HONG KONG

CIVIL AVIATION DEPARTMENT

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ELECTRONIC FLIGHT BAG (EFB)

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Note: Attachments 1C and 1E are reserved for future use.

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REFERENCE

ICAO Doc xxxx	Manual on Electronic Flight Bags
EASA AMC 20-25	Airworthiness and operational consideration for Electronic Flight Bags (EFBs)
EASA AMC 25.1581	Appendix 1- Computerised Aeroplane Flight Manual
EASA AMC 25.1309	System Design and Analysis
EASA AMC 25-11	Electronic Flight Deck Displays
EUROCAE ED-130()	Guidance for the Use of Portable Electronic Devices (PEDs) on Board Aircraft
EUROCAE ED-12()	Software Considerations in Airborne Systems and Equipment Certification
EUROCAE ED-14()	Environmental Conditions and Test Procedures for Airborne Equipment
EUROCAE ED-76()	Standards for Processing Aeronautical Data
EUROCAE ED-80()	Design Assurance Guidance for Airborne Electronic hardware
UL 1642	Underwriters Laboratory Inc. (UL) Standard for Safety for Lithium Batteries
FAA AC 120-76()	Guidelines for the Certification, Airworthiness, and Operational Approval of Electronic Flight Bag Computing Devices
RTCA DO-294()	Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft
RTCA DO-311()	Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems
ETO (Cap 553)	Electronic Transactions Ordinance
ETO (Exclusion) Order (Cap 553B)	Electronic Transactions (Exclusion) (Amendment) Order 2013
AN(HK)O 1995	Air Navigation (Hong Kong) Order 1995

GLOSSARY OF TERMS

ACARS - Aircraft Communications Addressing and Reporting System

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

Airport Moving Map Display (AMMD)

A software application displaying airport maps and using a navigation source to depict the aircraft current position on this map while on ground.

Controlled Portable Electronic Device (C-PED)

A controlled PED is a PED subject to administrative control by the operator using it. This will include, inter alia, tracking the allocation of the devices to specific aircraft or persons and ensuring that no unauthorised changes are made to the hardware, software, or databases.

Critical phases of flight:

Critical phases of flight includes all ground operations involving taxi, takeoff and landing; all other flight operations conducted below 10,000 feet, except cruise flight and when handling abnormal situations.

Data connectivity for EFB systems

Data connectivity for EFB system supports either uni- or bi-directional data communication between the EFB and other aircraft systems (e.g. avionics). Direct interconnectivity between EFBs or direct connectivity between EFBs and ground systems as with T-PED (e.g. GSM, Bluetooth) are not covered by this definition.

EMI/EMC- Electro Magnetic Interference / Electro Magnetic Compatibility

Electronic Flight Bag (EFB) is defined in ICAO Annex 6 as:

> *An electronic information system for flight crew which allows for storing, updating, delivering, displaying and/or computing digital data to support flight operations or duties.*

EFB administrator

An EFB administrator is a person appointed by the operator, held responsible for the administration of the EFB system within the company. The EFB administrator is the primary link between the operator and the EFB system and software suppliers.

EFB host platform

When considering an EFB system, the EFB host platform is the equipment (i.e. hardware) in which the computing capabilities and basic software (e.g. operating system, input/output software) reside.

EFB risk assessment and mitigation

A process that considers an EFB system, its software applications, and its integration inside a specific aircraft, to identify the potential malfunctions and failure scenarios, analyse their operational repercussions, and, if necessary, propose mitigation means.

EFB software application

Software installed on an EFB system that allows specific operational functionality.

EFB system

An EFB system comprises the hardware (including any battery, connectivity provision, I/O devices) and software (including databases) needed to support the intended EFB function(s).

EFB system supplier

The company responsible for developing, or for having developed, the EFB system or part of it. The EFB system supplier is not necessarily a host platform or aircraft manufacturer.

Minor failure conditions

Failure conditions which would not significantly reduce aircraft safety, and which involve crew actions that are well within their capabilities. Minor failure conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some physical discomfort to passengers or cabin crew.

GUI – Graphical User Interface

HMI – Human Machine Interface

Installed resources – Hardware/software installed in accordance with airworthiness requirements

Independent EFB platforms – Multiple EFBs that are designed in such a way that no single failure makes all of them unavailable

Portable Electronic Device (PED)

PEDs are typically consumer electronic devices, which have functional capability for communications, entertainment, data processing, and/or utility. There are two basic categories of PEDs – those with and those without intentional transmitting capability; please refer to ED-130/RTCA DO-294().

SCAP – Standard Computerized Aircraft Performance

STC – Supplemental Type Certificate

T-PED – Transmitting PED. A PED containing one or more devices intentionally emitting radio frequencies (WIFI, GSM, Bluetooth, NFC,...)

Commercial – Off-The-Shelf (COTS) – Include computer software or hardware, technology or computer products that are readily made and available for use.

Viewable stowage

A device that is secured on the flight crew (e.g. kneeboard) or in/to an existing aircraft part (e.g. suction cups) with the intended function to hold charts or to hold acceptable light mass portable devices (for example an EFB of no more than 1 kg) viewable to the pilot at her/his required duty station. The device is not necessarily part of the certified aircraft configuration.

CHAPTER 1 – INTRODUCTION

1.1 General

The purpose of this publication is to provide detailed guidelines to operators regarding their application for EFB.

1.2 Components of an EFB

EFB is a system comprising hardware and software that provides:

- Flight Crew access to emerging electronic flight operations data, general purpose computing and communications. Similar application may be found available to the cabin in some cases.

- Replacement of many of today's paper documents.

- A range of implementations spanning portable electronic devices up to installed certified integrated systems.

1.3 It should be noted that the following features are not considered as EFB functions and, unless airworthiness approved, should not be hosted on an EFB:

a) Displaying information which may be tactically used by the flight-crew members to check or control the aircraft position or trajectory,

b) Displaying information which may be directly used by the flight crew to assess the real- time status of aircraft critical and essential systems,

c) Communicating with air traffic services,

d) Sending data to certified aircraft systems other than those certified for that intent.

CHAPTER 2 – HARDWARE SYSTEM

Types of EFB

EFBs can be either portable or installed.

2.1 Portable EFB

(a) **Definition**

A portable EFB is a portable EFB host platform, used on the flight deck, which is not part of the certified aircraft configuration.

(b) **Complementary Characteristics**

- A portable EFB can be operated inside and outside the aircraft.
- A portable EFB hosts type A and/or type B EFB software applications. In addition, it may host miscellaneous (non-EFB) software applications.
- A portable EFB is a portable electronic device (PED).
- The mass, dimensions, shape, and position of the portable EFB should not compromise flight safety.
- A portable EFB may be provided with aircraft power through a certified power source.
- If mounted, the portable EFB is easily removable from its mounting device or attached to it, without the use of tools by the flight crew. If mounted, the attachment or removal does not constitute a maintenance action.
- A portable EFB may be part of a system containing EFB installed resources which are part of the certified aircraft configuration.
- The installed EFB components are part of the certified aircraft configuration with the intended function to mount the EFB to the aircraft and/or connect to other systems.

- When a portable EFB is a T-PED, the conditions for use of its transmitting capability are established in the approved Aircraft Flight Manual (AFM).

- Portable EFBs may be used in all phases of the flight if secured to a certified mount or securely attached to a viewable stowage device in a manner which allows its normal use. Portable EFBs not meeting the above characteristic, should be stowed during critical phases of the flight.

- Portable EFBs are controlled PEDs.

- Any EFB component that is either not accessible in the flight crew compartment by the flight crew members or not removable by the flight crew, should be installed as 'certificated equipment' covered by a Type Certificate (TC), changed TC or Supplemental (S)TC.

2.2 **Installed EFB**

(a) **Definition**

An EFB host platform installed in the aircraft and considered as an aircraft part, covered, thus, by the aircraft airworthiness approval.

(b) **Complementary Characteristics**

An installed EFB is managed under the aircraft type design configuration.

In addition to hosting Type A and B applications, an installed EFB may host certified applications, provided the EFB meets the certification requirements for hosting such applications, including assurance that the non-certified software applications do not adversely affect the certified application(s). For example, a robust partitioning mechanism is one possible means to ensure the independence between certified applications and the other types of applications.

The installation shall be approved through certification process such as STC. Operator has the responsibility to evaluate and declare that the modifications fulfil the requirements of the STC and is applicable to the EFB definition of this Document.

2.3 HARDWARE CONSIDERATIONS FOR PORTABLE EFB

Portable EFBs can be used as either handheld equipment or mounted in a fixed or moveable mount attached to the aircraft structure or temporarily secured (e.g. kneeboard).

2.3.1 Physical characteristics

The size and practicality of the EFB should be considered as the device may be cumbersome for normal use on a flight deck.

2.3.2 Readability

The EFB data should be legible under the full range of lighting conditions expected on the flight deck, including direct sunlight.

2.3.3 Environmental

The EFB has to be operable within the foreseeable cockpit operating conditions including rapid depressurization, if the EFB is intended for use after rapid depressurization.

2.3.4 Basic Non Interference Testing

2.3.4.1 EFB devices intended to be used in all phases of flight should demonstrate that they meet environmental standards for radiated emissions for equipment operating in an airborne environment. Installed EFBs will be required to demonstrate non-interference with other aircraft systems as part of their certification process. As previously noted, portable EFBs are considered to be portable electronic devices (PEDs). As such, in this section any reference to PEDs is also applicable to portable EFBs.

2.3.4.2 In order to operate a portable EFB during flight, the user/operator is responsible for ensuring that the EFB will not interfere in any way with the operation of aircraft equipment. The following is an accepted method to test portable EFBs that are to remain powered (including being in standby mode) during flight in order to ensure that the EFB will not interfere in any way with the operation of aircraft equipment.

2.3.4.3 The first step is to conduct an electromagnetic interference (EMI) test using RTCA/DO-160, section 21, category M. An EFB vendor or other source, can conduct this test for an EFB user/operator. An evaluation of the results of the RTCA/DO-160 EMI test can be used to determine if an adequate margin exists between the EMI emitted by the EFB and the interference susceptibility threshold of aircraft equipment. If this step determines that adequate margins exist for all interference (both front door and back door emissions susceptibility), then the test is complete. Front door emissions typically couple to aircraft system antennas by means of propagation through aircraft apertures such as doors and windows while back door emissions couple to aircraft equipment, wires, and cables. However, if this step identifies inadequate margins for interference, or either front door or back door susceptibility, then step 2 testing must be conducted.

2.3.4.4 Step 2 testing non-interference testing is a complete test in each aircraft using standard industry practices. This should be done to the extent normally considered acceptable for non-interference testing of a portable EFB or PED in an aircraft for all phases of flight. Credit may be given to other aircraft of the same make and model equipped with the same avionics as the one tested.

2.3.4.5 It should be acceptable for operators/users to bypass Step 1 and go directly to Step 2 in order to determine non-interference of the EFB/PED.

2.3.5 Additional Testing for Transmitting Portable EFBs and Other Transmitting PEDs

2.3.5.1 In order to activate the transmitting function of a portable EFB or other PED during flight in conditions other than those that may be already certified at aircraft level (e.g. tolerance to specific transmitting PED models) and hence documented in the aircraft flight manual or equivalent, the user/operator is responsible to ensure that the device will not interfere with the operation of the aircraft equipment in any way. The following is an accepted method to test portable EFBs and PEDs that are to remain powered (including being in standby mode) during flight.

2.3.5.2 This test consists of two separate test requirements

(a) **Test Requirement 1.** Each model of the device should have an assessment of potential electro-magnetic interferences (EMI) based on a representative sample of the frequency and power output of it. This EMI assessment should follow a protocol such as the applicable processes set forth in RTCA/DO-294, *Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft.* This frequency assessment must confirm that no interference of aircraft equipment will occur as a result of intentional transmissions from these devices.

(b) **Test Requirement 2**. Once an EMI assessment has determined that there will be no interference from the EFB/PED's intentional transmissions, test each model of the device while powered but not deliberately transmitting, using the basic non-interference testing methodology. Basic non-interference testing should be conducted with and without the transmit function being operative. The position of the transmitting device is critical to non-interference testing; hence locations of the EFB and of the transmitter (if applicable) should be clearly defined and adhered to.

2.3.6 Power Supply

The operator should ensure that power to the EFB, either by battery and/or supplied power, is available to the extent required for the intended operation.

2.3.7 Battery

Due to their proximity to the flight crew and potential hazard to safe operation of the aircraft, the use of rechargeable lithium-type batteries in portable EFBs located in the aircraft cockpit call for the following standards. Operators should collect and retain evidence of the following testing standards to determine whether rechargeable lithium-type batteries used to power EFBs are acceptable for use and for recharging. Operators should collect and retain evidence of the standards in subparagraphs (a) and either (b) or (c) or (d). Refer to the following current editions:

(a) 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.

(b) Underwriters Laboratory (UL). UL 1642, Lithium Batteries; UL 2054, Household and Commercial Batteries; and UL 60950-1, Information Technology Equipment - Safety.

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

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

(d) 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.

The operator should consider introducing procedures to handle thermal runaways or similar battery malfunctions potentially caused by EFB batteries.

