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Guidance Material for
Operations Specifications

Electronic Flight Bags (EFBs)

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ISSUE APPROVAL

This Guidance Material (GM) contains the standards, policies, procedures, and guidelines concerning the Royal Thai Air Force Regulation (AFR) and is published for use by the Military Aviation Authority (MAA) personnel delegated with the responsibility of certifying Air Operators shall comply with all provisions in this GM during the certification process.

In addition, this GM contains instruction in respect of certification to be eligible to conduct by Air Operator/Squadrons for guidance to reach the Royal Thai Air Force Flight Operations Standardization Regulations B.E.2564 ; Item 37.6.

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RECORDS OF REVISION

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REVISION HIGHLIGHTS

Section	Description of Change
All	New issue

GENERAL

Guidance Material (GM) are issued by The Military Aviation Authority of Royal Thai Air Force (MAA) and contain information about standards, practices, and procedures acceptable to the Authority. The revision number of the GM is indicated in parenthesis in the suffix of the GM number.

PURPOSE

This GM provides guidance to the operator/squadron applying for operational approval for Electronic Flight Bags (EFBs) operations.

SCOPE

1. Traditional all documentation and information available to flight crew for use on the flight deck has been in paper format. Much of this information is now available in electronic format and the purpose of this leaflet is to give guidance to operator/squadron on gaining approval from MAA for use of electronically processed information.

2. It is not intended to impose additional requirements in respect to basic information and data sources. The operator/squadron remains responsible for ensuring the accuracy of the information used and that it is derived from verifiable sources. The approval of EFBs is intended to cover the different methods of storing, retrieving and use of this information.

3. This guidance material is designed to cover airworthiness and operational criteria for the approval of Electronic Flight Bags (EFBs).

RELATED READING MATERIAL

a) International Civil Aviation Organization (ICAO).
   Doc 10020, Electronic Flight Bags (EFBs) Manual.
b) International Civil Aviation Organization (ICAO).
   Annex 6, Operation of Aircraft.
c) International Çivil Aviation Organization (ICAO).
   Doc 9859, Safety Management Manual. (SMM)

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.** - as defined by the state of the operator, e. g. takeoff, approach, and landing.
- **Operator/Squadron.** - A person, organization or enterprise engaged in or offering to engage in an aircraft operation.
- **Electronic flight bags (EFBs).** - An electronic information system, comprised 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 function hosted on an EFB platform.
- **EFB management.** - Contains all procedures related to the operator/squadron's EFB management as listed in the section "EFB management".
- **Installed resources.** - Hardware/ software installed in accordance with airworthiness requirements.
- **Independent EFB platforms.** - Multiple EFBs that are designed in such a way that no single failure makes all of them unavailable.
- **Portable electronic device (PED).** - Typically, lightweight consumer electronic device which is functionally capable for communications, data processing and/or utility.
- **Standard operating procedure (SOP).** - Flight crew operating procedures as described in the flight operations manuals.
- **Transmitting PED.** - A PED containing one or more devices intentionally emitting radio frequencies (Wi-Fi, GSM, Bluetooth, etc.).

ABBREVIATIONS

ACARS	Aircraft Communications Addressing and Reporting System
AFM	Aircraft Flight Manual
AID	Aircraft Interface Device
AMMD	Airport Moving Map Display
AODB	Airport, Runway, Obstacles Database
ARINC	Aeronautical Radio, Incorporated
CDL	Configuration Deviation List
CPU	Central Processing Unit
CS	Certification Specifications
EFBs	Electronic Flight Bags
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
FAR	Federal Aviation Regulation
FCOM	Flight Crew Operating Manual
GNSS	Global Navigation Satellite System
GUI	Graphical User Interface
HMI	Human-machine Interface
ICAO	International Civil Aviation Organization
MAA	Military Aviation Authority
MAC	Mean Aerodynamic Chord
MEL	Minimum Equipment List
OPS	Operations
OS	Operating Software
PED	Portable Electronic Device
RTCA	Radio Technical Commission for Aeronautics
SCAP	Standard Computerized Aircraft Performance
SOP	Standard Operating Procedure
STC	Supplemental Type Certificate
TC	Type Certificate
T/O	Take-off
TOW	Take-off Weight
T - PED	Transmitting PED
W&B	Weight and Balance
ZFW	Zero Fuel Weight

GUIDANCE MATERIAL FOR EFB

1. EQUIPMENT / HARDWARE CONSIDERATION

Electronic Flight Bags (EFBs) is defined as: An electronic information system for flight crew which allows for storing, updating, delivering, displaying and/or computing digital data to support flight operations or duties.

