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DIRECTORATE GENERAL OF CIVIL AVIATION
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CIVIL AVIATION REQUIREMENT
SECTION 8 – AIRCRAFT OPERATIONS
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Subject: Specific Approval for Operational Use of Electronic Flight Bag (EFB)

1 INTRODUCTION

1.1 Electronic Flight Bag (EFB) is an electronic information system, consisting of equipment and applications for flight crew, which allows for storing, updating, displaying and processing of EFB functions to support flight operations or duties.

1.2 ICAO Annex 6 lays down the standards for the installation/use of EFB equipment. The standards require specific approval by the State of Operator/ State of Registry for the operational use of EFB functions for safe operation of the aircraft. Accordingly, requirements have been laid down in CARs Section 8 Series O Parts II, III, IV, and V.

1.3 This CAR provides detailed requirements for obtaining specific approval for the operational use of EFB and is issued under the provisions of Rules 29C and 133A of the Aircraft Rules, 1937.

2 APPLICABILITY

2.1 This CAR is applicable to all operators including scheduled, scheduled commuter, non-scheduled and general aviation operators, desirous of using EFB flight operations.

3. ACRONYMS

AFM	Aircraft flight manual
AID	Aircraft interface device
AMMD	Airport Moving map display
AOC	Airline operations center
AODB	Airport, runway, obstacle database
CAA	Civil aviation authority
CDL	Configuration deviation list
ECL	Electronic checklist
C-EFB	Cabin Electronic Flight Bag
EFB	Electronic flight bag
EFF	Electronic flight folder
EMI	Electromagnetic interference
E-JLB	Electronic journey log book, technical log/flight log
FCOM	Flight crew operating manual
GNSS	Global navigation satellite system
HMI	Human-machine interface
IFW	In-flight weather
LPC	Less paper cockpit
M&B	Mass and balance
MEL	Minimum equipment list
OEM	Original equipment manufacturer
PED	Portable electronic device
SCAP	Standardized Computerized Aircraft Performance
SOP	Standard operating procedure
STC	Supplemental type certificate
TACS	Taxi aid camera system
TALP	Take-off and landing performance
TC	Type Certificate
TOM	Take-off mass
T-PED	Transmitting PED
WAFS	World area forecast system
ZFM	Zero fuel mass

4. 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.

AMM (Airport Moving Map). A software application displaying airport maps and using a navigation source to depict the aircraft current position on this map while on ground.

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.

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

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.

EMI/EMC. Electromagnetic Interference / Electromagnetic Compatibility

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

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

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

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

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

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

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

GUI. Graphical User Interface

HMI. Human Machine Interface

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

Independent EFB platforms. Multiple EFB platforms that are designed such thatno single failure makes all of them unavailable.

Less Paper Cockpit : A process where, to the extent permissible under relevant regulations, certain physical documentation required on board and aircraft is replaced with reliable electronic copies after due process of comprehensive risk mitigation, with procedures to ensure document currency and upon establishing reliable contingency procedures, and where continuous monitoring is undertaken to ensure reliability, accuracy and ease of use.

Major upgrade: A major upgrade includes substantial changes to the application or Operating System, such as updating version from 1.x to 2.x. A major upgrade can contain significant changes to the application or Operating System and have an impact on calculation algorithm and/or to the HMI, and is undertaken upon comprehensive risk analysis and mitigation and successful practical evaluation.

Minor upgrade: A minor upgrade is a change to the product large enough to merit a change to the product version, such as updating version 1.x to 1.y, but in which there have been no significant changes to the setup organization between versions of the application or Operating System, implemented only after due risk evaluation and mitigation and successful online trials.

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

Mounting device. An aircraft certified part which secures portable or installed EFB, and/or its system components

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

Portable electronic device (PED). Any lightweight, electrically-poweredequipment. 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 smartphones to small devices such as MP3 players and electronic toys.

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

SCAP. Standard Computerized Aircraft Performance

STC. Supplemental Type Certificate

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 device such as remote control equipment (which may include toys), two-way radios cellular/mobile/smart phones and satellite phone

5. EQUIPMENT/ HARDWARE CONSIDERATIONS

5.1 TYPES OF EFBs

a) EFB systems can be comprised of both portable as well as installed(i.e. part of the aircraft definition) components.
b) Portable EFBs (e.g. iPads) are not part of the aircraft configuration and are considered to be PEDs. They generally have self-containedpower and may rely on data connectivity to achieve full functionality.Modifications to the aircraft to use portable EFBs require the appropriate airworthiness approval.
c) Installed EFBs are integrated into the aircraft, subject to normal airworthiness requirements and under design control. The approvalof these EFBs is included in the aircraft's type certificate (TC) or in a supplemental type certificate (STC).

5.2 HARDWARE CONSIDERATIONS FOR INSTALLED RESOURCES AND MOUNTING DEVICES

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

5.2.1 Mounting devices

If the mounting is permanently attached to the aircraft structure, the installation will be such that:

a) The mounting method for the EFB would 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 shall 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 shall 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.

5.2.2 Data connectivity

a) The capability of connecting the EFB to certified aircraft systems shall be covered by an airworthiness approval.

b) Certified aircraft systems shall 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 and shall be approved as part of airworthiness approval.

5.2.3 Power to the EFB

The connection of the EFB shall be to a non-essential, or to the least critical power bus, so failure or malfunction of the EFB or power supply will not affect safe operation of aircraft critical or essential systems. In this regard, compliance with aircraft operating instructions regarding usage /charging of PED's, while using charging ports for portable PED's shall be followed.

5.3 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). Temporary hand-held/ movable mount shall be used only after extensive operational evaluation and safety risk.

5.3.1 Physical characteristics

a) The size and practicality of the EFB shall be such that the device is not cumbersome for normal use on a flight deck.

5.3.2 Readability

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

5.3.3 Environmental

The EFB shall 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.

5.3.4 Basic non-interference testing

a) Portable EFBs are considered to be PEDs. As such, any reference to PEDs in this section is also applicable to portable EFBs.
b) In order to operate a portable EFB during flight, the user/operator is responsible for ensuring that the EFB shall not interfere in any

way with operation of aircraft equipment. The user/ operator shall provide results of the non-interference tests.Guidance on Non-interference tests is given in Appendix A.

5.3.5 Power supply, connection and source

a) 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.

b) The power source shall be suitable for the device. It shall be a dedicated power source or a general purpose source already fitted.

c) 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).

5.3.6 Batteries

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

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

i) risk of leakage;

ii) safe storage of spares including the potential for short circuit; and

iii) hazards due to on-board continuous charging of the device, including battery overheat.

5.3.7 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.

5.3.8 Temperature rise

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

5.3.9 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 affect otherwise independent EFB platforms.

5.3.10 Data connectivity to aircraft systems

Refer Para 5.2.2(Data connectivity) above.

