

## **AIRWORTHINESS ADVISORY**

### **Airworthiness Impacts of Electronic Flight Bags**

#### **ATTACHMENTS:**

- (1) Glossary of Terms and Supporting Information

#### **PURPOSE:**

This Airworthiness Advisory (AA) provides System Program Managers, Directors of Engineering (DoE), Chief Engineers (CE), and MAJCOMs with guidance to support formulation of Electronic Flight Bag (EFB) Airworthiness (AW) impacts, certification basis, and reportability. This guidance is provided to ensure EFBs have undergone appropriate review to understand airworthiness compliance and risks, and Delegated Technical Authorities (DTAs) are cognizant of gaps in commercial EFB assessments to the military environment. Cybersecurity requirements for assessment and authorization are not addressed in this advisory. Consult the aircraft cybersecurity authorizing official for guidance.

#### **SCOPE:**

This AA applies to all USAF air systems, including those operated by the Air National Guard and USAF Reserve.

#### **REFERENCED DOCUMENTS:**

AFPD 62-6, *USAF Airworthiness*, 11 June 2010  
AFI 62-601, *USAF Airworthiness*, 11 June 2010  
AFI 91-202, *The US Air Force Mishap Prevention Program*, 01 August 1998  
AFLCMC OI 62-601, *USAF Airworthiness Process for Delegated Technical Authority (DTA)*, 5 December 2013  
AWB – 004, *Development of an Airworthiness Certification Basis*  
AWB – 007, *Determining Reportability of Modifications*  
FAA AC 120-76C, *Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags*, 9 May 2014  
MIL-HDBK-516B, *ASC/EN Airworthiness Certification Criteria Expanded Version of MIL-HDBK-516B*, 26 September 2005  
MIL-HDBK-516C, *Airworthiness Certification Criteria*, 12 December 2014  
Technical Service Bulletin: Electronic Flight Bag MACC  
USAF Airworthiness SharePoint collaboration website:  
<https://cs.eis.afmc.af.mil/sites/AeroEngDisciplines/Systems/Airworthiness/default.aspx>

**BACKGROUND:**

In an effort to enhance situational awareness (SA), increase efficiency, and reduce the amount of paper products used for in-flight operations, a growing number of portable electronic computing and display devices, both mounted and un-mounted, are being used in USAF air systems. The focus of this advisory is those devices serving as aircrew aids, referred to herein as EFBs. Leveraging terminology from Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76C, an EFB is defined as an:

“Electronic display system intended primarily for flight deck use that includes the hardware and software necessary to support an intended function.”

For EFB use in USAF systems, ‘flight deck’ in the above definition is synonymous with ‘aircrew,’ and the scope of this advisory includes EFB use by all aircrew members. Carry-on electronic devices not categorized as EFBs (e.g. aeromedical devices, digital cameras, personal electronic devices, etc.) are outside the scope of this airworthiness advisory.

A number of United States Government (USG) policy documents provide guidance for the use of EFBs in aviation; however, none comprehensively address airworthiness impacts of EFBs in the military environment. Civil and military EFB policies are included in Attachment 1.

Many programs currently using EFBs are relying solely on FAA AC 120-76C which does not consider military unique airworthiness requirements impacting airworthiness design criteria. The military unique requirements which impact airworthiness design criteria that may not be adequately addressed in commercial guidance include:

- Escape system compatibility
- Night Vision Imaging System (NVIS)
- Interface with flight gloves
- High Radio Frequency (RF) levels
- Explosive decompression vs. rapid decompression

Potential airworthiness risks relating to EFB implementation in the military environment are as follows:

- A more demanding/dangerous environment for operations than commercial systems
- Use on ejection seat equipped aircraft could interfere with ejection sequence and pose catastrophic hazard to crew
- As EFB functionality increases, potential for catastrophic event due to pilot loss of SA or spatial disorientation increases
- Hazards compounded by unusual attitudes or high workload
- Temperature and altitude fluctuations or extremes could result in failure of battery management system, which could result in EFB fire or explosion
- Inadequate redundancy could result in loss of flight critical information

- Installation and/or mounting must address risk of flight control interference and crash survivability requirements

Beyond airworthiness impacts, operational risks related to Information Assurance and OSS&E stemming from EFB implementation include:

- Compromise of operationally critical information
- Weapons employment or airdrop inaccuracy

The multitude of policy guidance partially covering use of EFBs in the USAF, coupled with the gaps in commercial guidance to military unique requirements underscores the need to conduct proper military airworthiness assessments on EFBs.

