Notification of a Proposal to issue a Certification Memorandum

Guidance to Certify an Aircraft as PED tolerant

EASA Proposed CM No.: Proposed CM-ES-003 Issue 01 issued 16th January 2017

Regulatory requirement(s): CS 23.1309(b)(1), CS 25.1309(a)(1), CS 27.1309(a), CS 29.1309(a)
CS 25.1353(a)
CS 23.1431(a), CS 25.1431(a), CS 29.1431(a)
CS 23.1529, CS 25.1529, CS 27.1529, CS 29.1529

In accordance with the EASA Certification Memorandum procedural guideline, the European Aviation Safety Agency proposes to issue an EASA Certification Memorandum (CM) on the subject identified above. All interested persons may send their comments, referencing the EASA Proposed CM Number above, to the e-mail address specified in the “Remarks” section, prior to the indicated closing date for consultation.

EASA Certification Memoranda clarify the European Aviation Safety Agency’s general course of action on specific certification items. They are intended to provide guidance on a particular subject and, as non-binding material, may provide complementary information and guidance for compliance demonstration with current standards. Certification Memoranda are provided for information purposes only and must not be misconstrued as formally adopted Acceptable Means of Compliance (AMC) or as Guidance Material (GM). Certification Memoranda are not intended to introduce new certification requirements or to modify existing certification requirements and do not constitute any legal obligation.

EASA Certification Memoranda are living documents into which either additional criteria or additional issues can be incorporated as soon as a need is identified by EASA.
Log of issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Issue date</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>16.01.2017</td>
<td>First issue.</td>
</tr>
</tbody>
</table>

Table of Content

Log of issues .................................................................................................................. 2
Table of Content ................................................................................................................ 2
1. Introduction ....................................................................................................................... 3
   1.1. Purpose and scope ........................................................................................................ 3
   1.2. References .................................................................................................................... 3
   1.3. Abbreviations ............................................................................................................... 5
2. Background ......................................................................................................................... 5
3. EASA Certification Policy ................................................................................................. 6
   3.1. Certification of an Aircraft as PED tolerant ................................................................. 6
      3.1.1. Certification Plan .................................................................................................. 6
      3.1.2. Safety Objectives ................................................................................................. 6
      3.1.3. RF and EMI Assessment at aircraft level ............................................................... 7
      3.1.4. Aircraft Flight Manual Limitations ...................................................................... 8
      3.1.5. Instructions for Continued Airworthiness ............................................................. 9
      3.1.6. Design data .......................................................................................................... 9
      3.1.7. Other regulatory requirements ............................................................................. 9
   3.2. Who this Certification Memorandum affects ............................................................... 9
4. Remarks ............................................................................................................................. 10
1. Introduction

1.1. Purpose and scope

The purpose of this Certification Memorandum is to provide specific guidance on the certification of an aircraft to be tolerant to the electromagnetic emissions of Portable Electronic Devices (PEDs). Wireless communication standards which are limited to a maximum of 100mW Equivalent Isotropic Radiated Power (EIRP) do not need to be analysed for backdoor coupling (for example Bluetooth, Wi-Fi), as these low power emissions are not considered a risk to the safe operation of an aircraft. Front door coupling assessment is only needed if it is intended to allow operation of PEDs in low visibility approach operation (e.g. CAT II and III precision approach).

Commission Regulation (EU) No 965/2012 and the relevant amendments require Part CAT, Part NCC and Part SPO operators to demonstrate that any PED use on-board is safe and does not affect adversely the performance of the aircraft systems and equipment. For Part NCO the pilot in command is responsible to permit the use of any PED on board.

The EASA published the Part-CAT AMC/GM and Part-NCC AMC/GM, this material offers guidance and defines different scenarios for the operator to determine whether it is safe to permit the use of PEDs on board. Some of this scenarios refer to an aircraft which is certified as PED tolerant. This Certification Memorandum aims at defining the specific guidelines to certify an aircraft as PED tolerant.