This Manual contains guidance on the operational evaluation of EFBs and commonly used software applications for granting an operational approval where appropriate. It can also be used as a source of information by operator/squadron planning EFB operations. It should be noted that the following features are not considered as EFB functions and, unless airworthiness approved, should not be hosted on an EFB:

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

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

c) Communicating with air traffic services,

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

1.1 Types of EFB

a) EFBs can be either portable or installed.

b) Portable EFBs are not part of the aircraft configurations and are considered as 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 MAA approval.

c) 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 either during the certification of the aircraft, through service bulletin by the original equipment manufacturer or through a third party STC.

1.2.1 Mounting Devices

If the mounting is permanently attached to 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 easy access to the EFB controls and a clear unobstructed view of the EFB display. It should be located such that the effects of glare and/or reflections are minimized. This may be accomplished by providing some adjustment for the flight crew to compensate for glare and reflections.

b) It should be confirmed that the mounted EFB does not obstruct visual or physical access to aircraft displays or controls or external vision and the location does not impede crew ingress, egress, and emergency egress path; and

c) There should be no mechanical interference between the EFB in its mounting device and any of the flight controls in terms of full 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 have 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 Aircraft Interface Device (AID). An AID may be implemented as a dedicated device, e. g. as defined in ARINC 759, or it may be implemented in non-dedicated devices, such as an EFB docking station, a network file server, or other avionics equipment.

1.2.3 Power to the EFB

Installed power provisions should comply with the applicable airworthiness regulations (e.g., FAR 25, CS 25). Connection of the EFB to a nonessential, 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.

1.2.4 Stowage

When an EFB is stowed, the device and its securing mechanism should not intrude into the flight deck space to the extent that they cause either visual or physical obstruction of flight controls/displays and/or egress routes.

1.3 Hardware Considerations for Portable EFBs

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

1.3.1 Physical Characteristics

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

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 foreseeable high/low temperatures, and after rapid depressurization if the EFB is intended for use in such an event.

1.4 Basic non-interference testing

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

1.4.2 In order to operate a portable EFB during flight, the user/squadron is responsible for ensuring that the EFB will not interfere in any way with the operation of aircraft equipment. The following methods are means 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.

1.4.3 Method 1

Step 1 is an electromagnetic interference (EMI) test using RTCA/DO - 60, Section 21, Category M. An EFB vendor or another source can conduct this test for an EFB user. 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.

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.

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

1.4.4 Method 2

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

1.5 Additional testing for transmitting portable EFBs

1.5.1 In order 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 must ensure that the device will not interfere with the operation of the aircraft equipment in any way. The following is a method to test transmitting portable EFBs that are to remain powered (including being in standby mode) during flight.

1.5.2 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 the applicable processes set forth in RTCA/DO - 294, Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft. This frequency assessment must confirm that no interference of aircraft equipment will occur as a result of intentional transmissions from these devices.

b) Test Requirement 2. Once an EMI assessment has determined that there will be no interference from the EFB's intentional transmissions (Test Requirement 1), and basic non-interference testing has been conducted with the device not deliberately transmitting (see Item 1.4), non-interference testing should be conducted with the transmit function being operative. The position of the transmitting device is critical to non- interference testing; hence, locations of the EFB and of the transmitter (if applicable) should be clearly defined and adhered to.

1.6 Power supply, connection, and source

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

1.6.2 The power source needs to be suitable for the device. The power source may be a dedicated power source, or a general-purpose source already fitted.

1.6.3 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, etc.).

1.7 Batteries

1.7.1 The operator/squadron should ensure that the batteries are compliant with the applicable standards for use in an aircraft.