2.3.8 Power Connection and Source

2.3.8.1 Connection of EFB power provisions to a non-essential, or to the least critical power bus, is recommended, so failure or malfunction of the EFB, or power supply, will not affect safe operation of aircraft critical or essential systems.

2.3.8.2 Connection to more critical aircraft power buses is, however, permitted if appropriate, taking into account the intended function of the EFB.

2.3.8.3 In all cases, an electrical load analysis should be conducted to replicate a typical EFB system to ensure that powering or charging the EFB will not adversely affect other aircraft systems and that power requirements remain within power-load budgets.

2.3.8.4 The aircraft power source delivering power supply to the EFB system should be demonstrated to protect the aircraft electrical network from EFB system failures or malfunctions (e.g. short-circuit, over-voltages, over-load, electrical transients or harmonics, etc.).

(a) A placard should be mounted beside the power outlet, containing the information needed by the flight or maintenance crews (e.g. 28 VDC, 115 VAC, 60 or 400 Hz, etc.).

(b) The EFB power source should be designed so that it may be deactivated at any time. If the flight crew cannot quickly remove the plug, which is used to connect the EFB to the aircraft electrical network, an alternate means should be provided to quickly stop powering and charging the EFB. Circuit breakers are not to be used as switches; their use for this purpose is prohibited.

(c) If a manual means (e.g. on/off switch) is used, this means should be clearly labelled and be readily accessible.

(d) If an automatic means is used, the applicant should describe the intended function and the design of the automatic feature and should substantiate that the objective of deactivating the EFB power source, when required to maintain safety, is fulfilled.

2.3.9 Cabling

If cabling is installed to mate aircraft systems with an EFB,

(a) if the cable is not run inside the mount, the cable should not hang loosely in a way that compromises task performance and safety. Flight crew should be able to easily secure the cables out of the way during operations (e.g., cable tether straps);

(b) cables that are external to the mounting device should be of sufficient length in order not to obstruct the use of any movable device on the flight crew compartment.

2.3.10 Temperature rise

Operating the proposed EFB device may generate heat. The placement of the EFB should allow sufficient airflow around the unit, if required.

2.3.11 Data Connectivity between EFBs

If two or more EFBs on the flight deck are connected to each other, then the operator should demonstrate that this connection does not negatively influence otherwise independent EFB platforms.

2.3.12 Data Connectivity to aircraft systems

2.3.12.1 EFB data connectivity should be validated and verified to ensure non-interference and isolation from certified aircraft systems during data transmission and reception.

2.3.12.2 Certified aircraft systems should be protected from adverse effects of EFB system failures by using a certified AID. An AID may be implemented as a dedicated device, e.g. as defined in ARINC 759, or it may be implemented in non-dedicated devices such as an EFB docking station, a Network File Server or other avionics equipment.

2.3.13 External connectivity

Some EFB may have the provision for external ports other than power or data connectivity with aircraft systems (e.g. an antenna or a data connection to operator ground network). Details should be supplied and approvals if necessary should be sought. External connectivity leading to a change to the aircraft Type design should require an airworthiness approval. The extent of this information is dependent on the complexity of the interface to the aircraft systems.

2.4 HARDWARE CONSIDERATIONS FOR INSTALLED RESOURCES

Installed resources should be certified either during the certification of the aircraft, through service bulletin by the original equipment manufacturer or through a third party STC.

2.4.1. Mounting Devices

2.4.1.1. If the mounting is permanently attached to aircraft structure, the installation will be approved in accordance with the appropriate airworthiness regulations.

2.4.1.2. The mounting device attaches or allows mounting of the EFB system. The EFB system may include more than one mounting device if it consists of separate items (e.g. one docking station for the EFB host platform and one cradle for the remote display).

2.4.1.3. The mounting device should not be positioned in such a way that it obstructs visual or physical access to aircraft controls and/or displays, flight crew ingress or egress, or external vision. The design of the mounting device should allow the user easy access to any item of the EFB system, even if stowed, and notably to the EFB controls and a clear view of the EFB display while in use. The following design practices should be considered:

(a) The mounting device and associated mechanisms should not impede the flight crew in the performance of any task (normal, abnormal, or emergency) associated with operating any aircraft system.

(b) When the mounting device is used to secure an EFB display (e.g. portable EFB, installed EFB side display), the mount should be able to be locked in position easily. If necessary, selection of positions should be adjustable enough to accommodate a range of flight crew member preferences. In addition, the range of available movement should accommodate the expected range of users' physical abilities (i.e. anthropometrics constraints). Locking mechanisms should be of the low-wear types that will minimise slippage after extended periods of normal use.

(c) Crashworthiness considerations should be taken into account in the design of this device.This includes the appropriate restraint of any device when in use.

(d) When the mounting device is used to secure an EFB display (e.g. portable EFB, installed EFB side display), a provision should be provided to secure or lock the mounting device in a position out of the way of flight crew operations when not in use. When stowed, the device and its securing mechanism should not intrude into the flight crew compartment space to the extent that they cause either visual or physical obstruction of flight controls/displays and/or egress routes.

(e) Mechanical interference issues of 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. For yoke mounted devices, (Supplemental) Type Certificate holder data should be obtained to show that the mass inertia effect on column force has no adverse effect on the aircraft handling qualities.

(f) Adequate means should be provided (e.g. hardware or software) to shut down the portable EFB when its controls are not accessible by the pilot strapped in the normal seated position.

2.4.2. Stowage

When an EFB is 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 exit routes.

CHAPTER 3 – SOFTWARE CONSIDERATIONS

3.1 Types of applications:

3.2 **Type A:**

- Type A applications are EFB applications whose malfunction or misuse have no safety effect.

- Type A applications:

  (a) may be hosted on either portable or installed EFBs;

  (b) do not require any approval but should follow the human factors guidance material provided in Chapter 4; and Examples of Type A applications can be found in Attachment 2.

3.3 **Type B:**

- Type B applications are applications:

  (a) whose malfunction or misuse are limited to a minor failure condition; and

  (b) which do neither substitute nor duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules. This does not preclude Type B software applications from being used to present the documents, manuals, and information as required.

- Type B applications:

  (a) may be hosted on either portable or installed EFBs;

  (b) require an operational assessment and risk assessment for EFB systems; and

  (c) do not require an airworthiness approval.

Type B applications require operational approval and the list of Type B software application that requires a documented evaluation is provided in Attachment 2. For EFB application changes, refer to Attachment 5 Section 3 for details.

3.4 EFBs allow the use of multiple software applications. Certain kinds of software applications require special measures for approval as described in Attachment 1. Except as provided for in Chapter 10, the CAD shall approve the operational use of EFB functions when an EFB is used as a primary source of information to perform functions required by airworthiness, airspace or operational requirements; and/or is to be relied upon as a source of information essential to the safe operation of an aircraft. Primary sources of information include original source material generated by an approved provider to support the operation (e.g., airplane flight manual, approved weather sources, electronic checklists, etc.).

3.5 **IMPORTANT: EFB functions cannot be used as a source of information to satisfy airworthiness requirements.**

Note: *EFB functions whose failure, malfunction or misuse would have adverse effect on the safety of flight operations (e.g. increase in flight crew workload during critical phases of flight, reduction in functional capabilities or safety margins...) are considered to be* ***essential to the safe operation of the aircraft****.*
The applications below may be considered to be examples of sources of information essential to the safe operation of the aircraft, depending on their use, and associated procedures and failure mitigation means:

- *Document Browser displaying some of the manuals and additional information and forms required to be carried by Regulations;*
- *Electronic aeronautical chart applications;*
- *Airport Moving Map Displays (AMMD) applications;*
- *Cabin-mounted video and aircraft exterior surveillance camera displays;*
- *Aircraft performance calculation application that uses algorithmic data or calculates using software algorithms to provide Take-off or landing performance calculations;*
- *Mass and balance calculation application used to establish the mass and centre of gravity of the aircraft and to determine that the load and its distribution is such that the mass and balance limits of the aircraft are not exceeded.*

3.6 The operator should ensure that the EFB hardware meets the requirements of the EFB software applications intended to be operated, e.g. in terms of memory or CPU requirements.

3.7 The operator should consider the interdependencies of software applications and the EFB platform operating system, e. g. a failed PDF viewer may block the pilot from accessing EFB applications.

3.8 The EFB system should provide an intuitive, and in general, consistent user interface within and across the various hosted EFB applications. This should include, but not be limited to, data entry methods, color-coding philosophies, and symbology.

3.9 Software considerations, including ease of access to common functions, consistency of symbols, terms and abbreviations, legibility of text, system responsiveness, methods of interaction, use of color, display of system status, error messages, management of multiple applications, off screen text/content and use of active regions should be addressed.

3.10 **Use of Colors and Messages**

The color “red” should be used only to indicate a warning level condition. “Amber” should be used to indicate a caution level condition. Any other color may be used for items other than warnings or cautions, providing that the colors used, differ sufficiently from the colors prescribed to avoid possible confusion. EFB messages and reminders should be integrated with (or compatible with) presentation of other flight deck system alerts. EFB aural messages should be inhibited during critical phases of flight. However, if there is a regulatory requirement that is in conflict with the recommendation above, those should have precedence.

3.11 **System Error Messages**

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

3.12 **Data Entry and Error Messages**

If user-entered data is not of the correct format or type needed by the application, the EFB should not accept the data. An error message should be provided that communicates which entry is suspect and specifies what type of data is expected.

3.13 **Responsiveness of Application**

The system should provide feedback to the user when user input is accepted. If the system is busy with internal tasks that preclude immediate processing of user input (e.g. calculations, self-test, or data refresh), the EFB should display a “system busy” indicator (e.g. clock icon) to inform the user that the system is occupied and cannot process inputs immediately. The timeliness of system response to user input should be consistent with an application’s intended function.

3.14 **Off-Screen Text and Content**

If the document segment is not visible in its entirety in the available display area, such as during "zoom" or "pan" operations, the existence of off-screen content should be clearly indicated in a consistent way. 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.

CHAPTER 4 – HUMAN FACTORS

4.1 The operator should assess the physical use of the device on the flight deck. Safe stowage, crashworthiness, safety and use under normal environmental conditions including turbulence should be addressed. The operator should carry out an assessment of the human machine interface and aspects governing crew coordination when using the EFB. Whenever possible the EFB user interface philosophy should be consistent (but not necessarily identical) with the flight deck design philosophy. The review of the complete system should include but not limited to:

- general considerations including workload, usability, integration of the EFB into the flight deck, display and lighting issues, system shutdown, and system failures;

- physical placement issues, including stowage area, use of unsecured EFBs, design and placement of mounting devices;

- considerations for interference with aircraft controls, anthropometric constraints, outside vision, view of other flight deck displays, oxygen mask access, egress, crew ventilation, and speaker sound;

- training and procedures considerations, including training on using EFB applications, operations EFB documentation and policy, fidelity of EFB training device, and mechanisms for gathering user feedback on EFB use;

- Flight crew error: The system should be designed to minimise the occurrence and effects of flight crew error and maximise the identification and resolution of errors. For example, terms for specific types of data or the format in which latitude/longitude is entered should be the same across systems. Data entry methods, colour-coding philosophies, and symbology should be as consistent as possible across the various hosted EFB applications. These applications should also be compatible with other flight crew compartment systems.

- Identifying failure modes: The EFB system should be capable of alerting the flight crew of probable EFB system failures.

- Responsiveness of application: The system should provide feedback to the user when user input is accepted. If the system is busy with internal tasks that preclude immediate processing of user input (e.g. calculations, self-test, or data refresh), the EFB should display a ‘system busy’ indicator (e.g. clock icon) to inform the user that the system is occupied and cannot process inputs immediately. The timeliness of system response to user input should be consistent with an application’s intended function. The feedback and system response times should be predictable to avoid flight crew distractions and/or uncertainty.

- Off-screen text and content: If the document segment is not visible in its entirety in the available display area, such as during ‘zoom’ or ‘pan’ operations, the existence of off-screen content should be clearly indicated in a consistent way. For some intended functions it may be unacceptable if certain portions of documents are not visible. This should be evaluated based on the application and intended operational function. If there is a cursor, it should be visible on the screen at all times while in use.

- hardware considerations – refer to Chapter 2

- software considerations – refer to Chapter 3

CHAPTER 5 – CREW OPERATING PROCEDURES

5.1 GENERAL

The operator should have in place procedures for using the EFB in conjunction with the other flight deck equipment. If an EFB generates information similar to that generated by existing flight deck systems, procedures should clearly identify:

- which information source will be primary;
- which source will be used for back up information;
- under what conditions to use the back-up source; and
- what actions to take when information provided by an EFB does not agree with that from other flight deck sources, or, if more than one EFB is used, when one EFB disagrees with another.

5.2 REVISION AND UPDATE

The operator should have a procedure in place to allow flight crews to confirm prior to flight the revision number and/or date of EFB application software including where applicable, database versions (e.g., update to the latest aeronautical charts). Flight crews should not have to confirm the revision dates for other databases that do not adversely affect flight operations. Procedures should specify what actions to take if the software applications or databases loaded on the EFB are out-of-date.

