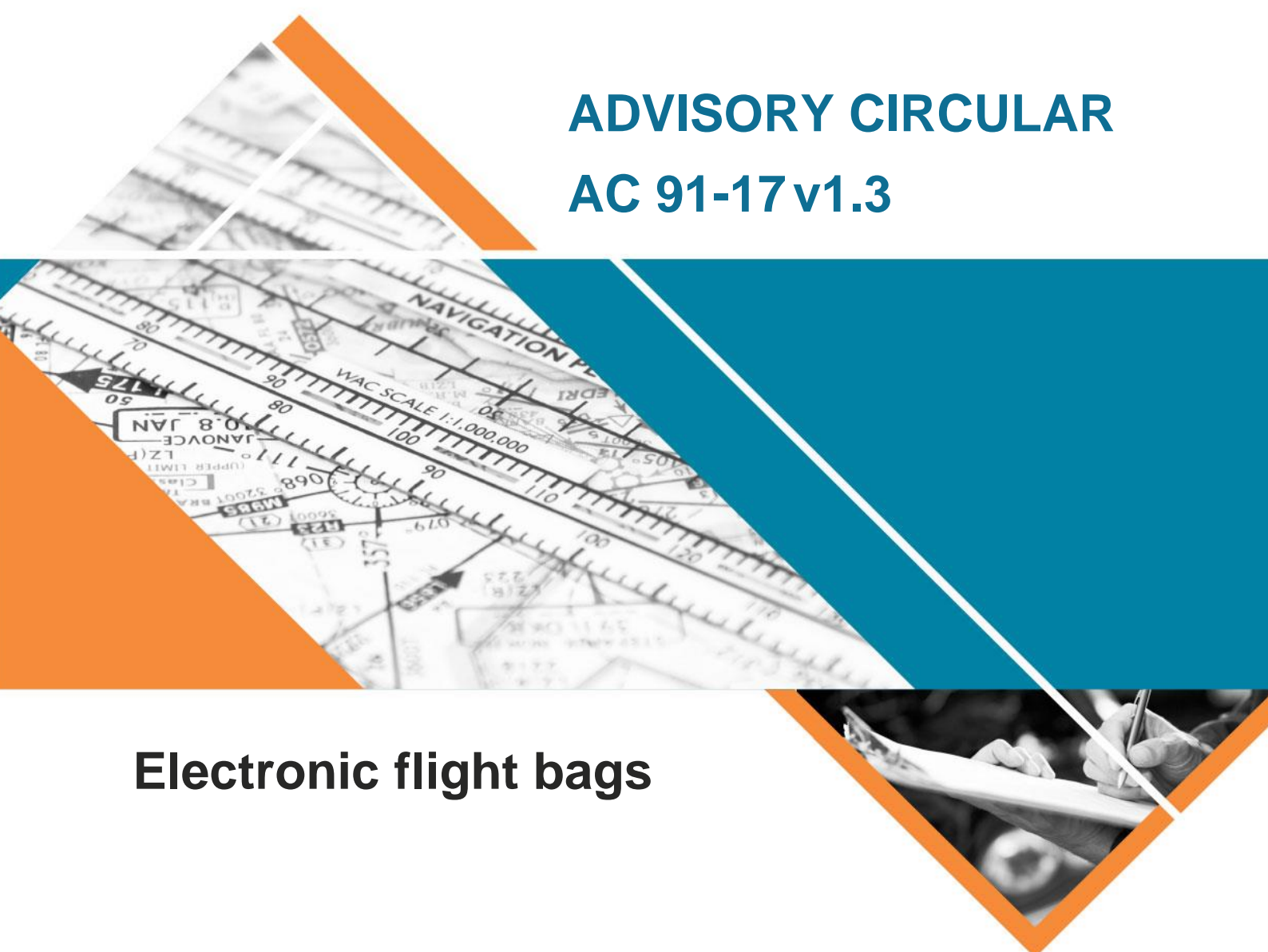




ADVISORY CIRCULAR

AC 91-17v1.3



Electronic flight bags

Date	May 2022
Project number	OS 99/08
File ref	D22/193974

Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory circulars should always be read in conjunction with the relevant regulations.

Audience

This advisory circular (AC) applies to the following:

- registered operators
- air operator's certificate holders
- pilots.

Purpose

This AC provides information and guidance in the use of Electronic Flight Bags (EFB) as a replacement for paper in the aircraft.

For further information

For further information, contact CASA's Flight Operations Branch (telephone 131 757).

Status

This version of the AC is approved by the Branch Manager, Flight Standards.

Note: Changes made in the current version are annotated with change bars.

Version	Date	Details
v1.3	May 2022	Minor changes due to AC 91-07 now being published and addition of some missing legislation references.
v1.2	March 2022	Re-ordered information in sections 2 and 3 of the AC. Clarified that Cabin EFB guidance is contained in a forthcoming new AC 91-07. Included references in section 4 of the AC to the correct legislation relating to the use of EFBs by AOC holders.
v1.1	February 2022	Section 6.7.1 amended in relation to battery capacity considerations. Section 9.8.4 amended in relation to an operator's considerations on the topic of crew member personal applications and data.
v1.0	October 2021	This AC replaces CAAP 233-1(1) - Electronic Flight Bags

Unless specified otherwise, all subregulations, regulations, Divisions, Subparts and Parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

Contents

1	Reference material	4
1.1	Acronyms	4
1.2	Definitions	4
1.3	References	5
1.4	Forms	6
2	Introduction	7
3	Background	8
4	When formal EFB approval is required	9
5	Classification of EFB	11
5.1	EFB categories	11
5.2	Hardware type	11
5.3	Software Types	12
6	Portable EFB hardware considerations	13
6.1	General	13
6.2	Screen size	13
6.3	Mounting devices	13
6.4	Cabling	14
6.5	Stowage area for EFB systems	14
6.6	Operating conditions	14
6.7	Power	15
6.8	Electromagnetic interference and compatibility (EMI/EMC) demonstrations	17
6.9	Emergency procedures	17
6.10	Data connectivity	17
6.11	Other connectivity	18
7	Considerations for selection of software	19
7.1	General considerations	19
7.2	Usability	19
7.3	Style of presentation	20
7.4	Ease of access to common functions	20
7.5	Consistency of symbols	20
7.6	Terms and abbreviations	20
7.7	Legibility of text	20

7.8	System responsiveness	21
7.9	Methods of interaction	21
7.10	Use of colour and messages	21
7.11	Display of system status	21
7.12	Error messages	22
7.13	Management of multiple applications and documents	22
7.14	Off-screen text and content	22
7.15	Use of active regions	22
7.16	Electronic signatures	23
8	Software types	24
8.1	Overview	24
8.2	Classification process	24
8.3	Miscellaneous software applications	25
9	Exposition guidance for EFB use and management	26
9.1	General	26
9.2	EFB administrator	26
9.3	Operational risk analysis	27
9.4	Procedures/considerations for the in-flight use of EFBs	27
9.5	Update process	27
9.6	Operator training program	28
9.7	Hardware management procedures	28
9.8	Software application management procedures	28
9.9	Data management procedures	29
9.10	Document change management control	29
Appendix A	Types of software applications	30
Appendix B	Operator's self-evaluation checklist for the introduction of EFB	33

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	advisory circular
AOC	Air Operator Certificate
CASA	Civil Aviation Safety Authority
CASR	<i>Civil Aviation Safety Regulations 1998</i>
COTS	commercial-off-the-shelf
C-EFB	cabin electronic flight bag
EFB	electronic flight bag
EFBA	electronic flight bag administrator
EMI	electromagnetic interference
FAA	Federal Aviation Administration (of the USA)
FCM	flight crew member
GPS	global positioning system
ICAO	International Civil Aviation Organization
MEL	minimum equipment list
OM	operations manual
PED	portable electronic device
SOPs	standard operating procedures

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below. Where definitions from the civil aviation legislation have been reproduced for ease of reference, these are identified by 'grey shading'. Should there be a discrepancy between a definition given in this AC and the civil aviation legislation, the definition in the legislation prevails.