5.3.11 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 shall require an airworthiness approval. The extent of this information is dependent on the complexity of the interface to the aircraft systems.

5.3.12 Stowage

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

Viewable stowage

A portable EFB (not mounted in 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.

Some types of viewable stowage may have characteristics that degrade appreciably with aging or due to various environmental factors. In that case, operator shall ~~be~~ ensure 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 shall 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.

6. HUMAN FACTORS

The operator shall carry out an assessment of the human-machine interface and aspects governing crew coordination when using the EFB. EFB user-interface philosophy shall 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 applicable parts of Para 5
f) software considerations — refer to Para 10

7. CREW OPERATING PROCEDURES

7.1 GENERAL

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

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

a) which information source will be primary;

b) which source will be used as secondary information;

c) conditions under which secondary source can be used; and

d) actions required to be taken 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.

7.1.3 If normal operational procedures require an EFB for each flight-deck crew member, the set-up shall comply with the definition of independent EFB

platforms.

7.1.4 Operators shall include the requirements for EFB availability as part of the minimum equipment list (MEL).

Note: Installed EFBs are part of the master minimum equipment list (MMEL) and shall be included in the MEL. Since MMEL does not include portable EFBs, the operator shall suitably revise the MEL toinclude portable EFBs and any associated systems such as power connection, mounting devices, aircraft interface devices etc.

Note: Training Considerations for Installed Equipment - additional training is required. In addition to procedures defined in AFM, Airplane Flight Manual Supplement (AFMS), Rotorcraft Flight Manual (RFM), Rotorcraft Flight Manual Supplement (RFMS), FSB Report, OSR, MMEL, documented training program shall include the following :

- Descriptions of authorized special flight maneuvers, operations, and procedures the operator conducts when using an EFB, ensuring that all procedures are as prescribed in OEM documentation.
- Any special pilot/controller procedures/ PBC procedures when using EFB-based information.
- procedures for Geographical areas authorized for specific EFB operations, if applicable., shall be as per defined procedures/ AIP.
- Authorized methods to defer inoperative EFB equipment, inline with OEM procedures and MEL philosophy.

7.2 REVISIONS AND UPDATES

7.2.1 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).

7.2.2 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 shall specify what actions to take if the software applications or databases loaded on the EFB are out of date.

7.2.3 While Flight crew shall be responsible for updating routine application requiring one or two steps, more complicated updates such as updating device Operating System (OS), or updating an app to a particular version shall be the responsibility of the operator which shall be documented in the EFB Policy and Procedure Manual.

7.3 WORKLOAD AND CREW COORDINATION

7.3.1 In general, using an EFB shall 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.

7.3.2 Workload shall 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.

7.4 REPORTING

The Operator shall establish a reporting system for EFB failures. Procedures shall 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. Information of a significant failure of hardware/ software shall be reported to DGCA (FSD) immediately by telephone and email. This shall be followed by a written report within 72 hours after carrying out safety risk assessment by the operator.

Note: Significant failure shall include but not limited to:

1) EFB outage in flight because of charging/ hardware/ software issues (Other than routine discharge).
2) Multiple EFB outage due hardware/ software issues.
3) Fire/damage to EFB in flight.
4) Inability of crew to ensure routine safe operation due to any aspect concerning EFB.

7.5 INFORMATION INTEGRITY

Operator shall ensure that there is only one version of an application/ document. Hosting a single document on application in multiple app is prohibited to ensure integrity.

8. FLIGHT CREW TRAINING

8.1 The use of the EFB shall be conditional on appropriate training. Training shall be in accordance with the operator's SOP (including abnormal procedures) and shall 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 application for changes to the hardware configuration;
j) recurrent training and proficiency checks; and

k) any area of special emphasis raised during the EFB evaluation with DGCA.

8.1 Training of EFB Personnel: Training of Non-Flight crew Members. EFB training is required for non-flight crew members if they are using similar devices and applications and are interacting with flight crew members using the same devices and applications. Examples are maintenance personnel, loading personnel, and dispatchers. Training must emphasize the coordinated procedures with flight crew members.

9 EFB RISK ASSESSMENT

9.1 GENERAL

9.1.1 The EFB risk assessment is a process that shall beperformed to assess the risks associated with the use of each EFBfunction and shall allow the operator to keep the risks to an acceptable level by defining the appropriate mitigation means.

9.1.2 This risk assessment shall be performed before the beginning of the approval process, and its results shall be reviewedon a periodic basis.

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

9.1.3 Fresh risk assessment is necessary whenever there is a significant change in hardware/ software or operator procedures and whenever there is a significant failure as defined in para 7.4. The operator shall closely monitor the impact of hardware/ softwarechange and implement change only after extensive trials. Safety risk assessment shall be undertaken whenever changes are significant.

9.1.4 The modifications to EFB Software application and/or OS which

(a) are Minor upgrades, or
(b) do not introduce any additional functionality to an existing EFB function.

may be introduced by the operator without the need to notify the competent authority, as long as a comprehensive risk assessment and mitigation have been completed and the EFB have been subjected to sufficient trials to ensure that there is no risk due to such modifications. These changes should, nevertheless, be controlled and record of update, risk mitigation exercise and trials shall be maintained for evaluation by DGCA during routine audits.

10 EFB FUNCTIONS

10.1 GENERAL

10.1.1 DGCA shall specifically approve the operational use of EFB functions to be used for the safe operation of aircraft.

10.1.2 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. increased in-flight crew workload during critical phases of flight, reduction in functional capabilities or safety margins).

10.1.3 Those functions shall be recorded in the operations manual and will be linked to the operations specifications.

10.1.4 The list below are 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, interactive or not and with or without online updation capability eg EFF with provision to read, complete, record and submit parameters or Electronic journey log book, technical log/flight log with provision to record and submit parameters
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 display;
e) aircraft performance calculation applications that provide take- off, en-route, approach, landing and missed approach performance calculations;
f) mass and balance calculation applications;
g) Electronic checklist (ECL); and
h) Cabin Electronic Flight Bag

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

10.1.5 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 ortrajectory, 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 crewto 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;

e) if the DGCA determine that the function requires airworthiness certification.

10.2 CONSIDERATIONS FOR ALL EFB APPLICATIONS

10.2.1 Software Human-Machine Interface (HMI)

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

b. Software considerations shall 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 color, display of system status, error messages, management of multiple applications, off-screen text and content and use of active regions.

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

d. *System error messages*. It is 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 is desirable to prioritize these EFB status and fault messages.

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

f. *Responsiveness of application.* The system shall 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 shall 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 ofsystem response to user input shall be consistent with an application’s intended function.

g. *Off-screen text and content*. If the document segment is not visiblein its entirety in the available display area, such as during “zoom” or “pan” operations, the existence of off-screen content shall be clearly indicated in a consistent way. For some intended functions,it may be unacceptable if off-screen content is not indicated. This shall be evaluated based on the application and intended operational function.

h. The Operator should review HMI 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 may require changes or enhancement of the given design.

