

The Republic of the Union of Myanmar
Ministry of Transport and Communications
Department of Civil Aviation



Manual on Electronic Flight Bags (EFB)

Published by

Flight Standards Division

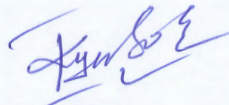
First Edition – October 2021

[THIS PAGE INTENTIONALLY LEFT BLANK]

Preface

As a government authority, DCA must ensure that the decisions we make and the processes by which we make them, are effective, efficient, fair, timely, transparent, properly documented and otherwise comply with the requirements of the law. At the same time, we are committed to ensuring that all of our actions are consistent with the requirements.

A thorough knowledge of the relevant civil aviation requirements, adherence to the procedures described in this manual will help to guide and inform the decisions you make, with a view to better ensuring the achievement of optimal outcomes in the interest of safety.


Kyaw Soe

Director General (Acting)
Department of Civil Aviation

Revision History

The table below is provided as a reference to highlight when a major changes were made to the content of this manual. It does not cover editorial changes. Amendments/ revisions of this manual are recorded below in order of most recent first.

Edition No.	Revision No.	Action	Date	Subject	Inserted by
First	00	-	Oct 2021	-	FSD

Table of contents

Preface		3
Revision History		4
Introduction		7
Glossary		8
Definitions		9
Chapter 1	Equipment and Hardware Considerations	11
	1.1 Types of EFBs	11
	1.2 Hardware considerations for installed resources and mounting devices	11
	1.3 Hardware considerations for portable EFBs	12
Chapter 2	Human Factors	19
Chapter 3	Crew Operating Procedures	20
	3.1 General	20
	3.2 Revisions and Updates	20
	3.3 Workload and Crew Coordination	20
	3.4 Reporting	21
Chapter 4	Flight Crew Training	22
Chapter 5	EFB Risk Assessment	23
	5.1 General	23
	5.2 EFB Failures and Mitigation Means	23
Chapter 6	EFB Functions	24
	6.1 General	24
	6.2 Considerations for all EFB applications	26
	6.3 Considerations for EFB applications to be used for the safe operation of aircraft	28
Chapter 7	Operational Evaluation Process	30
	7.1 Operational Evaluation Process	30
	7.2 Phase I - Pre-Application discussion	30
	7.3 Phase II - Formal Application	30
	7.4 Phase III - DCA Review	30

	7.5	Phase IV- Operational Evaluation	31
	7.6	Phase V- Issuance of EFB Operations Specifications and Approval	32
Chapter 8		EFB use in General Aviation Operations with Helicopters or other than Large or Turbo Aeroplanes	33
	8.1	Equipment/ Hardware Considerations	33
	8.2	Pilot Operating Procedures	33
	8.3	Pilot Training	33
	8.4	EFB Risk Assessment	33
	8.5	EFB Functions	34
	8.6	Evaluation Process	34
APPENDIX-A		Guidance for EFB Software Applications	35
	1	Performance (Take-off, Landing) and Mass and Balance (M&B) Applications	35
	2	Electronic Charting Application	43
	3	Aircraft Exterior Video Surveillance	44
	4	Airport Moving Map (AMM)	45
	5	Electronic Checklist Application	47
	6	In-Flight Weather (IFW) Application	50
APPENDIX-B		Electronic Flight Bag (EFB) Hardware & Software Evaluation Checklist	53
APPENDIX-C		Electronic Flight Bag (EFB) Operational Evaluation Checklist	64
APPENDIX-D		Electronic Flight Bag (EFB) Line Evaluation Checklist	75
APPENDIX-E		Example of Operations Specifications and Operations Manual Content	80
APPENDIX-F		EFB Policy and Procedures Manual	82
APPENDIX-G		EFB Policy and Procedures Manual Checklist	83

Introduction

This purpose of this manual is to provide the DCA staff and air operators with standard procedures and guidelines for processing an application and approval of Electronic Flight Bags. By adhering to the work steps outlined in this manual, a standard approach consistent with regulatory requirements will be created and maintained when applying and approving Electronic Flight Bags.

This manual is based on the following document:

1. ICAO Doc.10020- Manual on Electronic Flight Bags.
2. CAAS AC 98-7-1
3. FAA- Flight Standards Information Management System-8900.1, Volume 4, Chapter-15

Air Operators are encouraged to use the EFB system as a source of information and this manual does not address EFB airworthiness issues.

Glossary

Acronym/ Abbreviation	Description
AFM	Aircraft Flight Manual
AID	Aircraft Interface Device
AMM	Airport Moving Map
AOC	Airline Operations Center
AODB	Airport, Runway, Obstacle Database
DCA	Department of Civil Aviation
CDL	Configuration Deviation List
ECL	Electronic Checklist
EFB	Electronic Flight Bag
EMI	Electromagnetic Interference
FCOM	Flight Crew Operating Manual
GNSS	Global Navigation Satellite System
HMI	Human-Machine Interface
IFW	In-flight Weather
M&B	Mass and Balance
MEL	Minimum Equipment List
OEM	Original Equipment Manufacturer
PED	Portable Electronic Device
SCAP	Standardised Computerised Aircraft Performance
SOP	Standard Operating Procedure
STC	Supplemental Type Certificate
TC	Type Certificate
TOM	Take-off Mass
T-PED	Transmitting PED
WAFS	World Area Forecast System
ZFM	Zero Fuel Mass

Definitions

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

Critical phases of flight. The period of high workload on the flight deck, normally being the periods between the beginning of taxiing until the aircraft is on the route climb phase and between the final part of descent to aircraft parking.

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

EFB software application. Software hosted on an EFB platform, providing one or more EFB functions.

EFB management. Contains all procedures related to the operator's EFB management system as listed in the section "EFB management".

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

Independent EFB platforms. Multiple EFB platforms that are designed such that no single failure makes all of them unavailable.

Operator. The person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Portable electronic device (PED). Any lightweight, electrically-powered equipment. These devices are typically consumer electronic devices capable of communication, data processing and/or utility. Examples range from handheld, lightweight electronic devices such as tablets, e-readers, and smart phones to small devices such as MP3 players and electronic toys.

Note.— The definition of PED encompasses both transmitting and non-transmitting PEDs.

Standard operating procedure (SOP). Flight crew operating procedures as described in the flight operations manuals.

Transmitting PED. A PED that contains an intentional transmitter, which has some or all of the device's radio frequency transmitting functions turned on. Intentional transmitters may include devices enabled with cellular technology, wireless radio frequency network devices, and other wireless-enabled devices such as remote control equipment (which may include toys), two-way radios, cellular/mobile/smart phones and satellite phones.

Chapter 1

Equipment and Hardware Considerations

1.1 Types of EFBs

EFBs can be either portable EFBs or installed EFBs.

- a) **Portable EFBs** are not part of the aircraft configuration and are considered to be PEDs. They generally have self-contained power and may rely on data connectivity to achieve full functionality. Modifications to the aircraft to use portable EFBs require the appropriate airworthiness approval.
- b) **Installed EFBs** are integrated into the aircraft, subject to normal airworthiness requirements and under design control. The approval of these EFBs is included in the aircraft's type certificate (TC) or in a supplemental type certificate (STC).

1.2 Hardware considerations for installed resources and mounting devices

Installed resources should be certified during the certification of the aircraft, through service bulletins by the original equipment manufacturer (OEM) or through a third-party STC.

1.2.1 Mounting Devices

If the mounting is permanently attached to the aircraft structure, the installation will be approved in accordance with the appropriate airworthiness regulations. The following guidance may be considered for that purpose:

- a) The mounting method for the EFB should allow the pilot (when strapped in a seated position) to have easy access to the EFB controls and a clear unobstructed view of the EFB display. The EFB should be located such that the effects of glare and/or reflections are minimized. Flight crew should be able to make adjustments to compensate for glare and reflections.
- b) It should be confirmed that the intended EFB hardware in its mounting device does not obstruct visual or physical access to aircraft displays, controls or external vision, and that its location does not impede crew ingress, egress and emergency egress paths.
- c) There should be no mechanical interference between the EFB in its mounting device and any of the flight controls in terms of full and free movement, under all operating conditions, and no interference with buckles, oxygen hoses, etc.

1.2.2 Data Connectivity

1.2.2.1 The capability of connecting the EFB to certified aircraft systems has to be covered by an airworthiness approval.

1.2.2.2 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, eg. 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.

1.2.3 Power to the EFB

Installed power provisions should comply with the applicable airworthiness regulations. Connection of the EFB 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.

1.3 Hardware considerations for portable EFBs

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

1.3.1 Physical characteristics

The size and practicality of the EFB should be evaluated as some devices may prove to be cumbersome for normal use on a flight deck.

1.3.2 Readability

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

1.3.3 Environmental

The EFB has to be operable within the foreseeable cockpit operating conditions including probable high/low temperatures, and after rapid depressurization if the EFB is intended for use in such an event.

1.3.4 Basic non-interference testing

1.3.4.1 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.

1.3.4.2 As previously noted, portable EFBs are considered to be PEDs. As such, any reference to PEDs in this section is also applicable to portable EFBs.

1.3.4.3 To operate a portable EFB during flight, the user/operator is responsible for ensuring that a portable EFB will not interfere in any way with the operation of aircraft equipment. The following methods can be used to test portable EFBs that are to remain powered (including being in standby mode) throughout the flight, in order to ensure that they will not electromagnetically interfere with the operation of aircraft equipment.

