



European Aviation Safety Agency
Comment-Response Document 2016-12

Appendix
to Opinion No 10/2017

RELATED NPA: 2016-12 — RMT.0601 — 18.12.2017

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1. Summary of the outcome of the consultation

266 comments were submitted by 40 commenters, including 9 EU competent authorities, 8 EFB developers, 13 air operators and several associations.

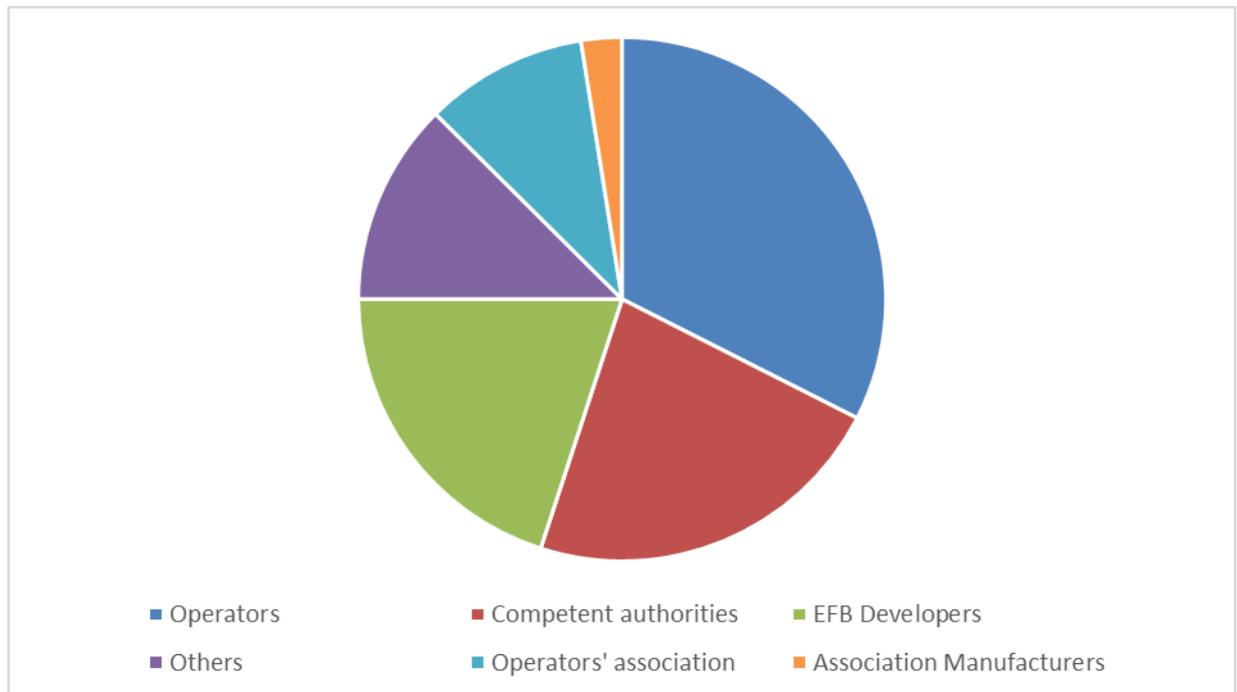


Figure 1: Comments received on NPA 2016-12

The most commented items of the proposals of NPA 2016-12¹ are the following:

- Definitions: many comments asked EASA to move the definitions of terms used in several annexes into Annex I (Definitions) for clarity. This Annex has been accordingly amended to address these comments.
- Transition for CAT operations: as several competent authorities are already issuing operational approvals for the use of EFBs, several commenters expressed the need for the introduction of transitional provisions. Considering that there is currently no legal basis for the issuing of an operational approval, no provisions for the transition could be defined and it is therefore up to each competent authority concerned to manage the transition.
- Scope of the operational approval for CAT operations: many comments asked EASA to clarify the scope of the operational approval for CAT operations, as it was considered to be misleading and subject to different interpretations. To address this issue, the definitions of type A and type B EFB applications have been moved to Annex I (Definitions) so that the implementing rule (IR) can now directly refer to type B EFB applications, making the scope clearer.
- Differentiation between point CAT.GEN.MPA.141 and point SPA.EFB.100: several comments asked for rationales for the introduction of these two implementing rules (IRs), which seemed to overlap. As described in the explanatory note of NPA 2016-12, point CAT.GEN.MPA.141 is

¹ <http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2016-12>

designed to address all EFBs, while point SPA.EFB.100 only addresses EFBs hosting type B EFB applications, which are therefore subject to an operational approval.

- Use of the operations specifications template: several comments asked for clarification on how to use the template for the operations specification:
 - It might have to be frequently updated, especially each time the operator installs a new type B EFB application or changes the EFB hardware;
 - As the operational approval is only linked with the use of a type B EFB application, the need to mention the hardware was questioned.

While it is true that the operational approval is related to the use of a type B EFB application, it is, however, considered that the hardware used should be suitable for the intended use, as it could prevent the operator from using the EFB application as expected (e.g. readability, power autonomy, HMI, etc.). This is why it was initially proposed to mention the hardware used, together with the list of type B EFB applications used.

To further clarify this, the need to ensure that the EFB hardware is suitable for the intended use of the hosted type B EFB applications has been introduced at the IR level.

At the same time, it is understandable that amending frequently the operations specifications of operators represents a burden for competent authorities and this is why, as stated in the footnotes of the operations specifications template, it is possible to refer to the operator's operations manual where the list of type B EFB applications would be provided, together with the hardware used.

- Proportionality for NCC/commercial SPO/SPO with CMPA: several comments asked EASA to amend the proposed provisions for these operators and align them with the provisions established for NCO operators.

The scope of NCC/commercial SPO/SPO with CMPA is quite wide and ranges from non-commercial operations of very small aircraft considered complex to non-commercial operations of long-range aeroplanes. To ensure proportionality, the provisions which were considered difficult to comply with by these operators had already been alleviated in NPA 2016-12 (e.g. human-machine interface (HMI) assessment). The remaining requirements are the following:

- Establishment of a risk assessment related to the use of a type B EFB application: NCC/commercial SPO/SPO with CMPA operators are already required to have a management system established in accordance with point ORO.GEN.200, which includes the identification of aviation safety hazards, their evaluation and the management of associated risks. They are therefore required to have established a process for this activity, either under the criteria for complex operators or non-complex operators. The requirement for a risk assessment is not designed to add a requirement for an extra process and therefore the operator is only required to use its existing process and to apply it to the risks associated with the use of an EFB application.
- Hardware criteria: The proposed hardware criteria applicable to these operators are considered to be easily manageable and to require no specific competency to verify the compliance of the



hardware used. In addition, several of them are already applicable to NCC operators under the portable electronic device (PED) requirements.

The only potential issue would be the rapid-decompression testing. However, by principle, it applies only to pressurised aircraft, which ensures an adequate level of proportionality for this provision. In addition, the operator may elect to not perform such testing if it defines appropriate mitigation related to the complete loss of the EFB.

- Procedures to be established:

In any case, these operators are already required to have established an operations manual in accordance with point ORO.MLR.100, which includes the standard operating procedures (SOPs) of the operator. The proposed AMCs for these operators introduce the need for some procedures related to the use of type B EFB applications, which can be stand-alone or included in the operator's existing operations manual. In addition, there is no minimum content for these procedures, as only the objective is stated, leaving it to the operator to determine what is an adequate level of detail for these procedures. The proposed change is therefore not expected to introduce any unachievable burden for these operators.

- Training on the use of the EFB application:

The proposed AMC related to flight crew training specifies a list of topics on which flight crews should be trained. However, it does not specify the means to be used and the duration of the training, leaving it to the operator to define the most adequate training means (e.g. self-training, classroom training, etc.) and its duration to ensure that flight crews are sufficiently trained to use the EFB.

- Use of own-ship EFB applications in flight: many comments were received asking EASA to lift the current ban on CAT operations related to the use of own-ship EFB applications in flight. In parallel, an industry group established a related study whose objective was to demonstrate that an own-ship EFB application could be eligible for classification as a type B EFB application. The scope of the study was the use of own-ship EFB applications during the en-route phase with glass cockpit aeroplanes only. It relied mostly on a detailed human factor assessment and a related risk assessment taking into consideration the different possible scenarios, including the case of a complete failure of the application, as well as the case of an erroneous output.

The outcome of the study was that own-ship EFB applications could be eligible as type B EFB applications, provided that adequate means of mitigation are put in place. The report provided a set of recommendations for the establishment of these conditions.

Based on this study, EASA decided to lift the ban related to the use of own-ship EFB applications during the en-route phase under certain conditions. To achieve this, some additional activities should be conducted to:

- review the recommendations of the group and establish the limitations and conditions for the use of own-ship EFB applications; and
- define limitations and conditions for the use of own-ship EFB applications outside the scope of the study (e.g. helicopter operations).

Considering the timeline of rulemaking task RMT.0601, it was not considered possible to complete these activities before the planned date of publication of the CRD/Opinion (2017/Q3).



As the changes related to the removal of the ban would only be in the AMCs and GM, the following has been decided:

- CRD 2016-12 contains the draft AMCs/GM, but doesn't yet include the changes associated with the use of own-ship EFB applications in flight;
 - EASA will develop a set of limitations and conditions for the use of own-ship EFB applications in flight;
 - once these provisions are established, a focused consultation will be organised to ensure that these new provisions undergo adequate public consultation;
 - the final version of the provisions will be published by EASA together with all the other AMCs/GM, once the regulation is adopted by the European Commission.
- In-flight weather (IFW) applications: many comments were received asking EASA to align the content of the draft AMC on IFW applications with the final provisions of ICAO Doc 10020 related to IFW applications. EASA agrees in principle with the comments and will take into account the latest version of this document before publishing the final version of the AMCs and GM. However, it should be emphasised that the ICAO provisions on IFW applications need to be adapted and made consistent with the EU regulatory framework, and therefore the final AMC on IFW applications will look slightly different from the ICAO text, while sharing most of the same content.

Several comments also asked for clarification about what was meant by 'reliable sources' related to the provision of weather data.

In the framework of rulemaking task RMT.0379 on 'All-Weather Operations', the 'Weather information to pilots' project was launched with the objective of proposing means to maximise in-flight safety through enhanced meteorological situational awareness in the cockpit and, therefore, to reduce the risk of flying in severe weather conditions. In that context, the project identified some possible improvements to be made with regard to the access of in-flight updates to meteorological information on EFBs. One of them concerns the source of the information. Indeed, it is recognised that the availability of weather applications from multiple sources and from a range of providers means that pilots and those operating in the aviation environment have 'easy' access to a vast amount of meteorological information. However, not all of that information is intended to be used by the aviation community. There is also a set of meteorological information that is mature and is seen as being beneficial to pilot situational awareness through an appropriate uplink to EFBs. Therefore, it is considered necessary to include some specific GM to clarify what is meant by the term 'reliable sources', proposed in NPA 2016-02 (in AMC8 SPA.EFB.100(b)(3), AMC7 NCC.GEN.131(b)(2) and AMC7 SPO.GEN.131(b)(2)) regarding the level of data quality assurance and the origin of the meteorological product that should be provided by such organisations.

- List of type B EFB applications: several comments were received asking EASA to review the list of the type B EFB applications, and to possibly move some of them to the type A list. The two lists for type A and type B EFB applications were reviewed based on the principles below.

Three different cases were considered:

- the application replaces paper products that are required to be on board and which are considered to be safety-relevant; in this case, such an application is considered to be a



- type B EFB application (e.g. an application that replaces a paper copy of an operations manual);
- the application replaces paper products that are required to be on board but which are not considered to be safety-relevant (e.g. a certificate of airworthiness); in this case, such an application is considered to be a type A EFB application;
 - all other applications are classified as type A or type B based on the criteria provided in AMC1 CAT.GEN.MPA.141(b).
- Use of on-board computerised mass and balance systems: a few comments asked about the status of currently required approvals to use an on-board computerised mass and balance system (CAT.POL.MAB.105), considering the proposal to introduce an operational approval for the use of a mass and balance EFB application. For consistency reasons, the approval contained in CAT.POL.MAB.105 has been removed, as it is considered that it is adequately covered by the approval for the use of type B EFB applications, which includes mass and balance EFB applications.
- Viewable stowage devices: several comments asked for more guidance on the concept of viewable stowage, and also clarification of the current related provisions. Most of the related comments have been accepted, and in addition, new GM providing guidance on viewable stowage devices has been introduced.
- Use of COTS GNSS for AMMD applications: various comments were received on the use of COTS GNSS for AMMD applications, and some on the proposed practical evaluation process which was introduced at AMC level in NPA 2016-12. Based on the comments received, this process has been considerably simplified as, for example, a reference receiver is not to be used any longer. Some additional clarifications and simplifications have also been introduced into the related draft AMC.



In summary, 56 % of the comments were accepted or partially accepted by EASA, and 13 % of the comments were noted, since they were supportive of the NPA, they answered a question asked in NPA 2016-12, or the commenter had no comment on the proposals.

Only 31 % of the comments received were not accepted.

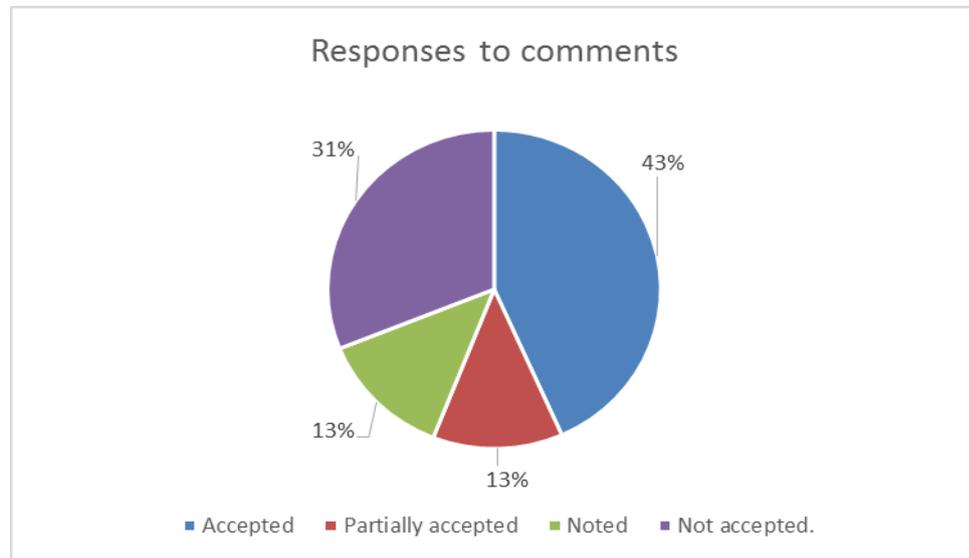


Figure 2: Distribution of the responses to the comments on NPA 2016-12

Individual answers to each one of the 266 comments received are contained in Chapter 2 of this CRD.

2. Additional changes introduced to the draft AMCs/GM

In addition to the changes stemming from the comments received during the public consultation of NPA 2016-12, changes have been made to the draft AMC1 CAT.GEN.MPA.140 and GM3 CAT.GEN.MPA.140 so as to simplify the EMI assessment process for cargo tracking devices.

The experience acquired on the evaluation of cargo tracking devices and their use in aircraft, associated with the advance in policy on PED tolerance demonstration, has permitted EASA to simplify the process through which operators allow the use of those devices. The new principle relies on gathering compliance declarations directly from the device manufacturers. The technical requirements are also alleviated by removing the prescriptive requirement on transmission times in cases of flight mode failures, as well as removing the need to obtain a failure modes and effects analysis (FMEA) for the device. The requirement for an automatic deactivation is maintained, but has been further clarified in the GM, in line with FAA AC material.



3. Individual comments and responses

In responding to comments, the following standard terminology has been applied to state EASA's position:

- (a) **Accepted** — EASA agrees with the comment and any proposed amendment is wholly transferred to the revised text.
- (b) **Partially accepted** — EASA either partially agrees with the comment, or agrees with it but the proposed amendment is only partially transferred to the revised text.
- (c) **Noted** — EASA acknowledges the comment, but no change to the existing text is considered to be necessary.
- (d) **Not accepted** — The comment or the proposed amendment is not agreed by EASA.

(General comments)	-
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comment	5	<p style="text-align: right;">comment by: <i>Erik WEINELT</i></p> <p>Dear EASA TEam,</p> <p>The German operator European Air Transport Leipzig GmbH operates 21 Airbus A300-600 freighters and 12 Boeing 757 freighters. European Air Transport also has engineering responsibility for 4 Airbus A300B4-622R converted freighters currently operated by ASL Airlines Ireland Limited and 24 Boeing 757 freighters operated by DHL Air Ltd. European Air Transport Leipzig would like to comment on the ref/A/ Proposed Amendment. We understand the necessity to integrate the electronic flight bags (EFBs) into the common rulemaking to establish a high level of security. The harmonisation process is welcomed as it shall limit the regulatory burden for the introduction of EFBs for CAT operations. However, the impact on operations and existing EFB environments approved under AMC20-25 conditions shall be kept to a minimum. Compliance times to changes shall be minimum 24 months to mirror Base Maintenance intervals.</p> <p>Erik Weinelt Avionics Engineer</p> <p>European Air Tansport Leipzig GmbH</p>	
response		<p>Noted.</p> <p>In any case, as stated in the Terms of Reference (ToRs) for RMT.0601 and in NPA 2016-12, the intent was to transpose the OPS content of AMC 20-25 into Regulation (EU) No 965/2012 without major modifications. Only modifications which were necessary due to the evolution of the scope of EFB applications or to correct inconsistencies or clarify some provisions were brought to the text of AMC 20-25. This results in minimal impact on existing EFB programmes already assessed against AMC 20-25.</p>	
comment	54	<p style="text-align: right;">comment by: <i>Austro Control</i></p> <p>Dear all,</p>	



please find attached the Austrian Comments to NPA 2016-12.

-) Page No. 32
- 2) Paragraph No. GM2 SPA.EFB.100(b) (a)(1)
- 3) Proposal (change): evaluate the risks associated with the use of an EFB, including a hot EFB battery;

- 1) Page No. 43
- 2) Paragraph No. AMC4 SPA.EFB.100(b)(3) (b)(3)(vi)
- 3) Proposal (change): Failures of component(s) of the EFB, including a hot EFB battery.

- 1) Page No. 56
- 2) Paragraph No. GM2 SPA.EFB.100(b)(3) (b)(11)
- 3) Proposal (NEW): Failures of component(s) of the EFB, including a hot EFB battery.

- 1) Page No. 60
- 2) Paragraph No. AMC1 NCC.GEN.131(b)(1) (a)(1)
- 3) Proposal (change): evaluate the risks associated with the use of an EFB, including a hot EFB battery;

- 1) Page No. 65
- 2) Paragraph No. AMC3 NCC.GEN.131(b)(2) (I)
- 3) Proposal (NEW): Failures of component(s) of the EFB, including a hot EFB battery.

- 1) Page No. 75
- 2) Paragraph No. AMC2 NCO.GEN.125 (a)
- 3) Proposal (change): The pilot-in-command should familiarise themselves with the use of the EFB hardware and its applications on the ground before using them in flight for the first time. A special consideration should be given to the handling of a hot EFB battery in flight.

- 1) Page No. 79
- 2) Paragraph No. AMC1 SPO.GEN.131(b)(1) (a)(1)
- 3) Proposal (change): evaluate the risks associated with the use of an EFB, including a hot EFB battery;

- 1) Page No. 85
- 2) Paragraph No. AMC3 SPO.GEN.131(b)(2) (I)
- 3) Proposal (NEW): Failures of component(s) of the EFB, including a hot EFB battery.

Justification für alle Fälle: das stetig steigende Risiko, das von Lithium Zellen ausgeht (siehe auch EASA SIB No.: 2016-14R1; Safety precautions regarding the transport by air of damaged, defective or recalled lithium batteries)

best regards
Franz Graser

response

Partially accepted.

- Page 32: Not accepted. The lithium battery risk is already covered by paragraph f) of AMC1 CAT.GEN.MPA.140.



- [Page 43](#): Accepted. The resulting text has been modified accordingly.
- [Page 56](#): Accepted. The resulting text has been modified accordingly.
- [Page 60](#): Not accepted. The lithium battery risk is already covered by paragraph f) of AMC1 NCC.GEN.130.
- [Page 65](#): Accepted. The resulting text has been modified accordingly.
- [Page 75](#): Not accepted. It is considered that the extent of the risk for NCO operations does not justify additional prescriptive considerations.
- [Page 79](#): Not accepted. The lithium battery risk is already covered by paragraph f) of AMC1 NCC.GEN.130.
- [Page 85](#): Not accepted. It is considered that the extent of the risk for SPO operations does not justify additional prescriptive considerations.

comment 105

comment by: *Airbus Helicopters*Attachment [#1](#)

For convenience, minor and formal comments are provided in a separate document (see attachment).

response

Partially accepted:

1. Type A and type B definitions have been transferred in Annex I.
2. All instances of 'aeroplane' have been replaced by 'aircraft'.
3. The GM on the loose equipment hazard has been lately removed but the EN had not been updated.
4. The use of the terms 'installed EFB' and 'EFB installed resources' has been made consistent in the resulting text to avoid any confusion.
5. All instances of 'aeroplane' have been replaced by 'aircraft'.
6. All instances of 'aeroplane' have been replaced by 'aircraft'.
7. The wording of points SPO.GEN.131 and NCC.GEN.131 has been aligned.
8. The AOC definition has been aligned with ICAO Annex 10 definition throughout the document.
9. All instances of 'aeroplane' have been replaced by 'aircraft'.
10. It should be noted that AMC 25.1309 is already referenced in the GM to Regulation (EU) No 965/2012. In any case, it is only a reference in GM and therefore only provides additional explanations. The reference to AMC 25.1309 has been kept in the resulting text.
11. The sentence related to the responsibility of the EFB administrator for miscellaneous applications has been removed from AMC1 CAT.GEN.MPA.141(b) as it was already addressed in the AMC related to the EFB administrator.
12. The term 'Non-EFB' has been removed from the proposed text, which clearly now states that these applications are not considered to be EFB applications.
13. The technical log application and the applications for continuing airworthiness records (used in flight and on the ground) have been moved to the type A application list.
14. The wording of AMC1 SPA.EFB.100(b) has been amended for clarity.
15. The identification of AMC2 SPA.EFB.100(b)(3) has been corrected.
16. The origin of the EFB application user guide has been removed from the related sentence as proposed.
17. The reference to the NCC AMC on hardware requirements in AMC1 SPO.GEN.131(b) has been corrected accordingly.
18. AMC2 SPO.GEN.131(a) has been renumbered accordingly.



- 19.AMC1 SPO.GEN.131(b) has been renumbered accordingly.
- 20.The typo on CRM in AMC3 SPO.GEN.131(b)(2) has been corrected accordingly.
- 21.The sentence related to the number of channels of the COTS GNSS has been corrected accordingly.
- 22.The table giving the level of risk as a function of severity and likelihood was indeed missing, but it is considered that its content could be easily deduced from the risk assessment table.
- 23.The numbering of the table in the safety risk assessment for NCO operators was indeed incorrect, but it is not considered to affect the outcome of the risk assessment.
- 24.Point NCO.GEN.125 clearly mentions PEDs that could adversely affect the performance of the aircraft systems and equipment. Therefore, an EFB that corrupts avionics definitely falls into this category.
- 25.Point NCO.GEN.135(a)(10) is already considered to be a mitigation. The outcome of the SRA is that some additional mitigation is needed and this is why in the proposed AMC2 NCO.GEN.125 it is stated that an AMMD application shall not be considered as a primary means of navigation for taxiing.
- 26.The ICAO standard is about airworthiness certification of the EFB or some of its equipment, hence the reference to M.A.304. This would be by definition not applicable to a portable EFB with no installed resources.

comment 108

comment by: Airbus Helicopters

Comment

The assessment of the safety impact of the use of EFB applications is globally proposed the following way:

1. In a first step, determine whether the application can be classified as type A or type B:
 1. Either as being part of pre-established lists of type A and type B applications,
 2. Otherwise, through the application of classification criteria, at least partly based on safety criteria for aircraft installed systems,
2. Reject applications which may have a safety impact higher than minor (although this is not absolutely clear in the proposed text),
3. In a second step, for type B applications, perform a risk assessment in the usage context and establish mitigating measures if needed,

We believe that this methodology is not totally appropriate, for the following reasons:

4. Criteria used by aircraft designers for system safety assessment are likely not accessible to operators (the definition of “minor failure condition” as provided in AMC/AC xx.1309 is interpretable and such an assessment needs the skills of experimented system safety analysts),
5. The criticality of an EFB application cannot be assessed considering only the function; the assessment needs to also consider the usage context (redundancy of EFBs, redundancy with aircraft equipment, procedures associated to the usage of the function and any other mitigation measures); some of the applications listed as type B might have failure conditions classified higher than minor in the absence of mitigation.



	<p>Consequently, there should not be separate steps for application classification and risk assessment.</p> <p>Suggestion It is not the objective of this comment to presently trigger changes in the proposed text.</p> <p>Nevertheless, we think there would be an interest for EASA to organize a workshop with all stakeholders (operators, national authorities, aircraft and EFB designers) to discuss about adequate solutions for EFB safety risk assessment.</p>
response	<p>Not accepted.</p> <p>AMC1 CAT.GEN.MPA.141(b) already states that the identification and assessment of failure conditions of an EFB application have to take into account the established means of mitigation. It should be noted that as part of its activities to establish a standard for EFB applications, the EUROCAE working group is currently working on a specific EFB application risk assessment.</p>
comment	<p>131 comment by: Airbus Helicopters</p> <p>Comment The proposal does not look fully compliant with ICAO Annex 6, especially:</p> <ol style="list-style-type: none"> 1. The assessment of safety risks, the establishment of procedures for the use of EFB and EFB functions, training aspects, are not addressed as far as the classification of applications has established that no type B application is used, 2. The requirements and guidance for NCO and SPO with other-than-complex aircrafts are extremely limited. <p>Suggestion An assessment of the coverage of ICAO requirements and possible rationale for deviating should be added in the explanatory note.</p>
response	<p>Not accepted.</p> <p>Type A EFB applications have, by definition, no safety effect and therefore their use is then not subject to a risk assessment, as there is no associated risk. ICAO Annex 6 states that the operator has to define its training requirement related to the use of EFB applications, but doesn't specify a minimum amount of training. Depending on the EFB application used, training might not be necessary.</p> <p>As stated in the explanatory note of NPA 2016-12, proportionality of the new requirements for NCO and SPO with non-complex motor-powered aircraft was a key objective, while ensuring that safety risks were adequately addressed. A risk assessment and an ICAO compliance table were established and allowed to reach this objective.</p>
comment	<p>186 comment by: Carl Norgren, Swiss Int Air Lines</p> <p>NPA 2016-12 has the goal to harmonize the implementation of the AMC 20-25 and to give EFB system providers, application developers, operators and regulators guidance how to implement an EFB solution. It is very detailed and covers all relevant areas. It supports the basic principle that an EFB system should support the pilots and should support a safe operation. Nevertheless in some parts the guidance is very specific, restrictive and complex.</p> <ol style="list-style-type: none"> 1. It will increase complexity, manpower needed and time to implement an EFB solution for

	<p>system suppliers, operators and regulators.</p> <p>2. It is questionable if a regulation this complex and specific can cope in all cases with technology innovations especially in the IT- and EFB-area. It is more likely that it could hinder new, smart, convenient or innovative solutions in future.</p> <p>As a general feedback the document should be reduced to be less complex, less specific and less detailed. Especially regarding IT-Issues it should not focus on « how things are done » (because this can change fast) but on what is « the aim to be reached » (performance based regulation).</p>
response	<p>Not accepted.</p> <p>The current applicable content of AMC 20-25 is not considered to be too complex and no specific major implementation issues have been identified. As the current content of AMC 20-25 has been transferred with limited changes into the AMCs to Regulation (EU) No 965/2012, it is considered that no additional complexity issue has been created.</p>
comment	<p>215 comment by: THALES AVIONICS</p> <p><i>THALES Avionics thanks EASA and the RMT601&602 working group for the quality of the work done for the preparation of this NPA. Even if the primary stakeholders impacted by this NPA are the member states registered operators and their respective competent authorities, THALES Avionics as EFB systems supplier is highly interested by the development of this regulation and its associated AMC & GM that may impact its solutions.</i></p>
response	<p>Noted.</p> <p>Thank you for your feedback.</p>
comment	<p>216 comment by: THALES AVIONICS</p> <p><i>From a general point of view, THALES Avionics has a positive position regarding this NPA which has a limited impact for EFB solutions already in line with AMC20-25 recommendations. Furthermore the introduction of new considerations for the use of In-Flight Weather applications and GNSS COTS receivers are noted and well appreciated. THALES Avionics supports also the introduction of EASA approvals for EFB software applications in complement to the current operational evaluation done through the OEB process, this would allow to streamline the operational approval process which is a positive point for all stakeholders.</i></p>
response	<p>Noted.</p> <p>Thank you for your feedback.</p>
comment	<p>217 comment by: THALES AVIONICS</p> <p><i>THALES Avionics would highlight two topics that should be taken into account in the future regulation:</i></p> <ul style="list-style-type: none"> - <i>Own-ship position display in flight : Still not allowed in the NPA (except for the specific case of VFR day operations) despite the recurrent requests from operators and pilots community and the positive experience accumulated by some of them already granted by their competent authorities to use it.</i> - <i>EFB data connectivity : As noted by EASA in the NPA, the EFB solutions moved from simple applications replacing on-board paper documentation to more complex and integrated applications. With the "connected aircraft" supported by the new high performance</i>

connectivity means, EFB solutions and the associated installed resources will support new applications to improve flight operations that will need more data exchanges between open world and avionics domain. The NPA renews AMC20-25 considerations that lists the authorized A/C systems to which a portable EFB is allowed to transmit data through an installed connectivity resource. This list is too restrictive and do not support further EFB developments, the need is more to develop the technical conditions and the required demonstrations allowing to achieve the safety objectives of such solutions.

response

Partially accepted.

Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

Regarding EFB data connectivity, it should be noted that the current text doesn't prevent data from being sent to avionics, it only ensures that it can't negatively affect the avionics by requiring that any avionics receiving data from portable EFBs have been certified for that purpose.

comment

218

comment by: THALES AVIONICS

THALES avionics reminds the importance of the harmonization of FAA and EASA regulations and associated means of compliance

response

Noted.

This is an objective EASA is pursuing.

NPA 2016-12 — General comments

p. 1-3

comment

55

comment by: René Meier, Europe Air Sports

Europe Air Sports involved staff of European Powered Flying Union, PPL IR Europe and of the Aero-Club of Switzerland to look at the text of NPA 2016-12. We thank the Agency for the preparation of the proposals presented, particularly those we read on pages 75 and 76 as well as the Annexes 6.1. and 6.2.

Our effort concentrated on the "NCO" and on the "SPO", core-elements of the operations of our members.

response

Noted.

Thank you for your feedback.

comment

65

comment by: CAA-NL

General remark 1

The NPA uses the terminology "type B application" and "EFB application that may have an adverse effect on the safe operation of an aircraft". The terminology "type B application" comes from AMC 20-25. The terminology "EFB application that may have an adverse effect on the safe operation of an aircraft" comes from ICAO. It is suggested to use one terminology



for clarity purposes. The need for clarity by using one terminology has been expressed by multiple NAAs during the EASA EFB authority meeting.

Furthermore, the terminology “EFB application that may have an adverse effect on the safe operation of an aircraft” was considered incorrect with respect that it is not the application that has the adverse effect but the malfunction or misuse of the application.

General remark 2

Coming from ICAO the NPA uses the terminologies “aeroplane” and “aircraft”. It is suggested to replace “aeroplane” by “aircraft” in order to allow applicability for helicopters.

response

Accepted.

The definition of a type B EFB application has been introduced in Annex I (Definitions) and therefore it is now directly used in the EFB implementing rules without the need for another definition. In addition, the term ‘aeroplane’ has been replaced by ‘aircraft’ accordingly.

comment

76

comment by: *IAOPA Europe*

At a general level IAOPA Europe would like to welcome the approach taken for Part-NCO operations which is proportionate and addresses the most important safety critical issues. The use of EFBs and uncertified portable equipment undoubtedly has been one the most important drivers behind the significant drop in CFIT accidents that has been documented for General Aviation over the last decade. For the same reason IAOPA Europe finds it very important that new regulation does not hinder or deter operators from using such equipment.

IAOPA Europe finds that this goal has been achieved for Part-NCO operations. On the other hand we are quite concerned that the proposed regulation for Part-NCC operations is **severely disproportionate for small NCC operators**.

Particularly the AMC material in many cases either directly refer to the commercial AMCs or to a very large extent are copied from commercial regulation. In some places the NCC AMCs even explicitly refers to "airline" operations.

It is very important for IAOPA Europe to stress that NCC operations cover a very wide spectrum of aviation: It ranges from the one-man pilot-owner operation to the large corporate operator.

For the small NCC operator with maybe one or two persons in the organisation the current proposal is entirely disproportionate. The sheer volume of requirements, testing and documentation required by the AMCs will be overwhelming for such a small operator and in many cases could deter from the use of EFBs altogether. **If small NCC operators were to give up their use of EFBs that would be a big step backwards in terms of safety**. It should not be ignored that old technology also has possibilities for errors: a paper manual where the relevant chart is missing or misplaced or a manual calculation error when doing the weight & balance calculation with pen and paper.

The regulation and the AMCs must take into account the very wide spectrum of NCC operations and not try to impose CAT requirements on all these. IAOPA therefore proposes to use the proposed Part-NCO regulation and AMCs also as the baseline for Part-NCC operations. The extensive set of AMC material could then be included as guidance material



	for the larger NCC operator.
response	Not accepted. Please refer to Chapter 1 of the CRD for detailed rationales and explanations.
comment	139 comment by: <i>Luftfahrt-Bundesamt</i> The LBA has no comments on NPA 2016-12.
response	Noted. Thank you for your feedback.
comment	232 comment by: <i>Erik Ringnes</i> Comment: The document introduces new provisions for in-flight weather applications. However, it does not provide guidance with respect to the approval of weather data sources for such EFB applications. Proposed Text and Justification: While updating Part-MET and associated AMCs to add this information could be envisioned, it may be more practical to consider creating a Guidance Material as an Appendix to AMC20-25 to detail the approval process and approval criteria for EFB in-flight weather data providers. The approval criteria would have to be commensurate with the Intended Function of the in-flight weather app (criticality no more than Minor) and to the integrity of the airborne infrastructure used (non-certified EFB and application). In particular, such criteria should be separate from and lighter than the ones applicable to Certified MET providers as per current Part-MET.
response	Accepted. New guidance material, providing explanations on how 'reliable sources' should be interpreted and assessed, has been introduced into the resulting text.
comment	233 comment by: <i>Erik Ringnes</i> Comment: The document introduces new provisions for in-flight weather applications. However, it does not provide guidance with respect to the approval of datalink means to uplink the weather information. Many operators have a desire to leverage existing high bandwidth cabin connectivity. In order to expedite operational approval with their local authorities, Operators would benefit from greater clarity from EASA as to which air-ground connectivity means can be used and what the approval criteria are. Proposed Text and Justification: Please consider enriching AMC20-25 with allowed data link means and approval criteria. Here again, allowable connectivity means and approval criteria would have to be commensurate with the Intended Function of the in-flight weather app and to the rest of the airborne infrastructure. Obviously, approval criteria would include cyber-security aspects as highlighted in GM3 SPA.EFB.100(b)(3).

response	<p>Not accepted.</p> <p>The provisions proposed for in-flight weather (IFW) applications do not preclude the use of any particular means of connectivity. Operators should ensure the compliance of their own solutions with the applicable data connectivity and security provisions.</p>
comment	<p>234 comment by: Erik Ringnes</p> <p>Comment: Many operators have a desire to establish wireless connectivity to the EFB, possibly leverage existing Wireless Access Points.</p> <p>The document allow EFB to be connected wirelessly to eligible aircraft system including those whose purpose is to provide air-ground connectivity (SATCOM and associated router). However, it does not provide guidance as to how to obtain operational approval for such wireless connectivity.</p> <p>Operators would benefit from greater clarity from EASA regarding applicable requirements and approval process.</p> <p>Proposed Text and Justification: Please consider enriching AMC20-25 with approval criteria for EFB wireless connectivity.</p>
response	<p>Not accepted.</p> <p>The provisions proposed for in-flight weather (IFW) applications do not preclude the use of any particular means of connectivity. Operators should ensure the compliance of their own solutions with the applicable data connectivity and security provisions.</p>
comment	<p>236 comment by: Erik Ringnes</p> <p>Comment: With the Paperless Concept and single pilot operations, will EFB failure be addressed?</p>
response	<p>Not accepted.</p> <p>The issue of a paperless cockpit is already addressed in the AMCs to Regulation (EU) No 965/2012 and especially in AMC1 CAT.GEN.MPA.180. It is not considered that any additional provisions for single-pilot operations are needed.</p>
comment	<p>237 comment by: Erik Ringnes</p> <p>Comment: We would recommend a “SHALL HAVE” requirement on on-board power source supplying the EFB instead of Lion batteries.</p> <p>Justification: During use of the EFB it should be powered by the on board electrical system. Internal batteries should be used as back-up.</p>
response	<p>Not accepted.</p> <p>A performance-based approach has been selected without requiring a prescriptive power source but rather specifying the criteria to be met for the solution selected by operators.</p>
comment	<p>262 comment by: Erik Ringnes</p> <p>Comment: Need a table with abbreviations - document is filled with abbreviations and reader has a difficult time determining what they are.</p>

	<p>Recommendations: Provide table of abbreviations at start of document.</p>
response	<p>Accepted. An abbreviations table is provided in Appendix 5.1 to the CRD.</p>
comment	<p>264 comment by: <i>Deutsche Lufthansa Airline, Eike Bloemsma</i></p> <p>Attachment #2</p> <p>From: Hans-Conrad Stamm (SWISS / OFI) in coordination with Lufthansa EFB Harmonisation Group representing EFB Administrators from AUA Austian Airlines, Brussels Airline, Eurowings/Germanwings, Lufthansa Passage, Lufthansa Cityline, Lufthansa Cargo, SWISS)</p> <p>Date: Dez 2016</p> <p>Feedback from LH EFB Harmonisation Group & SWISS regarding proposed “EASA NPA 2016-12 Transposition of provisions on electronic flight bags from ICAO Annex 6” (RMT.0601 — 4.10.2016)</p> <p><u>Executive Summary of the NPA 2016-12 EFB</u></p> <p>The NPA is published to maintain a high level of safety with regard to the use of EFBs by ensuring a harmonised implementation of the current provisions of AMC 20-25. It includes a proposal for an operational approval for the use of EFB applications by commercial air transport (CAT) operators.</p> <p>General Remarks LX</p> <p>The proposed NPA 2016-12 has the goal to harmonize the implementation of the AMC 20-25 and to give EFB system providers, application developers, operators and regulators guidance how to implement an EFB solution. The 138 page NPA is very detailed and covers all relevant areas. It supports the basic principle that an EFB system should support the pilots and should support a safe operation. Nevertheless in some parts the guidance is very specific, restrictive and complex. This could lead to:</p> <ul style="list-style-type: none"> - It will increase complexity, manpower needed and time to implement an EFB solution for system suppliers, operators and regulators. - It is questionable if a regulation this complex and specific can cope in all cases with technology innovations especially in the IT- and EFB-Area. It is more likely that it could hinder new, smart, convenient or innovative solutions in future. <p>As a general feedback the document should be reduced to be less complex, less specific and less detailed. Especially regarding IT-Issues it should not focus on « how things are done » (because this can change fast) but on what is « the aim to reach ».</p>
response	<p>Not accepted. The current applicable content of AMC 20-25 is not considered to be too complex and no specific major implementation issues have been identified. As the current content of AMC 20-25 has been transferred with limited changes into the AMCs to Regulation (EU) No 965/2012, it is considered that no additional complexity issue has been created.</p>



1. Procedural information p. 4-5

comment	<p>208 comment by: <i>NetJets Europe</i></p> <table border="1"> <tr> <td style="width: 15%;">General</td> <td style="width: 30%;">Own-ship position during flight was left outside.</td> <td>Operators and software companies have highlighted many advantages during the EFB user’s forum on using own-ship position during flight. It is imperative to regulate this.</td> </tr> </table>	General	Own-ship position during flight was left outside.	Operators and software companies have highlighted many advantages during the EFB user’s forum on using own-ship position during flight. It is imperative to regulate this.
General	Own-ship position during flight was left outside.	Operators and software companies have highlighted many advantages during the EFB user’s forum on using own-ship position during flight. It is imperative to regulate this.		
response	<p>Accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>			

2. Explanatory Note p. 6-10

comment	<p>61 comment by: <i>Tim Glasspool</i></p> <p>Editorial</p> <p>2.4.4 Annex V (Part-SPA) (6)safe operation of aeroplanes... should be ...safe operation of an aircraft... as per 2.4.3 (4) above.</p>
response	<p>Accepted.</p> <p>The resulting text has been modified accordingly.</p>
comment	<p>77 comment by: <i>ECOGAS</i></p> <p>2.1 bullet 3 <i>"— The current ICAO provisions for EFBs in Annex 6 Part I, II and III, applicable since November 2014, have not yet been transposed into the European regulatory framework."</i></p> <p>EASA and it's stakeholders should get a platform to be part of the ICAO rulemaking process in the early stage, to assure proportionality on the top rulemaking level.</p> <p>2.2 bullet 1 <i>"— ensure compliance with the ICAO Standards and Recommended Practices (SARPs);"</i></p> <p>If the rule is appropriately proportionate to the risks and other parameters, it will be easy to transpose as is. If not there is a danger of transposing rules not adequate.</p>



response	<p>Noted.</p> <p>EASA is a member of the ICAO OPS panel and also a member of the related EFB subgroup. EASA is therefore involved in the ICAO rulemaking process. However, EASA can only start its rulemaking process when the final version of the ICAO amendment is published.</p>
comment	<p>111 comment by: <i>Airbus Helicopters</i></p> <p>Comment</p> <p>The explanatory note is lacking precision about:</p> <ol style="list-style-type: none"> 1. the contents of proposed amendments, 2. the principles retained for EFB use and operational approval. <p>Suggestion</p> <p>More detailed explanations are expected in the final explanatory notes of the opinion and decision.</p>
response	<p>Accepted.</p> <p>Additional explanations on the proposed changes have been introduced in the explanatory note of the related Opinion.</p>
comment	<p>205 comment by: <i>IACA International Air Carrier Association</i></p> <p>Summary IACA comments to NPA 2016-12 – EFB – electronic flight bags</p> <ol style="list-style-type: none"> 1. The proposed EFB requirements seem reasonable, however having to follow an operational approval process for each new EFB application could have a significant economic impact. 2. From a safety point of view, the proposal for an operational approval for Type B applications is supported. 3. Existing previously approved (such as per AMC 20-25) EFB applications should be granted grandfather rights. 4. Due to the modular structure of software, record keeping and compliance monitoring a complex exercise. The NPA should provide more guidance and eventually propose an approval for a process making software changes rather than approving the applications themselves. 5. Due to the diversity in Type B applications, an operational approval for some applications is disproportionate. The NPA should focus on how airlines integrate and control EFB processes as a whole; this should be controlled under the airlines' management system to avoid the burden of getting an approval for each application. <p>For further details, see de-identified feedback IACA members airlines to questions on page 121.</p>
response	<p>Partially accepted.</p> <ol style="list-style-type: none"> 1. Due to the different types of EFB applications, one single approval for the whole EFB programme was not the selected option as described in the RIA of NPA 2016-12.



2. Noted.
 3. No EFB approval is currently required in the EU regulatory framework. Therefore, for competent authorities that have elected to already grant operations approvals, it is up to them to determine how they will manage the transition to the new requirement for an OPS approval.
 4. The change management process has been slightly amended for clarity and simplification.
 5. The list of type B EFB applications has been further amended to ensure its proportionality. In any case, this list is defined at AMC level and therefore the AltMoC process is applicable under points ARO.GEN.120/ORO.GEN.120.

comment	239	comment by: <i>Erik Ringnes</i>
	<p>Comment: 2.3. Summary of the regulatory impact assessment (RIA) From the pilot's perspective the use of EFB applications would be generally the same in all type of operations and the operating procedures used should reflect it.</p> <p>Justification: A less complex document would be clearer and better in order to avoid misinterpretations.</p>	
response	<p>Not accepted.</p> <p>It is not possible to have the same requirements for all types of operations due to, among other aspects, the different risks involved, due to proportionality issues and also due to the higher level of protection necessary for commercial air transport.</p>	

comment	247	comment by: <i>Bell Helicopter</i>
	<p>Section 2.1, Page 6 <i>"The main issue to be addressed by this NPA is level playing field."</i> Comment: Can you define this further? Is this safety driven? This lowers the safety level if lower tier operators are forced to remove electronic flight bags due to imposed regulations. Can you provide a justification that warrants levelling at at the highest level of regulation.</p>	
response	<p>Not accepted.</p> <p>It should be noted that the proposed provisions do not introduce any additional technical requirements for the use of EFB applications, as the current applicable OPS content of AMC 20-25 has been transposed without significant additions. The only main change relates to the introduction of an operational approval that ensures compliance with the ICAO SARPs and addresses the level playing field issue.</p>	

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.1. Annex I (Definitions)

p. 11-12

comment	20	comment by: <i>LE PUIL, Frederic</i>
	<p>Type A and B applications terminology being used in the requirements , the relevant definitions must be included in the definitions part</p>	
response	<p>Accepted.</p> <p>The related definitions have been introduced into Annex I (Definitions) to Regulation (EU) No 965/2012.</p>	



comment	97	comment by: AIRBUS
	The definition of EFB is missing. This definition is not given today in the Annex I to Air Ops regulation. The definition from current AMC 20-25 should be added.	
response	Accepted. The definition of an EFB was indeed not included in the NPA, as it was already introduced in NPA 2015-18 (A) 'Update of the rules on air operations' (<i>Air OPS Regulation — all Annexes & related AMC/GM</i>) — sub-NPA (A) 'Draft Implementing Rule' (RMT.0516 & RMT.0517) ² and will therefore be published in Annex I (Definitions) to Regulation (EU) No 965/2012 before the expected regulation stemming from RMT.0601.	
comment	219	comment by: DGAC France
	<i>"'EFB system' means the hardware (including any battery, connectivity provisions, I/O devices) and software (including databases) needed to support the intended <u>EFB function(s)</u>;"</i>	
	For consistency reason and avoid the use of different expression to cover the same target, EFB function(s) should be replaced here by EFB applications . EFB applications can support different functions.	
	In the rest of the NPA, EFB function is not used nor defined whereas the expression "EFB applications" are used (see appendix II, CAT.GEN.MPA.141,...).	
response	Accepted. The resulting text has been modified accordingly.	
comment	220	comment by: DGAC France
	The AMC 20-25 definition for EFB and PED should be also introduced in Annex I	
response	Accepted. The definition of an EFB was indeed not included in the NPA as it was already introduced in NPA 2015-18 (A) 'Update of the rules on air operations' (<i>Air OPS Regulation — all Annexes & related AMC/GM</i>) — sub-NPA (A) 'Draft Implementing Rule' (RMT.0516 & RMT.0517) ³ and will therefore be published in Annex I (Definitions) to Regulation (EU) No 965/2012 before the expected regulation stemming from RMT.0601. The definition of a PED has been introduced into the resulting text of Annex I (Definitions).	
comment	221	comment by: DGAC France
	Shouldn't we have the definition of an EFB application in the part Def since this expression is used in the regulation?	
response	Accepted. The definition of an EFB application has been introduced into Part-DEF.	
comment	222	comment by: DGAC France

² <http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2015-18>

³ <http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2015-18>



"'Installed EFB' means an EFB host platform installed in the aircraft, capable of hosting type A and/or type B EFB applications. It may also host certified applications. It is considered as an aircraft part, covered, thus, by the aircraft airworthiness approval;"

Since Type A and B are mentioned in the definition, Type A and B definition should also be added in the part def.

Suggestion :

Add Type A and B definition or Suppress any reference to type A and type B in the definition of "installed EFB" : "...capable of hosting EFB applications".

response

Accepted.

The definitions of type A and type B EFB applications have been introduced into Annex I (Definitions).

comment

223

comment by: DGAC France

"Type B EFB applications"

Since it is referenced in the AOC (appendix II part ARO), it may be better to define what type B EFB applications in the part Def.

response

Accepted.

The definition of a type B EFB application has been introduced into Annex I (Definitions).