10.2.2 Electronic signatures

a) Electronic signatures for use in EFB applications may be accepted provided that they fulfil the same objectives and assure the same degree of security as the handwritten or any other form of signature it intends to replace. Electronic signature shall not be used till the time the form/document is completely migrated to electronic form. Specific approval of DGCA (FSD) shall be obtained for use of electronic signature on any document.

NOTE 1.— Guidance on electronic signatures is contained in the Airworthiness Advisory Circular XX of 2023

11 CONSIDERATIONS FOR EFB APPLICATIONS TO BE USED FOR THE SAFE OPERATION OF AIRCRAFT

11.1 EFB MANAGEMENT

a) The operator shall have an EFB management system in place. Complex EFB systems shall require more than one individual to support the EFB management system. However, at least one person (e.g. dedicated EFB Administrator) shall possess an overview of the complete EFB system, including the distribution of responsibilities within the operator’s management structure.

b) EFB management is the key link between the operator and the EFB system and software suppliers.

c) 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 software applications there shall be a means for operators to carry out their own check of data content prior to load and/or releasefor operational use.

d) The EFB management system shall ensure that software application supporting function(s) not directly related to operations conducted bythe flight crew of the aircraft (e.g. web browser, email client, picture management) do not adversely impact the operation of the EFB.

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

f) EFB management shall establish procedures to ensure that no unauthorized changes take place to EFB applications. An EFB policyand procedures manual shall be part of the operator's operations manual (see Appendix C).

g) Procedures shall be established for the maintenance of the EFB.

h) EFB management shall be responsible for the procedures and system, documented in the EFB policy and procedures manual that maintain EFB security and integrity. The required level of EFB security dependson the criticality of the used applications.

i) Any new or modified EFB application requires a reassessment for proper functioning and on whether any additional training or procedures are necessary.

11.2 QUALITY ASSURANCE

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

12 APPLICATION FOR APPROVAL

12.1 An applicant seeking approval for the operation use of EFB function shall submit the application in the prescribed format given in Appendix D along with a copy of the draft EFB Policy and procedures manual.

12.2 Any amendment or changes to the existing specific approval to EFB

requires DGCA approval.

13 EFB USE IN GENERAL AVIATION OPERATIONS WITH HELICOPTERS OR OTHER THAN LARGE OR TURBOJET AEROPLANES

13.1 EQUIPMENT/ HARDWARE CONSIDERATIONS

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

b) The operator shall follow the provisions of 5.3 of this CAR when using a portable EFB.

13.2 PILOT OPERATING PROCEDURES

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

13.3 PILOT TRAINING

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

13.4 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 shall 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.

13.5 EFB FUNCTIONS

13.5.1 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.

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

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 thesize 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 appropriatesources).

c) *Airport moving map display application*. An AMMD application shouldnot be used asa primary means of navigation for taxi; outside references remain primary.

d) In-flight weather application. The displayed meteorological information may before cast, 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.

e) Information required to be carried by regulations, interactive or not and with or without online updation capability eg. EFF with provision to read, complete, record and submit parameters or electronic journey log book, technical log/flight log with provision to record and submit parameters, are as required under relevant regulations and guidelines.

14 LPC Paper Removal.

If an operator has an EFB program authorized with adequate mitigations or develops adequate mitigations as a modification to an existing program, it is possible to remove certain paper documentation from the aircraft using an equivalent level of safety. An operator proposing to remove any paper documentation from the aircraft shall ensure compliance with applicable regulations, complete a risk assessment and mitigation

exercise and complete comprehensive trials before seeking approval from DGCA. Such exercise shall be implemented only after receiving DGCA approval.

15 Program Catalog :

The EFB program catalog is a reference of the EFB hardware (make and model) and EFB applications used by flight crew members on each aircraft M/M/S and maintains configuration management of EFB program elements. An EFB program must have a process defined to keep the catalog current and readily available for audits. A record must be maintained for any change to the EFB program catalog. The catalog must also include:

- Current EFB OS, and include current version.
- EFB applications, and include current version.

16 Fees :

Fees for EFB approval on first aircraft type with the operator shall be INR.10,000/- (Ten Thousand only).

Sd/-
(Vikram Dev Dutt)
Director General of Civil Aviation

Appendix A

Guidance on non-interference testing and Rapid Decompression Testing for Portable EFBs

1. 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.

(a) Method 1

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.

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 via same EFB being used in the same type of aircraft / avionics by another reputed operator.

(b) **Method 2**

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

2. Additional testing for transmitting portable EFBs

2.1 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/operator shall 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.

2.2 This test consists of two separate test requirements:

Test Requirement 1. Each model of the device should have an assessment of potential electromagnetic interferences (EMI) based on arepresentative sample of its frequency and power output. This EMI assessment should follow 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.

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 beenconducted with the device not deliberately transmitting (see Para 3, 3.4), non-interference testing shall be conducted with an operating transmit function. The position of the transmitting device is critical to non- interference testing; hence, locationsof the EFB and of the transmitter (if applicable) should be clearly defined and adhered to.

3. Rapid Decompression Testing.

3.1 ***Representative Sample****.* To provide some level of assurance of functional capability during a decompression event, decompression testing must be accomplished on representative samples of powered EFB component make and model configurations. It is the responsibility of the operator to provide documentation showing these tests were accomplished on at least one representative sample of each make and model of powered EFB component. Representative testing is an appropriate level of testing for modern solid-state devices. The testing of operational EFBs should be avoided when possible to preclude the infliction of unknown damage to the unit during testing.

3.2 ***Rapid Decompression Testing.*** Rapid decompression testing must be accomplished for authorization of EFBs in pressurized aircraft in order to confirm the representative sample is safe during a rapid decompression event in close proximity to the flight crew member and remains available for operational use. The information from the rapid decompression test is used to establish the procedural requirements for the use of the EFB in a pressurized aircraft. Rapid decompression testing must comply with EUROCAE ED-14D/RTCA DO-160D or later revisions, guidelines for rapid decompression testing up to the maximum operating altitude of the aircraft in which the EFB is to be used. Similarity of a particular EFB make and model to a unit already tested may be used to comply with this requirement. It is the responsibility of the operator to provide the rationale for the similarity.

Appendix B

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, operators who have been granted a specific approval for particular EFB software applications may wish to consider adopting the methods discussed within this appendix.

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

1. TAKE-OFF AND LANDING PERFORMANCE (TALP) AND MASS AND BALANCE (M&B) APPLICATIONS

1.1. Introduction

1.1.1. The validity and integrity of take-off and landing performance (TALP) and mass and balance (M&B) data are essential for safe flight operations. These types of EFB applications and the operator's procedures for their use, require thorough evaluation prior to being approved for service.