1.3.4.4 Method 1

- a) **Step 1** is 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, then the test is complete. However, if this step identifies inadequate margins for interference, then step 2 testing must be conducted.
- b) **Step 2** 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 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.

1.3.4.5 Method 2

As an alternative, Step 2 of Method 1 can be used directly to determine non-interference of the EFB.

1.3.5 Additional testing for transmitting portable EFBs

1.3.5.1 To activate the transmitting functions of a portable EFB 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 must 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.

1.3.5.2 This test consists of two separate test requirements:

- a) **Test Requirement 1.** Each model of the device should have an assessment of potential electromagnetic interferences (EMI) based on a representative sample of its frequency and power output. This EMI assessment should follow a protocol such as 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's intentional transmissions (Test Requirement 1), and basic non-interference testing has been conducted with the device not deliberately transmitting (see Chapter 3, 3.4), non-interference testing should be conducted with an operating transmit function. 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.

1.3.6 Power supply

1.3.6.1 The operator shall ensure that power to the EFB, either by battery or externally supplied power, is available to the extent required for the intended operation.

1.3.6.2 If an operator intends to solely use battery power for the EFB or in the instance of a power source failure; the EFB discharge rates, battery conservation techniques and minimum EFB charge rates for dispatch should be documented.

1.3.6.3 If the EFB hosts functions essential to safe operation of flight, one of the following must be available before a flight departs:

- a) an established procedure to recharge the battery from aircraft power during flight operations.
- b) a battery or batteries with a combined useful battery life to ensure operational availability during taxi and flight operations to include diversions and reasonable delays considering duration of flight.

- c) an acceptable mitigation strategy providing availability of aeronautical information for the entire duration of flight authorised by the Principal Operations Inspector (POI).

1.3.6.4 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.

1.3.6.5 The power source needs to be suitable for the device. It may be a dedicated power source or a general purpose source already fitted.

1.3.6.6 Means to turn off the power source, other than a circuit breaker, should be reachable by the pilot when strapped in the normal seated position (e.g. access to unplug the EFB or a separate hardware or software switch clearly labelled for the power source).

1.3.7 Batteries

1.3.7.1 The operator shall ensure that the batteries are compliant with the applicable Standards for use in an aircraft.

1.3.7.2 The standards referred to in the following subparagraphs are currently accepted editions:

- a) United Nations (UN) Transportation Regulations. UNST/SG/AC.10/11/Rev.5, 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 60950-1,3 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.

1.3.7.3 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.

1.3.7.4 The operator should consider introducing procedures to handle thermal runaways or similar battery malfunctions potentially caused by EFB batteries (e.g. lithium-based batteries). At least the following issues should be addressed:

- a) risk of leakage;
- b) safe storage of spares including the potential for short circuit; and
- c) hazards due to on-board continuous charging of the device, including battery overheat.

1.3.8 Cabling

The operator shall ensure that any cabling attached to the EFB, whether in the dedicated mounting or when handheld, does not present an operational or safety hazard. This may be achieved using cable tether straps/ clips.

1.3.9 Temperature rise

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

1.3.10 Data connectivity between EFBs

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

1.3.11 Data connectivity to aircraft systems

See section 1.2.2

1.3.12 External connectivity

Some EFBs may have a provision for external ports other than power or data connectivity with aircraft systems (e.g. an antenna or a data connection to the operator ground network). 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.

1.3.13 Storage

1.3.13.1 All handheld EFBs not secured on the flight crew (e.g. kneeboard) or into an existing aircraft part (e.g. suction cups) need to be stowed during critical phases of flight to ensure the safety of the occupants of the flight deck. Stowage needs to be configured such that the EFB can be easily stowed securely but remain readily accessible in-flight. The method of stowage should not cause any hazard during aircraft operations.

Viewable stowage

1.3.13.2 A portable EFB (not mounted in a mounting device) may be used during all phases of flight provided that it is secured on the flight crew or into an existing aircraft part with the intended function to hold acceptable light mass portable devices viewable to the pilot's required duty station. This viewable stowage device is not necessarily part of the certified aircraft configuration. Its location should be documented in the EFB policy and procedures manual.

1.3.13.3 Some types of viewable stowage securing means may have characteristics that degrade appreciably with age or because of various environmental factors. In that case, it should be ensured that the stowage characteristics remain within acceptable limits for the proposed operations. Securing means based on vacuum (e.g. suction cups) which have a holding capacity that decreases with pressure. It should be demonstrated that they will still perform their intended function at operating cabin altitudes.

1.3.13.4 Viewable stowage solutions must not interfere with flight control movement, obstruct visual or physical access to controls and/or displays, or obstruct flight crew member ingress or egress. Viewable stowage should minimise blockage of the windshields to allow the pilots to maintain a clear view of critical outside references (e.g., during ground operations, taxiing, takeoff, approach, and landing). Training and procedures must address specific and acceptable placement of viewable stowage devices.

1.3.13.5 Regardless of whether an EFB is secured using either a certified mounting device or viewable stowage, the following guidance should be considered:

- a) There must be no interference with flight control movement, obstruction to visual or physical access to controls and/or displays or obstruct flight crew member ingress or egress.
- b) The pilot should have easy access to the EFB controls and a clear unobstructed view of the EFB when strapped in the normal seated position. The effects of glare and/or reflections should be minimised. This may be

accomplished by providing some adjustment to the pilot to compensate for glare and reflections.

- c) Blockage of windshields should be minimised to allow the pilots to maintain a clear view of critical outside references (eg. During ground operations, taxiing, takeoff, approach and landing).

Chapter 2

Human Factors

The operator shall 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 is not limited to, the following:

- a) general considerations including workload, usability, integration of the EFB into the flight deck, display and lighting issues, system shutdown and system failures;
- b) physical placement issues, including stowage area, use of unsecured EFBs, design and placement of mounting devices;
- c) considerations for interference with anthropometric constraints, cockpit ventilation and speaker sound;
- d) training and procedure considerations, including training on using EFB applications, the EFB policy and procedures manual, fidelity of the EFB training devices and mechanisms for gathering user feedback on EFB use;
- e) hardware considerations — refer to Chapter 1; and
- f) software considerations — refer to Chapter 6.

Chapter 3

Crew Operating Procedures

3.1 General

3.1.1 The operator shall have procedures for using the EFB in conjunction with the other flight-deck equipment.

3.1.2 If an EFB generates information similar to that generated by existing flight-deck systems, procedures should clearly identify the following:

- a) which information source will be primary;
- b) which source will be used as secondary information;
- c) under what conditions to use the secondary source; and
- d) 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.

3.1.3 If normal operational procedures require an EFB for each flight-deck crew member, the set-up should comply with the definition of independent EFB platforms.

3.1.4 Operators shall include the requirements for EFB availability in the operations manual, as part of the minimum equipment list, or both.

3.2 Revisions and Updates

3.2.1 The operator shall have a procedure in place to allow flight crews to confirm the revision number and/or date of EFB application software including, where applicable, database versions (e.g. update to the latest aeronautical charts).

3.2.2 Flight crews should not, however, have to confirm the revision dates for databases that would not, in case of outdated data, 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.

3.3 Workload and Crew Coordination

3.3.1 In general, using an EFB should not increase the 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.

3.3.2 Workload should be distributed among 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, if applicable.

3.4 Reporting

A reporting system for EFB failures should be established. Procedures should be put 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.

Chapter 4

Flight Crew Training

The use of the EFB should be conditional on appropriate training. Training should be in accordance with the operator's SOP (including abnormal procedures) and should include the following:

- a) overview of the system architecture;
- b) preflight checks of the system;
- c) limitations of the system;
- d) use of each operational software application;
- e) restrictions on the use of the system, including when some or all of the EFB functions are not available;
- f) conditions (including phases of flight) under which the EFB may not be used;
- g) procedures for cross-checking data entry and computed information;
- h) human performance considerations on the use of the EFB;
- i) additional training for new applications, new features of current applications or changes to the hardware configuration;
- j) recurrent training and proficiency checks; and
- k) any area of special emphasis raised during the EFB evaluation with the DCA.

Chapter 5

EFB Risk Assessment

5.1 General

5.1.1 The EFB risk assessment is a process that should be performed to assess the risks associated with the use of each EFB function and should allow the operator to keep the risks to an acceptable level by defining the appropriate mitigation means.

5.1.2 This risk assessment should be performed before the beginning of the approval process (if applicable), and its results should be reviewed on a periodic basis.

5.1.3 The guidance on safety risk assessment is contained in the *Safety Management Manual (SMM)* (Doc 9859).

5.2 EFB Failures and Mitigation Means

5.2.1 Based on the outcome of the EFB risk assessment, the operator shall determine the need for software architectural features, personnel, procedures and/or equipment that will eliminate, reduce or control risks associated with an identified failure in a system.

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

5.2.3 Apart from procedures to inform maintenance and flight crews about a fault or failure of the EFB and the actions taken to isolate it until corrective action is taken, back-up procedures shall also be in place to prevent the use of erroneous information by flight crews.