Term	Definition
electronic flight bag (EFB)	An information system for flight crew members which allows storing, updating, delivering, displaying and/or computing digital data to support flight operations or duties.
EFB system	The hardware, the operating system, the loaded software and any antennae, connections and power sources, used for the operation of an EFB.
interactive information	Information presented on an EFB that, via software applications, can be selected and rendered in a number of dynamic ways. This includes variables in the information presented based on data-oriented software algorithms,

Term	Definition
	concepts of de-cluttering and on-the-fly composition, as opposed to pre-composed information.
installed EFB	Installed EFB are integrated into the aircraft, subject to normal airworthiness requirements, and under design control.
mounting device	May include arm-mounted, kneeboard, cradle or docking-stations etc.
operating system	Software that controls the execution of programs and that may provide services, such as resource allocation, scheduling, input-output control and data management.
operator	Operator, of an aircraft, means: (a) if the operation of the aircraft is authorised by an AOC, a Part 141 certificate or an aerial work certificate—the holder of the AOC or certificate; or (b) otherwise—the person, organisation or enterprise engaged in aircraft operations involving the aircraft.
portable EFB	Portable EFBs are not part of the aircraft configuration and are considered PEDs.
portable electronic device (PED)	A self-contained electronic device that is not permanently connected to any aircraft system, although it may be connected temporarily to an aircraft's electrical power system, externally-mounted antenna, data bus, or mounting device. PEDs include numerous communications and computing devices. Portable EFBs are considered PEDs. For the intent of this publication, a PED is a device that can display EFB information.
pre-composed information	Information previously composed into a static composed state (non-interactive). The composed displays have consistent, defined and verifiable content, and formats that are fixed in composition.
software application	Software program installed on an EFB system.

1.3 References

Legislation

Legislation is available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

Document	Title
Regulation 91.095	Compliance with flight manual etc.
Division 91.C.3	Flight related documents
Division 91.C.8	Portable electronic devices
Part 119	Australian air transport operators - certification and management
Regulation 121.350	Procedures relating to portable electronic devices
Regulation 133.280	Procedures relating to portable electronic devices
Regulation 135.315	Procedures relating to portable electronic devices
CASA EX82/21	Part 119 of CASR – Supplementary Exemptions and Directions Instrument 2021 Note: Section 5 of EX82/21 contains a direction to Australian air transport operators in relation to the use of EFBs.

Document	Title
CAO 82.0	Instrument 2014
	<p>Notes:</p> <ol style="list-style-type: none"> 1. This CAO was amended on 2 December 2021 and only applies to AOCs authorising either commercial balloon flying training, Part 137 aerial application operations or commercial glider passenger carriage. 2. Paragraph 11.1 of this CAO, which relates to EFBs, only applies to AOCs that authorise Part 137 aerial application operations.

Advisory material

CASA's advisory materials are available at <https://www.casa.gov.au/publications-and-resources/guidance-materials>

Document	Title
AC 1-01	Understanding the legislative framework
AC 1-02	Guide to the preparation of expositions and operations manuals
AC 91-07	Cabin electronic flight bags
Part 91 AMC/GM	Acceptable means of compliance and guidance material - General operating and flight rules
Part 119 AMC/GM	Acceptable means of compliance and guidance material - Australian air transport operators—certification and management

Other material

International Civil Aviation Organization (ICAO) documents are available for purchase from <http://store1.icao.int/>

Document	Title
ICAO Doc 10020	Manual on Electronic Flight Bags (EFBs)
ICAO Doc 10111	Manual on the Implementation and Use of Cabin Electronic Flight Bags

1.4 Forms

CASA's forms are available at <http://www.casa.gov.au/forms>

Form number	Title
	Air operator's certificate / Aerial work certificate / Associated approvals

2 Introduction

2.1.1 The scope of this AC applies to EFBs used by flight crew members. It provides guidance for the use of EFBs by operators under the respective CASR Parts. It covers areas such as hardware, software, administration, maintenance, security, and the operational approvals for the AOC or certificate holder (as applicable).

Note: AOC holders conducting commercial balloon flying training, commercial passenger operations in gliders, or aerial application operations in aeroplanes under Part 137, and certificate holders under Parts 138 or 141, should read any reference of an 'exposition' in this AC to be a reference to their 'operations manual'.

2.1.2 An EFB developed for cabin crew operations is referred to as a cabin electronic flight bag (C-EFB). The functions of a C-EFB may include, but are not limited to, access to cabin crew operations manual content, checklists, forms, passenger information and real-time reporting. A C-EFB should not be confused with an EFB, which is a FCM device. Information on C-EFBs is available in [AC 91-07 Cabin electronic flight bags](#).

2.1.3 An EFB is designed to replace traditional paper products in an aircraft. EFBs can store and display a variety of aviation data or perform calculations such as those required to determine performance or weight and balance. The scope of the EFB system functionality may also include a range of other hosted databases and applications. EFB displays may use an assortment of technologies, formats, and forms of communication.

2.1.4 EFBs exist as both portable and installed devices, where installed devices are an integral part of the aircraft equipment. Subsequent developments have recognised that portable devices can be used by other crew members (e.g., non-flight crew), with a number of operators having already implemented these products for cabin crew and other air crew members.

2.1.5 Portable electronic devices (PEDs) vs EFBs – all portable EFBs are considered PEDs, but the use of the term EFB recognises that the operator has specifically elected to use a PED for a FCM provisioning purpose. Electing to use a portable EFB for operations still requires consideration of Division 91.C.8, which address the carriage and use of PEDs in aircraft.

2.1.6 Nothing prevents the operator having multiple configurations of PEDs in use. Some operators may find it preferable to configure devices for flight deck use with different software options as compared to those loaded on a C-EFB. Alternatively, an operator may opt for commonality and redundancy by configuring all company PEDs with a common fitment.

3 Background

- 3.1.1 The concept of EFBs is not new, and initially commenced as a product implemented to replace traditional paper products in flight deck use.
- 3.1.2 The Federal Aviation Administration of the United States of America (FAA) issued guidance material as early as 2003 (FAA Advisory Circular (AC) 120-76A), and the International Civil Aviation Organization (ICAO) issued Annex 4, Chapter 20 to deal with electronic display of aeronautical charts. Chapter 20 provides guidance on the basic requirements and is aimed at standardising electronic aeronautical chart displays while not unduly limiting the development of new cartographic technology. ICAO provided further guidance material in Doc 10020 Manual on Electronic Flight Bags (EFBs) and Doc 10111 Manual on the Implementation and Use of Cabin Electronic Flight Bags (C-EFB).
- 3.1.3 CASA recognises that technological advancements in commercial-off-the-shelf (COTS) tablets and Wi-Fi standards may yield additional products that can be used successfully in aircraft crew roles.
- 3.1.4 EFBs can electronically store and retrieve documents required for multiple roles, including products such as:
- flight planning, aircraft performance, and weight and balance
 - maps
 - charts
 - aircraft flight manual (AFM) and FCOMs
 - company exposition
 - minimum equipment lists
 - electronic checklists, including those for use during normal operations, abnormal and emergency situations
 - mandatory occurrence reporting forms.
- 3.1.5 Historically some of these functions were accomplished using paper documents or were based on data provided to the flight crew by an airline’s “flight dispatch” function.

