ICAO

Doc 10111

Manual on the Implementation and Use of Cabin Electronic Flight Bags

First Edition, 2019

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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AMENDMENTS

Amendments are announced in the supplements to the *Products and Services Catalogue;* the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

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FOREWORD

The use of electronic flight bags (EFBs) was initially intended to provide an alternative method of storing, retrieving, and using the manuals and information required to be on board by the applicable operational requirements. Subsequent technical developments have led to the hosting of software applications on EFBs, such as databases or real-time data received from operations (e.g. meteorological data, passenger information lists). Though EFBs were originally developed for flight crew members to perform flight management tasks, they are also useful for cabin operations.

An EFB developed for cabin operations is referred to as a cabin electronic flight bag (C-EFB). Functions of a C-EFB include but are not limited to: cabin crew operations manuals; checklists; forms; passenger information; and real-time reporting.

ICAO developed the *Manual on the Implementation and Use of Cabin Electronic Flight Bags* (Doc 10111) based on the EFB provisions contained in Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport*. ICAO EFB provisions address the responsibilities of States and operators regarding EFB hardware and EFB functions for flight crew members. The purpose of this document is to provide guidelines on the implementation and use of C-EFBs by cabin crew members. This includes an evaluation process by the State for the transition to a C-EFB device.

The content of this manual was developed with input from experts from civil aviation authorities, operators, aircraft manufacturers, training organizations and international organizations, and thereafter submitted for extensive peer review to take into account comments from the expert community.

ICAO gratefully acknowledges the contributions of the ICAO Cabin Safety Group and individual experts who provided support, advice and input for this manual.

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GLOSSARY

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.

Cabin crew member. A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

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

Change management. A formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes.

Crew member. A person assigned by an operator to duty on an aircraft during a flight duty period.

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

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

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

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Hazard. A condition or an object with the potential to cause or contribute to an aircraft incident or accident.

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

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

Non-transmitting portable electronic device. A portable electronic device that is not equipped with a radio frequency transmitting function or a portable electronic device that has all of the device's radio frequency transmitting functions turned off or is in airplane mode with the transmitting capability also turned off.

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

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

Passenger. A person who is not an operating crew member.

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

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

PED interference event. Unusual behavior of on-board electronic systems and equipment that may be suspected as originating from portable electronic device (PED) use. May also be referred to as an electromagnetic interference (EMI) event.

Risk mitigation. The process of incorporating defences, preventive controls or recovery measures to lower the severity and/or likelihood of a hazard's projected consequence.

Safety management system (SMS). A systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures.

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

Transmitting portable electronic device (T-PED). A PED that contains an intentional transmitter, which has some or all of the device's radio frequency transmitting functions turned on. Intentional transmitters may include devices enabled with cellular technology, wireless radio frequency network devices, and other wireless-enabled devices such as remote control equipment (which may include toys), two-way radios, cellular/mobile/smart phones and satellite phones.

ABBREVIATIONS AND ACRONYMS

CCOM	Cabin crew operations manual
C-EFB	Cabin electronic flight bag
EFB	Electronic flight bag
HMI	Human-machine interface
PED	Portable electronic device
TC	Type certificate

Chapter 1

INTRODUCTION

1.1 BACKGROUND

1.1.1 Traditionally, documentation and information available to crew members for use during operations have been presented mainly in paper format. These include the cabin crew portion of the operations manual (referred to as the cabin crew operations manual (CCOM)) and the operator's occurrence reporting forms. Much of an operator's documentation and information can be made available in electronic format. Cabin crew members may have access to electronic versions of operator procedures, data and information services. An electronic flight bag (EFB) is an electronic information management device that may help crew members perform flight-related tasks more easily and efficiently with less paper. An EFB reduces or replaces paper-based reference materials that crew members need to carry in their flight bags or that must be on board aircraft.

1.1.2 An EFB is defined in Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport* as: "an electronic information system, comprised of equipment and applications for flight crew, which allows for the storing, updating, displaying and processing of EFB functions to support flight operations or duties".

1.1.3 The use of EFBs was initially intended to cover an alternative method of storing, retrieving and using the manuals and information required to be on board by the applicable operational requirements. Subsequent technical developments have led to the hosting of software applications on EFBs, such as databases or real-time data coming from operations (e.g. weather information, passenger information lists).

1.1.4 Although EFBs were originally developed for flight crew members to perform flight management tasks, it is possible to implement EFBs for use in cabin operations. An EFB developed for cabin operations is referred to as a cabin electronic flight bag (C-EFB). The functions of a C-EFB may include but are not limited to: cabin crew operations manual, checklists, forms, passenger information, and real-time reporting.

1.2 PURPOSE

1.2.1 The *Manual on the Implementation and Use of Cabin Electronic Flight Bags* (Doc 10111) has been developed based on the EFB provisions contained in Annex 6, Part I. ICAO Standards and Recommended Practices (SARPs) related to EFBs address the responsibilities of States and operators regarding EFB hardware and EFB functions for flight crew members. This manual complements these SARPs by presenting guidance specific to EFBs for cabin crew members.

