Use of Cargo Tracking Devices

Guidelines in relation to the COVID-19 pandemic

Issue №: 1

Date: 02.12.2020

Contents

Revision record

Issue	Date of issue	Summary of changes
01	2 December 2020	Initial issue

1. Background and Scope

At this stage of the COVID-19 pandemic, preparedness for the safe transport of vaccines becomes crucial. Once the vaccines become available, air cargo operators will be extremely solicited to ensure quick and efficient delivery. Among the associated logistical needs is the use of location tracking and temperature monitoring devices, to guarantee the integrity of the vaccines and to facilitate shipment monitoring.

Authorising the use of cargo tracking devices on board the aircraft is a responsibility of each operator. To ensure that they do not create a risk to safety, the criteria of AMC1 CAT.GEN.MPA.140 of the Air Operations Regulation[1] (hereinafter called 'the Air Ops Regulation') have to be met.

The purpose of this document is to provide guidance and recommendations to facilitate the evaluation of cargo tracking devices used in the context of the COVID-19 pandemic for compliance with the Air Ops Regulation. It provides technical considerations related to electromagnetic interferences (EMI) and batteries. Passive radio frequency identification (RFID) tags, not powered by any battery or external power source, may be considered as not being PED and can be authorised without any assessment.

2. Definitions

'Portable electronic device (PED)' means 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, that is not included in the configuration of the certified aircraft. It includes all equipment that is able to consume electrical energy. The electrical energy can be provided from internal sources such as batteries (chargeable or non-rechargeable) or the devices may also be connected to specific aircraft power sources.

'Transmitting PED (T-PED)' means a PED that has intentional radio frequency (RF) transmission capabilities. Conversely, a non-intentionally transmitting PED has no intentional RF transmission capabilities (but will have non-intentional emissions when switched on).

'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.

'Cargo tracking device' means a PED attached to or included in airfreight (e.g. in or on containers, pallets, parcels, mail bags, and baggage), with the purpose of monitoring location and/or parameters such as location, temperature, humidity, vibrations. The cargo tracking device may transmit these parameters remotely by means of radio frequency (RF) emissions.

[1] Commission Regulation (EU) No 965/2012 of 5 October 2012 (as amended)

3. Regulatory Considerations

As per the Air Ops Regulation, namely CAT.GEN.MPA.140, it is the operator's responsibility to authorise the use of PED on board the aircraft, after having ensured that they have no impact on the safety of operations.

The technical criteria to support that decision are spelled out in **AMC1 CAT.GEN.MPA.140** of the Air Ops Regulation (as amended by Annex III to ED Decision 2019/008/R). The following paragraphs apply more specifically to cargo tracking devices:

— **(d)(3)** Alternative EMI assessment of cargo tracking devices,

— **(e)** Operational conditions of C-PEDs and cargo tracking devices,

— **(f)** Batteries in C-PEDs and cargo tracking devices

When evaluated in accordance with the AMC, the use of cargo tracking devices is safe and can be authorised by operators with no involvement necessary of their competent authority or EASA. In particular, the Air Ops Regulation does not require that any operational approval has to be granted by the competent authority. EASA cannot approve or certify these devices.

4. Documentation

For the cargo tracking devices to be authorised efficiently, the following documents should be obtained from device manufacturers and retained by operators:

(1) Device description (hardware/software), including any peripheral;

(2) Technical specifications;

(3) Manuals;

(4) Manufacturer statement of strict design and production controls;

(5) Battery test summaries or qualification reports;

(6) Declaration of conformity and technical documentation showing compliance with the European Norms (EN), regulating the transmitter characteristics of the tracking device or its transmission module;

(7) Specification / technical characteristics of the automated and prolonged radio suspension in flight (if applicable);

(8) Reports showing that the automated and prolonged radio suspension in flight has successfully been verified in flight (if applicable).

If the device manufacturer has obtained in the past a Non Technical Objection (NTO) letter from EASA applicable to the model to be authorised, the operator may decide to use the data specified in the letter for compliance demonstration.

In addition, an operator obtaining evidence and data from another operator regarding the authorisation of a particular cargo tracking device may decide under its own responsibility to take credit from this data for compliance with AMC1 CAT.GEN.MPA.140. It is recommended to verify that the device and aircraft models are identical.

5. Technical Considerations – EMI

5.1 Methods

If the aircraft was certified as PED-tolerant and the device conforms to the TC Holder instructions, compliance with AMC1 CAT.GEN.MPA.140 (d)(3) is ensured without further assessment.