4 When formal EFB approval is required

- 4.1.1 With the technological advancements that have facilitated growth in everyday electronic transactions, the Australian Government introduced legislation recognising that, from a legal perspective, electronic versions of documentation required by regulation are acceptable. The media that are used to store and display documents have become irrelevant.
- 4.1.2 The *Acts Interpretation Act 1901* and *Electronic Transactions Act 1999* are the enabling legislation allowing the use of digital media to display the documentation required by the *Civil Aviation Act 1988* and any of its subordinate regulations.
- 4.1.3 Division 91.C.3 (and similar regulations in Parts 121, 131, 133, 135 and 138) specifically permits the carriage of documents in an electronic format for the applicable documents of that Division.
- 4.1.4 Documents that have already been approved in accordance with the relevant regulations do not need additional approval if they have been stored in the EFB in essentially the same form as the original document.
- 4.1.5 Part 91 operations do not require any specific authorisation for EFB use, provided the EFB does not replace any system or equipment required by the civil aviation rules. However, operators and crew must still comply with the portable electronic device (PED) requirements.
- 4.1.6 For Australian air transport operators, commencing the use of an EFB is a significant change². Air transport operators are required to detail their plans, processes and procedures for managing an EFB throughout an operation³. This would include matters such as (but not limited to):
- limitations
 - device administration
 - approved hardware and software configurations
 - procedures for use of the device
 - responsibilities of users and administrators
 - device updates
 - applicable training programs for device use
 - hardware management
 - software management
 - security.
- 4.1.7 Where an operator is considering making changes to their EFB exposition or operations manual procedures after initially receiving their certificate (whether AOC, aerial work certificate or a Part 141 certificate), or after initially receiving the specific approval related to some Australian air transport operators, the operator must consider the

² Commencing the use of an EFB is a significant change due to subsection 5(2) of CASA EX82/21. This subsection requires an operator to gain CASA approval prior to using an EFB for the first time in an Australian air transport operation. An exception applies for certain pre-2 December 2021 operators - see subsection 5(4) of CASA EX82/21.

³ See subsection 5(3) of CASA EX82/21.

definition of significant change for their respective kind of operation⁴. The majority of variations to an operator EFB program are unlikely to be a significant change; however, the operator will need to consider the requirements of paragraphs 119.020 (b) and (c) (and equivalent paragraphs in the definitions of significant change in Parts 138, 141 and 142) in making this determination.

- 4.1.8 EFB software applications cannot replace aircraft equipment requirements unless they are specifically authorised for that purpose. For example if a moving map display was intended to be used as a valid navigation source, then the hardware and software would need to meet the applicable airworthiness requirements and standards applicable to flight instrumentation and avionics.
- 4.1.9 The use of an EFB must be in accordance with the regulations that require an operator to detail their processes and procedures in their exposition. That is, if an operator elects to use an EFB for the provision of take-off and landing performance, then the relevant regulations for consideration are those applicable to take-off and landing performance. In this scenario, the EFB is an electronic method to access and display the applicable data. If the EFB has a computational or look-up function, the function must be validated to ensure that the correct results are obtained and are equivalent to using the relevant conventional methodologies. The EFB would need to access suitably approved information, and operators should detail their plans and processes for crew to follow in computing the required information. If an operator's procedures/practices are considered unsuitable, the regulations provide that CASA may issue a direction requiring the operator to revise or vary the applicable procedures in their exposition or operations manual⁵.

⁴ There is no definition of significant change for Part 137 aerial application AOC holders. These operators need to comply with regulations 137.080 and 137.085.

⁵ Regulations 119.105, 131.115, 138.068, 141.100 and 142.155. CASA may also use the general directions power under Part 11.

5 Classification of EFB

5.1 EFB categories

5.1.1 The classification of an EFB considers two categories. These are:

- **Hardware type** – The physical characteristics of the device, for example whether the device is handheld, mounted or installed.
- **Software type** – What particular functions the EFB is intended to perform.

5.2 Hardware type

5.2.1 Portable

5.2.1.1 Portable EFBs are not part of the aircraft configuration and are considered PEDs. They generally have self-contained power and may rely on data connectivity to achieve full functionality. Any modifications to the aircraft to use portable EFBs require airworthiness approval. These modifications may include (but are not limited to):

- altering provision of power supplies to suit the EFB
- adding or changing fixtures in the aircraft for the purposes of holding an EFB
- adding or modifying aircraft antennae.

5.2.1.2 Any EFB component that is installed such that flight crew cannot easily remove it should be considered as aircraft equipment and should be covered by an airworthiness approval.

5.2.1.3 An example of a portable EFB may be an Electronic Chart Display or an Electronic Manuals Reader.

5.2.1.4 Installation of a permanent mounting device does not change the portable EFB to an installed device. For example, an iPad (or a similar device) is considered a portable EFB regardless of whether it is stowed, on a kneeboard mount, or on a mount attached to the aircraft's structure. Additional information on hardware considerations for the selection of a portable EFB is provided in Chapter 6.

5.2.2 Installed

5.2.2.1 Installed EFBs are fully integrated into the aircraft flight compartment and aircraft systems and are subject to normal airworthiness requirements and design control. The approval of these EFBs is included in the aircraft's type certificate (TC), supplemental type certificate (STC), or in accordance with other provisions of Subpart 21.M.

5.2.2.2 In addition to hosting EFB applications provided by the device manufacturer, some installed EFB permit customisation of the applications by the aircraft operator. This is permitted, provided that the integrity of the certified applications is not compromised by the operator-installed applications. For example, an operator may choose to load a software application that, due to its functions, does not require any certification and does not interface with the other applications. Alternatively, the device may contain a partitioning mechanism which provides an electronic separation between the certified applications and all other types of applications.

5.3 Software Types

- 5.3.1 From an operational perspective, the software used on an EFB is characterised by its functionality/capability.
- 5.3.2 There are primarily two types of software:
- TYPE A APPLICATIONS – are applications such that if the application fails or is used incorrectly, it is considered to have no safety effect on the flight.
 - TYPE B APPLICATIONS – are applications such that if the application fails or is used incorrectly, it is considered that the effect will continue to preserve a level of aviation safety that is at least acceptable.
- 5.3.3 More detail on software types is provided in Chapter 8. 9.10.1Appendix A of this AC contains examples of the typical software types.

6 Portable EFB hardware considerations

6.1 General

- 6.1.1 Regardless of the intended use, the operational implementation of an EFB will require a structured sequence of events and actions to satisfy both the operator and regulator that aircraft equipped with one or more EFBs can be operated safely.
- 6.1.2 The following sections outline the aspects that should be considered when evaluating the use of EFB hardware on an aircraft.

6.2 Screen size

- 6.2.1 The screen size and resolution will need to demonstrate the ability to display information in a manner comparable to the paper documents that are being replaced. For flight crew use, this would be evaluated against the aeronautical charts and other data. The recommended minimum size of the screen is 200 mm, measured diagonally across the active viewing area. If the intent of the device is to display charts and maps, it should be suitably sized to display the image without excessive scrolling.
- Note:** The screen sizes of some manufacturers may vary marginally from this minimum, but still may be acceptable.
- 6.2.2 The size of the proposed EFB may make it cumbersome during normal use. A laptop may have sufficient computing power to handle the required software, but the size may be a hindrance.