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.2. Annex II (Part-ARO)

p. 12-15

comment

66

comment by: CAA-NL

OPS-SPEC format

Annex II to Part ARO (OPS-SPEC format) note 23 mentions making reference of the EFB hardware. The EFB hardware is not an approvable. As a result the OPS-SPEC is made revision sensitive to a non approvable item. This issue has been raised during the EASA EFB authority meeting. SAFA inspections should be considered in this respect. A reference to the Operations Manual on the OPS-SPEC was considered most practical.

response

Partially accepted.

The hardware in itself is indeed not approved; however, it has to be suitable for the application used. Therefore, in the event of a change of the hardware, it is in theory possible that an approval to use a type B EFB application would be revoked because the hardware would no longer be suitable. In any case, both possibilities (hardware on the OPS-SPECs or a reference to the operations manual) are provided to the operator. To further clarify this, an amendment to the provisions related to the changes to an EFB programme has been made to clarify the case where an operator only changes the hardware.

comment

161

comment by: FAA

"Use of type B EFB applications" Recommend changing to "EFB" or "Electronic Flight Bag".



response Not accepted.
The approval is designed to be applicable only when an operator is using a type B EFB application. EFBs hosting only type A applications are not subject to this requirement, as the malfunction or misuse of type A applications has no safety effect.

comment 162 comment by: FAA
Section 23.

Recommend verbiage is changed so OpSpec is authorization for EFB program rather than specific hardware or, in this case, software applications. In an effort to allow the operator to manage their EFB program, the focus of the authorization process, surveillance, and oversight should be on how an operator manages their EFB program in accordance with the rules and guidance provided by each CAA.

response Not accepted.
The proposed text introduces an operational approval for the use of type B EFB applications. The hardware is only part of the assessment to be performed by the competent authority in order to determine whether it is suitable for the EFB application used.
In any case, the assessment performed by the competent authority focuses on the whole EFB programme.

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.3. Annex IV (Part-CAT)

p. 15

comment 8 comment by: SWISS FOCA

Safe Operation:

The following sentence is used several times in the proposed NPA:

- Explanatory Note – 2.4.3 and 2.4.4
- **CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)**
(b).....
- **SPA.EFB.100 Use of electronic flight bags (EFBs) — operational approval**
(a).....
- **NCC.GEN.131 Use of electronic flight bags (EFBs)**
(b).....
- **SPO.GEN.131 Use of electronic flight bags (EFBs)**
(b).....
- APPLICATION CLASSIFICATION
(b) Type B application

Type B applications are EFB applications which may have an adverse effect on the safe operation of an aircraft.

An operator shall only use an EFB application which may have an adverse effect on the safe operation of an aircraft if the operator has been granted an approval by the competent authority for such use.

This formulation is misleading and implies that an NAA is approving an application that has



an adverse effect on the safe operation.

Proposal for changed wording:

An operator shall only use an EFB application which may have an adverse effect on the operation of an aircraft if the operator has been granted an approval by the competent authority for such use.

è Removal of the word “safe”

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

This explanation is taken from the ICAO Doc 10020 Chapter 6.1.3 and is clarifying the term of “safe operation”.

On behalf of the SWISS FOCA

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response

Partially accepted.

The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.

comment

16

comment by: *Swedish Transport Agency, Civil Aviation Department
(Transportstyrelsen, Luftfartsavdelningen)*

The Swedish Transport Agency fully understands that EASA intends to describe criteria that triggers a specific approval process, or criteria for operator actions for NCC and SPO operators. But with the proposed wording the intentions behind the text does not come forward. The wording “may have an adverse effect on the safe operation of an aircraft” might be interpreted such that the functionality of the EFB has an adverse effect to the safe operation even after the approval has been granted. A competent authority would most likely not approve such equipment and an operator should not be using such equipment. Further to this, AMC-20-25 does not mention “adverse effect” etc. when describing Type-B EFB application as it only mentions “adverse effect” in the context of describing Type-A EFB application. The Swedish Transport Agency suggests the following changes to the proposed text.

CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)

(a) Where an EFB is used on-board an aircraft, the operator shall ensure that it does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aeroplane.

(b) The operator shall ~~not only~~ use an EFB application ~~which may have an adverse effect on~~ **for** the safe operation of an aircraft, ~~unless~~ **if it is** approved in accordance with Subpart M of Annex V (Part-SPA).



response Partially accepted.
The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.

comment 21 comment by: SWISS FOCA

Text proposed by NPA:
CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)
(a) Where an EFB is used on-board an aircraft, the operator shall ensure that it does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aeroplane.
(b) The operator shall not use an EFB application which may have an adverse effect on the safe operation of an aircraft, unless approved in accordance with Subpart M of Annex V (Part-SPA).
AMC1 CAT.GEN.MPA.140 Portable electronic devices
TECHNICAL PREREQUISITES FOR THE USE OF PEDS
[...]
(d) Demonstration of electromagnetic compatibility

Change proposed:
The whole requirements for EMI-assessment should be deleted for EFBs operating on a “customary in trade” hardware solution.

Rationale
This additional burden is not adapted to today's world. We experience daily, that many passenger PEDs are not switched off (despite proper announcement). For this it is disproportionate to require a formal assessment for PEDs of flight crews.
The prove of standard PEDs not being a safety issue is given daily on hundreds of flights.
A formal, cost-intensive, procedure should be omitted.

response Not accepted.
The proposal is outside the scope of this rulemaking task, as these provisions are already applicable to all PEDs, including EFBs. In addition, as EFBs are used in the flight crew compartment, it is important that the risk of interference is adequately mitigated.

comment 64 comment by: CAA-NL

CAT.GEN.MPA.141
With the introduction of CAT.GEN.MPA.141 and SPA.EFB we suggest to dedicate a specific chapter in the Operations Manual to EFB by amending AMC3 ORO.MLR.100.

response Accepted.
It should be noted that it is already specified that the EFB policy and procedure manual may be included in the operator's operations manual. However, a specific EFB section has been inserted in the operations manual content described in AMC3 ORO.MLR.100.

comment 78 comment by: Maarten TEMMINCK

	<p>In my opinion, the proposed text does not sufficiently specify what should be taken into consideration when determining if "it does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aeroplane".</p> <p>In its current form, the text could be read that this only hardware should be taken into account, while software is in this case just as relevant.</p>
response	<p>Not accepted.</p> <p>It is true that point CAT.GEN.MPA.141 focuses mostly on hardware. Indeed, all type B EFB applications are within the scope of point SPA.EFB.100 and would have to follow the associated software requirements. Type A EFB applications are within the scope of point CAT.GEN.MPA.141 and have no safety effect by definition, hence the very limited provisions for these EFB applications.</p>
comment	<p>113 comment by: Airbus Helicopters</p> <p>Comment</p> <p>Proposed CAT.GEN.MPA.141(b) and SPA.EFB.100(a) respectively state: <i>"The operator shall not use an EFB application which may have an adverse effect on the safe operation of an aircraft, unless approved in accordance with Subpart M of Annex V (Part-SPA)."</i> <i>"An operator shall only use an EFB application which may have an adverse effect on the safe operation of an aircraft if the operator has been granted an approval by the competent authority for such use."</i></p> <p>The formulation in CAT.GEN.MPA.141(b) lacks to consider that the operator shall first perform a safety impact analysis of the EFB applications (application classification according to AMC1 CAT.GEN.MPA.141(b)) before going to an operational approval if a possible adverse effect is assessed. It also gives the false impression that the operational approval concerns only the EFB application.</p> <p>Also, as presently expressed, CAT.GEN.MPA.141(b) and SPA.EFB.100(a) are highly redundant.</p> <p>NOTE: The formulation in CAT.GEN.MPA.141(b) gives the false impression that the approval only bears on the "EFB application", whereas it is only conditioned by applications, but also concerns the EFB hardware and procedural aspects (EFB administration, procedures, training ...).</p> <p>Suggestion</p> <p>We suggest the following:</p> <ol style="list-style-type: none"> 1. In CAT.GEN.MPA.141(b): <ol style="list-style-type: none"> 1. add a requirement for a safety impact analysis of the functions performed by the EFB, 2. then, state that, in case any of the functions may have an adverse effect on the safe operation of an aircraft, an operational approval is needed according to SPA.EFB.100, 2. Remove SPA.EFB.100(a).
response	<p>Partially accepted.</p>

A new requirement has been added to point SPA.EFB.100 to clearly state that the hardware has to be suitable for the type B EFB applications hosted.

With regard to the safety impact analysis mentioned, it is considered implicit and the related AMC's contain provisions on the criteria to be considered in order to classify EFB applications. As ICAO has introduced the EFB operational approval on the operations specifications of the operator, it has to be a Part-SPA approval, hence the introduction of point SPA.EFB.100 to support this approval.

comment	<p>158</p> <p>CAT.GEN.MPA.141 Use of electronic flight bags (EFBs) (b)</p> <p>The wording seems to suggest that, after the approval, an operator can fly with an EFB application that may have an adverse effect on the safe operation of an aircraft. In other words, the application could be used even if it may cause problems. Annex 6 states: <i>Where portable EFBs are used on board an aeroplane, the operator shall ensure that they do not affect the performance of the aeroplane systems, equipment or the ability to operate the aeroplane.</i></p> <p>That is repeated in SPO.GEN.131 Use of electronic flight bags (EFBs) (a)</p>	comment by: IATA
response	<p>Partially accepted.</p> <p>The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.</p>	
comment	<p>212</p> <p>With regard to CAT.GEN.MPA.141(b), Aer Lingus suggest that a provision should be put in place to ensure that Type B applications which already form part of an approved EFB System on the date that this IR comes into effect, are considered to already be approved in accordance with Subpart M of annex V (Part-SPA). In other words, it should not be necessary to retrospectively seek an Operational Approval for Type B applications which are already in use; to do so would place an unfair burden on the operator.</p>	comment by: Aer Lingus
response	<p>Not accepted.</p> <p>Since the current regulatory framework does not foresee any operational approval for the use of EFB applications, it is not possible to address the transition from some national requirements in the amending regulation. In any case, this process has to be managed by each competent authority, which should ensure that all operators comply with the new provisions when they enter into force.</p> <p>In any case, as stated in the Terms of Reference (ToRs) for RMT.0601 and in NPA 2016-12, the intent was to transpose the OPS content of AMC 20-25 into Regulation (EU) No 965/2012 without major modifications. Only modifications which were necessary due to the evolution of the scope of EFB applications or to correct inconsistencies or clarify some provisions were incorporated in the text of AMC 20-25. This results in minimal impact on existing EFB programmes already assessed against AMC 20-25.</p>	

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.4. Annex V (Part-SPA)	p. 15
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comment

12

comment by: *Dassault-Aviation*

Dassault-Aviation comment

Text:

3.1.4. Annex V (Part-SPA)**SUBPART M — ELECTRONIC FLIGHT BAGS****SPA.EFB.100 Use of electronic flight bags (EFBs) — operational approval**

(a) An operator shall only use an EFB application which may have an adverse effect on the safe operation of an aircraft if the operator has been granted an approval by the competent authority for such use.

Comment:

Dassault Aviation recommends to clarify to which operators “EFB operational approval” applies. As for SPA ETOS 100, the mention “ In commercial air transport operations” should be used to introduce SPA EFB 100 chapter.

response

Accepted.

The resulting text has been modified accordingly.

comment

17

comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

The Swedish Transport Agency fully understands that EASA intends to describe criteria that triggers a specific approval process, or criteria for operator actions for NCC and SPO operators. But with the proposed wording the intentions behind the text does not come forward. The wording “may have an adverse effect on the safe operation of an aircraft” might be interpreted such that the functionality of the EFB has an adverse effect to the safe operation even after the approval has been granted. A competent authority would most likely not approve such equipment and an operator should not be using such equipment. Further to this, AMC-20-25 does not mention “adverse effect” etc. when describing Type-B EFB application as it only mentions “adverse effect” in the context of describing Type-A EFB application. The Swedish Transport Agency suggests the following changes to the proposed text.

SUBPART M — ELECTRONIC FLIGHT BAGS**SPA.EFB.100 Use of electronic flight bags (EFBs) — operational approval**

(a) An operator **engaged in commercial air transport operations** shall only use an EFB application ~~which may have an adverse effect on~~ **for** the safe operation of an aircraft if the operator has been granted an approval by the competent authority for such use.

(b) In order to obtain an operational approval from the competent authority for the use of such an EFB application, the operator shall provide evidence that:

(1) a risk assessment related to the use of the devices and the EFB application and its associated function(s) has been conducted, identifying the associated risks and ensuring that they are appropriately managed and mitigated;

(2) the human-machine interfaces of the EFB devices and the EFB application have been assessed against human factors principles; and



(3) it has established an EFB administration system and that procedures and training requirements for the administration and use of the devices and the EFB application have been established and implemented.
This demonstration shall be specific to the EFB application and the hardware involved.

response

Partially accepted.
The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.

comment

63

comment by: CAA-NL

SPA.EFB.100 Use of electronic flight bags (EFBs) — operational approval

CAT.GEN.MPA. 141 refers to Part-SPA for the approval of type B applications. NCC.GEN.131, NCO.GEN.125 en SPO.GEN.131 specify what needs to be in place before using type B applications, without mentioning an approval. However, SPA.EFB.100, which calls for the approval, is just as much applicable to NCC/ NCO/SPO as it is to CAT. In the EASA EFB authority meeting of 16 and 17 November 2016 EASA acknowledged this and explained that it is the intention that NCC/NCO/SPO operations do not require approval for the use of type B applications.
As a result an applicability statement is missing in SPA.EFB 100.

response

Accepted.
Point SPA.EFB.100 has been amended to clarify that it is only applicable to CAT operators.

comment

98

comment by: AIRBUS

PROPOSED TEXT / COMMENT:

Recommendation to insert a paragraph (b)(1) reading "The EFB hardware is suitable for the intended function".

RATIONALE / REASON / JUSTIFICATION:

This new requirement would provide the performance objective of the AMC1 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval SUITABILITY OF THE HARDWARE.

response

Accepted.
Point SPA.EFB.100 has been amended accordingly.

comment

159

comment by: IATA

SPA.EFB.100 Use of electronic flight bags (EFBs) — operational approval (a)

The wording seems to suggest that, after the approval, an operator can fly with an EFB application that may have an adverse effect on the safe operation of an aircraft. In other words, the application could be used even if it may cause problems. Annex 6 states: *Where portable EFBs are used on board an aeroplane, the operator shall ensure that they do not affect the performance of the aeroplane systems, equipment or the ability to operate the*



	<i>aeroplane.</i> That is repeated in SPO.GEN.131 Use of electronic flight bags (EFBs) (a)
response	Partially accepted. The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.
comment	224 comment by: DGAC France Limitation to Annex IV (Part-CAT) of the Part SPA-Subpart M shall be defined likewise done in some others PART SPA subparts (i.e. SPA.NVIS.100 Night vision imaging system (NVIS) operations). So CAT.GEN.MPA.141 (b) requirement shall be deleted from CAT.GEN requirements and limitation to Annex IV (Part-CAT) operations shall be added as a new requirement in Part SPA-Subpart M.
response	Partially accepted. Point SPA.EFB.100 has been amended to clearly state that it is only applicable to CAT. Regarding point CAT.GEN.MPA.141, since some EFBs may only host type A applications, the generic hardware requirements contained in this implementing rule have to be kept.
comment	225 comment by: DGAC France SPA.EFB.100 Use of electronic flight bags (EFBs) — operational approval 1. 1. Evidence that the flight crew is adequately trained to the use of the EFB Type B applications is not mentioned in this rule whereas it is one of the key expected elements. The bullet 3 seems to address only the administration of the EFB. It is not so obvious that it could also address the crew's training, Ops procedures, MEL or equivalent... 2. 2. Nothing is expected with regards to the maintenance of the system? Justification: Even if these points are handled in the AMCs, it should be clearly established in the SPA.EFB.100 what is expected in order to proceed for a TYPE B application OPS approval. We suggest to follow the generic model proposed by EASA for the specific ops approval (refer to SPA.PBN.105, SPA.LVO.105 – from the AWO RMT379)
response	Accepted. The resulting text has been amended accordingly.

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.5. Annex VI (Part-NCC)

p. 16

comment	18 comment by: Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen) The Swedish Transport Agency fully understands that EASA intends to describe criteria that triggers a specific approval process, or criteria for operator actions for NCC and SPO
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operators. But with the proposed wording the intentions behind the text does not come forward. The wording “may have an adverse effect on the safe operation of an aircraft” might be interpreted such that the functionality of the EFB has an adverse effect to the safe operation even after the approval has been granted. A competent authority would most likely not approve such equipment and an operator should not be using such equipment. Further to this, AMC-20-25 does not mention “adverse effect” etc. when describing Type-B EFB application as it only mentions “adverse effect” in the context of describing Type-A EFB application. The Swedish Transport Agency suggests the following changes to the proposed text.

NCC.GEN.131 Use of electronic flight bags (EFBs)

(a) Where an EFB is used on-board an aircraft, the operator shall ensure that it does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aeroplane.

(b) Prior to using an EFB with applications ~~which may have an adverse effect on~~ **for** the safe operation of an aircraft, the operator shall:.....

response

Partially accepted.
The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.

comment

132 comment by: *General Aviation Manufacturers Association / Hennig*

The General Aviation Manufacturers Association (GAMA) appreciates the opportunity to file comments about Notice of Proposed Amendment (NPA) 2016-12.

The requirements proposed by the agency for Part NCC are cumbersome and likely will limit the opportunity for EFB safety benefits for the legacy business aviation fleet. The level of substantiation for the use of C-PEDs / EFB equipment in NCC operations is likely beyond the grasp of most NCC operators and would force significant validation by the OEM / STC organisation.

GAMA is specifically concerned about the burden imposed by the agency to address:

1. AMC1 NCC.GEN.130 (d) Demonstration of electromagnetic compatibility
2. AMC1 NCC.GEN.131 (c) Environmental testing for the requirement for depressurisation testing

As well as overall hardware suitability and durability testing criteria identified in the draft AMC.

GAMA recommends that the agency review these proposed requirements to identify a more proportional approach to business aviation operations to ensure the requirements are commensurate with the safety benefits achieved.

response

Not accepted.
Please refer to Chapter 1 of the CRD for detailed rationales and explanations.



comment	248	comment by: <i>Bell Helicopter</i>
	<p>Section 3.1.5 <i>"Prior to using an EFB with applications which may have an adverse effect on the safe operation of an aircraft, the operator shall"</i> Comment: Can you define "adverse effect" This is a broad statement that is open to interpretation</p>	
response	<p>Partially accepted. The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition</p>	

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.6. Annex VII (Part-NCO)

p. 16

comment	50	comment by: <i>Kevin Hogan</i>
	<p>On-board, inconsistent use of the hyphen on this page and throughout.</p>	
response	<p>Accepted. The resulting text has been amended accordingly.</p>	
comment	133	comment by: <i>General Aviation Manufacturers Association / Hennig</i>
	<p>The General Aviation Manufacturers Association (GAMA) appreciates the opportunity to file comments about Notice of Proposed Amendment (NPA) 2016-12.</p> <p>General aviation pilots today use tablet technology with great benefit including to provide the pilot situational awareness about terrain, traffic, and associated flight information. Providing pilots with this situational awareness enables significant safety into the cockpit.</p> <p>GAMA welcomes the agency's approach of establishing a simple set of requirements for NCO operations that are mostly common sense steps that a pilot should take to ensure safety. GAMA, however, recommends that the agency undertake an additional review to determine if even some of these straight forward requirements should be retained in an AMC text.</p> <p>As an example, the agency in AMC1 NCO.GEN.125 (a) EFB viewable stowage recommends that the pilot ensure that if the "EFB moves... it will not jam flight controls, damage flight deck equipment, or injure flight crew members." This is true for many other things that the pilot may bring into the cockpit, so GAMA questions why identifying EFBs specifically for this consideration in an AMC benefits safety.</p> <p>GAMA recommends that the agency limit the NCO AMC material to only those considerations that are unique to the use of an EFB.</p>	
response	<p>Not accepted. The intent of the comment is agreed. However, considering the rapid expansion of the use of EFBs among the NCO community, it is considered that on top of the current existing safety</p>	



promotion related to loose equipment in the flight compartment (SIB2011-10⁴), there was a need to ensure that this risk is adequately mitigated in the case of EFBs by raising the awareness of the NCO community on this issue.

comment 250

comment by: Bell Helicopter

3.1.6. Annex VII (Part-NCO)

“The pilot-in-command shall not permit any person to use a portable electronic device (PED), including an electronic flight bag (EFB), on board an aircraft that could adversely affect the performance of the aircraft’s systems and equipment or the ability to operate it.”

Comment: This should be limited to critical flight operations.

response

Not accepted.

This requirement is already applicable for all PEDs in the current Regulation and there is no intent to introduce any alleviation. The only amendment introduced was the inclusion of EFBs, which are PEDs, for clarity reasons only.

3. Proposed amendments — 3.1. Draft Regulation (Draft EASA Opinion) — 3.1.7. Annex VIII (Part-SPO)

p. 16

comment

19

comment by: Swedish Transport Agency, Civil Aviation Department
(Transportstyrelsen, Luftfartsavdelningen)

The Swedish Transport Agency fully understands that EASA intends to describe criteria that triggers a specific approval process, or criteria for operator actions for NCC and SPO operators. But with the proposed wording the intentions behind the text does not come forward. The wording “may have an adverse effect on the safe operation of an aircraft” might be interpreted such that the functionality of the EFB has an adverse effect to the safe operation even after the approval has been granted. A competent authority would most likely not approve such equipment and an operator should not be using such equipment. Further to this, AMC-20-25 does not mention “adverse effect” etc. when describing Type-B EFB application as it only mentions “adverse effect” in the context of describing Type-A EFB application. The Swedish Transport Agency suggests the following changes to the proposed text.

SPO.GEN.131 Use of electronic flight bags (EFBs)

(a) Where an EFB is used on-board an aircraft, the operator shall ensure that it does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aircraft.

(b) Prior to using an EFB with applications ~~which may have an adverse effect on~~ **for** the safe operation of an aircraft, the operator shall:.....

response

Partially accepted.

The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition

4

https://ad.easa.europa.eu/blob/SIB_201110_Loose_Equipment_in_the_Flight_Compartment.pdf/SIB_2011-10_1



comment	249	comment by: <i>Bell Helicopter</i>
	<p>Section 3.1.7 <i>“Prior to using an EFB with applications which may have an adverse effect on the safe operation of an aircraft, the operator shall”</i> Comment: Can you define “adverse effect” This is a broad statement that is open to interpretation</p>	
response	<p>Partially accepted. The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.</p>	

3. Proposed amendments — 3.2. Draft Acceptable Means of Compliance and Guidance Material (Draft EASA Decision) — 3.2.1. Draft AMC and GM to Part-CAT

p. 17-26

comment	4	comment by: <i>NFLC, Cranfield University, UK</i>
	<p>Ownship position should be permitted for all operations (VFR/IFR and day/night) as a Type B EFB application but it must not be used for primary navigation or as the primary means of avoiding weather / obstacles or in-flight traffic. This is reasonable providing an operator provides training that addresses the human factors issues associated with ownship position and it must be made clear that the flight crew understand which system is providing primary navigation or primary weather / obstacle / traffic avoidance. The benefits that ownship position could provide as an aid to situational awareness are significant.</p>	
response	<p>Accepted. Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>	
comment	6	comment by: <i>Deutsche Lufthansa Airline, Eike Bloemsma</i>
	<p>(b)..., but <i>without a display of aircraft/own-ship position</i>, except in the specific case of day VFR operations only.</p> <p>Lufthansa Group rates the benefits of OSP on digital maps higher than the accompanied risks. Until Nov 2016 LH has operated ~2,5 Mio flights with OSP on EFB charts, and there are no negative reports about this feature.</p> <p>In contrary the safety department has come to the conclusion that OSP could have avoided previous incidents on DLH aircraft without active OSP.</p> <p>LH OSP on EFB incorporates these features: - position of certified aircraft system sources (FMS, GPS) for OSP on charts.</p>	



- OSP is only to be used for orientation on the map, symbol is a circle
 - crew procedure and training how to use OSP by crews

Lufthansa Group proposes that OSP is allowed on EFB, maybe under the some to be defined requirements.

response

Accepted.
 Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMC/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

comment

7 comment by: SWISS FOCA

[Attachment #2](#)

3.1.2 Annex II (Part-ARO)
 Change for the entry of OPSSPECS
 To be replaced by:

EFB	R	£	Portable EFB – Type A / B	Type A or Type B only
			Installed EFB – Type A / B	Acc. application

Note: Insertion of the list of type B applications. Either the list is contained on the operations specification or in the OM. In the latter case, the related operations specifications must make a reference to the related page in the operations manual.

Reason: The EFB hardware is subject to several requirements in order to be approved by the NAA and therefore is by itself subject as an OPSSPEC.

response

Not accepted.
 It is important to note that for portable EFBs, the EFB hardware is in any case not subject to an approval; however, in the case of type B EFB applications used on portable EFBs, the hardware has to be suitable for the use of the type B EFB applications, hence the reference to the EFB hardware has to be mentioned in the operations specifications or in the OM as stated in the note to the operations specifications template.
 In addition, only type B EFB applications are subject to an operational approval, and therefore the list of type A EFB applications hosted is not expected to be mentioned in the operations specifications.

comment

10 comment by: Monarch Airlines

Monarch Airlines believes the ability to display ownship offers a vast improvement in situational awareness while only having minor safety implications if in error. Therefore the display of ownship information on electronic aeronautical charts should be acceptable while retaining Type B categorisation.

response Accepted.
Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

comment 13 comment by: KLM

AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION

*Sub (d) is too prescriptive, not in line with the current AMC20-25 and does not reflect current practice of some operators.
It should give more flexibility for operators with regard to the EFB administrator in case the EFB operating system or design architectures guarantee that no interference with EFB applications can reasonably take place.*

We propose to amend sub (d) as follows:

*(d) Miscellaneous (non-EFB) software applications
Miscellaneous software applications are non-EFB applications, supporting function(s) not directly related to operations conducted by the flight crew on the aircraft.
The configuration or installation of those applications (e.g. application updates, installation of new applications) should be managed by the EFB administrator, unless the EFB operating system or design architectures guarantee no interference with EFB applications can reasonably take place. Examples of such safeguards are logical storage partitioning or application sandboxing within the operating system.
Examples of miscellaneous software applications are web browsers (not used for operational purposes), e-mail clients, picture management applications, or even applications used by ground crews (e.g. for maintenance purposes).*

response Not accepted.
AMC1 SPA.EFB.100(b)(3) already mentions some possible IT solutions and the way the EFB administrator could discharge this responsibility.

comment 15 comment by: Swedish Transport Agency, Civil Aviation Department
(Transportstyrelsen, Luftfartsavdelningen)

The Swedish Transport Agency fully understands that EASA intends to describe criteria that triggers a specific approval process, or criteria for operator actions for NCC and SPO operators. But with the proposed wording the intentions behind the text does not come forward. The wording “may have an adverse effect on the safe operation of an aircraft” might be interpreted such that the functionality of the EFB has an adverse effect to the safe operation even after the approval has been granted. A competent authority would most likely not approve such equipment and an operator should not be using such equipment.

Further to this, AMC-20-25 does not mention “adverse effect” etc. when describing Type-B EFB application as it only mentions “adverse effect” in the context of describing Type-A EFB application. The Swedish Transport Agency suggests the following changes to the proposed text.

AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

APPLICATION CLASSIFICATION

(a) Type A application

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

(b) Type B application

Type B applications are EFB applications which ~~may~~ **are** have an adverse effect on ~~used for~~ the safe operation of an aircraft.

They are applications:

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

(2) which neither substitute nor duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules .

Examples of type A and type B EFB applications can be found in AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b).

response

Partially accepted.

The definition of a type B application has been moved to Annex I (Definitions) to Regulation (EU) No 965/2012, which then directly allows the use of the type B denomination in the implementing rules concerned, removing the need for an additional potentially confusing definition.

comment

24

comment by: *The Boeing Company*

Page: 20 of 138
 Paragraph: AMC1 CAT.GEN.MPA.141(a) Use of EFBs HARDWARE
 (d) EFB data connectivity

THE PROPOSED TEXT STATES:
 “Portable EFBs having data connectivity to aircraft systems, either wired or wireless, may receive or transmit data to and from aircraft systems, provided the connection (hardware and software for data connection provisions) and adequate interface protection devices are incorporated into the aircraft type design.”

REQUESTED CHANGE:
 “Portable EFBs having data connectivity to aircraft systems, either wired or wireless, may receive or transmit data to and from aircraft systems., provided the connection (hardware and software for data connection provisions) and adequate interface protection devices are incorporated into the aircraft type design. If data is transmitted to aircraft systems, the connection (hardware and software for data connection provisions) and adequate interface protection devices should be incorporated into the aircraft type design. If data is only received from aircraft systems, the operator or the provider of the interface hardware and software should ensure data are not corrupted and aircraft systems are not impacted.”

JUSTIFICATION:
 Read-only interfaces should not be part of the aircraft type design. The type design should end at the interface definition and data outlet point.



response Not accepted.
It is considered that proper protection of the aircraft should be ensured at aircraft type design level even in case of monodirectional connectivity.

comment 25 comment by: *The Boeing Company*

Page: 22 of 138

Paragraph: AMC1 CAT.GEN.MPA.141(b) Use of EFBs

APPLICATION CLASSIFICATION

(b) Type B application

(2)

THE PROPOSED TEXT STATES:

They are applications:

“(1)

(2) Which neither substitute nor duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules.”

REQUESTED CHANGE:

“(2) Which neither do not substitute nor duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules. If applications duplicate or partially duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules, the operator should establish flight crew procedures and flight crew training to ensure information displayed by airworthiness regulated systems prevail over any information displayed by EFB systems. Recurrent training should address this subordination of EFB information.”

JUSTIFICATION:

Navigation Displays (NDs) may present, for example, charting information and information relative to navigation points around the aircraft. This information prevails over the same information if presented in an EFB.

If case an EFB operation with own-ship depiction is authorized by a National Aviation Authority, the proposal for the new wording should hint to additional (training) requirements.

response Not accepted.
By principle, all information coming from certified avionics prevails over information provided by an EFB. With regard to a type B EFB application, the operator is already required to establish adequate training requirements and procedures for the use of the application, and therefore it is not considered necessary to duplicate these requirements in the definition of a type B EFB application.

comment 26 comment by: *The Boeing Company*

Page: 23 of 138



Paragraph: AMC1 CAT.GEN.MPA.141(b) Use of EFBs

APPLICATION CLASSIFICATION

(c) Determination of application type

Notes:

THE PROPOSED TEXT STATES:

“The severity of the failure conditions linked to displaying a function already existing in the certified type design, or already authorised through an ETSO, and used with same concept of operation, cannot be less than already assessed for this function...”

REQUESTED CHANGE:

Delete this paragraph

JUSTIFICATION:

The pure existence of EFB information that is also obtainable from avionics should not necessarily have the same failure effect if presented in an EFB context.

In many cases, avionics displays give specific, additional instructions to the flight crew, or predict a trajectory or combine several ‘sensed’ information in one display. EFBs usually do not do that, and should not. Therefore, this note is not relevant.

response

Not accepted.

The related sentence clearly states ‘used with the same concept of operations’ and therefore it already addresses this potential issue; hence no modification has been introduced in the resulting text.

comment

27

comment by: *The Boeing Company*

Page: 25 of 138

Paragraph: AMC3 CAT.GEN.MPA.141(b) Use of EFBs

TYPICAL TYPE B APPLICATIONS

(b)

THE PROPOSED TEXT STATES:

“Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps; these applications may offer features such as panning, zooming, scrolling, and rotation, centring and page turning, but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.”

REQUESTED CHANGE:

“Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps; these charts could be precomposed or data-driven and applications may offer features such as panning, zooming, scrolling, and rotation, centring and page turning, but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.”

JUSTIFICATION:



	Clarification: The chart rendering technology should not matter. Today's enroute charts often leverage on data-driven rendering technology which allows for context-driven information presentation (e.g. decluttering or adding information depending on zoom scale). Such technology should not be prevented from other than enroute charts.
response	Not accepted. It should be noted that data-driven charts are not excluded by the current text and have to follow the current provisions for chart applications.
comment	51 comment by: <i>Kevin Hogan</i> Email, non-U.S. English publications have mostly adopted the unhyphenated form.
response	Accepted. The resulting text has been modified accordingly.
comment	67 comment by: <i>CAA-NL</i> GM1 CAT.GEN.MPA.141 Use of electronic flight bags (EFBs) The NPA introduces the abbreviation "AOC", not being an Air Operator Certificate. This is considered confusing. Also applicable for AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs).
response	Noted. It should be however noted that 'AOC: airline operational communication' is also ICAO terminology. It is considered that the context should always prevent confusion between the two meanings.
comment	68 comment by: <i>CAA-NL</i> AMC2 CAT.GEN.MPA.141(b) AMC2 CAT.GEN.MPA.141(b) allows the carriage of digitally created documents. However, CAT.GEN.MPA.180 specifies that for the CofR, CofA, true certified copy of the AOC and aircraft radio licence originals have to be on board. It is suggested to delete these from AMC2 CAT.GEN.MPA. 141(b).
response	Not accepted. It is already possible to have electronic copies of original documents that prevent any amendment. In that case, those documents are considered to be originals.
comment	69 comment by: <i>CAA-NL</i> AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) Since AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) contain examples of applications we suggest these AMCs to be classified as GM.
response	Not accepted. GM would leave these lists as guidance only, and consequently the classification of EFB applications would rely only on the AMC1 CAT.GEN.MPA.141(b) process. Considering the objective of having a standardised approach throughout Europe, it is considered beneficial to

reflect the outcome of EASA's assessment of such applications. For very specific cases, the AltMoC process would still be applicable in accordance with points ARO.GEN.120/ORO.GEN.120.

comment

86

comment by: UK CAA

Page No: 23 of 138.

Paragraph No: AMC1 CAT.GEN.MPA.141(b) Use of EFBs APPLICATION CLASSIFICATION, sub para (c)(1)

Comment: The prohibition of applications which display position should be removed.

Justification: The advances in charting application technology are such that having own-ship position displayed does not present a safety hazard PROVIDED that this is used as a secondary source of information, and the aircraft is fitted with avionics standard equipment which must be treated as the primary source of information. The operator should have procedures to reinforce this.

Proposed Text: Add additional text as follows:

“displaying information which may tactically be used...obstacles or in-flight traffic, **unless such applications are used for situational awareness only and the aircraft is fitted with avionics standard equipment which is used as the primary source of position information. Such applications should have a means of removing own-ship position when the position information is unreliable. The operator should develop procedures indicating the primacy of information from avionics equipment should a difference in position be indicated**”

response

Partially accepted.

Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

comment

87

comment by: UK CAA

Page No: 25 of 138

Paragraph No: AMC3 CAT.GEN.MPA.141(b) Use of EFBs – TYPICAL TYPE B EFB APPLICATIONS, sub para (b)

Comment: The restriction of own-ship position in flight should be removed.

Justification: Operational use of EFB within other NAAs has shown that the increase in situational awareness brought by own-ship EFB displays far outweighs any potential risks provided that mitigating operational procedures are developed.



	<p>Proposed Text: The sentence “but without a display of aircraft/own-ship position except in the specific case of day VFR operations only” should be deleted.</p>
response	<p>Accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>94 comment by: EUROCONTROL</p> <p>AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) - Page 25 TYPICAL TYPE B EFB APPLICATIONS</p> <p>A non-exhaustive list of possible type B EFB applications is provided. At item (b) the list includes 'Electronic aeronautical chart applications'.</p> <p>The EUROCONTROL Agency is of the opinion that the provisions of ICAO Annex 4 'Chapter 20 Electronic Aeronautical Chart Display — ICAO' should also be taken into consideration with respect to EFB chart applications. It is not clear if this material was considered; any reference to these provisions is currently missing from the list of considered ICAO provisions on this page.</p> <p>It seems that this should be clarified since NPA 2016-02 (Technical requirements and operational procedures for aeronautical information services and aeronautical information management) excluded the Annex 4 requirement for display in the proposed regulation (in other terms these requirements from the list of products to be provided by the AIS Providers were removed).</p> <p>It is suggested 1/that the Opinion/Regulation based on NPA 2016-02 indicates that ICAO Annex 4 'Chapter 20 Electronic Aeronautical Chart Display — ICAO' provisions are excluded; and 2/ that, in Opinion/Regulation based on NPA 2016-12, it will be stated that this is the placeholder for these ICAO provisions.</p> <p>The EUROCONTROL Agency comments above also relate to section 'ICAO provisions on EFBs' at page 109.</p>
response	<p>Noted.</p> <p>Additional information is necessary to be able to assess the issue identified.</p>
comment	<p>96 comment by: Transport Malta - Civil Aviation Directorate</p> <p>AMC1 CAT.GEN.MPA.141(a) Use of Electronic Flight Bags</p> <p>(d) EFB data connectivity</p> <p>This is putting the aircraft vulnerable to virus attack. The best option is that the portable 'off the shelf' EFB should be physically off the aircraft systems. The operators are not in a</p>

response	<p>position to ensure that no malicious software has been installed in portable EFB.</p> <p>Not accepted. This issue is already addressed in AMC 20-25, which already contains provisions to adequately control this risk.</p>
comment	<p>99 comment by: AIRBUS</p> <p>AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs) HARDWARE</p> <p>PROPOSED TEXT / COMMENT: Recommendation to add an introduction to explain that these hardware considerations are intended to ensure that the EFB hardware does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aeroplane. These considerations are not intended to show that the hardware is suitable for the intended function.</p>
response	<p>Not accepted. The implementing rules that state the objective are considered to be already sufficiently clear and therefore no additional introduction has been included in the resulting text.</p>
comment	<p>100 comment by: Transport Malta - Civil Aviation Directorate</p> <p>AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) for Type A and Type B EFB applications should be re-arranged in a way that truly reflects if a document is important for the safe conduct of flight. For example, Airplane flight Plan, is not a manual that should not be normally consulted by the crew because the FCOM is more readable. I think the criteria to be used is the interactivity of the application. For example, Notams are important for the safe conduct of flight but once they have been uploaded on the EFB, it is just a static PDF files which cannot be amended.</p>
response	<p>Not accepted. For each and every document, the classification depends on whether this information is required to be carried on board or not, and also on the safety relevance of the related information. The possible amendment of the information displayed is indeed one issue, but the loss of this information also has to be considered, hence the current classification of EFB applications.</p>
comment	<p>101 comment by: AIRBUS</p> <p>AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs) HARDWARE (a) General</p> <p>PROPOSED TEXT / COMMENT: Complete the statement “Portable EFBs not meeting the above characteristics should be stowed during critical phases of the flight.” by “Portable EFBs are considered secured when continuously handheld by the pilot during the limiting periods of time needed to complete safety tasks (e.g. Checklist or Procedure completion)”.</p> <p>RATIONALE / REASON / JUSTIFICATION: The objective of securing loose portable EFBs during critical phases of flight is met when the device is continuously handheld by the pilot. The sections of the critical phases of flight</p>

response	<p>during which a movable EFB could be handheld by the pilot without posing a risk to the safety of the flight should be properly defined.</p> <p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>102 comment by: AIRBUS</p> <p>AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs) HARDWARE (h) Viewable stowage PROPOSED TEXT / COMMENT: "The viewable stowage should not be positioned in such a way that it creates significant obstruction to the flight crew members' view or hinders physical access to aircraft controls and/or displays and/or aircraft safety equipment's , flight crew ingress or egress, or external vision." RATIONALE / REASON / JUSTIFICATION: Add a consideration for aircraft safety equipment (e.g. flight crew oxygen masks) that should not be hindered by the positioning of the viewable stowage.</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>103 comment by: AIRBUS</p> <p>AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION PROPOSED TEXT / COMMENT: "An EFB software application is a non-certified application installed on an EFB system that allows specific flight operational functions" RATIONALE / REASON / JUSTIFICATION: EFB functions supports flight operations or duties performed by the flight crew. EFB functions do not cover all operational functions (e.g. maintenance).</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>104 comment by: AIRBUS</p> <p>AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION (c) Determination of an application type: PROPOSED TEXT / COMMENT: "1) displaying information which may be tactically used by the flight crew members to check, control or deduce the aircraft position or trajectory, as a replacement for existing installed avionics, either to follow the intended navigation route or to avoid adverse weather, obstacles or in-flight traffic; 2) displaying information which may be directly used by the flight crew members to assess</p>

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 a failure;
3) ~~communications with~~ **Sending data to** air traffic services;

4) sending data to the ~~certified aircraft systems other than the certified EFB installed resources~~ **that have not been certified for this intended purpose.** **RATIONALE / REASON / JUSTIFICATION:**

In accordance with the ToR of the EUROCAE WG-106, this first step should unambiguously define the perimeter of EFB applications, without preventing future innovation in that domain. The text proposals aims toward this objective as follows:

1): The frontier between tactical use and strategic use / situational awareness may not be cut and dry. For instance, an AMMD application may provide taxi clearance information which may be used by the flight crew to follow the route to the gate or the runway threshold agreed with the ATS. Though, the taxi clearance and the ownship are not used for ground maneuvering in accordance with the concept of use of an AMMD EFB application. It is not clear whether a taxi clearance is tactical or strategic information. It is hereby proposed to only restrict EFB applications from replacing existing installed avionics applications providing tactical information to the crew (e.g. TCAS). Any “tactical” information provided by an EFB application must still have a failure consequence not greater than Minor. This Minor classification restriction is the actual limitation for the function that could be performed by an EFB application.

3): EFB applications may display information coming or validated from the ATS (e.g. a taxi clearance) provided that the failure consequence is not greater than Minor. The restriction for EFB application should be limited to data sent to the ATS as the risk assessment at ATS level is not assured.

4): In accordance with AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs), (d) EFB data connectivity, an EFB application may send data to any aircraft systems, and not only EFB installed resources, that have been certified for this intended purpose.

response

Partially accepted.

1) The proposed wording is not accepted as it would lead to the interpretation that any applications that do not replace installed avionics equipment are eligible as EFB applications.
3) The resulting text has been amended accordingly.
4) The resulting text has been amended accordingly.

comment

106

comment by: AIRBUS

AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION
(c) Determination of an application type:

PROPOSED TEXT / COMMENT:

“The severity of the failure conditions linked to displaying a function already existing in the certified type design, or already authorised through an ETSO, and used with same concept of operation, **should be considered in the assessment of the severity of the software application cannot be less than already assessed for this function;**”

RATIONALE / REASON / JUSTIFICATION:

As the discussions on the in-flight display of the own-ship position on EFB application show



	<p>or for the AMMD, the content of ETSO applicable to avionics functions could not fully be transposed to EFB applications. The content of ETSO should be considered and deviations should be justified.</p>
response	<p>Partially accepted.</p> <p>The text has been amended to clarify that consistency should be achieved for comparable intended functional and operational mitigations, which therefore does not exclude the future use of own-ship EFB applications in flight with proper operational mitigations.</p>
comment	<p>109 comment by: AIRBUS</p> <p>AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) TYPICAL TYPE B EFB APPLICATIONS</p> <p>PROPOSED TEXT / COMMENT: “(a) Document browsers displaying the manuals and additional information and forms, required to be carried by regulations and necessary for the safe operations of the aircraft, such as:”</p> <p>RATIONALE / REASON / JUSTIFICATION: The definitions of Type A and Type B document browser is very similar in the NPA. Type B document browser display information and data with a potential impact on the safety of the flight.</p>
response	<p>Accepted.</p> <p>The resulting text has been amended accordingly.</p>
comment	<p>112 comment by: AIRBUS</p> <p>AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) TYPICAL TYPE B EFB APPLICATIONS</p> <p>PROPOSED TEXT / COMMENT: "Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps; these applications may offer features such as panning, zooming, scrolling, and rotation, centring and page turning, <u>but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.</u>"</p> <p>EASA should reconsider the restriction to display aircraft/own-ship position in-flight based on the on-going policy change at the FAA and the justifications provided by the industry.</p>
response	<p>Accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>114 comment by: AIRBUS</p>

AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)
TYPICAL TYPE B EFB APPLICATIONS

PROPOSED TEXT / COMMENT:

"Airport moving map displays (AMMD) applications ~~that comply with the means set forth in Part SPA, in particular with ETSO-C165a.~~"

RATIONALE / REASON / JUSTIFICATION:

This AMC provides the list of Type B application commonly accepted by EASA without necessarily mentioning that Part SPA provide additional AMC/GM for some applications. The reference to Part SPA is only given for the AMMD. This reference to Part SPA may be removed for sake of consistency. A general explanation may be added at the beginning of this AMC to indicate that the listed Type B applications are commonly accepted provided that the AMC/GM provided in the Part SPA for those applications are followed.

Equally and as indicated in AMC6 SPA.EFB.100.(b).(3), ETSO-165A is one acceptable means for an AMMD but not the only one. Full compliance may not be possible when deviations are justified (e.g. no design assurance for EFB applications).

response

Accepted.
The resulting text has been amended accordingly.

comment

115

comment by: *Airbus Helicopters*

AMC1 CAT.GEN.MPA.141(b) page 23

Comment

The proposed AMC excludes as type A or B applications the applications:

"(1) displaying information which may be tactically used by the flight crew members to check, control or deduce the aircraft position or trajectory, either to follow the intended navigation route or to avoid adverse weather, obstacles or in-flight traffic;"

This should not prevent for some operations, such as Helicopter Emergency Medical Services, to use a Street-Map View for helicopter use to accomplish the mission.

Suggestion

We suggest adding Street Map View for helicopters in the list of Type B applications in AMC3 CAT.GEN.MPA.141(b) (see comment No. 125).

No change proposed in AMC1 CAT.GEN.MPA.141(b).

response

Not accepted.
It is not possible to list specific products developed by a particular company or developer. Only the different categories of EFB applications are addressed in this classification.

comment

116

comment by: *AIRBUS*

AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)
TYPICAL TYPE B EFB APPLICATIONS

PROPOSED TEXT / COMMENT:



“(f) Aircraft performance calculation applications that use algorithmic data or calculate using software algorithms to provide **aircraft performance data such as:**
 (1) take-off, en-route, approach and landing, missed approach, etc., performance calculations providing limiting masses, distances, times and/or speeds, **etc;**
 (2) power settings, including reduced take-off thrust settings, **etc..**”

RATIONALE / REASON / JUSTIFICATION:

Make the definition more generic to include other types of aircraft performance EFB application (e.g. High Speed Performance (HSP) application optimizing the vertical aircraft flight profile...)

response

Accepted.
 The resulting text has been amended accordingly.

comment

117

comment by: *Airbus Helicopters*

AMC1 CAT.GEN.MPA.141(b) page 23

Comment

The proposed AMC excludes as type A or B applications the applications “(2) *displaying information which may be directly used by the flight crew members to assess the real-time status of aircraft critical and essential systems, as a replacement for existing installed avionics, and/or to manage aircraft critical and essential systems following a failure;*”

This should not prevent embedding check-lists in EFB.

Suggestion

We suggest adding “check-lists” in the list of Type B applications in AMC3 CAT.GEN.MPA.141(b) (see comment No. 123).

No change proposed in AMC1 CAT.GEN.MPA.141(b).

response

Not accepted.

This specific sentence is not designed to prohibit electronic checklists (ECLs) in general, but only the ECLs using and displaying real-time status of the aircraft systems. Considering the very different types of ECLs, it was considered more appropriate not to list ECLs in the type B list and rather to have them assessed on a case-by-case basis using the process described in AMC1 CAT.GEN.MPA.141(b) to determine whether a specific ECL application is eligible to be an EFB application.

comment

120

comment by: *Airbus Helicopters*

AMC1 CAT.GEN.MPA.141(b), page 23

Comment

“(2) *classify the failure conditions according to the severity of their effects (using the AMC 25.1309 definitions).*”

Software applications with failure conditions classified more severe than minor are ineligible as EFB type A or B applications.”



AMC 25.1309 is likely to be unknown in the operational world. A definition of “minor failure condition” is proposed in GM1 CAT.GEN.MPA.141 and higher criticality levels are considered not eligible to the EFB word.

Moreover, the second sentence gives the impression that applications classified more than minor can be another type of EFB applications. Our understanding is that such applications are simply not eligible as EFB applications.

Suggestion

We suggest replacing the above sentences by:

“assess the safety effect of each failure condition and classify the application as follows:

1. *If no failure condition may have a safety effect, the application should be classified as type A,*
2. *If one or several minor failure conditions are assessed according to the definition given in GM1 CAT.GEN.MPA.141, the application should be classified as type B,*
3. *If more severe failure conditions are assessed, the application should not be eligible as an EFB application“*

response

Accepted.