5.3 WORKLOAD AND CREW COORDINATION

In general using an EFB should not increase crew's workload during critical phases of flight. For other flight phases, crew operating procedures should be designed to mitigate and/or control additional workload created by using an EFB. Workload should be apportioned between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. The procedures should include specification of the phases of flight at which the flight crew may not use the EFB.

5.4 EFB FAILURE AND MITIGATION MEANS

5.4.1 Operators should determine the need for software architectural features, people, procedures, and/or equipment to eliminate, reduce, or control risks associated with an identified failure in a system.

5.4.2 If normal operational procedures require an EFB for each flight deck crew member, the installation should comply with the definition of independent EFB platforms.

5.4.3 Procedures should be in place to inform maintenance and flight crews about a fault or failure of the EFB, including actions to isolate it until corrective action is taken. Back-up procedures should be in place to prevent the use of erroneous information by flight crews**.** A reporting system for system failures should be established.

5.4.4 Mitigation against EFB failure or impairment may be accomplished by one or a combination of:

- system design;
- separate and backup power sources for the EFB;
- electronic fall-back solutions to the last known, stable configuration (e.g. before an update)
- redundant EFB applications hosted on independent EFB platforms;
- paper products carried by selected crewmembers;
- complete set of sealed paper backups in the flight deck; and/or
- procedural means.

5.4.5 Operators should include the requirements for EFB availability in the Operations Manual and/or as part of the minimum equipment list (MEL).

CHAPTER 6 – FLIGHT CREW TRAINING

Please refer to Attachment 5, Section 13.

CHAPTER 7 – EFB MANAGEMENT

7.1 The operator should have an EFB management system in place. For an operator, the role of the EFB administrator is a key factor in the management of the EFB system. Complex EFB systems may require more than one individual to conduct the management process, but one person should be designated as the EFB administrator responsible for the complete system with appropriate authority within the operator's management structure. This role and accountability can be by delegations and by establishing procedures to ensure compliance.

7.2 The EFB administrator is the key link between the operator and the EFB system and software suppliers.

7.3 The EFB administrator is responsible for hardware and software configuration management and for ensuring, in particular, that no unauthorised software is installed. The EFB administrator is also responsible for ensuring that only a valid version of the application software and current data packages are installed on the EFB system. For some software applications there should be a means for operators to carry out their own check of data content prior to load and/or release for operational use.

7.4 The EFB administrator is responsible for conducting internal quality control measures to ensure that all EFB management personnel comply with the defined procedures.

7.5 Each person involved in EFB management should receive appropriate training in their role and should have a good working knowledge of the proposed system hardware, operating system and relevant software applications as well as knowledge about flight operations.

7.6 The EFB administrator should establish procedures, documented in an EFB Policy and Procedures Manual, to ensure that no unauthorised changes take place. The EFB Policy and Procedures Manual may be part of the Operator's Operations Manual.

7.7 Procedures should be established for the maintenance of the EFB.

7.8 The EFB administrator should be responsible for the procedures and systems, documented in the EFB Policy and Procedures Manual that maintain EFB security and integrity. The required level of EFB security depends on the criticality of the used functions.

CHAPTER 8 – ELECTRONIC SIGNATURES

8.1 In order to be accepted as an equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and should, as a minimum, assure the same degree of security as the handwritten or any other form of signature it intends to replace.

8.2 Guidance on electronic signatures is contained in the ICAO Safety Management Manual (Doc 9859). The corresponding legal requirements on electronic signatures are detailed in Cap 553 Electronic Transaction Ordinance.

CHAPTER 9 – OPERATIONAL APPROVAL EVALUATION PROCESS

9.1 The process is designed to lead to formal operational approval where such is required and consists of the following courses of actions.

9.2 Elements of this process may also be used in instances where formal approval is not required.

9.3 The scope of the operational evaluation plan will depend upon the applicant's familiarity with EFB:

(a) the operator already has an existing approved EFB program established,
(b) is in the process of establishing an EFB program or
(c) has no EFB experience, thus requiring a "new application and approval process".

9.4 The operator is implementing EFB for a new fleet and may choose to start a paperless flight deck operation without paper back up.

9.5 A combination of solutions, with limited on-board paper backup, may also be used.

9.6 The operator may choose to keep the paper backup as a cross-check against the EFB information and as a means of mitigation against failure, when transition from paper to electronic format.

9.7 Phase One: Request Approval:

Phase one of the process begins when the operator requests approval from the CAD to use the EFB. It should be noted that use of the EFB prior to operational approval does not imply any deviation from the operator's present procedures. It simply defines a training phase which will eventually lead to paperless trials.

During this phase, the CAD and the operator reach a common understanding of when paperless trials should begin, how they must be conducted and documented, the role of the CAD, and what documents and actions the operator is responsible for during each phase of the approval process.

9.8 Phase Two: Application

9.8.1 Phase Two begins when the operator submits a formal compliance plan to the CAD for evaluation. The plan is reviewed for completeness and the CAD may coordinate with other regulatory offices as necessary. Once the plan is accepted, the operator follows that plan to produce a complete EFB program. The operator must clarify the intent of the operation (with or without paper back-up or a combination of paperless and paper). The applicant user should submit the following information in the application package:

- EFB Operational Suitability Report
- EFB hardware and application specification EFB operator procedures/manual revisions,
- EFB evaluation checklists,
- EFB training program,
- EFB evaluation report
- Operational risk analysis

9.9 Phase Three: CAD Review

The CAD should use the checklist (Attachment 3 of this manual) to conduct a review of the application submitted by an operator. The CAD should participate in the simulator evaluation or flight evaluation of an EFB when an operator is requesting initial EFB approval. Additional simulator or flight evaluations are not required for adding a new EFB to an existing approval unless there is a substantial change in EFB intended functions. When a new aircraft is added to a certificate with existing EFB approval, the suitability of the EFB for that aircraft must be addressed as part of the aircraft conformity and configuration control process. The CAD should examine the technical content and quality of the proposed EFB program and other supporting documents and procedures. The operator's program for EFB management is critical to EFB reliability. The EFB program must address all EFB issues and be well documented.

9.10 Phase Four: Interim Approval to use EFB

9.10.1 An interim EFB Approval may be granted to allow the operator to proceed with EFB validation testing.

9.10.2 For operator transitioning from paper to EFB, during this validation phase, the operator must maintain paper back-up for all electronic information. The validation phase begins when the operator formally begins use of the EFB combined with paper backup for an established period of time. Use of the attached Checklist may be used for data collection during the validation phase.

9.10.3 For operators starting EFB operations without paper back-up, they must have in place adequate mitigations means to access the information in case of EFB failures, that are accepted by the CAD.

9.10.4 Final considerations by the approving authority:

(a) Unacceptable Validation Results. If the CAD finds the proposed EFB reliability and/or function to be unacceptable, the CAD should contact the operator for corrective action. EFB deficiencies should be corrected and the EFB function revalidated prior to paperless approval being issued.

(b) Acceptable Validation Results. If the CAD finds the proposed EFB reliability and/or function to be acceptable based on validation data then paperless approval may be issued.

9.11 Phase Five: Approval to use EFB

9.11.1 A formal letter is issued by the CAD granting use of the EFB to the operator. Additionally, the approval of a "paperless flight deck" may be added if it was included as a part of the OPS Evaluation.

9.11.2 The initial approval should define criteria for changes to the EFB system which may require consideration of an amended approval.

Note: Please refer to 'ATTACHMENT 5' for the details of operational consideration and evaluation process.

CHAPTER 10 – EFB USE IN NON-PUBLIC TRANSPORT OPERATIONS

This chapter provides guidance on the use of EFBs in non-public transport operations. When the following criteria have been met non-public transport operations pilots and owners/operators should be permitted to use portable EFBs during all phases of flight operations in lieu of paper reference material without any need for approval. In such cases, the in-flight use of EFB systems should be the decision of the aircraft owner and the pilot-in-command.

- The EFB system does not replace any system or equipment (e.g. navigation, communication, or surveillance system) that is required by other aviation regulations.

- The EFB system on board the aircraft displays only information which is functionally equivalent to the paper reference material which the information is replacing or is substituted for.

- The information being used for navigation or performance planning is current, up-to-date, and valid, as verified by the pilot.

- The owner/operator has determined that the use of the EFB does not interfere with equipment or systems required for flight. Information on conducting interference tests can be found in Chapter 2 of this manual.

- A secondary or backup source of aeronautical information or paper reference material necessary for the flight should be available to the pilot in the aircraft. The secondary or backup information may be either traditional paper-based material or displayed electronically by other means.

  Note: Supporting reference material such as legends, glossaries, abbreviations, and other information is available to the pilot but is not required in the cockpit during operation.

- The owner/operator should carry out an assessment of the human-machine interface and aspects governing Crew Resource Management when using the EFB. General considerations for the assessment include workload, integration of the EFB into the cockpit, display and lighting issues, system shutdown, and system failures. More detailed assessment criteria can be found in Chapter 4 of this Manual. Attention must also be given to the physical EFB. Some items to consider are placement issues such as stowage during take-off or landing, and the operation of an unsecured EFB. Use of the controls and input devices may be easy on the ground, but demanding in flight.

- Flight crew training should include pre-flight checks of the system, the use of each operational function on the EFB, the conditions (including phases of flight) under which the EFB should not be used, and procedures for cross-checking data entry and computed information. Additional information on flight crew training can be found in Attachment 5, Section 13 of this Manual.

- Owners/operators transitioning to a paperless cockpit should undergo an evaluation period during which the owner/operator should carry paper backups of the material on the EFB. The backup should be readily available to the crew. During this period the owner/operator should validate that the EFB is as available and reliable as the paper-based system being replaced.

Attachment 1: Guidance for EFB Software Applications

Attachment 1A: Performance (Take-off, Landing and W&B)

BACKGROUND

Knowing aircraft weight & balance and aircraft performance is elementary for pilots in order to safely control the aircraft trajectory in all flight phases.

Traditionally, weight & balance and aircraft performance calculations have been performed by using paper references such as tables or graphs, either by the pilots themselves, dispatchers or ramp agents. Those paper references, FCOM (or Operations Manual), have been provided by the manufacturers. The FCOM reflects the data published in the Airplane Flight Manual (AFM) and observes the limitations as set forth by the AFM, but conservatively simplifies the presentation of the data to facilitate their day-to- day use. Unlike the AFM, which is a certified document and where the certification has been obtained by the manufacturer, the FCOM is neither certified nor has it any approval.

The operator has to comply with the AFM. Where the operator publishes and uses an FCOM, it is his sole responsibility to obtain an operations approval from his authorities and, in due course, to prove that the FCOM remains compatible with the AFM.

It is worth noting that the AFM only covers takeoff performance and landing performance and a few cruise performance items (e.g. altitude and gradient capability, enroute limit weights).

Many airlines choose to customize FCOMs, mostly for commonality reasons when operating airplanes from different manufacturers, but also to reflect their own operating policies (e.g. restricting the use of certain flap settings or derates, etc.). This was supported by the manufacturers by providing the performance data in a digital format (usually software together with an aircraft specific database), so that performance data could be incorporated in an operator’s in-house software.

In addition, an IATA working group has developed and continues to maintain a standardized format (SCAP format) to interface the aircraft performance software with the operator’s in-house or a third-party provider’s software. This standard has been accepted and implemented by most of the aircraft manufacturers. As such, it provides the means to include any aircraft as a module into an operator’s or a third-party provider’s software environment, provided the aircraft manufacturer’s software complies with this standard.

Currently there are SCAP specifications for take-off, landing, climb-out, inflight, noise calculations and performance monitoring. There is no SCAP specification for weight & balance, since the operators usually develop their own weight & balance software. Since there is no legal requirement to comply with SCAP, manufacturers need not provide SCAP modules. However, most manufacturers provide SCAP modules at least for take-off and landing performance.

Initially the operator's software was used to customize FCOM performance data or to create paper charts for the flight crews, so called "Runway Weight Limitation Charts". However, maintaining paper documents, especially for operators with large and varying fleets, was considered too costly, complex and error-prone. Moreover, the use of runway weight limitation charts typically induce conservatism and could be time consuming as it took place during preparation for the flight, a phase where pilots are subject to a high workload and distractions by other important tasks.

Along with the appearance of portable computers, the idea of "paperless cockpits" came up. Performance calculation tools were provided to the flight crews, allowing them to do calculations (mostly takeoff performance) when they need it and for the exact conditions they want. The objective was to reduce the complexity and the time needed for flight crews to obtain performance data and thus, to increase overall safety.

The two most common ways to provide performance information to flight crews are the EFB or an ACARS connection. With the ACARS connection a pilot will send input parameter like airport, runway, temperature, wind, etc. to software on the ground which does the performance calculation and sends the result back to the cockpit.

The EFB with the performance software included provides the means for crews to work self-contained. The software used for either of those systems doesn't differ too much from the software that was used to generate runway weight limitation tables. However, where a check for e.g. a runway weight limitation table was done before publishing it to the flight crews, there is no check for the results calculated by EFB and ACARS. Thus, a comprehensive check of the software has to be done for the software prior to its release on-board the aircraft or on flight crews PED.