6.3 Mounting devices

- 6.3.1 EFBs with temporary mounts that attach to the aircraft (e.g. suction mounts, Velcro pads etc.) are regarded as unsecured devices, and they should be stowed during critical phases of flight. These temporary mounts are unlikely to be considered airworthy and may constitute a hazard on the flight deck or crew station in certain circumstances. EFBs attached to kneeboard holders do not need to be stowed.
- 6.3.2 All EFB mounts attached to the aircraft structure require airworthiness approval (Subpart 21.M). An unsafe condition must not be created when attaching any EFB control yoke attachment/mechanism or mounting device. For example, the weight of the EFB and mounting bracket combination may affect flight control system dynamics, even though the mount alone may be considered light.
- 6.3.3 The mounting device, if it is adjustable, must be able to be locked in place by the crew. An adjustable mount will also assist the crew to compensate for glare and reflections. The mount must not block access to any of the EFB controls or display.
- 6.3.4 The mounted EFB must not cause obstruction to:
- external vision
 - physical access to aircraft displays or controls
 - visual access to aircraft displays or controls.

- 6.3.5 When mounted, the equipment must not present a safety-related risk or associated hazard to any crew member. A means to store or secure the device when not in use should be provided. Additionally, the unit (or its mounting structure) must not present a physical hazard in the event of a hard landing, crash landing or water ditching. EFBs and their power cords must not impede crew ingress, egress or emergency egress.
- 6.3.6 It is possible to have an EFB that is handheld. In this case, the operator may impose restrictions on its use, such as requiring the device to be stowed during the following phases of flight:
- during take-off and landing
 - during an instrument approach
 - when the aircraft is flying at a height less than 1 000 ft above the terrain
 - in turbulent conditions.
- 6.3.7 A device that is mounted in an approved mount within the crew station, or using a suitable kneeboard attachment (with no attachment to the aircraft) which is securely attached to the crew member, may be:
- connected to aircraft power for battery recharging
 - connected to an installed antenna (e.g. GPS) intended for use with that EFB.

6.4 Cabling

- 6.4.1 The cables required for EFB operation must not present a hazard. The required cabling should be of sufficient length to be secured to prevent damage or hazards. Use of cable ties, restraints and conduits should be considered, depending on the installation.

6.5 Stowage area for EFB systems

- 6.5.1 Stowage need only be considered for EFBs that are not mounted to the aircraft or a kneeboard. A designated stowage area with a securing mechanism for these EFBs is recommended for storage of the units when they are not in use. Stowed EFBs should be readily accessible by the crew during a flight and should not cause any obstruction or hazard during aircraft operations.
- 6.5.2 EFB systems that are not secured in a mounting device during use must be designed and used in a manner that prevents the device from jamming flight controls, damaging other aircraft equipment, or injuring crew members in the event that the device moves about as a result of turbulence, manoeuvring or other action in phases of flight other than those described in paragraph 6.4.6 above.

6.6 Operating conditions

- 6.6.1 The proposed EFB installation must be operable in a wide variety of environmental conditions, e.g. temperature range, low humidity, altitude etc. The operator needs to ensure that appropriate testing is undertaken to confirm the suitability of the selected device for use as an EFB in the conditions in which they intend operating.

6.7 Power

6.7.1 Power source and battery capacity

- 6.7.1.1 When EFB battery charging is not possible in the aircraft, additional fully-charged EFB batteries should be available to ensure that operational performance is maintained for the planned duration of the flight, including diversion times and operation on the ground.
- 6.7.1.2 Charging the EFB will generate extra heat, especially in warmer climates. However, this heat must not cause the EFB to shut down. The placement of the EFB should allow sufficient airflow around the unit. Consideration must be given to ensuring that the temperature of the EFB does not exceed the manufacturer's recommendations during usage. All care must be taken to ensure that the battery in the EFB does not go into a thermal runaway condition. Reliance on accessories to control cooling of the EFB should be avoided.
- 6.7.1.3 Useful battery life must be established and documented for the EFB. Rechargeable batteries in EFBs have a limited life and gradually lose their capacity to hold a charge. This loss of capacity is irreversible. As the battery loses capacity, the length of time it will power the product decreases. Useful battery life and battery degradation are elements of the operator's understanding regarding the minimum battery level required for their operations.
- 6.7.1.4 Careful monitoring of EFB batteries nearing the end of their service life should be implemented to ensure that as the battery degrades there is sufficient battery life to meet the operators' requirements (assuming on-board charging is not available). Depending upon the intended lifespan of the device when compared to the battery degradation, it is recommended that operators evaluate whether they should conduct regular evaluation of a device's ability to determine that it continues to meet their needs.
- 6.7.1.5 In order for the use of an EFB to achieve a comparable level of safety to that of a paper-based product, certain software applications, especially when used as a source of required information, may require the EFB system to have access to an alternate power supply. Guidance should also be provided in the adverse event of a battery failure or malfunction.

6.7.2 Lithium batteries

- 6.7.2.1 Rechargeable lithium-type batteries are becoming more common as a standby or backup power source for EFBs. The users of rechargeable lithium-type batteries in other industries, ranging from wireless telephone manufacturers to the electric vehicle industry, have noted safety concerns. These concerns are primarily the result of overcharging, over-discharging, and the flammability of cell components. Lithium-ion or lithium-polymer (lithium-ion polymer) batteries are two types of rechargeable lithium batteries commonly used to power EFBs.
- 6.7.2.2 These types of batteries are capable of ignition and subsequent explosion due to the flammability of cell components. They are also vulnerable to overcharging and over-discharging which can, through internal failure, result in overheating. Overheating may result in thermal runaway, which can cause the release of either molten burning lithium or a flammable electrolyte and toxic smoke. Once one cell in a battery pack goes into thermal runaway, it produces enough heat to cause adjacent cells to also go into

thermal runaway. The resulting fire can flare repeatedly as each cell ruptures and releases its contents.

- 6.7.2.3 The rechargeable lithium-type battery design should be compliant with the provisions of Institute of Electrical and Electronic Engineers (IEEE) 1625, IEEE Standard for Rechargeable Batteries for Portable Computing. This standard contains design considerations for: system integration, cell, pack, host device, and total system reliability. It also covers how to maintain critical operational parameters with respect to time, environment, extremes in temperature, and the management of component failure.

6.7.3 Lithium battery cautions

- 6.7.3.1 Due to their proximity to the flight crew and the potential hazard they present to safe operation of the aircraft, the use of rechargeable lithium-type batteries in EFBs should be monitored by operators.
- 6.7.3.2 Operators should test EFB batteries and recharging systems to ensure safety and reliability. Operators should use one of the following safety and testing standards as a minimum for determining whether rechargeable lithium-type batteries used to power EFBs are acceptable for use and for recharging:
- Underwriters Laboratories (UL). UL 1642, Lithium Batteries; UL 2054, Household and Commercial Batteries; and UL 60950-1, Information Technology Equipment – Safety
 - International Electrotechnical Commission (IEC). International Standard IEC 62133, Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for sealed secondary cells, and for batteries made from them, for use in portable applications
 - United Nations (UN) Transportation Regulations. UN ST/SG/AC.10/11/Rev.5 – 2009, Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Fifth revised edition, or
 - RTCA/DO-311, Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems. An appropriate airworthiness testing standard such as RTCA/DO-311 can be used to address concerns regarding overcharging, over-discharging, and the flammability of cell components. RTCA/DO-311 is intended to test permanently installed equipment; however, these tests are applicable and sufficient to test EFB rechargeable lithium-type batteries.

6.7.4 EFB battery replacement intervals

- 6.7.4.1 For those EFBs using batteries for power, the replacement interval for batteries should not exceed the Original Equipment Manufacturer (OEM) recommendations. If the EFB manufacturer has not specified a battery replacement interval, then the original battery (or cell) manufacturer's specified replacement interval should be followed.