1.2.2 The purpose of this document is to provide guidelines on the implementation and use of C-EFBs by cabin crew members. It is intended for all operators who want to replace required paper-based information or utilize other select software applications as part of C-EFB functions. The manual presents guidance on the implementation process, including a defined evaluation process that all C-EFBs should be subjected to, if they are to be used onboard an aircraft; this includes approval or acceptance by the State of the Operator, where applicable. In addition, it outlines the process that should be conducted by the State of the Operator for portable and installed C-EFBs proposed for use by the operator as a means to display information with an equivalent level of accessibility, usability and reliability to the means they replace. The manual also provides recommendations to assist operators in starting and managing the required

elements of a C-EFB programme, including: C-EFB functions; hardware and software considerations; C-EFB management system; cabin crew operating procedures; and training and risk assessment, as part of the transition to a C-EFB device.

1.3 SCOPE

1.3.1 The content of this manual is presented as guidance material. The approach outlined is considered an acceptable means, but not the sole means, to establish national regulations or guidance materials on the implementation and use of C-EFBs. Operators should consult specific requirements with their State and comply with national regulations as applicable. These requirements include the basic information, documentation and data sources that would need to be carried on board aircraft. The operator remains responsible for ensuring the accuracy of the information used in a C-EFB and that it is derived from verifiable sources.

1.3.2 This manual does not address EFB airworthiness issues; these are covered in ICAO Annex 8 — *Airworthiness of Aircraft*.

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Chapter 2

C-EFB TYPES AND FUNCTIONS

2.1 TYPES OF C-EFBs

2.1.1 C-EFBs can be either portable or installed.

2.1.2 **Portable EFBs** are not part of the aircraft configuration and are considered as portable electronic devices (PEDs). They generally have self-contained power and may rely on data connectivity to achieve full functionality. Modifications to the aircraft to use portable EFBs require the appropriate airworthiness approval depending on the State's regulatory framework.

2.1.3 **Installed EFBs** are integrated into the aircraft, subject to normal airworthiness requirements and under design control. The approval of these EFBs is included in the aircraft's type certificate (TC) or in a supplemental type certificate (STC).

2.2 C-EFB FUNCTIONS

2.2.1 Both safety and non-safety related functions are eligible as C-EFB functions. A C-EFB may include, but is not limited to, the following functions:

a) operations manuals, including the CCOM;

b) passenger information list;

c) passenger announcements;

d) aircraft system interaction (e.g. cabin defects);

e) documents and checklists (including quick reference handbooks);

f) reporting forms and functions (mandatory and operator-required reporting, safety, security, quality, service, fatigue, and flight operations);

g) medical service providers;

h) flight and duty time limitations;

i) training materials and digital learning access;

j) operator's email or other news communication;

k) operator's portal;

l) a copy of the C-EFB user manual;

m) on-board sales process;

n) layover information (e.g. hotel, embassy, doctors, security advices); and

o) labour contracts, if applicable.

2.2.2 Annex 6, Part I requires that the State of the Operator specifically approve the operational use of EFB functions, dedicated to flight crew members, to be used for the safe operation of aircraft. Annex 6 does not require such an approval for C-EFB functions for cabin crew. However, the State should implement a C-EFB evaluation process, similar to the process used for flight crew EFB approvals, to enable an operator to use C-EFBs and address C-EFB functions used for the safe operation of aircraft. This includes an approval or acceptance process, where applicable. Information on the C-EFB evaluation process is found in Chapter 8.

2.2.3 C-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 aircraft operations (e.g. increased 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 and failure mitigation means:

a) CCOM;

b) special authorizations/approvals;

c) cabin defect logbook/cabin maintenance discrepancy reporting forms;

d) electronic checklists, including those for use during normal operations, abnormal and emergency situations;

e) mandatory occurrence reporting forms; and

f) *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481).

Chapter 3

HARDWARE

3.1 HARDWARE CONSIDERATIONS FOR INSTALLED C-EFBs

3.1.1 An installed C-EFB is a component that is incorporated into the aircraft type design and, as such, is subject to 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 STC.

3.1.2 Data connectivity to aircraft systems

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 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 it may be implemented in non-dedicated devices, such as a C-EFB docking station, a network file server or other avionics equipment.

3.1.3 Power to the C-EFB

Installed power provisions should comply with the applicable airworthiness requirements. Connection of the C-EFB to a non-essential, or to the 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 breaker to disable installed C-EFBs in the event of unwanted operation (such as continuous flashing). Circuit breakers may not be used as switches.

3.2 HARDWARE CONSIDERATIONS FOR PORTABLE C-EFBs

3.2.1 Physical characteristics

Consideration should be given to the physical characteristics of the device selected for the C-EFB (e.g. a smartphone or tablet). Some devices may prove to be cumbersome for normal use in the cabin. The physical characteristics of the device should be evaluated as part of the C-EFB risk assessment. Information on the C-EFB risk assessment is found in Chapter 7.