The resulting text has been amended accordingly.

comment

122

comment by: Airbus Helicopters

AMC3 CAT.GEN.MPA.141(b) page 25

Comment

Appendix B of current AMC 20-25 considers as type B document browsers displaying a given list of documents and makes explicit that the display can be interactive or not and use a pre-composed format or not.

The concepts of ‘interactive application’ and ‘pre-composed format or not’ are no more explicit in the proposed text below:

“Document browsers displaying the manuals and additional information and forms, required to be carried by regulations, such as:“

Suggestion

We suggest amending the proposed text the following way:

“Document browsers displaying, whether in interactive form or not, whether based on pre-composed format or not, the manuals and additional information and forms required to be carried by regulations, such as:“

response

Not accepted.

This was indeed part of AMC 20-25, but it has not been transposed as it was not considered to be adequate, given the types of manuals and documents addressed in this bullet point.

comment

123

comment by: Airbus Helicopters

AMC3 CAT.GEN.MPA.141(b) page 25



	<p>Comment Item (a) provides a list of manuals and additional information and forms required by regulation which can be displayed by a type B EFB application. This list fails to explicitly include check-lists.</p> <p>Suggestion We suggest adding an explicit item “(8) check-lists.”</p>
response	<p>Not accepted. Considering the very different types of ECLs, it was considered more appropriate not to include ECLs in the type B list and rather to have them assessed on a case-by-case basis using the process described in AMC1 CAT.GEN.MPA.141(b) to determine whether a specific ECL application is eligible to be an EFB application. In particular, the ECLs using and displaying real-time status of aircraft systems are not considered to be eligible to be EFB applications.</p>
comment	<p>125 comment by: Airbus Helicopters</p> <p>AMC3 CAT.GEN.MPA.141(b) page 25</p> <p>Comment : The concept of moving map hosted on EFB is limited to AMMD, which is mainly an application used by aeroplanes.</p> <p>It should be extended to take into account helicopter operations, e.g. Helicopter Emergency Medical Services.</p> <p>Suggestion We suggest adding the following item as a type B application: <i>“Digital Moving Map applications that can support helicopter VFR operations in day or night condition (including for example Street Map View displaying aircraft position and electro-optical sensor footprint)”</i></p>
response	<p>Partially accepted. AMC3 CAT.GEN.MPA.141(b), published in NPA 2016-12, already mentioned that chart applications with an own-ship position are eligible as type B EFB applications when used in VFR by day. To fully reflect this, the AMC containing the list of eligible type B EFB applications has been amended accordingly.</p>
comment	<p>137 comment by: THALES AVIONICS</p> <p>AMC1 CAT.GEN.MPA.141(a)</p> <p>Commented text <i>If mounted or stowed, the portable EFB should be easily removable from its mounting device/viewable stowage device or attached to it, without the use of tools by the flight crew. The attachment or removal should not constitute a maintenance action.</i></p> <p>Proposed modification Add following sentence: <i>In case of use of locking devices to prevent portable EFB theft, it should be insured that it will be unlocked during flight.</i></p>

	<p>Justification consideration should be added for the recurrent topic of locking devices</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>138 comment by: THALES AVIONICS</p> <p>AMC1 CAT.GEN.MPA.141(b)</p> <p>Commented text <i>As a first step, it should be verified that the application does not belong to the following list of applications that are not eligible for classification as either type A or B: Applications:</i> (...) (4) <i>sending data to the certified aircraft systems other than the certified EFB installed resources.</i> (...)</p> <p>Proposed modification <i>As a first step, it should be verified that the application does not belong to the following list of applications that are not eligible for classification as either type A or B: Applications:</i> (...) (4) <i>sending data to aircraft systems not certified for such intended function as per AMC20-25 §5.1.5 EFB data connectivity</i> (...)</p> <p>Justification Consistency with AMC20-25 §5.1.5 EFB data connectivity</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>140 comment by: THALES AVIONICS</p> <p>AMC3 CAT.GEN.MPA.141(b)</p> <p>Commented text <i>A non-exhaustive list of possible type B EFB applications is provided below. It includes:</i> (...) (b) <i>Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps; these applications may offer features such as panning, zooming, scrolling, and rotation, centring and page turning, but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.</i> (...)</p> <p>Proposed modification It is suggested to develop a specific AMC dedicated to the use of aircraft/own-ship position in-flight on EFBs as proposed here below:</p> <p>AMCX SPA.EFBV.100(b)(2)</p>



Considerations for the use of in-flight aircraft/own-ship position

In order to improve situational awareness by helping pilots to use geo-referenced information provided by some EFB applications (e.g. in flight weather, en-route charts, ...), it may be useful to indicate current or foreseen aircraft position. This information shall never be used for navigation purpose and in all cases, certified primary means shall remain the unique source of information to navigate. In that conditions of use, the display of aircraft/own-ship position is allowed using following features :

- *Map/chart centering on aircraft position*
 - *Own-ship rough location display using adequate symbol like circle or equivalent*
- Dedicated operational procedures and flight crew training shall be defined to highlight the conditions of use of this indication.*

Consequently, it is suggested to remove the sentence "*, but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.*" in AMC3 CAT.GEN.MPA.141(b) and

Justification

This NPA does not support the use of own-ship position on portable EFB devices when in flight despite the need expressed by pilots for situational awareness purpose (e.g use with graphical weather mapping). Considering the added value for strategic decisions aid, some operators have been already approved by their national aviation authorities to display in flight own-ship position on portable EFB based on alternative means such as circles symbols.

response

Accepted.

Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

comment

155

comment by: ADAC Luftrettung GmbH

"AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs)

HARDWARE

Before using a portable EFB, the following considerations should be assessed by the operator:

(a) General

A portable EFB is a portable electronic device (PED) and may host type A and/or type B EFB software applications. In addition, it may host miscellaneous (non-EFB) software applications. Portable EFBs are controlled PEDs (C-PEDs)."

The underlined sentence should be amended as follows to explicitly include T-PEDs (transmitting PEDs):

"Portable EFB's are controlled PEDs (C-PEDs) or controlled T-PEDs (C-T-PEDs)."

response

Not accepted.

In the definition of a C-PED, it is already mentioned that a C-PED can be assigned to the



category of non-intentional transmitters or T-PEDs.

comment

157

comment by: *Virgin Atlantic*

Page 25 AMC3 CAT.GEN.MPA.141(b) Use of flight bags (EFBs)
TYPICAL TYPE B EFB APPLICATIONS

The proposed transposition of provisions on EFBs will adopt existing guidance for the use of own ship indication on en-route charts. Under the current guidance the use of own ship indication is not allowed unless used in specific cases like VFR flight.

Ref: AMC3 CAT.GEN.MPA.141(b) Use of flight bags (EFBs)

From the operational point of view, this functionality will greatly improve situational awareness and the usability of en-route charting applications. This function would be used only as a supplementary source of information.

Such change to the proposed ruling would also require a change to the classification of the failure conditions for the Electronic Map Systems provided in the ETSO-C165a section 3.2.1. The current standard classifies the incorrect depiction of aircraft own ship position as a Major failure condition which prevents the use of own ship position with EFB Type B applications.

response

Accepted.

Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

comment

160

comment by: *IATA*

AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION (c) (1)

Under SESAR, there were validations made on EFB (by Thales and Honeywell) to display SIGMET and time variable restricted airspace. Those will be useful tools, but this provision seems to preclude such things to be displayed.

response

Not accepted.

The new IFW provisions allow the use of weather information displays for strategic purposes.

comment

164

comment by: *FAA*

Section (B):

Regarding the last sentence, aircraft make and model are important, but since non-interference with communications and navigation systems are the focal point, "avionics suites" should be compared for EM interference.

response

Accepted.



Additional clarification has been introduced in the resulting text.

comment	165	comment by: FAA
	Section (a) General, Second paragraph:	
	How will this statement affect those manufacturers who utilize installed displays?	
response	Noted. This would not affect them unless the installed display became the sole means of viewing EFB information, in which case the classification as a portable EFB would not be accepted.	
comment	166	comment by: FAA
	First sentence:	
	If the crew plans on using the EFB for Electronic Checklist functions, does the above statement still apply?	
response	Noted. It is considered to be applicable in this case.	
comment	168	comment by: FAA
	Section (h), second paragraph:	
	Suggest changing the sentence regarding external vision to, "Viewable stowage must provide the pilots with a sufficiently extensive, clear, and undistorted view, to enable them to safely perform any maneuvers within the operating limitations of the airplane, including taxiing takeoff, approach, and landing."	
response	Accepted. The resulting text has been amended accordingly.	
comment	169	comment by: FAA
	Section (3):	
	"Crashworthiness" may elude the reader to Part 25 "emergency landing" requirements. In an effort to allow devices to be used with an equivalent level of safety as the provisions previous used, (e.g., bound paper books with a clip), recommend redacting this sentence.	
response	Accepted. The related sentence has been reworded in the resulting text to address the issue raised by the comment.	
comment	170	comment by: FAA
	Section (b) (1):	



	Recommend changing to "whose malfunction or misuse is considered to be limited to a minor failure condition".
response	Not accepted. The evaluation is expected to be the outcome of a formal assessment that prevents any kind of subjectivity.
comment	171 comment by: FAA Section (2) Note 1: Suggest a modification of this note if EASA is going to allow display of aircraft own-ship position while airborne.
response	Accepted. Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMC/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.
comment	187 comment by: Carl Norgren, Swiss Int Air Lines AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs) (h)(6) Please clarify the wording of this requirement. The requirements of this paragraph seem impossible to met. If the FCM cannot access the EFB controls, then the FCM cannot shut it down.
response	Not accepted. Adequate means include, for example, a remote power switch.
comment	188 comment by: Carl Norgren, Swiss Int Air Lines AMC1 CAT.GEN.MPA.141(b) Use of electronic fligth bags (EFBs) (b)(2) The following requirement should be deleted: '...which neither substitute nor duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules.' It could be interpreted to mean that the use or display of any aircraft data or the crosscheck of an aircraft function on the EFB is not permitted ('nor duplicated').
response	Not accepted. The intent is to ensure that no system that is required by a regulation is duplicated on an EFB. However, it should be noted that this does not prevent the display of avionics parameters.
comment	189 comment by: Carl Norgren, Swiss Int Air Lines AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) (b) add: '..., but without a display of aircraft/own-ship position (OSP), except in the specific case of day VFR operations only.' Lufthansa Group including SWISS rates the benefits of OSP on digital maps higher than the

	<p>accompanied risks.</p> <p>Until Nov 2016 Lufthansa Group has operated around 2.5 million flights with OSP on EFB charts, and there have been no negative reports about this feature.</p> <p>To the contrary the flight safety department has come to the conclusion that OSP could have avoided previous incidents where no OSP was available. Lufthansa and SWISS B77W OSP on EFB incorporates the following features:</p> <ol style="list-style-type: none"> 1. Position of certified aircraft system sources (FMS, GPS) for OSP on charts 2. OSP is only to be used for orientation on the map, symbol is a circle 3. crew procedure and training how to use OSP by FCM <p>Lufthansa Group including SWISS proposes that OSP is allowed on EFB, maybe under specific requirements yet to be defined.</p>
response	<p>Accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>199 comment by: <i>NetJets Europe</i></p> <p>Regarding: “The EMI demonstration should cover any cable connected to the EFB as well as non-certified power chargers.”</p> <p>According to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) Text with EEA relevance, “Equipment shall be so designed and manufactured, having regard to the state of the art, as to ensure that:</p> <p>(a) the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended;”</p> <p>It’s reasonable to test the EFB devices for EMI, but the EM generated by CE certified cables and chargers are negligible and regulated in the EU.</p> <p>We would suggest: “Any cable connected to the EFB as well as power chargers should be certified by the hardware manufacturer ”.</p>
response	<p>Not accepted.</p> <p>CE marking of cables and chargers does not provide sufficient assurance of the absence of front door interference with aeronautical products.</p>
comment	<p>200 comment by: <i>NetJets Europe</i></p> <p>AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION</p> <p>We support this.</p>

response	Noted. Thank you for your feedback.
comment	226 comment by: DGAC France GM1 CAT.GEN.MPA.141 Use of electronic flight bags (EFBs) DGAC France does consider that a clear reference to CS 25-1309 should be added.
response	Noted. Please note that GM1 CAT.GEN.MPA.141 already contained a clear reference to AMC 25.1309.
comment	227 comment by: DGAC France AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION <i>"An EFB software application is a non-certified application installed on an EFB system that allows specific operational functions."</i> Since an AMMD application would have to be ETSOed C165a (in other words "certified application") and could also be considered as an EFB type B application, this definition seems to be not fully consistent.
response	Not accepted. An ETSO is not considered to be an airworthiness certification. An installation approval is necessary in any case.
comment	228 comment by: DGAC France AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION Type B definition Making the link between the CAT.GEN.MPA.141, SPA.EFB.100 and the definition of type application, one could deduce that a type B application (and only a type B application) needs to be approved in accordance with SPA.EFB.100. Suggestion: depending on EASA intention, it should be simply and clearly written in the AMC that all type B applications have to be approved in accordance with SPA.EFB.100.
response	Accepted. The resulting text has been amended so that it clearly states that all type B EFB applications need to be approved for CAT operations. In addition, the suitability of the hardware is now clearly mentioned at the implementing rule level.
comment	235 comment by: Erik Ringnes

	<p>Comment: Type B apps page 25, b) The text “, but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.” does not allow using ownship location during cruise at high altitude.</p> <p>Justification and Proposed Text: <u>Displaying ownship position in a non-critical phase of flight such as cruise increases the usefulness of weather apps. The navigation use of ownship position is not expected to be an issue in service, especially in CAT operations. Proposed text is: “...centering and page turning. Display of aircraft/own-ship position is allowed in non-critical phase of flight such as cruise and in day VFR operations.”</u></p>
response	<p>Partially accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>238 comment by: Erik Ringnes</p> <p>Comment: AMC1 CAT.GEN.MPA.141(a) Most of the EFBs is used for display of electronic charts, approach plates and performance calculations and frequently used for flight path monitoring (constraints on SIDs/STARs, vertical profile of the APCH). The secured position/installation within the pilot’s extended field of view shall be required.</p> <p>Proposed Text: The EFB SHALL be installed in a secured position within the reach of the pilot and extended field of view.</p>
response	<p>Accepted. The text has been amended accordingly.</p>
comment	<p>240 comment by: Erik Ringnes</p> <p>Comment: AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) APPLICATION CLASSIFICATION - Some applications of class B are used for critical performance calculations. Any misuse, incorrect input/output or system failure may have significant impact on safety.</p> <p>Justification and Recommendation: Protection against incorrect inputs or automatic transfer of entry data should reduce a probability of incorrect output.</p>
response	<p>Not accepted.</p> <p>The HMI assessment process already includes software provisions that address incorrect inputs by the flight crew. In addition, the procedure related to performance calculations also includes provisions for independent calculations and for a gross error check by the flight crew.</p>
comment	<p>245 comment by: Erik Ringnes</p> <p>Comment: Regarding “‘malfunction or misuse’ means any failure, malfunction of the</p>

application, or design-related human errors that can be reasonably expected in service”

Justification and Proposed Text: “design-related human errors that can be reasonably expected in service” is subjective. Suggest removing misuse and limiting this to malfunctions that can be expected in service.

response Not accepted.
The misuse of an EFB application is considered to be one very important component of the assessment of the failure conditions of an EFB application.

comment 251 comment by: *Bell Helicopter*
Comment: All throughout the document several examples were given that meet the definition of minor failure conditions, the definition of “minor failure conditions” is very subjective.

response Not accepted.
The definition of a minor failure condition is the one used in AMC 25.1309, which is already widely used. Additional information can be found in this AMC, referred to in GM1 CAT.GEN.MPA.141, which contains the definitions.

comment 258 comment by: *Bell Helicopter*
Comment: Inconsistent use of the terminology "type A" and "type A EFB"

response Accepted.
The resulting text has been amended accordingly.

comment 265 comment by: *Deutsche Lufthansa Airline, Eike Bloemsma*
Specific Remarks:

AMC1.CAT.GEN.MPA.141(a)

(h) Viewable stowage (pg21)

(h)(6): What does this mean? If the pilot cannot access the EFB controls, how shall a shutdown be possible?

response Not accepted.
Adequate means include, for example, a remote power switch.

comment 266 comment by: *Deutsche Lufthansa Airline, Eike Bloemsma*
AMC3.CAT.GEN.MPA.141(b)

TYPICAL TPYE B APPLICATIONS (pg25)

(b):

(b)..., but without a display of aircraft/own-ship position, except in the specific case of day

VFR operations only.
Lufthansa Group including SWISS rates the benefits of OSP on digital maps higher than the accompanied risks.
Until Nov 2016 Lufthansa Group has operated ~2,5 Mio flights with OSP on EFB charts, and there are no negative reports about this feature. In contrary safety department has come to the conclusion that OSP could have avoided previous incidents where no OSP was available. LHP and SWISS B777 OSP on EFB incorporates these features:

- - Position of certified aircraft system sources (FMS, GPS) for OSP on charts.
- - OSP is only to be used for orientation on the map, symbol is a circle
- - crew procedure and training how to use OSP by crews

Lufthansa Group including SWISS proposes that OSP is allowed on EFB, maybe under the some to be defined requirements.

response

Accepted.
Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

3. Proposed amendments — 3.2. Draft Acceptable Means of Compliance and Guidance Material (Draft EASA Decision) — 3.2.2. Draft AMC and GM to Part-SPA

p. 26-56

comment

3

comment by: IZAIR

For Small Airlines who are outsourcing the Flight Operations Engineering (Performance Engineering) function to third parties could suffer to accomplish the written responsibilities of EFB Admin in this section. Because if there is no Performance Engineer within the company verifying and validating the airport data, airac infos, navigation data, mass&balance data, manufacturer publications about the aircraft, data scripts inside the NAVDATA codings etc.. Appointed inhouse EFB Admin would not be eligible, qualified as the EFB Supplier. Our suggestion would be a sentence could be included here to define the needs of small companies which is;

If the operator outsources Flight Operations Engineering (Performance Engineering) to a party which is also EFB System and Software Supplier, then EFB Administrator could be appointed from the personnel of the Supplier with a contract which defines the mutual responsibilities. However, in such case final responsibility relies with the operator.

response

Accepted.
Wording has been added to the resulting text to specify that the EFB administrator function can be contracted.

comment

11

comment by: Monarch Airlines

Monarch Airlines believes that internal GNSS receivers within COTS tablets acting as approved EFB devices should be acceptable receivers for receiving position data. The



response	<p>receiving antenna could then be placed within the Flight Crew compartment.</p> <p>Not accepted. Paragraph g) of this AMC already provides criteria for the use of COTS GNSS for AMMD applications.</p>
comment	<p>14 comment by: <i>KLM</i></p> <p>Sub (b)(1) of AMC1 SPA.EFB.100(b)(1) refers to the assessment of the worst-case scenario. As this is a predictive assessment, it should refer to the worst credible scenario.</p> <p>We suggest to replace 'worst-case' by 'worst credible'.</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>28 comment by: <i>The Boeing Company</i></p> <p>Page: 26 of 138 Paragraph: 3.2.2 Draft AMC and GM to Part-SPA AMC1 SPA.EFB.100(b)) Use of EFBs – operational approval SUITABILITY OF THE HARDWARE (a) Placement of the display</p> <p>THE PROPOSED TEXT STATES: “In addition, consideration should be given to the potential for confusion that could result from the presentation of relative directions when the EFB is positioned in an orientation inconsistent with that information. For example, it may be misleading if the aircraft heading indicator points to the top of the display and the display is not aligned with the aircraft longitudinal axis. This does not apply to charts that are presented in a static way (e.g. with no human-machine interface (HMI) mechanisation such as automatic repositioning), and that can be considered as similar to paper charts.”</p> <p>WE SUGGEST REMOVING THIS SECTION: Delete this paragraph</p> <p>JUSTIFICATION: The described situation is – if at all – a human factors consideration and is not related to hardware suitability. Additionally, this type of confusion has not been reported or mentioned in any feedback from operators.</p>
response	<p>Accepted. The paragraph has been deleted in the resulting text.</p>
comment	<p>29 comment by: <i>The Boeing Company</i></p> <p>Page: 28 of 138 Paragraph: AMC1 SPA.EFB.100(b)) Use of EFBs – operational approval SUITABILITY OF THE HARDWARE</p>

(d) Environmental testing

The proposed text states:
 “Testing done on a specific EFB model configuration may be applied to other aircraft installations and these generic environmental tests may not need to be duplicated. The operator should collect and retain:
 (1) evidence...
 (2) suitable...”
 Testing for rapid depressurisation does not need to be repeated when the EFB model identification and the battery type do not change.”

REQUESTED CHANGE:
 Add a note for clarification:
 “Note: Model identification means e.g. “iPad Air 2” or “Surface Pro 4”. Battery type means the typical battery specification that such a portable EFB model has been manufactured with. It is not intended to require the opening (destroying) of a mechanically, by the OEM locked device and research and separately test batteries from each potential battery manufacturer.”
 If this clarification is considered for SPA operations, the same provisions should also change in Parts NCC, SPO – COMPLEX AIRCRAFT

JUSTIFICATION:
 Based on feedback received from customers there is a need for further clarification. Customers have reported having been confronted with such requirements by their CAA, and requested to repeat environmental testing for every potential battery manufacturer.

response Accepted.
 The resulting text has been amended to address the issue raised by the comment.

comment 30 comment by: *The Boeing Company*
 Page: 31 of 138
 Paragraph: GM1 SPA.EFB.100 (b) Use of EFBs
 (f) Operational assessment

The proposed text states:
 “(1)...
 (2) Details of the human-machine interface assessment conducted for type A and type B software applications...”

REQUESTED CHANGE:
 “(2) Details of the human-machine interface assessment conducted for type A and type B software applications...”

JUSTIFICATION:
 According to GM3 CAT.GEN.MPA.141 (b) Use of EFBs (page 26 of 138), an HMI assessment is not required for type A EFB applications.

response Accepted.



The resulting text has been amended accordingly.

comment	<p>31</p> <p>Page: 32 of 138 Paragraph: GM1 SPA.EFB.100 (b) Use of EFBs (f) Operational assessment</p> <p>The proposed text states: “(13) A risk assessment summary for each application and the mitigation means put in place...”</p> <p>REQUESTED CHANGE: Delete this sentence</p> <p>JUSTIFICATION: Sub paragraph (1) – see page 31 of 138 – already requires ‘Details of the EFB risk assessment conducted’.</p>	comment by: <i>The Boeing Company</i>
response	<p>Accepted. The resulting text has been amended accordingly.</p>	

comment	<p>32</p> <p>Page: 32 of 138 Paragraph: GM1 SPA.EFB.100 (b) Use of EFBs (f) Operational assessment</p> <p>The proposed text states: “(15) Operator training; (16) EFB administrator qualification.”</p> <p>REQUESTED CHANGE: Delete these subject lines (or combine with subparagraphs 9 and 6 respectively)</p> <p>JUSTIFICATION: Appears to be redundant with: (9) Details of flight crew training (6) Details of EFB administration procedures</p>	comment by: <i>The Boeing Company</i>
response	<p>Accepted. The resulting text has been amended accordingly.</p>	

comment	<p>33</p> <p>Page: 51 of 138 Paragraph: AMC6 SPA.EFB.100(b)(3) Use of EFBs – operational approval (g) Use of COTS GNSS receivers</p>	comment by: <i>The Boeing Company</i>
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The proposed text states:

(1) The AMMD application should, in addition to position velocity time (PVT) data, receive a sufficient number of parameters related to the fix quality and integrity (e.g. EPU, HIL, integrity flags, number of space vehicles (SV) in view and tracked, etc.). The data provided to the AMMD application should be based exclusively on GPS or satellite-based augmentation system (SBAS) augmented GPS.

REQUESTED CHANGE:

Delete this sentence.

JUSTIFICATION:

Unnecessary limitation.

- 1) Limitation to GPS only (excluding GLONASS, Galileo, others);
- 2) Dedicated COTS GNSS receivers (e.g. such as Bad Elf) receive and provide GNSS signals only;
- 3) Location services that are built in a mobile device often use all kinds of location services; sometimes including cellular and WiFi sensors. Enabling other than GNSS based location services in conjunction with GNSS based location services may significantly increase initial signal acquisition time and increase position accuracy in general.

A potentially inaccurate position display resulting from e.g. inclusion of other than GNSS based location services will easily be detected through paragraph (a) of this chapter (AMMD not primary; outside view remains the operating procedure). Furthermore, the practical evaluation of the use of COTS GNSS receivers (paragraph (3) of this chapter) should reveal noncompliant or unacceptable installations and own-ship position inaccuracies.

response

Not accepted.

Location services other than GNSS and constellations other than GPS are not yet used in aviation applications due to uncertainty regarding their performance and integrity.

comment

34

comment by: *The Boeing Company*

Page: 51 of 138

Paragraph: AMC6 SPA.EFB.100(b)(3) Use of EFBs – operational approval

- (g) Use of COTS GNSS receivers
- (3) Practical evaluation

The proposed text states:

“...The test installation should record the data provided by the COTS GNSS receiver to the AMMD application, as well as data from a suitable reference position source. The GNSS antenna of the reference receiver should be located outside of the flight crew compartment with the best possible view of the sky.”

REQUESTED CHANGE:

	<p>Delete this paragraph</p> <p>JUSTIFICATION: Impractical and burdensome requirement killing the business case without significant improvement of safety or confidence.</p> <p>Testing against a reference GPS antenna (e.g. the aircraft's GPS antenna) may not necessarily lead to a testing against the overall error budget, especially not as the acceptable position error by certified equipment might be up to 36m.</p> <p>The test reference should instead be against the observed position at the taxiway or Apron. Using a report form to be filled out manually should do.</p>
response	<p>Accepted. The practical evaluation process has been simplified by removing the need for a reference GPS receiver.</p>
comment	<p>35 comment by: <i>The Boeing Company</i></p> <p>Page: 51 of 138 Paragraph: AMC6 SPA.EFB.100(b)(3) Use of EFBs – operational approval (g) Use of COTS GNSS receivers (3) Practical evaluation</p> <p>The proposed text states: “The analysis should measure the recorded COTS GNSS availability, latency, and accuracy in comparison to the source. The analysis should be used to demonstrate that the AMMD requirements are satisfactorily complied with in terms of total system accuracy (taking into account database errors, latency effects, display errors, and uncompensated antenna offsets) within 50 metres (95 %).”</p> <p>REQUESTED CHANGE: Delete this paragraph</p> <p>JUSTIFICATION: Impractical and burdensome requirement killing the business case without significant improvement of safety or confidence.</p> <p>Testing against a reference GPS antenna (e.g. the aircraft's GPS antenna) may not necessarily lead to a testing against the overall error budget, especially not as the acceptable position error by certified equipment might be up to 36m.</p> <p>The test reference should instead be against the observed position at the taxiway or Apron. Using a report form to be filled out manually should do.</p>
response	<p>Accepted. The practical evaluation process has been simplified by removing the need for a reference GPS receiver.</p>
comment	<p>36 comment by: <i>The Boeing Company</i></p>

Page: 52 of 138

Paragraph: AMC8 SPA.EFB.100(b)(3) Use of EFBs – operational approval
IN-FLIGHT WEATHER APPLICATIONS

The proposed text states:

Entire chapter affected.

REQUESTED CHANGE:

Replace with most current draft of the in-flight weather applications considerations of ICAO Doc 10020, Manual of EFBs, 1st edition.

JUSTIFICATION:

A newer, agreed upon version is available. See attachment.

response

Partially accepted.

The latest version of ICAO Doc 10020 will be considered when publishing the final version of AMC8 SPA.EFB.100(b)(3). However, it should be noted that it should in any case be adapted to the EU regulatory framework and will therefore be subject to minor changes.

comment

42

comment by: *The Boeing Company*

Attachment to Comments from The Boeing Company regarding:

Page: 52 of 138

Paragraph: AMC8 SPA.EFB.100(b)(3) Use of EFBs – operational approval
IN-FLIGHT WEATHER APPLICATIONS

The proposed text states:

Entire chapter affected.

REQUESTED CHANGE:

Replace with most current draft of the in-flight weather applications considerations of ICAO Doc 10020, Manual of EFBs, 1st edition.

JUSTIFICATION:

A newer, agreed upon version is available. See below:

Original text as proposed in draft of the in-flight weather applications considerations of ICAO Doc 10020, Manual of EFBs, 1st edition:

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 ICAO Annex 3. It should contribute to increased situational awareness and should 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. WAFC (World Area Forecast) 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 e.g. as an overlay over

aeronautical charts, geographical maps, or, may be a stand-alone weather depiction (e.g., radar plots, satellite images, etc.).

Note: This EFB Manual will not supersede the regulatory material contained in Annex 3.

6.3. Meteorological Information considerations

6.3.1. Meteorological information can be forecasted and/or observed, and can be updated on

the ground and/or in flight. It should be based on data from certified meteorological service providers or other reliable sources evaluated by the operator.

6.3.2. The meteorological information provided to the flight crew should be as far as possible consistent with the one available to ground-based aviation meteorological information users (e.g., Airline Operations Center (AOC), Dispatcher, etc.), 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:

- Type of information contained in the meteorological information (i.e., observed or forecasted),
- Currency or age and validity time of the meteorological information,
- Information necessary for interpreting the meteorological information (e.g., legend),
- Positive and 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 overlaying 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 to e.g., 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, labeling 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 forecasted information.

6.5. Training and Procedures



6.5.1. The operator has to specify Standard Operating Procedures specifying the use of IFW information.

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

- Limitations of the IFW, in particular those presented in chapter 6.2.;
- The latency of observed weather information and the hazards associated with utilization of old information;
- IFW information beyond Annex 3 specification is supplementary to the required information;
- Use of the application;
- Different types of displayed information (i.e., forecasted or observed);
- Symbology (e.g., Symbols, Colors);
- Interpretation of meteorological information;
- Identifying failures (e.g., incomplete uplinks, datalink failures, missing info);
- Avoiding fixation; and
- Managing Workload.

6.6. Note

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, etc.) – enable new service implementation.

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

response Partially accepted.
The latest version of ICAO Doc 10020 will be considered when publishing the final version of AMC8 SPA.EFB.100(b)(3). However, it should be noted that it should in any case be adapted to the EU regulatory framework and will therefore be subject to minor changes.

comment **44** comment by: AESA

Regarding to AMC1 SPA.EFB.100 (b). Environmental testing (d) pag 27,
In accordance with CAT.OP.MPA.145, The operator shall establish for all routes segments to be flow minimum flight altitudes that provide the required terrain clearance, and subject to AMC1 CAT.OP.MPA.145 (a)(b)(3) the operator should also consider any foreseeable contingencies along the planned route.
Some studies have demonstrated that emergency descent in case of rapid depressurization, time of depressurization of a typical profile between FL 100 and FL 390 is more than 13 minutes.
What are the reasons that the EFB should be operative for at least 10 minutes after the start of the decompression? We think that this EFB operation time may adversely affect the crew workload and should be higher.

response Accepted.
The 10-minute criterion has been removed from the resulting text.

comment	45	comment by: AESA
	<p>Regarding to AMC1 SPA.EFB.100 (b). Power source (c) pag.26-27 We suggest that it should be considered any mitigation measures or recommendations for the safe transport of potentially hazardous lithium batteries.</p>	
response	<p>Not accepted. The issue of lithium battery transportation is not specific to EFBs and is already addressed in other EASA documents. The current standards mentioned in the proposed text are considered to be adequate.</p>	
comment	46	comment by: AESA
	<p>Regarding to AMC5 SPA.EFB.100 (b) (3). Testing (b) pag 47 How the competent authority knows that the accuracy testing covered a sufficient number of testing points? What are the criteria to ensure that it has been done correctly?</p>	
response	<p>Noted. The difficulty is understood; however, it is not possible to give criteria that would satisfactorily apply in all cases. The involvement of a performance expert in the evaluation is recommended.</p>	
comment	47	comment by: AESA
	<p>According to AMC6 SPA.EFB.100 (b) (3) Use of COTS GNSS receivers (g) pag 50, Practical evaluation (3) pag 51 “The analysis should be used to demonstrate that the AMMD requirements are satisfactorily complied with in terms of total system accuracy within 50 metres (95 %).” We think that the analysis to measure the recorded COTS GNSS availability, latency and accuracy within 50 meters are considered many meters at airport and should be lower.</p>	
response	<p>Not accepted. 50 m is the value that was determined to be an acceptable compromise with respect to the intended function of an AMMD. Lower values will not be achievable with a standard GPS and AMDBs.</p>	
comment	48	comment by: AESA
	<p>According to AMC6 SPA.EFB.100 (b) (3) Data provided by the AMMD software application developer (c)pg 49 How should the operator ensure that the AMMD software application developer provides the appropriate data? Is there any provider similar to navigation data provider with LOA Type I and LOA Type II?</p>	
response	<p>Not accepted. AMC6 SPA.EFB.100(b)(3) already provides criteria for the data to be provided by the AMMD software application developer.</p>	
comment	49	comment by: Kevin Hogan
	<p>NOTAMs, inconsistent capitalization of the 's' at the end.</p>	

response	Accepted. The resulting text has been amended accordingly.
comment	52 comment by: <i>Kevin Hogan</i> Mentioning lithium as the type of battery might become a trap. The next generation will probably be lithium sulphur or calcium ion. See: http://business.financialpost.com/midas-letter/next-generation-battery-technology-goodbye-lithium
response	Noted. Considering the current safety issues regarding lithium batteries, it is considered important to specifically address this type of batteries. This will be revised if it becomes necessary.
comment	53 comment by: <i>Kevin Hogan</i> Measurement (e.g. kg or lbs) should probably have both as singular or both as plural (pages 47, 68, and 88).
response	Accepted. The resulting text has been amended accordingly.
comment	70 comment by: <i>CAA-NL</i> AMC3 SPA.EFB.100(b) (b) If the operator wishes to start usage of the EFB without paper backup AMC3 SPA.EFB.100(b) (b) calls for an observation by the competent authority to be part of the operational evaluation test of the operator. Why is an authority activity made a part of the operator evaluation? If this should be a prerequisite before the approval of the EFB system it should be in Part ARO with a reference in part SPA. This issue was discussed during the EASA EFB authority meeting. The text has been transposed from AMC 20-25 and was not before reviewed in this respect.
response	Accepted. The resulting text has been amended accordingly and a similar provision has been introduced in an AMC to Annex II (Part-ARO).
comment	71 comment by: <i>CAA-NL</i> AMC1 SPA.EFB.100(b)(1) (b)(1); AMC1 SPA.EFB.100(b)(1) (b)(1); It is suggested to rephrase “worst-case scenario” as “worst credible scenario” since it concerns a predictive risk assessment.
response	Accepted. The resulting text has been amended accordingly.
comment	72 comment by: <i>CAA-NL</i> AMC5 SPA.EFB.100(b)(3).

response	<p>AMC5 SPA.EFB.100(b)(3). It is suggested to clarify the relation of this AMC to CAT.POL.MAB.105(e) and the accompanying GM2 by including a reference to part SPA in GM2 CAT.POL.MAB.105(e).</p> <p>Partially accepted. Paragraph e) of point CAT.POL.MAB.105 has been deleted from the resulting text, as the approval of the use of an on-board mass and balance system will be covered by the approval to use a mass and balance EFB application (type B).</p>
comment	<p>82 comment by: <i>Widerøe AS, Norway</i></p> <p>AMC1 SPA.EFB.100(b) "All controls should be labelled for their intended use": Portable devices are usually normal consumer devices such as iPads, tablets etc. These are normally not labelled as such, i.e the home button on an ipad is not labelled, nor is the on/off button. Labelling these would therefore mean the operators labelling them, with the need for replacing labels that fall off etc. This will create unnecessary administration for devices that are commonly in use. Training should be adequate to ensure that users know the buttons' function(s).</p>
response	<p>Accepted. The resulting text has been amended to specify that when no confusion is possible, labelling is not necessary.</p>
comment	<p>84 comment by: <i>Widerøe AS, Norway</i></p> <p>AMC5 SPA.EFB.100(b)(3) Performance and M&B calculations: The requirement for individual computations and comparing of results is understandably necessary in the interest of safety on larger aeroplanes with potentially large speed and mass & balance differences. On smaller aircraft, the need for individual computations and comparing of results will likely make less sense to the pilots. There is a risk that this will lead to task optimizing and lack of procedural adherence. As a general principle, procedures and requirements should make sense and have a legitimate safety purpose if one is to expect procedural adherence from pilots. Thus, there should be a minimum MTOM, below which a gross error check should be adequate.</p>
response	<p>Not accepted. It is considered that the principle of individual computation has a safety relevance that is neither linked to the size of the aircraft, nor to the type of operations, as shown by the numerous incidents that have occurred.</p>
comment	<p>88 comment by: <i>UK CAA</i></p> <p>Page No: 41 of 138</p> <p>Paragraph No: AMC4 SPA.EFB.100(b)(3) Use of EFBs – operational approval FLIGHT CREW TRAINING, sub para (a)(3)</p> <p>Comment: Training should be included to indicate the limitations of own-ship position.</p> <p>Justification: To emphasise the primacy of avionics standard equipment information over that provided by the EFB.</p>

	<p>Proposed Text: Add additional text as follows:</p> <p>‘(3) limitations of the system, specifically the limitations of any own-ship position displayed by the EFB, and the primacy of information from installed avionics standard equipment’</p>
response	<p>Partially accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>89 comment by: UK CAA</p> <p>Page No: 48 of 138</p> <p>Paragraph No: AMC6 SPA.EFB.100(b)(3) Use of EFBs – operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION</p> <p>Comment: This section should be expanded to include requirements for own-ship position for all phases of flight and a full re-write is recommended.</p> <p>Justification: Essential if own-ship position is permitted in all phases of flight.</p>
response	<p>Accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>95 comment by: EUROCONTROL</p> <p>AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval - Page 48 AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION</p> <p>(b) Minimum requirements - Page 49</p> <p>The EUROCONTROL Agency believes that some clarification is required on both the meaning of ‘minimum requirements’ and the listing of specific versions of EUROCAE/RTCA specifications. For this specific instance, newer versions of the specification exist (ED-99D/DO-272D). Couldn't these be used since the older versions have been specified as the versions where adherence to them is the minimum that should be ensured?</p>
response	<p>Partially accepted.</p> <p>Provisions for later revisions of the standards listed have been introduced into the resulting text. The other parts of the text are deemed to already be clear enough and have not been</p>

amended.

comment	107	comment by: <i>Transport Malta - Civil Aviation Directorate</i>
	<p>AMC3 SPA.EFB.100(b) The operational evaluation test.</p> <p>This should be reduced to three months. There is no evidence that longer evaluation would be benefit safety especially to scheduled airlines that are using the EFB on a daily basis. However, it would be preferable that a simulator inspection at the first available OPC and after the crew EFB training and a flight inspection at the end of the evaluation phase are more indicative on the correct use of the EFB.</p>	
response	<p>Partially accepted. The principle of a reduction in the duration of the operational evaluation test is agreed and was already included in this AMC. Additional criteria have been included to further highlight this possibility.</p>	
comment	118	comment by: <i>AIRBUS</i>
	<p>AMC1 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval SUITABILITY OF THE HARDWARE</p> <p>PROPOSED TEXT / COMMENT: it is recommended to add an introduction to explain that these hardware considerations are intended to ensure that the EFB hardware is suitable for the intended function. These considerations complete the other hardware consideration intended to show that the EFB hardware does not adversely affect the performance of the aircraft systems or equipment, or the ability to operate the aeroplane.</p>	
response	<p>Not accepted. It is considered that the current text of the implementing rules is already clear with regard to the intent of each hardware requirement.</p>	
comment	119	comment by: <i>Transport Malta - Civil Aviation Directorate</i>
	<p>AMC8 SPA.EFB.100(b)(3) IN-FLIGHT WEATHER APPLICATIONS If this feature is not real time then the weather radar should be the primary means to monitor the weather especially during critical phases of the flight.</p>	
response	<p>Noted. It is indeed already stated in AMC8 SPA.EFB.100(b)(3) that current information from aircraft primary systems should always prevail over IFW information.</p>	
comment	121	comment by: <i>AIRBUS</i>
	<p>AMC3 SPA.EFB.100(b) Use of electronic flight bags (EFBs) OPERATIONAL EVALUATION TESTS</p>	

response	<p>PROPOSED TEXT / COMMENT: It is not clear whether this AMC is only applicable to the initial evaluation of an EFB application or whether it applies also to “significant changes” made by the operator to its EFB system.</p> <p>Accepted. The resulting text has been amended and clarified as proposed in your comment.</p>
comment	<p>124 comment by: AIRBUS</p> <p>AMC3 SPA.EFB.100(b) Use of electronic flight bags (EFBs) OPERATIONAL EVALUATION TESTS</p> <p>PROPOSED TEXT / COMMENT: “(6) for type B EFB applications replacing required paper documentation without initial retention of a paper backup: (i) a simulator line-oriented flight training (LOFT) session programme, and (ii) proposed flights for the competent authority observation flights.”</p> <p>RATIONALE / REASON / JUSTIFICATION: To be consistent with §(b) of this AMC.</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>126 comment by: AIRBUS</p> <p>AMC4 SPA.EFB.100(b) Use of electronic flight bags (EFBs) EFB APPLICATION WITH ETSO AUTHORISATION</p> <p>PROPOSED TEXT / COMMENT: Airbus appreciates the introduction of this AMC in the NPA. Though questions remain on how an ETSOA by EASA will fit with the new considerations of Part SPA, this provision gives clear perspective on the future involvement of EASA, at the request of the EFB application developers, in EFB operational aspects.</p>
response	<p>Noted. Thank you for your feedback.</p>
comment	<p>127 comment by: AIRBUS</p> <p>AMC5 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval PERFORMANCE AND MASS AND BALANCE APPLICATIONS</p> <p>PROPOSED TEXT / COMMENT: “(d) Training The training should emphasize the importance of executing all take-off and landing performance calculations or mass and balance in accordance with the SOPs to assure fully independent calculations.”</p> <p>RATIONALE / REASON / JUSTIFICATION:</p>

response	<p>Independent calculations apply also to mass and balance</p> <p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>128 comment by: AIRBUS</p> <p>AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION</p> <p>PROPOSED TEXT / COMMENT: Make the paragraph “(g) Use of COTS GNSS receivers.” applicable to other EFB applications (e.g. charting, In-Flight weather) than only the AMMD if the final regulation specifies the conditions for a in-flight display of the aircraft own-ship.</p>
response	<p>Partially accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>141 comment by: THALES AVIONICS</p> <p>AMC4 SPA.EFB.100(b)</p> <p>Commented text <i>Title: EFB application with ETSO autorisation</i> <i>EFB software applications may be approved by the Agency e.g. by means of an ETSO Authorisation. Such EFB applications are considered compliant with the requirements of SPA.EFB.100(b) that are covered in the approval scope, provided the EFB software is installed and used in conformity with its installation and operational instructions and limitations</i></p> <p>Proposed modification <i>Title: EFB application with Agency approval</i> <i>EFB software applications may be approved by the Agency through an ETSO Authorisation or alternative means. Such EFB applications are considered compliant with the requirements of SPA.EFB.100(b) that are covered in the approval scope, provided the EFB software is installed and used in conformity with its installation and operational instructions and limitations</i></p> <p>Justification THALES supports the introduction of Agency approval for EFB applications. Nevertheless the ETSO mean is questionable regarding the applicability of Part 21 subpart O requirements, alternative means should be explored. EASA and FAA approaches in that domain must be harmonized, an agency approval for an EFB application must be recognized by FAA and vice versa.</p>
response	<p>Not accepted.</p> <p>At this stage, the only process envisaged is the ETSO process, as it is the only possible means within the remit of EASA.</p>

comment	<p>142</p> <p style="text-align: right;">comment by: THALES AVIONICS</p> <p>AMC3 SPA.EFB.100(b)(3) (f) Security</p> <p>Proposed modification It is proposed to add the following sentence: <i>The operator should define the processes and procedures to maintain security level of the EFB system all along the lifetime of the EFB operational use.</i></p> <p>Justification To take into account threats evolution all over the time.</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>

comment	<p>143</p> <p style="text-align: right;">comment by: THALES AVIONICS</p> <p>AMC6 SPA.EFB.100(b)(3) (b) Minimum requirements</p> <p>Commented text <i>(...) in combination with a EUROCAE ED-99C/RTCA DO-272C medium-accuracy-compliant database is considered one acceptable means</i></p> <p>Proposed modification <i>(...) in combination with a EUROCAE ED-99/RTCA DO-272 (or later revision) medium-accuracy-compliant database is considered one acceptable means</i></p> <p>Justification A medium accuracy compliant database from previous of further versions of these documents should also be acceptable</p>
response	<p>Accepted. The text has been amended accordingly.</p>

comment	<p>144</p> <p style="text-align: right;">comment by: THALES AVIONICS</p> <p>AMC6 SPA.EFB.100(b)(3) (e) Operating concept</p> <p>Commented text <i>(...)This application is limited to ground operations only.'</i></p> <p>Proposed modification Sentence to be removed</p> <p>Justification The application can be used in flight for taxi-in briefing for example</p>
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response Accepted.
The text has been amended accordingly.

comment 145 comment by: THALES AVIONICS

AMC6 SPA.EFB.100(b)(3)
(g) Use of COTS GNSS receivers
(1) Characterisation of the receiver

Commented text
(...) should be based exclusively on GPS or satellite-based augmentation system (SBAS) augmented GPS.

Proposed modification
Sentence to be removed

Justification
Too much restrictive since it does not allow for new constellations such as Galileo

response Not accepted.
Location services other than GPS are not yet used in aviation applications due to uncertainty regarding their performance and integrity.

comment 146 comment by: THALES AVIONICS

AMC6 SPA.EFB.100(b)(3)
(g) Use of COTS GNSS receivers
(2) Installation aspects

Commented text
COTS GNSS receiver are PEDs (...)

Proposed modification
COTS GNSS receiver are C-PEDs (...)