6.7.5 Electrical backup power source

- 6.7.5.1 Some applications, especially when used as a source of required information, may require that the EFB use an alternate power supply to achieve a comparable level of

safety to that of a paper-based product. The operator is responsible for ensuring that the batteries are replaced as required.

6.8 Electromagnetic interference and compatibility (EMI/EMC) demonstrations

6.8.1 For the purpose of EMI demonstrations, portable EFB devices are considered PEDs and should satisfy the criteria contained within FAA AC 91.21-1D, or other standards accepted by CASA. All EFB devices must demonstrate that they meet appropriate industry-adopted environmental qualification standards for radiated emissions for equipment operating in an airborne environment. Initial testing may take the form of simple victim/source testing, which may identify issues warranting further investigation.

6.9 Emergency procedures

6.9.1 The operator is to establish, and set out in the exposition, procedures for the crew to safely manage serious EFB malfunctions, including:

- EFB battery overheat
- battery fire
- smoke evacuation
- secure isolation of an EFB that has seriously malfunctioned to prevent further hazard.

6.9.2 The primary method for stopping a lithium battery thermal runaway is to cool it down. Lithium battery fire containment or lithium safe battery bags can be used as a secondary measure for containment.

6.9.3 Procedures to mitigate a serious EFB malfunction need to be designed specifically for the particular EFB in use.

6.10 Data connectivity

6.10.1 Data connectivity with the aircraft avionics/systems is not permitted without an airworthiness approval.

6.10.2 Read only (1-way connectivity)

6.10.2.1 Data connectivity with the aircraft avionics in a “read only” manner is permitted through a certified interface unit. If the EFB is connected to a certified data link (either wired or wireless) where the data link, through the certification process, provides approved firewall protection to aircraft systems, then there is no further evaluation required prior to connecting the EFB to the data link port. Operators must demonstrate that safety mechanisms are in place to prevent EFB data connectivity failures from having any adverse effects on aircraft avionics systems.

6.10.3 Read/Write (2-way connectivity)

6.10.3.1 If an EFB is connected to an aircraft, then as a minimum the operator and airworthiness approvals should consider the following:

- demonstrated compliance with lightning protection requirements
- demonstrated compliance with high-intensity radiated fields protection requirements.

6.10.3.2 The safety and non-interference aspects of using wireless technology connections to installed equipment also need to be evaluated as part of the overall operator approval process. The intended function and safety (e.g. security and integrity) is applicable only to the interfaces with the avionics data sources, and not to the software applications.

6.10.3.3 The failure modes of the interface between the EFB and its avionics data sources should be assessed under normal and fault conditions (e.g. demonstrate that EFB inputs can be overridden by manual input in the event of an EFB failure, demonstrate that safety mechanisms are in place to prevent EFB data connectivity failures from having adverse effects on aircraft avionics systems). The assessment of safety and integrity of the software application should be addressed through the approval of the application itself.

6.11 Other connectivity

6.11.1 Wireless data connectivity (Wi-Fi/4G/5G) may be used to receive/transmit information for aircraft administrative control processes, e.g. Aeronautical Information Regulation and Control (AIRAC) etc. The operator needs to ensure that the exposition clearly identifies the situations in which this connectivity is to be used.

7 Considerations for selection of software

7.1 General considerations

- 7.1.1 It is the responsibility of the operator to ensure that the operating system and application programs meet the intended functional requirements. Unauthorised modification of any database, or the loading of any new or additional software, is not permitted unless that software is demonstrated to comply with the original validation basis.
- 7.1.2 Some software applications installed for flight operations may require regulatory approval prior to operational use. For example, if a software function is being used for the display of instrument approach procedure charts, then the software provider should hold an approval under Part 175 of CASR. Any information that is provided to the flight crew needs to be a true and accurate representation of the charts or documents being replaced and, as such, must be validated to confirm compliance with the aircraft's approved flight manual. Validation should be by endorsement of the software application by the person responsible for the relevant approved flight manual limitations, or by a suitably qualified and accredited person.
- 7.1.3 The operator should identify a means to demonstrate that adequate security measures are in place to prevent malicious introduction of unauthorised modifications to the EFB's operating system, its specific hosted applications, and any of the databases or data links used to enable its hosted applications. EFB systems need to be protected from possible contamination from external viruses.
- 7.1.3.1 Portable EFBs with GPS functionality may be used for situational awareness only. The portable EFB is not an approved navigation system and cannot be used as the primary means of navigation.
- 7.1.3.2 FCM's should be aware that there may be an appreciable lag time between the position indicated on the portable EFB and the aircraft's actual position. Loss of signal or failure indication might not be displayed on the portable EFB to indicate the integrity of the information being displayed.
- 7.1.3.3 Backup/redundancy provisions need to be addressed to ensure crew retain access to all required information in the event of an EFB failure in flight.

7.2 Usability

- 7.2.1 The EFB should provide an intuitive, user-friendly and consistent interface within and across the various software applications that it hosts. This should include, but not be limited to, data entry methods, colour-coding philosophies and symbols. Software developers and operators are encouraged to evaluate the usability of an existing human-machine interface (HMI) methodology before developing a new HMI. The HMI should be evaluated for common human errors after its introduction into the everyday operating environment to allow for required changes or enhancements of the given design.

7.3 Style of presentation

7.3.1 Software considerations that should be addressed by operators include, but are not limited to:

- ease of access to common functions
- consistency of symbols, terms and abbreviations
- legibility of text
- system responsiveness
- methods of interaction
- use of colour
- display of system status
- error messages
- management of multiple applications and documents
- off-screen text and content
- use of active regions.

7.4 Ease of access to common functions

7.4.1 EFB software should be designed to minimise crew workload and provide ease of access to common functions. Complex, multi-step data entry tasks should be avoided during critical phases of flight.

7.4.2 An evaluation of an EFB's intended functions should include a qualitative assessment of incremental crew workload, as well as user-system interfaces and their safety implications. If an EFB is to be used during critical phases of flight, such as during take-off and landing, or during abnormal and emergency situations, its use should be evaluated during simulated or actual aircraft operations under those conditions.

7.5 Consistency of symbols

7.5.1 Symbols used in the EFB applications should be consistent with those used on aircraft systems, equipment and the paper-based documentation they are intended to replace.

7.6 Terms and abbreviations

7.6.1 Terms and abbreviations used in the EFB applications should be consistent with those used in the paper-based documentation they are intended to replace.

7.7 Legibility of text

7.7.1 Information displayed on the EFB should be legible to the intended user at the intended viewing distance(s) and under the full range of lighting conditions expected in the operating station of the aircraft, including daytime use in direct sunlight and night operations. Brightness should be adjustable in fine increments. Consideration should be given to long-term display degradation due to abrasion and aging of the device.

7.8 System responsiveness

- 7.8.1 The system should provide feedback to the user once user input is accepted. If the system is busy with internal tasks that preclude immediate processing of user input, e.g. self-test or data refresh, the EFB should display a 'system busy' indicator to inform the user that the system is occupied and cannot process inputs immediately.
- 7.8.2 The timeliness of system response to user input should be consistent with an application's intended function, e.g. time-critical information should be prioritised by the system.

7.9 Methods of interaction

- 7.9.1 In choosing and designing input devices, such as keyboards, touch screens or cursor-control devices, operators should consider the type of entry to be made and the environmental factors, such as turbulence and other normal vibrations affecting the usability of the input device.
- 7.9.2 For touch screens, crew members may need physical locations or structures, such as a flight deck structures, to stabilise their hand to be able to make accurate inputs. Operators should verify that touch screens do not result in unacceptable levels of crew workload and error rates.
- 7.9.3 Input devices should provide feedback to indicate when they are operational. Since touch screens provide little or no tactile feedback or control motion, visual and/or aural or other touch activation feedback is especially important.
- 7.9.4 Other touch screen considerations include: selecting the touch technology, e.g. resistive or capacitive; controlling screen contaminants which may reduce readability, e.g. skin oils or perspiration; and mitigating inadvertent operation.