3.2.2 Stowage and securing

Stowage and securing require inherent means to prevent unwarranted C-EFB movement. Stowage and securing means are required for portable C-EFBs, as installed C-EFBs are by definition integrated into the aircraft. Stowage and securing should be configured such that the C-EFB can be easily stowed and secured but remains readily accessible. The methods of stowage and securing should not create a hazard during aircraft operations (refer to Chapter 6, 6.1.4).

3.2.3 Readability

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

3.2.4 Basic non-interference testing

As previously noted, portable C-EFBs are considered to be PEDs. As such, any reference to PEDs in this section is also applicable to portable C-EFBs. In order to operate a portable C-EFB during flight, the operator should ensure that the C-EFB will not interfere in any way with the operation of aircraft systems.

Note.— The Guidelines for the Expanded Use of Portable Electronic Devices *(Cir 340) contain guidance for the use of PEDs across all phases of flight.*

3.2.5 Power supply, connectivity and compatibility

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

3.2.5.1 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, and the potential need for an independent battery source. The operator should identify designated outlet(s) for use by cabin crew members to charge C-EFBs on board the aircraft.

3.2.5.2 The operator may consider providing approved charging stations for use in flight. If so, the charging stations should meet all airworthiness requirements. Charging stations that are dedicated for crew use should not be accessible to or used by passengers.

3.2.6 Cabling

The operator should ensure that any cabling attached to the C-EFB, whether the C-EFB is in the dedicated mounting or handheld, does not present a hazard. Cabin crew members should only use approved, compatible cables.

3.2.7 Temperature rise

Rechargeable lithium-type batteries are becoming more common as a source of principal power or standby/back-up power in C-EFBs. Lithium-ion or lithium-polymer (lithium-ion polymer) batteries are two types of rechargeable lithium batteries commonly used to power C-EFBs. Overheating can occur during use or charging of the C-EFB. Therefore, the placement of the C-EFB should allow sufficient airflow around the unit.

3.2.8 Data connectivity

The following should be considered with regard to data connectivity:

a) between C-EFBs, if two or more C-EFBs in the cabin and/or in the flight deck are connected to each other, the operator should demonstrate that this connection does not negatively affect otherwise independent C-EFB platforms; and

b) to aircraft systems, refer to 3.1.1.

3.2.9 Environmental conditions

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

3.3 MOUNTING DEVICES

3.3.1 A mounting device is a device that can be used to secure a portable C-EFB. It may include docking stations, suction cups, etc. 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. The following guidance may be considered for that purpose:

a) It should be confirmed that 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 escape paths nor pose any risk of injury to occupants (e.g. in the event of a hard landing).

b) There should be no mechanical interference between the C-EFB in its mounting device and any of the cabin display panels.

c) The mounting device should be able to lock in position easily. Crashworthiness considerations should be considered in the design of this device. This includes the appropriate restraint of any device, when in use.

d) A provision should be provided to secure, lock or stow the mounting device in a position out of the way of cabin crew member operations when not in use.

e) For fire safety reasons, the C-EFB hardware should be capable of being easily removed from the mounting device without tools or maintenance action by cabin crew members

3.3.2 A suction cup mounted device is not permanently attached to the aircraft structure and therefore does not require aircraft certification approval. EFBs mounted by suction cups are considered as portable EFBs. While some operators may be able to adequately mitigate the risks associated with suction cup mounts for their operation, other operators may choose to have their EFB mounts certified as installed equipment, in accordance with the applicable aircraft certification requirements. For a certified mount installation for portable EFBs, the security of the mount, the visibility, the function of the mount, and egress considerations would be addressed as part of the certification process.

Chapter 4

SOFTWARE

4.1 CONSIDERATIONS FOR ALL C-EFB SOFTWARE APPLICATIONS

4.1.1 Usability

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

4.1.2 Style of presentation

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

a) ease of access to common functions;

b) consistency of symbols;

c) terms and abbreviations;

d) legibility of text;

e) system responsiveness;

f) methods of interaction;

g) use of colour;

h) display of system status;

i) error messages;

j) management of multiple applications and documents;

k) off-screen text and content; and

l) use of active regions.

4.1.3 Ease of access to common functions

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. 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.

4.1.4 Consistency of symbols

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

4.1.5 Terms and abbreviations

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

4.1.6 Legibility of text

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 operation. Brightness should be adjustable in fine increments. Consideration should be given to long-term display degradation because of abrasion and aging of the device.

4.1.7 System responsiveness

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

4.1.8 Methods of interaction

In choosing and designing input devices, such as keyboards, touchscreens or cursor control devices, the operator 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. For touchscreens, cabin crew members may need physical locations or structures (i.e. galley table top) to stabilize their arm, hand, and fingers in order to make accurate inputs. The operator should verify that touchscreens do not result in unacceptable levels of cabin crew workload and error rates. Input devices should provide feedback to indicate when they are operational. Since touchscreens provide little or no tactile feedback or control motion, visual and/or aural or other touch activation feedback is especially important. Other touchscreen considerations include selecting the appropriate touch technology (e.g. resistive or capacitive), controlling screen contaminates that may reduce readability (e.g. skin oils and perspiration) and mitigating inadvertent operation.