Justification
As a portable EFB, a portable GNSS COTS receiver is a controlled PED

response Accepted.
The text has been amended accordingly.

comment 147 comment by: THALES AVIONICS

AMC6 SPA.EFB.100(b)(3)
(g) Use of COTS GNSS receivers
(3) Practical evaluation

Commented text
(...)
The test installation should record the data provided by the COTS GNSS receiver to the AMMD



*application, as well as data from a suitable reference position source.
(...)*

Proposed modification

*(...)
The test installation should record the data provided by the COTS GNSS receiver to the AMMD application in order to check with a suitable reference and to correlate with any flight crew observations relative to the own-ship position.
(...)*

Justification

Installation recording must be compared with a valid reference (either an accurate position recording from any reliable source/sensor either a reliable airport map) to track at least the installation position lateral offsets, knowing that noticeable longitudinal offsets would be noted as part of the test observations

response Partially accepted.
The practical evaluation process has been simplified by removing the need for a reference GPS receiver. The current text already mentions that unusual events observed by the flight crew should be noted.

comment 148 comment by: THALES AVIONICS

AMC6 SPA.EFB.100(b)(3)
(g) Use of COTS GNSS receivers
(3) Practical evaluation

Commented text

*(...)
The GNSS antenna of the reference receiver should be located outside of the flight crew compartment with the best possible view of the sky
(...)*

Proposed modification
Sentence to me removed

Justification

Even outside of the compartment a reference GNSS antenna may be subject to signal perturbations (such as multi-path) and thus can pollute data exploitation.

response Accepted.
The practical evaluation process has been simplified by removing the need for a reference GPS receiver.

comment 149 comment by: THALES AVIONICS

AMC6 SPA.EFB.100(b)(3)
(g) Use of COTS GNSS receivers
(3) Practical evaluation

Commented text



	<p>(...) <i>During the tests, any unusual events, such as observing the own-ship in a location on the map that is notably offset compared to the real world, the own-ship changing to non-directional when the aircraft is moving, and times when the own-ship disappears from the map display, should be noted</i> (...)</p> <p>Proposed modification (...) <i>During the tests, any unusual events, such as observing the own-ship in a location on the map that is notably offset compared to the real world, the own-ship changing to non-directional when the aircraft is moving, and times when the own-ship disappears from the map display, should be noted. For the test, the pilot should be instructed to diligently taxi on centerline.</i> (...)</p> <p>Justification Key point for recording exploitation that is precised in the corresponding FAA job aid</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>150 comment by: THALES AVIONICS</p> <p>AMC6 SPA.EFB.100(b)(3) (g) Use of COTS GNSS receivers (3) Practical evaluation</p> <p>Commented text (...) <i>The analysis should also include a comparison of the typical degradation due to locating the antenna inside the flight crew compartment in terms of masking (e.g. comparing the number of tracked space vehicles (SV)).</i> (...)</p> <p>Proposed modification <i>Sentence to me removed</i></p> <p>Justification Useless in this guidance material. If an operator consider the availability adequate and if the accuracy requirement is satisfied then this analysis does not add any additional value but would simply induce useless additional activity</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>151 comment by: THALES AVIONICS</p> <p>AMC8 SPA.EFB.100(b)(3) (a) General</p> <p>Commented text</p>

	<p>(...) It is designed to increase situational awareness and to support the flight crew when making strategic decisions (...)</p> <p>Proposed modification Terms "<i>Strategic decision</i>" and "<i>tactical decision</i>" should be defined</p> <p>Justification Clarification</p>
response	<p>Accepted. Definitions of the two terms have been introduced into the new GM to CAT.GEN.MPA.141.</p>
comment	<p>152 comment by: THALES AVIONICS</p> <p>AMC8 SPA.EFB.100(b)(3) (a) General</p> <p>Commented text (...) but should not be the only source of information required to be on board for dispatch. (...)</p> <p>Proposed modification Sentence to remove</p> <p>Justification Too restrictive recommendation (sole source forbidden), the AMC should be more oriented on the dispatch objectives that should consider not only software but also hardware. For instance, in case of electronic flight folder, on-board required meteorological information may be provided by a separate EFF application but running on the same EFB platform than IFW application...Furthermore the dispatch objective is already addressed by AMC1 CAT.GEN.MPA.180 "The documents, manuals and information may be available in a form other than on printed paper. Accessibility, usability and reliability should be assured."</p>
response	<p>Partially accepted. The resulting text has been aligned with the latest amendment of ICAO Doc 10020, in which this section was amended.</p>
comment	<p>153 comment by: THALES AVIONICS</p> <p>AMC8 SPA.EFB.100(b)(3) (a) General</p> <p>Commented text (...) Any current information from the meteorological documentation required to be carried on board or from aircraft primary systems should always prevail in case there is a difference from the IFW application information. (...)</p>

	<p>Proposed modification (...) Any up to date information from the meteorological documentation required to be carried on board or from aircraft primary systems should always prevail in case there is a difference from the IFW application information. (...) Justification Clarification</p>
response	<p>Not accepted. It is the responsibility of the operator to ensure that it has provided to the flight crew the valid weather information required to be on-board, issued in accordance with Part-MET. Information from an IFW application should always be considered secondary.</p>
comment	<p>154 comment by: THALES AVIONICS</p> <p>AMC8 SPA.EFB.100(b)(3) (a) General</p> <p>Commented text (...) from certified meteorological service providers or other reliable sources. (...) Proposed modification Guidance and criteria to assess reliability of other not certified sources should be defined Justification In order to harmonize practices in all member states</p>
response	<p>Accepted. Specific GM has been introduced in the draft resulting AMCs/GM to provide some related criteria.</p>
comment	<p>156 comment by: ADAC Luftrettung GmbH</p> <p>"(h) Responsiveness of application The system should provide feedback to the user when a user input is accepted. If the system is busy with internal tasks that preclude the immediate processing of a user input (e.g. performing calculations, self-tests, or refreshing data), the 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 first sentence is misleading. In absence of an error message it should be safe to assume that the input has been accepted. The sentence should be amended to read as follows: „The system should provide feedback to the user when a user input is not accepted“</p>
response	<p>Accepted. The text has been amended to clarify that feedback should be provided as soon as the user makes an input, independently of whether the input is accepted or not.</p>

comment	163 AMC3 SPA.EFB.100(b) Use of electronic flight bags (EFBs) OPERATIONAL EVALUATION TESTS (a) Three lists all restarting the count from (1)	comment by: IATA
response	Not accepted. The 3 lists are not consecutive and they therefore all restart at 1.	
comment	167 GM1 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval FINAL OPERATIONAL REPORT (c) Two lists with numbering restarting from (1)	comment by: IATA
response	Not accepted. The two lists are based on two different conditions which are exclusive, and therefore they both restart at 1.	
comment	172 GM2 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval EVALUATION BY THE AGENCY Useful provision. In this respect, in which case the Agency will perform an EFB application evaluation and how that will be available to operators?	comment by: IATA
response	Noted. In any case, such evaluation is currently performed and will continue to be performed at the request of an operator or a software developer. It should also be noted that since it is a service provided by EASA to an applicant, it is the applicant who determines whether the outcome of the evaluation should be made public or not.	
comment	173 AMC3 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval PROCEDURES(c) Wording may suggest that there are phases of flight when EFB may not be used, but if for example EFB is used to display charts then it should be available and used at all times.	comment by: IATA
response	Partially accepted. The sentence has been amended to clarify the related intent of the text.	
comment	174 AMC4 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval FLIGHT CREW TRAINING(b)(4)(ii)	comment by: IATA

	<p>Wording could be misleading and mistaken with the requirements of point (iii). The concept is to have the EFB use assessed during a skill or proficiency check only when the EFB is an integral part of the aircraft type rating. Suggested option of wording: “where the privilege of the type rating on the particular aircraft is dependent on the use of the EFB, proficiency in the use of the EFB should be assessed ...”</p>
response	<p>Not accepted.</p> <p>The current wording is designed to address the case where the use of an EFB application is part of the operator’s procedures. However, in such a situation, the EFB will not in all cases be part of the aircraft type rating (e.g. use of an EFB performance application, use of electronics charts, etc.) and therefore the proposed wording can’t be used.</p>
comment	<p>175 comment by: IATA</p> <p>AMC5 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval PERFORMANCE AND MASS AND BALANCE APPLICATIONS</p> <p>General comment: the level of details of this AMC is extremely fine, there is nothing performance based.</p>
response	<p>Noted.</p> <p>The content of this AMC has been directly transposed from AMC 20-25, as no need for a review had been identified.</p>
comment	<p>176 comment by: IATA</p> <p>AMC5 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval PERFORMANCE AND MASS AND BALANCE APPLICATIONS (c)(1) and (2)</p> <p>The requirement for calculations of take-off and landing performance or mass and balance done independently by each crew member is overly redundant. There is no such requirement for these calculations without the EFB and with the adoption of an advanced and reliable system the workload should be relieved and not amplified.</p>
response	<p>Not accepted.</p> <p>As stated in the explanatory note to NPA 2016-12, new risks, which were not applicable when using paper products, may be introduced with the use of EFB applications. Indeed, many incidents linked with the use of EFB performance applications have occurred recently, and the use of independent calculations has proved to be the best mitigation against errors due to using an EFB performance application.</p>
comment	<p>177 comment by: IATA</p> <p>AMC5 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval PERFORMANCE AND MASS AND BALANCE APPLICATIONS(e)</p> <p>A graph displaying the mass and its associated CG is not required for the automated paper mass and balance documentation. It should not be required from the EFB as well.</p>
response	<p>Not accepted.</p>

This provision has been transposed from the existing AMC 20-25 without any changes. Considering that no implementation issue has been reported, and also taking into account the safety benefits of having such a graph, this provision has been kept in the resulting text.

comment 178

comment by: IATA

AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION

Extremely detailed AMC, no performance based, anywhere.

The AMMD is not a potential hazard but in fact can prevent potential hazards when complexity of taxiways, poor markings, reduced visibility make taxiing a very risky procedure.

response Noted.

The content of this AMC mostly comes directly from AMC 20-25 without any modification, as no implementation issue was identified. The only changes are the ones related to the introduction of provisions for the use of COTS GNSS, which therefore provide flexibility.

comment 179

comment by: IATA

AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION(c)

“executable object code” refers to the executable file or the object code? Is the object code, the complied instructions but not linked in an executable file, needed?

This is emblematic of the detailed requirements.

response Accepted.

The related bullet point has been deleted from the resulting text.

comment 180

comment by: IATA

AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION(c)(1)

If the software is not provided in an acceptable transfer medium, how could it be used?

response Accepted.

The related bullet point has been deleted from the resulting text.

comment 181

comment by: IATA

AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION(e)

The AMC dictates the text to be included in the operator’s procedures.

Is performance based regulation being canceled from EASA policies?

response Accepted.

The resulting text has been amended to specify the objective to be achieved.



comment	182	comment by: IATA
	AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION(g)(1)	
	GBAS should also be allowed, and why not Galileo when it will be available?	
response	Not accepted. Location services other than GPS are not yet used in aviation applications due to uncertainty regarding their performance and integrity.	
comment	183	comment by: IATA
	AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION(g)(2)	
	A receiver receives, it does not transmit.	
response	Not accepted. The related sentence addresses the transmission of the position data from the COTS GNSS receiver to the EFB.	
comment	184	comment by: IATA
	AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION(g)(3)	
	Why the antenna should be located outside of the flight crew compartment? It should be allowed wherever it works.	
response	Not accepted. This provision is applicable to the reference GNSS used for the practical evaluation and not to the COTS GNSS supporting the AMMD application.	
comment	190	comment by: Carl Norgren, Swiss Int Air Lines
	AMC1 SPA.EFB.100(b)(1) (b)(3)(i)&(ii) What is a 'qualified/verified input data'? What are 'appropriate industry standards'? What is the aim of the requirements in these paragraphs? Also see: AMC1 NCC.GEN.131(b) AMC1 SPO.GEN.131(b)	
response	Partially accepted. The resulting text has been clarified accordingly.	
comment	191	comment by: Carl Norgren, Swiss Int Air Lines
	AMC1 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) - operational approval	

	<p>(c) The term 'partitioned' is too specific and outdated. It does not include other possible means of IT security measures such as 'iOS sandbox principle' or 'virtual machines'. Proposal:</p> <ol style="list-style-type: none"> 1. delete 'and partitioned' 2. replace with examples: '(e.g. separated partitions, virtual machines, sandbox etc.)'
response	<p>Not accepted. Partitioning is only required in the specific situation where the administration of the miscellaneous software applications is under the responsibility of the flight crew. In other cases, it has to be appropriately managed by the EFB administrator.</p>
comment	<p>192 comment by: <i>Carl Norgren, Swiss Int Air Lines</i></p> <p>AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) - operational approval (c) What is the aim of this requirement? Why is AMMD specifically addressed? Transfer medium could also be an online data transmission e.g. update over WiFi or download from an app store. Or the app or the entire service could be in a 'cloud'.</p>
response	<p>Accepted. The related bullet point has been deleted from the resulting text.</p>
comment	<p>194 comment by: <i>THALES AVIONICS</i></p> <p>AMC3 SPA.EFB.100(b)(3) (g) Electronic signatures</p> <p>Commented text <i>(...)Advanced electronic signatures, qualified certificates and secured signature-creation devices needed to create them are typically not required for EFB operations</i></p> <p>Proposed modification Terms "<i>advanced electronic signatures</i>" and "<i>qualified certificates</i>" should be detailed</p> <p>Justification These terms makes reference to specific technologies that should be explicitly named in order to clarify what is required or not.</p>
response	<p>Partially accepted. All these terms stem from Regulation (EU) No 910/2014*. The reference to this Regulation has been added to the resulting text for clarity.</p> <p>* Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (OJ L 257, 28.8.2014, p. 73) (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0910&rid=1)</p>
comment	<p>195 comment by: <i>THALES AVIONICS</i></p> <p>AMC8 SPA.EFB.100(b)(3)</p>

(b) Display**Commented text**

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.

Proposed modification

Display format is depending on the content of the weather information nevertheless colored graphical depiction is encouraged whenever practicable.

Justification

No specific criteria to assess appropriateness nevertheless human factor considerations and HMI assessment requirement from AMC1 SPA.EFB.100(b)(2) apply.

response

Accepted.
The resulting text has been amended accordingly.

comment

196

comment by: THALES AVIONICS

AMC8 SPA.EFB.100(b)(3)**(b) Display****Commented text**

The display of information should include:

- (1) information on the weather data (observed or forecasted);*
- (2) currency or age and validity time of the weather data;*
- (3) information necessary for interpreting the weather data (e.g. legend);*
- (4) positive and clear indication of any missing information or data to enable the flight crew to determine areas of uncertainty when making decisions to avoid hazardous weather; and*
- (5) an indication of the validity (functionality) of the data link, if meteorological information is uploaded via data link.*

Proposed modification

The IFW display should enable the flight crew to :

- (1) Distinguish if the weather data provided is type observed or forecasted;*
- (2) Identify currency or age and validity time of the weather data;*
- (3) Access the interpretation of the weather data (e.g. legend);*
- (4) Determine areas of uncertainty (i.e missing or incomplete weather information) when provided by the weather data source;*
- (5) Be aware of the datalink means status enabling necessary IFW data exchanges.*

Justification

Wording improved to highlight what the pilot needs.

Indication on missing or incomplete weather data can only be done if the information is given by the data provider

response

Accepted.
The resulting text has been amended accordingly.

comment

197

comment by: THALES AVIONICS



**AMC8 SPA.EFB.100(b)(3)
(b) Display**

Commented text

However, any reformatting of the meteorological information should preserve both the geo-location and intensity of the meteorological conditions regardless of projection, scaling, or any other types of processing.

Proposed modification

However, the displayed characteristics (geo-location and intensity) resulting from projection, scaling, or any other types of processing should not degrade pilot interpretation of the meteorological conditions

Justification

Whatever the treatments done on the weather data between the source and display on the EFB, the objective is to allow the pilot having a correct interpretation of the meteorological conditions

response Not accepted.
The preservation of the characteristics of the meteorological conditions is considered to be necessary to ensure a correct interpretation.

comment 201 comment by: NetJets Europe

AMC1 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval SUITABILITY OF THE HARDWARE	We agree with the proposed constraints
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response Noted.
Thank you for your feedback.

comment 202 comment by: NetJets Europe

AMC2 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval CHANGES	We agree with this.
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response Noted.
Thank you for your feedback.

comment 203 comment by: NetJets Europe

AMC1 SPA.EFB.100(b)(2) Use of electronic flight bags (EFBs) — operational approval HUMAN–MACHINE INTERFACE ASSESSMENT AND HUMAN FACTORS	We support this.
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CONSIDERATIONS

response Noted.
Thank you for your feedback.

comment 204 comment by: NetJets Europe

AMC8 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — operational approval IN-FLIGHT WEATHER APPLICATIONS	“It should be based on data from certified meteorological service providers or other reliable sources.”	We find this ambiguous. What is a reliable source for IFW?
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response Accepted.
Specific GM has been introduced in the draft resulting AMCs/GM to provide some related criteria.

comment 214 comment by: THALES AVIONICS

**AMC5 SPA.EFB.100(b)(3)
(a) General**

Commented text

The operator should establish procedures to define any new roles that the flight crew and dispatch office may have in creating, reviewing, and using performance calculations supported by EFB system.

Proposed modification

The operator should establish procedures to define any new roles that the flight crew and dispatch office may have in creating, reviewing, and using performance calculations supported by EFB system. These procedures should address the case where differences are noted by flight crew when comparing EFB and dispatch performance data (i.e by defining tolerance threshold ...)

Justification

Return of experience from airlines pilots: need of clear procedure for such situation.

response Partially accepted.
The need for the procedures to address the cases where discrepancies are identified by the flight crew has been added to the resulting text.

comment 230 comment by: Carl Norgren, Swiss Int Air Lines

AMC8 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) - operational approval

	<p>(a)..Any current information from the meteorological documentation required to be carried on board or from aircraft primary systems should always prevail in case there is a difference from the IFW application information. Comment: IFW will in nature always be different from the traditional / classical weather information. Change wording to improve clarity.</p>
response	<p>Accepted. The resulting text has been amended to address the issue raised.</p>
comment	<p>231 comment by: <i>Carl Norgren, Swiss Int Air Lines</i></p> <p>AMC8 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) - operational approval (a)..The displayed meteorological information may be forecasted and/or observed, and may be updated on the ground and/or in flight. It should be based on data from certified meteorological service providers or other reliable sources. Comment: The qualification of weather sources as reliable should be evaluated by the operator.</p>
response	<p>Accepted. Specific GM has been introduced in the draft resulting AMCs/GM to provide some related criteria for the evaluation to be performed by the operator.</p>
comment	<p>241 comment by: <i>Erik Ringnes</i></p> <p>Comment: AMC1 SPA.EFB.100(b)(1) Use of electronic flight bags (EFBs) — operational approval RISK ASSESSMENT: When used some applications could cause an application running in the background to crash.</p> <p>Recommendation: The analysis of possible consequences shall be performed to avoid the loss of important data.</p>
response	<p>Not accepted. By definition, the analysis of potential consequence is to be done by the operator as part of its EFB risk assessment.</p>
comment	<p>242 comment by: <i>Erik Ringnes</i></p> <p>Comment: There are different providers of charts, performance calculations software, meteorological information, etc. How is standardization achieved across such products?</p> <p>Recommendation: Standards for coding of specific inputs <u>shall be defined</u>.</p>
response	<p>Not accepted. It is not the purpose of this AMC to achieve standardisation across products with regard to software input coding.</p>
comment	<p>243 comment by: <i>Erik Ringnes</i></p> <p>Comment: "(c) If any applications use information that is specific to the aircraft type or tail number, how to ensure that the correct information is installed on each aircraft;"</p>

	<p>Recommendation: Particular tail number/MSN should be displayed at the start window. The user could be able to select the corresponding correct value if the current one is incorrect or missing.</p>
response	<p>Not accepted.</p> <p>Rather than being prescriptive, the proposed approach is to leave it open to operators to determine how to ensure that the correct information is available for each operated aircraft.</p>
comment	<p>244 comment by: Erik Ringnes</p> <p>Comment: " (2) a formal cross-check is made before data outputs are accepted for use; such cross-checks should utilise the independent calculations described above, together with the output of the same data from other sources on the aircraft;"</p> <p>Recommendation: Does it mean that the pilot should crosscheck the results with "paper" performance tables? Hopefully not!</p>
response	<p>Noted.</p> <p>The cross-check only addresses independent calculation by each flight crew member.</p>
comment	<p>246 comment by: Erik Ringnes</p> <p>Comment: Expectations for environmental testing should be more specific. Also, if EFB applications are limited to NSE or Minor, they should not be required to demonstrate in all foreseeable flight crew operating conditions. "Environmental testing, in particular testing for rapid depressurisation, should be performed when the EFB hosts applications that are required to be used during flight following a rapid depressurisation and/or when the EFB environmental operational range is potentially insufficient with respect to the foreseeable flight crew compartment operating conditions"</p> <p>Proposed Text: Suggest revising item (d) to: "Environmental testing for rapid depressurisation should be performed when the EFB hosts applications that are required to be used during flight following a rapid depressurization."</p>
response	<p>Not accepted.</p> <p>In any case, AMC1 SPA.EFB.100(b) is only applicable to EFBs hosting type B EFB applications.</p>
comment	<p>252 comment by: Bell Helicopter</p> <p>Comment: Inconsistent use of the terminology "type A" and "type A EFB"</p>
response	<p>Accepted.</p> <p>The resulting text has been amended accordingly.</p>
comment	<p>257 comment by: Bell Helicopter</p> <p>Comment: Inconsistent use of the terminology "type A" and "type A EFB"</p>
response	<p>Accepted.</p> <p>The resulting text has been amended accordingly.</p>

comment	<p>259</p> <p style="text-align: right;">comment by: <i>Erik Ringnes</i></p> <p>Comment: The focus of the in-service proving period seems to be on replacement of paper documents.</p> <p>Recommendation: Need to provide guidance for the proving period on other types of intended functions that go beyond replacing paper (eg weather apps, AMMD with ownship, etc) or whether it will be required for such applications.</p>
response	<p>Accepted.</p> <p>The resulting has been amended to clarify the applicability to cases where applications replace paper products and also to other cases.</p>
comment	<p>260</p> <p style="text-align: right;">comment by: <i>Erik Ringnes</i></p> <p>Comment: Page 35, Messages and use of colors. The text indicates that warning and caution level alerts can be provided on EFB apps.</p> <p>Recommendation: Additional guidance is needed here as warnings and cautions may not be permissible for Type B apps with a Minor classification.</p>
response	<p>Accepted.</p> <p>The sentence has been removed from the resulting text to avoid confusion as warning and caution level alerts were not indeed permissible for type B EFB applications.</p>
comment	<p>261</p> <p style="text-align: right;">comment by: <i>Erik Ringnes</i></p> <p>Comment: Page 35, Messages and use of colors. Not clear how EFB messages for a Type B app can be integrated with installed equipment alerts/messages or whether this is even practical.</p> <p>Recommendations: Provide practical guidance for alerts consistency in lieu of an “integrated solution” that is not very feasible for EFBs.</p>
response	<p>Accepted.</p> <p>The sentence has been removed from the resulting text to avoid confusion as warning and caution level alerts were not indeed permissible for type B EFB applications.</p>
comment	<p>267</p> <p style="text-align: right;">comment by: <i>Deutsche Lufthansa Airline, Eike Bloemsma</i></p> <p>AMC1.SPA.EFB.100 (b) (pg 32)</p> <p>AMC1.NCC.GEN.131 (b) (pg 61)</p> <p>AMC1.SPO.GEN.131 (b) (pg 80)</p> <p>(3) Upstream processes including [...]</p> <p>What is a “qualified/verified input data”, "appropriate industry standards"?</p> <p>What is the aim of this paragraph?</p>

response	Accepted. Examples have been introduced into the resulting text for clarity.
comment	268 comment by: <i>Deutsche Lufthansa Airline, Eike Bloemsma</i> AMC1.SPA.EFB.100 (b) (pg 37) (c): Term “partitioned” is too specific and outdated, it does not include other possible means of IT Security measurements like iOS sandbox principle or virtual machines. Proposal to: - DELETE “and partitioned” - CHANGE the (e.g. to “e.g. separated partitions, virtual machines, sandbox, etc)“
response	Not accepted. Partitioning is only required in the specific situation where the administration of the miscellaneous software applications is under the responsibility of the flight crew. In other cases, it has to be appropriately managed by the EFB administrator.
comment	269 comment by: <i>Deutsche Lufthansa Airline, Eike Bloemsma</i> AMC6.SPA.EFB.100(b) (pg 49) (c)(1): Why is this special to AMMD? Transfer medium could also be an online data-transmission e.g. update over wifi or download from an app-store. Or the app or the entire service could be in the cloud. What is the aim of this statement?
response	Accepted. The related bullet point has been removed from the resulting text.
comment	270 comment by: <i>Deutsche Lufthansa Airline, Eike Bloemsma</i> AMC8.SPA.EFB.100(b) (pg 52) ...prevail if there is a difference from IFW... IFW will in nature always be different from the classic wx information. The qualification of weather sources as reliable should be evaluated by the operator. (end of document)
response	Accepted. The resulting text has been amended accordingly and new GM has been introduced to provide some criteria for the evaluation of the reliability of the weather data source.

comment	<p>37</p> <p>comment by: <i>The Boeing Company</i></p> <p>Page: 57 of 138 Paragraph: AMC1 NCC.GEN.131(a) Use of EFBs HARDWARE</p> <p>The proposed text states:</p> <p>The following provisions should be considered in addition to the hardware provisions of AMC1 CAT.GEN.MPA.141(a):</p> <p>REQUESTED</p> <p>CHANGE:</p> <p>“The following provisions should be considered in addition to the hardware provisions of AMC1 CAT.GEN.MPA.141(a):”</p> <p>JUSTIFICATION:</p> <p>The proposed text for Hardware requirements for NCC operations does not list ‘additional’ requirements compared to requirements for CAT operations.</p> <p>NCC requirements appear to be less stringent than (i.e. they are proportional to) CAT requirements; e.g., no statements to data connectivity, external cables or viewable stowage.</p>
response	<p>Not accepted.</p> <p>As is the case for CAT, the hardware provisions are separated into two types: those addressing potential negative effects on the aircraft, and those addressing potential negative effects on the type B EFB applications used. In the case of NCC, and in order to avoid duplication of the provisions, the first type of hardware provisions is referred to in the NCC AMC.</p>
comment	<p>38</p> <p>comment by: <i>The Boeing Company</i></p> <p>Page: 71 of 138 Paragraph: AMC5 NCC.EFB.131(b)(2) Use of EFBs AMMD APPLICATION WITH OWN-SHIP POSITION (g) Use of COTS GNSS receivers</p> <p>The proposed text states:</p> <p>“(1)....</p> <p>The data provided to the AMMD application should be based exclusively on GPS or satellite-based augmentation system (SBAS) augmented GPS.”</p> <p>REQUESTED CHANGE:</p> <p>Delete this paragraph</p> <p>JUSTIFICATION:</p> <p>Essentially the same comment as #11 for CAT operations. Unnecessary limitation.</p> <p>1) Limitation to GPS only (excluding GLONASS, Galileo, others);</p> <p>2) Dedicated COTS GNSS receivers (e.g. such as Bad Elf) receive and provide GNSS signals only;</p> <p>3) Location services that are built in a mobile device often use all kinds of location services; sometimes including cellular and WiFi sensors. Enabling other than GNSS based location</p>

services in conjunction with GNSS based location services may significantly increase initial signal acquisition time and increase position accuracy in general. A potentially inaccurate position display resulting from e.g. inclusion of other than GNSS based location services will easily be detected through paragraph (a) of this chapter (AMMD not primary; outside view remains the operating procedure). Furthermore, the practical evaluation of the use of COTS GNSS receivers (paragraph (3) of this chapter) should reveal none-compliant or unacceptable installations and own-ship position inaccuracies.

response Not accepted.
Location services other than GNSS and constellations other than GPS are not yet used in aviation applications due to uncertainty regarding their performance and integrity.

comment 39 comment by: *The Boeing Company*

Page: 73 of 138

Paragraph: AMC7 NCC.GEN.131 (b)(2) Use of EFBs
IN-FLIGHT WEATHER APPLICATIONS

The proposed text states:

Entire chapter affected.

REQUESTED CHANGE:

Replace with most current draft of the in-flight weather applications considerations of ICAO Doc 10020, Manual of EFBs, 1st edition.

JUSTIFICATION:

A newer, agreed upon version is available. See attachment.

response Accepted.
The latest version of ICAO Doc 10020 has been considered when drafting the resulting text.

comment 73 comment by: *CAA-NL*

AMC2 NCC.GEN.131(b)(2) (g)

AMC2 NCC.GEN.131(b)(2) (g). "... procedures for electronic signatures, acceptable to the competent authority, ..." Is this to be interpreted as a prior approval? (see also AMC2 SPO.GEN.131(b)(2) (g))

response Accepted.
It was indeed not the intent. The resulting text has been amended accordingly.

comment 79 comment by: *IAOPA Europe*

The AMCs for NCC.GEN.131(b)(2) are generally way to prescriptive and disproportionate for small NCC operators. The amount of documentation and testing required will deter small operators from using EFBs.

Many small operators may only operate maybe a few times per month and the requirements for every software **version** to go through a full test procedure would in practice mean that a complete software test would be necessary before almost every flight (or that the software



response	<p>is not kept up to date which is also bad practice).</p> <p>AMC4 shows its inheritance from CAT rules since it refers explicitly to "the airline". The rules are clearly not adapted to con-commercial use.</p> <p>The AMCs for NCC.GEN.131(b)(2) should have status as guidance material since they would be disproportionate to impose on small NCC operators.</p> <p>Not accepted. Please refer to Chapter 1 of the CRD for detailed rationales and explanations.</p>
comment	<p>90 comment by: UK CAA</p> <p>Page No: 65 of 138</p> <p>Paragraph No: AMC3 NCC.GEN.131(b)(2) Use of EFBs – FLIGHT CREW TRAINING, sub para (c)</p> <p>Comment: Training should be included to indicate the limitations of own-ship position.</p> <p>Justification: To emphasise the primacy of avionics standard equipment information over that provided by the EFB.</p> <p>Proposed Text: Add additional text as follows:</p> <p>‘(c) limitations of the system, specifically the limitations of any own-ship position displayed by the EFB, and the primacy of information from installed avionics standard equipment’</p>
response	<p>Partially accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>91 comment by: UK CAA</p> <p>Page No: 69 of 138</p> <p>Paragraph No: AMC5 NCC.GEN.131(b)(2) Use of EFBs AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION</p> <p>Comment: This section should be expanded to include requirements for own-ship position for all phases of flight and a full re-write is recommended.</p> <p>Justification: Essential if own-ship position is permitted in all phases of flight.</p>
response	<p>Partially accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during</p>



the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.

comment

132 ❖

comment by: *General Aviation Manufacturers Association / Hennig*

The General Aviation Manufacturers Association (GAMA) appreciates the opportunity to file comments about Notice of Proposed Amendment (NPA) 2016-12.

The requirements proposed by the agency for Part NCC are cumbersome and likely will limit the opportunity for EFB safety benefits for the legacy business aviation fleet. The level of substantiation for the use of C-PEDs / EFB equipment in NCC operations is likely beyond the grasp of most NCC operators and would force significant validation by the OEM / STC organisation.

GAMA is specifically concerned about the burden imposed by the agency to address:

1. AMC1 NCC.GEN.130 (d) Demonstration of electromagnetic compatibility
2. AMC1 NCC.GEN.131 (c) Environmental testing for the requirement for depressurisation testing

As well as overall hardware suitability and durability testing criteria identified in the draft AMC.

GAMA recommends that the agency review these proposed requirements to identify a more proportional approach to business aviation operations to ensure the requirements are commensurate with the safety benefits achieved.

response

Not accepted.

Please refer to Chapter 1 of the CRD for detailed rationales and explanations.

comment

134

comment by: *EUROCONTROL*

AMC7 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs) - Page 73
IN-FLIGHT WEATHER APPLICATIONS

(a) General

An in-flight weather (IFW) application is an EFB function or application enabling the crew to access meteorological information. It is designed to *increase situational awareness and to support the flight crew when making strategic decisions*.

An IFW function or application may be used to access both information required to be on board and supplemental weather information, *but should not be the only information required to be on board for dispatch*.

An IFW application should not be used to support tactical decisions or to substitute for certified aircraft systems (e.g. weather radar).



The EUROCONTROL Agency finds that the text above, in particular those parts that it has put in italics, is unclear. One could ask what the added value of IFW is when it shall be used exclusively for situational awareness and strategic decisions. Moreover, why is this specific AMC in the regulation required?

Some clarity could be provided by defining ‘strategic decisions’ and ‘tactical decisions’ in the context of IFW. In addition, indicating what is the other information that is required to be on board when an IFW is used would also help bringing some more clarity.

Please find below three other pieces of text, also in italics, that are giving rise to comments from the EUROCONTROL Agency:

Any current information from the meteorological data required to be carried on board or from aircraft primary systems should always prevail in case there is a difference from the IFW application information.

The sentence ‘Any current information from the meteorological data...’ doesn’t read well and could be interpreted as follows: the information that is provided by a paper-based pre-flight information package, prepared at least 60 minutes before the flight, is always taking precedence over the updated information provided by the IFW. This is probably not the intention of the AMC.

The displayed meteorological information may be forecasted and/or observed, and may be updated on the ground and/or in flight.

The sentence ‘The displayed meteorological information may be forecasted and/or observed ...’ doesn’t read well. It is not the displayed information that is forecasted or observed but the displayed information can hold data that is of the type observation or forecast. It is not completely clear why the statement is anyhow made or important in the AMC. However, should this statement be considered crucial, it should be appropriately worded.

It should be based on data from certified meteorological services providers or other reliable sources.

The notion ‘other reliable sources’ is non-existent in EU/EC Regulation and/or ICAO provisions. So, if the statement means that MET information for IFW can be provided by 1) providers that need to conform to (EU) 2016/1377 and by 2) other providers that are not ‘regulated’ but ‘reliable’, this should be made more explicit to prevent any misunderstanding. This should probably come with criteria on what ‘reliable’ means since this is for the moment not covered by any Regulation.

(b) Display

Page 73 - (4) positive and clear indication of any missing information or data to enable flight crew to determine areas of uncertainty when making decisions to avoid hazardous weather; and

The terminology ‘determine areas of uncertainty’ used above is potentially not the best one to be used when explaining the required functionality of IFW. The intent appears to be to request a functionality that is indicating missing data, so that the actor could take this into

account when assessing the information. Since MET information is, per definition, uncertain, there could be a mix of available MET information in an IFW application with a variance in the level of certainty, plus areas with missing data. Rewording text is therefore suggested.

Page 74 - (5) The meteorological information may require reformatting for flight crew compartment use to accommodate, for example, the display size or the depiction technology. However, any reformatting of the meteorological information should preserve both the geo-location and intensity of the meteorological conditions regardless of projection, scaling, or any other types of processing.

The notion of 'intensity of the meteorological conditions' does not read well. Should not it be 'should preserve information on both geo-location and intensity (?) of the meteorological conditions'?

response Partially accepted.
By principle, IFW applications are used for situational awareness and to support the crew for strategic decisions. There is no intent to extend the scope of use of IFW applications. Definitions of what are meant by strategic and tactical have been added in the resulting text.

comment 198 comment by: THALES AVIONICS

**AMC5 NCC.GEN.131(b)(2):
(b) Minimum requirements**

Proposed modification

Following sentence should be added:

To achieve the total system accuracy requirements of ETSO-C165a, an airworthiness-approved sensor using the global positioning system (GPS) in combination with a EUROCAE ED-99C/RTCA DO-272(or later revision) medium-accuracy-compliant database is considered one acceptable means. Alternatively, the use of non-certified commercial off-the-shelf global navigation satellite system (COTS GNSS) receivers may be acceptable in accordance with (g).'

Justification

Should be consistent with AMC6 SPA.EFB.100(b)(3)

response Accepted.
The resulting text has been amended accordingly.

comment 256 comment by: Bell Helicopter

Comment: Inconsistent use of the terminology "type A" and "type A EFB"

response Accepted.
The resulting text has been amended accordingly.

comment 263 comment by: Erik Ringnes

Comment: AMC7 NCC.GEN.131(b)(2) It states "The meteorological information provided to the flight crew should be as far as possible consistent with the information available to ground-based aviation meteorological information users (e.g. operations control centre (OCC), dispatchers, etc.) in order to establish common situational awareness and to facilitate

	<p>collaborative decision-making.” How does the EFB designer get access to the HMI associated with ground-based tools? This is not widely accessible.</p> <p>Recommendation: Remove this requirement.</p>
response	<p>Not accepted. It’s only a recommendation, as stated in the text by the use of ‘as far as possible’.</p>



**3. Proposed amendments — 3.2. Draft Acceptable Means of Compliance and Guidance Material
(Draft EASA Decision) — 3.2.4. Draft AMC and GM to Part-NCO**

p. 75-76

comment	<p>59 comment by: <i>René Meier, Europe Air Sports</i></p> <p>3.2.4 Draft AMC and GM to Part-NCO AMC1 NCO.GEN.125 PEDs p 75/138</p> <p>(a) EFB viewable storage We would like to change the last three words to "any person on-board".</p> <p>Rationale Also injured passengers would impose stress on the flight crew. This should be avoided.</p>
response	<p>Accepted. The resulting text has been amended accordingly.</p>
comment	<p>129 comment by: <i>Airbus Helicopters</i></p> <p>AMC2 NCO.GEN.125 page 75</p> <p>Comment This AMC fails to insist on the need to mitigate the risk of erroneous outputs of EFB functions, except for:</p> <ol style="list-style-type: none"> 1. having backup charts and checklists (item (b)(4)), 2. checking the performance and W&B applications prior to first use (item (d)), 3. not using AMMD as a primary means (item (e)), 4. considering the EFB for not listed functions as only an advisory or supplementary means (item (f)). <p>This merely seems a strong mitigation against the pilot considering the outputs or the EFB as valuable data, despite no design assurance is requested on the EFB design.</p> <p>Suggestion Add a clear statement at the beginning of the AMC that the outputs of EFB functions should always be considered as being only advisory or supplementary information and should not relieve from using primary means for all required functions.</p>
response	<p>Not accepted. This is already mentioned for AMMD applications in paragraph e) and for other advanced functions in paragraph f). For performance calculations, charts or mass and balance applications, the information provided on the EFB may be used as primary.</p>
comment	<p>229 comment by: <i>DGAC France</i></p> <p>AMC1 NCO.GEN.125 Portable electronic devices (PEDs)</p> <p>This AMC1 focuses on "Electronic Flight Bags (EFBs) – Hardware. But the requirements about</p>



	viewable stowage and cables are linked to the PEDs equipment and not to the EFBs system includes in the PED. So we suggest to replace “EFB(s)” by “PED(s)” in this AMC.
response	Not accepted. The implementing rule is applicable to all PEDs, but this specific AMC is applicable only to EFBs, as stated in its subtitle.
comment	255 comment by: <i>Bell Helicopter</i> Comment: Inconsistent use of the terminology "type A" and "type A EFB"
response	Accepted. The resulting text has been amended accordingly.

**3. Proposed amendments — 3.2. Draft Acceptable Means of Compliance and Guidance Material
(Draft EASA Decision) — 3.2.5. Draft AMC and GM to Part-SPO**

p. 77-94

comment	40 comment by: <i>The Boeing Company</i> Page: 91 of 138 Paragraph: AMC5 SPO.GEN.131(b)(2) Use of EFBs AMMD APPLICATION WITH OWN-SHIP POSITION – COMPLEX AIRCRAFT (g) Use of COTS GNSS receivers The proposed text states: “(1).... The data provided to the AMMD application should be based exclusively on GPS or satellite-based augmentation system (SBAS) augmented GPS.” REQUESTED CHANGE: Delete this paragraph JUSTIFICATION: Essentially the same comment as #11 for CAT operations and comment #13 for NCC operations. Unnecessary limitation. 1) Limitation to GPS only (excluding GLONASS, Galileo, others); 2) Dedicated COTS GNSS receivers (e.g. such as Bad Elf) receive and provide GNSS signals only; 3) Location services that are built in a mobile device often use all kinds of location services; sometimes including cellular and WiFi sensors. Enabling other than GNSS based location services in conjunction with GNSS based location services may significantly increase initial signal acquisition time and increase position accuracy in general. A potentially inaccurate position display resulting from e.g. inclusion of other than GNSS based location services will easily be detected through paragraph (a) of this chapter (AMMD not primary; outside view remains the operating procedure). Furthermore, the practical evaluation of the use of COTS GNSS receivers (paragraph (3) of this chapter) should reveal non-compliant or unacceptable installations and own-ship position inaccuracies.
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response Not accepted.
Location services other than GNSS and constellations other than GPS are not yet used in aviation applications due to uncertainty regarding their performance and integrity.

comment 41 comment by: *The Boeing Company*

Page: 92 of 138
Paragraph: AMC7 SPO.GEN.131(b)(2)
IN-FLIGHT WEATHER APPLICATIONS – COMPLEX AIRCRAFT

The proposed text states:
Entire section affected.

REQUESTED CHANGE:
Replace with most current draft of the in-flight weather applications considerations of ICAO Doc 10020, Manual of EFBs, 1st edition

JUSTIFICATION:
A newer, agreed upon version is available. See attachment.

response Accepted.
The latest version of ICAO Doc 10020 was considered when drafting the resulting text.

comment 60 comment by: *René Meier, Europe Air Sports*

Various AMC Part-SPO related
p 79-94/138

We concentrated on the proposals applicable to non-complex aircraft. We have nothing to add.

Rationale
We got a complete picture of weaknesses and strengths of EFBs, if we may write so. The provisions are appropriate and fit with our operations. Furthermore these pages contain useful hints for flight crews as well as for FI.

response Noted.
Thank you for your feedback.

comment 92 comment by: *UK CAA*

Page No: 85 of 138

Paragraph No: AMC3 SPO.GEN.131(b)(2) Use of EFBs – FLIGHT CREW TRAINING, sub para (c)

Comment: Training should be included to indicate the limitations of own-ship position.

Justification: To emphasise the primacy of avionics standard equipment information over that provided by the EFB.



	<p>Proposed Text: Add additional text as follows:</p> <p>‘(c) limitations of the system, specifically the limitations of any own-ship position displayed by the EFB, and the primacy of information from installed avionics standard equipment’</p>
response	<p>Partially accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>93 comment by: <i>UK CAA</i></p> <p>Page No: 89 of 138</p> <p>Paragraph No: AMC5 SPO.GEN.131(b)(2) Use of EFBs AIRPORT MOVING MPA DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION – COMPLEX AIRCRAFT</p> <p>Comment: This section should be expanded to include requirements for own-ship position for all phases of flight, and a full re-write is recommended.</p> <p>Justification: Essential if own-ship position is permitted in all phases of flight</p>
response	<p>Accepted.</p> <p>Based on extensive studies performed by an industry group, the use of own-ship EFB applications could be allowed under specific conditions (including specific training) during the en-route phase. Due to the timeline of the RMT.0601 rulemaking task, it was not possible to publish the draft related AMCs/GM in CRD 2016-12. However, in order to ensure adequate public consultation before the publication of the related EASA decision, a focused consultation will be organised once these provisions are ready.</p>
comment	<p>135 comment by: <i>EUROCONTROL</i></p> <p>AMC7 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs) - Page 92 IN-FLIGHT WEATHER APPLICATIONS — COMPLEX AIRCRAFT</p> <p>The EUROCONTROL Agency makes the same comments as those it made concerning AMC7 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs) IN-FLIGHT WEATHER APPLICATIONS at page 73.</p>
response	<p>Partially accepted.</p> <p>By principle, IFW applications are used for situational awareness and to support the crew for strategic decisions. There is no intention to extend the scope of use of IFW applications. Definitions of what are meant by strategic and tactical have been added in the resulting text.</p>
comment	<p>254 comment by: <i>Bell Helicopter</i></p> <p>Comment: Inconsistent use of the terminology "type A" and "type A EFB"</p>

response Accepted.
The resulting text has been amended accordingly.

**3. Proposed amendments — 3.2. Draft Acceptable Means of Compliance and Guidance Material
(Draft EASA Decision) — 3.2.6. Draft AMC 20-25**

p. 95-107

comment 74 comment by: CAA-NL

AMC 20-25 new 5.2.1
Draft AMC 20-25 5.2.1 mentions “... type A and B EFB applications in accordance with this AMC 20-25.” The definition of type A en B applications has been moved from AMC 20-25 to 965/2012, AMC1 CAT.GEN.MPA.141(b). Please amend this reference to the correct one.

response Accepted.
Type A and type B denominations have been removed and replaced by EFB applications in the resulting text of AMC 20-25.

comment 130 comment by: Airbus Helicopters

§ EFB data connectivity, page 106

Comment
The proposed AMC1 CAT.GEN.MPA.141(b) excludes applications “*sending data to the certified aircraft systems other than the certified EFB installed resources*”.

However the proposed AMC 20-25, although it uses the term “connectivity resource”, does not clearly state that connectivity between an EFB and the aircraft systems should only be through a dedicated “connectivity resource”.

Also, this concept of “connectivity resource” is not defined in § 4.

At last, the definition of “Data connectivity for EFB systems” in § 4.5 is not totally clear and not really useful, as the concept is sufficiently detailed in § 6.1.5.

Suggestion
We suggest the following:

1. Removing the definition of “Data connectivity for EFB systems”
2. Introducing the concept of “connectivity resource” in the definitions (§ 4 of AMC 20-25),
3. Explicitly stating in § 6.1.5 that data transfer between EFBs and aircraft systems should only be through a dedicated “connectivity resource”.

response Partially accepted.
The connectivity provisions have been clarified in the resulting text to address the issue reported.

comment 193 comment by: AIRBUS



Page 107, AMC 20-25 Rev. 1 - paragraph 5.2.2 (c)

PROPOSED TEXT / COMMENT:

Current wording :

(c) information necessary to ensure the development of a software application consistent with the avionics interface and the human machine interface that is also accurate, reliable, secure, testable, and maintainable;

Proposed change :

(c) characteristics of the EFB installed resources (eg. display unit, control and pointing device) necessary to ensure the development of a software application consistent with the human machine interface characteristics of the EFB installed resources;

RATIONALE / REASON / JUSTIFICATION:

The current wording (notably referring the avionics interface) is misleading. The paragraph 5.2.2 (c) is intended to provide the software developer with the main characteristics of the EFB resources in order to allow a correct S/W integration or interface with the EFB H/W. For instance, a software application will not be designed in a same way if the pointing device is through a tactile display or if the pointing device is a touchpad. The paragraph 5.2.2 (c) is not intended to provide considerations about button size, symbology, colour coding which are already covered by the paragraph AMC1 SPA.EFB.100(b)(2) : Use of electronic flight bags (EFBs) — operational approval “Human–Machine Interface Assessment and Human Factors Considerations”. This proposed change makes the paragraph 5.2.2 (c) consistent with the paragraph 5.2.3 (a)(2).

response

Not accepted.

The proposal is considered to completely change the intent of the original text, which is intended to also provide software HMI guidelines.

comment

206

comment by: *NetJets Europe*

AMC 20-25 Rev. 1 We support all proposed changes.

response

Noted.

Thank you for your feedback.

comment

210

comment by: *THALES AVIONICS*

AMC20-25 §5.1.1 Installed resources

Commented text

The installed resources should be dedicated to EFB functions only, or in the case of use of resources shared with avionics, this possibility shall be part of the approved type design.

Proposed modification



The installed resources should be dedicated to EFB functions only, or in the case of share of avionics resources, this possibility shall be part of the approved type design.

Justification

It should be clarified that the term "resources shared with avionics" may include some avionics systems themselves (i.e. avionic display units use as remote EFB display thanks to a safe and secured video link).

response

Not accepted.
The notion of installed resources already includes avionic systems by definition.

comment

211

comment by: THALES AVIONICS

AMC20-25 §5.1.4 Power source

Commented text

Refer to the applicable EASA provisions related to power supply

Proposed modification

Precision should be added on where these provisions can be found

Justification

Incomplete information

response

Accepted.
The reference of the related document has been added to the resulting text.

comment

213

comment by: THALES AVIONICS

AMC20-25 §5.1.5 EFB data connectivity

Commented text

A connectivity resource for a portable EFB can allow the EFB to receive any data from aircraft systems, but data transmission from EFBs is limited to:

(a) systems whose failures have no safety effect or minor safety effect at aircraft level (e.g. printer or ACARS);

(b) aircraft systems which have been certified with the purpose of providing connectivity to PEDs (e.g. SATCOM with a router) in accordance with the limitations established in the AFM;

(c) systems which are completely isolated (in both directions) from the certified aircraft systems (e.g. a transmission media that receives and transmits data for Aircraft Administrative Communications (AAC) purposes on the ground only); and

(d) EFB system installed resources according to section 5.1.1

Proposed modification

Instead of providing the list of systems authorized to receive data from portable EFB applications, it should be provided dedicated requirements and guidelines for the airworthiness approval of such A/C systems having the intended function to allow use of data from open world source like portable EFB applications.

Justification

For an equivalent text to FAA AC 20-173.



response Accepted.
The connectivity provisions have been amended in the resulting text.

comment 253 comment by: *Bell Helicopter*
Comment: Inconsistent use of the terminology "type A" and "type A EFB"

response Accepted.
The resulting text has been amended accordingly.

4. Regulatory impact assessment (RIA)

p. 108-121

comment 85 comment by: *Widerøe AS, Norway*
General question: There is no mention as to whether or not operators that already have an operational approval from N-CAA based on AMC 20-25 need to go through a full new approval process. If required, this would mean a large administrative burden for operators having used EFB systems successfully for a few years already.

For operators with existing approvals based on AMC 20-25, the approval should be continued and compliance checked by N-CAA during audits.

response Not accepted.
As there is currently no regulatory requirement for an operational approval in the applicable Regulation, it is not possible to give provisions related to the grandfathering of an EFB OPS approval that was granted based on national provisions. This transition will be under the control of each competent authority that has elected to already grant EFB operational approvals.

In any case, as stated in the Terms of Reference (ToRs) for RMT.0601 and in NPA 2016-12, the intent was to transpose the OPS content of AMC 20-25 into Regulation (EU) No 965/2012 without major modifications. Only modifications which were necessary due to the evolution of the scope of EFB applications or to correct inconsistencies or clarify some provisions were incorporated in the text of AMC 20-25. This results in minimal impact on existing EFB programmes already assessed against AMC 20-25.

comment 136 comment by: *EUROCONTROL*
ICAO Provisions on EFBs - page 109

The comments made by the EUROCONTROL Agency on AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs) - TYPICAL TYPE B EFB APPLICATIONS at page 25 also relate to section 'ICAO provisions on EFBs'.

response Noted.
Additional information is necessary to be able to assess the issue identified.