5.2.4 Mitigation against EFB failure or impairment may be accomplished by one or a combination of the following:

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

Chapter 6

EFB Functions

6.1 General

6.1.1 Use of multiple software applications in an EFB is allowable.

6.1.2 Operational use of EFB functions require DCA approval.

6.1.3 Guidance / Criteria for operational use of EFB functions.

6.1.4 The following are the guidance / criteria established by DCA for the operational use of EFBs that:

- a) the EFB equipment and its associated installation hardware, including interaction with aircraft systems as applicable, meet the DCA Airworthiness Certification requirements;
- b) the operator/owner has assessed the safety risks associated with the operations with support by the EFB function(s);
- c) the operator/owner has established requirements for redundancy of the information, as appropriate, contained in and displayed by the EFB functions;
- d) the operator/owner has established and documented procedures for the management of the EFB function(s) including any database it may use;
- e) the operator/owner has established and documented the procedures for the use of, and training requirements for, the EFB and the EFB function(s).

6.1.5 EFB functions essential to safe operation of flight.

6.1.6 EFB functions whose failure, malfunction or misuse would have an adverse effect on the safety of flight operations (e.g. increased in-flight crew workload during critical phases of flight, reduction in functional capabilities or safety margins, etc.) are essential to the safe operation of flight should be recorded in the **operations manual and linked to the operations specifications**.

6.1.7 Those functions should be recorded in the operations manual and linked to the operations specifications as proposed in Appendix-E (for commercial air transport).

6.1.8 The list below may be considered examples of applications providing such functions, depending on their use, associated procedures, and failure mitigation means:

- a) document browsers displaying information required to be carried by regulations (subject to approval, where required);
- b) electronic aeronautical chart applications;
- c) airport moving map display (AMMD) applications, not used as a primary means of navigation on the ground and used in conjunction with other materials and procedures;
- d) cabin-mounted video and aircraft exterior surveillance camera displays;
- e) aircraft performance calculation applications that provide take-off, en-route, approach, landing and missed approach performance calculations; and
- f) mass and balance calculation applications.

These applications require special attention during their evaluation, as described in Appendix A.

6.1.9 On the contrary, the following features are not EFB functions and, unless certified as avionics functions, should not be hosted on an EFB:

- a) displaying information that may be tactically used by the flight crew members to check, control or deduce the aircraft position or trajectory, either to follow the intended navigation route or to avoid adverse meteorological conditions, obstacles or other traffic, in-flight or on ground;
- b) displaying information that may be directly used by the flight crew to assess the real-time status of aircraft critical and essential systems, as a replacement for existing installed avionics, and/or to manage aircraft critical and essential systems following failure;
- c) communicating with air traffic control;
- d) sending data to aircraft systems not certified for this intended purpose; and
- e) any other function determined by the DCA to require airworthiness certification.

6.1.10 The display of own-ship position, in-flight, for strategic use is not universally accepted by State authorities and not specifically covered in this manual. If an operator elects to implement the display of own-ship position, in-flight, on an EFB application, the following risks should be addressed and properly mitigated:

- a) use of hazardously misleading information (in particular in case of erroneous position or frozen display);
- b) misuse of the information for short-term piloting, e.g. for track monitoring purposes (see 6.1.9, a);
- c) excessive fixation on EFB information and excessive head-in time; and

- d) conflicting information with certified aircrafts systems.

6.1.11 Possible effects of improperly mitigated risks include an increase in workload and a decrease in situation awareness. In some cases, crews might unknowingly build an over-reliance on this uncertified, yet compelling information.

6.2 Considerations for all EFB applications

6.2.1 Software HMI

6.2.1.1 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, colour-coding philosophies and symbology.

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

6.2.1.3 Use of colours and messages.

- a) The colour “red” should be used only to indicate a warning level condition.
- b) “Amber” should be used to indicate a caution level condition.
- c) Any other colour may be used for items other than warnings or cautions, providing that the colours used differ sufficiently from the colours prescribed to avoid possible confusion.
- d) EFB messages and reminders should be integrated with (or compatible with) presentation of other flight-deck system alerts.
- e) EFB aural messages should be inhibited during critical phases of flight. Regulatory requirements in conflict with the recommendation above should have precedence.

6.2.1.4 **System error messages.** It may be desirable to have an indication of whether an application is fully or partially disabled or is not visible or accessible to the user available to the user upon request. It may be desirable to prioritize these EFB status and fault messages.

6.2.1.5 **Data-entry and error messages.** If user-entered data are not of the correct format or type needed by the application, the EFB should not accept the data. An error

message should be provided that communicates which entry is suspect and specifies what type of data are expected.

6.2.1.6 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.

6.2.1.7 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.

6.2.1.8 Software developers and operators are encouraged to evaluate the usability of an existing HMI before developing a new HMI themselves. It is also recommended that the HMI be reviewed after some time of operation in the 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.

6.2.2 Electronic signatures

6.2.2.1 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. Authenticated certificates and secure signature creation devices are normally not required for EFB operations.

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

Note.— Guidance on electronic signatures is contained in the Safety Management Manual (SMM) (Doc 9859).

6.3 Considerations for EFB applications to be used for the safe operation of aircraft

6.3.1 EFB Management

6.3.1.1 The operator shall have an EFB management system in place. The role of an EFB administrator is a key factor in the management of the EFB system. Complex EFB systems may require more than one individual to support the EFB management system. However, at least one person (e.g. the EFB administrator, dedicated EFB manager, OPS director, etc.) should possess an overview of the complete EFB system, including the distribution of responsibilities within the operator's management structure. This role and accountability can be by delegations and by establishing procedures to ensure compliance

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

6.3.1.3 The following are responsibilities of the EFB administrator:

- a) Hardware and software configuration management and for ensuring, in particular, that no unauthorised software is installed.
- b) Ensuring that only a valid version of the application software and current data packages are installed on the EFB system.
- c) That the operator establishes the means to carry out their own check of data contents prior to load and/or release for operational use.
- d) Conducting internal quality control measures to ensure that all EFB management personnel comply with the defined procedures.
- e) Ensure that software applications supporting function(s) not directly related to operations conducted by the flight crew on the aircraft (e.g. web browser, email client, picture management, etc.) do not adversely impact the operation of the EFB.
- f) Ensure each person involved in EFB management receive appropriate training in their role and have a good working knowledge of the proposed system hardware, operating system and relevant software applications as well as knowledge about flight operations.
- g) Shall 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
- h) Ensure procedures are established for the maintenance of the EFB.

6.3.1.4 EFB management 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 applications.

6.3.2 Quality assurance

The operator shall ensure that the software developer has a quality assurance process in place. The software development and verification processes should be included and documented in the quality assurance process.

Chapter 7

Operational Evaluation Process

7.1 Operational Evaluation Process

7.1.1 Subject to DCA's operational evaluation and approval, an operator implementing EFB functions:

- a) may choose to start a paperless flight deck operation without paper backup or a combination of solutions with limited on-board paper backup.
- b) may also choose to keep the paper backup as a cross-check against the EFB information and as a means of mitigation against failure, when transitioning from paper to electronic format.

7.1.2 The operational evaluation process below is designed to lead to specific operational approval and consists of the following phases of actions. **Appendix-B,C & D** provide a sample checklist of evaluation items.

7.2 Phase I- Pre-Application discussion

This phase begins when DCA meets the operator to establish a common contact and the understanding of requirements, of what need to be evaluated and how they must be conducted and documented.

7.3 Phase II - Formal Application

7.3.1 Phase II begins when the operator submits the formal application letter with supporting documents and compliance plan to DCA for evaluation of completeness and compliance to the regulations. The operator must clarify his intent to operate with or without paper backup or a combination of paperless and paper. The typical documents to be submitted are:

- a) EFB operational suitability report, as applicable;
- b) EFB hardware and application specifications;
- c) EFB operator procedures/manual revisions;
- d) EFB training programme;
- e) EFB evaluation
- f) EFB risk assessment

7.4 Phase III - DCA Review

7.4.1 At this phase DCA conducts a review of the operator's submission; examine the technical contents and quality of the proposed EFB program, supporting documents and

procedures. Operations inspectors shall utilize the checklist (Appendix-B) to validate the operator's initial EFB program application and the checklist (Appendix-G) for a review of the operator's EFB policy and procedures manual.

7.4.2 Where an operator seeks to start operations with a new EFB system, the DCA should participate in either the simulator evaluation or flight evaluation of an EFB. 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 an existing EFB approval, the suitability of the EFB for that aircraft must be addressed. The DCA should examine the technical content and quality of the proposed EFB programme and other supporting documents and procedures.

7.5 Phase IV - Operational Evaluation

7.5.1 The operator would receive permission to conduct an operational trial run to ensure satisfactory operation of the EFB program. This process would normally be conducted over a mutually agreed timeframe. The operator will notify DCA of the trial progress and the results accordingly.

7.5.2 During this phase, Operations Inspectors shall utilize the checklists (Appendix-C and D) to observe and verify the operator's ability to manage an EFB program and conduct flight operations in a planned demonstration period. Where an operator seeks to start operations with a new EFB system, Operations Inspectors should participate in either the simulator evaluation or flight evaluation of an EFB. 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 an existing EFB approval, the suitability of the EFB for that aircraft must be addressed.

7.5.3 An operator who is approved to operate EFB without paper backup shall have adequate mitigations means in place to access the information in case of EFB failures.

7.5.4 Final considerations by DCA:

- a) Unacceptable validation results: If DCA finds the proposed EFB reliability and/or function to be unacceptable, DCA will contact the operator for corrective action. EFB deficiencies should be corrected and the EFB function revalidated prior to being approved.