1.1.2. DGCA should consider the application architecture, the HMI, the documented testing results and the operator's EFB procedures and training before approving the operational use of EFB, TALP and M&B applications.

1.2. Take-off and landing performance (TALP) 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-1 shows a typical architecture of a TALP 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.

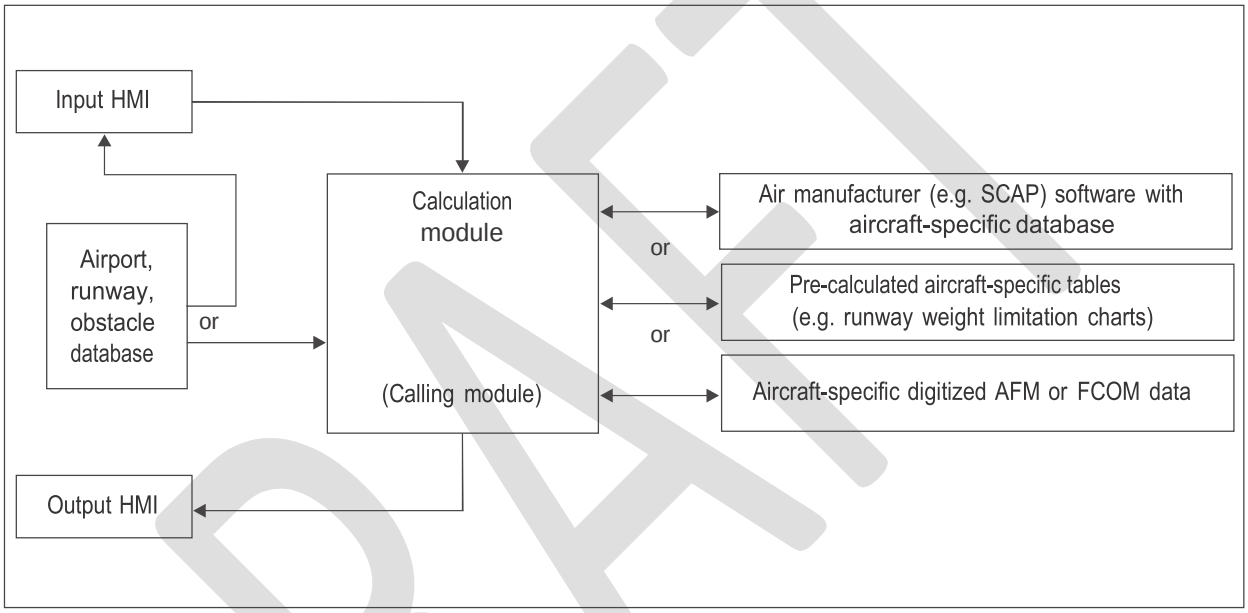

Figure A-1.Typical architecture of a TALP application

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. TALP source data is generally derived from either pre-calculated tables (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) Standardised Computerised Aircraft Performance (SCAP) specification.

The IATA SCAP specification provides a standardized means for manufacturers, operators 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 or “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; it may 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 equivalent, delivered by the manufacturer;

b) digitized aircraft performance data, built by the operator 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 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 (TALP), mass and balance (M&B) applications and human-machine interface (HMI)

1.3.1. Operators 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 Para 10 of the CAR:

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 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. The application should clearly distinguish user entries from default values or entries imported from other aircraft systems.

e) 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.

f) 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.

g) 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.

h) 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.

i) 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 Para 6 of the CAR).

j) The user should be able to modify its input data easily, especially to account for last-minute changes.

k) When calculation results are displayed, they should be displayed with the input parameters used for calculation.

l) Any active MEL/CDL/special restriction should be clearly visible and identifiable.

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

n) 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 (TALP) and mass and balance (M&B) applications testing

1.4.1. Accurate TALP and M&B calculations are essential to safe aircraft operation. EFB applications can be effective tools used to make these calculations. Authorities and operators 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 M&B calculations must use data derived from the AFM or other sources acceptable to DGCA.

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 M&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 M&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 aircraftunder a representative cross section of conditions for TALP applications (e.g. runway surface condition, runway slope, wind conditions, temperature, pressure altitude, obstacle clearance and aircraft configuration, including failures with a performance impact).

1.4.5.2. The results of M&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 M&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'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 DGCA.

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 enteredwith identical parameters.

1.4.5.7. Tests should be acceptable to DGCA.

1.4.6. *User-interface tests*. Tests designed to verify that an application's user interface is acceptable.

1.4.6.1. Test cases should be defined to demonstrate that:

a) the HMI requirements are complied with (see section 1.3.1 in Appendix B);

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

c) the application provides easily comprehended results or error messages and 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.

1.4.7.1. *Test* cases should be defined that demonstrate that:

a. the application functions correctly on the EFB platform;

b. the application does not adversely impact other EFB applications or aircraft systems or vice versa; and

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

1.5. Procedures, management and training

The evaluation of EFB applications that calculate TALP and M&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 M&B data. The procedures should apply to the flight crew and ground personnel (e.g. flight dispatchers, flight operating officers, operating personnel) who may have roles defined in the use of the applications.

1.5.1.2. TALP and M&B data should be independently calculated and cross- checked by both pilots. When a dispatch system described in CAR Section 8, Series O, Part 2, Para 3 is used for the control and supervision of flights, the flight dispatcher (or other ground staff assigned) should verify that the results are within operating limits. Any differences should be discussed before the results are used operationally. All M&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 checksum 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 M&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 an incorrect 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. Training should emphasize that the use of EFBs makes TALP and M&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 flap settings for take-off) and pilots should be trained accordingly.

1.5.5. Management of performance TALP and M&B EFB applications

Within the operator’s organization, the responsibilities between the TALP and M&B management and the EFB management should be clear and well documented. An operator should designate a person or group who are sufficiently trained to provide support for the performance tools. This person or group must have comprehensive knowledge of current regulations, TALP and M&B, and TALP and M&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. 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.

3. TAXI AID CAMERA SYSTEM (TACS)

3.1. Description

3.1.1. Taxi aid camera system (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. The following should be considered:

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

b) Image quality should be adequate during foreseeable environmental lighting condition.

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 for accuracy.

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

f) Pilot use of TACS should not induce disorientation.

4. AIRPORT MOVING MAP DISPLAY (AMMD)

4.1. Description

4.1.1. This section provides some consideration on how to demonstrate the safe operational use for airport moving map display (AMMD) applications to be hosted on EFBs.

4.1.2. 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.

4.1.3. The AMMD application is designed to indicate aeroplane 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 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. 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, 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 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 CAR Section 8, Series O, Part II — *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.

Flight crew training

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

4.1.6. 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 wayto 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 recognizable 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 CAR Section 9 Series M, Part 2 — *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 CAR will not supersede the regulatory requirement contained in the CAR Section 9, Series M Part I.