1.7.2 The operator/squadron 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.

1.8 Cabling

The operator/squadron needs to ensure that any cabling attached to the EFB, whether in the dedicated mounting or when handheld, does not present an operational or safety hazard.

1.9 Temperature rise

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

1.10 Data connectivity between EFBs

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

1.11 Data connectivity to aircraft systems

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

1.12 External connectivity

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

1.13 Stowage

All hand-held EFBs 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

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 (e. g. kneeboard) or into an existing aircraft part (e.g. suction cups) with the intended function to hold acceptable light mass portable devices viewable to the pilot at her/his 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.

Some types of viewable stowage securing means may have characteristics that degrade appreciably with aging or due to 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) have a holding capacity that decreases with pressure. It should be demonstrated that they will still perform their intended function at operating cabin altitudes. In addition, it should be demonstrated that if the EFB moves or is separated from its stowage, or if the viewable stowage is unsecured from the aircraft (as a result of turbulence, maneuvering, or other action) , it will not interfere with flight controls, damage flight deck equipment, or injure flight crew members.

2. HUMAN FACTORS

The operator/squadron should carry out an assessment of the human-machine interface and aspects governing crew coordination when using the EFB. Whenever possible, the EFB user interface philosophy should be consistent (but not necessarily identical) with the flight deck design philosophy. The review of the complete system should include, but is not limited to:

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 procedures 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 item 1.2 and Item 1.3

f) software considerations - refer to Item 6.2 and Item 6.3

3. CREW OPERATING PROCEDURES

3.1 General

3.1.1 The operator/squadron should 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:

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 Operator/Squadron should include the requirements for EFB availability in the operations manual and/or as part of the minimum equipment list.

3.2 Revisions and Updates

3.2.1 The operator/Squadron should 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

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. Workload should be distributed between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. The procedures should include specification of the phases of flight at which the flight crew may not use the EFB, if applicable.

3.4 Reporting

A reporting system for EFB failures should be established. Procedures should be in place to inform maintenance and flight crews about a fault or failure of the EFB, including actions to isolate it until corrective action is taken.

3.5 EFB Failure and Mitigation Means

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

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

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

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

1) system design
2) separate and backup power sources for the EFB.
3) electronic fallback solutions to the last known, stable configuration (e.g. Before an update)
4) redundant EFB applications hosted on independent EFB platforms.
5) paper products carried by selected crewmembers.
6) complete set of sealed paper backups in the flight deck; and/or
7) procedural means.

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

4. FLIGHT CREW TRAINING

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

a) an overview of the system architecture.

b) pre-flight checks of the system.

c) limitations of the system.

d) the 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) the 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 MAA.

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/squadron to keep the risks to an acceptable level by defining the appropriate mitigation means.

5.1.2 his 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 ICAO 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/squadron should 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 Mitigation against EFB failure or impairment may be accomplished by one or a combination of:

a) system design.
b) separate and backup power sources for the EFB.
c) electronic fullback 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 procedural means.

6. EFB FUNCTIONS

6.1 General

6.1.1 ICAO Annex 6 - Operation of Aircraft, Part I - International Commercial Air Transport - Aeroplanes, and Part III - International Operations - Helicopters, Section II require that the State of the Operator specifically approve the operational use of EFB functions to be used for the safe operation of aircraft.

6.1.2 Annex 6, Part II - International General Aviation - Aero planes and Annex 6, Part III, Section III require that the State of Registry (Kingdom of Thailand) establish criteria for the operational use of EFB functions to be used for the safe operation of aircraft.

6.1.3 EFB functions to be used for the safe operation of aircraft are considered to be those whose failure, malfunction or misuse would have an adverse effect on the safety of flight operations (e.g., increase in flight crew workload during critical phases of flight, reduction in functional capabilities or safety margins, etc.).

6.1.4 Those functions should be recorded in the operations manual and linked to the operations specifications as shown in Appendix C.

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

a) a document browser displaying information required to be carried by MAA regulations (subject to MAA 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) an aircraft performance calculation application to provide take-off, en-route, approach, landing and missed approach performance calculations; and

f) a weight and balance calculation application.