#### **POLICY:**

DTAs are expected to execute the AW process described in AFI 62-601 to evaluate a request to deploy EFBs. EFBs constitute an aircraft modification and must be evaluated for airworthiness impact consistent with AFI 62-601 paragraph 1.14 (Certification of Temporary Equipment). AFLCMC OI 62-601 and AWB 007 describe the determination of airworthiness impact and reportability. AWB 004 describes the development of an airworthiness certification basis.

#### **GUIDANCE/RECOMMENDATIONS:**

The following general guidance is provided to support formulation of EFB airworthiness impacts, certification bases, and reportability determinations.

- a. To aid in the decision of AW impact, usage of an EFB would have no AW impact if all of the following conditions apply:
  - 1) The device is not the primary source for Technical Order data or flight data
  - 2) The device is stowed during take-off and landing.
  - 3) The device is not attached into the aircraft system (no power, no exchange of information via wired or wireless connection.)
  - 4) The system has undergone Electromagnetic Environmental Effects (E3) testing consistent with Section 13 of Guidance/Recommendations paragraph (b) below
  - 5) The platform is not equipped with an ejection seat
  - 6) The device does not interfere with or obscure controls or displays
  - 7) The device is not used to generate or display data to the aircrew which is used to operate the aircraft, including situational awareness aids

Non-applicability of any of the above conditions is a strong indication an EFB does impact airworthiness; however, a definitive decision hinges on a full understanding of system performance and sound professional engineering judgment and experience of a CE/DOE DTA.

- b. If the use of the EFB is determined to constitute an airworthiness impact, it must be assessed according to existing airworthiness processes. If determined to have an AW impact, the USAF Technical Airworthiness Authority (TAA) has developed an EFB

Modified AW Certification Criteria (MACC) template to aid program offices in determining reportability and applicable airworthiness criteria along with the associated standards and methods of compliance for EFBs. This EFB MACC is available as a Technical Service Bulletin on the Airworthiness SharePoint collaboration website. The EFB MACC offers a starting point for EFB evaluations, but is general and needs to be tailored for specific implementations.

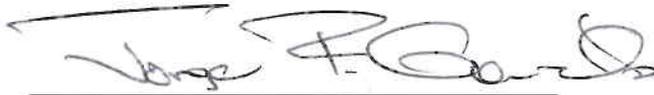
A summary of the applicable sections of MIL-HDBK-516 identified for consideration within the EFB MACC are listed below, along with potential concerns:

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|---|---|
| <p><b>(4) Systems Engineering</b></p> <ul style="list-style-type: none"> <li>• System process standardization</li> </ul>  | <p><b>(11) Avionics</b></p> <ul style="list-style-type: none"> <li>• Architecture               <ul style="list-style-type: none"> <li>– Redundancy</li> <li>– Display of unsafe/misleading info</li> </ul> </li> <li>• Subsystems</li> <li>• Air vehicle installation</li> </ul>   |
| <p><b>(5) Structures</b></p> <ul style="list-style-type: none"> <li>• Loads</li> <li>• Strength</li> <li>• Damage tolerance and durability</li> </ul>   | <p><b>(12) Electrical Systems</b></p> <ul style="list-style-type: none"> <li>• Wiring</li> <li>• Batteries</li> </ul>   |
| <p><b>(6) Flight Technology</b></p> <ul style="list-style-type: none"> <li>• Effect on flight controls</li> </ul>   | <p><b>(13) Electromagnetic Environmental Effects</b></p> <ul style="list-style-type: none"> <li>• Must comply with Electromagnetic Interference (EMI) Emissions &amp; Susceptibility requirements of the host aircraft</li> <li>• Aircraft Electromagnetic Compatibility (EMC) testing is required for WiFi operations</li> </ul> |
| <p><b>(8) Subsystems</b></p> <ul style="list-style-type: none"> <li>• Fire and hazard protection</li> </ul>   | <p><b>(14) System Safety</b></p> <ul style="list-style-type: none"> <li>• Systems Safety Program</li> <li>• Safety Design Requirements               <ul style="list-style-type: none"> <li>– Human Factors</li> </ul> </li> </ul>  |
| <p><b>(9) Crew Systems</b></p> <ul style="list-style-type: none"> <li>• Escape and egress               <ul style="list-style-type: none"> <li>– Interference with egress</li> </ul> </li> <li>• Ejection safety</li> <li>• Crew station</li> <li>• Controls and displays               <ul style="list-style-type: none"> <li>– Touch screen interface</li> <li>– NVIS compatibility</li> <li>– Glare</li> <li>– Reflections</li> </ul> </li> <li>• Human performance               <ul style="list-style-type: none"> <li>– Workload</li> </ul> </li> <li>• Military unique ops (airdrop, weapons delivery, etc.)</li> <li>• Crash survivability</li> </ul> | <p><b>(15) Computer Resources</b></p> <ul style="list-style-type: none"> <li>• Safety Critical Functionality</li> <li>• Processing architecture               <ul style="list-style-type: none"> <li>– Separation</li> <li>– Timing</li> </ul> </li> <li>• Failure detection</li> </ul>   |
| <p><b>(10) Diagnostic Systems</b></p> <ul style="list-style-type: none"> <li>• Failure modes</li> </ul>   |   |