4.1.9 Use of colour

The colour “red” should be used only to indicate a warning level condition. “Amber” should be used to indicate a caution level condition. Any other colour may be used for items other than warnings or cautions, providing that the colours used differ sufficiently from the colours prescribed to avoid possible confusion. The use of colours should take into consideration cabin crew members with colour impairments.

4.1.10 Display of system status

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

4.1.11 Error messages

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

4.1.12 Management of multiple applications and documents

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

4.1.13 Off-screen text and content

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

4.1.14 Use of active regions

Active regions are regions to which special user commands apply (e.g. hyperlinks or copying). The active region can be text, a graphic image, a window, a frame, or another document object. For example, a text string might be selected for copying into a search query or a window might be activated in order to bring it to the front of other windows on the screen. 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. If the display uses active regions, these regions 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.

4.2 ELECTRONIC SIGNATURES

National regulations may require a signature to signify acceptance or to confirm the authority. In order to be accepted as an equivalent 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. The operator should have a process in place for an electronic recordkeeping system to ensure the integrity of the system.

4.3 C-EFB SECURITY

The C-EFB system should be secure from malicious software, data hijack, unauthorized usage and fraudulent or criminal intent both on the ground and in the air. Access to the system should be controlled and authenticated. The operator should ensure that adequate security procedures are in place to protect the system software and data. Adequate measures should also be in place for compilation, secure distribution and remote wiping of the data to the C-EFB. Content should be protected on unsecured networks. Additional security procedures to protect hardware should be developed (e.g. device distribution, replacement and collection list, loss, theft, possibility of erasing device content remotely and storage when device is not in use).

Note.— Guidance on cyber security is contained in the Aviation Security Manual *(Doc 8973), Chapter 18.*

4.4 UPDATES

4.4.1 If updates to the C-EFB software are necessary, the operator 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 system and software data.

4.4.2 The operator should have a process to ensure cabin crew members are informed and have received all system, applications and data updates (e.g. operating systems, tracking systems, notification systems, administrative systems). The C-EFB should have a status page that shows if there are any updates to the C-EFB, if there were any updates performed and what these updates entail.

4.5 QUALITY ASSURANCE

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

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Chapter 5

C-EFB MANAGEMENT SYSTEM

5.1 GENERAL

5.1.1 The operator should have a C-EFB management system in place for its C-EFB programme that includes the following:

a) procedures and systems related to the C-EFB;

b) hardware configuration management;

c) software configuration management;

d) C-EFB security;

e) software update management; and

f) content management.

5.1.2 The C-EFB management system is the key link between the operator and the C-EFB system and software suppliers. It is responsible for hardware and software configuration management and for ensuring that no unauthorized software is installed. 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. The C-EFB management system should ensure that the software applications and any updates supporting functions not directly related to operations conducted by cabin crew members on board aircraft (e.g. web browser, email client, picture management, etc.) do not adversely impact the operation of the C-EFB. There should be a means for the operator to carry out its own check of data content prior to load and release for operational use.

5.1.3 The C-EFB management system should establish procedures to ensure that no unauthorized changes are made to C-EFB functions. Procedures should be established for the development, maintenance, security and integrity of, and system updates and content downloads to, 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 be part of the operator's operations manual. Procedures should be established for the maintenance of the C-EFB.

5.2 DEDICATED PERSONNEL

5.2.1 The operator should assign at least one person (e.g. a dedicated C-EFB manager, a cabin crew manager, etc.) who should maintain oversight of the complete C-EFB system, including the distribution of responsibilities within the operator's management structure. Complex C-EFB systems may require additional support.

5.2.2 The operator should ensure that each person involved in the C-EFB management system receives appropriate training in his or her role and has a good working knowledge of the proposed system hardware, operating system and relevant software applications. Information on C-EFB operating procedures and training is found in Chapter 6.

5.3 TECHNICAL SUPPORT

The C-EFB management system should also include dedicated technical support for all users. Procedures should include a situation when cabin crew members may need assistance outside the technical support's operating hours. The operator should ensure that cabin crew members have access to necessary information during operations.

5.4 USER MANUAL

The operator should develop a user manual. The user manual for the C-EFB should contain the following sections, as a minimum:

a) an introduction;

b) a table of contents;

c) general guidelines (e.g. security and confidentiality aspects, actions in the event of lost devices, crew member responsibilities, on-board usage);

d) a manual overview;

e) a process for updating and any software prerequisites;

f) viewing and functionality;

g) search and navigation;

h) design features;

i) information about care (e.g. hardware, cabling, converters, device maintenance, damage prevention, etc.);

j) troubleshooting;

k) frequently asked questions;

l) technical support;

m) a process for incorporating CCOM revisions and updates; and

n) a glossary or an index.

Chapter 6

CABIN CREW OPERATING PROCEDURES AND TRAINING

6.1 OPERATING PROCEDURES

6.1.1 The operator should develop procedures for the C-EFB related to the following:

a) the user's role and responsibilities;

b) the phases of flight when the usage of the C-EFB is not permitted;

c) stowage and securing specifications;

d) battery power management;

e) revisions and updates;

f) inclusion of the operator's reporting system and forms, where applicable;

g) damage prevention;

h) loss, damage, theft or software failure;

i) replacement or repair; and

j) reporting of C-EFB failures or faults.