- b) Acceptable validation results. If DCA finds the proposed EFB reliability and/or function to be acceptable based on validation data, then the specific operational approval may be issued.

7.6 Phase V - Issuance of EFB Operations Specifications and Approval

7.6.1 The successful operator will need to submit to DCA form (AOC-001) for the Application for Variation of Air Operator Certificate (AOC) to update the AOC Operations Specifications with EFB entry. The recommendation letter from Airworthiness Division for EFB approval will be required before approving the operator to use EFB.

7.6.2 The Operations Specifications entry will include references to the operator's Operations Manual where more details of the approved EFB applications are document.

Chapter 8

EFB use in General Aviation Operations with Helicopters or other than Large or Turbo Aeroplanes

Note.— This material relates to the provisions in Annex 6, Part II, Section 2 (excluding Section 3), MCAR Part-12 and MCAR Part-14.

8.1 Equipment/ Hardware Considerations

8.1.1 Operators involved in general aviation with helicopters or other than large or turbojet aeroplanes, should consider the following provisions before using an EFB.

8.1.2 The operator shall follow the provisions of 1.3 of this manual when using a portable EFB.

8.2 Pilot Operating Procedures

To ensure that adequate guidance is available for use of the EFB applications, the user guide established by the software developer should be available to the pilot.

8.3 Pilot Training

The pilot should be familiar with EFB use before using it in-flight. Changes to EFB hardware or software may warrant additional familiarization.

8.4 EFB Risk Assessment

For general aviation operations, hazard assessment in the traditional sense is not practical; therefore, the following mitigations are presented to address risks associated with EFB use. Before each flight, the pilot should conduct the following checks to ensure the continued safe operation of the EFB during the flight:

- a) general check of the EFB operation by switching it ON and checking that the applications intended to be used in-flight are operative;
- b) check battery or other power sources to ensure the availability of the EFB during taxi and flight operations, including diversions and reasonable delays;
- c) check for currency of EFB databases (effective dates), (e.g. aeronautical charts, performance calculation, and weight and balance applications); and
- d) check that an appropriate backup is available when using an application displaying information or data required to be on board.

8.5 EFB Functions

8.5.1 If EFB applications provide functions that display information related to the aircraft position in-flight, navigation, terrain or traffic surroundings or altitude, the pilot should be aware of the potential misleading or erroneous information displayed and should only use these functions as an advisory means.

8.5.2 When using an aeronautical chart, performance calculation, mass and balance or in-flight weather application, or an airport moving map display (AMM), the following considerations should be taken into account by the pilot:

- a) *Aeronautical chart application.* The aeronautical charts that are depicted should contain the information necessary, in appropriate form, to conduct the flight safely. Consideration should be given to the size and resolution of the display to ensure legibility.
- b) *Performance calculation and mass and balance (M&B) application.* Prior to the first use of a performance or M&B application and following any update of the database supporting the application, the operator should obtain assurance that the output of the application corresponds with the data derived from the AFM (or other appropriate sources).
- c) *Airport moving map application.* An AMM application should not be used as a primary means of navigation for taxi; outside references remain primary.
- d) *In-flight weather application.* The displayed meteorological information may be forecast, observed, or both and may be updated on the ground or in-flight. It should be based on data from providers approved by the meteorological authority concerned or other sources approved by the operator. Consideration should be given to the latency of meteorological information and the hazards associated with utilization of latent information. Pilots should only use in-flight weather applications for broad strategic avoidance of adverse meteorological conditions.

8.6 Evaluation Process

As stated in Chapter 7, an evaluation process is not required, but it is nevertheless recommended that pilots and/or the operator/owner undergo an evaluation period to ensure that mitigations to risk, including EFB failures, EFB misuse and other EFB malfunctions, are addressed. During this period, the pilot or owner/operator should validate that the EFB is as available and reliable as the paper-based system being replaced, if applicable.

APPENDIX- A
Guidance for EFB Software Applications

1. Performance (Take-off, Landing) and Mass and Balance (M&B) Applications

1.1 Introduction

1.1.1 The use of EFB to compute aircraft performance as well as mass and balance (M&B) data has become commonplace in recent years. The computing power and versatility offered particularly by the portable devices such as laptops and tablets in relation to their flexibility for development and use have also allowed the creation of numerous applications for most types of aircraft.

1.1.2 In any event, for the safe operations of flight, the validity and integrity of the aircraft performance and M&B data are crucial and the applications and the procedures for their use have to be properly evaluated before being used in service.

1.1.3 In that regard, the verification of the aircraft performance data and calculation algorithm correctness becomes an essential step of the evaluation. The other part of the evaluation is to deal with the user interface and crew procedures. A proper human- machine interface (HMI) on one side, with adequate administration and crew procedures and training on the other, are necessary to mitigate those errors.

1.2 Performance application architecture

1.2.1 Performance applications are usually separated into different layers:

- a) human-machine interface (HMI);
- b) calculation module;
- c) aircraft-specific information; and
- d) airport, runway, obstacle database (AODB).

Figure A-1 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, but rather, have the different parts integrated into one software. Alternatively, there might be solutions where modularity is taken to a point where some or all parts are supplied by different providers.

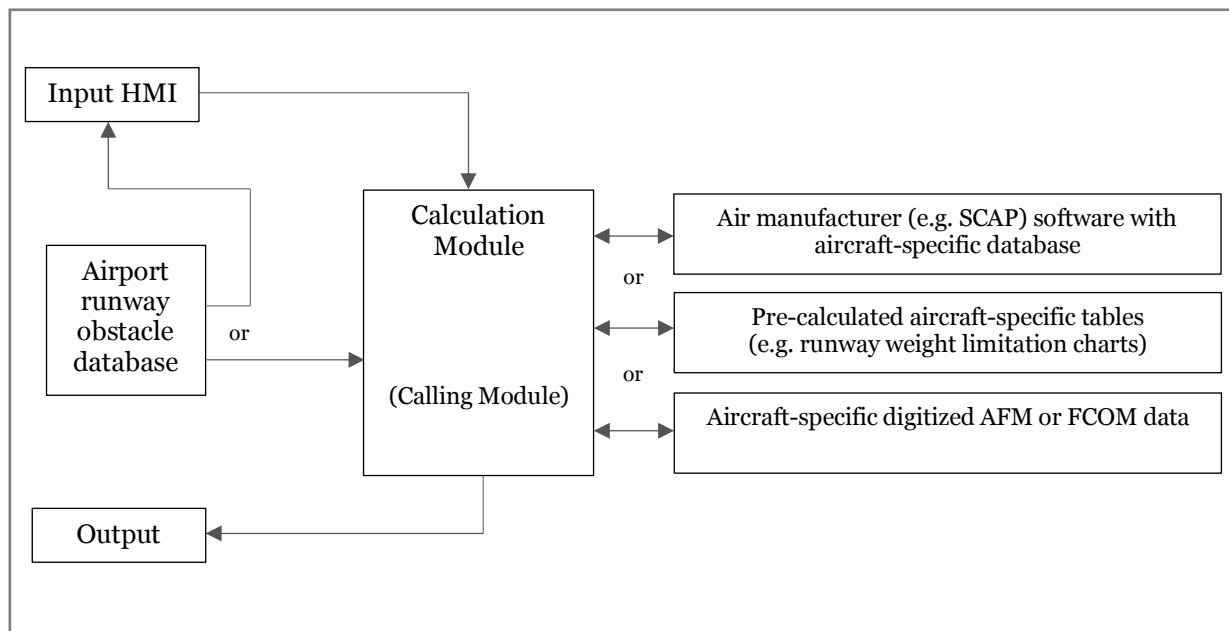


Figure A-1. Typical architecture of a TALP application

1.2.2 Input and output HMI. The input HMI takes the pilot's inputs (or data read from the avionics if applicable) and requests the calculation from the calculation module. The results are transferred to the output HMI.

1.2.3 Calculation module. The calculation module will process the requested data from the input HMI and determine the results which are then returned to the output HMI.

1.2.3.1 Calculation modules are commonly setup using manufacturer SCAP software together with the respective aircraft-specific database. To obtain the results, the calculation module might call the SCAP software several times. Thus, the expression "calling module" has become widespread in the industry.

1.2.3.2 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. The SCAP software itself, however, is not specifically part of the performance application.

1.2.3.3 Where manufacturer software is not available, paper AFM or FCOM charts may have to be digitised.

1.2.4 Aircraft performance data sources. Different sources of performance data can be used by TALP applications. Performance data can be delivered in various digitized formats:

- a) SCAP modules or the equivalent delivered by the manufacturer. The SCAP module is either based on equations of motion or digitised AFM material. Modules may or may not come from an airworthiness approved electronic flight manual;
- b) the operator can build its own digitised performance data, based on the data published in the flight manual; and
- c) data based on pre-calculated take-off or landing performance tables.

1.2.5 Airport, runway, obstacle database (AODB). Take-off and landing performance applications require information about airports, runways 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. The management of this data is critical. The operator is ultimately responsible for the data quality, accuracy and integrity of the runway and obstacle data, and should ensure this together with the data provider.