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 centre (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 section6.2;

b) latency of observed meteorological information and the hazards associated with utilization of old information;

c) that IFW information beyond CAR Section 9, Series M, Part 1, 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, data link failures, missing information);

i) avoiding fixation; and

j) managing workload.

6.6. Note

6.6.1. Consideration should be given to the speed of technological development. The authority providing or arranging for the provision of meteorological service for international air navigation on behalf of a Contracting State (meteorological authority) should collaboratively work with the stakeholders to assess and, if requirements are met (e.g. actuality, latency, accuracy), enable new service implementation.

6.6.2. Whenever possible, future comparable information display functions, e.g. volcanic ash, solar radiation, should consider this guidanceunless specific guidance is available.

7. Electronic journey log book, technical log/flight log

Refer CAR Section 2 Series X, Part VI on Aircraft Log Books along with CAR 8/S/VIII & CAP 8600 for Approval process.

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, 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 managementUpdates and changes management (Major & Minor upgrades)

- Hardware description
  EFB system architecture Hardware configuration control

- Software description Operating system description
  List and description of applications hosted

- **Flight crew training/ Flight Dispatcher training**

- **Operating procedures**

- **Maintenance considerations**

- **Security consideration**

Appendix 'D'

ELECTRONIC FLIGHT BAG (EFB) APPROVAL APPLICATION FORM

This form is designed to elicit all the required information from those operators requiring the Electronic Flight Bag (EFB) operational approval.

1. SCOPE & GENERAL INFORMATION

1.1	**EFB**	EFB Type:	Portable ☐	Installed ☐
		EFB Function(s): ~~Software application(s) type:~~	☐ A ☐ B	
1.2	**Operator Name**			
	Designated EFB Administrator	Tel:		
1.3	**Aircraft Registration(s)**			
	Manufacturer			
	Type/Model(s)			

2. HARDWARE PLATFORM

2.1	**Hardware Type No.**							
2.2	EFB to be used	on ground ☐			in-flight cruise only ☐			
		Portable Devices Storage (mount) ☐			**Remarks*			
	EFB to be used by	Cockpit crew ☐			Cabin crew ☐			
2.3	**Data Storage Device**	HD ☐	CD ☐	DVD ☐	FD ☐		Other ☐	
	Remarks							
2.4	**Data Transfer Device**	N/A	Bluetooth	IR	USB	Serial	Parallel	Other
	Remarks							

2.5	**Cursor Navigation** Installed and used	Touch screen ☐	Touch pad ☐	Mouse ☐	Track ball ☐	Keyboard ☐	Other ☐
	Remark						
2.6	**Lithium Battery Used**	yes ☐ no ☐					
	If yes →	Specific items are addressed and regulations are included in the operational documentation.					
2.7	**Onboard Power Supply**	yes ☐ no ☐					
	If yes →	Power source certified to be used ☐ in-flight ☐ on ground					
	If No →	Remarks					

3. SOFTWARE APPLICATION(S)

3.1	**Operating System Description**	(e.g. MS Windows, MAC, Linux or Android)				
	Remarks					
	List of programs & Applications submitted?	yes ☐ no ☐				
3.2	**Program(s) Based on**	MS Office ☐	Adobe PDF Application ☐	Html ☐	Manufacturer ☐	Other *specify in the Remarks ☐
	Remarks					
3.3	**Kind of Software**	Data presentation ☐ Data processing ☐				
	Remarks					
3.4	**Program Settings**	Handled by EFB administrator ☐ End user ☐				
	Remarks					

3.5	**Intentions / Tasks to be Done by EFB**	

4. OPERATION & TRAINING DOCUMENTATIONS

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

5. AIRWORTHINESS DOCUMENTATIONS

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

6. APPLICATION PACKAGE

Operations manuals(s) extract (s) and/or checklist (s) that include EFB operating practices and procedures									
OM/A ☐	OM/B ☐	OM/C ☐	OM/D ☐	QRH ☐	MEL ☐	AFM ☐	EFB Manual ☐	FCOM ☐	Others ☐
EMI demonstration report ☐			Operational Risk Analysis ☐			Rapid decompression test report ☐			

7. EFB APPLICANT'S STATEMENT

The undersigned certify the enclosed information to be complete and true and that the system installation, continuing airworthiness of systems, minimum equipment for dispatch, operating procedures and flight crew training comply with the requirements of the regulation.		
Designated Representative/ Manager	Signature:	Date:

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

8. APPROVALASSESSMENT (FOR DGCA USE ONLY)

Subject	Responsible	Signature	Date
Application package complete	FOI		
Operational and training document reviewed and considered satisfactory	FOI		
Airworthiness document reviewed and considered satisfactory	AWI		
Simulator Demo: Aircraft	FOI		
Evaluation Test	FOI/AWI		
EFB approval issued & process completed	FOI		

Inspectors Remarks
Air Worthiness Inspector
Name……Signature ……Date…….
Flight Operations Inspector
Name……Signature ……Date…….

Appendix E

CABIN ELECTRONIC FLIGHT BAG (C- EFB)

1.1 Background

1.1.1 An EFB developed for cabin operations is referred to as a cabin electronic flight bag (C-EFB). The functionsof a C-EFB may include, but are not limited to:

– accessing expositions
– checklists
– forms
– passenger information
– real-time reporting.

1.1.2 C-EFBs can perform a variety of functions traditionally accomplished using paper references by electronically storing and retrieving documents required for flight operations. C-EFBs may be authorized for usein conjunction with, or to replace, some of the hard copy material that cabin crew typically carry in their document library.

1.1.3 This appendix can be read in conjunction with guidance relating to flight crew member EFBs available at CAR Section 8, Series S Part VIII, Specific Approval for Operational Use of Electronic Flight Bag (EFB).

1.2 Types of C-EFBs

1.2.1 C-EFBs can be either portable or installed.

1.2.2 Portable C-EFBs are not part of the aircraft configuration and are categorized as portable electronic devices (PEDs). They generally have self-contained power and may rely on data connectivity to achieve full functionality.

– parts of an exposition including that which relates to cabin crew operations
– passenger information list
– passenger announcements
– aircraft system interaction, for example, cabin defects

1.2.3 Installed C-EFBs are integrated into the aircraft, subject to normal airworthiness requirements and under design control. The approval of these C-EFBs is included in the aircraft's type certificate or in a supplemental type certificate.

1.3 C-EFB Functions

1.3.1 Both safety and non-safety related functions are eligible as C-EFB functions.

1.3.2 A C-EFB may include, but is not limited to, the following functions:

– parts of an exposition including that which relates to cabin crew operations
– passenger information list
– passenger announcements
– aircraft system interaction, for example, cabin defects
– documents and checklists, including quick reference handbooks
– reporting forms and functions (mandatory and operator-required reporting, safety, security, quality, service,fatigue and flight operations)
– medical service providers
– flight and duty time limitations

– training materials and digital learning access
– operator email or other news communication
– operator portal
– onboard sales process
– layover information, for example, hotel, embassy, medical services
– a copy of the C-EFB user manual.