6.1.2 User's role and responsibilities

The operator procedures should address the individual cabin crew member's role and responsibilities with regard to C-EFB use. These include, but are not limited to, the following:

a) the requirements for C-EFB availability and accessibility;

b) usage of the C-EFB during flight;

c) use and download of other or external applications; and

d) data protection measures for the device.

6.1.3 Phases of flight when the usage of the C-EFB is not permitted

The procedures should include specification of the phases of flight during which cabin crew members may not use the C-EFB, if applicable (e.g. during critical phases of flight, unless required for safety-related tasks).

6.1.4 Stowage and securing specifications

The procedures should include specifications of 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. Secured portable C-EFBs should remain accessible to the cabin crew members throughout the flight.

6.1.5 Battery power management

If battery-powered C-EFBs will utilize aircraft power for recharging the C-EFB battery, the operator should establish a procedure to ensure safe recharge of the battery (e.g. minimum percentage charge of the battery before the flight to be sufficiently charged to support the operation, charging on board, use of a power bank). In addition, the operator should identify designated outlet(s) for use by cabin crew members to charge C-EFBs on board the aircraft. Means to operate the power source should be documented per the procedures in the operator's CCOM, including connectivity and compatibility. The operator should also establish procedures to respond to PED or stand-alone lithium battery fires.

Note.— Doc 9481 contains guidelines for cabin crew procedures to respond to PED or stand-alone lithium battery fires.

6.1.6 Revisions and updates

The operator should have a procedure in place to allow cabin crew members to confirm the revision number and date of C-EFB software applications or databases. Procedures should specify what actions to take if the software applications or databases loaded on the C-EFB are out of date.

6.1.7 Inclusion of the operator's reporting system and forms

If the operator includes its reporting system and forms as part of the C-EFB applications, it should establish procedures regarding their use. This includes mandatory and voluntary reports, as part of the safety management system, including real-time reporting, where applicable.

6.1.8 Damage prevention

The operator should establish procedures for preventing damage to the C-EFBs and to 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.

6.1.9 Loss, damage, theft or software failure

The operator should have procedures in place to address device loss, damage, theft or software failure, particularly to protect safety and security sensitive information contained in the C-EFB. This should include, but is not limited to:

a) the reporting process (e.g. when, why and how to report to the operator);

b) the device replacement process; and

c) the backup procedure for software failure or unavailability of the device (e.g. use of hard copies).

6.1.10 Replacement and repair

The operator procedures should address individual cabin crew members' actions and responsibilities with regard to replacing or repairing their assigned C-EFB device.

6.1.11 Reporting of C-EFB failures or faults

A reporting system for C-EFB failures should be established. 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.

6.2 WORKLOAD AND CABIN CREW COORDINATION

In general, 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 use and continued monitoring of other cabin crew tasks.

6.3 TRAINING

6.3.1 The type of C-EFB training will depend on the nature and complexity of the C-EFB system. Training should address any gaps in the level of proficiency that the user may have with technology and the specific device to be used. The operator may use different delivery methods for C-EFB training, including classroom instruction, hands-on exercises (to familiarize users with the device) and/or computer-based training (digital learning methods).

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

a) the user's role and responsibilities;

b) basics on how to use the C-EFB (e.g. navigating throughout the C-EFB, turning the device on and off, logging in and out, adjusting screen settings and brightness, charging the device, screen maintenance, etc.);

c) information on safe practices (cable removal, usage of protective cases, converter practices, usage of aircraft power outlets, temperature exposure, preservation of long-term battery life, procedure when faced with lithium battery fire, etc.);

d) clear instruction (e.g. step by step) on how and when to update the C-EFB's content, software, operating system, applications, and security aspects, as well as the importance of keeping the device up to date;

e) instruction on operating the C-EFB in normal, abnormal and emergency situations;

f) the protection of sensitive safety and security information (e.g. passcode security, passenger information, etc.); and

g) how to handle and report the failure of C-EFB component(s).

6.3.3 The operator should provide additional training for users on any new or modified functions of the device and applications. It may offer supplemental training to maintain and reinforce cabin crew knowledge and proficiency of the C-EFB.

Chapter 7

C-EFB RISK ASSESSMENT

7.1 GENERAL

The C-EFB risk assessment is a process to evaluate the risks associated with the use of each C-EFB function. The operator should use this process to develop appropriate risk mitigation strategies to manage risks to an acceptable level. The operator should perform a risk assessment prior to the entry into operation of any C-EFB system and the results of the risk assessment should be reviewed periodically.

7.2 RISK ASSESSMENT

7.2.1 The risk assessment should evaluate the risks associated with the use of a C-EFB by addressing the following, as a minimum:

a) 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 monuments such as class dividers or closets, or be obstructed by other items or easily lost);

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

c) analyse the operational consequences of these failure scenarios;

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

e) ensure the C-EFB will not cause interference with on-board electronic systems and the aircraft equipment on which it will be permitted for use (through aircraft PED tolerability testing);

f) analyse human factors and ergonomics considerations related to the C-EFB (e.g. to minimize human errors); and

g) establish risk mitigation strategies.