PERFORMANCE DATA SOURCES

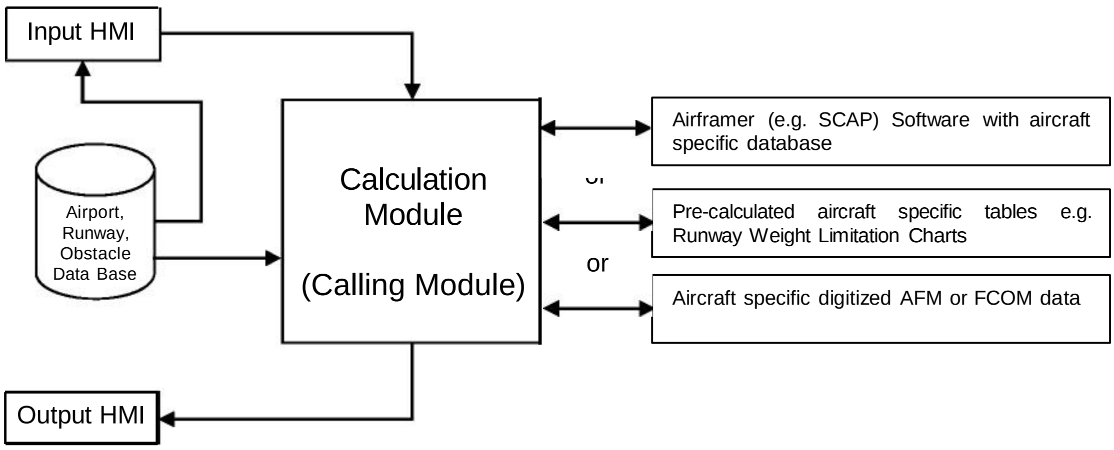
Different sources of performance data can be used when developing performance applications. Performance data can be delivered in a digitized format by the manufacturer:

- SCAP modules delivered by the manufacturer. SCAP module is either based on equations of motion or digitized AFM material.
- The operator can built its own digitized performance data, based on the data published in the Flight Manual based on pre-calculated take-off or landing performance tables

PERFORMANCE APPLICATION DEVELOPMENT

Algorithm based performance applications are usually separated into a HMI (human machine interface), the calculation module, aircraft specific information and - for takeoff and landing applications - the airport, runway, obstacle database (AODB).

The diagram below shows a typical architecture of a performance application. Individual solutions that are in use by operators might not need to be as modular as shown below, but rather have the different parts integrated into one software. On the other hand, there might be solutions where modularity is taken to a point where some or all parts are supplied by different providers.



INPUT AND OUTPUT HMI

In the case of a connected- EFB or ACARS solution, only the HMIs may be hosted on board. Flight crews perform all necessary inputs on the Input HMI. Where a connection to the avionics is available, some inputs might be imported from there.

The Input HMI requests the calculation from the calculation module. The results are transferred to the Output HMI. The calculation request and the transfer of the results can be done within the software or by a request file that is transmitted via ACARS, 3G or other means to a ground module.

CALCULATION MODULE

The calculation module is either part of the performance application on an EFB, or it is hosted on the ground for ACARS or connected EFB solutions.

The calculation module will process the request file from the Input HMI and determine the results, which are then sent back to the Output HMI.

Using manufacturer SCAP software together with the respective aircraft specific database is probably the most common way calculation modules are set up. To obtain the desired results, the calculation module might call the SCAP software several times. Thus, the expression "Calling Module" has become widespread in the industry.

Another way for the calculation module to obtain results is to interpolate between pre-calculated tables (e.g. Runway Weight Limitation Charts). Those tables are typically calculated using SCAP software, however, the SCAP software itself is not part of the performance application.

Where manufacturer software is not available, paper AFM or FCOM charts have to be digitized, so that the AFM and FCOM information can be provided as tables or (polynomial) functions.

AIRPORT, RUNWAY, OBSTACLE DATABASE (AODB)

Takeoff and landing performance applications require information about airport, runway and obstacles. The AODB should provide this information in a suitable way. Usually it is the part of the EFB performance applications that will be updated most often.

PERFORMANCE APPLICATION GRAPHICAL USER INTERFACE

Operators and authorities should be aware of the criticality of performance calculations and the relatively high number of incidents and accidents where pilot data entry errors have been a contributing factor. The Graphical User Interface (GUI) is an important safety factor. A good, thorough GUI design can significantly reduce the risk of errors, thus special consideration has to be taken for the GUI design. Below are examples of recommended design guidelines. ACARS is not specifically addressed.

- Field names and abbreviations used in the GUI should correspond to those used in the manuals and should match the labels in the cockpit.
- The aircraft tail sign used for calculation must be clearly displayed to the flight crews, if relevant differences between tail signs exist. If tail signs are associated to different sub-fleets, the selected sub-fleet should be clearly displayed to the flight crew.
- By defining data entry rules, the GUI should assure that input data cannot be entered into the wrong fields of the GUI.
- As long as unambiguous, the GUI may accept different representations for a value, e.g. the QNH in hPa or inches or a weight in kg or tons.
- The GUI should only accept input parameters within the aircraft's operational envelope approved for the operator. This is usually more limiting than the certified envelope.
- The GUI should check all input parameters for plausibility. There should be alert flags in case of valid but unusual parameters e.g. a very high QNH or very low weight.
- If options are available, the GUI should represent the direct status, e.g. Air Condition Packs "On Engines" or "Off/On APU".
- The GUI should warn the pilot if entered data doesn't correspond to SOPs, even if within the operational envelope.

- The GUI should warn the pilot if entered data leads to violation of combined limits (e.g. use of engine anti ice in combination with wet runway & low temperature or exceeded cross wind limit for contaminated runway operation or tailwind in combination with reverser inoperative).

- Error messages should be self-explanatory and contain a hint on how the error can be corrected.

- Calculation results should be removed whenever input parameters are modified.

- When calculation results are displayed, all input parameters should be visible at the same time.

- By presentation characteristics, the GUI should minimize the risk of misinterpretation of calculation results. E.g. a stop margin of 35 m could be presented as "< 100m" to minimize the risk of mistaking it for flex temperature. In addition graphical means can assist in the interpretation of figures.

- MEL/CDL/Special Restrictions should be clearly visible and identifiable.

- In case of multiple runway selection the output data should be clearly associated with the selected runway.

- Changes of runway data by the pilot should be clearly marked and the changes should be easy to identify.

- Input and output data presented on the screen should always be consistent. E.g. if, following a calculation, an input parameter is changed, all output data should be cleared. Or if a new airport code is entered, associated input data like weather and TOW should be cleared. However, re- calculations last minute should not require to re-enter non associated data. E.g. in case of a runway or intersection change, input data like weather or TOW should stay.

- A warning should be presented or output data should be cleared in case the calculation was done a long time ago, because environmental conditions like weather usually change over time.

The development, testing and approval of a GUI are considerable investments and system integrators and operators are encouraged to evaluate the usability of an existing GUI, before developing a new GUI themselves. In any case, the experience gained from incidents and accidents, where the GUI design was a contributing factor, should be taken into account. It is also recommended to review the GUI after some time of operation in everyday environment for unforeseeable common human errors with special regard to the specific use case of the operator, which require changes or enhancement of the given design.

Any new or modified GUI requires exhaustive testing of this component.

Any major GUI modification requires a risk assessment by the operator.

PERFORMANCE APPLICATION TESTING

Operators and authorities should be aware of the criticality of performance calculations and the importance of the correctness of the calculation results delivered by performance algorithms or calculation modules.

The development, testing and approval or certification of a performance algorithm or calculation modules is a considerable investment.

Depending on the EFB setup three different test phases may apply:

(1) The correctness test checks whether the performance results are consistent with the AFM data.

(2) A robustness and constraint test checks for sensible system behavior in case incorrect values have been entered.

(3) Finally the integration test shall make sure that the application runs in the EFB environment without any ill effects. It is acceptable that the three mentioned testing phases might be combined.

CORRECTNESS TEST

When developing a new performance calculation module which processes entry variables (e.g. takeoff or landing performance calculations) the calculation results must be checked. Due to the large number of parameters influencing the results of performance applications, testing all possible combinations of parameter values is not feasible. So, test cases should be defined to sufficiently cover the approved operating conditions of the aircraft.

For selected calculations, a detailed check against certified (AFM) or, where data is not published in the AFM, the best available data has to be documented. Those calculations must prove that the module's results will match the data source or are consistently conservative.

Tests can be documented graphically or in tabular form, as is acceptable to the CAD.

ROBUSTNESS AND CONSTRAINT TEST

Sufficient test cases shall make sure that the performance application still provides understandable answers or instructions if incorrect input values (outside envelope, wrong combination of inputs) are entered.

Even if using incorrect input values the application shall not fail or get into a state that would require special skills or procedures to bring it back to an operational state.

Where incorrect inputs result in errors, the application has to return meaningful error messages or guidelines.

While results might be consistent with data source, they could still be inconsistent with operational policies set forth by the operator.

In such cases, the performance application has to be tested for the proper handling of those cases.

INTEGRATION TESTING

Typically the design and test of performance applications is done on a different hardware and software environment than the EFB. Thus, an integration testing shall make sure that the application runs properly on the EFB environment. These tests should be performed using the final system (e.g. a connected EFB, hosting the performance HMI, while accessing a ground based performance engine and database via a mobile phone link.)

Integration testing shall make sure that the performance application produces the same results on the EFB as on the computer it was designed and tested on. In addition, the performance application shall not interfere adversely with other EFB applications or vice versa.

Where data from other applications are processed (e.g. T/O performance using results from W&B application), the correct interfacing of those data shall be tested.

Finally the overall acceptability of the performance calculation should be assessed. E.g. the data modification and calculation times should be within acceptable limits to allow quick recalculations in case of dynamic operational conditions like meteorological or last minute runway changes.

APPROVING THE OPERATIONAL USE OF PERFORMANCE APPLICATIONS

When approving the operational use of a performance application, due consideration shall also be given to all other processes that contribute to the use of the application.

CREW OPERATING PROCEDURES

Procedures should be developed that define any new roles that the flight crew and the flight dispatcher may have in creating, reviewing, and using performance calculations supported by EFBs.

Performance calculations should be performed by both pilots independently on independent EFBs, if available.

The results should be crosschecked and differences discussed before the results are used operationally.

Note: Performance parameters entered by the crew such as registration, airport, runway intersection or TOW should be checked by each pilot immediately after entering or selecting them. Plausibility and range checks to identify data-entry errors should be used. To avoid that one pilot follows the other by choosing a wrong parameter, there should be no announcement of input parameters.

PROCEDURES FOR EFB SECURITY AND QUALITY ASSURANCE

Application and data should be checked for integrity and protected against unauthorized manipulation, e.g. by checking file checksum values at EFB start-up or prior to each calculation.

A quality assurance process should apply for all performance related software application modifications.

PROCEDURES FOR ADDRESSING EFB FAILURES

Procedures should be developed and introduced to assure that EFB failure events, especially those where the EFB failure leads to the calculation of misleading information (such as an error in the AODB) is immediately brought to the attention of other pilots who may be effected.

A reporting system shall be in place, allowing the operator to detect the nature of problems and to decide on mitigations.

FLIGHT CREW TRAINING

Training should emphasize the importance of executing all performance calculations in accordance with SOP to assure fully independent calculations. As an example, one pilot should not announce the values to be entered into the HMI of the performance applications, because a wrong announcement could lead to both calculations showing the same misleading results.

Training should include cross checks (e.g. with avionics or flight plan data) and gross error checks among which rule-of-thumbs may be used by pilots to identify order-of-magnitude errors like entering the ZFW as TOW or transposed digits.

It should be understood, that the use of EFBs makes performance calculations simple and does not eliminate the necessity of good pilot performance knowledge.

Through the use of EFBs, new procedures may be introduced (e.g. the use of multiple flaps settings for takeoff) and pilots should be trained accordingly.

MANAGEMENT OF PERFORMANCE EFB APPLICATIONS

Within the operator's organization, the responsibilities between the performance management, other departments involved and the EFB management should be, if separate, clear and well documented. Furthermore, an operator needs to utilize a designated person/group which is sufficiently trained to provide support for the performance tools. This person/group must have comprehensive knowledge of current regulations, aircraft performance and performance software (eg SCAP modules) used in the EFB.

TRANSITIONING FROM PAPER

Before transitioning from table- (e.g. runway weight limitation charts) or graph-based calculation to an algorithm based performance calculation, a risk assessment for the existing calculation method should be performed. Additionally, a risk assessment for the new algorithm based performance calculation should be performed.

OPERATIONAL EVALUATION OF PERFORMANCE APPLICATIONS

An Operational Evaluation should be conducted by the CAD to verify that the above elements have been satisfied before final approval of the use of the algorithm based performance application.

Attachment 1B: Electronic Charting

Description

An EFB software application that supports route planning, route monitoring and navigation by displaying required information. Includes visual, instrument and aerodrome charts.

Consideration

- Electronic aeronautical charts should provide, at least to a minimum, a level of information and usability comparable to paper charts.

- For approach charts, the EFB software application should be able to show the entire instrument approach procedure all at once on the intended EFB hardware, with a degree of legibility and clarity equivalent to that of a paper chart. This requirement is not meant to preclude panning and zooming features, but is intended to prevent a workload increase during the critical phase of flight.