7.10 Use of colour and messages

- 7.10.1 The colour 'red' should only be used to indicate a warning level condition.
- 7.10.2 The colour 'amber' should be used to indicate a caution level condition.
- 7.10.3 Any other colour may be used for items other than warnings or cautions, providing that the colours used differ sufficiently from the colours prescribed to avoid possible confusion.
- 7.10.4 Where colour is used to draw attention to an item that requires further consideration then this should also provide for consideration of crew members with vision impairments.

7.11 Display of system status

- 7.11.1 If an application is fully or partially disabled, or is not visible or accessible to the user, it may be desirable to have an indication of its status available to the user upon request. It may also be desirable to prioritise these EFB status and fault messages.

7.12 Error messages

- 7.12.1 Where possible, EFB messages and reminders should be integrated with (or compatible with) other aircraft system alerts.
- 7.12.2 The EFBs should not cause a distraction through visual or audible notifications.
- 7.12.3 If additional messages are available but not currently displayed, there should be an indication of the additional messages.
- 7.12.4 If user-entered data are not of the correct format or type needed by the application, the EFB should not accept the data. An error message should be provided that clearly communicates which entry is suspect and specifies the expected type of data.

7.13 Management of multiple applications and documents

- 7.13.1 The EFB should provide a continuous indication of which application and/or document is active if the system supports multiple open documents or allows multiple open applications. The active application/document is the one currently displayed and responding to user actions. During normal operations, the user should be able to select which of the open applications or documents is currently active. In addition, the user should be able to easily switch between open applications/documents.
- 7.13.2 The user should be able to open a new application or document quickly and easily.
- 7.13.3 When the user returns to an application running in the background, it should appear in the same state as when the user left the application, other than differences associated with the progress or completion of processing performed in the background.

7.14 Off-screen text and content

- 7.14.1 If a document segment is not visible in its entirety in the available display area, such as during 'zoom' operations, the existence of off-screen content should be clearly indicated in a consistent manner.
- 7.14.2 For some intended functions, it may be unacceptable if off-screen content is not indicated. This should be evaluated based on the application and intended operational function.

7.15 Use of active regions

- 7.15.1 Active regions are those to which special user commands apply, for example, hyperlinks or copying. The active region can be text, an image, window, frame or another document object. Active regions are also useful for distinguishing between frames on a frame-based visual display. The information in the active frame responds to update commands entered by the user. If the display uses active regions, these should be clearly indicated. If users do not know how to use an active region, they will have trouble applying special commands to the intended object. If users do not know that a particular region is active, they may enter inappropriate commands and become frustrated when these commands are not processed as expected.

7.16 Electronic signatures

- 7.16.1 A signature to signify acceptance or to confirm authority may be required. To be accepted as equivalent to a handwritten signature, an electronic signature used in EFB applications should assure the same degree of accessibility and security as the physical signature it replaces. Operators should have a process in place for an electronic record keeping system to ensure the integrity of the system.

8 Software types

8.1 Overview

8.1.1 An EFB software application is an application that is installed on an EFB to support flight operations. The classification of the applications, based on their respective safety effects, is intended to highlight the distinctions between such applications and correspondingly any management of risk that may be needed by the operator.

8.1.2 As stated above, there are primarily two types of software:

- TYPE A APPLICATIONS – are applications such that if the application fails or is used incorrectly, it is considered to have no safety effect on the flight.
- TYPE B APPLICATIONS – are applications such that if the application fails or is used incorrectly, it is considered that the effect will continue to preserve a level of aviation safety that is at least acceptable.

8.2 Classification process

8.2.1 All air transport operators are required to have an SMS⁶, and the risk assessment and management of the EFB should be conducted in accordance with the operator's SMS requirements.

8.2.2 For the purpose of the following paragraphs, 'failure or incorrect usage' means any failure, malfunction of the application, or design-related human errors that can reasonably be expected during normal use.

8.2.3 EFB applications cannot replace aircraft equipment requirements unless they are specifically authorised for that purpose. For example, if a moving map display was intended to be used as a valid navigation source, then the hardware and software would need to meet the applicable airworthiness requirements and standards applicable to flight instrumentation and avionics. Such an EFB application would not be eligible for classification as either a Type A or Type B application.

8.2.4 In determining whether an EFB application is Type A or Type B, the following should be considered:

- Identify any failure conditions resulting from potential failure or incorrect usage, taking into account any relevant factors (e.g. aircraft/system failures, operational or environmental conditions) and any established mitigation (e.g. flight crew procedures, flight crew training) that would intensify or alleviate the effects.
- Classify the application based on the assessment of the safety effect of each failure condition:
 - o If there is no failure that may have a safety effect, the application should be classified as Type A.
 - o If one or more failures generate a safety effect that preserves a level of aviation safety that is at least acceptable, the application should be classified as Type B.

⁶ Some air transport operators may not have an SMS until 2 December 2024 due to the deferral of the requirement.

- o If one or more failures generate a safety effect that does **not** preserve a level of aviation safety that is at least acceptable, the application should be deemed unsuitable for use as an EFB application.
- EFB applications with failure conditions that are more severe than minor are ineligible for classification as either Type A or Type B applications.

8.3 Miscellaneous software applications

- 8.3.1 Miscellaneous software applications are applications that support functions that are not directly related to operations conducted by the flight crew on the aircraft. Miscellaneous software applications are not considered to be EFB applications for the purposes of this AC.
- 8.3.2 Examples of miscellaneous software applications that are not used for operational purposes may include web browsers, email clients, picture viewers, or other applications used by cabin crew or maintenance crew. However, if an email client was used by a FCM for sending data or forms, such as load sheets or flight plans, then it would become an EFB application and require classification as either Type A or B.

9 Exposition guidance for EFB use and management

9.1 General

- 9.1.1 Air transport operators are required to detail in their exposition how they manage EFBs to ensure that they safely conduct and manage their Australian air transport operations⁷. For other operators, the information below is available for guidance.
- 9.1.2 In developing their exposition material, the operator should remain aware of any outcomes of the EFB application classification process. Type B applications may require specific procedures to support the risk treatments outlined for their use.
- 9.1.3 As a minimum, the exposition should provide guidance on the following:
- EFB limitations
 - requirements and responsibilities for all personnel
 - EFB-approved hardware
 - EFB-approved software applications
 - procedures for use of the EFB, including specific operating procedures
 - Hardware and software updates procedures and policies
 - flight crew training
 - device maintenance considerations
 - data management
 - security considerations.
- 9.1.4 Where the EFB in use is an installed device, much of the management procedures will be described by referral to the aircraft maintenance program. Where this occurs, the exposition content should still address software management and applicable operational procedures. For example, in the case of aircraft performance calculations, many operators will require an independent entry and crosscheck as part of their operation. This procedure should be described in the operator's exposition.
- 9.1.5 Operators should consider the items listed below as guidance to assist them in developing their procedures. These items should be used in conjunction with Appendix B of this AC, Operator's self-evaluation checklist for the introduction of EFB.

9.2 EFB administrator

- 9.2.1 The operator is to designate a competent person as an EFB Administrator (EFBA) who will be responsible for managing the administration of the operator's EFB hardware and software. The operator should assign the EFBA responsibilities and duties to ensure that the proposed paperless system is as robust and reliable as the paper-based system being replaced. Operators must ensure that EFBA's are provided with adequate resources and a suitable level of training.