Additionally the EUROCAE Working Group 99 (WG-99) and RTCA Special Committee 234 (SC-234) have recently updated the existing material, providing recommendations to demonstrate tolerance to RF from intentionally transmitting PEDs following existing practices for aircraft system high intensity radiated field (HIRF) protection. The intention of this Certification Memorandum is to recognize this new approach as acceptable means of compliance for the demonstration of an aircraft as PED tolerant.

This Certification Memorandum is applicable to aircraft certified to CS-23, CS-27, CS-29 and CS-25.

The certification guidance included in this Certification Memorandum to demonstrate an aircraft as tolerant to the electromagnetic hazards created by PEDs, may also be used by the operators to show compliance with the operational provisions referred above.

1.2. References

It is intended that the following reference materials be used in conjunction with this Certification Memorandum:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Code</th>
<th>Issue</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.1309(b)(1)</td>
<td>Equipment, systems and installations</td>
<td>CS-23</td>
<td>1 and up</td>
<td>12/02/2009</td>
</tr>
<tr>
<td>25.1309(a)(1)</td>
<td></td>
<td>CS-25</td>
<td>5 and up</td>
<td>05/09/2008</td>
</tr>
<tr>
<td>27.1309(a)</td>
<td></td>
<td>CS-27</td>
<td>1 and up</td>
<td>30/11/2007</td>
</tr>
<tr>
<td>29.1309(a)</td>
<td></td>
<td>CS-29</td>
<td>1 and up</td>
<td>30/11/2007</td>
</tr>
<tr>
<td>25.1353(a)</td>
<td>Electrical equipment and installations</td>
<td>CS-25</td>
<td>5 and up</td>
<td>05/09/2008</td>
</tr>
<tr>
<td>23.1431(a)</td>
<td>Electronic equipment</td>
<td>CS-23</td>
<td>1 and up</td>
<td>12/02/2009</td>
</tr>
<tr>
<td>25.1431(a)</td>
<td></td>
<td>CS-25</td>
<td>5 and up</td>
<td>05/09/2008</td>
</tr>
<tr>
<td>29.1431(a)</td>
<td></td>
<td>CS-29</td>
<td>1 and up</td>
<td>30/11/2007</td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Code</td>
<td>Issue</td>
<td>Date</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------------------</td>
<td>---------------</td>
<td>---------</td>
<td>-----------</td>
</tr>
<tr>
<td>23.1529 25.1529 27.1529 29.1529</td>
<td>Instructions for continued airworthiness</td>
<td>CS-23 CS-25 CS-27 CS-29</td>
<td>1 and up 5 and up 1 and up 1 and up</td>
<td>12/02/2009 05/09/2008 30/11/2007 30/11/2007</td>
</tr>
<tr>
<td>Regulation 965/2012</td>
<td>Commission Regulation (EU) No 965/2012</td>
<td></td>
<td></td>
<td>05/10/2012</td>
</tr>
<tr>
<td>Part 21</td>
<td>Annex 1 to Commission Regulation (EU) No 748/2012</td>
<td>Part 21</td>
<td>---</td>
<td>03/08/2012</td>
</tr>
<tr>
<td>EUROCAE ED-130A / RTCA DO-363</td>
<td>Guidance for the Use of Portable Electronic Devices (PEDs) on Board Aircraft</td>
<td>ED-130 / DO-363</td>
<td>A / Initial (Note 1)</td>
<td>15/12/2016</td>
</tr>
<tr>
<td>RTCA DO-294C (Note 2)</td>
<td>Guidance on Allowing Transmitting Portable Electronic Devices (T-PEDS) on Aircraft</td>
<td>DO-294</td>
<td>C</td>
<td>16/12/2008</td>
</tr>
</tbody>
</table>

The applicable requirements and provisions listed above are based on the up-to-date CS standards. Different standards and amendments may apply depending on retained Type Certification Basis (i.e. previous JARs). These lay out the regulatory basis for the certification of an aircraft as PED tolerant.

Note 1: Although the use of EUROCAE ED-130 at its initial revision or RTCA DO-307 Change 1 are also acceptable means of compliance, these previous versions contain more stringent requirements. Therefore EASA recommends the use of the versions pointed out in the table above.