1.3.3 C-EFB functions to be used for the safe operation of aircraft are considered by DGCA to be those whosefailure, malfunction or misuse would have an adverse effect on the safety of aircraft operations, for example, byincreasing cabin crew workload during critical phases of flight. The applications below may be considered examples of software applications providing such functions, depending on their use, associated procedures andfailure mitigation means:

– expositions
– special authorizations/approvals; check requirements of that
– cabin defect log/cabin maintenance discrepancy reporting forms
– electronic checklists, including those for use during normal operations, abnormal and emergency situations
– mandatory occurrence reporting forms.

1.4 Required specific approval

1.4.1 The civil aviation requirement contains specific provisions accepting electronic copies of certain required documents as being approved.

2 C-EFB training risk assessment and mitigation strategies

3.1.1 The C-EFB risk assessment is a process to evaluate the risks associated with the use of each C-EFB function. It is important that operators develop appropriate risk mitigation strategies to manage risks to an acceptable level. It is highly recommended that this type of analysis be performed prior to the entry into operation of any C-EFB system and the results reviewed periodically.

– evaluate the physical characteristics of the C-EFB, including size (e.g., physical size of the device, screen size,font size), stowage, securing and accessibility (e.g., a C-EFB that is too small may fall behind or under structuressuch as class dividers or closets, be obstructed by other items or easily lost) — system

design (including hardwareand software)

– alternative C-EFB possibly supplied from a different power source

– C-EFB applications hosted on more than one platform

– paper backup, for example, cabin crew operations manual

– alternative procedures

– training

– identify potential losses of function or malfunction (detected and undetected erroneous output) and associatedfailure scenarios

– analyze the operational consequences of these failure scenarios

– ensure the C-EFB system (hardware and software) achieves at least the same level of accessibility, usabilityand reliability as the paper-based system that it is replacing

ensure the C-EFB will not cause interference with on-board electronic systems and aircraft equipment on which it will be permitted for use (through aircraft PED tolerability testing): As defined in the CAR.

– analyze human factors and ergonomic considerations related to the C-EFB, for example, to minimize human errors

– manufacturing defects, product recalls and processes for continued operation should be considered in the risk assessment.

– establish risk mitigation strategies.

3.1.2 The risk assessment is recommended to evaluate the risks associated with the use of a C-EFB byaddressing the following, as a minimum:

3.1.3 When the C-EFB system is intended for introduction alongside a paper-based system, only the failures thatwould not be mitigated by using the paper-based system need to be addressed.

3.1.4 Based on the outcome of the C-EFB risk assessment, operators should determine a series of risk mitigationstrategies against C-EFB failure.

3.1.5 Operators should consider establishing a reliable alternative means of providing information that isavailable on the C-EFB system.

3.1.6 The risk mitigation strategies can be one or a combination of the following examples:

– system design (including hardware and software)

- alternative C-EFB possibly supplied from a different power source

– C-EFB applications hosted on more than one platform

– paper backup, for example, cabin crew operations manual

– alternative procedures

– training

-administration support, for example, operators should ensure that cabin crew members have access to necessary information during operations.

3.1.7 In order to address the accessibility, usability and reliability of the C-EFB system, operators should include risk mitigation strategies for failure of the C-EFB system, such as:

– complete system failure

– individual application failures

– corruption or loss of data

– battery testing and recharge
– erroneously displayed information

3 Hardware considerations

3.1 Readability

3.1.1 The C-EFB data should be legible under the full range of lighting conditions expected in the cabin. Font style, color, formatting and background should also be legible. The screen background should be considered to ensure readability, for example, color and wallpaper.

3.2 Basic non-interference testing

3.2.1 As portable C-EFBs are PEDs, pilots-in-command, or operators on their behalf, must ensure that the C- EFB will not interfere in any way with the operation of aircraft systems.

3.3 Environmental conditions

3.3.1 Operators should ensure that the C-EFB can be operable within the anticipated environmental conditions in the cabin, including foreseeable high/low temperatures, and after rapid decompression if the C-EFB is intended for use in such an event.

3.3.2 Overheating can occur during use or charging of the C-EFB. The placement of the C-EFB should allow sufficient airflow around the unit.

3.4 Hardware considerations for installed C-EFB

3.4.1 An installed C-EFB is a component that is incorporated into the aircraft type design and, as such, is subjectto airworthiness authority approval. Installed C-EFBs should be certified either during the airworthiness certification of the aircraft, through operational bulletins by the original equipment manufacturer or through a third-party supplemental type certificate.

3.4.2 The capability of connecting an installed C-EFB to certified aircraft systems should be covered by an airworthiness approval. Certified aircraft systems should be protected from the adverse effects of an installed C- EFB system failure by using a certified aircraft interface device (AID). An AID may be implemented as a dedicated device or implemented in non-dedicated devices such as a C-EFB docking station, a network file server or otheravionics equipment.

3.4.3 Installed power provisions should comply with the applicable airworthiness requirements. Connection of the C-EFB to the non-essential or least critical power bus is recommended, so failure or malfunction of the C- EFB or power supply will not affect the safe operation of an aircraft's critical or essential systems. There should be a means other than a circuit other than a circuit breaker to disable installed C-EFBs in the event of unwantedoperation, such as continuous flashing. Circuit breakers may not be used as switches.

3.5 Hardware considerations for portable C-EFB

3.5.1 Consideration should be given to the physical characteristics of the device selected for the C-EFB, for example, a smart phone or tablet. Some devices may prove to be cumbersome for normal use in the cabin. Thephysical characteristics of the device should be evaluated as part of the C-EFB risk assessment.

3.5.2 Stowage and securing require inherent means to prevent unwarranted portable C-EFB movement. Stowage and securing should be configured such that the C-EFB can be easily stowed and secured but remainsreadily accessible. The methods of stowage and securing should not create a hazard during aircraft operations.

3.6 Power supply

3.6.1 Operators should ensure that power supply to the C-EFB, either by battery and/or externally supplied, is compliant with the applicable standards for use in an aircraft and is available to the extent required for the intended operation. The power source needs to be suitable for the device.

3.6.2 Installed power provisions should comply with the applicable airworthiness requirements. C-EFB design should consider the source of electrical power, the independence of the power sources for multiple C-EFBs andthe potential need for an independent battery source. Operators should identify designated outlet(s) for use by cabin crew to charge C-EFBs onboard the aircraft.

3.6.3 Operators may consider providing approved charging stations for use in flight. If so, stations should meet all airworthiness requirements. Charging stations that are dedicated for crew use should not be accessible to orused by passengers.

3.7 Cabling

3.7.1 Operators should ensure that any cabling attached to the C-EFB, whether in the dedicated mounting or handheld, does not present a hazard. Persons using the C-EFB should only use approved, compatible cables.