- Panning, scrolling, zooming, rotating, or other active manipulation is permissible for these EFB software applications. An EFB display may not be capable of presenting an entire aerodrome chart (airport diagram) if the chart is the expanded detail (fold over) type. Aerodrome charts should include all information useful for airport operation.

- For data driven charts, it should be assured that shown symbols and labels remain clearly readable, (e.g., not overlapping each other). Layers of data may be used for decluttering.

See also ICAO Annex 4, Section 20 ELECTRONIC AERONAUTICAL CHART DISPLAY

Attachment 1D: Taxi Aid Camera System (TACS)

Description

TACS is an EFB software application to increase situational awareness during taxi by displaying electronic real-time images of the actual external scene.

Considerations

- Ensure real-time, live display of received imagery without noticeable time-lapse.

- Adequate image quality during foreseeable environmental lighting conditions.

- Display of turning or aircraft dimension aids may be provided, (e.g., turning radius, undercarriage track width, etc.) In this case, the information provided to the pilot should be validated to be accurate.

- Connection to one or more installed vision system. Vision systems include but are not limited to visible light cameras, forward-looking infrared sensors and low-light level image intensifying.

- Operators should establish SOPs for use of TACS. Training should emphasize use of TACS as an additional resource and not as a primary means for ground navigation or avoiding obstacles.

- Pilot use of TACS should not induce disorientation.

Attachment 1F: Airport Moving Map Display (AMMD)

This attachment provides some consideration on how to demonstrate the safe operational use for AMMD applications to be hosted in EFBs.

An EFB AMMD with own-ship position symbol is designed to assist flight crews in orienting themselves on the airport surface to improve pilot positional awareness during taxi operations. The AMMD function is not to be used as the basis for ground maneuvering. This application is limited to ground operations only.

The AMMD application is designed to indicate airplane position and heading on dynamic maps. The application's high resolution maps graphically portray runways, taxiways, and other airport features to support taxi and taxi-related operations. Additionally warning functions can be provided which alert crews about potentially dangerous conditions like inadvertently entering a RWY.

The AMMD application is typically use to perform the following task:

- Orient the flight crew to the airplane's position in relation to runways, taxiways and airport structures.
- In conjunction with external visual references to identify airplane position in relation to runways, hold points and taxi way navigation where a turn might be required or locate a specific parking spot or gate.
- Improved correlation of taxi clearances with taxi planning.
- Ability to monitor current position during taxi progress and direction along a cleared route while enhancing external visual markings on the airport such as signage, pavement markings, etc. with the AMMD map.

Considerations for AMMD

- AMMD application should **not be used as the primary means of taxiing** navigation and should be used in conjunction with other materials and procedures identified in this attachment.
- When an AMMD is in use, the primary means of taxiing navigation remains the use of normal procedures and direct visual observation out of the cockpit window.
- The system should provide means to display the revision number of the software installed.

- The Flight Crew should be able to easily ascertain the validity of the on-board map database. The application should provide an indication when the AMMD database is no longer valid.
- The Total System Error of the end-to-end system should be specified and characterized. The accuracy should be sufficient to ensure that the own-ship symbol is depicted on the correct runway or taxiway.

- The AMMD should provide compensation means for the installation dependent antenna position bias error i.e. along track error associated to the GNSS antenna position to the flight deck.

- The system should remove automatically the own-ship position when the aircraft is in flight (e.g. weight on wheels, speed monitoring) and when the positional accuracy exceeds the maximum defined value.

- It is recommended that the AMMD detects, annunciates to the flight crew and fully removes depiction of own-ship data, in case of any loss or degradation of AMMD functions due to failures such as memory corruption, frozen system, latency, etc.

- The AMMD data base should comply with applicable standards for use in aviation (refer to ICAO annex 6 part1 7.4 Electronic navigation and data management).

- The operator should review the documents and the data provided by the AMMD developer and ensure that installation requirements of the AMMD software in the specific EFB platform and aircraft are addressed.

Flight crew training

The operator should define specific training in support of an AMMD's implementation. It should be included in the operator's overall EFB training.

The flight crew training should include any mitigation to hazards that are mitigated by flight crew procedures.

The operating manual or user guide shall provide sufficient information to flight crews including limitations and accuracy of the system and all related procedures.

Attachment 1G: Electronic Checklist

The following conditions should be applied.

(1) The resulting crew actions called for in the checklist shall be identical for paper and electronic versions.

(2) Layout: All checklists shall be similar to the paper version. Headings, sub-headings and titles shall be consistent to the paper version.

(3) The Title of the checklist must be displayed and distinguished at all times when in use.

(4) If one or more checklist can be opened at a time, a master checklist shall be available defining the actual status of each checklist.

(5) If more than one checklist can be opened at once, other checklist should be accessible without closing the display.

(6) The ECL (Electronic Checklist) should allow a status where no checklists are open.

(7) The Electronic checklist shall allow a status where no checklist is open and shall therefore give a positive indication. A blank screen is not sufficient.

(8) The completion status of each checklist shall be indicated clearly.

(9) Access, ambiguity and readability: quick-access for any checklist, on crew request, must be provided at all times.

Note: all supported checklists should be accessible for reference/review at any time while system is active.

(10) Readability shall be equivalent to paper checklists.

(11) Electronic checklists should be as quick and accurate to access as paper checklist, even better.

(12) The ECL system should open checklists only upon crew request.

(13) The user's current position within the checklist as well as the possibility to look ahead in the checklist must be continuously possible.

(14) Information regarding the length of checklist, the user's current position within the checklist, and how much of the checklist had been completed should be continuously available.

(15) The active-item pointer should be moved to the next item with a simple action. Returning to the previous item should not change the status of any item.

(16) The system indicates active items:-The next item should become active when an item has been completed, unless it is on the next page. A separate action should be required to move to the next page.

(17) Moving to the next item without completing the current item should require an input distinct from that of specifying the item as complete.

(18) An undo function should be available.

(19) The user should be able to quickly select one item after another; system processing should not induce delay.

(20) An item within the checklist being used, should not be allowed to be completed unless the particular item is shown on the active screen.

(21) If the user attempts to close incomplete checklists, the system should provide an indication that the checklist is incomplete. The user should be able to close incomplete checklists after acknowledging this indication, when returning to an incomplete checklist, the active item prior to the move should be active again. Positive indications should be presented when the entire checklist is completed. Note: It should be a reminder available on the screen to notify the user of incomplete checklist. Also a place holder should be used to indicate which item was active prior to leaving the checklist.

(22) The ECL should track and indicate the active checklist item.

(23) When returning to the incomplete checklist, the item active prior to the move should be active again.

(24) The option shall be provided to change certain items by the user to a deferred status. The deferred status of the item then shall be visible for clear identification.

(25) If normal checklists are supported, then all the content of the normal checklists should be supported.

(26) If non-normal checklists are supported, then all the contents of the non-normal checklists should be supported.

(27) Normal checklists should be accessible in accordance with the normal sequence of use.

(28) Can checklists be accessible individually for review or reference?

(29) Users' actions to mark an item after completion should be simple.

(30) Completed items should not be removed from the screen immediately. The crew should be able to review the item and undo their action, if necessary.

(31) All checklists associated with on-going non-normal conditions that are sensed should be listed on one master list indicating the status of each one.

(32) During non-normal conditions, the relevant checklists should be easy to access.

(33) During non-normal conditions, does the device indicate which checklists and /or checklist items are required and which are optional?

(34) If needed, it should be possible to restart the full ECL. Note: the crew should be able to reset the checklist with a verification step to include a warning verifying a restart condition.

(35) The checklist should provide appropriate reminders for tasks that require a delayed action.

(36) The checklist should clearly highlight decision branches, if appropriate. Note: the selected branch should be clearly indicated.

(37) The navigation between links in the ECL and related information needs to be simple and clear.

(38) Related information should appear in a single window or area of the screen, as much as possible.

(39) The next in sequence item should automatically become active when the previous one is complete.

(40) There should be a clear indication that all items as well as the whole checklist are complete when finished.

(41) Emergency and/or abnormal checklists should not be customised.

(42) Customisation of checklist items should only be done after consultation with the manufacturer.

(43) Many applications plus an ECL may complicate the operation (the need to display a chart during a check list). The section started should be terminated before displaying another application. It should be demonstrated that the flight crew procedures.

(44) If the electronic checklist is used as a primary source, a backup source should be easily accessible at any time it may be required and identical to the primary checklist.

(45) For approved electronic checklists to be on an EFB, an Operational Risk Assessment should be conducted.

Attachment 1H: EFB Policy and Procedures Manual

These are the typical contents of an EFB policy and procedures manual that can be part of the Operation Manual. The proposed outline is very extensive. It may be adapted to the specific EFBs system and to the size and complexity of the operations in which the operator is involved.

EFB Policy & Procedures Manual
Typical Contents

(1) **Revision history**

(2) **List of effective pages or paragraphs**

(3) **Table of contents**

(4) **Introduction**

- Glossary of terms and acronyms
- EFB general philosophy, environment and dataflow
- EFB system architecture
- Limitations of the EFB system
- Hardware description
- Operating system description
- Detailed presentation of the EFB applications
- EFB application customization
- Data management:
  - Data administration
  - Organisation & workflows
  - Data loading
  - Data revision mechanisms
  - Approval workflow
  - Data publishing & dispatch
  - Customisation
  - How to manage the airline specific documents
  - Airport data management
  - Aircraft fleet definition

- Data authoring
- Navigation and customization

(5) **Hardware and operating system control and configuration**

- Purpose and scope
- Description of the following processes:
  - Hardware configuration and part No control
  - Operating system configuration and control
  - Accessibility control
  - Hardware maintenance
  - Operating system updating
  - Responsibilities and accountabilities
  - Records and filing
  - Documentary references

(6) **Software application control and configuration**

- Purpose and scope
- Description of the following processes:
  - Part No control
  - Software configuration management
  - Application updating process
- Responsibilities and accountabilities
- Records and filing
- Documentary references

(7) **Flight crew**

- Training
- Operating procedures (normal, abnormal, and emergency)

(8) **Maintenance considerations**

(9) **EFB security policy**

- Security solutions and procedures

Attachment 1I: Considerations for Rapid Depressurisation Test

When the EFB system hosts applications that are required to be used during flight following a rapid depressurisation, testing is required to determine an EFB device's functional capability. The information from the rapid depressurisation test is used to establish the procedural requirements for the use of that EFB device in a pressurised aircraft. Rapid decompression testing should follow the EUROCAE ED-14G/RTCA DO-160F guidelines for rapid decompression testing up to the maximum operating altitude of the aircraft on which the EFB is to be used. The EFB should be operative for at least 10 minutes after the start of the decompression.

(a) **Pressurised aircraft:** When a portable EFB has successfully completed rapid depressurisation testing, then no mitigating procedures for the depressurisation event need to be developed. When a portable EFB has failed the rapid depressurisation testing while turned ON, but successfully completed it when OFF, then procedures will need to ensure that at least one EFB on board the aircraft remains OFF during the applicable flight phases or configured so that no damage will be incurred should rapid decompression occur in flight above 10 000 ft AMSL.

If the EFB system has not been tested or has failed the rapid depressurisation test, then alternate procedures or paper backup should be available.

(b) **Non-Pressurised aircraft**: Rapid decompression testing is not required for an EFB used in an non-pressurised aircraft. The EFB should 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 should be established to preclude operation of the EFB above the maximum demonstrated EFB operation altitude while still maintaining availability of the required aeronautical information.

Attachment 2: Examples of Software Applications

TYPE A:

Type A applications are EFB applications whose malfunction or misuse would have no adverse effect on the safety of any flight operation, i.e. a hazard level defined as no greater than a 'no safety effect' failure condition classification.
Such applications might typically be, but not limited to:

(a) browser displaying:

(1) the certificates and other documents required to be carried by the applicable operational regulations and where copies are acceptable such as:

(i) the noise certificate, and its English translation if applicable;

(ii) the air operator certificate (AOC);

(iii) the operations specifications relevant to the aircraft type, issued with the AOC; and

(iv) the Third-Party Liability Insurance Certificate(s);

(2) some manuals and additional information and forms required to be carried by the applicable operational regulations such as:

(i) notification of special categories of passenger (SCPs) and special loads; and

(ii) passenger and cargo manifests, if applicable; and

(3) other information within the operator's aircraft library such as:

(i) airport diversion policy guidance, including a list of special designated airports and/or approved airports with emergency medical service (EMS) support facilities;

(ii) maintenance manuals;

(iii) Emergency response guidance for aircraft incidents involving dangerous goods(ICAO Doc 9481-AN/928);

(iv) aircraft parts manuals;

(v) service bulletins/published Airworthiness Directives, etc.;

(vi) current fuel prices at various airports;

(vii) trip scheduling and bid lists;

(viii) passenger information requests;

(ix) Authorized Examiner and flight instructor records; and

(x) Flight crew currency requirements.

(b) interactive applications for crew rest calculation in the framework of flight time limitation;

(c) interactive forms to comply with the reporting requirements of the CAD and the operator.