Note 2: Even if RTCA DO-294C is superseded by the new documents developed by EUROCAE WG-99 and RTCA SC- 234, it can be used as alternative means of compliance, as it contains more stringent requirements that the new documents.
1.3. Abbreviations

AFM  Aircraft Flight Manual  
CAT  Commercial Air Transport  
CS  Certification Specification  
EASA European Aviation Safety Agency  
EIRP Equivalent Isotropic Radiated Power  
EMC Electromagnetic Compatibility  
EMH Electromagnetic Hazards  
EMI Electromagnetic Interference  
EUROCAE European Organisation for Civil Aviation Equipment  
ICA Instructions for Continued Airworthiness  
MEF Multiple Equipment Factor  
NCC Non-commercial air operations with complex motor-powered aircraft  
PED Portable Electronic Device  
RF Radio Frequency  
RTCA Radio Technical Commission for Aeronautics  
STC Supplemental Type Certificate  
TC Type Certificate  
T-PED Transmitting Portable Electronic Device  
WLAN Wireless Local Area Network

2. Background

EASA reviewed the Portable Electronic Device (PED) policy, with the publication of the ED Decisions 2014/029/R and 2014/030/R, recognizing the wide proliferation of PEDs and the wish of passengers to use them everywhere and at any time. These provisions refer to different scenarios for permitting the use of PEDs by the operator, some of these scenarios refer to an aircraft which is certified as PED tolerant.

This Certification Memorandum is issued to provide the applicant with acceptable means of compliance to demonstrate that an aircraft is tolerant to the electromagnetic emissions of PEDs.

PEDs are any kind of electronic devices 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. The use of PEDs on board the aircraft, either by crew members and passengers or included in the cargo, presents a source of uncontrolled electromagnetic emissions with potential risk of adverse interference effects to aircraft systems.

PEDs fall into two main categories: non-intentional transmitters and intentional transmitters (T-PEDs).
After deactivation of the transmitting capability, e.g. by activating the so-called ‘flight mode’ or ‘flight safety mode’, the T-PED remains a PED having non-intentional emissions.

The electromagnetic hazard created by the PEDs that are operating on-board the aircraft can be defined as:

1. Front door coupling is the possible disturbance to an aircraft system as received by the antenna of the system and mainly in the frequency band used by the system.
2. Back door coupling is the possible disturbance of aircraft systems by electromagnetic fields generated by transmitters. Back door coupling requirements are in line with HIRF certification requirements.

To be able to allow the use of PEDs within an aircraft, it is necessary to demonstrate that the aircraft and its systems are compatible with the RF emissions generated by the intentional and non-intentional transmissions of PEDs.

The applicant for certification of installed wireless RF systems that communicate with portable wireless RF transmitters and receivers, which will not become part of the aircraft configuration, should provide evidence of approved data that shows the airplane has demonstrated transmitting PED tolerance.

It is also the responsibility of the certification applicant to demonstrate that the installed system does not interfere with the other aircraft systems. This standard EMI test is out of the scope of this CM.

3. EASA Certification Policy

3.1. Certification of an Aircraft as PED tolerant

The following EASA policy is intended to provide means of compliance for the applicant that intends to demonstrate an aircraft’s compatibility with PED emissions within the cabin, cargo hold and/or flight deck.

It remains the operator’s responsibility to allow the use of PED on board aircraft in accordance with his procedures, which are supervised by the responsible National Aviation Authority (NAA).

3.1.1. Certification Plan

The applicant should prepare a certification plan that will explain how PED tolerance will be shown to allow safe use of PEDs under prescribed conditions.

The plan may follow the guidance provided in EUROCAE ED-130A/ RTCA DO-363 or EUROCAE ED-239 /RTCA DO-307A. The referenced documents describe a process involving analyses and measurements that determine the character of an interference environment, and the susceptibility (or tolerance) of specific aircraft and its equipment.

Any mitigating actions, including necessary AFM procedures, should be developed as necessary to declare an aircraft PED tolerant.

3.1.2. Safety Objectives

To comply with the certification requirements the applicant should address the safety issues associated with the widespread use of PEDs in the aircraft.