1.3 Performance and Mass and Balance (M&B) applications and human-machine interface (HMI)

1.3.1 Data error in performance calculations have been identified to have contributed to and accidents. A good, well-designed HMI can significantly reduce the risk of errors. The following are examples of design guidelines that are supplemental to the software HMI considerations from Chapter 6:

- a) Input data and output data (results) should be clearly distinctive. All the information necessary for a given task should be presented together or easily accessible.
- b) All data required for performance and M&B applications should be prompted for or displayed, including correct and unambiguous terms (names), units of measurement (e.g. kg or lbs). The units should match those from other cockpit sources for the same type of data.
- c) Field names and abbreviations used in the HMI should correspond to those used in the manuals and should match the labels in the cockpit.
- d) If the application computes both dispatch (regulatory, factored) and other results (e.g. in-flight or not factored), the flight crew should be made aware of the nature of the results.

- e) The application should clearly distinguish user entries from default values or entries imported from other aircraft systems.
- f) 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 with different subfleets, the selected subfleet should be clearly displayed to the flight crew.
- g) The HMI should be designed so that input data are difficult to enter into the wrong fields of the HMI, by defining data-entry rules.
- h) The HMI should only accept input parameters within the aircraft's operational envelope approved for the operator (commonly more limiting than the certified envelope). Consideration should be given to the plausibility of outputs within the AFM envelope but outside normal operating conditions.
- i) All critical TALP calculation assumptions (e.g. use of thrust reversers, full or reduced thrust/power rating) should clearly be displayed. The assumptions made about any calculation should be at least as clear to pilots as similar information would be on a tabular chart.
- j) The HMI should indicate to the pilot if a set of entries results in an unachievable operation (for instance, a negative stopping margin), in accordance with general HMI considerations (see Chapter 6).
- k) The user should be able to modify its input data easily, especially to account for last-minute changes.
- l) When calculation results are displayed, they should be displayed with the input parameters used for calculation.
- m) Any active MEL/CDL/special restriction should be clearly visible and identifiable.
- n) In the case of multiple runway selection, the output data should be clearly associated with the selected runway.
- o) Changes of runway data by the pilot should be clearly displayed and the changes should be easy to identify.

1.4 Performance and Mass and Balance (M&B) applications testing

1.4.1 The criticality of performance calculations and the importance of the correctness of the calculation results delivered by performance algorithms or calculation modules cannot be over-emphasised and hence the justification for the considerable investment in the development, testing and approval or certification of a performance algorithm or calculation module.

1.4.2 Depending on the EFB set-up three different test phases may apply:

- a) the **correctness test** checks whether the performance results are consistent with the approved data;
- b) a **robustness and constraint test** checks for sensible system behaviour in case incorrect values have been entered; and
- c) finally, the **integration test** shall make sure that the application runs in the EFB environment without any issue.

1.4.3 **Correctness test**

1.4.3.1 When developing a performance calculation module which processes entry variables (e.g. take-off or landing performance calculations), the calculation outputs must be verified. Due to the large number of parameters influencing the results of performance applications, testing all possible combinations of parameter values is not feasible.

1.4.3.2 Test cases should, therefore, be defined to sufficiently cover the operations of the aircraft under a representative cross section of conditions (e.g. for performance applications: runway state and slope, different wind conditions and pressure altitudes, various aircraft configuration including failures with a performance impact, etc.), and take into account the data sources and their individual characteristics (e.g. corner points, break points, etc.). The evaluation effort should be adapted to the type of data source used.

1.4.3.3 For selected calculations, a detailed check against approved data, or where data are not approved 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 throughout the entire operating envelope of the aircraft.

1.4.3.4 The operator should provide an explanation of the methods used to evaluate enough testing points with respect to the design of their software application and databases.

1.4.3.5 Tests, documented graphically or in tabular form, are subject to Authority acceptance.

1.4.4 **Robustness and constraint test**

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

1.4.4.2 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.

1.4.4.3 The testing should show that the application, in its operating environment (operating software (OS) and hardware included), is stable and deterministic, i.e. identical answers are generated each time the process is entered with identical parameters.

1.4.5 Integration testing

1.4.5.1 Typically, the design and test of performance applications are done on a different hardware and software environment than the EFB. Thus, 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.)

1.4.5.2 Integration testing shall ensure the performance application(s) 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.

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

1.4.5.4 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.

1.5 Procedures, Management and Training

When approving the operational use of a performance or M&B application(s), due consideration shall also be given to all other processes that contribute to the use of the application.

1.5.1 Crew operating procedures

1.5.1.1 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 or M&B calculations supported by EFBs.

1.5.1.2 Performance and M&B calculations should be performed by both the pilots independently on independent EFBs, if available.

1.5.1.3 The results should be cross-checked and differences discussed before the results are used operationally.

1.5.1.4 Crew procedures should ensure that, in the event of loss of functionality by an EFB through either the loss of a single application or the failure of the device hosting the application, a high level of safety can be maintained. Consistency with the EFB risk assessment assumptions should be confirmed.

1.5.2 Procedures for EFB security and quality assurance

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

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

1.5.3 Procedures for addressing EFB failures

1.5.3.1 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 affected.

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

1.5.4 Flight Crew Training

1.5.4.1 Training should emphasise 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.

1.5.4.2 Training should include cross-checks (e.g. with avionics or flight-plan data) and gross error check methods (e.g. “rule-of-thumb”) that may be used by pilots to identify order-of-

magnitude errors (e.g. entering the zero fuel mass (ZFM) as take-off mass (TOM) or transposing digits).

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

1.5.4.4 Using EFBs, new procedures may be introduced (e.g. the use of multiple flaps settings for take-off) and pilots should be trained accordingly.

1.5.5 Management of performance EFB applications

Within the operator's organisation, 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 utilise a designated person/group who 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 (e.g. SCAP modules) used on the EFB.

2. Electronic Charting Application

2.1 Description

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

2.1.2 The following should be considered:

- a) Electronic aeronautical charts should provide, at least to a minimum, a level of information and usability comparable to paper charts.
- b) 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.
- c) An EFB display may not be capable of presenting an entire chart (e.g. airport diagram, departure and arrival procedures) if the chart is the expanded detail (fold-over) type.
- d) Panning, scrolling, zooming, rotating or other active manipulation is permissible.
- e) 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.

Note.— See also Annex 4 — Aeronautical Charts, Chapter 20 — Electronic Aeronautical Chart Display — ICAO.

3. Aircraft Exterior Video Surveillance

3.1 Description

3.1.1 Aircraft exterior surveillance may be an EFB hosted software application to increase situational awareness during taxi by displaying real-time video of the actual external scene.

3.1.2 The following should be considered:

- a) Ensure real-time, live display of received imagery without noticeable time-lapse.
- b) Adequate image quality during foreseeable environmental lighting conditions;
- c) Display of turning or aircraft dimension aids may be provided, (e.g. turning radius, undercarriage track width, etc.). In such cases, the information provided to the pilot should be verified to be accurate.
- d) Connection should be made to one or more installed vision systems that include, but are not limited to, visible light cameras, forward-looking infrared sensors and intensifying low-light level images.
- e) Operators should establish SOPs for use of the application. Training should emphasize use of as an additional resource and not as a primary means for ground navigation or avoiding obstacles.
- f) Pilot use should not induce disorientation.

4. Airport Moving Map (AMM)

4.1 Introduction

4.1.1 This section provides some consideration on how to demonstrate the safe operational use for AMM applications to be hosted on EFBs.

4.1.2 An EFB AMM 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 primary means of taxiing navigation. This application is limited to ground operations only.

4.1.3 The AMM application is designed to indicate the aircraft position and heading (in case the own-ship position symbol is directional) on dynamic maps. The maps graphically portray runways, taxiways and other airport features to support taxi and taxi-related operations. Additionally, warning functions can be provided that notify crews about potentially dangerous conditions, for example, inadvertently entering a runway.

4.1.4 The following should be considered:

- a) An AMM application should not be used as the primary means of taxiing navigation; primary means of taxiing navigation remains the use of normal procedures and direct visual observation out of the cockpit window.
- b) The total system error of the end-to-end system should be specified and characterized by either the AMM software developer, EFB vendor or OEM. The accuracy should be sufficient to ensure that the own-ship position symbol is depicted on the correct runway or taxiway.
- c) The AMM should provide compensation means for the installation-dependent antenna position bias- error, for example, along-track error associated to the GNSS antenna position to the flight deck.
- d) The system should automatically remove the own-ship position symbol when the aircraft is in-flight (e.g. weight on wheels, speed monitoring) and when the positional uncertainty exceeds the maximum defined value.
- e) It is recommended that the AMM 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.
- f) The AMMD database should comply with applicable Standards for use in aviation (refer to Annex 6, Part I, 7.5 — *Electronic navigation data management*).

- g) 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.

4.2 Flight Crew Training

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

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

5. Electronic Checklist Application

5.1 Scope

5.1.1 An electronic checklist (ECL) is an EFB application that displays checklists to the flight crew by means of an EFB.

5.1.2 This guidance applies to the following:

- a) an ECL displaying pre-composed information or featuring a specific HMI to display the information in an optimized way to the flight crew;
- b) an ECL with or without capability to interact with the pilot to record the completion of the actions and checklists;
- c) an ECL without capability to process information from the aircraft (e.g. a stand-alone ECL); and

Note.— The capability to process information from the aircraft is more critical and not addressed by this manual.

- d) an ECL displaying only normal checklists (Non-normal/abnormal/emergency checklists and procedures are more critical and are not addressed in this manual).