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

6.1.6 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 which 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 weather, obstacles or other traffic, in flight or on ground (except AMMD as described above);

b) displaying information which 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 the certified aircraft systems other than the EFB installed/shared resources; and

e) if MAA determines that the function requires airworthiness certification.

6.2 Considerations for all EFB Functions

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, color-coding philosophies, and symbiology.

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

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

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

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.

6.2.2 Electronic signatures

6.2.2.1 In some cases of regulations may require a signature to signify acceptance or to confirm the authority.

6.2.2.2 In order to be accepted as an equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfill 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.

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

6.3 Considerations for EFB Functions to be used for the Safe Operation of Aircraft

EFB Management

6.3.1 the operator/squadron should have an EFB management system in place. Complex EFB systems may require more than one individual to support the EFB management system. However, at least one person (e.g., dedicated EFB manager, OPS director, etc.) should possess an overview of the complete EFB system, including the distribution of responsibilities within the operator/squadron's management structure.

6.3.2 EFB management is the key link between the operator/squadron and the EFB system and software suppliers.

6.3.3 EFB management is responsible for hardware and software configuration management, and for ensuring, in particular, that no unauthorized software is installed. EFB management is also responsible for ensuring that only a valid version of the application software and current data packages are installed on the EFB system. For some software

applications, there should be a means for operator/squadron to carry out their own check of data content prior to load and/or release for operational use.

6.3.4 The EFB management system should 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.

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

6.3.6 EFB management should establish procedures to ensure that no unauthorized changes take place to EFB functions. An EFB policy and procedures manual may be part of the operator/squadron operations manual (see Appendix C).

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

6.3.8 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 functions.

7. OPERATIONAL EVALUATION PROCESS

The operational evaluation process is designed to lead to specific operational approval, where such is required, and consists of the following courses of actions. Elements of this process are to be understood as guidelines for MAA and operator/squadron and may also be used in instances where specific approval is not required.

7.1 Definition of the Scope

7.1.1 The scope of the operational evaluation plan will depend upon the applicant's experience with EFBs. Considerations should include whether the operator/squadron has:

a) no EFB experience, thus requiring a "new application and approval process"; or

b) initiated the process of establishing an EFB programmer; or

c) an existing approved EFB programmer established.

7.1.2 An operator/squadron implementing EFB functions may choose to start a paperless flight deck operation without paper backup or a combination of solutions with limited on-board paper backup. The operator/squadron 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.

7.2 Phase 1. Initial Discussion

During this phase, MAA and the operator/squadron reach a common understanding of what needs to be evaluated, the role of MAA, the applicable requirements, whether trials should take place and when, how they must be conducted and documented, and what documents and actions the operator/squadron is responsible for during each phase of the approval process.

7.3 Phase 2. Application

Phase 2 begins when the operator/squadron submits a formal compliance plan to MAA for evaluation. The plan is reviewed for completeness and compliance to the regulations and MAA may coordinate with other inspectors and regulatory offices as necessary.

Once MAA is satisfied with the submitted plan, the operator/squadron follows that plan to produce a complete EFB program. The operator/squadron must clarify the intent of the operation (with or without paper backup or a combination of paperless and paper).

The applicant will typically submit information in the application package, such as:

a) EFB operational suitability report (if applicable).

b) EFB hardware and application specifications.

c) EFB operator/squadron procedures/manual revisions.

d) EFB training program; and

e) EFB evaluation report.

f) EFB risk assessment.

7.4 Phase 3. MAA Review

7.4.1 MAA will use a checklist to conduct a review of the application submitted by an operator/squadron.

7.4.2 Where an operator/squadron seeks to start operations with a new EFB system, MAA should participate in 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. MAA should examine the technical content and quality of the proposed EFB program and other supporting documents and procedures.

7.5 Phase 4. Operational Evaluation

7.5.1 The operator/squadron should conduct an operational evaluation that verifies whether the above elements have been satisfied. The operator/squadron should notify MAA of its intention to conduct an operational evaluation by sending a plan and keep a receipt of this notification in the aircraft during the test period.