4. Regulatory impact assessment (RIA) — Questions to stakeholders on economic impacts — To CAT operators

p. 121



comment	<p>22</p> <p style="text-align: right;">comment by: <i>Monarch Airlines</i></p> <p>1) Monarch Airlines has the following number of Type A and B applications:</p> <p>Type A: 2 Type B: 3</p> <p>2) The main economic benefits following operational approval of our EFB solution have been:</p> <ol style="list-style-type: none"> 1. Reduced fuel burn 2. Reduced paper consumption 3. Reduced weight carried on board aircraft 4. Increased operational efficiency 5. Increased safety of operation 6. Crew access to more up-to-date information for operational decision making
response	<p>Noted. Thank you for your input.</p>
comment	<p>43</p> <p style="text-align: right;">comment by: <i>Thomson Airways</i></p> <p>Answer to Questions posed to CAT operators:</p> <ol style="list-style-type: none"> 1. Thomson Airways use 2 Type A applications (Aviobook and EDB) and 2 Type B applications (OPT and Lido ERM). 2. No impact as this is already covered with the UK CAA.
response	<p>Noted. Thank you for your input.</p>
comment	<p>62</p> <p style="text-align: right;">comment by: <i>Tim Glasspool</i></p> <ol style="list-style-type: none"> 1. 200 EFB's in use with type A applications. 2. Already have approval through AOC Ops Spec in accordance with AMC 20-25.
response	<p>Noted. Thank you for your input.</p>
comment	<p>83</p> <p style="text-align: right;">comment by: <i>Widerøe AS, Norway</i></p> <p>Q1 to CAT Wideroe, Norway: Currently approx 700 EFB iPads in use. 2 EFB applications on each. (jeppesen FDPro and AvioBook).</p> <p>Q2 to CAT Wideroe, Norway: The norwegian CAA has already granted us operational approval for use of EFB based on AMC 20-25. If this approval is continued, the impact is none. If a new approval is required, a full new process would be administratively demanding and we estimate a cost of around 1000 man hours.</p>

response Noted.
Thank you for your input.

comment 207 comment by: *Aer Lingus*
In response to the questions posed to CAT operators:

1. In the approved portable EFB system in use in Aer Lingus, 5 Type B applications are already in use. Plans are in place to incorporate at least 2 additional Type B applications. There are no Type A applications in use.

2. No significant economic impacts should accrue to Aer Lingus provided that the competent authority considers an application for operational approval in a timely manner. Significant economic impacts could occur if unreasonable delays are experienced. The speed at which an EFB system can be developed and improved should not be unduly hindered by the competent authority.

response Noted.
Thank you for your input.

comment 209 comment by: *IACA International Air Carrier Association*
De-identified responses from IACA member airlines:

How many EFB applications (type A, type B) are you currently using?	What are the main anticipated economic impacts for you as a result of the operational approval for the use of EFB applications?
1 type A application 5 type B applications	Economic benefits due to the paperless cockpits. Reduced contractual costs for charting services, reduced manpower to update aeroplanes, reduced weights.
We already have an EFB system in use, approved earlier this year in accordance with AMC 20-25.	In my opinion, the proposed requirement to gain an operational approval for the use of type B applications is reasonable. However, I am not clear on what EASA intend to do with regard to Type B applications which are already in use as part of an EFB system that was approved under AMC 20-25. Clearly, I would not be in favour of a requirement for such applications to be “re-approved” given that they were already in use when a system wide approval was granted under AMC 20-25. As far as I can see, the NPA is silent in this area (or, at least, only implies a position; it refers to the need for “new type B applications” to undergo an approval process.)
2 type A applications 5 type B applications	I do not foresee any significant economic impact provided that current applications, which were put into operation under the AMC 20-25 regulation, are not affected. However, when an operational approval process has to be followed for each new EFB application we would like to introduce on our EFB system, it could have a significant economic impact as this would include more administrative and compliance related costs. From a safety point of view we do support the proposal for an

	operational approval for Type B EFB applications.
Type B applications using iPads 3 and 4	LEFT BLANK
4 type A application and 6 type B applications spread over dedicated aircraft EFB devices and personal flight crew iPads also approved as EFB's.	I trust that Type B applications already in use under the current EFB approval do not need to be re-approved with the introduction of the new proposed regulations. Generally the proposed requirements seem reasonable but they will likely have an increased economic impact when introducing new EFB software applications. The economic impact could be associated with more resources being required, possible delays due to lengthy approval processes when introducing or enhancing applications that are intended to lower operational costs and so on.
NavAero EFB: 2 type A applications 5 type B applications iPad: 8 Type B application	<p>– Number of type B applications is quite significant. Most software is modular and each module is classified separately as Type B. For example, on our iPad we only use briefing application, documentation viewer and a chart viewer; still according the vendor 8 different modules are required. Software releases of various modules are often integrated in a single release and are not harmonized in the way approvals are granted. This increases the complexity with regard to the records keeping or compliance demonstrations for Operational Approval for each type B application in case of change / releases, just to keep the match between the software and approval. From an airline perspective, a minor changes to the application should be implemented without the need for an approval in order to reduce implementation times for approval and fees for the approval review. The NPA should provide the more guidance on this matter or I would recommend to provide the option to receive an approval for a process on performing changes to the software, rather than the applications itself.</p> <p>– Existing approval should receive grandfather rights, based on the existing information from the safety management system, or like the comments below that the NPA refers to the New Type B applications. The pre-EFB procedures and policy are no longer available. To develop these conventional procedures again requires investment in paper-based documentation, flight crew training and resources.</p> <p>– There is a large distinction between the various Type B applications. For performance and weight / balance application I can understand this level of control via an OPS approval due to the complexity and safety aspect of this kind of applications. For M&B application used on-board the aircraft a specific approval is already required by EASA CAT.POL.MAB.105(e). For other applications, like briefing or viewers, an OPS approval on the application this is disproportional. In addition, I believe the OPS approval should</p>



	<p>focus on how the airlines EFB processes are integrated and controlled for its entire solution, rather than approving at single applications. For this kind of application I would to avoid the burden of getting approvals and should be controlled under the airlines management system.</p>
<p>response</p>	<p>Noted. Thank you for your input.</p>

4. Regulatory impact assessment (RIA) — Questions to stakeholders on economic impacts — To competent authorities p. 121

<p>comment</p> <p>80</p> <p>4.5.4.1 question 3: rough estimate 100 hours per year question 4: not so much, most operators have continued to request operational approval for the EFB system and the applications under AMC 20-25</p>	<p>comment by: CAA-NL</p>
<p>response</p>	<p>Noted. Thank you for your input.</p>

4. Regulatory impact assessment (RIA) p. 121-122

<p>comment</p> <p>75</p> <p>NPA regulatory impact assessment 4.1 NPA regulatory impact assessment 4.1: “These risks need to be assessed and, where necessary, mitigated through proportionate regulatory measures and/or safety promotion actions.” What about the management system of the organization itself, should that not be the first to act?</p>	<p>comment by: CAA-NL</p>
<p>response</p>	<p>Not accepted. Indeed the management system of the operator is also designed to capture risks and define adequate mitigations. However, due to the commonality of many risks associated with the use of an EFB, it is considered that it requires some global regulatory mitigations, which might be complemented by specific mitigations stemming from the risk analysis performed in the frame of the operator’s management system.</p>

4. Regulatory impact assessment (RIA) — Questions to stakeholders on economic impacts — To competent authorities p. 122

<p>comment</p> <p>81</p> <p>4.5.4.2</p>	<p>comment by: CAA-NL</p>
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	question 3: not so much, time will be spent on EFB applications during planned audits
response	Noted. Thank you for your input.

4. Regulatory impact assessment (RIA)

p. 122-131

comment	23	comment by: <i>Monarch Airlines</i>
	Monarch Airlines believes Option 2 is the best choice.	
response	Noted. Thank you for your feedback.	

6. Appendices — 6.1. Risk assessment related to the use of EFBs by NCO operators

p. 133-136

comment	56	comment by: <i>René Meier, Europe Air Sports</i>
	<p>6. Appendices 6.1. Risk assessment p 133, 134/138</p> <p>Many thanks for the tables 1, 2, 3 which help us to identify risks, to set-up safety requirements and to find mitigation measures one the one hand, enabling us to find a common language when we have to explain to third parties what this is all about on the other. We used identical structures when we assessed "IFR (in airspace G) without ATC", a Swiss pilot-project, delivering results of a very high quality.</p> <p>A minor remark, however, and another story: Dealing with the CRD 2016-05CS-23 Reorganisation, RMT.0498, we found that quite many commentors questioned the use of the word "likely", "unlikely" respectively.</p> <p>Please leave "likely" as used here. Our reactions on the requests for a definition of these words were negative.</p> <p>Rationale What "likely" and "unlikely" means is "common sense", "gesunder Menschenverstand" as Messrs. Schiller, Goethe, Lessing, and others would have written.</p>	
response	Noted. Thank you for your feedback.	

comment	57	comment by: <i>René Meier, Europe Air Sports</i>
	<p>6. Appendices 6.1. Risk assessment p 136/138</p> <p>"Table 2" Risk assessment linked to software issues</p>	



	<p>Question: Should "2" be replace by "5"?</p> <p>Rationale This table is the fifth within the 6.1 subchapter according to our understanding.</p>
response	<p>Accepted. The table is not, however, reproduced in the CRD/Opinion.</p>

6. Appendices — 6.2. ICAO compliance table for NCO operations	p. 137-138
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comment	58	comment by: <i>René Meier, Europe Air Sports</i>
	<p>6. Appendices 6.2. ICAO compliance table for NCO operations p 137, 138/138</p> <p>Many thanks for this compliance table demonstrating that within EASALand we shall be confronted with a minimum set of provisions only.</p> <p>Rationale This set of risk-based rules appropriate to our operations will enhance the use of EFB, make available most recent information conveniently, by this flight safety of our segment of General Aviation will be increased.</p>	
response	<p>Noted. Thank you for your feedback.</p>	



4. Draft acceptable means of compliance and guidance material (draft EASA decision)

The text of the amendment is arranged to show deleted, new or amended text as shown below:

- deleted text is ~~struck through~~;
- new or amended text is highlighted in grey;
- an ellipsis ‘(...)’ indicates that the remaining text is unchanged.

4.1. Proposed amendments to the AMCs/GM to Annex I (Definitions) to Commission Regulation (EU) No 965/2012

GM1 Annex I Definitions

DEFINITIONS OF TERMS USED IN THE ACCEPTABLE MEANS OF COMPLIANCE AND GUIDANCE MATERIAL

(...)

(ba) ‘Airport moving map display (AMMD)’ means a software application that displays an airport map on a display device and uses data from a navigation source to depict the aircraft current position on this map while the aircraft is on the ground.

(...)

(fa) ‘Controlled portable electronic device (C-PED)’ means a PED subject to administrative control by the operator that uses it. This includes, inter alia, tracking the allocation of the devices to specific aircraft or persons and ensuring that no unauthorised changes are made to the hardware, software, or databases. C-PEDs can be assigned to the category of non-intentional transmitters or T-PEDs.

(fb) ‘EFB installed resources’ means certified EFB hardware components external to the EFB host platform itself, such as input/output components (installed remote displays, keyboards, pointing devices, switches, etc.) or a docking station.

(fc) ‘EFB mounting device’ means an aircraft certified part which secures a portable or installed EFB, or EFB system components.

(fd) ‘EFB system supplier’ means the company responsible for developing, or for having developed, the EFB system or part of it.

(...)

(na) ‘Installed EFB’ means an EFB host platform installed in an aircraft, capable of hosting type A and/or type B EFB applications. It may also host certified applications. It is an aircraft part, and is, thus, covered by the aircraft airworthiness approval.

(...)

(ta) ‘Miscellaneous (non-EFB) software applications’ means non-EFB applications that support function(s) not directly related to the tasks performed by the flight crew in the aircraft.

(...)

(ac) ‘Transmitting PED (T-PED)’ means a portable electronic device (PED) that has intentional radio frequency (RF) transmission capabilities.

(aed) ‘Vertical navigation’ means a method of navigation which permits aircraft operation on a vertical flight profile using altimetry sources, external flight path references, or a combination of these.

(ae) ‘Viewable stowage’ means a non-certified device that is attached to the flight crew member (e.g. with a kneeboard) or to an existing aircraft part (e.g. using suction cups), and is intended to

hold charts or to hold low-mass portable electronic devices that are viewable by the flight crew members at their assigned duty stations.

GM17 Annex I Definitions
MINOR FAILURE CONDITION

Minor failure conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some physical discomfort to passengers or cabin crew. Further guidance can be found in AMC 25.1309.

Minor failure conditions are not considered to be unsafe conditions in accordance with AMC 21.A.3B(b).

4.2. Proposed amendments to the AMCs/GM to Annex II (Part-ARO) to Commission Regulation (EU) No 965/2012

AMC5 ARO.OPS.200 Specific approval procedure

ELECTRONIC FLIGHT BAGS — PROCEDURE FOR THE APPROVAL OF THE USE OF TYPE B EFB APPLICATIONS REPLACING PAPER DOCUMENTATION WITHOUT PAPER BACKUP AT COMMENCEMENT OF OPERATIONS, AND OTHER TYPE B EFB APPLICATIONS

Where an operator intends to use a type B EFB application replacing paper documentation without paper backup at commencement of operations, or another type B EFB application, the competent authority should require a demonstration flight to be conducted before the start of the operational evaluation test.

AMC1 ARO.RAMP.115(b)(2)(i) Qualification of ramp inspectors
SYLLABUS OF THEORETICAL KNOWLEDGE FOR RAMP INSPECTORS

(...)

2. MODULE (A)	
a. RAMP INSPECTION ITEMS (A)	
<p>A1 General condition (flight crew compartment)</p> <ul style="list-style-type: none"> — Circuit breakers (C/B) (inappropriately pulled/popped) — Secure stowage of interior equipment (incl. baggage) — Crew seats (manual or electrical) — Security/reinforced flight crew compartment door — General condition of flight crew compartment <p>A2 Emergency exit (flight crew compartment)</p> <ul style="list-style-type: none"> — Access (easy/no blockings) — Escape ropes (secured) — Emergency exits (flight crew compartment) <p>A3 Equipment</p> <ul style="list-style-type: none"> — Awareness of different design philosophies of A/C systems (BITE, message displays/status) — Proper functioning (system test) <p>GPWS - TAWS</p> <ul style="list-style-type: none"> — General (basic principles) — Forward looking terrain avoidance function (7-channel SRPBZ ICAO compliant) — Presence of the equipment — Validity of GPWS database 	<p>Objectives:</p> <p>Trainees should possess the relevant knowledge enabling them to inspect each item.</p>

<ul style="list-style-type: none"> — System test — passed — CIS built A/C systems (SSOS, SPPZ and SRPBZ) <p>ACAS/TCAS II</p> <ul style="list-style-type: none"> — General (applicability and principles) — Mode S transponder and ACAS II (general) — System test <p>8.33 kHz radio channel spacing</p> <ul style="list-style-type: none"> — Selection of an 8.33 kHz channel — Presence of 6 or 5 digits (132.055 or 32.055) — Letter Y in field 10 of the flight plan <p>RNAV — BRNAV — PRNAV</p> <ul style="list-style-type: none"> — General (applicability and principles) — Special authorisation — Required equipment — Flight planning and completion of the flight <p>RVSM</p> <ul style="list-style-type: none"> — General (applicability and principles) — Special authorisation — Required equipment — Flight planning and completion of the flight <p>MNPS</p> <ul style="list-style-type: none"> — General (applicability and principles) — Special authorisation — Required equipment — Flight planning and completion of the flight <p>A4 Manuals</p> <ul style="list-style-type: none"> — Operation manual (structure) — Aircraft flight manual (structure) — Competent authority approval — Update status — Ex-Soviet-built aircraft: 'Rukowodstwo' or RLE — Electronic flight bag (portable and installed EFB class 1, 2 and 3) — Content in relation to flight preparation <p>A5 Checklists</p> <ul style="list-style-type: none"> — Availability: within reach and update status — Compliance with operator procedures (normal, abnormal and emergency) — Appropriateness of checklist used (aircraft checklists) — A/C system integrated checklists — Ex-Soviet-built aircraft issues (pilot's checklist and flight engineer's checklist) <p>A6 Radio navigation/instrument charts</p> <ul style="list-style-type: none"> — Required charts (departure, en route, destination and alternate): within reach and update status — Validity of FMS database — Electronic maps and charts — The AIRAC Cycle <p>A7 Minimum equipment list (MEL)</p>	
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<ul style="list-style-type: none"> — Availability: approval and update status — Content: MEL reflects installed equipments — Ex-Soviet-built aircraft: 'Rukowodstwo' content — Relationship MEL/Master MEL — CDL (configuration deviation list) <p>A8 Certificate of registration</p> <ul style="list-style-type: none"> — Availability and accuracy — Original documents and certified copies acceptability — Presence of mandatory information on the certificate: identification plate (type, location) <p>A9 Noise certificate</p> <ul style="list-style-type: none"> — Availability (if applicable) — Multiple noise certification — Approval status <p>A10 AOC or equivalent</p> <ul style="list-style-type: none"> — Availability (original or copy) and accuracy — Content in compliance with requirements/format — Content of operational specifications <p>A11 Radio (station) licence</p> <ul style="list-style-type: none"> — Availability and accuracy — Original documents and certified copies acceptability <p>A12 Certificate of Airworthiness (CofA)</p> <ul style="list-style-type: none"> — Format of Certificate of Airworthiness — Original documents and certified copies acceptability — Presence, accuracy and validity <p>A13 Flight preparation</p> <ul style="list-style-type: none"> — Presence and accuracy of operational flight plan — Performance calculations — Proper fuel calculation and monitoring — Special considerations for ETOPS operations — Availability and update of meteorological information — Availability and update of NOTAMS <p>A14 Mass and balance calculation</p> <ul style="list-style-type: none"> — Availability and accuracy — Data available for a verification by the crew <p>A15 Hand fire extinguishers</p> <ul style="list-style-type: none"> — Validity, access and locations — Mounting — Types <p>A16 Life jackets/flotation devices</p> <ul style="list-style-type: none"> — Validity, access and locations — Applicability <p>A17 Harness</p> <ul style="list-style-type: none"> — Presence (and usage) — Availability for all flight crew members — Requirements for different crew positions 	
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<ul style="list-style-type: none"> — Conditions (wearing) <p>A18 Oxygen equipment</p> <ul style="list-style-type: none"> — Presence, access and condition — Oxygen cylinder pressure — Minimum required according to the operations manual (in case of low pressure) — Operational functional check of the combined oxygen and communication system (crew) <p>A19 Independent portable light</p> <ul style="list-style-type: none"> — Number of required independent portable light(s) (day/night) — Condition, serviceability and access <p>A20 Flight crew licences</p> <ul style="list-style-type: none"> — Validity of flight crew licences and appropriate ratings — Validation of foreign licences — Validity of medical certificates — Special medical conditions (spare glasses, etc.) — Age limitations — Minimum flight crew requirements <p>A21 Journey logbook</p> <ul style="list-style-type: none"> — Content of journey logbook (recommendation/Roman numerals) — Examples of journey logbooks <p>A22 Maintenance release</p> <ul style="list-style-type: none"> — Applicable requirements and duties of the PIC/commander <p>A23 Defect notification and rectification (incl. technical log)</p> <ul style="list-style-type: none"> — Defects notification — Cross-check with MEL — History of defects/notification (incl. hold item list) <p>A24 Preflight inspection</p> <ul style="list-style-type: none"> — Applicable requirements and duties of the PIC 	
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(...)

4.3. Proposed amendments to the AMCs/GM to Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012

GM1 ORO.GEN.130(b) Changes related to an AOC holder

CHANGES REQUIRING PRIOR APPROVAL

(...)

(k) mass and balance:

(1) — standard masses for load items other than standard masses for passengers and checked baggage;

(2) — use of on-board mass and balance computer systems;

(...)

AMC3 ORO.MLR.100 Operations manual — General

CONTENTS — CAT OPERATIONS

(...)



A GENERAL/BASIC

0 ADMINISTRATION AND CONTROL OF OPERATIONS MANUAL

(...)

8 OPERATING PROCEDURES

(...)

8.9 Procedures related to the use of type B EFB applications:

(...)

4.4. Proposed amendments to the AMCs/GM to Annex IV (Part-CAT) to Commission Regulation (EU) No 965/2012**AMC1 CAT.GEN.MPA.140 Portable electronic devices**

TECHNICAL PREREQUISITES FOR THE USE OF PEDS

(...)

(d) Demonstration of electromagnetic compatibility

(1) EMI assessment at aircraft level

The means to demonstrate that the radio frequency (RF) emissions (intentional or non-intentional) are tolerated by aircraft systems should be as follows:

(i) to address front door coupling susceptibility for any kind of PEDs:

~~(A) RTCA, 'Guidance on allowing transmitting portable electronic devices (T-PEDs) on aircraft', DO-294C (or later revisions), Appendix 5C; or~~

(A) EUROCAE, 'Guidance for the use of Portable Electronic Devices (PEDs) on Board Aircraft', ED-130A / RTCA DO-363 'Guidance for the Development of Portable Electronic Devices (PED) Tolerance for Civil Aircraft', Section 5; or

~~(B) RTCA, 'Aircraft design and certification for portable electronic device (PED) tolerance', DO-307 (including Change 1 or later revisions), Section 4; and~~

(B) EUROCAE, 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', ED-239 / RTCA DO-307A, Section 4;

The use of RTCA, 'Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft', DO-294C (or later revisions), Appendix 5C; or RTCA DO-307 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', (including Change 1 or later revisions), Section 4 may be acceptable.

(ii) to address back door coupling susceptibility for T-PEDs:

(A) EUROCAE, 'Guidance for the use of portable electronic devices (PEDs) on Board Aircraft', ED-130A/RTCA DO-363, Section 6; or ~~(or later revisions), Annex 6;~~

~~(B) RTCA DO-294C (or later revisions), Appendix 6D; or~~

(B) EUROCAE, 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', ED-239 / RTCA DO-307A, Section 3; or



~~(C) — RTCA DO-307 (including Change 1 or later revisions), Section 3.~~

The use of EUROCAE, 'Guidance for the use of Portable Electronic Devices (PEDs) on Board Aircraft', ED-130, Annex 6; or RTCA DO-294C (or later revisions), Appendix 6D; or RTCA DO-307 (including Change 1 or later revisions), Section 3 may be acceptable.

(2) Alternative EMI assessment of controlled PEDs (C-PEDs)

(i) ~~For~~ To address front door coupling:

(A) C-PEDs should comply with the levels as defined by:

(a) EUROCAE/RTCA, 'Environmental conditions and test procedures for airborne equipment', ED-14D/RTCA DO-160D (or later revisions), Section 21, Category M, for operation in the passenger compartment and the flight crew compartment; and

(b) EUROCAE ED-14ED/RTCA DO-160ED (or later revisions), Section 21, Category H, for operation in areas not accessible during the flight.

(B) If the C-PEDs are electronic flight bags used in the flight crew compartment and if the DO-160 testing described in (A) identifies inadequate margins for interference or has not been performed, it is necessary to test the C-PED in each aircraft model in which it will be operated. The C-PED should be tested in operation on the aircraft to show that no interference with aircraft equipment occurs. Credit may be given to other similarly equipped aircraft (meaning in particular that they contain the same avionics equipment) of the same make and model as the one tested, ~~an alternative compliance method described in EASA, 'General acceptable means of compliance for airworthiness of products, part and appliances', AMC 20, AMC 20-25 ('Airworthiness and operational considerations for electronic flight bags'), may be used.~~

(ii) ~~For~~ To address back door coupling susceptibility for C-PEDs with transmitting capabilities, the EMI assessment described in (1)(ii) should be performed.

(3) Alternative EMI assessment of cargo tracking devices

In cases where a transmitting function is automatically deactivated in a cargo tracking device ~~that (being is a T-PED)~~, the unit should be qualified for safe operation on board the aircraft. One of the following methods should be considered to be acceptable as evidence of its ~~for~~ safe operation:

(i) A type-specific safety assessment, including failure mode and effects analysis, has been ~~performed~~ conducted at the aircraft level. The main purpose of the assessment should be to determine the worst hazards and to demonstrate that the ~~an adequate~~ design assurance levels of the relevant hardware and software components of the cargo tracking device are adequate.

(ii) The high intensity radiated field (HIRF) certification of the aircraft has been performed, i.e. the aircraft type has been certified ~~after~~ since 1987 and meets the appropriate special condition. In such a case, the operator should ~~observe~~ ensure that the following objectives are met:

(A) The tracking device:



- (a) features an automated and prolonged radio suspension in flight using multiple modes of redundancy; and
 - (b) has been verified in the aircraft environment to ensure deactivation of the transmitting function in flight.
- ~~(B) The transmissions of the tracking device are limited per design to short periods of time (less than 1 second per 1 000 seconds) and cannot be continuous.~~
- ~~(C) The emissions from the tracking device emissions should comply comply with the levels as defined by EUROCAE ED-14E/RTCA DO-160E (or later revisions), Section 21, Category H.~~
- (D) ~~In order to provide assurance on the tracking device design and production,~~ For this purpose, the operator should ensure that the following documents are provided by the tracking device manufacturer ~~retained as part of the evaluation package:~~
- ~~(a) operational description, technical specifications, product label and images of the tracking device and any peripheral attachments~~ a declaration from the manufacturer identifying the device and confirming that the device and its deactivation function comply with the requirement (A) and (B) above;
 - ~~(b) failure mode and effects analysis report of the tracking device and any peripheral attachments;~~
 - ~~(c) a declaration showing that of stringent design and production controls are in place during the manufacturing of the tracking device manufacturing;~~
 - ~~(d) a declaration of conformity and technical documentation showing compliance to with the European Norms (EN), regulating the transmitter characteristics of the tracking device or its transmission module; and~~
 - ~~(e) an the EMI assessment report documenting the emission levels compliance with point (B) above.~~

(...)

GM1 CAT.GEN.MPA.140 Portable electronic devices

DEFINITIONS

(a) ~~Definitions and~~ Categories of PEDs

~~PEDs are any kind of electronic device, typically but not limited to consumer electronics, brought on board the aircraft by crew members, passengers, or as part of the cargo and that are not included in the approved aircraft configuration. All equipment that is able to consume electrical energy falls under this definition. The electrical energy can be provided from internal sources as batteries (chargeable or non-rechargeable) or the devices may also be connected to specific aircraft power sources.~~

PEDs include the following two categories:

(...)

~~(b) Controlled PEDs (C-PEDs)~~



A controlled PED (C-PED) is a PED subject to administrative control by the operator using it. This will include, inter alia, tracking the allocation of the devices to specific aircraft or persons and ensuring that no unauthorised changes are made to the hardware, software or databases. C-PEDs can be assigned to the category of non-intentional transmitters or T-PEDs.

(be) Cargo tracking device

A cargo tracking device is a PED attached to or included in airfreight (e.g. in or on containers, pallets, parcels or baggage). Cargo tracking devices can be assigned to the category of unintentional transmitters or transmitting PEDs (T-PEDs). If the device is a T-PED, it should comply with the European Norms (EN) for transmissions.

(cd) Definition of the switched-off status

Many PEDs are not completely disconnected from the internal power source when switched off. The switching function may leave some remaining functionality, e.g. data storage, timer, clock, etc. These devices can be considered switched off when in the deactivated status. The same applies to devices having no transmitting capability that are operated by coin cells without further deactivation capability, e.g. wrist watches.

(de) Electromagnetic interference (EMI)

The two classes of EMI to be addressed can be described as follows:

- (1) Front door coupling is the possible disturbance to an aircraft system that is received by the antenna of the system and is mainly in the frequency band used by the system. Any PED internal oscillator has the potential to radiate low-level signals in the aviation frequency bands. Due to this disturbance, especially the instrument landing system (ILS) and the VHF omnirange (VOR) navigation system may indicate erroneous information.
- (2) Back door coupling is the possible disturbance of aircraft systems by electromagnetic fields generated by transmitters at a level which could exceed at short distance (i.e. within the aircraft) the electromagnetic field level used for the aircraft system certification testing. This disturbance may then lead to system malfunctions.

GM3 CAT.GEN.MPA.140 Portable electronic devices

EVALUATION OF CARGO TRACKING DEVICES EVALUATION

(...)

(c) ~~Failure mode and effects analysis~~

~~Further guidance on performing a failure mode and effects analysis can be found in:~~

- ~~(1) SAE ARP 4761 (or later revisions); and~~
- ~~(2) U.S. Department of Defense, 'Procedures for performing a failure mode, effects and criticality analysis', Military Standard MIL-STD-1629A (or later revisions).~~

(c) Multiple modes of redundancy

Multiple modes of redundancy means that the device is designed with a minimum of two independent means to turn it off completely, turn off the cellular or mobile functions, or a combination of both when airborne. These independent methods should use different sources to identify that the aircraft is in flight, for example, a cargo tracking device may be designed to sense rapid altitude changes and

acceleration in order to determine when to turn off cellular transmissions. Redundant sources of the same information, such as two vertical accelerometers, should not be considered to be independent.

GM1 CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)

DEFINITIONS

For the purpose of EFB use, the following definitions apply:

(a) Aircraft administrative communications (AAC):

AAC are defined by ICAO as non-safety communications used by aeronautical operating agencies related to the business aspects of operating their flights and transport services. These communications are used for a variety of purposes, such as flight and ground transportation, bookings, deployment of crew and aircraft or any other logistical purposes that maintain or enhance the efficiency of overall flight operations. AAC data links receive/transmit information that includes but is not limited to the support of EFB applications.

(b) Aeronautical operational control (AOC):

AOC communications are defined by ICAO as communications required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons.

GM2 CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)

BACKGROUND INFORMATION

Further related information on EFB hardware and EFB applications can be found in the following documents:

- (a) EASA AMC 20-25, Airworthiness considerations for EFBs;
- (b) EASA CS-25, Book 2, AMC Subpart F, AMC 25.1309, System Design and Analysis;
- (c) EUROCAE ED-14D/DO-160D (or later revisions) Environmental Conditions and Test Procedures for Airborne Equipment;
- (d) EASA ETSO-C165A, Electronic Map Systems for Graphical Depiction of Aircraft Position;
- (e) FAA AC 120-76(C), Authorization for an Electronic Flight Bag Program;
- (f) FAA AC 120-78, Electronic Signatures, Electronic Recordkeeping, and Electronic Manuals;
- (g) ICAO Doc 10020, Manual of Electronic Flight Bags (EFBs).

AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs)

HARDWARE

Before using a portable EFB, the following considerations should be assessed by the operator:

(a) General

A portable EFB is a portable electronic device (PED) and may host type A and/or type B EFB applications. In addition, it may host miscellaneous software applications. Portable EFBs are controlled PEDs (C-PEDs).

A portable EFB should be capable of operation autonomously inside and outside the aircraft.

The mass, dimensions, shape and position of the portable EFB should not compromise flight safety.

The power supply of a portable EFB may be provided from aircraft sources through an adequate power source.



If mounted or stowed, a portable EFB should be easily removable from its mounting device/viewable stowage device or attached to it, without the use of tools by the flight crew. The attachment or removal should not constitute a maintenance action. Any locking devices used to prevent theft should be unlocked during flight.

A portable EFB may be part of a system containing EFB installed resources which are part of the certified aircraft configuration. The intended functions of the EFB installed components may be to mount the EFB on the aircraft and/or connect it to other systems.

Portable EFBs may be used in all phases of the flight if secured to a certified mount or securely attached to a viewable stowage device in a manner which allows its use.

Portable EFBs that do not meet the above characteristics should be stowed during critical phases of the flight.

However, this does not preclude a flight crew from using a portable EFB during restricted portions of the critical phases of flight to complete a task related to the safety of the flight on the condition that the device is continuously handheld and used only during a short period of time. When the task is completed, the device should be stowed again.

Any EFB component that is either not accessible in the flight crew compartment by the flight crew members or not removable by the flight crew members should be installed as 'certified equipment' covered by a type certificate (TC), a change to a TC or a supplemental (S)TC.

(b) Characteristics and placement of the EFB display

For a portable EFB, the considerations on the location of the display proposed below should apply to the proposed location of the display when the EFB is in use.

The EFB display and any other elements of the EFB system should be placed in such a way that they do not unduly impair the flight crew's external view during any of the phases of the flight. Equally, they should not impair the view of or access to any flight crew compartment control or instrument.

The location of the display unit and the other EFB system elements should be assessed for impact on egress requirements.

When the EFB is in use (intended to be viewed or controlled), its display should be within 90 degrees on either side of each flight crew member's line of sight.

Glare and reflection on the EFB display should not interfere with the normal duties of the flight crew.

(c) Power source

If the aircraft is equipped with electrical power outlet(s) in the flight crew compartment, the operator should ensure that their certified characteristics are compatible with the intended use of the EFB system. The powering or charging of the EFB system should be compatible with the electrical characteristics of the power supplied by the outlets in terms of power consumption, voltage, frequency, etc., in order not to impair the EFB system or other aircraft systems.

(d) EFB data connectivity

Portable EFBs may have data connectivity to aircraft systems, either wired or wireless, provided that the connections (hardware and software for data connection provisions) and adequate interface protection devices are incorporated into the aircraft type design.



A portable EFB may receive any data from aircraft systems, but data transmission from EFBs should be limited to aircraft systems that have been certified for this intended purpose (refer to AMC 20-25 for more details).

(e) External connecting cables (to avionics and/or power sources)

When external cables are used to connect a portable EFB to the aircraft systems and/or to a power source, the following should apply:

- (1) cables should not hang loosely in a way that compromises task performance and safety; flight crew members should be able to easily secure the cables out of the way during operations (e.g. by using cable tether straps); and
- (2) cables should be of sufficient length that they do not obstruct the use of any movable device (e.g. flight controls, switches, seats, windows) in the flight crew compartment.

(f) Electromagnetic interference (EMI) demonstrations

See paragraph (b), (c) and (d) of AMC1 CAT.GEN.MPA.140.

The EMI demonstration should cover any cable connected to the EFB as well as non-certified power chargers.

(g) Batteries

See paragraph (f) of AMC1 CAT.GEN.MPA.140.

(h) Viewable stowage

The evaluation of the viewable stowage should be performed for a given location in the flight deck. This location should be documented and this information should be part of the EFB policy.

The viewable stowage should not be positioned in such a way that it creates significant obstruction to the flight crew members' view or hinders physical access to aircraft controls and/or displays and/or aircraft safety equipment, flight crew ingress or egress. The viewable stowage as positioned should allow the flight crew to retain a sufficiently extensive, clear, and undistorted view, to enable them to safely perform any manoeuvres within the operating limitations of the aircraft, including taxiing, take-off, approach, and landing. The design of the viewable stowage should allow the user easy access to any item of the EFB system, even if stowed, and notably to the EFB controls and a clear view of the EFB display while in use. The following design practices should be considered:

- (1) The viewable stowage and associated mechanisms should not impede the flight crew members in the performance of any task (whether normal, abnormal, or emergency) associated with operating any aircraft system;
- (2) When the viewable stowage is used to secure an EFB display, it should be able to be easily locked in position. If necessary, the selection of positions should be adjustable enough to accommodate a range of flight crew member preferences. In addition, the range of available movement should accommodate the expected range of users' physical abilities (i.e. anthropometric constraints). Locking mechanisms should be of a low-wear type that will minimise slippage even after extended periods of normal use;
- (3) The viewable stowage should be designed and installed so that it will sustain all foreseeable conditions relative to the flight environment (e.g. severe turbulence, hard landings) while retaining

its structural integrity and without becoming detached. The use of restraints of the device should be considered where appropriate;

- (4) A provision should be available to secure or lock the device in a position out of the way of flight crew operations when not in use. When stowed, the device and its securing mechanism should not intrude into the flight crew compartment space to the extent that they cause either visual or physical obstruction of flight controls/displays and/or ingress/egress routes;
- (5) Possible mechanical interference issues of the viewable stowage, either on the side panel (side stick controller) or on the control yoke in terms of full and free movement under all operating conditions and non-interference with buckles, etc., should be prevented;
- (6) Adequate means should be provided (e.g. hardware or software) to shut down the portable EFB when its controls are not accessible by the flight crew members when strapped in the normal seated position; and
- (7) The viewable stowage device should be easily removable from the aircraft without the use of tools.

Some types of means for securing viewable stowage may have characteristics that degrade noticeably with ageing or due to various environmental factors. In that case, the documentation should include procedures (e.g. crew procedures, checks, or maintenance actions) to ensure that the stowage characteristics remain within acceptable limits for the proposed operations. Securing means based on vacuums (e.g. suction cups) have holding capacities that decrease with pressure. It should be demonstrated that they will still perform their intended function at operating cabin altitudes or in the event of a rapid decompression.

In addition, it should be demonstrated that if the EFB moves or is separated from its stowage, or if the viewable stowage is unsecured from the aircraft (as a result of turbulence, manoeuvring, or other action), it will not jam flight controls, damage flight deck equipment, or injure flight crew members.

GM1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs)

VIEWABLE STOWAGE

- (a) Viewable stowage devices have been involved in several reported incidents worldwide. The following issues should be considered by the operator when assessing the compliance of a viewable stowage device:
 - (1) The EFB or EFB stowage interfering with controls (e.g. side sticks, tillers, PTT switches, etc.);
 - (2) Stowage or EFB cables interfering with the opening of windows;
 - (3) Stowage or EFB cables interfering with the access to oxygen masks;
 - (4) The EFB falling during take-off, cruise, or landing, interfering with flight controls, disengaging the autopilot, or hurting the flight crew; and
 - (5) Suction cups detaching following a loss of pressurisation, adding to the crew's workload.
- (b) Guidance on the safety, reliability and usability of different viewable stowage solutions and on the related operating conditions can be found in a study published by the FAA⁵.

⁵ <http://fsims.faa.gov/wdocs/other/efb%20securing%20solutions%20environmental%20test%20report.pdf>

With regard to the specific example of suction cups, the following means of mitigation are recommended:

- (1) The suction cups and the surface to which they will be attached should be properly cleaned with isopropyl alcohol or aircraft window cleaner prior to attachment of the suction cups;
- (2) Attachment surfaces should be substantially smooth and flat;
- (3) Periodic cleaning and reattachment should be performed as appropriate for the conditions of the environment in which they are used (dusty, etc.);
- (4) Suction cups should not be left attached to the aircraft windscreen for long periods of time;
- (5) Suction cups should be replaced every 6 months at a minimum; more often in extreme environments.

AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

APPLICATION CLASSIFICATION

An EFB software application is an application that is not part of the configuration of the certified aircraft and is installed on an EFB system that provides specific flight operational functions. The classification of the applications, based on their respective safety effects, is intended to provide clear divisions between such applications and, therefore, between the assessment processes applied to each.

For the purpose of the following process, 'malfunction or misuse' means any failure, malfunction of the application, or design-related human errors that can reasonably be expected in service.

(a) Determination of an application type:

AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) may be used to justify a classification, provided that the application does not feature design or functional novelties that introduce new forms of crew interaction or unusual procedures.

An application may also be recognised as a type A or type B EFB application through an appropriate ETSO authorisation granted by EASA.

If an application is not listed in AMC2 or AMC3 to CAT.GEN.MPA.141(b), presents a high degree of novelty, or is not covered by an ETSO authorisation, the classification should be established using the definitions and criteria provided hereafter.

As a first step, it should be verified that the application does not belong to the following list of applications that are not eligible for classification as either type A or type B EFB applications.

Applications that:

- (1) display information which may be tactically used by the flight crew members to check, control or deduce the aircraft position or trajectory (except for VFR operations by day), either to follow the intended navigation route or to avoid adverse weather, obstacles or traffic during the flight;
- (2) display information which may be directly used by the flight crew members to assess the real-time status of aircraft critical and essential systems, as a replacement for existing installed avionics, and/or to manage aircraft critical and essential systems following a failure;
- (3) send data to air traffic services;

are not eligible to be classified as either type A or type B EFB applications.

Then, the next steps in this process should be to:

- (1) identify any failure conditions resulting from potential losses of function or malfunction (with either detected or undetected erroneous outputs), taking into consideration any relevant factors (e.g. aircraft/system failures, operational or environmental conditions) and any established mitigation (e.g. flight crew procedures, flight crew training) that would intensify or alleviate the effects; and
- (2) classify the application as follows, based on the assessment of the safety effect of each failure condition:
 - (i) if there is no failure condition that may have a safety effect, the application should be classified as a type A EFB application;
 - (ii) if one or several failure conditions with a safety effect that is limited to minor are identified, the application should be classified as type B;
 - (iii) if more severe failure conditions are identified, the application should not be eligible for classification as an EFB application.

Software applications with failure conditions that are classified as more severe than minor are ineligible as type A or type B EFB applications.

Notes:

- The severity of the failure conditions linked to displaying a function that already exists in the certified type design, or that is already authorised through an ETSO, and used with same concept of operation (considering the intended function but also operational means of mitigation), should be considered in the assessment of the severity of the failure condition of an application and cannot be less than the severity already assessed for this function.
- The data resulting from this process may be reused by the operators in the context of the EFB risk assessment process.

(b) Miscellaneous software applications

Miscellaneous software applications are applications that support function(s) not directly related to operations conducted by the flight crew on the aircraft. Miscellaneous software applications are not considered to be EFB applications for the purposes of this AMC.

Examples of miscellaneous software applications are web browsers (not used for operational purposes), email clients, picture management applications, or even applications used by ground crews (e.g. for maintenance purposes).

AMC2 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

TYPICAL TYPE A EFB APPLICATIONS

Type A EFB applications may be but are not limited to:

- (a) browsers that display:
 - (1) the certificates and other documents required to be carried by the applicable operational regulations, including digitally created documents such as:
 - (i) the certificate of registration;



- (ii) the certificate of airworthiness (CofA);
 - (iii) the noise certificate, and its English translation if applicable;
 - (iv) the air operator certificate (AOC);
 - (v) the operations specifications relevant to the aircraft type, issued with the AOC;
 - (vi) the third-party liability insurance certificate(s); and
 - (vii) the aircraft continuing airworthiness records, including the technical log (flight crew view thereof);
- (2) some manuals and additional information and forms required to be carried by the applicable operational regulations such as:
- (i) notifications of special categories of passenger (SCPs) and special loads; and
 - (ii) passenger and cargo manifests, if applicable; and
- (3) other information within the operator's aircraft library such as:
- (i) airport diversion policy guidance, including a list of special designated airports and/or approved airports with emergency medical service (EMS) support facilities;
 - (ii) maintenance manuals;
 - (iii) emergency response guidance for aircraft incidents involving dangerous goods (see ICAO Doc 9481-AN/928);
 - (iv) aircraft parts manuals;
 - (v) service bulletins/published airworthiness directives, etc.;
 - (vi) current fuel prices at various airports;
 - (vii) trip scheduling and bid lists;
 - (viii) passenger information requests;
 - (ix) check airman and flight instructor records; and
 - (x) flight crew currency requirements;
- (b) interactive applications for crew rest calculations in the framework of flight time limitations;
- (c) interactive forms to comply with the reporting requirements of the competent authority and the operator;
- (d) applications that make use of aircraft administrative communications (AAC) to collect, process and then disseminate data that has no effect on the safe operation of an aircraft.

AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

TYPICAL TYPE B EFB APPLICATIONS

A non-exhaustive list of possible type B EFB applications is provided below. It includes:

- (a) Document browsers that display the manuals and additional information and forms required to be carried by regulations and that are necessary for the safe operation of the aircraft, such as:



- (1) the operations manual (including the minimum equipment list (MEL) and configuration deviation list (CDL));
 - (2) the aircraft flight manual, or equivalent document;
 - (3) the operational flight plan;
 - (4) meteorological information with graphical interpretation;
 - (5) air traffic services (ATS) flight plan;
 - (6) notices to airmen (NOTAMS) and aeronautical information service (AIS) briefing documentation.
- (b) Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps; these applications may offer features such as panning, zooming, scrolling, and rotation, centring and page turning, but without a display of aircraft/own-ship position, except in the specific case of day VFR operations only.
- (c) Airport moving map display (AMMD) applications.
- (d) Applications that make use of the aeronautical operational control (AOC) communications to collect, process and then disseminate operational data.
- (e) Cabin-mounted video and aircraft exterior surveillance camera displays.
- (f) Aircraft performance calculation applications that use algorithmic data or that perform calculations using software algorithms to provide aircraft performance data such as:
- (1) take-off, en-route, approach and landing, missed approach, etc., performance calculations providing limiting masses, distances, times and/or speeds, etc.;
 - (2) power settings, including reduced take-off thrust settings, etc.
- (g) Mass and balance calculation applications used to establish the mass and centre of gravity of the aircraft and to determine that the load and its distribution are such that the mass and balance limits of the aircraft are not exceeded.
- (h) Applications providing in-flight weather information.

GM1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)**TACTICAL USE**

The tactical use of an EFB application is considered to be related to short-term decision-making, while strategic use is related to long-term decision-making support.

GM2 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)**HUMAN–MACHINE INTERFACE (HMI) FOR TYPE A EFB APPLICATIONS**

An HMI assessment is not required for a type A EFB application. However, type A EFB applications should be designed in accordance with the human factor principles in order to minimise their impacts on crew workload.

~~**GM1 CAT.POL.MAB.105(e) Mass and balance data and documentation**~~~~**ON-BOARD INTEGRATED MASS AND BALANCE COMPUTER SYSTEM.**~~

~~An on-board integrated mass and balance computer system may be an aircraft installed system capable of receiving input data either from other aircraft systems or from a mass and balance system on ground, in order to generate mass and balance data as an output.~~

~~**GM2 CAT.POL.MAB.105(e) Mass and balance data and documentation**~~~~**STAND-ALONE COMPUTERISED MASS AND BALANCE SYSTEM**~~

~~A stand-alone computerised mass and balance system may be a computer, either as a part of an electronic flight bag (EFB) system or solely dedicated to mass and balance purposes, requiring input from the user, in order to generate mass and balance data as an output.~~

4.5. Proposed amendments to the AMCs/GM to Annex V (Part-SPA) to Commission Regulation (EU) No 965/2012

AMC1 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — operational approval**SUITABILITY OF THE HARDWARE****(a) Placement of the display**

The placement of the display should be consistent with the intended use of the EFB and should not create unacceptable pilot workload or require undue ‘head-down’ movements during critical phases of flight. Displays used for EFB chart applications should be located so as to be visible from the pilots’ stations with the minimum practicable deviation from their lines of vision when looking forward along the flight path.

(b) Display characteristics

Consideration should be given to the long-term degradation of a display as a result of abrasion and ageing. AMC 25-11 (paragraph 3.16a) may be used as appropriate guidance material to assess luminance and legibility aspects.

Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected in a flight crew compartment, including direct sunlight.

Users should be able to adjust the screen brightness of an EFB independently of the brightness of other displays in the flight crew compartment. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight crew compartment. Brightness

adjustment using software means may be acceptable provided that this operation does not adversely affect the flight crew workload.

Buttons and labels should have adequate illumination for night use. 'Buttons and labels' refers to hardware controls located on the display itself.

All controls should be properly labelled for their intended functions, except where no confusion is possible.

The 90-degree viewing angle on either side of each flight crew member's line of sight may be unacceptable for certain EFB applications if aspects of the display quality are degraded at large viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).

(c) Power source

The design of a portable EFB system should consider the source of electrical power, the independence of the power sources for multiple EFBs, and the potential need for an independent battery source. A non-exhaustive list of factors to be considered includes:

- (1) the possibility to adopt operational procedures to ensure an adequate level of safety (for example, a minimum preflight level of charge);
- (2) the possible redundancy of portable EFBs to reduce the risk of exhausted batteries;
- (3) the availability of backup battery packs to ensure that there is an alternative source of power.

Battery-powered EFBs that have aircraft power available for recharging the internal EFB batteries are considered to have a suitable backup power source.

For EFBs that have an internal battery power source and that are used in place of paper copies of documentation required by CAT.GEN.MPA.180, the operator should either have at least one EFB connected to an aircraft power bus, or established and documented mitigation means and procedures to ensure that sufficient power will be available during the whole flight with acceptable margins.

(d) Environmental testing

Environmental testing, in particular testing for rapid decompression, should be performed on EFBs that host applications that are required to be used during flight following a rapid decompression and/or on EFBs with an environmental operational range that is potentially insufficient with respect to the foreseeable flight crew compartment operating conditions.

The information from the rapid-decompression test of an EFB is used to establish the procedural requirements for the use of that EFB device in a pressurised aircraft. Rapid-decompression testing should follow the EUROCAE ED-14D/RTCA DO-160D (or later revisions) guidelines for rapid-decompression testing up to the maximum operating altitude of the aircraft on which the EFB is to be used.

- (1) Pressurised aircraft: if a portable EFB has successfully completed rapid-decompression testing, then no mitigating procedures for depressurisation events need to be developed. If a portable EFB has failed the rapid-decompression testing while turned ON, but successfully completed it when OFF, then procedures should ensure that at least one EFB on board the aircraft either remains OFF during the applicable flight phases, or is configured so that no damage will be incurred should

rapid decompression occur in flight at altitudes greater than 10 000 ft above mean sea level (AMSL).