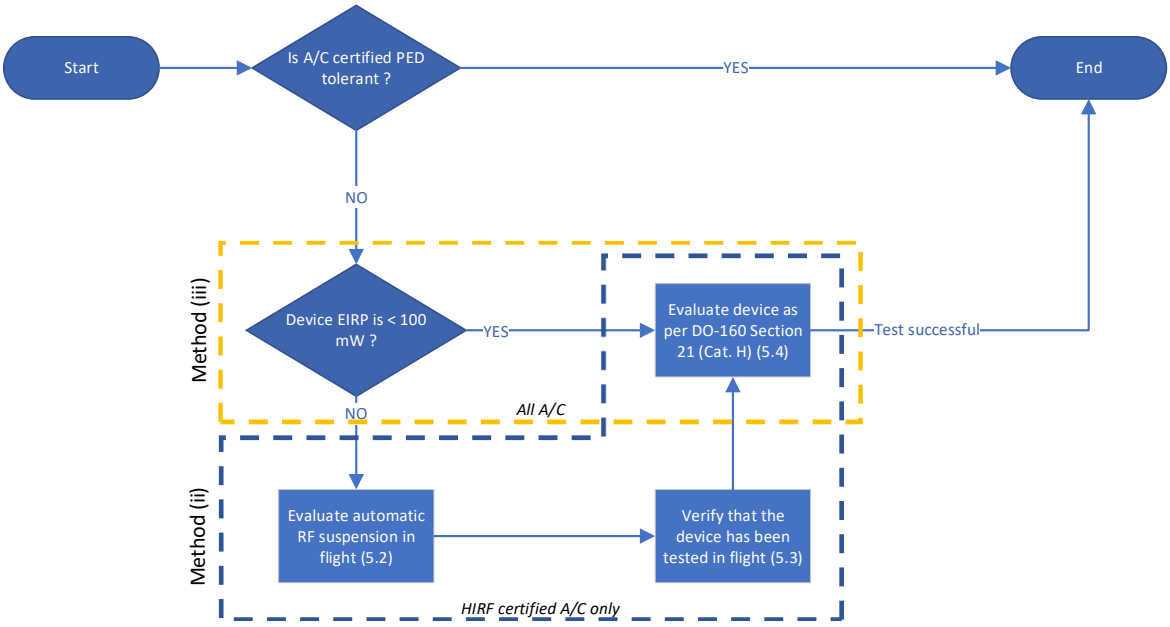
For aircraft not certified as PED-tolerant, **AMC1 CAT.GEN.MPA.140 (d)(3)** proposes 3 methods which can be used to justify that the cargo tracking device does not create harmful EMI. Operators can select any one of these methods when showing compliance with the AMC, depending on the type of device and aircraft in the fleet.

In practice, only methods **(ii)** and **(iii)** are used for a quick approval of common devices that have not been developed according to aeronautical development assurance practices (e.g. DO-178, DO-254).

Method (ii) takes credit from the high intensity radiated field (HIRF) certification of aircraft to mitigate the risk associated to backdoor interferences. This is usually the method to follow to authorise cargo tracking devices using cellular GSM/3G/LTE technologies, or newer technologies such as NarrowBand Internet-of-Things (NB-IoT), and having an automated radio suspension in flight. The absence of front door interferences should be demonstrated by showing compliance with EUROCAE ED-14E/RTCA DO-160E (or later revisions) Section 21 Cat. H criteria and by the use of (EN) compliant transmitters.

Method (iii) is dedicated to devices with low-powered emissions (EIRP < 100 mW or 20 dBm) and to non-intentionally transmitting PEDs. Those devices do not require a radio suspension in flight, since it is considered that the risk of backdoor interferences can be neglected (both for HIRF-certified and non HIRF-certified aircraft). However, as the devices will be active in all phases of flight, a successful ED-14E/DO-160E Section 21 Cat. H evaluation is still needed. This is usually the method for devices using technologies such as RFID, LPWAN, Bluetooth or Zigbee (configured to not exceed 100 mW / 20 dBm EIRP), as well as for PEDs without transmitters but active during the whole flight (e.g. dataloggers).

The following process shows how to evaluate that the EMI demonstration is satisfied. Criteria for each step are provided further down in this chapter.



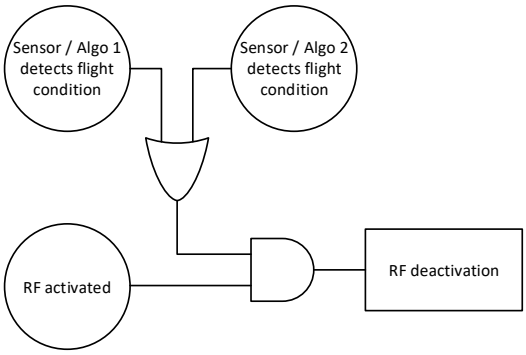
5.2 Automatic RF Suspension in Flight

The purpose of the automatic suspension in flight is to prevent interferences caused by the device's intentional emissions.

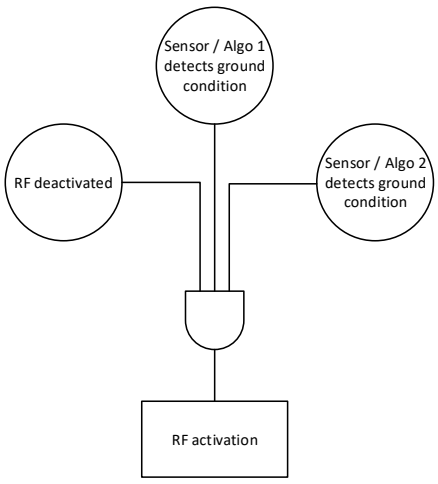
A device with an automatic suspension in flight should have 'Multiple modes of redundancy', meaning it should be designed with a minimum of two independent means to turn it off completely, turn off the cellular or mobile functions, or a combination of both when airborne. These independent methods should use different sources to identify that the aircraft is in flight, for example sensing rapid altitude changes and acceleration to determine when to turn off cellular transmissions. Redundant sources of the same information, such as two vertical accelerometers, should not be considered independent.