TYPE B:

A non-exhaustive list of possible Type B software applications, that are to be evaluated, is provided in this attachment.

(a) Document Browser displaying the following documents, interactive or not, or not in pre- composed format, and not driven by sensed aircraft parameters:

(1) The manuals and additional information and forms required to be carried by Regulations such as:

(i) The Operations Manual (including the MEL and CDL);

(ii) The Aircraft Flight Manual;

(iii) The Operational Flight Plan;

(iv) The aircraft continuing airworthiness records, including the technical Log;

(2) Meteorological information including with graphical interpretation;

(3) ATS Flight Plan;

(4) notices to airmen (NOTAMs) and aeronautical information service (AIS) briefing documentation;

(b) Electronic aeronautical chart applications including en route, area, approach, and airport surface maps; these applications may offer features such as panning, zooming, scrolling, and rotation, centering and page turning, but without display of aircraft/own-ship position.

(c) Applications that make use of the internet and/or other aircraft operational communications (AAC) or company maintenance-specific data links to collect, process, and then disseminate data for uses such as spare parts and budget management, spares/inventory control, unscheduled maintenance scheduling, etc.

(d) Cabin-mounted video and aircraft exterior surveillance camera displays;

(e) Aircraft performance calculation application that uses algorithmic data or calculates using software algorithms to provide:

- take-off, en route, approach and landing, missed approach, etc. performance calculations providing limiting masses, distances, times and/or speeds;
- power settings, including reduced take-off thrust settings;
- mass and balance calculation application used to establish the mass and centre of gravity of the aircraft and to determine that the load and its distribution is such that the mass and balance limits of the aircraft are not exceeded.

(f) Other Type B applications not listed in this attachment.

Attachment 3: Operational Approval Checklist

Part 1

Have the installed EFB resources been certified by a CAD to accepted aviation standards either during the certification of the aircraft, service bulletin by the original equipment manufacturer, or by a third party STC?	Yes □ No □ N/A □
Has the operator assessed the physical use of the device on the flight deck to include safe stowage, crashworthiness, safety and use under normal environmental conditions including turbulence?	Yes □ No □ N/A □
Will the display be readable in all the ambient lighting conditions, both day and night, encountered on the flight deck?	Yes □ No □ N/A □
If the EFB device is intended to be used during critical phases of flight, does it demonstrate that it meets environmental qualification standards for radiated emissions for equipment operating in an airborne environment?	Yes □ No □ N/A □
Has the EFB been tested to confirm operation in the anticipated environmental conditions (e.g., temperature range, low humidity, altitude, etc.)?	Yes □ No □ N/A □
Is power to the EFB, either by battery and/or supplied power, available to the extent required for the intended operation?	Yes □ No □ N/A □
Have procedures been developed to establish the level of battery capacity degradation during the life of the EFB?	Yes □ No □ N/A □
Have procedures been developed which meet or exceed the OEM's battery recommendations?	Yes □ No □ N/A □
Has the operator ensured that the EFB hardware meets the requirements of the EFB software applications intended to be operated (e.g., in terms of memory or CPU requirements)?	Yes □ No □ N/A □

Part 2

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

Software Application (fill in name of software application)	
Does the software application installed on the EFB enable it to replace documents and charts required to be carried on board the aircraft?	Yes ☐ No ☐ N/A ☐
Does the software application proposed require regulatory approval prior to operational use?	Yes ☐ No ☐ N/A ☐
Has the software application been evaluated to confirm that the information being provided to the pilot is a true and accurate representation of the documents or charts being replaced?	Yes ☐ No ☐ N/A ☐
Has the software application been evaluated to confirm that the computational solution/s being provided to the pilot is a true and accurate solution (e.g., weight and balance, performance, etc.)?	Yes ☐ No ☐ N/A ☐
Does the software application have adequate security measures to prevent unauthorized database modifications and prevent contamination by external malware?	Yes ☐ No ☐ N/A ☐
Does the EFB system provide, in general, a consistent and intuitive user interface, within and across the various hosted applications?	Yes ☐ No ☐ N/A ☐
Has the EFB software been evaluated to consider HMI to include ease of access to common and time-critical system functions, consistency of symbols, terms and abbreviations, legibility of text, system responsiveness, methods of interaction, use of color, display of system status, error messages, management of multiple applications, off screen text/content and use of active regions?	Yes ☐ No ☐ N/A ☐
Does the software application follow basic Human Factors guidance as described in the Chapter 4?	Yes ☐ No ☐ N/A ☐
Has the operator considered the interdependencies of software applications and the EFB platform operating system, (e.g., a failed PDF viewer may block the pilot from accessing EFB applications)?	Yes ☐ No ☐ N/A ☐

Part 3

If EFB is not mounted, can it be easily stowed securely?	Yes □ No □ N/A □
Can the EFB be easily stowed securely but remain readily accessible in flight?	Yes □ No □ N/A □
Has the installation of the mounting device been approved in accordance with the appropriate airworthiness regulations?	Yes □ No □ N/A □
If the mounting device for the EFB is moveable, can it be easily be locked in place?	Yes □ No □ N/A □
Has a provision been provided to secure or lock the mounting device in a position out of the way of flight crew operations?	Yes □ No □ N/A □
Is it evident that there are no 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 □ No □ N/A □
If EFB mounting is on the control yoke, has it been checked for negative impact (e.g. has the flight control system dynamics been checked)?	Yes □ No □ N/A □
Has it been confirmed that the mounted EFB location does not impede crew ingress, egress and emergency egress path?	Yes □ No □ N/A □
Is it evident that the mounted EFB does not obstruct visual or physical access to aircraft displays or controls?	Yes □ No □ N/A □

Does the mounted EFB location minimize the effects of glare and/or reflections?	Yes □ No □ N/A □
Does the mounting method for the EFB allow easy access to the EFB controls and a clear unobstructed view of the EFB display?	Yes □ No □ N/A □
Is the EFB mounting easily adjustable by flight crew to compensate for glare and reflections?	Yes □ No □ N/A □
Does the placement of the EFB allow sufficient airflow around the unit, if required?	Yes □ No □ N/A □

Is there a means other than a circuit breaker to turn off the power outlet (e.g., can the pilot easily remove the plug from the installed outlet)?	Yes □ No □ N/A □
Does a placard specify electrical characteristics of the power outlet (e.g., 115 VAC, 60 Hz, 100 W)?	Yes □ No □ N/A □
If the EFB has an alternate backup power source, does the backup source have an equivalent level of safety to the primary power source?	Yes □ No □ N/A □
Is the power source suitable for the device?	Yes □ No □ N/A □
Have guidance/procedures been provided for battery failure or malfunction?	Yes □ No □ N/A □
Is power to the EFB, either by battery and/or supplied power, available to the extent required for the intended operation?	Yes □ No □ N/A □

Has the operator ensured, over the whole lifetime of the EFB, that its battery is adequate for its intended operation?	Yes □ No □ N/A □
Has the operator ensured that the batteries are compliant to acceptable standards?	Yes □ No □ N/A □
Is it evident that the EFB cabling does not present a hazard (e.g., it does not interfere with flight controls movement, egress, oxygen mask deployment, etc.)?	Yes □ No □ N/A □
Is there a means to secure the EFB cabling, if loose cables could compromise task performance and safety?	Yes □ No □ N/A □
Has the operator ensured that any cabling attached to the EFB, whether in the dedicated mounting or when hand held does not present an operational or safety hazard?	Yes □ No □ N/A □
Is stowage readily accessible in flight?	Yes □ No □ N/A □
Is it evident that stowage does not cause any hazard during aircraft operations?	Yes □ No □ N/A □
Is it evident that when the EFB is stowed, the device and its securing mechanism does 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 □ No □ N/A □

Part 4

Usability	
Is the EFB data legible under the full range of lighting conditions expected on the flight deck, including using direct sunlight?	Yes □ No □ N/A □
Can the brightness or contrast of the EFB display be easily adjusted by the flight crew for various lighting conditions?	Yes □ No □ N/A □
Can the hand held EFB be easily stowed during flight?	Yes □ No □ N/A □
Is it evident that the location of the EFB does not interfere with any normal or emergency procedures?	Yes □ No □ N/A □
Can the flight crew easily determine the validity and currency of the software application and databases installed on the EFB, if required?	Yes □ No □ N/A □

Part 5

Is the EFB administrator suitably trained?	Yes □ No □ N/A □
Is one person designated as the EFB administrator responsible for the complete system with appropriate authority within the operator's management structure?	Yes □ No □ N/A □
Do the listed responsibilities of the EFB administrator match the requirements of the EFB system?	Yes □ No □ N/A □
Are there adequate resources assigned for managing the EFB?	Yes □ No □ N/A □
Is there a clear description of the system, its operational philosophy and operational limitations?	Yes □ No □ N/A □
If there is an AFM or AFM supplement limitation, has the information been incorporated into the company Operations Manual?	Yes □ No □ N/A □
Are the requirements for EFB availability in the Operations Manual and/or as part of the minimum equipment list (MEL)?	Yes □ No □ N/A □
Have crew procedures for EFB operation been integrated within the existing Operations Manual?	Yes □ No □ N/A □
Are there suitable crew cross-checks for verifying safety-critical data (e.g., performance, weight & balance calculations)?	Yes □ No □ N/A □

If an EFB generates information similar to that generated by existing flight deck systems, do procedures identify which information will be primary?	Yes □ No □ N/A □
Are there procedures when information provided by an EFB does not agree with that from other flight deck sources, or, if more than one EFB is used, when one EFB disagrees with another?	Yes □ No □ N/A □
Are there procedures that specify what actions to take if the software applications or databases loaded on the EFB are out-of-date?	Yes □ No □ N/A □
Are there back-up procedures in place to prevent the use of erroneous information by flight crews?	Yes □ No □ N/A □
Is there a reporting system for system failures?	Yes □ No □ N/A □
Have crew operating procedures been designed to mitigate and/or control additional workload created by using an EFB?	Yes □ No □ N/A □
Are there procedures in place to inform maintenance and flight crews about a fault or failure of the EFB, including actions to isolate it until corrective action is taken?	Yes □ No □ N/A □
Do the procedures cover system re-boots, lock-ups and recovery from incorrect crew actions?	Yes □ No □ N/A □
Are there procedures/guidance for loss of data and identification of corrupt/erroneous outputs?	Yes □ No □ N/A □
Are there contingency procedures for total or partial EFB failure?	Yes □ No □ N/A □

Is there a procedure in the event of a dual EFB failure (e.g., use of paper checklist or a third EFB)?	Yes □ No □ N/A □
Have the EFB redundancy requirements been incorporated into the Ops Manual?	Yes □ No □ N/A □
Training	
Does the training material match the EFB equipment status and published procedures?	Yes □ No □ N/A □
Does the training program include human factors/CRM in relation to EFB use?	Yes □ No □ N/A □
Does the training program incorporate training system changes and upgrades in relation to EFB operation?	Yes □ No □ N/A □
Does the training cover the list of items in Attachment 5, Section 13: "Flight Crew Training"?	Yes □ No □ N/A □
Hardware Management Procedures	
Are there documented procedures for the control of EFB hardware?	Yes □ No □ N/A □
Do the procedures include repair, replacement and maintenance of EFB equipment and peripherals?	Yes □ No □ N/A □
Do the procedures include validation following repair?	Yes □ No □ N/A □
Software Management Procedures	
Are there documented procedures for the configuration control of loaded software?	Yes □ No □ N/A □

Are the access rights for personnel to install or modify software components clearly defined?	Yes □ No □ N/A □
Are there adequate controls to prevent user corruption of operating systems and software?	Yes □ No □ N/A □
Are there adequate security measures to prevent system degradation, malware and unauthorized access?	Yes □ No □ N/A □
Are procedures defined to track database expiration/updates?	Yes □ No □ N/A □
Are there documented procedures for the control and management of data?	Yes □ No □ N/A □
Are the access rights for users and managers clearly defined?	Yes □ No □ N/A □
Are there adequate safeguards to prevent user corruption of data?	Yes □ No □ N/A □
If the hardware is assigned to the flight crew, does a policy on private use exist?	Yes □ No □ N/A □

Attachment 4: Example of a Letter of Approval

香港特別行政區政府
民航處
Civil Aviation Department
The Government of the Hong Kong Special Administrative Region

APPROVAL

ELECTRONIC FLIGHT BAG (EFB)

I, Jackie Chan, being a person duly delegated for the purpose, hereby approve the use of (Portable/Installed) Electronic Flight Bag (EFB) by Sky Airlines Limited on Boeing 777 aircraft with the following software:

Type B Software Application:

- Operations Manuals A,B,C,D & E
- The Aircraft Flight Manual
- Performance Computations for Take Off & Landing

This Approval is granted subject to the following condition:

- The Sky Airlines Limited should ensure the continued compliance of the EFB software package with CAD 562.
- No amendments, revisions or additions to the specifications and the use of EFB as detailed in the Operations Manuals shall be made without the prior agreement of the Director-General of Civil Aviation.

This Approval shall have effect from the date hereon until the 31th day of January 2018, unless varied, suspended or revoked.