If an EFB system has not undergone a rapid-decompression test or has failed the test, then alternate procedures or a paper backup should be available for the related type B EFB applications.

- (2) Non-pressurised aircraft: rapid-decompression testing is not required for an EFB used in a non-pressurised aircraft. The EFB should be demonstrated to operate reliably up to the maximum operating altitude of the aircraft. If the EFB cannot be operated at the maximum operating altitude of the aircraft, procedures should be established to preclude operation of the EFB above the maximum demonstrated EFB operating altitude while still maintaining the availability of any required aeronautical information displayed on the EFB.

The results of testing conducted on a specific EFB model configuration (as identified by the EFB hardware manufacturer) may be applicable to EFBs of the same model used in other aircraft installations, in which case these generic environmental tests may not need to be duplicated. The operator should collect and retain:

- (1) evidence of these tests that have already been accomplished; or
- (2) suitable alternate procedures to deal with the total loss of the EFB system.

Testing for rapid decompression does not need to be repeated when the EFB model identification and the battery type do not change.

The testing of operational EFBs should be avoided when possible to preclude the infliction of unknown damage to the units during testing.

This testing is not equivalent to a full environmental qualification. Operators should account for the possible loss or erroneous functioning of the EFB in abnormal environmental conditions.

The safe stowage and the use of the EFB under any foreseeable flight crew compartment environmental conditions, including turbulence, should be evaluated.

AMC2 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — Operational approval CHANGES

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

Those modifications that:

- (a) do not result in a hardware change that would require a re-evaluation of the HMI and human factors aspects in accordance with AMC1 SPA.EFB.100(b)(2);
- (b) do not bring any change to the calculation algorithms of a type B EFB application;
- (c) do not bring any change to the HMI of a type B EFB application that requires a change to the flight crew training programme or operational procedures;
- (d) introduce a new type A EFB application or modify an existing one (provided its software classification remains type A);
- (e) do not introduce any additional functionality to an existing type B EFB application; or

(f) update an existing database necessary to use an existing type B EFB application; may be introduced by the operator without the need to be approved by its competent authority.

These changes should, nevertheless, be controlled and properly tested prior to use in flight.

The modifications in the following non-exhaustive list are considered to meet these criteria:

- (a) operating system updates;
- (b) chart or airport database updates;
- (c) updates to introduce fixes (i.e. patches); and
- (d) installation and modification of a type A EFB application.

For all other types of modification, the operator should apply the change management procedure approved by the competent authority in accordance with point ARO.GEN.310(c). This includes the extension of the use of an EFB system, for which the operator already holds an approval, to another aircraft type of the operator's fleet.

In the specific case of a complete change of the hardware hosting the EFB application, the operator should demonstrate to its competent authority that the new hardware is suitable for the intended use of the EFB application as per AMC1 SPA.EFB.100(b).

AMC3 SPA.EFB.100(b) Use of electronic flight bags (EFBs)

OPERATIONAL EVALUATION TESTS

- (a) The operator should conduct an operational evaluation test which should enable verification that the relevant provisions of SPA.EFB have been satisfied before a final decision is made on the operational use of the EFB.

An operational evaluation test should be conducted by operators seeking an operational approval for the use of a type B EFB application. This does not apply to changes to a type B EFB application whose use has already been approved by the operator's competent authority.

The operator should notify its competent authority of its intention to conduct an operational evaluation test by sending a plan, which should contain at least the following information:

- (1) the starting date of the operational evaluation test;
- (2) the duration of the operational evaluation test;
- (3) the aircraft involved;
- (4) the EFB hardware and type(s) of software(s);
- (5) the EFB policy and procedure manual;
- (5) for type B EFB applications, their EFB risk assessment; and
- (6) for type B EFB applications that replace paper documentation without initial retention of a paper backup, and type B EFB applications that do not replace paper documentation:
 - (i) a simulator line-oriented flight training (LOFT) session programme; and
 - (ii) proposed schedule for the competent authority's observation flights.

The operational evaluation test should consist of an in-service proving period with a standard duration of 6 months. A reduced duration may be considered after taking into account the following criteria:

- (1) the operator's previous experience with EFBs;
- (2) the monthly number of flights operated;
- (3) the intended use of the EFB system; and
- (4) the mitigation means defined by the operator.

An operator wishing to reduce the duration of the operational evaluation test to less than 6 months should provide its competent authority with the appropriate justification in its operational evaluation plan.

The competent authority may ask for an operational evaluation test lasting more than 6 months if the number of flights operated in this period is not considered sufficient to evaluate the EFB system.

The general purpose of the in-service proving period for type B EFB applications that replace paper documentation is for the operator to demonstrate that an EFB system provides at least the levels of accessibility, usability and reliability of the paper documentation.

For all type B EFB applications, the proving period should show that:

- (1) the flight crew members are able to operate the EFB applications;
- (2) the operator's administration procedures are in place and function correctly;
- (3) the operator is capable of providing timely updates to the applications on the EFB, where a database is involved;
- (4) the introduction of the EFB does not adversely affect the operator's operating procedures, and that alternative procedures for use when the EFB system is not available provide an acceptable equivalent;
- (5) for a system including uncertified elements (hardware or software), that the system operates correctly and reliably; and
- (6) the EFB risk assessment is adequate for the type of operations intended after the operational evaluation test (with or without paper backup).

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

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

- (b) For applications that replace paper documentation without any paper backup at the commencement of operations, and for other type B EFB applications.

If an operator seeks to start operations without any paper backup, the operational evaluation test should include a simulator LOFT session to verify the use of the EFB under operational conditions including normal, abnormal and emergency conditions.

The operator should demonstrate that it will be able to continue to maintain the EFB to the required standard.

- (c) Final operational report



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

AMC4 SPA.EFB.100(b) Use of electronic flight bags (EFBs)

EFB APPLICATIONS WITH ETSO AUTHORISATIONS

EFB software applications may be approved by EASA e.g. by means of an ETSO authorisation. Such approved EFB applications are considered to be compliant with the requirements of point SPA.EFB.100(b) that are covered in the scope of the approval, provided that the EFB software is installed and used in conformity with its installation and operational instructions and limitations.

GM1 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — Operational approval

FINAL OPERATIONAL REPORT

An example of the typical items the operator may include in the final operational report is provided below:

(a) System description and classification of the EFB system:

- (1) a general description of the proposed EFB system and of the proposed hardware and software applications.

(b) Software applications:

- (1) a list of the type A EFB applications installed;
- (2) a list of the type B EFB applications installed;
- (3) a list of the miscellaneous software applications installed.

(c) Hardware:

For portable EFBs used without installed resources, relevant information or references for:

- (1) the EMI compliance demonstration;
- (2) the lithium battery compliance demonstration;
- (3) the depressurisation compliance demonstration; and
- (4) details of the power source.

For portable EFBs served by installed resources:

- (1) details of the airworthiness approval for the mounting device;
- (2) a description of the placement of the EFB display;
- (3) details of the use of installed resources;
- (4) information on the EMI compliance demonstration;
- (5) information on the lithium battery compliance demonstration;
- (6) information on the depressurisation compliance demonstration;
- (7) details of the power source;
- (8) details of any data connectivity.

For installed EFBs:



- (1) details of the airworthiness approval as installed equipment.
- (d) Certification documentation:
 - (1) EFB limitations contained within the AFM;
 - (2) guidelines for EFB application developers; and
 - (3) guidelines for EFB system suppliers.
- (e) Specific considerations for performance applications:
 - (1) details of performance data validation conducted.
- (f) Operational assessment:
 - (1) details of the EFB risk assessment conducted;
 - (2) details of the human–machine interface (HMI) assessment conducted for type B EFB applications;
 - (3) Details of flight crew operating procedures:
 - (i) for using EFB systems with other flight crew compartment systems;
 - (ii) ensuring flight crew awareness of EFB software/database revisions;
 - (iii) to mitigate and/or control workload; and
 - (iv) describing flight crew responsibilities for performance calculations;
 - (4) Details of proposed compliance monitoring oversight of the EFB system;
 - (5) Details of EFB system security measures;
 - (6) Details of EFB administration procedures, including provision of the EFB policy and procedures manual and EFB administrator qualifications;
 - (7) Details of the procedure for electronic signatures;
 - (8) Details of the system for routine EFB system maintenance;
 - (9) Details of EFB training including flight crew training:
 - (i) initial training;
 - (ii) differences training; and
 - (iii) recurrent training;
 - (10) Report of the operational evaluation test:
 - (i) proposals for the initial retention of a paper backup;
 - (ii) proposals for the commencement of operations without any paper backup;
 - (11) EFB platform/hardware description;
 - (12) A description of each software application to be included in the assessment;
 - (13) A human factors assessment for the complete EFB system, human–machine interface (HMI) and all the software applications that covers:
 - (i) the flight crew workload in both single-pilot and multi-pilot aircraft;

- (ii) the size, resolution, and legibility of symbols and text;
- (iii) for navigation chart displays: access to desired charts, access to information within a chart, grouping of information, general layout, orientation (e.g. track-up, north-up), depiction of scale information.

GM2 SPA.EFB.100(b) Use of electronic flight bags (EFBs) — Operational approval

EVALUATION BY EASA

Operators may use the results of an EFB application evaluation performed by EASA to support their application to their competent authority for an operational approval.

AMC1 SPA.EFB.100(b)(1) Use of electronic flight bags (EFBs) — Operational approval

RISK ASSESSMENT

(a) General

Prior to the use of any EFB system, the operator should conduct a risk assessment for all type B EFB applications as part of its hazard identification and risk management process.

If an operator makes use of a risk assessment established by the software developer, the operator should ensure that its specific operational environment is taken into account.

The risk assessment should:

- (1) evaluate the risks associated with the use of an EFB;
- (2) identify potential losses of function or malfunction (with detected and undetected erroneous outputs) and the associated failure scenarios;
- (3) analyse the operational consequences of these failure scenarios;
- (4) establish mitigating measures; and
- (5) ensure that the EFB system (hardware and software) achieves at least the same level of accessibility, usability, and reliability as the means of presentation it replaces.

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

This risk assessment should be defined before the beginning of the trial period and should be amended accordingly, if necessary, at the end of this trial period. The results of the trial should establish the configuration and use of the system. Once the operator has been granted the operational approval for the use of the related EFB applications, it should ensure that the related risk assessment is maintained and kept up to date.

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

(b) Assessing and mitigating the risks



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

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

- (1) The minimisation of undetected erroneous outputs from applications and assessment of the worst-credible scenario;
- (2) Erroneous outputs from the software application, including:
 - (i) a description of the corruption scenarios that were analysed; and
 - (ii) a description of the mitigation means;
- (3) Upstream processes including:
 - (i) the reliability of root data used in applications (e.g. qualified input data, such as databases produced under ED-76/DO-200A, 'Standards for Processing Aeronautical Data');
 - (ii) the software application validation and verification checks according to relevant industry standards, if applicable; and
 - (iii) the independence between application software components, e.g. robust partitioning between EFB applications and other certified software applications;
- (4) A description of the mitigation means to be used following the detected loss of an application, or of a detected erroneous output due to an internal EFB error;
- (5) The need for access to an alternate power supply in order to achieve an acceptable level of safety for certain software applications, especially if they are used as a source of required information.

As part of the mitigation means, the operator should consider establishing a reliable alternative means of providing the information available on the EFB system.

The mitigation means could be, for example, one of, or a combination of, the following:

- (1) the system design (including hardware and software);
- (2) a backup EFB device, possibly supplied from a different power source;
- (3) EFB applications being hosted on more than one platform;
- (4) a paper backup (e.g. quick reference handbook (QRH));
- (5) procedural means;
- (6) training; and
- (7) administration.

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

AMC1 SPA.EFB.100(b)(2) Use of electronic flight bags (EFBs) — Operational approval
HUMAN–MACHINE INTERFACE ASSESSMENT AND HUMAN FACTORS CONSIDERATIONS

The operator should conduct an assessment of the human–machine interface (HMI), the installation, and aspects governing crew resource management (CRM) when using the EFB system.

The HMI assessment is key to identifying acceptable mitigation means, e.g.:

- (a) to establish procedures to reduce the risk of making errors; and
- (b) to control and mitigate the additional workload related to EFB use.

The assessment should be conducted by the operator for each kind of device and application installed on the EFB. The operator should assess the integration of the EFB into the flight deck environment, considering both physical integration (e.g. anthropometrics, physical interference, etc.) and cognitive ergonomics (the compatibility of look and feel, workflows, alerting philosophy, etc.).

(a) Human–machine interface

The EFB system should provide a consistent and intuitive user interface within and across the various hosted applications and with flight deck avionics applications. This should include but is not limited to data entry methods, colour-coding philosophies, and symbology.

(b) Input devices

In choosing and designing input devices such as keyboards or cursor-control devices, applicants should consider the type of entry to be made and also flight crew compartment environmental factors, such as turbulence, that could affect the usability of that input device. Typically, the performance parameters of cursor-control devices should be tailored for the function of the intended application as well as for the flight crew compartment environment.

(c) Consistency**(1) Consistency between EFBs and applications:**

Particular attention should be paid to the consistency of all interfaces, in particular when a provider develops the software application and a different organisation integrates it into the EFB.

(2) Consistency with flight deck applications:

Whenever possible, EFB user interfaces should be consistent with the other flight deck avionics applications with regard to design philosophy, look and feel, interaction logic, and workflows.

(d) Messages and the use of colours

For any EFB system, EFB messages and reminders should be readily and easily detectable and intelligible by the flight crew under all foreseeable operating conditions.

While the regulations refer to lights, the intent should be generalised to extend it to the use of colours on displays and controls. The use of red and amber colours should be limited and carefully considered. EFB messages, both visual and aural, should be as far as practicable inhibited during critical phases of the flight.

Flashing text or symbols should be avoided in any EFB application. Messages should be prioritised and the message prioritisation scheme should be evaluated and documented.

Additionally, during critical phases of the flight, required flight information should be continuously presented without uncommanded overlays, pop-ups, or pre-emptive messages, except for those indicating the failure or degradation of the current EFB application. However, if there is a regulatory or technical standard order (TSO) requirement that is in conflict with the recommendation above, that requirement should take precedence.

(e) System error messages

If an application is fully or partially disabled, or is not visible or accessible to the user, it may be desirable to have an indication of its status available to the user upon request. Certain non-essential applications such as those for email connectivity and administrative reports may require an error message when the user actually attempts to access the function, rather than an immediate status annunciation when a failure occurs. EFB status and fault messages should be prioritised and the message prioritisation scheme should be evaluated and documented.

(f) Data entry screening and error messages

If any user-entered data is not of the correct format or type needed by the application, the EFB should not accept the data. An error message should be provided that communicates which entry is suspect and specifies what type of data is expected. The EFB system should incorporate input error checking that detects input errors at the earliest possible point during entry, rather than on completion of a possibly lengthy invalid entry.

(g) Error and failure modes

(1) Flight crew errors:

The system should be designed to minimise the occurrence and effects of flight crew errors and to maximise the identification and resolution of errors. For example, terms for specific types of data or the format in which latitude/longitude is entered should be the same across systems.

(2) Identifying failure modes:

The EFB system should alert the flight crew of EFB system failures.

(h) Responsiveness of applications

The EFB system should provide feedback to the user when a user input is performed. If the system is busy with internal tasks that preclude the immediate processing of a user input (e.g. performing calculations, self-tests, or refreshing data), the 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 the EFB system response to a user input should be consistent with an application's intended function. The feedback and system response times should be predictable in order to avoid flight crew distractions and/or uncertainty.

(i) Off-screen text and content

If the document segment is not visible in its entirety in the available display area, such as during 'zoom' or 'pan' operations, the existence of off-screen content should be clearly indicated in a consistent way. For some intended functions, it may be unacceptable if certain portions of documents are not visible. Likewise, some applications may not require an off-screen content indicator when the presence of

off-screen content is readily obvious. This should be evaluated based on the application and its intended operational function. If there is a cursor, it should be visible on the screen at all times while in use.

(j) Active regions

Active regions are regions to which special user commands apply. The active region can be text, a graphic image, a window, frame, or some other document object. These regions should be clearly indicated.

(k) Managing multiple open applications and documents

If the electronic document application supports multiple open documents, or the system allows multiple open applications, an indication of which application and/or document is active should be continuously provided. The active document is the one that is currently displayed and responds to user actions. Under non-emergency, 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 flight crew compartment applications are running and easily switch to any one of these applications. When the user returns to an application that was running in the background, it should appear in the same state as when the user left that application, with the exception of differences stemming from the progress or completion of processing performed in the background.

(l) Flight crew workload

The positioning and procedures associated with the use of the EFB should not result in an unacceptable flight crew workload. Complex, multi-step data entry tasks should be avoided during take-off, landing, and other critical phases of the flight. An evaluation of the EFB intended functions should include a qualitative assessment of the incremental flight crew workload, as well as the flight crew–system interfaces and their safety implications.

AMC1 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval

EFB ADMINISTRATOR

The operator should appoint an EFB administrator responsible for the administration of the EFB system within the operator's organisation. The EFB administrator is the primary link between the operator and the EFB system and software suppliers.

The EFB administrator function may be contracted to an external organisation in accordance with point ORO.GEN.205.

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

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

The EFB administrator should be responsible:

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



- (b) for checking potential security issues associated with the applications installed;
- (c) for hardware and software configuration management of the EFBs and for ensuring, in particular, that no unauthorised software is installed.

The EFB administrator should ensure that miscellaneous software applications do not adversely impact on the operation of the EFB and should include miscellaneous software applications in the scope of the configuration management of the EFB.

This does not preclude EFB devices from being allocated to specific flight crew members.

However, and only in the cases where it is demonstrated that miscellaneous software applications run in a way that is fully segregated and partitioned from the EFB or avionics applications (e.g. on a separate operating system on a distinct 'personal' hard drive partition that is selected when the EFB boots up), the administration of these miscellaneous software applications can be exercised by the flight crew members and not by the EFB administrator.

The EFB administrator should also be responsible:

- (d) for ensuring that only valid versions of the application software and current data packages are installed on the EFB system; and
- (e) for ensuring the integrity of the data packages used by the applications installed.

The operator should make arrangements to ensure the continuity of the management of the EFB system in the absence of the EFB administrator.

Each person involved in EFB administration should receive appropriate training in their role and should have a good working knowledge of the proposed system hardware, operating system, and relevant software applications, and also of the appropriate regulatory requirements related to the use of EFBs. The content of this training should be determined with the aid of the EFB system supplier or application supplier.

The operator should ensure that the persons involved in EFB administration keep their knowledge about the EFB system and its security up to date.

AMC2 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval EFB POLICY AND PROCEDURES MANUAL

The operator should establish procedures, documented in an EFB policy and procedures manual, to ensure that no unauthorised changes take place. The EFB policy and procedures manual may be fully or partially integrated in the operations manual.

The EFB policy and procedures manual should also address means to ensure that the content and databases of the EFB are valid and up to date, in order to ensure the integrity of the EFB data. This may include establishing revision control procedures so that flight crew members and others can ensure that the contents of the system are current and complete. These revision control procedures may be similar to the revision control procedures used for paper or other storage means.

The EFB policy and procedures manual should also clearly identify those parts of the EFB system that can be accessed and modified by the operator's EFB administration process and those parts that are only accessible by the EFB system supplier.



For data that is subject to a revision cycle control process, it should be readily evident to the user which revision cycle has been incorporated in the information obtained from the system. Procedures should specify what action to take if the applications or databases loaded on the EFB are outdated. This manual should at least include the following:

- (a) All EFB-related procedures, including:
 - (1) operating procedures;
 - (2) security procedures;
 - (3) maintenance procedures;
 - (4) software control procedures;
- (b) Management of changes to content/databases;
- (c) Notifications to crews of updates;
- (d) If any applications use information that is specific to the aircraft type or tail number, how to ensure that the correct information is installed on each aircraft;
- (e) Procedures to avoid corruption/errors when implementing changes to the EFB system; and
- (f) In cases involving multiple EFBs in the flight crew compartment, procedures to ensure that they all have the same content/databases installed.

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

AMC3 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval PROCEDURES

(a) General

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

(b) Flight crew awareness of EFB software/database revisions

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

(c) Procedures to mitigate and/or control workload



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

(d) Dispatch

The operator should establish dispatch criteria for EFB systems. The operator should ensure that the availability of the EFB system is confirmed by preflight checks. Instructions to the flight crew should clearly define the actions to be taken in the event of any EFB system deficiency.

Mitigation should be in the form of maintenance and/or operational procedures for items such as:

- (1) replacement of batteries at defined intervals as required;
- (2) ensuring there is a fully charged backup battery on board;
- (3) the flight crew checking the battery charging level before departure; and
- (4) the flight crew switching off the EFB in a timely manner when the aircraft power source is lost.

In the event of a partial or complete failure of the EFB, alternative dispatch procedures should be followed. These procedures should be included either in the minimum equipment list (MEL) or in the operations manual, and should ensure an acceptable level of safety.

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

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

(e) Maintenance

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

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

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

(f) Security



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

Procedures should be transparent, and easy to understand, to follow and to oversee:

- (1) If an EFB is based on consumer electronics (e.g. a laptop) which can be easily removed, manipulated, or replaced by a similar component, then special consideration should be given to the physical security of the hardware;
- (2) Portable EFB platforms should be subject to allocation tracking to specific aircraft or persons;
- (3) Where a system has input ports, and especially if widely known protocols are used through these ports, or internet connections are offered, then special consideration should be given to the risks associated with these ports;
- (4) Where physical media are used to update the EFB system, and especially if widely known types of physical media are used, then the operator should use technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through these media.

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

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

(g) Electronic signatures

Part-CAT and Part-M may require a signature when issuing or accepting a document (e.g. load sheet, technical logbook, notification to captain (NOTOC)). In order to be accepted as being equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and to assure the same degree of security as the handwritten or any other form of signature that they are intended to replace. AMC1 CAT.POL.MAB.105(c) provides the means to comply with the required handwritten signature or its equivalent for mass and balance documentation.

On a general basis, in the case of required signatures, an operator should have in place procedures for electronic signatures that guarantee:

- (1) their uniqueness: a signature should identify a specific individual and be difficult to duplicate;
- (2) their significance: an individual using an electronic signature should take deliberate and recognisable action to affix their signature;
- (3) their scope: the scope of the information being affirmed with an electronic signature should be clear to the signatory and to the subsequent readers of the record, record entry, or document;

- (4) their security: the security of an individual's handwritten signature is maintained by ensuring that it is difficult for another individual to duplicate or alter it;
- (5) their non-repudiation: an electronic signature should prevent a signatory from denying that they affixed a signature to a specific record, record entry, or document; the more difficult it is to duplicate a signature, the likelier it is that the signature was created by the signatory; and
- (6) their traceability: an electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. Systems using either a PIN or a password with limited validity (timewise) may be appropriate in providing positive traceability to the individual who affixed it. Advanced electronic signatures, qualified certificates and secured signature-creation devices needed to create them in the context of Regulation (EU) No 910/2014⁶ are typically not required for EFB operations.

AMC4 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval

FLIGHT CREW TRAINING

- (a) Flight crew members should be given specific training on the use of the EFB system before it is operationally used.

Training should at least include the following:

- (1) an overview of the system architecture;
- (2) preflight checks of the system;
- (3) limitations of the system;
- (4) specific training on the use of each application and the conditions under which the EFB may and may not be used;
- (5) restrictions on the use of the system, including cases where the entire system or some parts of it are not available;
- (6) procedures for normal operations, including cross-checking of data entry and computed information;
- (7) procedures to handle abnormal situations, such as a late runway change or a diversion to an alternate aerodrome;
- (8) procedures to handle emergency situations;
- (9) phases of the flight when the EFB system may and may not be used;
- (10) human factors considerations, including crew resource management (CRM), on the use of the EFB; and
- (11) additional training for new applications or changes to the hardware configuration.

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

⁶ Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (OJ L 257, 28.8.2014, p. 73).

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

EFB training should be included in the relevant training programme established and approved in accordance with ORO.FC.

(b) EFB training and checking

(1) Assumptions regarding flight crew members' previous experience

Training for the use of the EFB should be for the purpose of operating the EFB itself and the applications hosted on it, and should not be intended to provide basic competence in areas such as aircraft performance, etc. Initial EFB training, therefore, should assume basic competence in the functions addressed by the software applications installed.

Training should be adapted to the flight crew's experience and knowledge.

(2) Programmes crediting previous EFB experience

Training programmes for the EFB may give credit for trainees' previous EFB experience. For example, previous experience of an aircraft performance application hosted on a portable EFB and using similar software may be credited towards training on an installed EFB with a performance application.

(3) Initial EFB training

Training required for the granting of an aircraft type rating may not recognise variants within the type nor the installation of particular equipment. Any training for the granting of a type qualification need not, therefore, recognise the installation or the use of an EFB unless it is installed equipment across all variants of the type. However, where training for the issuing of the type rating is combined with the operator's conversion course, the training syllabus should recognise the installation of the EFB where the operator's standard operating procedures (SOPs) are dependent on its use.

Initial EFB training may consist of both ground-based and flight training, depending on the nature and complexity of the EFB system. An operator or approved training organisation (ATO) may use many methods for ground-based EFB training including written handouts or flight crew operating manual (FCOM) material, classroom instruction, pictures, videotapes, ground training devices, computer-based instruction, flight simulation training devices (FSTDs), and static aircraft training. Ground-based training for a sophisticated EFB lends itself particularly to computer-based training (CBT). Flight EFB training should be conducted by a suitably qualified person during line flying under supervision (LIFUS) or during differences or conversion training.

The following areas of emphasis should be considered when defining the initial EFB training programme:

- (i) The use of the EFB hardware and the need for proper adjustment of lighting, etc., when the system is used in flight;
- (ii) The intended use of each software application together with any limitations or prohibitions on its use;

- (iii) If an aircraft performance application is installed, proper cross-checking of data inputs and outputs;
- (iv) If a terminal chart application is installed, proper verification of the applicability of the information being used;
- (v) If a moving map display is installed, the need to avoid fixation on the map display;
- (vi) Failures of component(s) of the EFB; and
- (vii) Actions to be taken following the failure of component(s) of the EFB, including cases of battery smoke or fire.

(4) Initial EFB checking

(i) Initial ground EFB checking

The check conducted following the ground-based element of initial EFB training may be accomplished by the use of a questionnaire (oral or written) or as an automated component of the EFB CBT, depending on the nature of the training conducted.

(ii) Skill test and proficiency check

Where the operator's SOPs are dependent on the use of the EFB on the particular aircraft type or variant, proficiency in the use of the EFB should be assessed in the appropriate areas (e.g. item 1.1, item 1.5, etc., of Appendix 9 to Annex I (Part-FCL) to Commission Regulation (EU) No 1178/2011).

(iii) Operator proficiency check

Where an operator's SOPs are dependent on the use of an EFB, proficiency in its use should be assessed during the operator proficiency check (OPC). Where the OPC is performed on an FSTD not equipped with the operator's EFB, proficiency should be assessed by another acceptable means.

(iv) Line check

Where an operator's SOPs are dependent on the use of an EFB, proficiency in its use should be assessed during a line check.

(v) Areas of emphasis during EFB checking:

- (A) Proficiency in the use of each EFB application installed;
- (B) Proper selection and use of EFB displays;
- (C) Where an aircraft performance application is installed, proper cross-checking of data inputs and outputs;
- (D) Where a chart application is installed, proper checking of the validity of the information and the use of the chart clip function;
- (E) Where a moving map display is installed, maintenance of a proper outside visual scan without prolonged fixation on the EFB, especially during taxiing; and
- (F) Actions to be taken following the failure of component(s) of the EFB, including cases of battery smoke or fire.

(c) Differences or familiarisation training

When the introduction of the use of an EFB requires differences or familiarisation training to be carried out, the elements of initial EFB training should be used, as described above.

(d) Recurrent EFB training and checking

(1) Recurrent EFB training

Recurrent training is normally not required for the use of an EFB, provided the functions are used regularly in line operations. Operators should, however, include normal EFB operations as a component of the annual ground and refresher training.

In the case of mixed-fleet operations, or where the EFB is not installed across the fleet, additional recurrent training should be provided.

(2) Recurrent EFB checking

Recurrent EFB checking should be integrated in those elements of the licence proficiency check, the operator proficiency check and the line check applicable to the use of an EFB.

(e) Suitability of training devices

Where the operator's SOPs are dependent on the use of an EFB, the EFB should be present during the operator's training and checking. Where present, the EFB should be configured and operable in all respects as per the relevant aircraft. This should apply to:

- (1) the operator's conversion course;
- (2) differences or familiarisation training; and
- (3) recurrent training and checking.

Where the EFB system is based on a portable device used without any installed resources, it is recommended that the device should be present, operable and used during all phases of the flight during which it would be used under the operator's SOPs.

For all other types of EFB systems, it is recommended that the device should be installed and operable in the training device (e.g. an FFS) and used during all phases of the flight during which it would be used under the operator's SOPs. However, an operator may define an alternative means of compliance when the operator's EFB system is neither installed nor operable in the training device.

Note: It is not necessary for the EFB to be available for those parts of the training and checking that are not related to the operator or to the operator's SOPs.

AMC5 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval
PERFORMANCE AND MASS AND BALANCE APPLICATIONS

(a) General

Performance and mass and balance applications should be based on existing published data found in the AFM or performance manual, and should deliver results that allow the flight crew to operate in compliance with the appropriate air operations regulations. The applications may use algorithms or data spreadsheets to determine results. They may have the capability to interpolate within the information contained in the published data for the particular aircraft but they should not extrapolate beyond it..

To protect against intentional and unintentional modifications, the integrity of the database files related to performance and to mass and balance (the performance database, airport database, etc.) should be checked by the program before performing any calculations. This check can be run once at the start-up of the application.

Each software version should be identified by a unique version number. The compatibility between specific modules of a performance or mass and balance software application and the specific software revisions installed on a specific host (e.g. model of computer) should be ensured. The performance and mass and balance applications should record each computation performed (inputs and outputs) and the operator should have procedures in place to retain this information for at least 3 months.

The operator should ensure that aircraft performance or mass and balance data provided by the application is correct compared with the data derived from the AFM (e.g. for take-off and landing performance data) or from other reference data sources (e.g. mass and balance manuals or databases, in-flight performance manuals or databases) under a representative cross-check of conditions (e.g. for take-off and landing performance applications: take-off and landing performance data on dry, wet and contaminated runways, with different wind conditions and aerodrome pressure altitudes, etc.).

Where there is already a certified mass and balance and performance application (e.g. hosted in the flight management system (FMS)), the operator should ensure the independence of the EFB and the avionics-based algorithms.

The operator should establish procedures to define any new roles that the flight crew and, if applicable, the flight dispatcher, may have in creating, reviewing, and using performance calculations supported by EFB systems. In particular, the procedures should address cases where discrepancies are identified by the flight crew.

(b) Testing

The demonstration of the compliance of a performance or mass and balance application should include evidence of the software testing activities performed with the software version candidate for operational use.

The testing can be performed either by the operator or a third party, as long as the testing process is documented and the responsibilities identified.

The testing activities should include human-machine interface (HMI) testing, reliability testing, and accuracy testing.

HMI testing should demonstrate that the application is not error-prone and that calculation errors can be detected by the flight crew with the proposed procedures. The testing should demonstrate that the applicable HMI guidelines are followed and that the HMI is implemented as specified by the application developer and in paragraph (f).

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

Accuracy testing should demonstrate that the aircraft performance or mass and balance computations provided by the application are correct in comparison with data derived from the AFM or other reference data sources, under a representative cross section of conditions (e.g. for take-off and landing

performance applications: runway state and slope, different wind conditions and pressure altitudes, various aircraft configurations including failures with a performance impact, etc.).

The demonstration should include a sufficient number of comparison results from representative calculations throughout the entire operating envelope of the aircraft, considering corner points, routine and break points.

Operators are expected to justify that the accuracy testing covered a sufficient number of testing points with respect to the design of their software application and databases.

Any difference compared to the reference data that is judged significant should be examined and explained. When differences are due to more conservative calculations or reduced margins that were purposely built into the approved data, this approach should be clearly mentioned. Compliance with the applicable certification and operational rules needs to be demonstrated in any case.

The testing method should be described. The testing may be automated when all the required data is available in an appropriate electronic format, but in addition to conducting thorough monitoring of the correct functioning and design of the testing tools and procedures, operators are strongly suggested to perform additional manual verification. It could be based on a few scenarios for each chart or table of the reference data, including both operationally representative scenarios and 'corner-case' scenarios.

The testing of a software revision should, in addition, include non-regression testing and testing of any fix or change.

Furthermore, an operator should conduct testing related to its customisation of the applications and to any element pertinent to its operation that was not covered at an earlier stage (e.g. airport database verification).

(c) Procedures

Specific care is needed regarding the flight crew procedures concerning take-off and landing performance or mass and balance applications. The flight crew procedures should ensure that:

- (1) calculations are conducted independently by each flight crew member before data outputs are accepted for use;
- (2) a formal cross-check is made before data outputs are accepted for use; such cross-checks should utilise the independent calculations described above, together with the output of the same data from other sources on the aircraft;
- (3) a gross-error check is conducted before data outputs are accepted for use; such gross-error checks may use either a 'rule of thumb' or the output of the same data from other sources on the aircraft; and
- (4) in the event of a loss of functionality of an EFB through either the loss of a single application, or the failure of the device hosting the application, an equivalent level of safety can be maintained; consistency with the EFB risk assessment assumptions should be confirmed.

(d) Training

The training should emphasise the importance of executing all take-off and landing performance or mass and balance calculations in accordance with the SOPs to assure fully independent calculations.



Furthermore, due to optimisations included at various levels in performance applications, flight crew members may be confronted with new procedures and different aircraft behaviour (e.g. the use of multiple flap settings for take-off). The training should be designed and provided accordingly.

Where an application allows the computing of both dispatch results (from regulatory or factored calculations) and other results, the training should highlight the specificities of those results. Depending on the representativeness of the calculations, flight crew members should be trained on any operational margins that might be required.

The training should also address the identification and the review of default values, if any, and assumptions about the aircraft status or environmental conditions made by the application.

(e) Specific considerations for mass and balance applications

The basic data used for mass and balance calculations should be modifiable by the EFB administrator or by the software application provider on behalf of the EFB administrator.

In addition to the figures, a graph displaying the mass and its associated centre-of-gravity (CG) position should be provided.

(f) Human-factors-specific considerations

Input and output data (i.e. results) shall be clearly separated from each other. All the information necessary for a given calculation task should be presented together or be easily accessible.

All input and output data should include correct and unambiguous terms (names), units of measurement (e.g. kg or lb), and when applicable, an index system and a CG-position declaration (e.g. Arm/%MAC). The units should match the ones from the other flight crew compartment sources for the same kinds of data.

Airspeeds should be provided in a form that is directly useable in the flight crew compartment, unless the unit clearly indicates otherwise (e.g. KCAS). Any difference between the type of airspeed provided by the EFB application and the type provided by the aircraft flight manual (AFM) or flight crew operating manual (FCOM) performance charts should be mentioned in the flight crew guides and training material.

If the landing performance application allows the computation of both dispatch (regulatory, factored) and other results (e.g. in-flight or unfactored), flight crew members should be made aware of the computation mode used.

(1) Inputs:

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

Performance applications should enable the flight crew to check whether a certain obstacle is included in the performance calculations and/or to include new or revised obstacle information in the performance calculations.

(2) Outputs:

All critical assumptions for performance calculations (e.g. the use of thrust reversers, full or reduced thrust/power rating) should be clearly displayed. The assumptions made about any calculation should be at least as clear to the flight crew members as similar information would be on a tabular chart.

All output data should be available in numbers.

The application should indicate when a set of entries results in an unachievable operation (for instance, a negative stopping margin) with a specific message or colour scheme. This should be done in accordance with the relevant provisions on messages and the use of colours.

In order to allow a smooth workflow and to prevent data entry errors, the layout of the calculation outputs should be such that it is consistent with the data entry interface of the aircraft applications in which the calculation outputs are used (e.g. flight management systems).

(3) Modifications:

The user should be able to easily modify performance calculations, especially when making last-minute changes.

The results of calculations and any outdated input fields should be deleted whenever:

- (i) modifications are entered;
- (ii) the EFB is shut down or the performance application is closed; or
- (iii) the EFB or the performance application has been in a standby or 'background' mode too long, i.e. such that it is likely that when it is used again, the inputs or outputs will be outdated.

AMC6 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval
AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION

(a) General

An AMMD application should not be used as the primary means of navigation for taxiing and should be only used in conjunction with other materials and procedures identified within the operating concept (see paragraph e)).

When an AMMD is in use, the primary means of navigation for taxiing remains the use of normal procedures and direct visual observation out of the flight crew compartment window.

Thus, as recognised in ETSO-C165a, an AMMD application with a display of own-ship position is considered to have a minor safety effect for malfunctions that cause the incorrect depiction of aircraft position (own-ship), and the failure condition for the loss of function is classified as 'no safety effect'.

(b) Minimum requirements

AMMD software that complies with European Technical Standard Order ETSO-C165a is considered to be acceptable.

In addition, the system should provide the means to display the revision number of the software installed.

To achieve the total system accuracy requirements of ETSO-C165a, an airworthiness-approved sensor using the global positioning system (GPS) in combination with a medium-accuracy database compliant with EUROCAE ED-99C/RTCA DO-272C, 'User Requirements for Aerodrome Mapping Information,' (or later revisions) is considered one acceptable means.

Alternatively, the use of non-certified commercial off-the-shelf global navigation satellite system (COTS GNSS) receivers may be acceptable in accordance with (g).

(c) Data provided by the AMMD software application developer



The operator should ensure that the AMMD software application developer provides the appropriate data including:

- (1) installation instructions or the equivalent as per ETSO-C165a Section 2.2 that address:
 - (i) the identification of each target EFB system computing platform (including the hardware platform and the operating system version) with which this AMMD software application and database was demonstrated to be compatible;
 - (ii) the installation procedures and limitations to address the AMMD installation requirements for each applicable platform such as target computer resource requirements (e.g. memory resources) to ensure the AMMD will work properly when integrated and installed;
 - (iii) the interface description data including the requirements for external sensors providing data inputs; and
 - (iv) the verification means required to verify the proper integration of the AMMD into the target platform environment, including identification of any additional activities that the integrator of an EFB must perform to ensure that the AMMD meets its intended function, such as testing in the aircraft.
- (2) any AMMD limitations, and known installation, operational, functional, or performance issues of the AMMD.

(d) AMMD software installation in the EFB

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

- (1) ensure that the software and databases are compatible with the EFB system computing platform on which they are intended to function, including the analysis of the compatibility of the AMMD with any other type A and type B EFB applications residing on the same platform; operators should follow the program installation instructions provided by the software supplier, as applicable to the compatible EFB computer;
- (2) check that the objectives for installation, the assumptions, limitations and requirements for the AMMD, as part of the data provided by the AMMD software application developer, are satisfied;
- (3) perform any verification activities proposed by the AMMD software application developer, as well as to identify and perform any additional integration activities to be completed;
- (4) ensure the compatibility and the compliance with requirements of any data provided for other installed systems, such as a GNSS sensor and the associated latency assumptions.

(e) Operating concept

The operating concept should include, as a minimum:

- (1) operation by the flight crew, including confirmation of the effectivity;
- (2) the handling of updates;
- (3) the quality assurance function;
- (4) the handling of NOTAMs; and



(5) the provision of current maps and charts to cover the intended operation of the aircraft.

Changes to operational or procedural characteristics of the aircraft (e.g. flight crew procedures) should be documented in the operations manual or user's guide as appropriate. In particular, the documentation should highlight that the AMMD is only designed to assist flight crew members in orienting themselves on the airport surface so as to improve the flight crew members' positional awareness during taxiing, and that it is not to be used as the basis for ground manoeuvring.

(f) Training requirements

The operator may use flight crew procedures to mitigate some hazards. These should include limitations on the use of the AMMD function or application. As the AMMD could be a compelling display and the procedural restrictions are a key component of the mitigation, training should be provided in support of an AMMD.

All mitigation means that are flight crew procedures should be included in the flight crew training. Details of the AMMD training should be included in the operator's overall EFB training.

(g) Use of COTS GNSS receivers

(1) Characterisation of the receiver:

The COTS GNSS receiver candidate for use with the AMMD EFB application should be fully characterised in terms of technical specifications. It should feature an adequate number of channels (12 or more). The COTS GNSS receiver initial acquisition time for 20 metres or better accuracy should be 2 minutes or less.

The AMMD application should, in addition to position and velocity data, receive a sufficient number of parameters related to the fix quality and integrity to allow compliance with the accuracy requirements (e.g. the number of satellites and constellation geometry parameters such as dilution of position (DOP), 2D/3D fix). The data provided to the AMMD application should be based exclusively on GPS pseudo-range measurements on the L1 frequency, and data provided by GPS or a satellite-based augmentation system (SBAS).

(2) Installation aspects:

COTS GNSS receivers are C-PEDs and their installation and use should follow the provisions of point CAT.GEN.MPA.140.

If the external COTS GNSS receiver transmits wirelessly, security aspects have to be considered.

Non-certified securing systems should be assessed according to paragraph (h) of AMC1 CAT.GEN.MPA.141(a).

(3) Practical evaluation:

As variables are introduced by the placement of the COTS GNSS antenna in the aircraft and the characteristics of the aircraft itself (e.g. heated and/or shielded windshield effects), the tests have to take place on the type of aircraft in which the EFB will be operated, with the antenna positioned at the location to be used in service.

The test installation should record the data provided by the COTS GNSS receiver to the AMMD application.



The tests should consist of a statistically relevant sample of taxiing. It is recommended to include taxiing at airports that are representative of the more complex airports typically accessed by the operator. Taxiing segment samples should include data that is derived from runways and taxiways, and should include numerous turns, in particular of 90 degrees or more, and segments in straight lines at the maximum speed at which the own-ship symbol is displayed. Taxiing segment samples should include parts in areas of high buildings such as terminals. The analysis should include at least 25 inbound and/or outbound taxiing segments between the parking location and the runway.

During the tests, any unusual events (such as observing the own-ship symbol in a location on the map that is notably offset compared to the actual position, the own-ship symbol changing to non-directional when the aircraft is moving, and times when the own-ship symbol disappears from the map display) should be noted. For the test, the pilot should be instructed to diligently taxi on the centre line.

The analysis should measure the recorded COTS GNSS availability, latency, and accuracy. The analysis should be used to demonstrate that the AMMD requirements are satisfactorily complied with in terms of the total system accuracy (taking into account database errors, latency effects, display errors, and uncompensated antenna offsets) within 50 metres (95 %). The availability should be sufficient to prevent distraction or increased workload due to frequent loss of position.

When demonstrating compliance with the following requirements of DO-257A, the behaviour of the AMMD system should be evaluated in practice. It should:

- (i) indicate degraded position accuracy within 1 second (Section 2.2.4 (22)); and
- (ii) indicate a loss of positioning data within 5 seconds (Section 2.2.4 (23)); conditions to consider are both a loss of the GPS view (e.g. antenna failure) and a loss of communication between the receiver and the EFB.

AMC7 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval

HUMAN FACTORS CONSIDERATIONS FOR CHART APPLICATIONS

The navigation charts that are depicted should contain the information necessary, in an appropriate form, to conduct the operation safely. Consideration should be given to the size, resolution and position of the display to ensure legibility whilst retaining the ability to review all the information required to maintain adequate situational awareness.

AMC8 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval

IN-FLIGHT WEATHER APPLICATIONS

(a) General

An in-flight weather (IFW) application is an EFB function or application enabling the flight crew to access meteorological information. It is designed to increase situational awareness and to support the flight crew when making strategic decisions.

An IFW function or application may be used to access both information required to be on board (e.g. World Area Forecast Centre (WAFC) data) and supplemental weather information.

The use of IFW applications should be non-safety-critical and not necessary for the performance of the flight. In order for it to be non-safety-critical, IFW data should not be used to support tactical decisions and/or as a substitute for certified aircraft systems (e.g. weather radar).



Any current information from the meteorological documentation required to be carried on board or from aircraft primary systems should always prevail over the information from an IFW application.

The displayed meteorological information may be forecasted and/or observed, and may be updated on the ground and/or in flight. It should be based on data from certified meteorological service providers or other reliable sources evaluated by the operator.

The meteorological information provided to the flight crew should be, as far as possible, consistent with the information available to ground-based aviation meteorological information users (e.g. operations control centre (OCC) staff, flight dispatchers, etc.) in order to establish common situational awareness and to facilitate collaborative decision-making.

(b) Display

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

The IFW display should enable the flight crew to:

- (1) distinguish between observed and forecasted weather data;
- (2) identify the currency or age and validity time of the weather data;
- (3) access the interpretation of the weather data (e.g. the legend);
- (4) obtain positive and clear indications of any missing information or data and determine areas of uncertainty when making decisions to avoid hazardous weather; and
- (5) be aware of the status of the data link that enables the necessary IFW data exchanges.

Meteorological information in IFW applications may be displayed, for example, as an overlay over navigation charts, over geographical maps, or it may be a stand-alone weather depiction (e.g. radar plots, satellite images, etc.).

If meteorological information is overlaid on navigation charts, special consideration should be given to HMI issues in order to avoid adverse effects on the basic chart functions.

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

(c) Training and procedures

The operator should establish procedures for the use of an IFW application.

The operator should provide adequate training to the flight crew members before using an IFW application. This training should address:

- (1) limitations of the use of an IFW application:
 - (i) acceptable use (strategic planning only);
 - (ii) information required to be on board; and
 - (iii) latency of observed weather information and the hazards associated with utilisation of old information;



- (2) information on the display of weather data:
 - (i) type of displayed information (forecasted, observed);
 - (ii) symbology (symbols, colours); and
 - (iii) interpretation of meteorological information;
- (3) identification of failures and malfunctions (e.g. incomplete uplinks, data-link failures, missing info);
- (4) human factors issues:
 - (i) avoiding fixation; and
 - (ii) managing workload;

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EFB POLICY AND PROCEDURES MANUAL

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

- (a) Revision history;
- (b) List of effective pages or paragraphs;
- (c) Table of contents;
- (d) Introduction:
 - (1) Glossary of terms and acronyms;
 - (2) EFB general philosophy, environment and dataflow;
 - (3) EFB system architecture;
 - (4) Limitations of the EFB system;
 - (5) Hardware description;
 - (6) Operating system description;
 - (7) Detailed presentation of the EFB applications;
 - (8) EFB application customisation;
 - (9) Data management:
 - (i) data administration;
 - (ii) organisation and workflows;
 - (iii) data loading;
 - (iv) data revision mechanisms;
 - (v) approval workflow;
 - (vi) data publishing and dispatch;
 - (vii) customisation;



- (viii) how to manage operator-specific documents;
- (ix) airport data management;
- (x) aircraft fleet definition;
- (10) Data authoring:
 - (i) navigation and customisation;
- (e) Hardware and operating system control and configuration:
 - (1) Purpose and scope;
 - (2) Description of the following processes:
 - (i) hardware configuration and part number control;
 - (ii) operating system configuration and control;
 - (iii) accessibility control;
 - (iv) hardware maintenance;
 - (v) operating system updating;
 - (3) Responsibilities and accountability;
 - (4) Records and filing;
 - (5) Documentary references;
- (f) Software application control and configuration:
 - (1) Purpose and scope;
 - (2) Description of the following processes:
 - (i) version control;
 - (ii) software configuration management;
 - (iii) application updating process;
 - (3) Responsibilities and accountability;
 - (4) Records and filing;
 - (5) Documentary references;
- (g) Flight crew:
 - (1) Training;
 - (2) Operating procedures (normal, abnormal, and emergency);
- (h) Maintenance considerations;
 - (i) EFB security policy:
 - (1) Security solutions and procedures.

GM2 SPA.EFB.100(b)(3) Use of electronic flight bags (EFBs) — Operational approval**FLIGHT CREW TRAINING**

The following might be a typical training syllabus, provided that it does not contradict the operational suitability data established in accordance with Regulation (EU) No 748/2012⁷.

- (a) Ground-based training:
- (1) System architecture overview;
 - (2) Display unit features and use;
 - (3) Limitations of the system;
 - (4) Restrictions on the use of the system:
 - (i) phases of the flight;
 - (ii) alternate procedures (e.g. MEL);
 - (5) Applications as installed;
 - (6) Use of each application;
 - (7) Restrictions on the use of each application:
 - (i) phases of the flight;
 - (ii) alternate procedures (e.g. MEL);
 - (8) Data input;
 - (9) Cross-checking of data inputs and outputs;
 - (10) Use of data outputs;
 - (11) Alternate procedures (e.g. MEL);
- (b) Flight training:
- (1) Practical use of the display unit;
 - (2) Display unit controls;
 - (3) Data input devices;
 - (4) Selection of applications;
 - (5) Practical use of applications;
 - (6) Human factors considerations, including CRM;
 - (7) Situational awareness;
 - (8) Avoidance of fixation;
 - (9) Cross-checking of data inputs and outputs;
 - (10) Practical integration of EFB procedures into SOPs; and

⁷ Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 224, 21.8.2012, p. 1).