⁷ Paragraph 119.205(1)(h).

⁸ This version of the AC is advance released to provide industry with notice of the revised policy. The regulatory provisions will initially be issued by an exemption and then incorporated in Parts 121,133 and 135.

- 9.2.2 In some cases the operator may require individuals to take action to ensure that their EFBs have the required currency and documentation.

9.3 Operational risk analysis

- 9.3.1 Operators must determine appropriate procedures to eliminate, reduce or control risks associated with identified failures in the EFB system. These procedures will be the result of their operational risk analysis that considers whether an application is Type A or B. Considerations may include, but are not limited to:

- total and partial failures of the EFB
- loss of data
- corrupt/erroneous outputs
- MEL dispatch condition.

- 9.3.2 There should be at least one means of access to backup material available to the pilot in command at the time of flight dispatch. This can be either another EFB (it may belong to another member of the crew), or paper charts and documents required for the sector being flown.

9.4 Procedures/considerations for the in-flight use of EFBs

- 9.4.1 Clear limitations and procedures must be provided and documented for all phases of flight. A system description and operating philosophy should be included. Procedures should:

- be properly integrated with existing standard operating procedures (SOPs). For pilots not operating to company SOPs, the EFB should be integrated with airmanship that is consistent with safe flying practices
- contain suitable flight crew cross-checks for verifying safety-critical data
- mitigate and/or control any additional workload associated with the EFB
- provide contingency procedures for total or partial EFB failure
- cover system reboots, lock-ups and recovery from incorrect crew actions
- include a requirement to verify the revision status of software. For example, ensure that flight crew confirm the revision numbers and/or dates of EFB flight databases and software installed on their units that are required for that flight. For instance, a date-sensitive revision is an aeronautical chart database on a 28-day revision cycle. Procedures should specify what action to take if the applications or databases loaded on the EFB are out-of-date
- provide for easily adjustable brightness and contrast controls of the EFB by the flight crew to compensate for varying lighting conditions
- be designed to define the actions to be taken when information provided by an EFB does not agree with that from other flight compartment sources, or when one EFB disagrees with another.

9.5 Update process

- 9.5.1 The operator needs to establish a method for revising EFB databases. The method of data revision should ensure both the integrity of the data the operator loads, and that it

does not negatively impact the integrity of the EFB operation. Particularly when using internet and/or wireless means, procedures should exist to protect the EFB data from corruption.

- 9.5.2 Operators also need to establish revision control procedures so that flight crews and others can ensure that the contents of databases are current and complete. These revision control procedures may be similar to the revision control procedures used for paper or other storage media. For data that is subject to a revision cycle control process, it should be readily evident to the user which revision cycle is currently loaded into the system.

9.6 Operator training program

- 9.6.1 The operator should establish suitable training programs for ground staff and crew members. Once established, the training program needs to be evaluated to determine that, where applicable:

- the program is fully documented
- the training methodology matches the level of knowledge and experience of the participants
- the operator has assigned adequate resources to deliver the training
- procedures are clearly presented, suitably illustrated and readily understood
- adequate EFB and/or EFB simulation equipment has been provided
- human factors and cockpit resource management are included in the training
- there is adequate training for flight crew to carry out cross-checks for verifying safety-critical data
- the training material matches both the EFB equipment status and the published procedures
- the training program incorporates training for system changes and upgrades
- if applicable, the training program maintains crew proficiency in non-EFB (e.g. paper charts) procedures.

9.7 Hardware management procedures

- 9.7.1 The operator must establish documented procedures for the control of hardware and component stocks covering removal, repair, replacement, re-installation and maintenance. Procedures should also cover validation of operation following an EFB repair or replacement.
- 9.7.2 Any accessories (batteries, docks, screen protectors etc.) required for use of the EFB should also be taken into account during installation and usage.
- 9.7.3 If any protective screens are fitted to the EFB, they should not interfere with viewing of the display or the ability to control the EFB.

9.8 Software application management procedures

- 9.8.1 The operator must establish documented procedures for the control of installed software. These procedures must include:

- a clear definition of who has access rights to install or modify software
 - adequate controls to prevent user corruption of operating systems and software
 - adequate security measures to mitigate viruses and unauthorised user access.
- 9.8.2 Database revisions must not include application software or operating system changes, unless the application software and/or operating system changes are controlled and properly tested prior to use in flight. Also, changes to the database and/or application software should not be undertaken during operations (taxi, take-off, in-flight, landing).
- 9.8.3 Procedures should be clearly defined to track EFB database expiry. Procedures should be documented to control and manage data on the EFB.
- 9.8.4 For operators, it is strongly recommended that a dedicated device be used for the sole purpose of an EFB. However, if the operator allows personal use of the EFB, it is recommended that the operator:
- consider whether:
 - o personal applications and data loaded onto a EFB device would affect operator applications or data
 - o historical experience or appropriate technical knowledge has identified that cross-application data corruption is unlikely, taking into account the kind of device used as the EFB and the nature of the device's operating system in relation to cross-application data sharing
 - o locking the EFB to prevent unauthorised installation of applications or data is appropriate for the operator's circumstances, i.e. technical competency with EFB or the specific usage circumstances.
 - have a policy on the use of non-flight related applications during flight.

9.9 Data management procedures

- 9.9.1 The operator should establish documented data management procedures. These procedures need to:
- interface satisfactorily with procedures used by external data providers
 - define access rights for users and administrators
 - incorporate necessary EFB operations into existing expositions and AFM supplements
 - provide adequate controls to prevent user corruption of data
 - provide means for the flight crew to recover the EFB to the default settings.

9.10 Document change management control

- 9.10.1 The operator's exposition should detail procedures for the amendment of electronic documents such as those maintained in an EFB.

Appendix A

Types of software applications

A.1 Examples of Type A EFB applications

A.1.1 Typical Type A EFB applications

A.1.1.1 The following EFB applications would normally be considered as Type A EFB applications:

- a. Applications that display documents required to be carried, but where the inability to access these during the flight would have no safety effect:
 - i. instruments of approval, certificates and other documents (including digital versions) such as the:
 - A. air operator's certificate (AOC)
 - B. operations specifications, issued with the AOC
 - C. certificate of registration
 - D. certificate of airworthiness (CofA)
 - E. noise certificate
 - F. insurance certificate
 - G. aircraft continuing airworthiness records, including the technical log
 - ii. supplementary manuals and forms which are required to be carried by the applicable operational regulations, such as:
 - A. notifications of passengers with reduced mobility (PRMs) and special loads
 - B. passenger and cargo manifests
 - iii. other information within the operator's aircraft library, such as:
 - A. airport diversion policy guidance, including a list of special designated airports and/or approved airports with emergency medical service (EMS) support facilities
 - B. maintenance manuals
 - C. emergency response guidance for aircraft incidents involving dangerous goods (see ICAO Doc 9481-AN/928)
 - D. aircraft parts manuals
 - E. service bulletins/published airworthiness directives
 - F. passenger information requests
 - G. flight crew currency requirements
- b. Applications for calculation of limits associated with a flight and duty period
- c. Electronic forms used for reporting as required by the operator
- d. Administrative applications where failure would have no effect on the safety of the aircraft operation.

A.2 Examples of Type B applications

A.2.1 Typical Type B EFB applications

A.2.1.1 The following EFB applications would normally be considered as Type B EFB applications:

- a. Applications that display documents required to be carried by regulations and that are necessary for the safe operation of the aircraft, such as:
 - i. the exposition
 - ii. the aircraft flight manual
 - iii. minimum equipment list
 - iv. the operational flight plan
 - v. meteorological information
 - vi. notices to airmen (NOTAMs) and briefing documentation
- b. Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps
- c. Aircraft performance calculation applications that perform calculations to provide aircraft performance data, such as:
 - i. for take-off, en-route, approach and landing, missed approach and other phases of flight - limiting masses, distances, times and/or speeds
 - ii. power settings, including reduced take-off thrust settings
- d. Weight and balance calculation applications used to determine that the load and its distribution are within the limits of the aircraft.