(Captain Jackie Chan)
for Director-General of Civil Aviation

Dated the 5th day of January 2015

Approval No. : AU/xxx/2015

Attachment 5: Details of Operational Consideration and Evaluation Process

1. The operator should ensure the continued compliance of the EFB software package with this Manual. The operator may demonstrate the fidelity and reliability of the system in different ways, but a detailed EFB risk assessment and suitable means of mitigation against failure or malfunction are required. Those evaluations will assess compliance with this Manual. The operator may choose to keep the paper backup as a cross-check against the EFB information and as a means of mitigation against failure. A combination of solutions, with limited on board paper backup, may also be used. The scope of the final operational evaluation test (see paragraph 14) will depend on the selected solutions. The air operations requirements do not foresee a prior approval of EFB. However, the CAD may, through the change management procedure, require the operator to notify any change concerning EFB. Modifications and amendments of database and/or software may also be required by the CAD. The operator should ensure that these modifications and amendments are incorporated and they follow the revision control procedures specified in Paragraph 11.1.

1.1 Role of the EFB system supplier

As stated in paragraph 1, the operator should ensure as well the compliance of the initial EFB software package (batch) with this Manual at the time it is delivered.

2. Risk assessment for EFB systems

2.1. General

Prior to the entry into operation of any EFB system, the operator should carry out a risk assessment as part of its hazard identification and risk management process.

The risk assessment should:

(a) evaluate the risks associated with the use of an EFB and to define the appropriate mitigation;

(b) identify potential losses of function or malfunction (detected and undetected erroneous output) and associated failure scenarios;

(c) analyse the operational consequences of these failure scenarios;

(d) establish mitigating measures; and

(e) ensure that the EFB system (hardware and software) achieves at least the same level of accessibility, usability, and reliability as the means of presentation it replaces.

In considering the accessibility, usability, and reliability of the EFB system, the operator should ensure that the failure of the complete EFB system as well as individual applications, including corruption or loss of data and erroneously displayed information, has been assessed and that the risks have been mitigated to an acceptable level.

This risk assessment should be defined before the beginning of the trial period and should be amended accordingly, if necessary, at the end of this trial period. The results of the trial should establish the configuration and use of the system. When the EFB system is intended for introduction alongside a paper-based system, only the failures that would not be mitigated by the use of the paper-based system need to be addressed. In all other cases, and especially when an accelerated introduction with a reduced trial period (as defined in 14.1) or paperless entry-into-service of a new EFB system is intended, a complete risk assessment should be carried out.

2.2. Assessing and mitigating the risks

Some EFB applications parameters may depend on crew/dispatchers entries whereas others may be parameters defaulted from within the system and subject to an administration process (e.g. the runway line-up allowance in an aircraft performance application). In the first case, mitigation means would concern mainly training and crew procedures aspects whereas in the second case, mitigation means would more likely focus on administrator and data management aspects.

The analysis should be specific to the operator concerned and should address at least the following points:

(a) Minimisation of undetected erroneous application output and assessment of worst case scenario;

(b) Erroneous outputs from the software application including:

- (i) description of corruption scenarios; and
- (ii) description of mitigation means.

(c) Upstream processes including:

- (i) reliability of root data used in applications (qualified/verified input data);
- (ii) software application validation and verification checks according to appropriate industry standards; and
- (iii) independence between application software, e.g. robust partitioning between Type A, B and other certified SW applications.

(d) Description of the mitigation means following detected loss of application, or detected erroneous output due to internal EFB error;

(e) Need to access to an alternate power supply, in order to achieve an acceptable level of safety for certain software applications, especially if used as a source of required information.

As part of the mitigation means, the operator should consider establishing a reliable alternative means of providing the information available on the EFB system. The mitigation means could be, for example, one or a combination of the following:

(a) system design (including hardware and software);

(b) alternative EFB possibly supplied from a different power source;

(c) EFB applications hosted on more than one platform;

(d) paper backup (e.g. Quick Reference Handbook (QRH));

(e) procedural means;

(f) training; and

(g) administration.

EFB system design features such as those assuring data integrity and the accuracy of performance calculations (e.g. a 'reasonableness' or 'range' check) may be integrated in the risk assessment performed by the operator.

When relevant, the EFB system supplier may also apply this risk assessment methodology to allow the operational environment to be taken into account and to support the development of the risk assessment by the operator.

3. Changes to EFB

Modifications to an EFB may have to be introduced, either by the EFB system suppliers, the EFB applications developers, or by the operator itself. The modifications which:

(a) do not bring any change to the calculation algorithm and/or to the HMI of a type B application,

(b) introduce a new Type A application or modify an existing one (provided its software classification remains Type A),

(c) do not introduce any additional functionality to an existing Type B application, or

(d) update an existing database necessary to use an existing Type B,

may be introduced by the operator without the need to notify the CAD. These changes should, nevertheless, be controlled and properly tested prior to use in flight. The modifications in the following non-exhaustive list are considered to meet these criteria:

(a) Operating system updates;

(b) Chart or airport database update;

(c) Update to introduce fixes (patch); and

(d) Type A application installation and modification.

For all other types of modification, the operator should apply the change management procedure approved by the CAD.

4. Dispatch considerations

The operator should establish dispatch criteria for EFB system. The operator should ensure that the availability of the EFB system is confirmed by pre-flight checks. Instructions to flight crew should clearly define the actions to be taken in the event of any EFB system deficiency. Mitigation may be in the form of maintenance and/or operational procedures such as:

(a) replacement of batteries at defined intervals as required;

(b) fully charged backup battery on board;

(c) procedures for the flight crew to check the battery charging level before departure; and

(d) procedures for the flight crew to switch off the EFB in a timely manner when the aircraft power source is lost.

4.1. Dispatch with inoperative EFB elements

In case of partial or complete failure of the EFB, alternative dispatch procedures should be followed. These procedures should be included either in the Minimum Equipment List (MEL) or in the Operations Manual and ensure an acceptable level of safety.

MEL coverage can be granted only when the corresponding item exists in the applicable Master Minimum Equipment List (MMEL) or MMEL supplement of the aircraft type.

Particular attention should be paid to alternative dispatch procedures to obtain operational data (e.g. performance data) in case of a failure of an EFB hosting applications providing such calculated data.

When data input and output integrity is obtained by cross-checking and gross error checks, the same checking principle should apply to alternative dispatch procedures to ensure equivalent protection.

5. Human factors assessment

The operator should carry out an assessment of the human machine interface, installation, and aspects governing Crew Resource Management (CRM) when using the EFB system. Elements to be assessed are provided in Chapter 4.

In addition to any possible already performed assessment for which the operator may take credit, the human machine interface assessment should be carried by each operator for each kind of device and application installed on the EFB. Each operator should assess the integration of the EFB into the flight deck environment, considering both physical integration (anthropometrics, physical interferences, etc.) and cognitive ergonomics (compatibility of look and feel, workflows, alerting philosophy, etc.).

6. Specific Considerations for mass and balance and performance applications

A specific part of the evaluation will be dedicated to the verification that aircraft performance or mass and balance data provided by the application are correct in comparison with data derived from the AFM (or other appropriate sources) under a representative cross check of conditions (e.g. for performance applications: take-off and landing performance data on a dry, wet and contaminated runway, different wind conditions and aerodrome pressure altitudes, etc.).

Further considerations regarding the assessment can be found in Attachment1A. The HMI training and crew procedures should as well be part of the evaluation.

Where there is already a certified mass and balance and performance application (e.g. hosted in the FMS), the operator should ensure independence of EFB and avionics based algorithms or other appropriate means.

7. Flight crew operating procedures

7.1 Procedures for using EFB systems with other flight crew compartment systems

Procedures should be established to ensure that the flight crew know which aircraft system to use for a given purpose, including the EFB system. Procedures should define the actions to be taken by the flight crew when information provided by an EFB system is not consistent with that from other flight crew compartment sources, or when one EFB system shows different information than the other. If an EFB system generates information similar to that generated by existing automation, procedures should clearly identify which information source will be the primary, which source will be used for backup information, and under which conditions the backup source should be used.

7.2 Flight crew awareness of EFB software/database revisions

The operator should have a procedure in place to verify that the configuration of the EFB, including software application versions and, where applicable, database versions, are up to date. Flight crews should have the ability to easily verify database version effectivity on the EFB. Nevertheless, flight crews should not be required to confirm the revision dates for other databases that do not adversely affect flight operations, such as maintenance log forms or a list of airport codes. An example of a date-sensitive revision is that applied to an aeronautical chart database. Procedures should specify what actions should be taken if the software applications or databases loaded on the EFB system are out of date.

7.3 Procedures to mitigate and/or control workload

Procedures should be designed to mitigate and/or control additional workload created by using an EFB system. The operator should implement procedures that, while the aircraft is in flight or moving on the ground, flight crew members do not become preoccupied with the EFB system at the same time. Workload should be allocated between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. These procedures should be strictly applied in flight and should specify the times at which the flight crew may not use the EFB system.

7.4 Defining flight crew responsibilities for performance calculations

Procedures should be established to define any new roles that the flight crew and dispatch office may have in creating, reviewing, and using performance calculations supported by EFB systems.

8. Compliance monitoring

The operator should include the EFB system in its compliance monitoring program. The purpose is to provide confidence that EFB operations and administration are conducted in accordance with all applicable requirements, standards, and operational procedures.

9. EFB system security

The EFB system (including any means used for its updating) should be secure from unauthorised intervention (e.g. malicious software). The operator should ensure that adequate security procedures are in place to protect the system at software level and to manage hardware (e.g. identification of the person to whom the hardware is released, protected storage when the hardware is not in use). These procedures should guarantee that prior to each flight the EFB operational software works as specified and the EFB operational data is complete and accurate. Moreover, a system should be in place to ensure that the EFB does not accept a data load that contains corrupted contents. Adequate measures should be in place for compilation and secure distribution of the data to the aircraft.

The procedures should be transparent, easy to understand to follow and to oversee:

(a) if an EFB is based on consumer electronics, e.g. a laptop, which can be easily removed, manipulated, or replaced by a similar component, then special consideration should be shown to the physical security of the hardware;

(b) portable EFB platforms should be subject to allocation tracking to specific aircraft or persons;

(c) where a system has input ports and especially if widely known protocols are using these ports or internet connections are offered, then special consideration should be shown to the risks associated with these ports;

(d) where physical media is used to update the EFB system and especially if widely known types of physical media are used, then the operator should use technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through these media.

The required level of EFB security depends on the criticality of the used functions (e.g. an EFB which only holds a list of fuel prices may require less security than an EFB used for performance calculations).

Beyond the level of security required to assure that the EFB can properly perform its intended functions, the level of security ultimately required depends on the abilities of the EFB.

Examples of typical safety and security defenses are contained in the following non exhaustive list:

(a) Individual system firewalls;

(b) Clustering of systems with similar safety standards into domains;

(c) Data encryption & authentication;

(d) Virus scans;

(e) Keeping the OS up to date;

(f) Initiating air/ground connections only when required and always from the aircraft;

(g) ‘Whitelists’ for allowed Internet domains;

(h) VPNs;

(i) Granting of access rights on a need-to-have basis;

(j) Troubleshooting procedures should consider as well security threats as potential root cause of EFB misbehavior, and responses should be developed to prevent future successful attacks when relevant;

(k) Virtualization; and

(l) Forensic tools and procedures.

The EFB administrator should not only keep the EFB system, but also his/her knowledge about security of EFBs systems up to date.

10. Electronic signatures

In order to be accepted as an equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and should, as a minimum, assure the same degree of security as the handwritten or any other form of signature it intends to replace.

In the case of legally required signatures, an operator should have in place procedures for electronic signatures, acceptable to the CAD, that guarantee:

(a) **the uniqueness**: A signature should identify a specific individual and be difficult to duplicate;

(b) **the significance**: An individual using an electronic signature should take deliberate and recognizable action to affix his or her signature;

(c) **the scope**: The scope of information being affirmed with an electronic signature should be clear to the signatory and to subsequent readers of the record, record entry, or document;

(d) **the signature security**: The security of an individual's handwritten signature is maintained by ensuring that it is difficult for another individual to duplicate or alter it;

(e) **the non-repudiation**: An electronic signature should prevent a signatory from denying that he or she affixed a signature to a specific record, record entry, or document. The more difficult it is to duplicate a signature, the likelier the signature was created by the signatory; and

(f) **the traceability**: An electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. Systems using either a PIN or a password with limited validity (time-wise) may be appropriate in providing positive traceability to the individual who appended it. Advanced electronic signatures, qualified certificates and secured signature-creation devices needed to create them are typically not required for EFBs operations.

Note 1: The provision of secure access to EFB functions is outside the scope of this section, which only addresses the replacement of handwritten signature by an electronic one.

Note 2: The corresponding legal requirements on electronic signatures are detailed in Cap 553 Electronic Transaction Ordinance.

11. Role of the EFB administrator

The role of the EFB administrator is a key factor in the management of the EFB system of an operator. Complex EFB systems may require more than one individual to conduct the administration process, but one person should be designated as the EFB administrator responsible for the complete system with appropriate authority within the operator's management structure.

The EFB administrator will be the person in overall charge of the EFB system, and will be responsible for ensuring that any hardware conforms to the required specification, and that no unauthorised software is installed. He/she will also be responsible for ensuring that only the current version of the application software and data packages are installed on the EFB system.