Note.— Cir 340 contains guidance related to PED interference events and aircraft PED tolerability testing.

7.2.2 When the C-EFB system is intended for introduction alongside a paper-based system, only the failures that would not be mitigated by the use of the paper-based system need to be addressed. In all other cases a, complete risk assessment should be carried out, especially when an accelerated introduction of a new C-EFB system with a reduced trial period or paperless entry-into-service is intended.

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

7.2.4 The risk assessment should be defined before the beginning of the trial period and should be amended accordingly, if necessary, at the end of the trial period. The results of the trial should establish the configuration and use of the C-EFB system (refer to Chapter 8).

7.3 RISK MITIGATION STRATEGIES

7.3.1 Based on the outcome of the C-EFB risk assessment, the operator should determine a series of risk mitigation strategies against C-EFB failure. The operator should consider establishing a reliable alternative means of providing information that is available on the C-EFB system. If applicable, particular attention should be given to forms and data that are required by national regulations, as per operator policy, and/or that are required to be submitted within specified timeframes.

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

a) system design (including hardware and software);

b) an alternative C-EFB, possibly supplied from a different power source;

c) C-EFB applications hosted on more than one platform;

d) paper backup (e.g. CCOM);

e) alternative procedures;

f) training; and

g) administration support (e.g. the operator should ensure that cabin crew members have access to necessary information during operations).

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

a) complete system failure;

b) individual application failures;

c) corruption or loss of data;

d) battery testing and recharge; and

e) erroneously displayed information.

7.4 CHANGES TO THE C-EFB

If any updates of the C-EFB are necessary, appropriate testing of the changes should be performed prior to use in flight. For all other types of modification (e.g. hardware), the operator should apply its change management process as approved by the State.

Note.— The Safety Management Manual (Doc 9859) *contains guidance related to risk assessment and the change management process.*

Chapter 8

C-EFB EVALUATION PROCESS

8.1 GENERAL

A C-EFB evaluation process should be developed for the implementation and use of C-EFBs. This process is designed to lead to the issue of a specific approval, where such is required, and consists of a phased approach. This process should also be used in instances where the State does not require a specific approval.

8.2 INITIAL DISCUSSION WITH THE STATE (PHASE 1)

During this initial phase, the State and the operator should reach a common understanding of what needs to be evaluated, including:

a) the role of the State;

b) the applicable requirements;

c) whether trials should take place, when and how they must be conducted and documented; and

d) any actions the operator is responsible for during each phase of the process.

8.3 APPLICATION (PHASE 2)

8.3.1 Phase 2 begins when the operator submits an implementation plan to the State for evaluation. The State should review the plan for completeness and compliance with the national regulations. The State's competent authority designated to review the plan may coordinate with other inspectors and regulatory offices, as necessary. Once the State is satisfied with the submitted plan, the operator will follow that plan to produce a complete C-EFB programme.

8.3.2 The following should be taken into account, as part of the plan:

a) the introduction of a new C-EFB programme by the operator;

b) changes to an existing C-EFB programme;

c) an existing, approved EFB programme (e.g. for the flight crew); or

d) previous experience within the civil aviation authority or among other national operators with EFB implementation.

8.3.3 The operator may choose to keep a paper backup as a means of mitigation against failure when transitioning from paper to electronic format. A paper backup may also be maintained as a mitigation following the full

implementation of C-EFBs. As part of the implementation plan, the operator should clarify the intent of the operation (i.e. with or without paper backup or a combination of paperless and paper).

8.3.4 The operator should submit the following information in the implementation plan, as applicable:

a) C-EFB infrastructure and management plan;

b) C-EFB hardware and application specifications;

c) C-EFB operator procedures and manual revisions;

d) C-EFB training programme;

e) C-EFB risk assessment; and

f) proposed risk mitigation strategies.

8.4 REVIEW BY THE STATE (PHASE 3)

During this phase, the State should use a checklist (refer to the Appendix) to conduct a review of the application submitted by the operator. Where an operator seeks to start operations with a new C-EFB system, the State should participate in practical simulation evaluation(s) of the C-EFB. Additional cabin evaluations should not be required when adding a new C-EFB device to an existing approval unless there is a change in C-EFB functions where the State would determine whether an additional cabin evaluation is required. When a new aircraft is added to an existing C-EFB approval, the suitability of the C-EFB for that aircraft should be addressed. The State should examine the technical content and quality of the proposed C-EFB programme and other supporting documents and procedures.

8.5 OPERATIONAL EVALUATION (PHASE 4)

8.5.1 The operator should conduct an operational evaluation that verifies whether all the required elements have been satisfied. The operator should notify the State of its intention to conduct an operational evaluation. Phase 4 starts when the operator formally begins use of the C-EFB combined with paper backup for an established period of time.

8.5.2 During this phase, operators transitioning from paper to C-EFB may maintain paper backup for all electronic information, as a risk mitigation strategy. Operators starting C-EFB operations without paper backup should have adequate mitigations in place to access the information in case of C-EFB failures.