7.5.2 During this validation phase, operator/squadron transitioning from paper to EFB should maintain paper backup for all electronic information. The validation phase begins when the operator/squadron formally begins use of the EFB combined with paper backup for an established period of time. Appendix B of ICAO Doc 10020 may be used for data collection during the validation phase.

7.5.3 Operator/squadron starting EFB operations without paper backup should have adequate mitigations means in place to access the information in case of EFB failures.

7.5.4 Final considerations by the MAA:

a) Unacceptable validation results. If MAA finds the proposed EFB reliability and/ or function to be unacceptable, MAA should contact the operator/squadron for corrective action. EFB deficiencies should be corrected and the EFB function revalidated prior to approval being issued.

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

7.6 Phase 5. Issuance of EFB Operations Specifications and Approval

MAA who will grant a specific EFB approval to the operator/squadron should update the operations specifications with an EFB entry. The operations specifications will reference the location in the operations manual where more details of the approved EFB applications can be found (see Appendix B)

APPENDIX A - GUIDANCE FOR EFB SOFTWARE APPLICATIONS

Preamble

The purpose of this appendix is to provide information on best practices and general guidance for the development of commonly used EFB software applications. The specific examples used are not intended to preclude alternate methods which may accomplish similar objectives. In addition, operator/squadron who have been granted a specific approval for particular EFB software applications may wish to consider adopting the methods discussed within this attachment.

Manufacturers, operator/squadron, or vendors should carefully consider their particular operational needs when developing EFB software applications in an effort to maintain the highest safety and reliability standards for their specific-use case.

1. TAKE - OFF AND LANDING PERFORMANCE (TALP) AND WEIGHT AND BALANCE (W&B) APPLICATIONS

1.1 Introduction

1.1.1 The validity and integrity of TALP and W&B data are essential for safe flight operations. These types of EFB applications, and the operator/squadron's procedures for their use, require thorough evaluation prior to being approved for service.

1.1.2 Appropriate Military Aviation Authorities should consider the application architecture, HMI, documented testing results, and the operator/squadron's EFB procedures and training before approving the operational use of EFB, TALP and W&B applications.

1.2 Take-off and landing performance applications architecture

1.2.1. TALP 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 Shows a typical architecture of a TALP application. Individual solutions that are in use by operator/squadron 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.

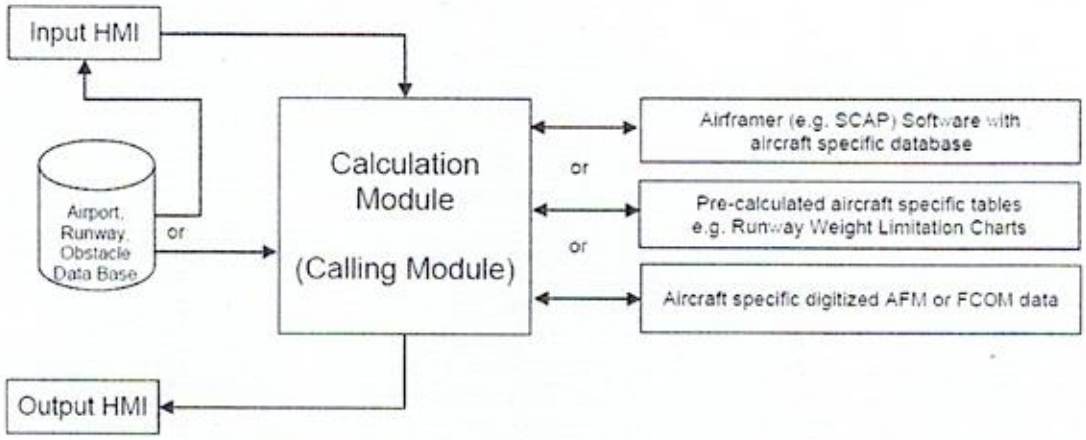

Figure A - Typical architecture of a TALP application

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 request data from the input HMI and determine the results, which are then sent back to the output HMI.

1.2.3.1 TALP source data generally is derived from either pre-calculated table (e.g. runway weight limitation charts), digitized AFM or FCOM charts, or equations of motion-based software algorithms and data.