Appendix B

Operator's self-evaluation checklist for the introduction of EFB

B.1 Part 1

Table 1: Hardware

Hardware	
Do the physical characteristics of the proposed device make it suitable for use as an EFB?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Will the display be readable in all the ambient lighting conditions, both day and night, encountered on the flight deck or nominated area of use?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Has testing been conducted to confirm EMI/EMC compatibility? If yes, provide details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Is the format of the EFB suitable for the intended application (e.g. is it a document reader only, map reader only, performance calculator only, etc.)?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Has the EFB been tested to confirm operation in the anticipated environmental conditions (e.g. temperature range, low humidity, altitude etc.)? If yes, provide details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does charging cause the EFB to heat above ambient temperature? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
During operations in warm climates, can the operating temperature of the EFB, while charging, rise above OEM specifications/recommendations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does the internal battery of the EFB have sufficient capacity to function for the maximum duration of operations anticipated? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Has a procedure been developed to establish the level of battery capacity degradation during the life of the EFB? If yes, provide details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does the EFB require any external connectivity to function (i.e. is it self-contained)? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

B.2 Part 2

Note: This part may be required to be completed multiple times to account for the different applications being considered.

Table 2: Software

Software	
Does the software application(s) installed on the EFB enable it to replace documents and charts required to be carried on board the aircraft? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does the software application(s) require regulatory approval prior to operational use? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Has the software application been evaluated to confirm that the information being provided to the crew member is a true and accurate representation of the documents or charts being replaced? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Has the software application been evaluated to confirm that the computational solution(s) being provided to the crew is a true and accurate solution (e.g. weight and balance, performance, passenger manifests etc.)? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Are there other software applications intended to support any additional requirements of the operator or the NAA (e.g. tech log, flight folder, taxi camera etc.)? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does the software application(s) have adequate security measures to prevent unauthorised database modifications and prevention of contamination by external viruses? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

B.3 Part 3

Table 3: Installation

Installation	
Mounting	
If the EFB is a hand-held device, can it be easily stowed securely?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
When stowed, is the EFB readily accessible in flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Is the mounting device compliant with the applicable crashworthiness requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Has the installation of the mounting device been approved in accordance with the appropriate airworthiness regulations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
If the mounting device for the EFB is moveable, can it be easily locked in place?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Is there provision to secure or lock the mounting device in a position out of the way of crew operations? Note: When stowed, the device and its securing mechanism should not intrude into the flight deck space to the extent that they cause either visual or physical obstruction of flight controls/displays and/or egress routes.	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Is there any evidence of mechanical interference issues with the mounting device, either on the side panel (side stick controller), or on the control yoke in terms of full and free movement under all operating conditions and non-interference with buckles etc.?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
If EFB mounting is on the control yoke, have flight control system dynamics been affected?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
For fixed mounts, has it been confirmed that the location of the mounted EFB does not obstruct visual or physical access to aircraft displays or controls or external vision?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
For fixed mounts, has it been confirmed that the mounted EFB location does not impede crew ingress, egress and emergency egress pathways?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does the mounted EFB allow easy access to the EFB controls & EFB display?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

Installation	
Power connection	
Does a dedicated power outlet for powering/charging the EFB need to be fitted? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Is there a means, other than a circuit breaker, to turn off the power outlet?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
If the EFB has an alternate backup power source, does the backup source have an equivalent level of safety to the primary power source? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Have guidance/procedures been provided for battery failure or malfunction? Details:	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Cabling	
Does the EFB cabling present a hazard?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Is there a means to secure any cabling?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Stowage	
Is stowage readily accessible in flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Does the stowage cause any hazard during aircraft operations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

B.4 Part 4

Table 4: Operation

Usability		
Operation		
Is the EFB mount easily adjustable by crew to compensate for glare and reflections?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Can the brightness or contrast of the EFB display be easily adjusted by the crew for various lighting conditions?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Is the hand-held EFB easily stowed in an approved receptacle during flight?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Is there an easy means for the crew to turn off the EFB in the event of a failure?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Does the location of the EFB interfere with any normal or emergency procedures?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Does the protective screen (if fitted) interfere with the viewing of the EFB or the ability to manipulate the cursor?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Configuration		
Is there an easy way to recover the configuration of the EFB back to the default settings, as controlled by the EFB Administrator, in the event of a failure?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Can the crew easily determine the validity and currency of the software installed on the EFB?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
When hosting a variety of applications on the EFB, is the crew able to make a clear distinction between flight and non-flight related activities?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>

B.5 Part 5

Table 5: Administration

Administration		
EFB administration		
Is the person nominated to administer the EFB suitably trained?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Do the listed responsibilities match the requirements of the system?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Are there adequate resources assigned for EFB administration?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Crew procedures		
Are there appropriate procedures for all phases of flight?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Are the procedures clearly presented, suitably illustrated and readily understood?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Is there a clear description of the EFB system, its operational philosophy, and operational limitations?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Has the information in the AFM supplement been incorporated into the company exposition?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Have crew procedures for EFB operation been integrated with the company exposition?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Are there suitable crew cross-checks for verifying safety-critical data?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Is there any additional workload mitigated/controlled?	Yes	<input type="checkbox"/>
Details:	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Do crew procedures include a requirement to verify the revision status of software and data?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Do the procedures cover system reboots, lock-ups and recovery from incorrect crew actions?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>

Administration		
Operational risk analysis		
Are there procedures/guidance for loss of data and identification of corrupt/erroneous outputs?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Are there contingency procedures for total or partial EFB failure? What are the redundancy provisions?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Details:		
Is the procedure in the event of a total EFB failure available outside the EFB (e.g. as a paper checklist)?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Have the EFB redundancy requirements been incorporated into the company exposition?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Training		
Are crew members and ground staff training programs fully documented?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Is the training methodology matched to the participant's level of experience and knowledge?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Has the operator assigned adequate resources (time/personnel/facilities) for training in operation of EFB?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Is there access to actual or simulated EFB equipment for interactive training?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Does the training material match the EFB equipment status and published procedures?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Does the training program include HF/NTS/CRM in relation to EFB use?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Does the training program incorporate training system changes and upgrades in relation to EFB operation?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
Does the training material match the EFB equipment status and published procedures?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
Comment:	N/A	<input type="checkbox"/>
Hardware management procedures		
Are there controlled, documented procedures for the control of hardware and component stocks?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>

Administration		
	N/A	<input type="checkbox"/>
Do the procedures include repair, replacement and maintenance of EFB equipment and peripherals?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Do the procedures include validation following repair?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Software management procedures		
Are there documented procedures for the configuration control of installed software?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are the access rights for personnel to install or modify software components clearly defined?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are there adequate controls to prevent user corruption of the operating system and software?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are there adequate security measures to prevent system degradation, viruses and unauthorised access?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are procedures defined to track database expiration and install chart database updates?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are there documented procedures for the control and management of data? Details:	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
How do the procedures interface with procedures used by external data providers?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are the access rights for users and administrators to manage data clearly defined?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Are there adequate controls to prevent user corruption of data? Details:	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Does the operator allow private use of the EFB?	Yes No N/A	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Administration	
Does the operator have a policy on private use? If so, how is this monitored?	Yes <input type="checkbox"/>
Details:	No <input type="checkbox"/>
	N/A <input type="checkbox"/>