The EFB administrator is responsible:

(a) for all the applications installed, and for providing support to the EFB users on these applications;

(b) to check potential security issues associated with the application installed;

(c) for hardware and software configuration management and for ensuring, in particular, that no unauthorised software is installed;

(d) for ensuring that only a valid version of the application software and current data packages are installed on the EFB system; and

(e) for ensuring the integrity of the data packages used by the applications installed.

The operator should make arrangements to ensure the continuity of the management of the EFB system in the absence of the EFB administrator. EFB administration should be subject to independent routine audits and inspections as part of the operator's compliance monitoring program (see paragraph 8). Each person involved in EFB administration should receive appropriate training in their role and should have a good working knowledge of the proposed system hardware, operating system, and relevant software applications, and also of the appropriate regulatory requirements related to the use of EFB. The content of this training should be determined with the aid of the EFB system supplier or application supplier. The administrator training material should be made available on request to the CAD.

11.1 The EFB policy and procedures manual

The (S)TC holder, the EFB system supplier or the operator in the case of consumer device should clearly identify those parts of the EFB system that can be accessed and modified by the operator's EFB administration process and those parts that are only accessible by the EFB system supplier. The EFB administrator should establish procedures, documented in an EFB policy and procedures manual, to ensure that no unauthorised changes take place. The EFB policy and procedures manual may be fully or partly integrated in the Operations Manual. The EFB policy and procedures manual should also address the validity and currency of EFB content and databases, ensuring, thus, the integrity of EFB data. This may include establishing revision control procedures so that flight crews and others can ensure that the contents of the system are current and complete. These revision control procedures may be similar to the revision control procedures used for paper or other storage means. For data that is subject to a revision cycle control process, it should be readily evident to the user which revision cycle has been incorporated in the information obtained from the system. Procedures should specify what action to take if the applications or databases loaded on the EFB are out of date. This manual may include, but is not limited to, the following:

(a) Document changes to content/databases;

(b) Notification to crews of updates;

(c) If any applications use information that is specific to the aircraft type or tail number, ensuring that the correct information is installed on each aircraft;

(d) Procedures to avoid corruption/errors during changes to the EFB system; and

(e) In case of multiple EFBs in the flight crew compartment, procedures to ensure that they all have the same content/databases installed.

The EFB administrator should be responsible for the procedures and systems, documented in the EFB policy and procedures manual that maintain EFB security and integrity. This includes system security, content security, access security, and protection against harmful software (see paragraph 9).

Note: An example of the subjects relevant for inclusion in the EFB policy and procedures manual is included at Attachment 1H.

12. EFB system maintenance

Procedures should be established for the routine maintenance of the EFB system and how unserviceability and failures are to be dealt with to ensure that the integrity of the EFB system is assured. Maintenance procedures may also need to include the secure handling of updated information and how it is accepted and then promulgated in a timely and complete format to all users and aircraft platforms.

The operator is responsible for the maintenance of EFB system batteries, and should ensure that they are periodically checked and replaced as required.

Should a fault or failure of the system come to light, it is essential that such failures are brought to the immediate attention of the flight crew and that the system is isolated until rectification action is taken. In addition to backup procedures, to deal with system failures, a reporting system will need to be in place so that the necessary action, either to a particular EFB system, or to the whole system, is taken in order to prevent the use of erroneous information by flight crews.

13. Flight crew training

Flight crew should be given specific training on the use of the EFB system before it is operationally used. Training should be in accordance with operator's SOP (including abnormal procedures) and should include at least the following:

(a) An overview of the system architecture;

(b) Pre-flight checks of the system;

(c) Limitations of the system;

(d) Specific training on the use of each application and the conditions under which the EFB may and may not be used;

(e) Restrictions on the use of the system, including where some or the entire system is not available;

(f) Procedures for normal operations, including cross-checking of data entry and computed information;

(g) Procedures to handle abnormal situations, such as a late runway change or diversion to an alternate aerodrome;

(h) Procedures to handle emergency situations;

(i) Phases of the flight when the EFB system may and may not be used;

(j) CRM and human factor considerations on the use of the EFB; and

(k) Additional training for new applications, new features of current application, or changes to the hardware configuration; and

(l) Recurrent training and proficiency checks.

As far as practicable, it is recommended that the training simulators' environments include the EFBs in order to offer a higher level of representativeness.

Consideration should also be shown to the role that the EFB system plays in operator proficiency checks as part of recurrent training and checking, and to the suitability of the training devices used during training and checking.

EFB training should be included in the relevant training program approved by CAD.

14. Operational evaluation test

The operator should conduct an operational evaluation test which should allow verifying that the above elements have been satisfied before final decision on the operational use of the EFB. The operator should notify CAD of its intention to conduct an operational evaluation test by sending a plan which should contain at least the following information:

(a) starting date of the operational evaluation test;

(b) duration;

(c) aircraft involved;

(d) EFB hardware and type(s) of software(s); and

(e) when no paper backup is retained:

  (i) EFB detailed risk assessment,

  (ii) simulator LOFT session program, and

  (iii) proposed flights for the CAD observation flights.

14.1 Applications replacing paper products with an initial retention of paper backup

Where paper is initially retained as backup, the operational evaluation test should consist of an in-service proving period no longer than six months. A reduction to no less than three months may be considered taking into account the following criteria:

(a) the operator's previous experience with EFBs,

(b) the intended use of the EFB system, and

(c) the mitigation means defined by the operator.

An operator wishing to reduce the six months operational evaluation test should submit to the CAD a request with justification in its operational evaluation plan.

The CAD may ask for an operational evaluation test lasting more than six months if the number of flights operated in this period is not considered sufficient to evaluate the EFB system.

The purpose of the in-service proving period is for the operator to demonstrate that the EFB system provides an acceptable level of accessibility; usability and reliability. In particular that:

(a) the flight crews are able to operate the EFB applications without reference to paper;

(b) the operator's administration procedures are in place and function correctly;

(c) the operator is capable of providing timely updates to the applications on the EFB, where a database is involved;

(d) the introduction of the EFB without paper backup does not adversely affect the operator's operating procedures and alternative procedures for use when the EFB system is not available provide an acceptable equivalent;

(e) for a system including uncertified elements (hardware or software), that the system operates correctly and reliably; and

(f) the EFB risk assessment, as required under 2, is adequate to the type of operations intended after the operational evaluation test (with or without paper backup).

The results of the demonstration may be documented in the form of a report from the in- service proving period on the performance of the EFB system.

The operator may remove the paper backup once it has shown that the EFB system is sufficiently robust.

14.2 Applications replacing paper products without paper backup at commencement of operations and other applications

Where an operator seeks to start operations without paper backup, the operational evaluation test should consist of the following elements:

(a) a detailed review of the EFB risk assessment;

(b) a simulator LOFT session to verify the use of the EFB under operational conditions including normal, abnormal, and emergency conditions; and

(c) observation by the CAD of the initial operator's line flights.

The operator should demonstrate that they will be able to continue to maintain the EFB to the required standard through the actions of the Administrator and Compliance Monitoring Program.

15. Final operational report

The operator should produce and retain a final operational report, which summarizes all activities conducted and the means of compliance used, supporting the operational use of the EFB system.

Attachment 6: Application for Electronic Flight Bag Operational Approval

Please complete the form in BLOCK CAPITALS using black or dark blue ink after reading the attached guidance.

This form is designed to elicit all the required information from those operators requiring the Electronic Flight Bag (EFB) operational approval. Completed form should be submitted to the Flight Standards and Airworthiness Division (FSAD), Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport, Lantau, Hong Kong.

The assessment to the application of EFB Operational Approval is based on CAD 562.

1. SCOPE & GENERAL INFORMATION

1.1△	**EFB**	EFB Type: ☐ Portable ☐ Installed Software application(s) type: ☐A ☐B
1.2△	**Operator Name**	
	Flight OPS Manager	Tel:
	EFB Administrator	Tel:
	EFB Administrator e-mail contact	
1.3	**Aircraft Registration(s)**	
	Manufacturer	
	Type/Model(s)	
	Serial No(s)	

△See Paragraph 8

2. HARDWARE PLATFORM

2.1	**Hardware Type No.**	
2.2	EFB to be used	☐ on ground ☐ in-flight cruise only ☐ in-flight all phases
	EFB to be used by	☐ Cockpit crew ☐ Cabin crew
2.3△	**Data Storage Device**	☐ HD ☐ CD ☐ DVD ☐ FD ☐ Other
	Remark	
2.4△	**Data Transfer Device**	Bluetooth ☐ IR ☐ USB ☐ Firewire ☐ Serial ☐ Parallel ☐ Other ☐
	Remark	
2.5△	**Cursor Navigation**	Touch screen Touch pad Mouse Track ball Keyboard Other
	Installed and used	☐ ☐ ☐ ☐ ☐ ☐
	Remark	
2.6	**Lithium Battery Used**	☐ yes ☐ no
	If yes →	☐ Specific items are addressed and regulations are included in the operational documentation.
2.7	**Onboard Power Used**	☐ yes ☐ no
	If yes →	Power source certified to be used ☐ in-flight ☐ on ground

3. SOFTWARE APPLICATION(S)

3.1△	**Operating System Description**	(e.g. MS Windows, MAC, Linux or Android)
	Remark	
3.2△	**Program(s) Based on**	☐MS Office ☐Adobe PDF ☐Html ☐Manufacturer Application
	Remark	
3.3	**Kind of Software**	☐ Data presentation ☐ Data processing
	Remark	
3.4	**Program Settings**	handled by ☐ System administrator ☐ End user
	Remark	
3.5△	**Intentions / Tasks to be Done by EFB**	
3.6△	**Classification**	☐ Type A ☐ Type B

△See Paragraph 8

4. OPERATION & TRAINING DOCUMENTATIONS

	Scope:	Document Number /Chapter and Subchapter of the Relevant Manual
4.1	**System Administration & Database Update**	
4.2	**System Description**	
4.3	**System Operation**	
4.4	**System Failure (Contingency Procedure)**	
4.5	**Crew Basic Training**	
4.6	**Crew Recurrent Training**	
4.7	**MEL Reference**	

5. AIRWORTHINESS DOCUMENTATIONS

	Scope:	Document Number /Chapter and Subchapter of the Relevant Manual
5.1△	**Certification Documentation**	
5.2△	**Instruction for Continuing Airworthiness**	

6. APPLICATION PACKAGE

Operations manual(s) extract(s) and/or checklist(s) that include EFB operating practices and procedures.

☐ OM/A ☐ OM/B ☐ OM/C ☐ OM/D ☐ QRH ☐ MEL ☐ AFM ☐ Others

☐ EMI demonstration report ☐ Operational Risk Analysis

△See Paragraph 8

7. EFB APPLICANT'S STATEMENT

The undersigned certify the enclosed information to be complete and true and that the system installation, continuing airworthiness of systems, minimum equipment for dispatch, operating procedures and flight crew training comply with the requirements of CAD 562 for EFB systems.

Name of EFB Administrator	Signature:	Date:
Name of Flight OPS Manager	Signature:	Date:

8. NOTES FOR APPLICATION

Most of the fields are self-explanatory. Those probably requiring further explanations are listed below:

1.1	EFB	Evaluate EFB type and software type from the criteria stated in CAD 562.
1.2	Operator	In addition to the phone contacts to the responsible persons, please provide an e-mail address for EFB Administrator as he/she is the focal point of contact.
2.3	Data storage device	If [Other] is ticked, more information shall be given under [Remark].
2.4	Data transfer device	
2.5	Cursor navigation	
3.1	Operating System	If the operating system used is not addressed in the selection, information shall be given under [Remark].
3.2	Program(s) Based on	If the program used is not addressed in the selection, information shall be given under [Remark].
3.5	Intention/Tasks to be done by EFB	List or describe all tasks, with reference to CAD 562 Attachment 3 to be handled by the proposed EFB.
3.6	Classification	State Classification according CAD 562 Chapter 2 and Attachment 3.
5.1	Certification Documentation	The Certification documentation should be demonstrated according to CAD 562 Chapter 2 and Attachment 3.
5.2	ICA Documentation	Documents such as Maintenance Schedule, Maintenance Manual and IPC.

When completed, the form should be signed by the relevant persons. The application package should comprise the following documents:

- EFB application form
- Extract of OM A/B/C/D containing any information about the EFB such as system description, limitations, operating procedures and the operator's quality system related to the EFB
- Compliance checklist(s) for revised Manual(s)
- Any certification documents of concern

Note: A minimum of 60 working days will normally be required to check and confirm the information given above. If data and/or application package are missing or omitted the process may take considerably longer.

9. APPROVAL ASSESSMENT (FOR CAD USE ONLY)

Subject	Responsible	Signature	Date
Application package complete	FSO		
Operational and training document reviewed and considered satisfactory	FSO		
Airworthiness document reviewed and considered satisfactory	AWO		
Demo: Simulator ☐ Aircraft ☐	FSO		
Evaluation Test agreed to commence on …………….	FSO		
Operator's Evaluation Test reports reviewed and considered satisfactory	FSO		
	AWO		
EFB approval issued & process completed	FSO		