1.2.3.2 For TALP source data that is either digitized AFM data or based on equations of motion, the data is generally provided in a form that complies with the International Air Transport Association (IATA) Standardized Computerized Aircraft Performance (SCAP) specification. The IATA SCAP specification provides a standardized means for manufacturers, operator/squadron and third parties to exchange aircraft performance data.

1.2.3.3 A typical software system that uses the SCAP approach will consist of the calling module, a "SCAP module" (also known as a "manufacturer's module"). To obtain the results, the calculation module assembles the inputs from the HMI and other sources and might call the SCAP software several times. Thus, the expression "calling module" has become widespread in the industry.

1.2.3.4 Another way for the calculation module to obtain results is to interpolate between pre - calculated tables (e.g., runway weight limitation charts).

1.2.3.5 In some cases, where manufacturer software and data are not available, paper AFM or FCOM charts may be digitized by third parties that develop the data for their own products.

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.

b) the operator/squadron can build its own digitized aircraft 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 airport, runway, and obstacles. The AODB should provide this information in a suitable way. Usually, it is the part of the EFB performance applications that will be updated most often. The management of this data is critical. The operator is 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 TAKE–OFF AND LANDING PERFORMANCE, WEIGHT AND BALANCE APPLICATIONS AND HUMAN-MACHINE INTERFACE (HMI)

1.3.1 Operator/squadron and authorities should be aware that pilot data entry errors have been a contributing factor to numerous aviation incidents and accidents. A 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 Item 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 TALP, and W&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 sub-fleets, the selected sub-fleet 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/squadron (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 Item 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 case of multiple runway selection, the output data should be clearly associated with the selected runway; and

o) changes of runway data by the pilot should be clearly displayed and the changes should be easy to identify.

1.4 TAKE-OFF AND LANDING PERFORMANCE AND WEIGHT AND BALANCE APPLICATION TESTING

1.4.1 Accurate TALP and W&B calculations are essential to safe aircraft operation. EFB applications can be effective tools used to make these calculations. Authorities and operators/squadron should be aware of the importance of thoroughly testing EFB applications that use mathematical algorithms or calculation modules before they are approved for operational use.

1.4.2 Applications designed to perform TALP, and W&B calculations must use data derived from the AFM or other appropriate sources, as accepted by MAA.

1.4.3 Application testing should be conducted with the application running on a representative operating system and hardware device.

1.4.4 A proper evaluation of a TALP or W&B EFB application includes documented testing that verifies the calculation accuracy, user interface and complete environmental integration. The extent of testing and supporting documentation should reflect the complexity and functionality of the application being tested.

1.4.5 Calculation Accuracy Tests. Tests designed to verify an application calculates TALP and W&B results that are consistent with the AFM data or advisory data provided by the aircraft manufacturer.

1.4.5.1 The results of TALP applications are influenced by a large number of input parameters, and therefore it is not feasible to verify all possible outputs for accuracy. Test cases should be defined to sufficiently cover the entire operating envelope of the aircraft under a representative cross section of conditions for TALP applications (e.g., runway surface condition, runway slope, wind, temperature, pressure altitude, obstacle clearance and aircraft configuration including failures with a performance impact).

1.4.5.2 The results of W&B applications are also influenced by a large number of input parameters, and therefore it is not feasible to verify all possible outputs for accuracy. Test cases should be defined to sufficiently cover the entire operating envelope of the aircraft under a representative cross section of conditions for W&B applications (e.g., fuel load schedules, including varying fuel densities or actual fuel density if known, passenger load schedules, cargo load schedules and unique or special cargo loads).

1.4.5.3 Test cases should also be defined to sufficiently cover a representative cross section of an operator/squadron's aircraft (e.g., different aircraft types, models, configurations, and modifications).

1.4.5.4 Test cases should contain a detailed check showing that the application produces results that match or are consistently conservative to results derived from previously approved methods accepted by the MAA.

1.4.5.5 An applicant should provide an explanation of the methods used to evaluate a sufficient number of testing points with respect to the design of their software application and databases.

1.4.5.6 Test cases should demonstrate the application is stable and produces consistent results each time the process is entered with identical parameters.