8.5.3 The operator should share the operational evaluation results with the State. These results will be relevant in the State's final decision regarding the implementation of C-EFBs. Final considerations by the State should result in one of the following outcomes:

a) *Unsatisfactory results*. If the State finds the proposed C-EFB reliability and/or function to be unacceptable, it should contact the operator for corrective action. C-EFB deficiencies should be corrected and the C-EFB function revalidated prior to approval being issued.

b) *Satisfactory results*. If the State finds the proposed C-EFB reliability and/or function to be acceptable based on validation data, then the approval may be issued.

8.6 ISSUANCE OF C-EFB APPROVAL/OPERATIONS SPECIFICATIONS (PHASE 5)

During the final phase, the State grants a C-EFB approval to the operator. In certain States, when the specific C-EFB approval is granted to the operator, the operations specifications are updated with a C-EFB entry. In such instances, the operations specifications should reference the location in the operations manual where more details of the approved C-EFB applications can be found.

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Appendix to Chapter 8

SPECIFIC OPERATIONAL APPROVAL CHECKLIST

1. INTRODUCTION

1.1 The checklists below constitute an example of what may be used during Phase 3 (review by the State) of the C-EFB operational evaluation process.

1.2 Checklist items can be customized to the specific C-EFB and applications being evaluated.

1.3 Checklist items are designed so that some questions may be not applicable (check "N/A"). Questions answered as "No" are meant to allow identifying deficiencies that should be corrected and revalidated prior to approval being issued.

2. EXAMPLE OF SPECIFIC APPROVAL CHECKLIST

Part 1

HARDWARE	
Have the cabin electronic flight bag (C-EFB) installed resources been certified by a State to accepted aviation standards during the certification of the aircraft, through service bulletins by the original equipment manufacturer or through a third-party supplemental type certificate?	Yes □ No □ N/A □
Has the operator assessed the physical use of the device in the cabin to include safe stowage, securing, crashworthiness (mounting devices and C-EFBs, if installed), safety and use under normal environmental conditions, including turbulence?	Yes □ No □ N/A □
Will the display be readable in all the ambient lighting conditions, both day and night, encountered in the cabin?	Yes □ No □ N/A □
Has the operator demonstrated that the C-EFB will not electromagnetically interfere with the operation of aircraft equipment?	Yes □ No □ N/A □
Has the C-EFB been tested to confirm operation in the anticipated environmental conditions (e.g. temperature range, low humidity, altitude)?	Yes □ No □ N/A □
Have procedures been developed to establish the level of battery capacity degradation during the life of the C-EFB?	Yes □ No □ N/A □

Is the capability of connecting the C-EFB to certified aircraft systems covered by an airworthiness approval?	Yes □ No □ N/A □
When using the transmitting functions of a portable C-EFB during flight, has the operator ensured that the device does not electromagnetically interfere with the operation of the aircraft equipment in any way?	Yes □ No □ N/A □
If two or more C-EFBs in the cabin are connected to each other, has the operator demonstrated that this connection does not negatively affect otherwise independent C-EFB platforms?	Yes □ No □ N/A □
Can the brightness or contrast of the C-EFB display be easily adjusted by the cabin crew member for various lighting conditions?	Yes □ No □ N/A □

Part 2.

INSTALLATION	
Mounting	
Has the installation of the mounting device been approved in accordance with the appropriate airworthiness requirements?	Yes □ No □ N/A □
Is it evident that there are no mechanical interference issues between the C-EFB in its mounting device and any of the cabin system controls, allowing full and free movement under all operating conditions and no interference with other equipment such as safety harnesses and oxygen dispensing equipment?	Yes □ No □ N/A □
Has it been confirmed that the mounted C-EFB location does not impede occupant ingress, egress and the emergency escape path?	Yes □ No □ N/A □
Is it evident that the mounted C-EFB does not obstruct visual or physical access to cabin system displays or controls?	Yes □ No □ N/A □
Does the mounted C-EFB location minimize the effects of glare and/or reflections?	Yes □ No □ N/A □
Does the mounting method for the C-EFB allow easy access to the C-EFB controls and a clear unobstructed view of the C-EFB display?	Yes □ No □ N/A □
Is the C-EFB mounting easily adjustable by the cabin crew member to compensate for glare and reflections?	Yes □ No □ N/A □
Does the placement of the C-EFB allow sufficient airflow around the unit, if required?	Yes □ No □ N/A □

Does the location of the mounted C-EFB prevent unwarranted access by passengers or unauthorized personnel?	Yes □ No □ N/A □

Part 3.