3.8 Mounting devices

3.8.1 A mounting device is a device that can be used to secure a portable C-EFB. It may include equipment such as docking stations and suction cups. The mounting device may have aircraft power and data connectivity. It may require quick disconnect for egress. If the mounting device for the C-EFB is permanently attached to the aircraft structure, the installation should be approved in accordance with the appropriate airworthiness requirements.

3.8.2 Some considerations for these devices include:

- The intended C-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 ingress, egress and emergency escapepaths, nor pose any risk of injury to occupants, for example, in the event of a hard landing.
– There should be no mechanical interference between the C-EFB in its mounting device and any of the cabin display panels.
– The mounting device should be able to lock in position easily. Crashworthiness considerations should be considered in the design of this device, including appropriate restraint of any device when in operation.
– Provisioning to secure, lock or stow the mounting device in a position clear of cabin crew member operations when not in operation.
– The C-EFB hardware should be capable of being easily removed from the mounting device by the cabin crewmember without tools or maintenance action, for fire safety reasons.

4 Software considerations

4.1 Usability

4.1.1 The C-EFB should provide an intuitive, user-friendly and consistent interface within and across the varioussoftware applications that it hosts. This should include, but not be limited to:

– data entry methods
– colour-coding philosophies
– symbols.

4.1.2 Software developers and operators are encouraged to evaluate the usability of an existing human-machineinterface (HMI) before developing a new HMI. The HMI should be evaluated for unforeseeable common humanerrors after its introduction into operation in the everyday environment to allow for required changes or enhancements of the given design.

4.1.3 Software considerations include, but are not limited to, the following and should be addressed by operators:

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

4.2 Ease of access to common functions

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

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

4.3 Consistency of symbols

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

4.4 Terms and abbreviations

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

4.5 Legibility of text

4.5.1 Information displayed on the C-EFB should be legible to the intended user at the intended viewing distance(s) and under the full range of lighting conditions expected in the cabin, including daytime use in direct sunlight and night operations. Ideally brightness should be adjustable in fine increments.

4.5.2 It is recommended that operators consider the effects of long-term display degradation due to abrasion and ageing of the device.

4.6 System responsiveness

4.6.1 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 for example, self-test or data refresh, the C-EFBshould display a 'system busy' indicator to inform the user the system is occupied and cannot process inputs immediately.

4.6.2 The timeliness of system response to user input should be consistent with an application's intended function, for example, time-critical information should be prioritized by the system.

4.7 Methods of interaction

4.7.1 In choosing and designing input devices, such as keyboards, touch screens or cursor-control devices, operators should consider the type of entry to be made and the cabin environmental factors, such as turbulence and other normal vibrations affecting the usability of the input device.

4.7.2 For touch screens, cabin crew members may need physical locations or structures, such as a galley bench,to stabilize their hand to be able to make accurate inputs. Operators should verify that touch screens do not result in unacceptable levels of cabin crew workload and error rates.

4.7.3 Input devices should provide feedback to indicate when they are operational. Since touch screens provide little or no tactile feedback or control motion, visual and/or aural or other touch activation feedback is especiallyimportant.

4.7.4 Other touch screen considerations include selecting the touch technology, for example, resistive or capacitive, controlling screen contaminates which may reduce readability, for example, skin oils or perspiration,and mitigating inadvertent operation.

4.8 Use of colour and messages

4.8.1 Certain colours are commonly used in aviation to represent particular emergency or non-normal conditions.It is therefore recommended that:
– the colour 'red' only be used to indicate a warning level condition
– the colour 'amber' only be used to indicate a caution level condition.

4.8.2 Any other colour may be used for items other than warnings or cautions, providing that the colours useddiffer sufficiently from red and amber to avoid possible confusion.

4.8.3 It is recommended that the use of colours should take into consideration cabin crew members with visionimpairments.

4.9 Display of system status

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

4.10 Management of multiple applications

4.10.1 The C-EFB should provide continuous indication of which application and/or document is active if the system supports multiple open documents or allows multiple open applications. The active application/document is the one currently displayed and responding to user actions.

4.10.2 During normal operations, the user should be able to select which of the open applications or documentsis currently active. Additionally, the user should be able to find which open applications are running and switch to any one of them easily. The user should also be able to open a new application quickly and easily.

4.10.3 When the user returns to an application running in the background, it should appear in the same state aswhen the user left the application, other than differences associated with the progress or completion of processing performed in the background.

4.11 Off-screen text and content

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

4.11.2 For some intended functions, it may be unacceptable if off-screen content is not indicated. This should be evaluated based on the application and intended operational function.

4.12 Use of active regions

4.12.1 Active regions are those to which special user commands apply, for example, hyperlinks or copying. Theactive region can be text, a graphic image, window, frame or another document object. Active regions are also useful for selecting between frames on a frame-based visual display. The information in the active frame would respond to update commands entered by the user.

4.12.2 If the display uses active regions, these should be clearly indicated. If users do not know how to use an active region, they will have trouble applying special commands to the intended object. If users do not know that a particular region is active, they may enter inappropriate commands and become frustrated when these commands are not processed as expected.

4.13 Electronic signatures

4.13.1 A signature to signify acceptance or to confirm the authority may be required. In order to be accepted asequivalent to a handwritten signature, an electronic signature used in C-EFB applications should assure the same degree of accessibility and security as the signature it replaces.

4.13.2 Operators should have a process in place for an electronic record keeping system to ensure the integrity of the system in line with AAC XX of 2023 - Guidance for organizations implementing Electronic Signatures, Electronic Record keeping and Manuals.

4.14 Error messages

4.14.1 C-EFB messages and reminders should be integrated with (or compatible with) other cabin system alerts. The C-EFBs should not cause a distraction through visual or audible notifications. If additional messages are available but not currently displayed, there should be an indication of the additional messages.

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

5 C-EFB management and technical support

5.1 C-EFB management system

5.1.1 Operators should have a C-EFB management system in place for their C-EFB program, which includes the following:

– procedures and systems related to the C-EFB
– hardware configuration management
– software configuration management
– C-EFB security
– software update management
– quality assurance process
– content management.

5.1.2 The C-EFB management system is the key link between an operator and the C-EFB system and softwaresuppliers. This system should manage C-EFB hardware and software configuration and ensure that no unauthorised software is installed.

5.1.3 The C-EFB management system is also responsible for ensuring that only a valid version of the software application and current data packages are installed on the C-EFB system.

5.1.4 The C-EFB management system should ensure that the software applications and any updates supportingfunctions not directly related to operations conducted by cabin crew members on board aircraft, for example, web browser, email client, picture management, do not adversely impact the operation of the C-EFB. There should be a means for operators to carry out their own check of data content prior to load and/or release for operational use.