5.1.3 Other ECL functionalities, such as those identified in the list below, may be present, in which case the operator's CAA is responsible for the establishment of the applicable basis for compliance:

- a) The ECL receives information from the aircraft (e.g. senses items such as aircraft system state, switch positions). The status of the sensed items may be reflected on the checklist. For example, if an action line of a checklist indicates that a button should be pressed and the aircraft sensors sense that the button has been pressed, then the checklist display will indicate that the item has been accomplished.
- b) The ECL content includes non-normal (abnormal or emergency) checklists/procedures.

5.2 HMI design and Human Factors considerations

5.2.1 The ECL system (hardware, software) should provide at least the same level of accessibility, usability and reliability as a paper checklist.

5.2.2 HMI and Human Factor considerations:

- a) Accessibility time for any checklist should not be longer than an equivalent paper checklist.
- b) All checklists should be easily accessible for reference or review.
- c) The resulting pilot actions called from an ECL should be identical to a paper checklist.
- d) The pilot should be able to clearly recognize which items or checklists are safety relevant for the operation of the aircraft and which are of an additional nature.
- e) Checklists should be presented in accordance with the normal sequence of flight.
- f) The title of the checklist should be displayed and distinguished at all times when in use.
- g) An indication of the existence of off-screen checklist content should be provided.
- h) The end of each checklist should be clearly indicated.
- i) The effect of switching between ECL and other EFB applications on the same hardware should be evaluated.

5.2.3 Additional HMI and Human Factor considerations for ECL with capability to interact with the pilot to record the completion of the actions and checklists:

- a) ECL should provide a checklist overview displaying which checklists are completed and which are not.
- b) ECL should display the completion status of action items within a checklist.
- c) It should be possible to restart a checklist, if needed. The crew should be able to reset the checklist with a verification step to confirm the restart.
- d) It should be possible to uncheck an action item in a checklist, if needed.

5.3 Flight crew procedures

5.3.1 The operator should consider the impact on the pilot's workload in determining the method of use of ECL.

5.3.2 Flight crew procedures should be established to:

- a) ensure that the flight crew verifies the validity of the ECL database before use;
and

- b) define backup procedure in case of loss of ECL during the flight to enable access to checklists at any time (e.g. to include scenarios regarding power loss, software malfunctions).

5.4 Administration

5.4.1 The operator should also establish a consistent and methodical process for modifying the ECL data and updated data transmission and implementation on the EFBs. Such processes should include a method for database applicability verification to individual aircraft in the operator's fleet.

5.4.2 ECL populated data content should:

- a) be concise, simple, clear and unambiguous; and
- b) ensure consistency between aircraft manufacturer provided data and operator customized data (e.g. language, terminology, acronyms).

5.5 Flight Crew Training and Documentation

The operator should define specific flight crew training in support of an ECL implementation. It should be included in the operator's overall EFB training. The operating manual or user guide should provide sufficient information to flight crews including limitations of the system and all related procedures.

6. In-Flight Weather (IFW) Application

6.1 Definition

In the context of this manual, in-flight weather (IFW) is an electronic flight bag (EFB) function enabling the crew to access meteorological information.

6.2 Intended Use and Limitations

6.2.1 The introduction of IFW is supplemental to the information required by Annex 3 — *Meteorological Service for International Air Navigation*. It would contribute to increased situational awareness and support the flight crew when making strategic decisions.

6.2.2 The IFW application could be used to access both information required to be on board (e.g. world area forecast system (WAFS) data) and supplemental weather information.

6.2.3 Use of IFW should be non-safety-critical and not necessary for the performance of the flight.

6.2.4 In order to be non-safety-critical, IFW should not be used to support tactical decisions and/or substitute certified aircraft systems (e.g. weather radar).

6.2.5 Information from the official flight documentation or aircraft primary systems should always prevail in case there is a contradiction with IFW information.

6.2.6 Meteorological information in IFW applications may be displayed, for example, as an overlay on aeronautical charts and geographical maps or may be a stand-alone weather depiction (e.g. radar images, satellite images).

Note.— This manual will not supersede the regulatory material contained in ICAO Annex 3.

6.3 Meteorological Information Considerations

6.3.1 Meteorological information can be forecast and/or observed, and can be updated on the ground and/or in-flight. It should be based on data from providers approved by the meteorological authority concerned or other sources approved by the operator.

6.3.2 The meteorological information provided to the flight crew should, as far as possible, be consistent with the information available to ground-based users (e.g. airline operations

center (AOC), dispatcher) in order to establish common situation awareness and to facilitate collaborative decision-making.

6.4 Display Considerations

6.4.1 Meteorological information should be presented to the flight crew in a format that is appropriate to the content of the information; graphical depiction is encouraged whenever practicable.

6.4.2 Presentation should include:

- a) type of information contained in the meteorological information (e.g. forecast or observed);
- b) currency or age and validity time of the meteorological information;
- c) information necessary for interpreting the meteorological information (e.g. legend); and
- d) a clear indication of any missing information or data in order for the flight crew to determine areas of uncertainty when making hazardous weather avoidance decisions.

6.4.3 If meteorological information is overlaid on aeronautical charts, special considerations should be given to human-machine interface (HMI) issues in order to avoid adverse effects on the basic chart functions.

6.4.4 Meteorological information may require reformatting for cockpit use, for example, to accommodate display size or depiction technology. However, any reformatting of meteorological information should preserve both the geo-location and intensity of meteorological conditions regardless of projection, scaling or any other types of processing.

6.4.5 IFW display should, as far as possible, be consistent with the flight-deck design philosophy in terms of location of titles, location and visual representation of legends, element size, labelling and text styles, etc.

6.4.6 It is recommended that the IFW is able to display the meteorological information in relation to the route or operational flight plan, in order to ease interpretation of forecast information.

6.5 Training and Procedures

6.5.1 The operator is required to specify standard operating procedures (SOPs) specifying the use of IFW information.

6.5.2 Adequate training should be provided for the use of IFW. Training should address the following:

- a) limitations of the IFW, in particular those presented in section 6.2;
- b) latency of observed meteorological information and the hazards associated with utilization of old information;
- c) that IFW information beyond Annex 3 specifications is supplementary to the required information;
- d) use of the application;
- e) different types of displayed information (e.g. forecast or observed);
- f) symbology (e.g. symbols, colours);
- g) interpretation of meteorological information;
- h) identifying failures (e.g. incomplete uplinks, datalink failures, missing information);
- i) avoiding fixation; and
- j) managing workload.



DEPARTMENT OF CIVIL AVIATION (MYANMAR)
Electronic Flight Bag (EFB) Hardware & Software
Evaluation Checklist

Operator	Aircraft type	Date	Location	Inspector

Note: This checklist contains a list of questions for inspectors to use during a tabletop evaluation of the EFB focusing on the EFB hardware and software applications. The checklist starts with EFB hardware questions, then presents general user interface questions, and ends with specific EFB software application questions (if applicable). The checklist is designed so any question answered as “No” requires a comment.

Electronic flight bag (EFB) Hardware	
1. Is the display brightness and contrast adjustable?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
2. Is the display brightness acceptable when it adjusts automatically?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
3. Are there any display artifacts, such as jagged lines, impairing functionality?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
4. Are controls labeled appropriately to describe their intended function?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
5. Is the display readable under all flight deck illumination conditions?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
6. Are touch-sensitive areas clearly indicated on the touch screen?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
7. Can EFB inputs be made quickly and accurately in any operational environment (e.g., in turbulence)?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
8. Can touch screen inputs and selections be made without obscuring critical information on the display?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
9. Are inadvertent or multiple activation of controls minimized?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
10. Does the EFB start up in a predictable state?	Yes <input type="checkbox"/> No <input type="checkbox"/>

	N/A <input type="checkbox"/>
11. Can the EFB be rebooted when power is cut to the EFB?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
12. Does the EFB function correctly when rebooted?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
13. Are all the EFB failure modes easy to see and identify?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
14. Is the failure annunciation/message appropriate for the EFB function which failed?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
15. Are EFB recovery means easy to remember and apply when the EFB fails?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
16. Has the operator provided evidence of electromagnetic compatibility (EMC) testing if utilizing portable EFB hardware?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
17. Has the operator provided evidence that the device will continue operation after a rapid decompression event?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

General User Interface

18. Is the revision information and currency expiration date available and presented clearly?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
19. Does the device respond immediately to user inputs?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

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

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

--

--

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

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

--

--

Electronic Document (if applicable)	
58. Is it easy to find the information needed in a document?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
59. Is it easy to tell which documents are open?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
60. Is it easy to move between documents quickly?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
61. Is it easy to tell what document is currently in view?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
62. Is there a list of available documents to choose from?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
63. Is the document search function appropriate?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
64. Are tables readable and usable?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
65. Are figures readable and usable?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

Electronic Charts (if applicable)	
66. Is there a way to pre-select specific charts for easy access during a particular flight?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
67. Is it easy to search for a chart?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
68. Is it easy to access charts when a last-minute change is necessary?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
69. If the chart application uses aircraft location to facilitate access to charts, is this function appropriate (i.e., either approved by Aircraft Certification Service (AIR) or explicitly allowed by the current edition of Advisory Circular (AC) 120-76)?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

70. Is the information layout for fixed charts consistent with the paper equivalent?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
71. Is it easy to switch between a decluttered and normal display if decluttering is supported?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
72. Is there a clear indication when any chart elements are suppressed?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
73. Can the display be easily returned to its default position after zooming, panning, or decluttering?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

Electronic Checklists (if applicable)