The operator should check in the data provided by the device manufacturer that the architecture of the automatic suspension is designed in a conservative manner, i.e. such that a single sensor malfunction cannot lead to an activation of the RF functions in flight.

This means that the radio suspension should be activated if any of the sensors/means senses that the aircraft is in flight (logical OR gate):



Conversely, the radio suspension should not be deactivated unless all sensors/means identify that the aircraft is on ground (logical AND gate):



These diagrams are provided for guidance only. Actual implementation can be different and acceptable if the principle of a conservative use of the sensors is kept.

Sensors used for flight detection algorithms are quite varied. They can rely, for example, on measurements of ambient vibrations, acceleration, or pressure. The use of GPS parameters is not recommended as reception within the aircraft cannot be reliably predicted (signals may or may not be received).

5.3 Verification in Flight

The operator should be satisfied that the device has been tested sufficiently to demonstrate that its radio suspension mode is working correctly. In case the radio suspension algorithm is based on aircraft-dependent criteria (e.g. takeoff acceleration), it is recommended to verify that the correct behaviour of the function has been tested on board the relevant aircraft types. There is no exact figure regarding how many test flights are needed. The tests can be performed by the device manufacturers and reports provided to the operator.

5.4 Manual RF Deactivation

Method (ii) and chapters 5.2 and 5.3 above apply to devices featuring an automatic radio suspension in flight.

However, if the operator has robust procedures in place to ensure that all transmission functions of a device are manually switched off before flight and will not reactivate in flight, then this device can be considered as a non intentionally transmitting PED and can be addressed by method (iii).

5.5 DO-160 Testing

DO-160 Section 21 tests can be conducted by specialised laboratories. The purpose is to ensure that there are no spurious emissions likely to create front-door interferences (coupling with antennas). It is recommended to verify that the test has been done in all operational modes, with a least one test point when the device is transmitting. The test is successful if no negative margins are identified by the laboratory with respect to the Category H limits.

5.6 Non-HIRF Certified Aircraft

Some older aircraft, not HIRF certified, are still in operations today for air cargo transport. The main risk when using PED in these aircraft is back-door interference.

The only devices that can be used in these aircraft with no further assessment are the passive RFID tags. As per method (iii) described above, cargo tracking devices with low-powered emissions (EIRP < 100 mW or 20 dBm) or without intentional emissions can also be used, subject to their successful ED-14 / DO-160 Section 21 assessment.

To authorise the use of other devices, the aircraft needs to be evaluated as per the process in AMC1 CAT.GEN.MPA.140 (d)(1).

6. Technical Considerations – Design and Production Controls

Operators should ensure that the devices are designed and produced in a quality-controlled environment. This can be achieved by obtaining ISO 9001 (or equivalent) certificates covering the design and manufacturing.

7. Technical Considerations – Operational Conditions

As per **AMC1 CAT.GEN.MPA.140 (e)**, operators should ensure that C-PEDs and cargo tracking devices are maintained in good and safe condition. An inspection of every cargo tracking device by the operator is not needed for this purpose if that assurance can be obtained from the shippers.

8. Technical and Transport-Related Considerations – Batteries

Batteries may create a risk of fire. Operators should ensure that all batteries are transported in accordance with CAT.GEN.MPA.200, and therefore with the ICAO Technical Instructions for the Safe Transport of Dangerous Goods, and fulfil all the criteria established in such instructions.

Operators may also refer to the IATA guidance on the applicability of these provisions (see link in chapter 10).

When lithium batteries are used in a cargo tracking device, the operator should check that they meet the standards listed in **AMC1 CAT.GEN.MPA.140 (f)**.

9. Liaison with EASA

Operators engaged in the evaluation of cargo tracking devices in the context of COVID-19 logistics may obtain technical advice from EASA on compliance with AMC1 CAT.GEN.MPA.140 by contacting covid-ctd@easa.europa.eu.

10. Useful links

All EASA published information can be found through the COVID-19 portal on the EASA website:

https://www.easa.europa.eu/the-agency/coronavirus-covid-19

EASA's FAQ on cargo tracking devices:

https://www.easa.europa.eu/the-agency/faqs/cargo-tracking-devices

IATA guidance for Vaccine and Pharmaceutical Logistics and Distribution (includes considerations on PEDs):

https://www.iata.org/en/pressroom/pr/2020-11-16-01/

EASA Type Certificate Data Sheets (for checking the HIRF certification status of an aircraft):

https://www.easa.europa.eu/document-library/type-certificates

The TCDS lists whether the HIRF certification has been performed through a special condition. The operator may contact the type certification holder to gain the necessary information.