(11) Actions following the failure of component(s) of the EFB, including cases of battery smoke or fire.

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SECURITY

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

- (a) Individual system firewalls;
- (b) The clustering of systems with similar safety standards into domains;
- (c) Data encryption and authentication;
- (d) Virus scans;
- (e) Keeping the OS up to date;
- (f) Initiating air–ground connections only when required and always from the aircraft;
- (g) ‘Whitelists’ for allowed internet domains;
- (h) Virtual private networks (VPNs);
- (i) Granting of access rights on a need-to-have basis;
- (j) Troubleshooting procedures that consider security threats as potential root causes of EFB misbehaviour, and provide for responses to be developed to prevent future successful attacks when relevant;
- (k) Virtualisation; and
- (l) Forensic tools and procedures.

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IN-FLIGHT WEATHER APPLICATIONS

‘Reliable sources’ of data used by in-flight weather (IFW) applications are the organisations evaluated by the operator as being able to provide an appropriate level of data assurance in terms of accuracy and integrity. It is recommended that the following aspects be considered during that evaluation:

- (a) The organisation should have a quality assurance system in place that covers the data source selection, acquisition/import, processing, validity period check, and the distribution phase;
- (b) Any meteorological product provided by the organisation that is within the scope of the meteorological information included in the flight documentation as defined in point MET.TR.215(e) (Annex V (Definitions of terms used in Annexes II to XIII) to Commission Implementing Regulation (EU) 2016/1377⁸) should originate only from authoritative sources or certified providers and should not be transformed or altered, except for the purpose of packaging the data in the correct format. The organisation’s process should provide assurance that the integrity of those products is preserved in the data for use by the IFW application.

⁸ Commission Implementing Regulation (EU) 2016/1377 of 4 August 2016 laying down common requirements for service providers and the oversight in air traffic management/air navigation services and other air traffic management network functions, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 and amending Regulation (EU) No 677/2011 (OJ L 226, 19.8.2016, p. 1).

4.6. Proposed amendments to the AMCs/GM to Annex VI (Part-NCC) to Commission Regulation (EU) No 965/2012

AMC1 NCC.GEN.130 Portable electronic devices (PEDs)

TECHNICAL PREREQUISITES FOR THE USE OF PEDs

(...)

(d) Demonstration of electromagnetic compatibility

(1) EMI assessment at aircraft level

The means to demonstrate that the radio frequency (RF) emissions (intentional or non-intentional) are tolerated by aircraft systems should be as follows:

(i) To address front door coupling susceptibility for any kind of PEDs:

~~(A) RTCA, 'Guidance on allowing transmitting portable, electronic devices (T-PEDs) on aircraft', DO-294C (or later revisions), Appendix 5C; or~~

(A) EUROCAE, 'Guidance for the use of Portable Electronic Devices (PEDs) on Board Aircraft', ED-130A / RTCA DO-363 'Guidance for the Development of Portable Electronic Devices (PED) Tolerance for Civil Aircraft', Section 5; or

~~(B) RTCA, 'Aircraft design and certification for portable electronic device (PED) tolerance', DO-307 (including Change 1 or later revisions), Section 4; and~~

(B) EUROCAE, 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', ED-239 / RTCA DO-307A, Section 4.

The use of RTCA, 'Guidance on Allowing Transmitting Portable, Electronic Devices (T-PEDs) on Aircraft', DO-294C (or later revisions), Appendix 5C; or RTCA, 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', DO-307 (including Change 1 or later revisions), Section 4, may be acceptable.

(ii) To address back door coupling susceptibility for T-PEDs:

(A) EUROCAE, 'Guidance for the use of Portable Electronic Devices (PEDs) on Board Aircraft', ED-130A/RTCA DO-363, Section 6; or ~~(or later revisions), Annex 6;~~

~~(B) RTCA DO-294C (or later revisions), Appendix 6D; or~~

(B) EUROCAE, 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', ED-239 / RTCA DO-307A, Section 3.

~~(C) RTCA DO-307 (including Change 1 or later revisions), Section 3.~~

The use of EUROCAE, 'Guidance for the use of Portable Electronic Devices (PEDs) on Board Aircraft', ED-130, Annex 6; or RTCA DO-294C (or later revisions), Appendix 6D; or RTCA DO-307 (including Change 1 or later revisions), Section 3, may be acceptable.

(2) Alternative EMI assessment of C-PEDs

(i) For front door coupling:

(A) C-PEDs should comply with the levels as defined by:

- (a) EUROCAE/RTCA, 'Environmental Conditions and Test Procedures for Airborne Equipment', ED-14D/DO-160D (or later revisions), Section 21, Category M, for operation in the passenger compartment and the flight crew compartment; and
 - (b) EUROCAE ED-14ED/RTCA DO-160ED (or later revisions), Section 21, Category H, for operation in areas not accessible during the flight.
- (B) If the C-PEDs are electronic flight bags used in the flight crew compartment and if the DO-160 testing described in (A) identifies inadequate margins for interference or has not been performed, it is necessary to test the C-PED in each aircraft model in which it will be operated. The C-PED should be tested in operation on the aircraft to show that no interference occurs with the aircraft equipment. This testing should be conducted in a real aircraft, and credit may be given to other similarly equipped aircraft (meaning in particular that they have the same avionics equipment) of the same make and model as the one tested. ~~an alternative compliance method described in EASA, 'General acceptable means of compliance for airworthiness of products, part and appliances', AMC-20, AMC 20-25 ('Airworthiness and operational considerations for electronic flight bags'), may be used.~~
- (ii) ~~For~~ To address back-door coupling susceptibility for C-PEDs with transmitting capabilities, the EMI assessment described in (1)(ii) should be ~~performed~~conducted.

(...)

AMC1 NCC.GEN.131(a) Use of electronic flight bags (EFBs)

HARDWARE

The following provisions should be considered in addition to the hardware provisions of AMC1 CAT.GEN.MPA.141(a):

(a) Display characteristics

Consideration should be given to the long-term degradation of a display as a result of abrasion and ageing. AMC 25-11 (paragraph 3.16a) may be used as appropriate guidance material to assess luminance and legibility aspects.

Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected in a flight crew compartment, including direct sunlight.

Users should be able to adjust the brightness of an EFB screen independently of the brightness of other displays in the flight crew compartment. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight crew compartment. Brightness adjustment using software means may be acceptable provided that this operation does not adversely affect the flight crew workload.

Buttons and labels should have adequate illumination for night use. 'Buttons and labels' refers to hardware controls located on the display itself.

All controls should be properly labelled for their intended function, except where no confusion is possible.



The 90-degree viewing angle on either side of each flight crew member's line of sight may be unacceptable for certain EFB applications if aspects of the display quality are degraded at large viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).

(b) Power source

The design of a portable EFB system should consider the source of electrical power, the independence of the power sources for multiple EFBs, and the potential need for an independent battery source. A non-exhaustive list of factors to be considered includes:

- (1) the possibility to adopt operational procedures to ensure an adequate level of safety (for example, ensure a minimum level of charge before departure);
- (2) the possible redundancy of portable EFBs to reduce the risk of exhausted batteries;
- (3) the availability of backup battery packs to ensure an alternative source of power.

Battery-powered EFBs that have aircraft power available for recharging the internal EFB batteries are considered to have a suitable backup power source.

For EFBs that have an internal battery power source and that are used in place of paper documentation required by NCC.GEN.140, the operator should either have at least one EFB connected to an aircraft power bus or have established mitigation means and procedures to ensure that sufficient power will be available during the whole flight with acceptable margins.

(c) Environmental testing

Environmental testing, in particular testing for rapid decompression, should be performed when the EFB hosts applications that are required to be used during flight following a rapid decompression and/or when the EFB environmental operational range is potentially insufficient with respect to the foreseeable flight crew compartment operating conditions.

The information from the rapid-decompression test of an EFB is used to establish the procedural requirements for the use of that EFB device in a pressurised aircraft. Rapid-decompression testing should follow the EUROCAE ED-14D/RTCA DO-160D (or later revisions) guidelines for rapid-decompression testing up to the maximum operating altitude of the aircraft on which the EFB is to be used.

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

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

- (2) Non-pressurised aircraft: rapid-decompression testing is not required for an EFB used in a non-pressurised aircraft. The EFB should be demonstrated to reliably operate up to the maximum operating altitude of the aircraft. If the EFB cannot be operated at the maximum operating altitude of the aircraft, procedures should be established to preclude operation of the EFB above the

maximum demonstrated EFB operating altitude while still maintaining the availability of any required aeronautical information displayed on the EFB.

Testing done on a specific EFB model configuration (as identified by the EFB hardware manufacturer) may be applied to other aircraft installations and these generic environmental tests may not need to be duplicated. The operator should collect and retain:

- (1) evidence of these tests that have already been accomplished; or
- (2) suitable alternate procedures to deal with the total loss of the EFB system.

Testing for rapid decompression does not need to be repeated when the EFB model identification and the battery type do not change.

The testing of operational EFBs should be avoided when possible to preclude the infliction of unknown damage to the unit during testing.

This testing is not equivalent to a full environmental qualification. Operators should account for the possible loss or erroneous functioning of the EFB in abnormal environmental conditions.

The safe stowage and the use of the EFB under any foreseeable flight crew compartment environmental conditions, including turbulence, should be evaluated.

AMC1 NCC.GEN.131(b) Use of electronic flight bags (EFBs)

SOFTWARE

The same considerations as those in AMC1 CAT.GEN.MPA.141(b), AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) should apply in respect of EFB software.

AMC1 NCC.GEN.131(b)(1) Use of electronic flight bags (EFBs)

RISK ASSESSMENT

(a) General

Prior to the use of any EFB system, the operator should conduct a risk assessment for all type B EFB applications as part of its hazard identification and risk management process.

The operator may make use of a risk assessment established by the software developer. However, the operator should ensure that its specific operational environment is taken into account.

The risk assessment should:

- (1) evaluate the risks associated with the use of an EFB;
- (2) identify potential losses of function or malfunction (with detected and undetected erroneous outputs) and the associated failure scenarios;
- (3) analyse the operational consequences of these failure scenarios;
- (4) establish mitigating measures; and
- (5) ensure that the EFB system (hardware and software) achieves at least the same level of accessibility, usability, and reliability as the means of presentation it replaces.

In considering the accessibility, usability, and reliability of the EFB system, the operator should ensure that the failure of the complete EFB system as well as of individual applications, including any corruption

or loss of data and any erroneously displayed information, has been assessed and that the risks have been mitigated to an acceptable level.

The operator should ensure that the risk assessments for type B EFB applications are maintained and kept up to date.

When the EFB system is intended to be introduced 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 conducted.

(b) Assessing and mitigating the risks

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

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

- (1) The minimisation of undetected erroneous outputs from applications and assessment of the worst-credible scenario;
- (2) Erroneous outputs from the software application including:
 - (i) a description of the corruption scenarios that were analysed; and
 - (ii) a description of the mitigation means;
- (3) Upstream processes including:
 - (i) the reliability of root data used in applications (e.g. qualified input data, such as databases produced under ED-76/DO-200A, 'Standards for Processing Aeronautical Data');
 - (ii) the software application validation and verification checks according to appropriate industry standards, if applicable; and
 - (iii) the independence between application software components, e.g. robust partitioning between EFB applications and other certified software applications;
- (4) A description of the mitigation means to be used following the detected loss of an application, or of a detected erroneous output due to an internal EFB error;
- (5) The need for access to an alternate power supply in order to achieve an acceptable level of safety for certain software applications, especially if they are used as a source of required information.

As part of the mitigation means, the operator should consider establishing a reliable alternative means of providing the information available on the EFB system.

The mitigation means could be, for example, one of, or a combination of, the following:

- (1) the system design (including hardware and software);
- (2) a backup EFB device, possibly supplied from a different power source;
- (3) EFB applications being hosted on more than one platform;



- (4) a paper backup (e.g. quick reference handbook (QRH));
- (5) procedural means;
- (6) training; or
- (7) administration.

Depending on the outcome of their risk assessment, the operator may also consider conducting an operational evaluation test before allowing unrestricted use of its EFB devices and applications.

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

(c) Changes

The operator should update its EFB risk assessment based on the planned changes to its EFB system.

However, modifications to the operator's EFB system which:

- (1) do not bring any change to the calculation algorithms and/or to the interface of a type B EFB application;
 - (2) introduce a new type A EFB application or modify an existing one (provided its software classification remains type A);
 - (3) do not introduce any additional functionality to an existing type B EFB application;
 - (4) update an existing database necessary to use an existing type B EFB application; or
 - (5) do not require a change to the flight crew training or operational procedures,
- may be introduced by the operator without having to update its risk assessment.

These changes should, nevertheless, be controlled and properly tested prior to use in flight.

The modifications in the following non-exhaustive list are considered to meet these criteria:

- (1) operating system updates;
- (2) chart or airport database updates;
- (3) updates to introduce fixes (patches); and
- (4) installation and modification of a type A EFB application.

AMC1 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

EFB ADMINISTRATION

The operator should ensure:

- (a) that adequate support is provided to the EFB users for all the applications installed;
- (b) that potential security issues associated with the application installed have been checked;
- (c) that the hardware and software configuration is appropriately managed and that no unauthorised software is installed.

The operator should ensure that miscellaneous software applications do not adversely impact on the operation of the EFB, and should include miscellaneous software applications in the scope of the EFB configuration management;

- (d) that only a valid version of the application software and current data packages are installed on the EFB system; and
- (e) the integrity of the data packages used by the applications installed.

AMC2 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

PROCEDURES

The procedures for the administration or the use of the EFB device and the type B EFB application may be fully or partly integrated in the operations manual.

(a) General

If an EFB system generates information similar to that generated by existing certified systems, procedures should clearly identify which information source will be the primary, which source will be used for backup information, and under which conditions the backup source should be used. Procedures should define the actions to be taken by the flight crew members when information provided by an EFB system is not consistent with that from other flight crew compartment sources, or when one EFB system shows different information than the other.

(b) Flight crew awareness of EFB software/database revisions

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

(c) Workload mitigation and/or control

The operator should ensure that additional workload created by using an EFB system is adequately mitigated and/or controlled. The operator should ensure that, while the aircraft is in flight or moving on the ground, flight crew members do not become preoccupied with the EFB system at the same time. Workload should be shared between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. This should be strictly applied in flight and the operator should specify any times when the flight crew members may not use the specific EFB application.

(d) Dispatch

The operator should establish dispatch criteria for the EFB system. The operator should ensure that the availability of the EFB system is confirmed by preflight checks. Instructions to flight crew should clearly define the actions to be taken in the event of any EFB system deficiency.

Mitigation may be in the form of maintenance and/or operational procedures for items such as:



- (1) replacement of batteries at defined intervals as required;
- (2) ensuring that there is a fully charged backup battery on board;
- (3) the flight crew checking the battery charging level before departure; and
- (4) the flight crew switching off the EFB in a timely manner when the aircraft power source is lost.

In the event of a partial or complete failure of the EFB, alternative dispatch procedures should be followed. These procedures should be included either in the minimum equipment list (MEL) or in the operations manual and should ensure an acceptable level of safety.

Particular attention should be paid to alternative dispatch procedures to obtain operational data (e.g. performance data) in the event of a failure of an EFB hosting application that provides such calculated data.

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

(e) Maintenance

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

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

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

(f) Security

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

Procedures should be transparent, and easy to understand, to follow and to oversee:



- (1) If an EFB is based on consumer electronics (e.g. a laptop) which can be easily removed, manipulated, or replaced by a similar component, then special consideration should be given to the physical security of the hardware;
- (2) Portable EFB platforms should be subject to allocation tracking to specific aircraft or persons;
- (3) Where a system has input ports, and especially if widely known protocols are used through these ports or internet connections are offered, then special consideration should be given to the risks associated with these ports;
- (4) Where physical media are used to update the EFB system, and especially if widely known types of physical media are used, then the operator should use technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through these media.

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

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

(g) Electronic signatures

Some applicable requirements may require a signature when issuing or accepting a document (e.g. load sheet, technical logbook, notification to captain (NOTOC)). In order to be accepted as being equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and should assure the same degree of security as the handwritten or any other form of signature that they are intended to replace. AMC1 NCC.POL.110(c) provides means to comply with the required handwritten signature or its equivalent for mass and balance documentation.

On a general basis, in the case of required signatures, an operator should have in place procedures for electronic signatures that guarantee:

- (1) their uniqueness: a signature should identify a specific individual and be difficult to duplicate;
- (2) their significance: an individual using an electronic signature should take deliberate and recognisable action to affix their signature;
- (3) their scope: the scope of the information being affirmed with an electronic signature should be clear to the signatory and to the subsequent readers of the record, record entry, or document;
- (4) their security: the security of an individual's handwritten signature is maintained by ensuring that it is difficult for another individual to duplicate or alter it;
- (5) their non-repudiation: an electronic signature should prevent a signatory from denying that they affixed a signature to a specific record, record entry, or document; the more difficult it is to duplicate a signature, the more likely it is that the signature was created by the signatory; and
- (6) their traceability: an electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. Systems using either a PIN or a password with limited validity (timewise) may be appropriate in providing positive traceability to the individual who affixed it. Advanced electronic

signatures, qualified certificates and secured signature-creation devices needed to create them in the context of Regulation (EU) No 910/2014 are typically not required for EFB operations.

AMC3 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

FLIGHT CREW TRAINING

Flight crew members should be given specific training on the use of the EFB system before it is operationally used.

Training should at least include the following:

- (a) an overview of the system architecture;
- (b) preflight checks of the system;
- (c) limitations of the system;
- (d) specific training on the use of each application and the conditions under which the EFB may and may not be used;
- (e) restrictions on the use of the system, including cases where the entire system or some parts of it are not available;
- (f) procedures for normal operations, including cross-checking of data entry and computed information;
- (g) procedures to handle abnormal situations, such as a late runway change or a diversion to an alternate aerodrome;
- (h) procedures to handle emergency situations;
- (i) phases of the flight when the EFB system may and may not be used;
- (j) human factors considerations, including crew resource management (CRM), on the use of the EFB;
- (k) additional training for new applications or changes to the hardware configuration; and
- (l) actions following the failure of component(s) of the EFB, including cases of battery smoke or fire.

AMC4 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

PERFORMANCE AND MASS AND BALANCE APPLICATIONS

(a) General

Performance and mass and balance applications should be based on existing published data found in the AFM or performance manual, and should deliver results that allow the flight crew to operate in compliance with the appropriate air operations regulations. The applications may use algorithms or data spreadsheets to determine results. They may have the capability to interpolate within the information contained in the published data for the particular aircraft but should not extrapolate beyond it.

To protect against intentional and unintentional modifications, the integrity of the database files related to performance and mass and balance (the performance database, airport database, etc.) should be checked by the program before performing any calculations. This check can be run once at the start-up of the application.

Each software version should be identified by a unique version number. The performance and mass and balance applications should record each computation performed (inputs and outputs) and the operator should ensure that this information is retained for at least 3 months.



The operator should ensure that aircraft performance or mass and balance data provided by the application is correct compared with the data derived from the AFM (e.g. for take-off and landing performance data) or from other reference data sources (e.g. mass and balance manuals or databases, in-flight performance manuals or databases) under a representative cross-check of conditions (e.g. for take-off and landing performance applications: take-off and landing performance data on dry, wet and contaminated runways, with different wind conditions and aerodrome pressure altitudes, etc.).

Where there is already a certified mass and balance and performance application (e.g. hosted in the flight management system (FMS)), the operator should ensure the independence of the EFB and avionics-based algorithms.

The operator should define any new roles that the flight crew and, if applicable, the flight dispatcher, may have in creating, reviewing, and using performance calculations supported by EFB systems.

(b) Testing

The verification of the compliance of a performance or mass and balance application should include software testing activities performed with the software version candidate for operational use.

The testing can be performed either by the operator or a third party, as long as the testing process is documented and the responsibilities identified.

The testing activities should include reliability testing and accuracy testing.

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

Accuracy testing should demonstrate that the aircraft performance or mass and balance computations provided by the application are correct in comparison with data derived from the AFM or other reference data sources, under a representative cross section of conditions (e.g. for take-off and landing performance applications: runway state and slope, different wind conditions and pressure altitudes, various aircraft configurations including failures with a performance impact, etc.).

The verification should include a sufficient number of comparison results from representative calculations throughout the entire operating envelope of the aircraft, considering corner points, routine and break points.

Operators should ensure that the accuracy testing covered a sufficient number of testing points with respect to the design of their software application and databases.

Any difference compared to the reference data that is judged significant should be examined. When differences are due to more conservative calculations or reduced margins that were purposely built into the approved data, this approach should be clearly specified. Compliance with the applicable certification and operational rules needs to be assessed in any case.

The testing method should be described. The testing may be automated when all the required data is available in an appropriate electronic format, but in addition to conducting thorough monitoring of the correct functioning and design of the testing tools and procedures, operators are strongly suggested to perform additional manual verification. It could be based on a few scenarios for each chart or table of the reference data, including both operationally representative scenarios and 'corner-case' scenarios.

The testing of a software revision should, in addition, include non-regression testing and testing of any fix or change.

Furthermore, an operator should conduct testing related to its customisation of the applications and to any element pertinent to its operation that was not covered at an earlier stage (e.g. airport database verification).

(c) Procedures

Specific care is needed regarding flight crew procedures concerning take-off and landing performance or mass and balance applications. Flight crew procedures should ensure that:

- (1) calculations are conducted independently by each flight crew member before data outputs are accepted for use;
- (2) a formal cross-check is made before data outputs are accepted for use; such cross-checks should utilise the independent calculations described above, together with the output of the same data from other sources on the aircraft;
- (3) a gross-error check is conducted before data outputs are accepted for use; such gross-error checks may use either a 'rule of thumb' or the output of the same data from other sources on the aircraft; and
- (4) in the event of a loss of functionality of an EFB through either the loss of a single application, or the failure of the device hosting the application, an equivalent level of safety can be maintained; consistency with the EFB risk assessment assumptions should be confirmed.

(d) Training

The training should emphasise the importance of executing all take-off and landing performance or mass and balance calculations in accordance with the SOPs to assure fully independent calculations.

Furthermore, due to the optimisation at different levels brought by performance applications, the flight crew members may be confronted with new procedures and different aircraft behaviour (e.g. the use of multiple flap settings for take-off). The training should be designed and provided accordingly.

Where an application allows the computing of both dispatch results (from regulatory and factored calculations) and other results, the training should highlight the specificities of those results. Depending on the representativeness of the calculation, the flight crew should be trained on any operational margin that might be required.

The training should also address the identification and the review of default values, if any, and assumptions about the aircraft status or environmental conditions made by the application.

(e) Specific considerations for mass and balance applications

The basic data used for mass and balance calculation should be modifiable by the operator or by the software application provider on behalf of the operator.

In addition to the figures, a graph displaying the mass and its associated centre of gravity (CG) should be provided.

(f) Human-factors-specific considerations



Input and output data (i.e. results) shall be clearly separated from each other. All the information necessary for a given calculation task should be presented together or be easily accessible.

All input and output data should include correct and unambiguous terms (names), units of measurement (e.g. kg or lb), and when applicable, an index system and a CG-position declaration (e.g. Arm/%MAC). The units should match the ones from the other flight crew compartment sources for the same kinds of data.

Airspeeds should be provided in a way that is directly useable in the flight crew compartment unless the unit clearly indicates otherwise (e.g. KCAS). Any difference between the type of airspeed provided by the EFB application and the type provided by the AFM or flight crew operating manual (FCOM) performance charts should be mentioned in the flight crew guides and training material.

If the landing performance application allows the computation of both dispatch (regulatory, factored) and other results (e.g. in-flight or unfactored), the flight crew members should be made aware of the computation mode used.

(1) Inputs

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

Performance applications should allow the flight crew to check whether a certain obstacle is included in the performance calculations and/or to include new or revised obstacle information in the performance calculations.

(2) Outputs

All critical assumptions for performance calculations (e.g. the use of thrust reversers, full or reduced thrust/power rating) should be clearly displayed. The assumptions made about any calculation should be at least as clear to the flight crew members as similar information would be on a tabular chart.

All output data should be available in numbers.

The application should indicate when a set of entries results in an unachievable operation (for instance, a negative stopping margin) with a specific message or colour scheme. This should be done in accordance with the relevant provisions on messages and the use of colours.

In order to allow a smooth workflow and to prevent data entry errors, the layout of the calculation outputs should be such that it is consistent with the data entry interface of the aircraft applications in which the calculation outputs are used (e.g. flight management systems).

(3) Modifications

The user should be able to easily modify performance calculations, especially when making last-minute changes.

Calculation results and any outdated input fields should be deleted when:

- (i) modifications are entered;
- (ii) the EFB is shut down or the performance application is closed; and

- (iii) the EFB or the performance application have been in a standby or 'background' mode too long, i.e. such that it is likely that when it is used again, the inputs or outputs will be outdated.

AMC5 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)**AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION****(a) General**

An AMMD application should not be used as the primary means of navigation for taxiing and should be only used in conjunction with other materials and procedures identified within the operating concept (see paragraph (e)).

When an AMMD is in use, the primary means of navigation for taxiing remains the use of normal procedures and direct visual observation out of the flight crew compartment window.

Thus, as recognised in ETSO-C165a, an AMMD application with a display of own-ship position is considered to have a minor safety effect for malfunctions that cause the incorrect depiction of aircraft position (own-ship), and the failure condition for the loss of function is classified as 'no safety effect'.

(b) Minimum requirements

AMMD software that complies with European Technical Standard Order ETSO-C165a is considered to be acceptable.

In addition, the system should provide the means to display the revision number of the software installed.

To achieve the total system accuracy requirements of ETSO-C165a, an airworthiness-approved sensor using the global positioning system (GPS) in combination with a medium-accuracy database compliant with EUROCAE ED-99C/RTCA DO-272C, 'User Requirements for Aerodrome Mapping Information,' (or later revisions) is considered one acceptable means.

Alternatively, the use of non-certified commercial off-the-shelf global navigation satellite system (COTS GNSS) receivers may be acceptable in accordance with (g).

(c) Data provided by the AMMD software application developer

The operator should ensure that the AMMD software application developer provides the appropriate data including:

- (1) installation instructions or equivalent as per ETSO-C165a Section 2.2 addressing:
 - (i) the identification of each target EFB system computing platform (including the hardware platform and the operating system version) with which this AMMD software application and database was demonstrated to be compatible;
 - (ii) the installation procedures and limitations to address the AMMD installation requirements for each applicable platform such as target computer resource requirements (e.g. memory resources) to ensure the AMMD will work properly when integrated and installed;
 - (iii) the interface description data including the requirements for external sensors providing data inputs; and
 - (iv) the verification means required to verify the proper integration of the AMMD into the target platform environment, including identification of any additional activities that the integrator

of an EFB must perform to ensure that the AMMD meets its intended function, such as testing in the aircraft.

- (2) Any AMMD limitations, and known installation, operational, functional, or performance issues of the AMMD.

(d) AMMD software installation in the EFB

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

- (1) ensure that the software and database are compatible with the EFB system computing platform on which they are intended to function, including the analysis of the compatibility of the AMMD with any other type A and type B EFB applications residing on the same platform; operators should follow the program installation instructions provided by the software supplier, as applicable to the compatible EFB computer;
- (2) check that the objectives for installation, the assumptions, limitations and requirements for the AMMD, as part of the data provided by the AMMD software application developer, are satisfied;
- (3) perform any verification activities proposed by the AMMD software application developer, as well as to identify and perform any additional integration activities to be completed;
- (4) ensure the compatibility and the compliance with the requirements of any data provided for other installed systems, such as a GNSS sensor and the associated latency assumptions.

(e) Operating concept

The operating concept should include, as a minimum:

- (1) operation by the flight crew, including confirmation of the database validity;
- (2) the handling of updates;
- (3) the quality assurance function;
- (4) the handling of NOTAMs; and
- (5) the provision of current maps and charts to cover the intended operation of the aircraft.

Changes to operational or procedural characteristics of the aircraft (e.g. flight crew procedures) should be documented in the operations manual or user's guide as appropriate. In particular, the documentation should highlight that the AMMD is only designed to assist flight crew members in orienting themselves on the airport surface so as to improve the flight crew members' positional awareness during taxiing and that it is not to be used as the basis for ground manoeuvring.

(f) Training requirements

The operator may use flight crew procedures to mitigate some hazards. These should include limitations on the use of the AMMD function or application. As the AMMD could be a compelling display and the procedural restrictions are a key component of the mitigation, training should be provided in support of an AMMD implementation.

All mitigation means that are flight crew procedures should be included in the flight crew training. Details of the AMMD training should be included in the operator's overall EFB training.



(g) Use of COTS GNSS receivers**(1) Characterisation of the receiver:**

The COTS GNSS receiver candidate for use with the AMMD EFB application should be fully characterised in terms of technical specifications. It should feature an adequate number of channels (12 or more). The COTS GNSS receiver initial acquisition time for 20 metres or better accuracy should be 2 minutes or less.

The AMMD application should, in addition to position and velocity data, receive a sufficient number of parameters related to the fix quality and integrity to allow compliance with the accuracy requirements (e.g. number of satellites and constellation geometry parameters such as dilution of position (DOP), 2D/3D fix). The data provided to the AMMD application should be based exclusively on GPS pseudo-range measurements on the L1 frequency, and data provided by GPS or a satellite-based augmentation system (SBAS).

(2) Installation aspects:

COTS GNSS receivers are C-PEDs and their installation and use should follow the related provisions for PEDs.

If the external COTS GNSS receiver transmits wirelessly, security aspects have to be considered.

The connectivity between the COTS GNSS receiver and the EFB should be shown to be sufficiently reliable.

(3) Practical evaluation:

As variables are introduced by the placement of the COTS GNSS antenna in the aircraft and the characteristics of the aircraft itself (e.g. heated and/or shielded windshield effects), the tests have to take place on the type of aircraft in which the EFB will be operated, with the antenna positioned at the location used in service.

The test installation should record the data provided by the COTS GNSS receiver to the AMMD application.

The tests should consist of a statistically relevant sample of taxiing. It is recommended to include taxiing at airports that are representative of the more complex airports typically accessed by the operator. Taxiing segment samples should include data that is derived from runways and taxiways, and should include numerous turns, in particular of 90 degrees or more, and segments in straight lines at the maximum speed at which the own-ship symbol is displayed. Taxi segment samples should include parts in areas of high buildings such as terminals. The analysis should include at least 25 inbound and/or outbound taxiing segments between the parking location and the runway.

During the tests, any unusual events, such as observing the own-ship symbol in a location on the map that is notably offset compared to the actual position, the own-ship symbol changing to non-directional when the aircraft is moving, and times when the own-ship symbol disappears from the map display, should be noted. For the test, the pilot should be instructed to diligently taxi on the centre line.

The analysis should measure the recorded COTS GNSS availability, latency, and accuracy in comparison to the source. The analysis should be used to demonstrate that the AMMD

requirements are satisfactorily complied with in terms of the total system accuracy (taking into account database errors, latency effects, display errors, and uncompensated antenna offsets) within 50 metres (95 %).

The connectivity between the COTS GNSS receiver and the EFB should be shown to be sufficiently reliable.

When demonstrating compliance with the following requirements of DO-257A, the behaviour of the AMMD application should be evaluated in practice. It should:

- (i) indicate degraded position accuracy within 1 second (Section 2.2.4 (22)); and
- (ii) indicate a loss of positioning data within 5 seconds (Section 2.2.4 (23)); conditions to consider are both a loss of GPS view (e.g. antenna failure) and a loss of communication between the receiver and the EFB.

AMC6 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

CHART APPLICATIONS

The navigation charts that are depicted should contain the information necessary, in an appropriate form, to conduct the operation safely. Consideration should be given to the size, resolution and position of the display to ensure legibility whilst retaining the ability to review all the information required to maintain adequate situational awareness. The identification of risks associated with the human-machine interface, as part of the operator's risk assessment, is key to identifying acceptable mitigation means, e.g.:

- (a) to establish procedures to reduce the risk of making errors;
- (b) to control and mitigate the additional workload related to EFB use;
- (c) to ensure the consistency of colour-coding and symbology philosophies between EFB applications and their compatibility with other flight crew compartment applications; and
- (d) to consider aspects of crew resource management (CRM) when using an EFB system.

AMC7 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

IN-FLIGHT WEATHER APPLICATIONS

(a) General

An in-flight weather (IFW) application is an EFB function or application enabling the flight crew to access meteorological information. It is designed to increase situational awareness and to support the flight crew when making strategic decisions.

An IFW function or application may be used to access both information required to be on board (e.g. World Area Forecast Centre (WAFC) data) and supplemental weather information.

The use of IFW applications should be non-safety-critical and not necessary for the performance of the flight. In order for it to be non-safety-critical, IFW data should not be used to support tactical decisions and/or as a substitute for certified aircraft systems (e.g. weather radar).

Any current information from the meteorological data required to be carried on board or from aircraft primary systems should always prevail over the information from an IFW application.

The displayed meteorological information may be forecasted and/or observed, and may be updated on the ground and/or in flight. It should be based on data from certified meteorological services providers or other reliable sources evaluated by the operator.

The meteorological information provided to the flight crew should be as far as possible consistent with the information available to ground-based aviation meteorological information users (e.g. operations control centre (OCC) staff, flight dispatchers, etc.) in order to establish common situational awareness and to facilitate collaborative decision-making.

(b) Display

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

The IFW display should enable the flight crew to:

- (1) distinguish between observed and forecasted weather data;
- (2) identify the currency or age and validity time of the weather data;
- (3) access the interpretation of the weather data (e.g. the legend);
- (4) obtain positive and clear indications of any missing information or data and determine areas of uncertainty when making decisions to avoid hazardous weather; and
- (5) be aware of the data-link means status enabling necessary IFW data exchanges.

Meteorological information in IFW applications may be displayed, for example, as an overlay over navigation charts, over geographical maps, or it may be a stand-alone weather depiction (e.g. radar plots, satellite images, etc.).

If meteorological information is overlaid on navigation charts, special consideration should be given to HMI issues in order to avoid adverse effects on the basic chart functions.

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

(c) Training and procedures

The operator should establish procedures for the use of an IFW application.

The operator should provide adequate training to the flight crew members before using an IFW application. This training should address:

- (1) limitations of the use of an IFW application:
 - (i) acceptable use (strategic planning only);
 - (ii) information required to be on board; and
 - (iii) latency of observed weather information and the hazards associated with utilisation of old information;
- (2) information on the display of weather data:

- (i) type of displayed information (forecasted, observed);
 - (ii) symbology (symbols, colours); and
 - (iii) interpretation of meteorological information;
- (3) identification of failures and malfunctions (e.g. incomplete uplinks, data-link failures, missing info);
- (4) human factors issues:
- (i) avoiding fixation; and
 - (ii) managing workload.

GM1 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

IN-FLIGHT WEATHER APPLICATIONS

'Reliable sources' of data used by in-flight weather (IFW) applications are the organisations evaluated by the operator as being able to provide an appropriate level of data assurance in terms of accuracy and integrity. It is recommended that the following aspects be considered during that evaluation:

- (a) The organisation should have a quality assurance system in place that covers the data source selection, acquisition/import, processing, validity period check, and the distribution phase;
- (b) Any meteorological product provided by the organisation that is within the scope of meteorological information included in the flight documentation as defined in point MET.TR.215(e) (Annex V (Definitions of terms used in Annexes II to XIII) to Commission Implementing Regulation (EU) 2016/1377) should originate only from authoritative sources or certified providers and should not be transformed or altered, except for the purpose of packaging the data in the correct format. The organisation's process should provide assurance that the integrity of those products is preserved in the data for use by the IFW application.

4.7. Proposed amendments to the AMCs/GM to Annex VII (Part-NCO) to Commission Regulation (EU) No 965/2012

AMC1 NCO.GEN.125 Portable electronic devices (PEDs)

ELECTRONIC FLIGHT BAGS (EFBs) — HARDWARE

(a) EFB viewable stowage

When a viewable stowage device is used, the pilot-in-command should ensure 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, manoeuvring, or other action), it will not jam flight controls, damage flight deck equipment, or injure any person on board.

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

(b) Cables

If cables are used to connect an EFB to an aircraft system, power source or any other equipment:



- (1) the cables should not hang loosely in a way that compromises task performance and safety; flight crew should be able to easily secure the cables out of the way during operations (e.g. by using cable tether straps); and
- (2) the cables should be of sufficient length that they do not obstruct the use of any movable device on the flight deck.

AMC2 NCO.GEN.125 Portable electronic devices (PEDs)**ELECTRONIC FLIGHT BAGS (EFBs) — FUNCTIONS****(a) Familiarisation**

The pilot-in-command should familiarise themselves with the use of the EFB hardware and its applications on the ground before using them in flight for the first time.

A user guide should be available to the pilot-in-command.

(b) Check before flight

Before each flight, the pilot-in-command should conduct the following checks to ensure the continued safe operation of the EFB during the flight:

- (1) general check of the EFB operation by switching it ON and checking that the applications they intend to use in flight are adequately operative;
- (2) check of the remaining available battery power, if applicable, to ensure the availability of the EFB during the planned flight;
- (3) check of the version effectivity of the EFB databases, if applicable (e.g. for charts, performance calculation and weight and balance applications); and
- (4) check that an appropriate backup is available when a chart application or an application displaying aircraft checklists is used.

(c) Chart applications

The navigation charts that are depicted should contain the information necessary, in an appropriate form, to conduct the operation safely. Consideration should be given to the size of the display to ensure legibility.

(d) Performance calculation and weight and balance functions or applications

Prior to the first use of a performance or weight and balance function or application, and following any update of the database supporting the function or the application, a check should be performed on the ground to verify that the output of the application corresponds with the data derived from the AFM (or other appropriate sources);

(e) Airport moving map display (AMMD) application

An AMMD application should not be used as a primary means of navigation for taxiing, but as a confirmation of outside visual references.

(f) Other functions

If advanced functions on non-certified devices are used that display information related to the aircraft position in flight, navigation, surroundings in terms of e.g. terrain or traffic, or attitude, the



pilot-in-command should be aware of the potential misleading or erroneous information displayed and should only use these functions as an advisory or supplementary means.

4.8. Proposed amendments to the AMCs/GM to Annex VIII (Part-SPO) to Commission Regulation (EU) No 965/2012

AMC1 SPO.GEN.131(a) Use of electronic flight bags (EFBs)

ELECTRONIC FLIGHT BAGS (EFBs) — HARDWARE — COMPLEX AIRCRAFT

The following provisions should be considered in addition to the hardware provisions of AMC1 CAT.GEN.MPA.141(a).

SUITABILITY OF THE HARDWARE — COMPLEX AIRCRAFT

(a) Display characteristics

Consideration should be given to the long-term degradation of a display as a result of abrasion and ageing. AMC 25-11 (paragraph 3.16a) may be used as appropriate guidance material to assess luminance and legibility aspects.

Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected in a flight crew compartment, including direct sunlight.

Users should be able to adjust the screen brightness of an EFB independently of the brightness of other displays in the flight crew compartment. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight crew compartment. Brightness adjustment using software means may be acceptable provided that this operation does not adversely affect the flight crew workload.

Buttons and labels should have adequate illumination for night use. 'Buttons and labels' refers to hardware controls located on the display itself.

All controls should be properly labelled for their intended function, except where no confusion is possible.

The 90-degree viewing angle on either side of each flight crew member's line of sight may be unacceptable for certain EFB applications if aspects of the display quality are degraded at large viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).

(b) Power source

The design of a portable EFB system should consider the source of electrical power, the independence of the power sources for multiple EFBs, and the potential need for an independent battery source. A non-exhaustive list of factors to be considered includes:

- (1) the possibility to adopt operational procedures to ensure an adequate level of safety (for example, ensure a minimum level of charge before departure);
- (2) the possible redundancy of portable EFBs to reduce the risk of exhausted batteries;
- (3) the availability of backup battery packs to assure an alternative source of power.

Battery-powered EFBs that have aircraft power available for recharging the internal EFB batteries are considered to have a suitable backup power source.

For EFBs that have an internal battery power source and that are used in place of paper documentation required by SPO.GEN.140, the operator should either have at least one EFB connected to an aircraft power bus or have established mitigation means and procedures to ensure that sufficient power will be available during the whole flight with acceptable margins.

(c) Environmental testing

Environmental testing, in particular testing for rapid decompression, should be performed when the EFB hosts applications that are required to be used during flight following a rapid decompression and/or when the EFB environmental operational range is potentially insufficient with respect to the foreseeable flight crew compartment operating conditions.

The information from the rapid-decompression test of an EFB is used to establish the procedural requirements for the use of that EFB device in a pressurised aircraft. Rapid-decompression testing should follow the EUROCAE ED-14D/RTCA DO-160D (or later revisions) guidelines for rapid-decompression testing up to the maximum operating altitude of the aircraft on which the EFB is to be used.

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

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

(2) Non-pressurised aircraft: rapid-decompression testing is not required for an EFB used in a non-pressurised aircraft. The EFB should be demonstrated to reliably operate up to the maximum operating altitude of the aircraft. If the EFB cannot be operated at the maximum operating altitude of the aircraft, procedures should be established to preclude operation of the EFB above the maximum demonstrated EFB operating altitude while still maintaining availability of any required aeronautical information displayed on the EFB.

Testing done on a specific EFB model configuration (as identified by the EFB hardware manufacturer) may be applied to other aircraft installations and these generic environmental tests may not need to be duplicated. The operator should collect and retain:

- (1) evidence of these tests that have already been accomplished; or
- (2) suitable alternate procedures to deal with the total loss of the EFB system.

Testing for rapid decompression does not need to be repeated when the EFB model identification and the battery type do not change.

The testing of operational EFBs should be avoided when possible to preclude the infliction of unknown damage to the unit during testing.

This testing is not equivalent to a full environmental qualification. Operators should account for the possible loss or erroneous functioning of the EFB in abnormal environmental conditions.

The safe stowage and the use of the EFB under any foreseeable flight crew compartment environmental conditions, including turbulence, should be evaluated.

AMC2 SPO.GEN.131(a) Use of electronic flight bags (EFBs)

ELECTRONIC FLIGHT BAGS (EFBs) — HARDWARE — NON-COMPLEX AIRCRAFT

The same considerations as those in AMC1 NCO.GEN.125 should apply in respect of EFB hardware.

AMC1 SPO.GEN.131(b) Use of electronic flight bags (EFBs)

ELECTRONIC FLIGHT BAGS (EFBs) — SOFTWARE — COMPLEX AIRCRAFT

The same considerations as those in AMC1 CAT.GEN.MPA.141(b), AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) should apply in respect of EFB software.

AMC2 SPO.GEN.131(b) Use of electronic flight bags (EFBs)

ELECTRONIC FLIGHT BAGS (EFBs) — SOFTWARE — NON-COMPLEX AIRCRAFT

The same considerations as those in AMC2 NCO.GEN.125 should apply in respect of EFB software.

AMC1 SPO.GEN.131(b)(1) Use of electronic flight bags (EFBs)

RISK ASSESSMENT — COMPLEX AIRCRAFT

(a) General

Prior to the use of any EFB system, the operator should conduct for all type B EFB applications a risk assessment as part of its hazard identification and risk management process.

The operator may make use of a risk assessment established by the software developer. However, the operator should ensure that its specific operational environment is taken into account.

The risk assessment should:

- (1) evaluate the risks associated with the use of an EFB;
- (2) identify potential losses of function or malfunction (with detected and undetected erroneous outputs) and the associated failure scenarios;
- (3) analyse the operational consequences of these failure scenarios;
- (4) establish mitigating measures; and
- (5) ensure that the EFB system (hardware and software) achieves at least the same level of accessibility, usability, and reliability as the means of presentation it replaces.

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

This risk assessment should be defined before the beginning of the trial period and should be amended accordingly, if necessary, at the end of this trial period. The results of the trial should establish the configuration and use of the system.

When the EFB system is intended to be introduced 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 conducted.

(b) Assessing and mitigating the risks

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

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

- (1) The minimisation of undetected erroneous outputs from applications and assessment of the worst-credible scenario;
- (2) Erroneous outputs from the software application including:
 - (i) a description of the corruption scenarios; and
 - (ii) a description of the mitigation means;
- (3) Upstream processes including:
 - (i) the reliability of root data used in applications (e.g. qualified input data, such as databases produced under ED-76/DO-200A 'Standards for Processing Aeronautical Data');
 - (ii) the software application validation and verification checks according to appropriate industry standards, if applicable; and
 - (iii) the independence between application software components, e.g. robust partitioning between EFB applications and other certified software applications;
- (4) A description of the mitigation means to be used following the detected loss of an application, or of a detected erroneous output due to an internal EFB error;
- (5) The need for access to an alternate power supply in order to achieve an acceptable level of safety for certain software applications, especially if they are used as a source of required information.

As part of the mitigation means, the operator should consider establishing a reliable alternative means of providing the information available on the EFB system.

The mitigation means could be, for example, one of, or a combination of, the following:

- (1) the system design (including hardware and software);
- (2) a backup EFB device, possibly supplied from a different power source;
- (3) EFB applications being hosted on more than one platform;
- (4) a paper backup (e.g. quick reference handbook (QRH));
- (5) procedural means;
- (6) training; and

(7) administration.

Depending on the outcome of its risk assessment, the operator may also consider conducting an operational evaluation test before allowing unrestricted use of its EFB devices and applications.

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

(c) Changes

The operator should update its EFB risk assessment based on the planned changes to its EFB system.

However, modifications to the operator's EFB system which:

- (1) do not bring any change to the calculation algorithms and/or to the HMI of a type B EFB application;
- (2) introduce a new type A EFB application or modify an existing one (provided its software classification remains type A);
- (3) do not introduce any additional functionality to an existing type B EFB application;
- (4) update an existing database necessary to use an existing type B EFB application; or
- (5) do not require a change to the flight crew training or operational procedures,

may be introduced by the operator without having to update its risk assessment.

These changes should, nevertheless, be controlled and properly tested prior to use in flight.

The modifications in the following non-exhaustive list are considered to meet these criteria:

- (1) operating system updates;
- (2) chart or airport database updates;
- (3) updates to introduce fixes (patches); and
- (4) installation and modification of a type A EFB application.

GM1 SPO.GEN.131(b)(1) Use of electronic flight bags (EFBs)

RISK ASSESSMENT— NON-COMPLEX AIRCRAFT

The operator of non-complex motor-powered aircraft should at least perform the check before the flight actions described in paragraph (b) of AMC2 NCO.GEN.125.

AMC1 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

EFB ADMINISTRATION — COMPLEX AIRCRAFT

The operator should ensure:

- (a) that adequate support is provided to the EFB users for all the applications installed;
- (b) that potential security issues associated with the application installed have been checked;
- (c) that hardware and software configuration is appropriately managed and that no unauthorised software is installed.

The operator should ensure that miscellaneous software applications do not adversely impact on the operation of the EFB and should include miscellaneous software applications in the scope of EFB configuration management;

- (d) that only a valid version of the application software and current data packages are installed on the EFB system; and
- (e) the integrity of the data packages used by the applications installed.

AMC2 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

PROCEDURES — COMPLEX AIRCRAFT

The procedures for the administration or the use of the EFB device and the type B EFB application may be fully or partly integrated in the operations manual.

(a) General

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

(b) Flight crew awareness of EFB software/database revisions

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

(c) Workload mitigation and/or control

The operator should ensure that additional workload created by using an EFB system is adequately mitigated and/or controlled. The operator should ensure that, while the aircraft is in flight or moving on the ground, flight crew members do not become preoccupied with the EFB system at the same time. Workload should be shared between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. This should be strictly applied in flight and the operator should specify any times when the flight crew members may not use the specific EFB application.

(d) Dispatch

The operator should establish dispatch criteria for the EFB system, when type B EFB applications that replace paper products are hosted. The operator should ensure that the availability of the EFB system is confirmed by preflight checks. Instructions to the flight crew should clearly define the actions to be taken in the event of any EFB system deficiency.

Mitigation may be in the form of maintenance and/or operational procedures for items such as:



- (1) replacement of batteries at defined intervals as required;
- (2) ensuring that there is a fully charged backup battery on board;
- (3) the flight crew checking the battery charging level before departure; and
- (4) the flight crew switching off the EFB in a timely manner when the aircraft power source is lost.

In the event of a partial or complete failure of the EFB, alternative dispatch procedures should be followed. These procedures should be included either in the minimum equipment list (MEL) or in the operations manual and should ensure an acceptable level of safety.