SOFTWARE[1]	
Software application: _____ (fill in name of software application)	
Is the software application considered a C-EFB function (refer to Chapter 2)?	Yes □ No □ N/A □
Has the software application been evaluated to confirm that the information being provided to the cabin crew member is a true and accurate representation of the documents being replaced?	Yes □ No □ N/A □
Does the software application have adequate security measures to ensure data integrity (e.g. preventing unauthorized manipulation both on the ground and in the air)?	Yes □ No □ N/A □
Does the C-EFB system provide, in general, a consistent and intuitive user interface, within and across the various hosted applications?	Yes □ No □ N/A □
Has the C-EFB software been evaluated to consider human-machine interface and workload aspects?	Yes □ No □ N/A □
Can the cabin crew member easily determine the validity and currency of the software application and databases installed on the C-EFB, if required?	Yes □ No □ N/A □
Power connection / batteries	
Is there a means other than a circuit-breaker to turn off the power source (e.g. can the cabin crew member easily remove the plug from the installed outlet)?	Yes □ No □ N/A □
Is the power source suitable for the device?	Yes □ No □ N/A □
Have guidance/procedures been provided for battery failure or malfunction?	Yes □ No □ N/A □
Is power to the C-EFB, either by battery and/or supplied power, available to the extent required for the intended operation?	Yes □ No □ N/A □

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

Has the operator ensured that the batteries are compliant to acceptable standards?	Yes □ No □ N/A □
Cabling	
Has the operator ensured that any cabling attached to the C-EFB, whether in the dedicated mounting or when handheld, does not present a hazard (e.g. it does not interfere with cabin system controls, movement, egress or oxygen mask deployment)?	Yes □ No □ N/A □
Stowage and securing	
If there is no mounting device available, can the C-EFB be easily stowed and secured during critical phases of flight and in turbulence and remain readily accessible throughout the flight?	Yes □ No □ N/A □
Is it evident that stowage and securing do not cause any hazard during aircraft operations?	Yes □ No □ N/A □

Part 4.

MANAGEMENT	
C-EFB management system	
Is there a C-EFB management system in place?	Yes □ No □ N/A □
Does one person possess an overview of the complete C-EFB system and responsibilities within the operator's management structure?	Yes □ No □ N/A □
Are the authorities and responsibilities clearly defined within the C-EFB management system?	Yes □ No □ N/A □
Are there adequate resources assigned for managing the C-EFB?	Yes □ No □ N/A □
Are third party (e.g. software vendor) responsibilities clearly defined?	Yes □ No □ N/A □
Cabin crew operating procedures	
Is there a clear description of the C-EFB system, its operational philosophy and operational limitations?	Yes □ No □ N/A □

Are the requirements for C-EFB availability in the cabin crew operations manual (CCOM) and/or part of the minimum equipment list (MEL)?	Yes □ No □ N/A □
Have crew procedures for C-EFB operation been integrated within the existing CCOM?	Yes □ No □ N/A □
If the C-EFB generates information similar to that generated by existing cabin systems, do procedures identify which information will be primary?	Yes □ No □ N/A □
Are there procedures when information provided by a C-EFB does not agree with that from other cabin sources, or, if more than one C-EFB is used, when one C-EFB disagrees with another?	Yes □ No □ N/A □
Are there procedures that specify what actions to take if the software applications or databases loaded on the C-EFB are out of date?	Yes □ No □ N/A □
Are there procedures in place to prevent the use of erroneous information by cabin crew members?	Yes □ No □ N/A □
Is there a reporting system for system failures?	Yes □ No □ N/A □
Have crew operating procedures been designed to mitigate and/or control additional workload created by using a C-EFB?	Yes □ No □ N/A □
Are there procedures in place to inform maintenance personnel and cabin crew members about a fault or failure of the C-EFB, including actions to isolate it until corrective action is taken?	Yes □ No □ N/A □
C-EFB risk assessment	
Has a C-EFB risk assessment been performed?	Yes □ No □ N/A □
Are there procedures/guidance for loss of data and identification of corrupt or erroneous outputs?	Yes □ No □ N/A □
Are there contingency procedures for total or partial C-EFB failure?	Yes □ No □ N/A □
Is there a procedure in the event of multiple C-EFB failure (e.g. use of paper checklist)?	Yes □ No □ N/A □

Have the C-EFB dispatch requirements (e.g. minimum number of C-EFBs on board) been incorporated into the CCOM?	Yes □ No □ N/A □
Have MEL or procedures in case of C-EFB failure been considered and published?	Yes □ No □ N/A □
Training	
Is the training material appropriate with respect to the C-EFB equipment and published procedures?	Yes □ No □ N/A □
Does the training cover the list of bulleted items in Chapter 6 — *Cabin crew operating procedures and training*?	Yes □ No □ N/A □
Hardware management procedures	
Are there documented procedures for the control of C-EFB hardware configuration?	Yes □ No □ N/A □
Do the procedures include maintenance of C-EFB equipment?	Yes □ No □ N/A □
Software management procedures	
Are there documented procedures for the configuration control of loaded software and software access rights to the C-EFB?	Yes □ No □ N/A □
Are there adequate controls to prevent corruption of operating systems, software, and databases?	Yes □ No □ N/A □
Are there adequate security measures to prevent system degradation, malware and unauthorized access?	Yes □ No □ N/A □
Are procedures defined to track database expiration and updates?	Yes □ No □ N/A □
Are there documented procedures for the management of data integrity?	Yes □ No □ N/A □
If the hardware is assigned to the cabin crew member, does a policy on private use exist?	Yes □ No □ N/A □

— END —

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