5.1.5 The C-EFB management system should establish procedures to ensure that no unauthorised changes take place to C-EFB functions.

5.1.6 Procedures should be established for the development, system updates, content downloads, maintenance, security and integrity of the C-EFB. The required level of C-EFB security depends on the complexity of the system and data protection. A C-EFB policy and procedures manual may form part of

the exposition.

5.1.7 Procedures should be established for the maintenance of the C-EFB.

5.1.8 If updates to the C-EFB software are necessary, operators should ensure that the changes are properly tested in a controlled environment prior to upload for use in flight. This includes updates to the operating systemand software data.

5.1.9 Operators should have a process to ensure cabin crew members are informed and have received all systemapplications and data updates, for example, operating systems, tracking systems, notification systems, administrative systems. The C-EFB should have a status page that shows if any updates were performed and what these involved.

5.2 Dedicated personnel : EFB admin

5.2.1 Operators should assign at least one person, for example, a dedicated C-EFB manager, who is able to maintain oversight of the complete C-EFB system. This includes the distribution of responsibilities within the operator management structure. Complex C-EFB systems may require additional support.

5.2.2 Operators should ensure that each person involved in the C-EFB management system receives appropriate training in their role and has a good working knowledge of the proposed system hardware, operating system and relevant software applications.

5.3 Technical support

5.3.1 The C-EFB management system should also include dedicated technical support for all users.

5.3.2 Procedures should include a situation when cabin crew members may need assistance outside the technical support operating hours.

5.3.3 Operators should ensure that cabin crew members have access to necessary information during operations.

6 Crew operating procedures

7.1.1 Using a C-EFB should not increase the crew's workload during critical phases of flight. For other flight phases, cabin crew operating procedures should be designed to mitigate and/or control additional workload created by using a C-EFB. Workload should be distributed between cabin crew members to ensure ease of useand continued monitoring of other cabin crew tasks.

7.1.2 Operators should develop a user manual which may contain the following sections, as a minimum:
– introduction
– table of contents
– general guidelines, for example, security/confidentiality aspects, actions in the event of lost devices, crewmember responsibilities, onboard usage
– manual overview
– process for updating and any software prerequisites
– viewing and functionality
– search and navigation
– design features

– care, for example, hardware, cabling, converters, device maintenance, damage prevention
– troubleshooting
– frequently asked questions
– technical support
– process for incorporating CCOM revisions and updates
– glossary or index.

7.1.3 Operators should develop procedures for using the C-EFB in relation to the following:

– user role and responsibilities
– phases of flight when the usage of the C-EFB is not permitted
– stowage and securing specifications
– battery power management
– revisions and updates
– inclusion of the requisite reporting system and forms, where applicable
– damage prevention
– loss, damage, theft or software failure
– replacement/repair
– reporting of C-EFB failures or faults.

7.2 User role and responsibilities

7.2.1 Operator procedures should address the individual cabin crew member's role and responsibilities regardingC-EFB use. These include, but are not limited to, the following:

– requirements for C-EFB availability and accessibility
– usage of the C-EFB during flight
– use and download of other/external applications
– data protection measures for the device.

7.3 Phases of flight when use of the C-EFB is not permitted

7.3.1 Procedures should include specification of the phases of flight during which cabin crew members may notuse the C-EFB, for example, during critical phases of flight.

7.4 Stowage and securing specifications

7.4.1 Procedures should include specifications for when and how all portable C-EFBs must be stowed and secured. This includes during critical phases of flight and in turbulence to ensure the safety of the cabin occupants.

7.4.2 Secured portable C-EFBs should remain accessible to the cabin crew members throughout the flight.

7.5 Battery power management

7.5.1 If battery-powered C-EFBs utilize aircraft power for recharging, operators should establish a procedure toensure safe recharge of the battery, for example, minimum percentage of battery before the flight to be sufficiently charged to support the operation, charging on board or use of power bank.

7.5.2 Operators should identify designated outlet(s) for use by cabin crew members to charge C-EFBs onboard the aircraft. The means to operate the power source should be documented, including connectivity and compatibility considerations.

7.6 Revisions and updates

7.6.1 Operators should have a procedure in place to allow cabin crew members to confirm the revision number and/or date of C-EFB software application or databases.

7.6.2 The procedures should specific what actions to take if the software applications or databases loaded on the C-EFB are out of date.

7.7 Inclusion of the operator reporting system and forms

7.7.1 Where operators include the reporting system and associated report templates as part of the C-EFB applications, procedures regarding their use should be established. This includes mandatory and voluntary reporting as part of the safety management system, including real-time reporting where applicable.

7.8 Damage prevention

7.8.1 An operator should establish procedures for preventing damage to the C-EFBs and the aircraft. This includes, but is not limited to, guidelines regarding the use of uncertified cabling, crew monitoring of the device while it is charging and exposure to water and temperature.

7.9 Loss, damage, theft or software failure

7.9.1 While not necessarily a specific aviation safety matter, operators may wish to consider including procedures that address device loss, damage, theft or software failure, particularly to protect safety and sensitive informationcontained in the C-EFB. These might include the following matters:

– reporting process, for example, when, why and how to report
– device replacement process
– backup procedure for software failure or unavailability of the device, for example, use of paper documents.

7.10 Reporting of C-EFB failures or faults

7.10.1 A reporting system for C-EFB failures should be established. These procedures should be in place to inform maintenance personnel and cabin crew members about a failure or fault of the C-EFB, including actions to isolate it until corrective action is taken.

7 Crew training

8.1.1 The type of C-EFB training will depend on the nature and complexity of the C-EFB system. Training shouldaddress any gaps in the level of proficiency that the user may have with technology and the specific device to be used.

8.1.2 Operators may use different delivery methods for C-EFB training including classroom instructions and/or computer-based training (digital learning methods).

8.1.3 Initial C-EFB training should include the following, as a minimum:

– User role and responsibilities.
– Fundamentals on how to use the C-EFB, for example, navigating throughout the C-EFB, turning the device onand off, logging in and out, adjusting screen settings and brightness, charging the device, screen maintenance.

– Safe practices, for example, cable removal, use of protective cases, converter practices, use of aircraft poweroutlets, temperature exposure, preservation of long-term battery life, procedure for lithium battery fire.
– Clear instruction, for example, step-by-step on how and when to update the C-EFB content and software,operating system, applications and security aspects, as well as the importance of keeping the device up-to-date.
– Operating the C-EFB in normal, abnormal and emergency situations.
– The protection of safety and sensitive information, for example, passcode security, passenger information.
– How to handle and report the failure of C-EFB component(s).

8.1.4 Operators shall provide additional training for users on any new or modified functions of the device and applications. They may offer supplemental training to maintain and reinforce cabin crew knowledge and proficiency of the C-EFB.

8 C-EFB security : As per this CAR

10. Five Phase approval process to be followed as per guidance in CAP 8600