Particular attention should be paid to alternative dispatch procedures to obtain operational data (e.g. performance data) in the event of a failure of an EFB that hosts an application providing such calculated data.

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

(e) Maintenance

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

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

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

(f) Security

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

Procedures should be transparent, and easy to understand, to follow and to oversee:

- (1) If an EFB is based on consumer electronics (e.g. a laptop) which can be easily removed, manipulated, or replaced by a similar component, then special consideration should be given to the physical security of the hardware;
- (2) Portable EFB platforms should be subject to allocation tracking to specific aircraft or persons;
- (3) Where a system has input ports, and especially if widely known protocols are used through these ports or internet connections are offered, then special consideration should be given to the risks associated with these ports;
- (4) Where physical media are used to update the EFB system, and especially if widely known types of physical media are used, then the operator should use technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through these media.

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

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

(g) Electronic signatures

Some applicable requirements may require a signature when issuing or accepting a document (e.g. load sheet, technical logbook, notification to captain (NOTOC)). In order to be accepted as being equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and should assure the same degree of security as the handwritten or any other form of signature that they are intended to replace. GM1 SPO.POL.115 provides guidance related to the required handwritten signature or its equivalent for mass and balance documentation.

On a general basis, in the case of legally required signatures, an operator should have in place procedures for electronic signatures that guarantee:

- (1) their uniqueness: a signature should identify a specific individual and be difficult to duplicate;
- (2) their significance: an individual using an electronic signature should take deliberate and recognisable action to affix their signature;
- (3) their scope: the scope of the information being affirmed with an electronic signature should be clear to the signatory and to the subsequent readers of the record, record entry, or document;
- (4) their security: the security of an individual's handwritten signature is maintained by ensuring that it is difficult for another individual to duplicate or alter it;
- (5) their non-repudiation: an electronic signature should prevent a signatory from denying that they affixed a signature to a specific record, record entry, or document; the more difficult it is to duplicate a signature, the more likely it is that the signature was created by the signatory; and
- (6) their traceability: an electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. Systems using either a PIN or a password with limited validity (timewise) may be appropriate in providing positive traceability to the individual who affixed it. Advanced electronic

signatures, qualified certificates and secured signature-creation devices needed to create them in the context of Regulation (EU) No 910/2014 are typically not required for EFB operations.

AMC3 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

FLIGHT CREW TRAINING — COMPLEX AIRCRAFT

Flight crew members should be given specific training on the use of the EFB system before it is operationally used.

Training should at least include the following:

- (a) an overview of the system architecture;
- (b) preflight checks of the system;
- (c) limitations of the system;
- (d) specific training on the use of each application and the conditions under which the EFB may and may not be used;
- (e) restrictions on the use of the system, including cases where the entire system or some parts of it are not available;
- (f) procedures for normal operations, including cross-checking of data entry and computed information;
- (g) procedures to handle abnormal situations, such as a late runway change or a diversion to an alternate aerodrome;
- (h) procedures to handle emergency situations;
- (i) phases of the flight when the EFB system may and may not be used;
- (j) human factors considerations, including crew resource management (CRM);
- (k) additional training for new applications or changes to the hardware configuration; and
- (l) actions following the failure of component(s) of the EFB, including cases of battery smoke or fire.

AMC4 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

PERFORMANCE AND MASS AND BALANCE APPLICATIONS — COMPLEX AIRCRAFT

(a) General

Performance and mass and balance applications should be based on existing published data found in the AFM or performance manual, and should deliver results that allow the flight crew to operate in compliance with the appropriate air operations regulations. The applications may use algorithms or data spreadsheets to determine results. They may have the capability to interpolate within the information contained in the published data for the particular aircraft but should not extrapolate beyond it.

To protect against intentional and unintentional modifications, the integrity of the database files related to performance and mass and balance (the performance database, airport database, etc.) should be checked by the program before performing any calculations. This check can be run once at the start-up of the application.

Each software version should be identified by a unique version number. The performance and mass and balance applications should record each computation performed (inputs and outputs) and the operator should ensure that this information is retained for at least 3 months.



The operator should ensure that aircraft performance or mass and balance data provided by the application is correct compared with the data derived from the AFM (e.g. for take-off and landing performance data) or from other reference data sources (e.g. mass and balance manuals or databases, in-flight performance manuals or databases) under a representative cross-check of conditions (e.g. for take-off and landing performance applications: take-off and landing performance data on dry, wet and contaminated runways, with different wind conditions and aerodrome pressure altitudes, etc.).

Where there is already a certified mass and balance and performance application (e.g. hosted in the flight management system (FMS)), the operator should ensure the independence of the EFB and the avionics-based algorithms.

The operator should define any new roles that the flight crew and, if applicable, the flight dispatcher, may have in creating, reviewing, and using performance calculations supported by EFB systems.

(b) Testing

The verification of compliance of a performance or mass and balance application should include software testing activities performed with the software version candidate for operational use.

The testing can be performed either by the operator or a third party, as long as the testing process is documented and the responsibilities identified.

The testing activities should include reliability testing and accuracy testing.

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

Accuracy testing should demonstrate that the aircraft performance or mass and balance computations provided by the application are correct in comparison with data derived from the AFM or other reference data sources, under a representative cross section of conditions (e.g. for take-off and landing performance applications: runway state and slope, different wind conditions and pressure altitudes, various aircraft configurations including failures with a performance impact, etc.).

The verification should include a sufficient number of comparison results from representative calculations throughout the entire operating envelope of the aircraft, considering corner points, routine and break points.

Operators should ensure that the accuracy testing covered a sufficient number of testing points with respect to the design of their software application and databases.

Any difference compared to the reference data that is judged significant should be examined. When differences are due to more conservative calculations or reduced margins that were purposely built into the approved data, this approach should be clearly specified. Compliance with the applicable certification and operational rules needs to be assessed in any case.

The testing method should be described. The testing may be automated when all the required data is available in an appropriate electronic format, but in addition to conducting thorough monitoring of the correct functioning and design of the testing tools and procedures, operators are strongly suggested to perform additional manual verification. It could be based on a few scenarios for each chart or table of the reference data, including both operationally representative scenarios and 'corner-case' scenarios.

The testing of a software revision should, in addition, include non-regression testing and testing of any fix or change.

Furthermore, an operator should conduct testing related to its customisation of the applications and to any element pertinent to its operation that was not covered at an earlier stage (e.g. airport database verification).

(c) Procedures

Specific care is needed regarding the crew procedures concerning take-off and landing performance or mass and balance applications. The crew procedures should ensure that:

- (1) calculations are conducted independently by each flight crew member before data outputs are accepted for use;
- (2) a formal cross-check is made before data outputs are accepted for use; such cross-checks should utilise the independent calculations described above, together with the output of the same data from other sources on the aircraft;
- (3) a gross-error check is conducted before data outputs are accepted for use; such gross-error checks may use either a 'rule of thumb' or the output of the same data from other sources on the aircraft; and
- (4) in the event of a loss of functionality of an EFB through either the loss of a single application, or the failure of the device hosting the application, an equivalent level of safety can be maintained; consistency with the EFB risk assessment assumptions should be confirmed.

(d) Training

The training should emphasise the importance of executing all take-off and landing performance or mass and balance calculations in accordance with the SOPs to assure fully independent calculations.

Furthermore, due to the optimisation at different levels brought by performance applications, the flight crew members may be confronted with new procedures and different aircraft behaviour (e.g. the use of multiple flap settings for take-off). The training should be designed and provided accordingly.

Where an application allows the computing of both dispatch results (from regulatory and factored calculations) and other results, the training should highlight the specificities of those results. Depending on the representativeness of the calculation, the flight crew should be trained on any operational margins that might be required.

The training should also address the identification and the review of default values, if any, and assumptions about the aircraft status or environmental conditions made by the application.

(e) Specific considerations for mass and balance applications

The basic data used for mass and balance calculations should be modifiable by the operator or by the software application provider on behalf of the operator.

In addition to the figures, a graph displaying the mass and its associated centre of gravity (CG) should be provided.

(f) Human-factors-specific considerations



Input data and output data (i.e. results) shall be clearly separated from each other. All the information necessary for a given calculation task should be presented together or be easily accessible.

All input and output data should include correct and unambiguous terms (names), units of measurement (e.g. kg or lb), and when applicable, an index system and a CG-position declaration (e.g. Arm/%MAC). The units should match the ones from the other flight crew compartment sources for the same kinds of data.

Airspeeds should be provided in a way that is directly useable in the flight crew compartment, unless the unit clearly indicates otherwise (e.g. KCAS). Any difference between the type of airspeed provided by the EFB application and the type provided by the AFM or flight crew operating manual (FCOM) performance charts should be mentioned in the flight crew guides and training material.

If the landing performance application allows the computation of both dispatch results (regulatory, factored) and other results (e.g. in-flight or unfactored), the flight crew members should be made aware of the computation mode used.

(1) Inputs

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

Performance applications should allow the flight crew to check whether a certain obstacle is included in the performance calculation and/or to include new or revised or new obstacle information in the performance calculations.

(2) Outputs

All critical assumptions for performance calculation (e.g. the use of thrust reversers, full or reduced thrust/power rating) should be clearly displayed. The assumptions made about any calculation should be at least as clear to the flight crew members as similar information would be on a tabular chart.

All output data should be available in numbers.

The application should indicate when a set of entries results in an unachievable operation (for instance, a negative stopping margin) with a specific message or colour scheme. This should be done in accordance with the relevant provisions on messages and the use of colours.

In order to allow a smooth workflow and to prevent data entry errors, the layout of the calculation outputs should be such that it is consistent with the data entry interface of the aircraft applications in which the calculation outputs are used (e.g. flight management systems).

(3) Modifications

The user should be able to easily modify performance calculations, especially when making last-minute changes.

The results of calculations and any outdated input fields should be deleted whenever:

- (i) modifications are entered;
- (ii) the EFB is shut down or the performance application is closed; or

- (iii) the EFB or the performance application has been in a standby or 'background' mode too long, i.e. such that it is likely that when it is used again, the inputs or outputs will be outdated.

AMC5 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)**AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION — COMPLEX AIRCRAFT****(a) General**

An AMMD application should not be used as the primary means of navigation for taxiing and should be only used in conjunction with other materials and procedures identified within the operating concept (see paragraph (e)).

When an AMMD is in use, the primary means of navigation for taxiing remains the use of normal procedures and direct visual observation out of the flight crew compartment window.

Thus, as recognised in ETSO-C165a, an AMMD application with a display of own-ship position is considered to have a minor safety effect for malfunctions that cause the incorrect depiction of aircraft position (own-ship), and the failure condition for the loss of function is classified as 'no safety effect'.

(b) Minimum requirements

AMMD software that complies with European Technical Standard Order ETSO-C165a is considered to be acceptable.

In addition, the system should provide the means to display the revision number of the software installed.

To achieve the total system accuracy requirements of ETSO-C165a, an airworthiness-approved sensor using the global positioning system (GPS) in combination with a medium-accuracy database compliant with EUROCAE ED-99C/RTCA DO-272C, 'User Requirements for Aerodrome Mapping Information' (or later revisions) is considered one acceptable means.

Alternatively, the use of non-certified commercial off-the-shelf global navigation satellite system (COTS GNSS) receivers may be acceptable in accordance with (g).

(c) Data provided by the AMMD software application developer

The operator should ensure that the AMMD software application developer provides the appropriate data including:

(1) installation instructions or equivalent as per ETSO-C165a Section 2.2 addressing:

- (i) the identification of each target EFB system computing platform (including the hardware platform and the operating system version) with which this AMMD software application and database was demonstrated to be compatible;
- (ii) the installation procedures and limitations to address the AMMD installation requirements for each applicable platform such as target computer resource requirements (e.g. memory resources) to ensure the AMMD will work properly when integrated and installed;
- (iii) the interface description data including the requirements for external sensors providing data inputs; and

(iv) the verification means required to verify the proper integration of the AMMD into the target platform environment, including identification of any additional activities that the integrator of an EFB must perform to ensure that the AMMD meets its intended function, such as testing in the aircraft;

(2) any AMMD limitations, and known installation, operational, functional, or performance issues of the AMMD.

(d) AMMD software installation in the EFB

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

(1) ensure that the software and databases are compatible with the EFB system computing platform on which they are intended to function, including the analysis of the compatibility of the AMMD with any other type A and type B EFB applications residing on the same platform; operators should follow the program installation instructions provided by the software supplier, as applicable to the compatible EFB computer;

(2) check that the objectives for installation, the assumptions, limitations and requirements for the AMMD, as part of the data provided by the AMMD software application developer, are satisfied;

(3) perform any verification activities proposed by the AMMD software application developer, as well as to identify and perform any additional integration activities to be completed;

(4) ensure the compatibility and the compliance with requirements of any data provided for other installed systems, such as a GNSS sensor and the associated latency assumptions.

(e) Operating concept

The operating concept should include, as a minimum:

(1) operation by the flight crew, including confirmation of the effectivity;

(2) the handling of updates;

(3) the quality assurance function;

(4) the handling of NOTAMs; and

(5) the provision of current maps and charts to cover the intended operation of the aircraft.

Changes to operational or procedural characteristics of the aircraft (e.g. flight crew procedures) should be documented in the operations manual or user's guide as appropriate. In particular, the documentation should highlight that the AMMD is designed to assist flight crew members in orienting themselves on the airport surface so as to improve the flight crew members' positional awareness during taxiing and that it is not to be used as the basis for ground manoeuvring.

(f) Training requirements

The operator may use flight crew procedures to mitigate some hazards. These should include limitations on the use of the AMMD function or application. As the AMMD could be a compelling display and the procedural restrictions are a key component of the mitigation, training should be provided in support of an AMMD implementation.

All mitigation means that are flight crew procedures should be included in the flight crew training. Details of the AMMD training should be included in the operator's overall EFB training.

(g) Use of COTS GNSS receivers

(1) Characterisation of the receiver:

The COTS GNSS receiver candidate for use with the AMMD EFB application should be fully characterised in terms of technical specifications. It should feature an adequate number of channels (12 or more). The COTS GNSS receiver initial acquisition time for 20 metres or better accuracy should be 2 minutes or less.

The AMMD application should, in addition to position and velocity data, receive a sufficient number of parameters related to the fix quality and integrity to allow compliance with the accuracy requirements (e.g. number of satellites and constellation geometry parameters such as dilution of position (DOP), 2D/3D fix). The data provided to the AMMD application should be based exclusively on GPS pseudo-range measurements on the L1 frequency and data provided by GPS or a satellite-based augmentation system (SBAS).

(2) Installation aspects:

COTS GNSS receivers are C-PEDs and their installation and use should follow the related provisions for PEDs.

If the external COTS GNSS receiver transmits wirelessly, security aspects have to be considered.

The connectivity between the COTS GNSS receiver and the EFB should be shown to be sufficiently reliable.

(3) Practical evaluation:

As variables are introduced by the placement of the COTS GNSS antenna in the aircraft and the characteristics of the aircraft itself (e.g. heated and/or shielded windshield effects), the tests have to take place on the type of aircraft in which the EFB will be operated, with the antenna positioned at the location used in service.

The test installation should record the data provided by the COTS GNSS receiver to the AMMD application.

The tests should consist of a statistically relevant sample of taxiing. It is recommended to include taxiing at airports that are representative of the more complex airports typically accessed by the operator. Taxiing segment samples should include data that is derived from runways and taxiways, and should include numerous turns, in particular of 90 degrees or more, and segments in straight lines at the maximum speed at which the own-ship symbol is displayed. Taxiing segment samples should include parts in areas of high buildings such as terminals. The analysis should include at least 25 inbound and/or outbound taxiing segments between the parking location and the runway.

During the tests, any unusual events, such as observing the own-ship symbol in a location on the map that is notably offset compared to the actual position, the own-ship symbol changing to non-directional when the aircraft is moving, and times when the own-ship symbol disappears from the map display, should be noted. For the test, the pilot should be instructed to diligently taxi on the centre line.

The analysis should measure the recorded COTS GNSS availability, latency, and accuracy in comparison to the source. The analysis should be used to demonstrate that the AMMD requirements are satisfactorily complied with in terms of the total system accuracy (taking into account database error, latency effects, display errors, and uncompensated antenna offsets) within 50 metres (95 %).

The connectivity between the COTS GNSS receiver and the EFB should be shown to be sufficiently reliable.

When demonstrating compliance with the following requirements of DO-257A, the behaviour of the AMMD application should be evaluated in practice. It should:

- (i) indicate degraded position accuracy within 1 second (Section 2.2.4 (22)); and
- (ii) indicate a loss of positioning data within 5 seconds (Section 2.2.4 (23)); conditions to consider are both a loss of the GPS view (e.g. antenna failure) and a loss of communication between the receiver and the EFB.

AMC6 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

CHART APPLICATIONS — COMPLEX AIRCRAFT

The navigation charts that are depicted should contain the information necessary, in an appropriate form, to conduct the operation safely. Consideration should be given to the size, resolution and position of the display to ensure legibility whilst retaining the ability to review all information required to maintain adequate situational awareness. The identification of risks associated with the human-machine interface, as part of the operator's risk assessment, is key to identifying acceptable mitigation means, e.g.:

- (a) to establish procedures to reduce the risk of making errors;
- (b) to control and mitigate the additional workload related to EFB use;
- (c) to ensure the consistency of colour-coding and symbology philosophies between EFB applications and their compatibility with other flight crew compartment applications; and
- (d) to consider aspects of crew resource management (CRM) when using an EFB system.

AMC7 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

IN-FLIGHT WEATHER APPLICATIONS — COMPLEX AIRCRAFT

(a) General

An in-flight weather (IFW) application is an EFB function or application enabling the flight crew to access meteorological information. It is designed to increase situational awareness and to support the flight crew when making strategic decisions.

An IFW function or application may be used to access both information required to be on board (e.g. World Area Forecast Centre (WAFC) data) and supplemental weather information.

The use of IFW applications should be non-safety-critical and not necessary for the performance of the flight. In order to be non-safety-critical, IFW data should not be used to support tactical decisions and/or as a substitute for certified aircraft systems (e.g. weather radar).

Any current information from the meteorological documentation required to be on board or from aircraft primary systems should always prevail over the information from an IFW application.

The displayed meteorological information may be forecasted and/or observed, and may be updated on the ground and/or in flight. It should be based on data from certified meteorological services providers or other reliable sources evaluated by the operator.

The meteorological information provided to the flight crew should be as far as possible consistent with the information available to ground-based aviation meteorological information users (e.g. operations control centre (OCC), dispatchers, etc.) in order to establish common situational awareness and to facilitate collaborative decision-making.

(b) Display

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

The IFW display should enable the flight crew to:

- (1) distinguish between observed and forecasted weather data;
- (2) identify the currency or age and validity time of the weather data;
- (3) access the interpretation of the weather data (e.g. the legend);
- (4) obtain positive and clear indications of any missing information or data and determine areas of uncertainty when making decisions to avoid hazardous weather; and
- (5) be aware of the data-link means status enabling necessary IFW data exchanges.

Meteorological information in IFW applications may be displayed, for example, as an overlay over navigation charts, over geographical maps, or it may be a stand-alone weather depiction (e.g. radar plots, satellite images, etc.).

If meteorological information is overlaid on navigation charts, special consideration should be given to HMI issues in order to avoid adverse effects on the basic chart functions.

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

(c) Training and procedures

The operator should establish procedures for the use of an IFW application.

The operator should provide adequate training to the flight crew members before using an IFW application. This training should address:

- (1) limitations of the use of an IFW application:
 - (i) acceptable use (strategic planning only);
 - (ii) information required to be on board; and
 - (iii) latency of observed weather information and the hazards associated with utilisation of old information;
- (2) information on the display of weather data:
 - (i) type of displayed information (forecasted, observed);

- (ii) symbology (symbols, colours); and
- (iii) interpretation of meteorological information;
- (3) identification of failures and malfunctions (e.g. incomplete uplinks, data-link failures, missing info);
- (4) human factors issues:
 - (i) avoiding fixation; and
 - (ii) managing workload.

GM1 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)**IN-FLIGHT WEATHER APPLICATIONS — COMPLEX AIRCRAFT**

'Reliable sources' of data used by IFW applications are the organisations evaluated by the operator as being able to provide an appropriate level of data assurance in terms of accuracy and integrity. It is recommended that the following aspects be considered during that evaluation:

- (a) The organisation should have a quality assurance system in place that covers the data source selection, acquisition/import, processing, validity period check, and the distribution phase;
- (b) Any meteorological product provided by the organisation that is within the scope of the meteorological information included in the flight documentation as defined in point MET.TR.215(e) (Annex V (Definitions of terms used in Annexes II to XIII) to Commission Regulation (EU) 2016/1377) should originate only from authoritative sources or certified providers and should not be transformed or altered, except for the purpose of packaging the data in the correct format. The organisation's process should provide assurance that the integrity of those products is preserved in the data for use by the IFW application.

4.9. Proposed amendments to AMC 20-25:

The entire Section 6.2, Chapter 7, and Appendices A to K are deleted.

AMC 20-25 Rev. 1**Airworthiness and operational considerations for Electronic Flight Bags (EFBs)****Contents**

1. Purpose and scope
2. Reference documents
3. Glossary of terms in the context of this AMC
4. System description and classification of EFB systems
5. Airworthiness criteria



1 PURPOSE AND SCOPE

This Acceptable Means of Compliance (AMC) is one, but not the only, means to obtain an airworthiness approval and to satisfactorily assess the operational aspects for the use of for installed Electronic Flight Bags (EFBs) and for EFB installed resources. Additional guidance material can be found in ICAO Doc 10020 'Manual of Electronic Flight Bags'.

Operational considerations for the evaluation and approval of the use of EFB applications can be found in Commission Regulation (EU) No 965/2012.

It is considered an acceptable means of complying with the requirements contained in CAT.GEN.MPA.180 concerning carriage of electronic documents and manuals, Commission Regulation (EC) No 2042/2003 and Commission Regulation (EU) No 748/2012.

Traditionally, some of the documentation and information available to flight crew for use on the flight crew compartment has been in paper format. Much of this information is now available in electronic format. In addition, many non-required information services, data, and company procedures may also be made available to flight or cabin crew electronically. Operators have long recognised the benefit of hosting these materials on the flight crew's EFBs.

This AMC does not contain additional or double set requirements to those already contained in the operational requirements for the basic information, documentation and data sources that would need to be carried on board. The operator remains responsible for ensuring the accuracy of the information used and that it is derived from verifiable sources. 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 development has led to potentially hosting on EFBs even applications using computational software (e.g. for performances), databases (e.g. digital navigation data) or real-time data coming from the avionics (e.g. Airport Moving Map Display).

The evaluation of an EFB may have both an airworthiness and an operational aspect depending on the category/type of EFB/application used and, therefore, where necessary, to make a complete evaluation of an EFB system, there is a need for close coordination between the two processes.

In harmonisation with FAA, this AMC does not include a Type C software application classification as a potential EFB application. The Agency's policy is that any non-Type A (please refer to paragraph 5.2.1) or non-Type B (please refer to paragraph 5.2.2) software application, unless it is miscellaneous (non-EFB) application, should undergo a full airworthiness approval and so become a certified avionics function. A non-exhaustive list of examples of Type A and B applications is provided in Appendices A and B.

2 APPLICABILITY

This AMC is to be used by:

- (a) Operators of aeroplanes and helicopters;
- (b) applicants or holders of an aircraft Type Certificate (TC) or Supplemental TC; and
- (c) applicants or holders of ETSO authorisations covering software applications hosted in EFBs.

32 REFERENCE DOCUMENTS**3.1 Related Requirements**

From Annexes III and IV to Commission Regulation (EU) No 965/2012 ('Part ORO' and 'Part-CAT')⁹, the following articles are to be used as references:

~~CAT.GEN.MPA.140, CAT.GEN.MPA.180, ORO.GEN.130, ORO.GEN.140, ORO.GEN.200, ORO.MLR.100, CAT.POL.MAB.105, ORO.FC.230.~~

23.21 Related Certification Specifications

~~CS 25.561, 25.777, 25.789, 25.1301, 25.1302, 25.1309, 25.1316, 25.1321, 25.1322, 25.1357, 25.1431, 25.1529, 25.1581~~

~~CS 23.561, 23.1301, 23.1309, 23.1321, 23.1322, 23.1357, 23.1431, 23.1581~~

~~CS 29.1301, 29.1309, 29.1321, 29.1322, 29.1431, 29.1581~~

~~CS 27.1301, 27.1309, 27.1321, 27.1322, 27.1581~~

~~EASA CS MMEL (Draft) Master Minimum Equipment List~~

~~Appendix G to CS-23, Appendix H to CS-25, and Appendices A to CS-27 and CS-29: Instructions for Continued Airworthiness~~

~~ETSO C165a: Electronic map systems for graphical depiction of aircraft position~~

~~EASA Special Condition on Information Security (Network Security)~~

23.32 Related Guidance Material**23.3.1 Europe**

~~EASA AMC 25.1581 Appendix 1 – Computerised Aeroplane Flight Manual~~

~~EASA AMC 25.1309 System Design and Analysis~~

~~EASA AMC 25-11 Electronic Flight Deck Displays~~

~~EUROCAE ED-130() Guidance for the Use of Portable Electronic Devices (PEDs) on Board Aircraft~~

~~EUROCAE ED-12() Software Considerations in Airborne Systems and Equipment Certification~~

~~EUROCAE ED-14D/DO-160D (or later revisions) Environmental Conditions and Test Procedures for Airborne Equipment~~

~~EUROCAE ED-76/RTCA DO-200A (or later revisions) Standards for Processing Aeronautical Data~~

~~EUROCAE ED-80() Design Assurance Guidance for Airborne Electronic hardware~~

~~UL 1642 Underwriters Laboratory Inc. (UL) Standard for Safety for Lithium Batteries~~

3.3.2 USA

~~FAA AC 20-159 Obtaining Design and Production Approval of Airport Moving Map Display Applications Intended for Electronic Flight Bag Systems~~

~~FAA AC 120-74A Parts 91, 121, 125, and 135 Flight crew Procedures during Taxi Operations~~

⁹ ~~Commission Regulation (EU) No 965/2012 of 05 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council. (OJ L 296, 25.10.2012, p.1).~~



FAA AC 120-76()	Guidelines for the Certification, Airworthiness, and Operational Approval of Electronic Flight Bag Computing Devices
FAA AC 120-78	Acceptance and use of Electronic Signatures
FAA AC 20-173	Installation of Electronic Flight Bag Components
EASA ETSO-C165A/FAA TSO-C165A	Electronic Map Systems for Graphical Depiction of Aircraft Position / Electronic Map Display Equipment for Graphical Depiction of Aircraft Position (Own-ship)
RTCA DO-160()	Environmental Conditions and Test Procedures for Airborne Equipment
RTCA DO-178()	Software Considerations in Airborne Systems and Equipment Certification
RTCA DO-200()	Standards for Processing Aeronautical Data
RTCA DO-254()	Design Assurance Guidance for Airborne Electronic Hardware
RTCA DO-257()	Minimum Operation Performance Standards for the Depiction of Navigational Information on Electronic Maps
RTCA DO-294()	Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDs) on Aircraft
RTCA DO-311()	Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems
TGM/21/07	Electrical Wiring Policy for certification of large Aeroplanes, Engines and Propeller

34 GLOSSARY OF TERMS IN THE CONTEXT OF THIS AMC

4.1 ~~Aircraft Administrative Communications (AAC)~~

~~AAC data link receive/transmit information that includes, but is not limited to, the support of applications identified in Appendices A and B of this AMC. Aircraft Administrative Communications (AAC) are defined by ICAO as communications used by aeronautical operating agencies related to the business aspects of operating their flights and transport services. The airlines use the term Airline Operational Communication (AOC) for this type of communication.~~

4.2 ~~Airport Moving Map Display (AMMD)~~

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

34.31 Consumer device

Electronic equipment primarily intended for non-aeronautical use.

4.4 ~~Controlled Portable Electronic Device (C-PED)~~

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

34.52 Data connectivity for EFB systems

Data connectivity for EFB system supports either uni- or bi-directional data communication between the EFB and other aircraft systems (e.g. avionics).

Direct interconnectivity between EFBs or direct connectivity between EFBs and ground systems as with a T-PED (e.g. GSM, Bluetooth) are not covered by this definition.

34.63 Electronic Flight Bag (EFB)

An information system for flight deck crew members which allows the storage, updating, delivering, displaying, and/or computation of digital data to support flight operations or duties.



4.7 EFB administrator

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

34.84 EFB host platform

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

4.9 EFB risk assessment and mitigation

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

34.105 EFB software application

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

34.116 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).

34.127 EFB system supplier

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

4.13 Minor failure conditions

~~Failure conditions which would not significantly reduce aeroplane safety, and which involve crew actions that are well within their capabilities. Minor failure conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some physical discomfort to passengers or cabin crew. Further guidance can be found in AMC 25.1309.~~

34.148 Mounting device

A mounting device is an aircraft certified part which secures portable or installed EFB, or EFB system components.

4.15 No safety effect

~~Failure conditions that would have no effect on safety: for example, failure conditions that would not affect the operational capability of the aeroplane or increase crew workload. Further guidance can be found in AMC 25.1309.~~

34.169 Portable Electronic Device (PED)

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

34.1710 Software application developer

The company responsible for developing, or for having developed a particular software application.

34.1811 Transmitting PED (T-PED)

PEDs that have intended radio frequency (RF) transmission capabilities.

4.19 Viewable stowage

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

45 SYSTEM DESCRIPTION AND CLASSIFICATION OF EFB SYSTEMS

This section is divided into two parts. The first part deals with the host platform (e.g. the hardware and operating system) used to run the EFB software suite. The second part deals with this software suite which includes the EFB applications installed to provide the relevant functionality.

5.1 EFB systems hardware

This AMC defines two possibilities for the hardware of EFB systems: portable and installed.

45.1.1 Portable EFB

Definition

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

Except for installed components, portable EFBs are outside the scope of this document.

Complementary characteristics

~~A portable EFB can be operated inside and outside the aircraft.~~

~~A portable EFB hosts type A and/or type B EFB software applications. In addition, it may host miscellaneous (non-EFB) software applications (see 6.2.2.3).~~

~~A portable EFB is a portable electronic device (PED) as defined in GM1 CAT.GEN.MPA.140¹⁰.~~

~~The mass, dimensions, shape, and position of the portable EFB should not compromise flight safety.~~

~~A portable EFB may be provided with aircraft power through a certified power source (see 6.1.1.1.3).~~

~~If mounted, the portable EFB is easily removable from its mounting device or attached to it, without the use of tools by the flight crew. If mounted, the attachment or removal does not constitute a maintenance action.~~

~~A portable EFB may be part of a system containing EFB installed resources which are part of the certified aircraft configuration.~~

~~The installed EFB components are part of the certified aircraft configuration with the intended function to mount (see 6.1.1.1.1) the EFB to the aircraft and/or connect to other systems (see 6.1.1.1.4).~~

~~When a portable EFB is a T-PED, the conditions for use of its transmitting capability are established in the approved Aircraft Flight Manual (AFM). In absence of information in the AFM, the EFB transmitting capability may be allowed during non-critical phases of the flight (see 6.2.1.1.2).~~

~~Portable EFBs may be used in all phases of the flight if secured to a certified mount or securely attached to a viewable stowage device in a manner which allows its normal use (see 6.1.1.1.1, 6.1.1.1.2, and 6.2.1.6).~~

~~Portable EFBs not meeting the above characteristic, should be stowed during critical phases of the flight.~~

~~Portable EFBs are controlled PEDs (see paragraph 4.4).~~

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

45.1.2 Installed EFB

Definition

¹⁰ ~~PEDs are any kind of electronic device, typically but not limited to consumer electronics, brought on board the aircraft by crew members, passengers, or as part of the cargo and that are not included in the approved aircraft configuration. All equipment that is able to consume electrical energy falls under this definition. The electrical energy can be provided from internal sources as batteries (chargeable or non-rechargeable) or the devices may also be connected to specific aircraft power sources.~~

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

Complementary characteristics

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

In addition to hosting type A and B EFB applications (refer to point CAT.GEN.MPA.141 for the definitions and characteristics of EFB applications), an installed EFB may host certified applications, provided the EFB meets the certification requirements for hosting such applications, including assurance that the non-certified software applications do not adversely affect the certified application(s). For example, a robust partitioning mechanism is one possible means to ensure the independence between certified applications and the other types of applications.

5.2 — Software applications for EFB systems

The functionality associated with the EFB system depends, in part, upon the applications loaded on the host platform. The classification of the applications, based on respective safety effects, is intended to provide clear divisions among such applications and, therefore, the assessment process applied to each.

Appendices A and B provide support regarding the classification of traditional EFB software applications. They may be used for justifying a classification provided that the application does not feature design or functional novelties introducing new ways of interaction or unusual procedures.

If an application is not listed in the appendices or presents a high degree of novelty, the classification should be established using the definitions provided hereafter and the guidance in Appendix C.

For the purpose of the following definitions, 'malfunction or misuse' means any failure, malfunction of the application, or design-related human errors that can be reasonably expected in service.

5.2.1 — Type A

Definition

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

Complementary characteristics

Type A applications:

- (a) may be hosted on either portable or installed EFBs;
- (b) do not require any approval (see paragraph 6.2.2.1); and
- (c) should follow guidance provided in Appendix D, paragraph D.2.

Examples of Type A applications can be found in Appendix A.

5.2.2 Type B

Definition

Type B applications are applications:

- (a) whose malfunction or misuse are limited to a minor failure condition; and
- (b) which do neither substitute nor duplicate any system or functionality required by airworthiness regulations, airspace requirements, or operational rules⁴⁴.

Complementary characteristics

Type B applications:

- (a) may be hosted on either portable or installed EFBs;
- (b) require an operational assessment as described in paragraph 6.2.2.2; and
- (c) do not require an airworthiness approval.

Examples of Type B applications can be found in Appendix B.

5.2.2.1 Airport Moving Map Display (AMMD) application with own-ship position

AMMD with own-ship position is a Type B application that is subject to the specific conditions described in Appendix H of this AMC.

5.2.3 Miscellaneous (non EFB) software applications

Miscellaneous software applications are non-EFB applications, supporting function(s) not directly related to operations conducted by the flight crew on the aircraft.

⁴⁴ This does not preclude Type B software applications from being used to present the documents, manuals, and information required by CAT.GEN.MPA.180.

56 AIRWORTHINESS CRITERIA ~~HARDWARE AND SOFTWARE PROCESSES~~

The table below provides a summary of the different processes presented in this chapter.

EFB constituent		Portable EFB paragraph 5.1.1		Installed EFB paragraph 5.1.2	
		Assessment	Records or approvals	Assessment	Records or approvals
Hardware	EFB Installed resources mounting device	EASA Airworthiness process and approval paragraph 6.1.1.1		EASA Airworthiness process and approval paragraph 6.1.1.1	
	EFB host platform	Evaluation paragraph 6.2.1	As a minimum, operations Manual amended as required	EASA Airworthiness process and approval paragraph 6.1.1.2	
Software	Miscellaneous software paragraph 6.2.2.3	Operator evaluation paragraph 6.2.2.3	Operations Manual amended as required	Operator evaluation paragraph 6.2.2.3	Operations Manual amended as required
	Software Type A paragraph 5.2.1	Operator evaluation paragraph 6.2.2.1	Operations Manual amended as required	Operator evaluation paragraph 6.2.2.1	Operations Manual amended as required
	Software Type B paragraph 5.2.2	Evaluation paragraph 6.2.2.2	As a minimum, operations Manual amended as required	Evaluation paragraph 6.2.2.2	As a minimum, operations Manual amended as required

6.1 — Airworthiness approval

Airworthiness approval is necessary for installed EFB systems (see paragraph 5.1.2), as well as EFB installed resources and mounting devices.

~~A portable EFB device does not require an airworthiness approval but its presence and use in the cockpit needs to be evaluated (see paragraph 6.2.1).~~

56.1.1 Hardware airworthiness approval**56.1.1.1 Installed resources**

Installed resources are the input/output components external to the EFB host platform itself, such as an installed remote display, a control device (e.g. a keyboard, pointing device, switches, etc.) or a docking station.

The installed resources should be dedicated to EFB functions only, or in the case of use of resources shared with avionics, this possibility shall be part of the approved type design. It should be demonstrated, using the appropriate level of assessment, that the integration in the aircraft of the EFB and the EFB software applications does not jeopardise the compliance of the aircraft installed systems and equipment (including the shared resources) ~~to~~ with airworthiness requirements such as CS 25.1302 or 25.1309.

Installed resources require an airworthiness approval.

56.1.1.1.1 Mounting device

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

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

- (a) The mounting device and associated mechanisms should not impede the flight crew in the performance of any task (whether normal, abnormal, or emergency) associated with operating any aircraft system.
- (b) When the mounting device is used to secure an EFB display (e.g. portable EFB, installed EFB side display), the mount should be able to be locked in position easily. If necessary, the selection of positions should be adjustable enough to accommodate a range of flight crew member preferences. In addition, the range of available movement should accommodate the expected range of users' physical abilities (i.e. anthropometrics constraints). Locking mechanisms should be of a low-wear type that will minimise slippage after extended periods of normal use.
- (c) Crashworthiness considerations should be taken into account in the design of this device. This includes the appropriate restraint of any device when in use.
- (d) When the mounting device is used to secure an EFB display (e.g. a portable EFB, an installed EFB side display), a provision should be provided made to secure or lock the mounting device in a position out of the way of flight crew operations when not in use. When stowed, the device and its securing mechanism should not intrude into the flight crew compartment space to the extent that they cause either visual or physical obstruction of flight controls/displays and/or egress routes.
- (e) Mechanical interference issues of the mounting device, either on the side panel (side stick controller) or on the control yoke in terms of full and free movement under all operating conditions and non-interference with buckles, etc. For yoke mounted devices, (Supplemental) Type Certificate holder data should be obtained to show that the mass inertia effect on column force has no adverse effect on the aircraft handling qualities.
- (f) Adequate means should be provided (e.g. hardware or software) to shut down the portable EFB when its controls are not accessible by the ~~pilot~~ flight crew when strapped in the normal seated position. This objective can be achieved through a dedicated installed resource certified according to 5.1.16.1.1.1 (e.g. a button accessible from ~~pilot~~ the flight crew seated position).

56.1.31.1.2 Characteristics and placement of the EFB display

(a) Placement of the display

The EFB display and any other element of the EFB system should be placed in such a way that they do not unduly impair the ~~pilot's~~ flight crew's external view during any of the phases of the flight. Equally, they should not impair the view of or access to any flight crew compartment ~~cockpit~~ control or instrument.

The location of the display unit and the other EFB system elements should be assessed for impact on egress requirements.

When the EFB is in use (intended to be viewed or controlled), its display should be within 90 degrees on either side of each ~~pilot's~~ flight crew member's line of sight.

Glare and reflection on the EFB display should not interfere with the normal duties of the flight crew or unduly impair the legibility of the EFB data.

The EFB data should be legible under the full range of lighting conditions expected in a flight crew compartment, including use in direct sunlight.

In addition, consideration should be given to the potential for confusion that could result from the presentation of relative directions when the EFB is positioned in an orientation inconsistent with that information. For example, it may be misleading if the aircraft heading indicator points to the top of the display and the display is not aligned with the aircraft longitudinal axis. This does not apply to charts that are

presented in a static way (e.g. with no HMI mechanisation such as automatic repositioning), and that can be considered as similar to paper charts.

(b) Display characteristics

Consideration should be given to the long-term degradation of a display as a result of abrasion and ageing. AMC 25-11 (paragraph 3.16a) can be used as an appropriate guidance material to assess luminance and legibility aspects.

Users should be able to adjust the screen brightness of an EFB independently of the brightness of other displays in the flight crew compartment. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight crew compartment. Brightness adjustment using software means may be acceptable providing that this operation does not affect adversely the crew workload. Buttons and labels should have adequate illumination for night use. 'Buttons and labels' refers to hardware controls located on the display itself.

The 90-degree viewing angle on either side of each pilot's flight crew member's line of sight may be unacceptable for certain EFB applications if aspects of the display quality are degraded at large viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).

(c) Applicable specifications

Each EFB system should be evaluated with regard to the requirements in this section (i.e. Section 5.1.3)6.1.1.1.2: see CS 23.1321, CS 25.1321, CS 27.1321, and CS 29.1321.

If the display is an installed resource, it should be assessed against CS 25.1302 or in accordance with the applicable certification basis.

56.1.41.1.3 Power Source

Refer to the applicable EASA provisions related to power supplies (Certification Memorandum CM-ES-001).

~~This section applies to design considerations for installing dedicated power port and cabling provisions for EFBs. EFB power provisions should comply with the applicable airworthiness specifications.~~

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

~~Connection to more critical aircraft power buses is, however, permitted if appropriate, taking into account the intended function of the EFB. Further considerations can be found in Appendix J of this AMC.~~

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

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

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

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

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

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

Further considerations can be found in 6.1.1.1.5 which deals with connecting cables.

56.1.51.1.4 EFB data connectivity

Portable EFBs having data connectivity to aircraft systems, either wired or wireless, may receive or transmit data to and from aircraft systems, provided the connection (hardware and software for data connection provisions) and adequate interface protection devices are incorporated into the aircraft type design.

Connectivity provisions for a A-portable EFB may allow the EFB to receive any data from aircraft systems, but data transmission from EFBs to aircraft systems is limited to:

- (a) systems whose failures have no safety effect or a minor safety effect at the aircraft level (e.g. printers or ACARS);
- (b) aircraft systems which have been certified with the purpose of providing connectivity to non-certified devices such as PEDs (e.g. SATCOM with a router) or EFBs in accordance with the limitations established in the AFM; and
- (c) systems which are completely isolated (in both directions) from the certified aircraft systems (e.g. a transmission media that receives and transmits data for Aircraft Administrative Communications (AAC) purposes on the ground only); and
- (d) EFB system installed resources according to section 5.1.16.1.1.1.

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

The safety assessment of the EFB data connectivity installation should include an analysis of vulnerabilities to new threats that may be introduced by the connection of the EFB to the aircraft systems (malware and unauthorised access) and their effect on safety. This assessment should be independent and should not take any credit from the operational assessment of EFB system security (see section 7.9), which is intended to protect EFB systems themselves.

For aircraft systems certified for the purpose of receiving data from PEDs or EFBs (case (b) above), their connectivity with PEDs/EFBs should be taken into account in their demonstration of compliance with requirements such as CS 25.1302 and 25.1309. The applicant should, in particular, conduct a safety assessment demonstrating that the failure conditions associated with the reception of erroneous PED/EFB data have criticalities that are not higher than minor. Adequate design measures to mitigate the risk that erroneous data is used should be implemented if needed, such as preliminary flight crew review and acceptance of the imported parameters.

Certified aircraft systems should not be adversely affected by EFB system failures.

Any consequent airworthiness limitations should be included in the AFM (please refer to 5.2.16.1.2.1).

56.1.61.1.5 Connecting cables

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

- (a) if the cable is not run inside the mount, the cable should not hang loosely in a way that compromises task performance and safety. Flight crew should be able to easily secure the cables out of the way during operations (e.g., by using cable tether straps);
- (b) cables that are external to the mounting device should be of sufficient length in order that they do not obstruct the use of any movable device on the flight crew compartment; and
- (c) for Part 25 airplanes, installed cables are considered electrical wiring interconnection systems and, therefore, need to comply with CS-25 Subpart H (FAA Part-25, Transport Category Airplanes) or TGM/21/07 (FAA Part-29, Transport Category Rotorcraft).

56.1.1.2 Installed EFB

An installed EFB is considered as part of the aircraft and, therefore, requires a full airworthiness approval. This host platform includes the Operating System (OS).

The assessment of compliance with the airworthiness requirements would typically include two specific areas:

- (a) the safety assessment addressing failure conditions of the EFB system hardware, of any certified application (or applications ineligible as type A and/or type B) installed on the EFB and the partition provided for uncertified applications and miscellaneous software non-EFB applications; and

- (b) hardware and operating system software qualification conducted in accordance with the necessary Development Assurance Level (DAL) for the system and its interfaces.

56.1.2 Certification documentation

56.1.2.1 Aircraft flight manual

For installed EFBs and certified installed resources, the AFM section or an Aircraft Flight Manual Supplement (AFMS) should contain:

- (a) a statement of the limited scope of the airworthiness approval of EFBs provisions (e.g. these EFB provisions are only intended for type A and type B EFB applications in accordance with this AMC 20-25. The airworthiness approval does not replace the operational assessment for the use of the EFB system).
- (b) the identification of the installed equipment, which may include a very brief description of the installed system or resources; and
- (c) appropriate amendments or supplements to cover any limitations concerning:
- (1) the use of the EFB host platform for the installed EFB system; and
 - (2) the use of the installed EFB provisions/resources for the portable EFB system.

For this purpose, the AFM(Ss) should make reference to any guidelines (relevant to the airworthiness approval), intended primarily for EFB software application developers or EFB system suppliers.

56.1.2.2 Guidelines for EFB software application developers (installed EFB and certified installed resources)

TC/STC holders for EFB installed resources or installed EFBs should compile and maintain a guideline document to provide a set of limitations, considerations, and guidelines to design, develop, and integrate software applications into the installed EFB or with certified resources for portable EFB. The guidelines should address, at least, the following:

- (a) a description of the architecture for of the EFB installed components;
- (b) the Development Assurance Level (DAL) of the EFB component and any assumptions, limitations, or risk mitigation means necessary to support this;
- (c) information necessary to ensure the development of a software application consistent with the avionics interface and the human machine interface that is also accurate, reliable, secure, testable, and maintainable;
- (d) integration procedures between any new software application and those already approved; and
- (e) guidelines on how to integrate any new software application into the installed platform or installed resources.

The guideline document should be available, at least, to the aircraft operator, to the competent authority, and to EASA.

56.1.2.3 Guidelines for EFB system suppliers (installed resources for portable EFBs)

TC/STC holders for installed resources of portable EFBs should provide a set of requirements and guidelines to integrate the portable EFB into the installed provisions, and to design and develop EFB software applications.

Guidelines intended primarily for use by the EFB system supplier, should address, at least, the following:

- (a) A description of the EFB installed EFB resources and associated limitations, if any. For example, the:
 - (1) intended function, limitations of use, etc.;
 - (2) characteristics of the mounting devices, display units, control and pointing devices, printer, etc.;
 - (3) maximum authorised characteristics (dimensions, weight, etc.) of the portable parts of the EFB system supported by the mounting devices;
 - (4) architectural description of the EFB provisions, including normal/abnormal/manual/automatic reconfigurations; and
 - (5) normal/abnormal/emergency/maintenance procedures including the allowed phases of the flight.
- (b) Characteristics and limitations, including safety and security considerations concerning:
 - (1) the power supply;
 - (2) the laptop battery; and
 - (3) data connectivity.

The guidelines should be available at least to the operator, the competent authority and EASA.



5. Appendices

5.1. Abbreviations

AFM	aircraft flight manual
AIS	aeronautical information services
AMC	acceptable means of compliance
AMMD	airport moving map display
AAC	aircraft administrative communications
AOC	air operator certificate
AOC	aeronautical operational control
CAT	commercial air transport
CDL	configuration deviation list
CG	centre of gravity
COTS	commercial off the shelf
C-PED	controlled portable electronic device
CRM	crew resource management
DAL	development assurance level
EFB	electronic flight bag
EMI	electromagnetic interference
ETSO	European technical standard order
FCOM	flight crew operating manual
FFS	full-flight simulator
FSTD	flight simulation training device
GNSS	global navigation satellite system
GPS	global positioning system
HMI	human-machine interface
ICAO	international civil aviation organisation
IFW	in-flight weather
IR	implementing rule
LOFT	line-oriented flight training
MEL	minimum equipment list
NCC	non-commercial operations with complex motor-powered aircraft
NCO	non-commercial operations with other than complex motor-powered aircraft



NOTAM	notice to airmen
NOTOC	notice to captain
OPC	operator proficiency check
OS	operating system
PED	portable electronic device
SARPs	standards and recommended practices
SOP	standard operating procedure
SPA	specific approval
SPO	specialised operations
STC	supplemental type certificate
SV	space vehicle
TC	type certificate
T-PED	transmitting portable electronic device
TSO	technical standard order

5.2. Attachments to comments

 [NPA 2016-12 - AH minor comments.pdf](#)
Attachment #1 to comment [#105](#)

 [EASA NPA 2016-12 Feedback LH EFB Harmonisation Group LX.pdf](#)
Attachment #2 to comment [#264](#)

 [Proposed Comments on the NPA 2016-12.pdf](#)
Attachment #2 to comment [#7](#)