1.4.5.7 Tests should be acceptable to the operator/squadron by MAA.

1.4.6 User interface tests. Tests designed to verify that an application's user interface is acceptable. Test cases should be defined to demonstrate that:

a) the HMI requirements are complied with. (See section 1.3.1 in Appendix A.).

b) the application has a reasonable system response when incorrect values are inadvertently entered.

c) the application provides easily comprehended results or error messages/ instructions if incorrect input values (e.g., outside envelope, wrong combination of inputs) are entered; and

d) the application does not fail or get into a state that would require special skills or procedures to bring it back to an operational state if incorrect input values are entered.

1.4.7 Operational integration tests. Tests that demonstrate that the application runs properly in the complete operational environment for which the EFB application is to be used. Test cases should be defined that demonstrate that the application:

a) functions correctly on the EFB platform.

b) does not adversely impact other EFB applications or aircraft systems or vice versa; and

c) correctly interfaces with other applications when applicable (e.g., take-off performance using results from W&B application).

1.5 PROCEDURES, MANAGEMENT AND TRAINING

The evaluation of EFB applications that calculate TALP, and W&B data should take into consideration all other processes, procedures and training that support the use of the application.

1.5.1 Normal operating procedures

1.5.1.1 Procedures should ensure the proper use of EFB applications that calculate TALP or W&B data. The procedures should apply to the flight crew and ground personnel (e.g., flight dispatchers, flight operating officers, operating personnel) that may have roles defined in the use of the applications.

1.5.1.2 TALP and W&B data should be independently calculated and cross-checked by both pilots. When a dispatch system described in Annex 6, Part 1, Item 1 is used for the control and supervision of flights, the flight dispatcher (or other ground staff assigned) should verify the results are within operating limits. Any differences should be discussed before the results are used operationally. All W&B documents should be available to the dispatcher or the person on the ground responsible for the control and supervision of flight before take-off.

1.5.2 Abnormal operating procedures

Procedures should ensure that a high level of safety can be maintained consistent with the EFB risk assessment assumptions during a loss of EFB functionality (e.g., the loss of a single application or the failure of the device hosting the application).

1.5.3 Security procedures

The application and the data it references should be checked for integrity and protected against unauthorized manipulation (e.g., by checking file check sum values at EFB start-up or prior to each calculation).

1.5.4 Training

1.5.4.1 Training should emphasize the importance of executing all TALP and W&B performance calculations in accordance with SOP to assure fully independent and cross-checked 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 like entering the zero-fuel weight (ZFW) as take-off weight (TOW) or transposed digits.

1.5.4.3 Training should be emphasized that the use of EFBs makes TALP and W&B calculations simple, but it does not eliminate the necessity of good pilot performance knowledge.

1.5.4.4 Through the use of 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 take-off and landing performance and weight and balance EFB applications

Within the operator/squadron's organization, the responsibilities between the TALP and W&B management and the EFB management should be clear and well-documented. An operator should utilize a designated person/group that is sufficiently trained to provide support for the performance tools. This person/group must have comprehensive knowledge of current regulations, TALP and W&B, and TALP and W&B 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 Considerations:

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 press ending an entire chart (e.g., airport diagram, departure/arrival procedures) if the chart is the expanded detail (fold-over) type.

d) panning, scrolling, zooming, rotating, or other active manipulation is permissible; and

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 de-cluttering.

Note: See also Annex 4 - Aeronautical Charts - Chapter 20 Electronic Aeronautical Chart Display - ICAO.

3. TAXI AID CAMERA SYSTEM (TACS)

3.1 DESCRIPTION

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

3.1.2 Considerations:

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). In such cases, the information provided to the pilot should be verified to be accurate.

d) connection to one or more installed vision systems. Vision systems 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 TACS. Training should emphasize use of TACS as an additional resource and not as a primary means for ground navigation or avoiding obstacles; and

f) pilot use of TACS should not induce disorientation.

4. AIRPORT MOVING MAP DISPLAY (AMMD)

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

4.2 An EFB AMMD with own-ship position symbol is designed to assist flight crews in orienting themselves on the airport surface to improve pilot positional awareness during taxi operations. The AMMD function is not to be used as the primary means of taxiing navigation.