74. Are normal checklists available in the appropriate order of use?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
75. Can checklists be accessed individually for review or reference?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
76. During abnormal conditions, are relevant checklists easy to access?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
77. During abnormal conditions, does the device indicate which checklists and/or checklist items are required and which are optional?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
78. Is it clear where to find all checklists, whether on the EFB or on paper?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
79. Is the location of a paper document provided when it is referred to by the ECL?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
80. Does each checklist have a constantly visible title distinct from other checklists?	Yes <input type="checkbox"/>

	No <input type="checkbox"/> N/A <input type="checkbox"/>
81. Is it easy to select a checklist from a set of open checklists?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
82. Is there a reminder to review incomplete items when closing an incomplete checklist?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
83. Can an incomplete checklist be closed after acknowledging it is not complete?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
84. Does the ECL discourage two or more checklists from being used simultaneously?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
85. Is progress through the ECL clear?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
86. It is easy to reset the ECL to start over again?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
87. Does the checklist provide appropriate reminders for tasks requiring a delayed action?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
88. Does the checklist clearly highlight decision branches?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
89. Can you return to the checklist from links or related information in one step?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
90. Is there an indicator of which item in the checklist you are working on?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
91. Is the checklist's active item clearly indicated?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
92. Can the status of an item be easily changed?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
93. Does the next item automatically become active when the previous one is complete?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
94. Can the current item be deferred without completing it?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
95. Is it easy to view other items, even in a long checklist, without changing the active item?	Yes <input type="checkbox"/> No <input type="checkbox"/>

	N/A <input type="checkbox"/>
96. Is it easy to move between items within a checklist?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
97. Is there a clear indication all items, as well as the whole checklist, are complete when finished?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

Performance Calculations (if applicable)

98. Does the device identify entries having an incorrect format or type and does it generate an appropriate error message?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
99. Does the error message clarify the type and range of data expected?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
100. Are units for performance data clearly labeled?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
101. Do the labels used in the EFB match the language of other operator documents?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
102. Is all the information necessary for a given task presented together or easily accessible?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
103. Can the crews modify performance calculations easily, especially when making last-minute changes?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
104. Are outdated results of performance calculations deleted when modifications are entered?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
105. Does the display and/or crew training provide information to the crew on the assumptions on which the calculations are based?	Yes <input type="checkbox"/> No <input type="checkbox"/>

	N/A <input type="checkbox"/>
106. Are crews trained to identify and review default values and assumptions about the aircraft status or environmental conditions?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
107. Are the assumptions made about any calculation as clear to pilots as similar information would be on a tabular chart?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

Mounting Device	
108. Has the installation of the mounting device been approved in accordance with the appropriate airworthiness regulations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
109. Is it evident that there are no mechanical interference issues between the EFB in its mounting device and any of the flight controls in terms of full and free movement, under all operating conditions and no interference with other equipment such as buckles, oxygen hoses, etc.?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
110. Has it been confirmed that the mounted EFB location does not impede crew ingress, egress and emergency egress path?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
111. Is it evident that the mounted EFB does not obstruct visual or physical access to aircraft displays or controls?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
112. Does the mounted EFB location minimize the effects of glare and/or reflections?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
	Yes <input type="checkbox"/>

113. Does the mounting method for the EFB allow easy access to the EFB controls and a clear unobstructed view of the EFB display?	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
114. Is the EFB mounting easily adjustable by flight crew to compensate for glare and reflections?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
115. Does the placement of the EFB allow sufficient airflow around the unit, if required?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>

Provide the Number and a Comment for Each Mounting Device Question Checked as “No.”

--

Inspector Name: _____

Date: _____

Inspector Signature: _____



DEPARTMENT OF CIVIL AVIATION (MYANMAR)
Electronic Flight Bag (EFB) Operational Evaluation
Checklist

Operator	Aircraft type	Date	Location	Inspector

Note: This checklist contains a list of questions for inspectors consideration during an operational evaluation of the EFB program, to include documentation, procedures, and training. It also contains questions to be answered in a training or operational environment by crewmembers, instructor/evaluators, or other operational personnel. The checklist is designed so any question answered as “No” requires a comment.

General Electronic flight bag (EFB) Hardware	
1. Is there a backup source in the flight deck for EFB information?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
2. Is the EFB display readable under all typical flight-deck lighting conditions?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
3. Are there appropriate Master Minimum Equipment List (MMEL)/minimum equipment list (MEL) items to handle EFB failures?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
4. Are crews able to adjust and lock the EFB for optimal viewing?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
5. Are the EFB hardware components usable and suitably durable for the flight deck?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

EFB Stowage	
6. Is there a stowage area for the EFB?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
7. Is the stowage securing mechanism simple to operate?	Yes <input type="checkbox"/>

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

Unsecured EFB (if applicable)	
13. Is there appropriate access to flight controls/displays when the unsecured EFB is in use?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
14. Is there an acceptable place to put an unsecured EFB when in use?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
15. Is there an acceptable place to put an unsecured EFB when <i>not</i> in use?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
16. Can the kneeboard EFB be positioned so the pilot has full control authority?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
17. Is the kneeboard EFB comfortable for the pilot to wear under normal conditions?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

Workload	
18. Is the EFB installation appropriate for use in high workload phases of flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
19. Does stowing the EFB require excessive head-down time or workload?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
20. Is the workload acceptable when there is an EFB failure?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
21. Are other than critical EFB messages inhibited during high workload phases of flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
22. Is the workload acceptable when configuring electronic charts while flying a procedure?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
23. Are there procedures to mitigate EFB workload?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
24. Are there appropriate procedures for using EFB in high workload phases of flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

Software Applications	
25. Does the EFB use terms, icons, colors, and symbols consistent with other flight deck systems?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
26. Does using the electronic checklist (ECL) produce the same crew actions the paper equivalent would?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
27. If the EFB shows own-ship in flight, is there an operationally similar function presented on an installed display? Can the flight crew differentiate between the information on the EFB and the information on the installed display?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
28. Is there a clear indication of the revision date(s) of the software that are on the EFB?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

EFB Cybersecurity

29. Are cybersecurity controls in place to mitigate against the risk of unauthorized modifications to an EFB's operating system architecture, its specific hosted applications, and any of the databases or datalinks used to enable its hosted applications?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
30. Are cybersecurity controls in place to ensure administrative management of portable electronic devices (PED), which have been authorized for use as a portable EFB? (Note: This includes, but is not limited to, identifying the individual or aircraft to which the PED is assigned, as well as ensuring operating system architecture and associated hosted software applications are updated in a timely manner.)	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>

EFB Procedures

31. Are there procedures for starting up and shutting down the EFB?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
32. Are there appropriate procedures for all the EFB failure modes?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
33. Are there EFB procedures for when other aircraft system failures could render the EFB unusable?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
34. Are there procedures for using EFB backup information?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
35. Are there procedures for establishing which source of information is primary?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
36. Are there procedures specifying what data to use when data is redundant or different from the EFB?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
37. Are there procedures for removal of a kneeboard EFB during emergency landing or egress (if applicable)?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
38. Are there procedures for updating passwords and for device lockout?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>

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

--

--

Procedures for Keeping EFB Content/Data Current	
39. Are there procedures to ensure data is accurate and current for each software application?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
40. Are changes to content/data appropriately documented?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
41. Are there procedures to notify crews of EFB updates?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
42. Are there procedures to ensure the correct information is installed when EFBs use information specific to the aircraft type or tail number?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
43. Are operational control procedures consistent with regulations concerning preventative maintenance?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
44. Is there a procedure to avoid corruption/errors during changes to the EFB device?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
45. Is there a procedure to ensure all EFBs have the appropriate content/data installed when there are multiple EFBs on the flight deck?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
46. Is there a procedure to ensure EFB data in use is approved for use in flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
47. Is there a procedure for when the database is not approved for use in flight?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
48. Is there a procedure to ensure all customized values are cleared from the EFB?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

Procedures for User Feedback	
49. Is there a procedure for EFB users to provide feedback?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
50. Is there a procedure for the operator to monitor feedback, correct EFB deficiencies, and/or notify the EFB manufacturer?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

51. Are there procedures or built-in limits preventing the setting of customized color schemes conflicting with flight deck color conventions?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
52. Is there a policy regarding the use of supplemental audio and/or video in flight?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
53. Is the EFB audio set to minimize any interference with higher priority communications?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

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

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

--

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

Training for Charts (If Applicable)	
73. Is training on the use of electronic charts appropriate?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
74. Is there training on unique features of the electronic charts?	Yes <input type="checkbox"/> No <input type="checkbox"/>

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

Training for ECL Systems (If Applicable)

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

Training for Flight Performance Calculations (If Applicable)

84. Is there appropriate training on how and when to use the flight performance software application?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
85. Is there training on critical performance calculation assumptions (e.g., runway length, W&B)?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
86. Is there training to review default values for aircraft status and environmental conditions?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
87. Is there training on how to enter information required by the performance software applications?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
88. Is there training on how to interpret and use results of the flight performance calculations?	Yes <input type="checkbox"/> No <input type="checkbox"/>

	N/A <input type="checkbox"/>
89. Is there training on where to obtain values when their normal sources are not available?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
90. Is there training on coordinating the roles of dispatchers and crewmember?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

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

--

Crew Performance: Preflight Planning

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

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

Crew Performance: Takeoff

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

95. There is a takeoff on a runway requiring a briefing for a special operator engine-out procedure?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
96. There is a complex Standard Instrument Departure (SID) with an abnormal or an emergency during the departure climb-out?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

97. There is an emergency requiring a return to the departure or alternate departure airport?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
98. One EFB fails, requiring one pilot to rely on the EFB of the other pilot immediately after takeoff?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

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

--

Crew Performance: Cruise

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

99. There is an engine failure/fire with possible condition of destination below weather minimums?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
100. There is electrical smoke in the cockpit requiring use of smoke mask/goggles while completing checklists or using EFB for approach briefing?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

Crew Performance: Descent

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

101. There are conditions requiring reference to Surface Movement Guidance and Control System (SMGCS) taxi routing or a complex clearance?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
102. Reported runway conditions require reference to operational limitations?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

Crew Performance: Approach/Landing

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

103. There is a runway change or the need to recompute landing weight and V speeds during approach?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
104. There are poor weather conditions or airports with complex taxi routes?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

105. There is a request for a specific taxiway turn during rollout after landing?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
---	---

Crew Performance: Destination Ground Operations

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

106. There is an EFB partial failure or erroneous output requiring maintenance discrepancy to be entered?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
---	---

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

Empty space for providing numbers and comments for questions checked as "No."