The applicant should demonstrate that the use of PEDs does not adversely affect the correct operation of any “required” aircraft systems or equipment, i.e. those required for type certification, or whose improper functioning would reduce safety; throughout the entire flight envelope, including taxiing to/from the runway, and Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR)

In other words, equipment and systems that have failure modes that are classified as Major, Hazardous or Catastrophic, and Flight Data Recorder and Cockpit Voice Recorder need to be assessed.

The failure classification should be derived from a system safety analysis performed for the aircraft.
3.1.3. RF and EMI Assessment at aircraft level

The applicant should perform a detailed RF and EMI assessment that defines the character of the total RF environment in the aircraft, which now includes conditions comprising the operation of multiple PEDs, and the vulnerability of aircraft systems to interference.

This assessment should consider intentional transmissions and their potential effect on aircraft equipment and wiring through direct illumination (back door coupling), and unintended spurious emissions within the aircraft RF receiver bands (front door coupling).

1. To address back door coupling aircraft systems susceptibility acceptable means of compliance are:
   - EUROCAE ED-239 / RTCA DO-307A Section 3 or,
   - EUROCAE ED-130A / RTCA DO-363 Section 6.

   The recommendations in the guidance material to address back door coupling closely follow existing practices for aircraft system high intensity radiated fields (HIRF) protection, therefore consideration of the existing HIRF certification of the aircraft is helpful to address the back-door coupling effects.

   Wireless communication standards which are limited to a maximum of 100mW EIRP do not need to be analysed for backdoor coupling, as these low power emissions are considered not to affect aircraft systems.

2. To address front door coupling susceptibility, acceptable means of compliance are:
   - EUROCAE ED-239 / RTCA DO-307A Section 4 or,
   - EUROCAE ED-130A / RTCA DO-363 Section 5 or,
   - In case the PED is becoming part of the aircraft configuration, an alternative acceptable means of compliance is to quality the PED in accordance to EUROCAE ED-14 / RTCA DO-160 Section 21.

   The use of EUROCAE ED-130 at its initial revision, RTCA DO-294C or RTCA DO-307 Change 1 are also acceptable means of compliance, however these previous versions contain more stringent requirements. Therefore EASA recommends the use of the documents versions pointed out in the paragraphs above.

Depending on the intention of the certification exercise, different scenarios are possible:

<table>
<thead>
<tr>
<th>No.</th>
<th>Certification Objective</th>
<th>Back door coupling assessment</th>
<th>Front door coupling assessment</th>
<th>Correspondence with operational scenarios in Annex to ED Decision 2014/029/R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Certification of an aircraft as PED tolerant (for all technologies)</td>
<td>Needed (Note 3)</td>
<td>Needed</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Certification of the installation of a wireless communication system to be used in all flight phases</td>
<td>Needed (Note 4)</td>
<td>Needed</td>
<td>3</td>
</tr>
<tr>
<td>No.</td>
<td>Certification Objective</td>
<td>Back door coupling assessment</td>
<td>Front door coupling assessment</td>
<td>Correspondence with operational scenarios in Annex to ED Decision 2014/029/R</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Certification of the installation of a wireless communication system to be used in all flight phases except low visibility approach operation</td>
<td>Needed (Note 4)</td>
<td>N/A (Note 5)</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>PEDs will be allowed to be used only with transmitting capabilities disabled, i.e. no wireless transmission capabilities are allowed in any flight phase</td>
<td>N/A</td>
<td>Needed</td>
<td>5</td>
</tr>
</tbody>
</table>

Note 3: When the intention is to certify an aircraft as PED tolerant, account should be taken of all possible PED transmission standards which are likely to exist within the PEDs that can be brought on-board the aircraft.

Note 4: When the intention is to certify the installation of a system that controls the intentional transmissions of the PEDs, i.e. a picocell for mobiles telephones or a Wi-Fi router; the RF and EMI assessment should take into account as a minimum the PED transmissions standards that will be controlled by the installed system.

Note 5: A front door coupling susceptibility assessment is necessary when the intention is to allow gate-to-gate operation of the PEDs, i.e. including low visibility approach operation. In all other cases, performing a back door coupling assessment is sufficient.