This application is limited to ground operations only.

4.3 The AMMD application is designed to indicate aero plane 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 which notify crews about potentially dangerous conditions, i.e., inadvertently entering a runway.

4.4 Considerations for AMMD:

a) an AMMD 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 AMMD software developer, EFB vendor or OEM, etc. The accuracy should be sufficient to ensure that the own-ship position symbol is depicted on the correct runway or taxiway.

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

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

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); and

g) the operator/squadron 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.

4.5 FLIGHT CREW TRAINING

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

4.5.2 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 which displays checklists to the flight crew by means of an EFB.

5.1.2 This guidance applies to:

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., stand-alone ECL). (Capability to process information from the aircraft is more critical and not addressed by this manual.); and

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/squadron's MAA is responsible for the establishment of the applicable basis for compliance:

e) the ECL receives information from the aircraft (sensed 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; and

f) 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) it should be clearly recognizable to the pilot 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; and

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) if needed, it should be possible to restart a checklist. The crew should be able to reset the checklist with a verification step to confirm the restart; and

d) if needed, it should be possible to uncheck an action item in a checklist.

5.3 FLIGHT CREW PROCEDURES

5.3.1 The operator/squadron should consider the impact on 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 back-up 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/squadron 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/squadron '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/squadron customized data (e.g., language, terminology, acronyms).

5.5 FLIGHT CREW TRAINING AND DOCUMENTATION

The operator/squadron 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.

APPENDIX B - EXAMPLE OF OPERATIONS SPECIFICATIONS AND OPERATIONS MANUAL CONTENT

When an EFB function is to be used for the safe operation of an aero plane(see Item 4), an entry must be included in the operator/squadron's operations specifications approved by MAA. The operations specification will reference the location in the operations manual where the approved EFB applications are detailed. Figure B below shows an example of a specific approval EFB entry.

OPERATIONS SPECIFICATIONS
(Subject to the approved conditions in the operations manual)

SPECIFIC APPROVAL	YES	NO	DESCRIPTION	REMARKS
Continuing airworthiness				
EFB for A/C type *Type1*			19 - Specifically approved EFB hardware and software applications for A/C type *Type1* are contained in [operations manual reference]	
EFB for A/C type *Type2*			- Specifically approved EFB hardware and software applications for A/C type *Type2* are contained in [operations manual reference]	
Other				

19 List of EFB functions with any applicable limitations

Figure B - Example of a specific approval EFB entry

Notes.— 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 specific EFB 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 C below contains an example of a companion EFB-specific approval table.

The "Approved hardware for A/C type" column should match the "SPECIAL AUTHORIZATIONS" column of the operations specifications form. The "Approved EFB applications" column should indicate the EFB functions, including versions which are specifically approved with any applicable limitations. The "Specific references and/or remarks" column should include the application version in addition to any specific operations manual reference and other remarks if applicable.

EFB specifically approved hardware and software applications		
Approved hardware for A/C type	Specifically approved EFB applications *(List of EFB functions, versions and any applicable limitations.)*	Specific references and/or remarks
EFB for A/C type *Type1*	– Aircraft performance calculation (take-off and landing) – *AppName1 ver x.x*	*See procedures in operations manual page X* *Back up: Quick Reference Handbook*
	– Airport moving map – *AppName2 ver x.x*	
	– Charts application : En route – *AppName3 ver x.x*	*Refer to operations manual page X*
	– Airport charts (SID, STAR, approach) – *AppName4 ver x.x*	*See operations manual page Y* *Paper back-up operation* *Paperless operation* *Refer to operations manual page Z*
EFB for A/C type *Type2*	– Charts application : En route – *AppName3 ver x.x*	*See operations manual page X* *Paper back-up operation*

Figure C - Example of a companion EFB specific approval table

APPENDIX C - EFB POLICY AND PROCEDURES MANUAL

These are the typical contents of an EFB policy and procedures manual that can be fully or partly integrated in the operations manual, if applicable.

The structure and content of the EFB policy and procedures manual should correspond to the size of the operator/squadron, 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 considerations

- Security considerations