The assessment of airworthiness impacts, construction of a certification basis, and determination of reportability for any EFB is platform and implementation dependent and requires a knowledgeable CE/DOE DTA evaluation.

**POINTS OF CONTACT:**

USAF Airworthiness Office (AFLCMC/EN-EZ) is the OPR. Comments, suggestions, or questions on this advisory should be emailed to the USAF Airworthiness Office Mailbox ([USAF.Airworthiness.Office@us.af.mil](mailto:USAF.Airworthiness.Office@us.af.mil)). Additional AW Subject Matter Expertise for determining EFB AW impacts, reportability, certification basis, and potential risks is available through AFLCMC/EN-EZ. If required, this additional expert support for EFBs can be requested by a Program Office through the USAF Airworthiness Office.



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## Attachment 1

### GLOSSARY OF TERMS AND SUPPORTING INFORMATION

#### *Supplemental EFB Guidance*

AFI 11-202, Volume 3, *General Flight Rules*, 7 November 2014

AFGSCI 11-270, *Electronic Flight Bag Operations*, 21 March 2014

Air Mobility Command Electronic Flight Bag Concept of Employment, 21 June 2012

FAA AC 120-76C, *Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags*, 9 May 2014

#### *Abbreviations and Acronyms*

**AA** – Airworthiness Advisory

**AC** – Advisory Circular

**ADF** – Airworthiness Determination Form

**AFGSC** – Air Force Global Strike Command

**AFI** – Air Force Instruction

**AFLCMC/EN-EZ** – Air Force Life Cycle Management Center, Engineering Directorate

**AFLCMC/EZSA** – Air Force Life Cycle Management Center, Engineering Directorate Systems Integration Branch

**AFMC** – Air Force Materiel Command

**AFPD** – Air Force Policy Directive

**ASC** – Aeronautical Systems Center

**ATO** - Authority to Operate

**AW** - Airworthiness

**AWB** – Airworthiness Bulletin

**CE** – Chief Engineer

**CONEMP** – Concept of Employment

**DOE** – Director of Engineering

**DTA** – Delegated Technical Authority

**E3** - Electromagnetic Environmental Effects

**EFB** – Electronic Flight Bag

**EMC** – Electromagnetic Compatibility

**EMI** – Electromagnetic Interference

**FAA** – Federal Aviation Administration

**FLIP** - Flight Manuals, Tech Orders and Flight Information Publications

**MAJCOM** – Major Commands

**MACC** – Modification Airworthiness Certification Criteria

**MDS** – Mission Design Series

**NVIS** - Night Vision Imaging System

**OI** – Operating Instruction

**OPR** – Office of Primary Responsibility

**OSS&E** - Operational Safety, Suitability & Effectiveness

**PM** – Program Manager

**RF** – Radio Frequency

**SA** – Situational Awareness

**TAA** – Technical Airworthiness Authority

**TACC** – Tailored Airworthiness Certification Criteria

**USAF** – United States Air Force

**USG** – United States Government