### 3.1.4. Aircraft Flight Manual Limitations

Restrictions arising from the EMI assessment should be documented in the aircraft flight manual (AFM) or equivalent documents. They may be linked to different aircraft zones where EMI testing has not been successfully conducted and where PED use should be prohibited, or to particular transmission technologies covered.

When back door PED tolerance has only been demonstrated for certain transmission technologies (scenarios 2 and 3 in section 3.1.3), the AFM should include a clear statement of the technologies that has been addressed.

When front door PED tolerance has not been demonstrated (scenario 3 in section 3.1.3), the AFM should include a clear statement that PED allowance during low visibility approach is not covered by aircraft certification.

When no back door PED tolerance assessment has been performed (scenario 4 in section 3.1.3), the AFM should include a clear statement that PEDs transmitting capabilities assessment is not performed as part of the aircraft certification.

Taking into account that the back door susceptibility assessment for non-HIRF or partially HIRF certified aircraft relies on a risk based approach, where not all Part Numbers involved in Hazardous or Major failure conditions have been assessed to be PED tolerant to back door coupling, in order to continuously assess the PED risk, the AFM needs to include requirements for the operator to systematically monitor and report to the TC or STC holder any interferences caused by the use of PEDs on board.
3.1.5. Instructions for Continued Airworthiness

The applicant should produce an ICA document in accordance with CS 23.1529, 25.1529, 27.1529 or 29.1529. In order to sustain the aircraft PED tolerance, any design changes introduced to the aircraft should consider any impact that this might have on the RF and EMI assessment that has been undertaken.

The outcome of the RF and EMI assessment performed is valid only for the approved configuration of the aircraft as tested or for which the analysis was performed against. Altering the aircraft in any way from the approved configuration could invalidate the results, making the aircraft no longer PED tolerant.

Any modifications to an aircraft that is certified PED tolerant should be assessed to confirm if the PED tolerance is maintained or if there are limitations. Any instructions for sustaining aircraft PED tolerance should be specified in the instructions for continuous airworthiness document.

Guidance on sustaining aircraft PED tolerance can be found in EUROCAE ED-130A / RTCA DO-363 section 7.

3.1.6. Design data

The data to be submitted by the applicant to support the granting of approval should address the subjects of this Certification Memorandum.

The applicant should list all of the evaluated aircraft systems and equipment for which PED tolerance has been demonstrated.

The list should comprise all Hazardous and Major systems including CVR and FDR shown to be PED tolerant, and a list of all equipment part numbers performing Catastrophic functions. In addition the list should also identify the type of PED technologies that have been assessed, if a technology specific demonstration was made. The list can also be in the format of a Non-PED tolerant Equipment list.

The equipment list should be utilized for follow-on installations and anticipate additional aircraft equipment configurations to determine the need for additional assessment or testing.

3.1.7. Other regulatory requirements

In addition to airworthiness approval, the applicant should be aware of other specific issues that are associated with the scope of this demonstration. Specific test and development license(s) will need to be obtained to permit transmissions at designated T-PED frequencies, prior to conducting any ground and flight testing activities.

Safety precautions from RF emissions for personnel conducting all tests should be taken.

Licenses for generating the necessary RF fields and modulations for the required tests should be obtained from the relevant communications regulator.

Testing instructions should take into account emission restrictions imposed by spectrum usage licences.

3.2. Who this Certification Memorandum affects

The guidelines in the Certification Memorandum are applicable to all TC and STC applicants who intend to demonstrate an aircraft as PED tolerant or are installing a wireless communication system that will connect with PEDs.
4. Remarks

1. This EASA Proposed Certification Memorandum will be closed for public consultation on the 27th of February 2017. Comments received after the indicated closing date for consultation might not be taken into account.

2. Comments regarding this EASA Proposed Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu.

3. For any question concerning the technical content of this EASA Proposed Certification Memorandum, please contact:

   Name, First Name: Iniguez-Yarza, Maria Teresa
   Function: Senior Expert Electrical Systems
   Phone: +49 (0)221 89990 4332
   E-mail: maria-teresa.iniguez-yarza@easa.europa.eu