Inspector Name: _____

Date: _____

Inspector Signature: _____



DEPARTMENT OF CIVIL AVIATION (MYANMAR)
Electronic Flight Bag (EFB) Line Evaluation
Checklist

Operator	Aircraft type	Date	Location	Inspector

Note: This checklist provides a starting point for EFB line operations evaluations. This is a final checklist to ensure there are no problems with the EFB design/interface, training, or procedures prior to the authorization for use.

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

Describe any problems checked as "No" above:

--

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

previously approved methods?	No <input type="checkbox"/> N/A <input type="checkbox"/>
23. Was the time to complete normal tasks appropriate?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
24. Were audio features adjustable and appropriate for the flight deck or cabin environment and did they not cause crewmember distraction?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

Describe any problems checked as “No” above:

--

Electronic Charts, Documents, and Checklists

25. Were all necessary documents (including charts, checklists, and manuals) found, identified, and easily viewed by the crewmember(s) without undue distraction?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
26. Was information contained in electronic charts, documents, and checklists complete, equal in quality to previously provided products, and easily accessible and understandable?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
27. Was crewmember knowledge of chart/document/checklist selection and viewing adequate?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
28. Could the crewmember(s) easily rearrange content on the screen to meet needs (e.g., by zooming, panning, or otherwise customizing the view)?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
29. Could the crewmember(s) use the EFB concurrently with an installed display and differentiate the information?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
30. Did the crewmember(s) exhibit adequate knowledge of EFB functions to efficiently brief and fly required procedures?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
31. Did the crewmember(s) exhibit adequate knowledge of the software applications revision process procedure/method ensuring appropriate database accuracy and currency?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
32. Did the crewmember(s) exhibit adequate knowledge of contingency procedures?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
33. In the event of a failure of a single device?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

34. In the event both devices fail?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
35. Were crewmember(s) able to monitor necessary electronic chart displays during critical phases of flight?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
36. Did the EFB allow quick entry of updates for last-minute changes (e.g., flight plan/runway changes)?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
37. For electronic checklists (ECL), was it easy to track completed items?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

Describe any problems checked as “No” above:

Flight Performance Data/Calculations.	
38. Could the crewmember(s) interpret and use flight performance data/calculations efficiently and accurately?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
39. Did the device allow quick entry of updates for last-minute changes (e.g., flight plan/runway changes)?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
40. Are crewmembers aware of any software application limitations and do they understand only approved calculation methods may be used as a primary means of computation?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>
41. Are there appropriate procedures for using EFB in high workload phases of flight?	Yes <input type="checkbox"/>
	No <input type="checkbox"/>
	N/A <input type="checkbox"/>

Describe any problems checked as “No” above:

42. Were any unique safety issues or events caused or exacerbated by using the EFB during this evaluation?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
43. Can the flight be conducted as safely with an EFB as with the methods/products it is intended to replace?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>
44. Does the EFB add an unacceptable level of complexity for any critical activity or phase of flight?	Yes	<input type="checkbox"/>
	No	<input type="checkbox"/>
	N/A	<input type="checkbox"/>

Date: _____

Page -79

EXAMPLE OF OPERATIONS SPECIFICATIONS AND OPERATIONS MANUAL CONTENT

When an EFB function is to be used for the safe operation of an aeroplane (see Chapter 6), an entry must be included in the operator's operations specifications approved by the DCA. The operations specifications will reference the location in the operations manual where the approved EFB applications are detailed. Figure E-1 shows an example of a specific approval EFB entry.

OPERATIONS SPECIFICATIONS (Subject to the approved conditions in the operations manual)				
	YES	NO	DESCRIPTION	REMARKS
Continuing airworthiness				
EFB for A/C type <i>Type 1</i>	<input type="checkbox"/>	<input type="checkbox"/>	18 - Specifically approved EFB hardware and software applications for A/C type <i>Type 1</i> are contained in [operations manual reference]	
Other				
18. <i>List the EFB functions with any applicable limitations.</i>				

Figure E-1. Example of a specific approval EFB entry

Note.— Boxes YES/NO are not used since some EFB functions might not require an operational approval. Other EFB functions not requiring an EFB approval should not be listed in the operations specifications form.

The EFB-specific approvals referenced in the operations specifications form should have a companion detailed list of EFB-approved hardware and software applications. This list should be located in the operations manual in a table and be updated through the normal operations-manual-approval process established by the State. Figure E-2 contains an example of a companion EFB-specific approval table.

The “Approved hardware for A/C type” column of the companion *EFB (hardware and software) with specific approval table* should match the “DESCRIPTION” column of the operations specifications form. The “EFB applications” column of the table should list all the applications requiring a specific approval and include the application version, with any applicable limitations. The

“Specific references and/or remarks” column of the table should include the application version in addition to any specific operations manual reference and other remarks, if applicable.

<i>EFB (hardware and software) with specific approval</i>		
Approved hardware for A/C type	EFB applications (List of EFB functions, versions and any applicable limitations.)	Specific references and / or remarks
EFB for A/C type <i>Type 1</i>	<ul style="list-style-type: none"> - Aircraft performance calculation (take-off and landing) – <i>AppName1 ver x.x</i> – Airport moving map – <i>AppName2 ver x.x</i> – Charts application: En route – <i>AppName3 ver x.x</i> – Airport charts (SID, STAR, approach) – <i>AppName4 ver x.x</i> 	<p><i>See procedures in operations manual page X</i> <i>Backup: Quick Reference Handbook</i></p> <p><i>Refer to operations manual page X</i></p> <p><i>See operations manual page Y</i> <i>Paper backup operation</i></p> <p><i>Paperless operation</i> <i>Refer to operations manual page Z</i></p>
EFB for A/C type <i>Type 2</i>	<ul style="list-style-type: none"> – Charts application: En route – <i>AppName3 ver x.x</i> 	<p><i>See operations manual page X</i> <i>Paper backup operation</i></p>

Figure E-2. Example of a companion EFB-specific approval table

APPENDIX-F

EFB Policy and Procedures Manual

1. The following are typical contents of an EFB policy and procedures manual that can be fully or partly integrated in the Operations Manual, as applicable.

2. The structure and content of the EFB policy and procedures manual should correspond to the size of the operator, the complexity of its activities and the complexity of the EFB used.

- **Introduction**

- EFB general philosophy

- EFB limitations

- EFB-approved hardware and software applications

- **EFB management**

- Responsibilities

- Data management

- Updates and changes management

- **Hardware description**

- EFB system architecture

- Hardware configuration control

- **Software description**

- Operating system description

- List and description of applications hosted

- **Flight crew training**

- **Operating procedures**

- **Maintenance consideration**

- **Security considerations**



DEPARTMENT OF CIVIL AVIATION (MYANMAR)
Electronic Flight Bag (EFB) Policy and Procedures
Manual Checklist

Operator	Aircraft type	Date	Location	Inspector

Introduction	
1. EFB general philosophy is explained?	Yes <input type="checkbox"/> No <input type="checkbox"/>
2. EFB limitations are described?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3. Approved EFB hardware and software applications are outlined?	Yes <input type="checkbox"/> No <input type="checkbox"/>
EFB Management	
4. Duties and responsibilities of personnel concerned for EFB management are outlined?	Yes <input type="checkbox"/> No <input type="checkbox"/>
5. Procedures for EFB data management are written down?	Yes <input type="checkbox"/> No <input type="checkbox"/>
6. Procedures for EFB updates and changes are written down?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Hardware description	
7. EFB system architecture is illustrated?	Yes <input type="checkbox"/> No <input type="checkbox"/>
8. EFB hardware configuration control is illustrated?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Software description	
9. Operating system description is outlined?	Yes <input type="checkbox"/> No <input type="checkbox"/>
10. List and description of applications hosted are described?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Training	
11. EFB training for flight crew is outlined?	Yes <input type="checkbox"/> No <input type="checkbox"/>

Operating Procedures	
12. Crew operating procedures for EFB usage are outlined?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Maintenance	
13. Maintenance considerations for EFB are described?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Security	
14. Security considerations for EFB are outlined?	Yes <input type="checkbox"/> No <input type="checkbox"/>

Describe any findings as “No” above:

Inspector Name: _____

Date: _____

Inspector Signature: _____