澳門特別行政區
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

AC
No. : AC/OPS/032R00
Date : 30 March 15

AERONAUTICAL CIRCULAR
CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT:

Use of Portable Electronic Devices

EFFECTIVE DATE:
15 April 2015

CANCELLATION:
NIL.

GENERAL:
The President of Civil Aviation Authority – Macao, China, in exercise of his power under Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M and Paragraph 89 of the Air Navigation Regulation of Macao (ANRM), established this Aeronautical Circular (AC).

APPLICABILITY:
This AC applies to all Macao AOC holders.

1 INTRODUCTION

1.1 According to Air Navigation Regulation of Macao (ANRM) Part V Paragraph 31 (b), "the pilot-in-command shall take all reasonable steps to ensure before the aircraft takes off on any flight, that all passengers are given specific warnings and take the appropriate actions to ensure that during certain stages of the flight no use can be made of certain electronic devices or any other personal belongings used by passengers individually which can possibly endanger the safety of the flight or its occupants."

1.2 This AC prescribes the requirements for the use of Portable Electronic Devices (PEDs) onboard an aircraft and provides guidance on obtaining AACM's approval for expanded use of PEDs to Macao AOC holders.

2 BACKGROUND

2.1 PEDs could potentially cause electromagnetic (EM) interference to installed aircraft systems, including communications and navigation equipment, thus could pose a safety risk to aircraft operation. PEDs can be classified into two main categories: unintentionally transmitting PEDs and intentionally transmitting PEDs (T-PEDs).

(a) Unintentionally Transmitting PEDs

(1) Unintentionally transmitting PEDs do not intentionally transmit Radio Frequency (RF) signals. However, by virtue of their electrical operation, spurious RF radiation will be unintentionally emitted and these could cause EM interference in the operational band of aircraft radio receivers by distorting low level desired signals or create erroneous signals received by them.

(2) These PEDs may include but not limited to, computing equipment, cameras, radio receivers, electronic games and toys and medical portable electronic devices (such as automated external defibrillators (AEDs) and portable oxygen concentrators).

Note: Due to the proliferation of wireless technologies in consumer products, PEDs that were conventionally not wireless enabled are increasingly embedded with such capabilities. *For the purpose of this AC, unintentionally transmitting PEDs refers to PEDs with no embedded wireless function, or with their wireless function positively deactivated (Airplane mode enabled).*

(b) Intentionally Transmitting PEDs (T-PEDs)

(1) Intentionally transmitting PEDs transmit RF signals to accomplish their intended functions. For such PEDs, the primary concern is that the radiated RF energy could induce direct EM interference into aircraft equipment, wiring and components, and compromise safe operation of flight.

(2) T-PEDs may include but not limited to cellphones, satellite phones, wireless enabled devices (such as laptops and tablets), remote control equipment and two-way radios.

3 REQUIREMENTS

3.1 The operator shall not permit the use of a PED on board an aircraft except as provided for in paragraphs 3.2 and 3.3.

3.2 An operator may permit the use of a PED on board an aircraft:

(a) if the PED is an unintentionally transmitting PED or an intentionally transmitting PED with its transmitting function disabled, when the aircraft is operating at an altitude of above 10,000ft;

(b) after the aircraft has exited the runway upon landing;

(c) if it is a PED that has very low power consumption, such as a heart pacemaker, hearing aid or digital watch; or

(d) if it is a medical PED, such as an automated external defibrillator or a portable oxygen concentrator, that has been approved for use in an aircraft.

3.3 An operator may permit the use of a PED on board an aircraft in the following circumstances if he has obtained the approval of AACM under paragraph 3.6:

(a) unintentionally transmitting PED or intentionally transmitting PED with transmitting functions disabled, when the aircraft is operating at an altitude of 10,000ft or lower; or

(b) intentionally transmitting PED with transmitting functions in active mode when the aircraft is operating at an altitude above 10,000ft.

3.4 Notwithstanding paragraph 3.2 and 3.3,

(a) the operator shall not permit the use of a PED for voice communications on board an aircraft except when the aircraft has exited the runway upon landing; and

(b) the operator shall not permit the use, or shall terminate any permitted use, of a PED on board an aircraft when its use may interfere, or is suspected of interfering, with the performance of the navigation and communication systems of the aircraft.

3.5 The operator shall ensure that when any PED is used on board an aircraft that:

(a) the use of the PED will not interfere with the performance of the aircraft's navigation and communications systems,

(b) there are established procedures for ensuring that the use of the PED complies with paragraph 3; and

(c) crew members are assigned responsibilities and trained for ensuring the safe use of the PED.

3.6 The AACM may grant an approval required by an operator under paragraph 3.3 upon an application made by the operator with the submission of the following documents:

(a) a report of the safety risk assessment and required certification tests as necessary conducted on the tolerance of the aircraft to PED radio frequency interference to ascertain that the use of the PED in the required modes will not interfere with the performance of the navigation or communications systems of the aircraft;

(b) the appropriate manuals containing written procedures that include the following:

(i) the assignment of responsibilities to crew members for ensuring the safe use of PED;

(ii) the procedures to isolate or prohibit the use of PED should interference from PED be suspected or is ascertained; and

(iii) the required training of the crew members.

3.7 The operator shall inform the passengers of the permissible times, conditions and limitations for the use of PED.

3.8 Notwithstanding any use of PED permitted by the operator, the pilot-in-command has the right to terminate the use of any PED.

3.9 An operator shall obtain an approval from AACM if it provides or intends to provide a PED as part of its In-Flight Entertainment or other services on board the aircraft.

4 GUIDANCE ON OBTAINING AACM APPROVAL FOR EXPANDED USE OF PED

4.1 The permitted use of PEDs onboard an aircraft during the different phases of flight is depicted as follows:

Types of PEDS	USE OF PEDs			
	Critical Phases of Flight	**Non-Critical Phase of Flight**	**Critical Phases of Flight**	**Non-Critical Phases of Flight**
	From taxi-out to 10,000ft	Above 10,000ft	From 10,000ft to Landing	After aircraft has exited runway
				
Unintentionally transmitting PEDs	Permitted to use if granted an approval by AACM(i)	Permitted	Permitted to use if granted an approval by AACM(i)	Permitted
T-PEDs with its transmitting functions disabled (i.e. "Airplane Mode")				
T-PEDs in active mode	Prohibited	Permitted if granted an approval by AACM(ii)	Prohibited	Permitted
Voice communications using T-PEDs	Prohibited			Permitted
Unintentionally transmitting, with low level of emission	Permitted(iii)			
Medical PEDs approved for use in an aircraft	Permitted(iv)			

Footnotes:

(i) The procedures to control the use of PED on board the aircraft must be approved. For Low Visibility Operations (LVO), PEDs should be switched off unless aircraft systems have been shown to be tolerant of "front door" interference effects as per RTCA DO-307 or EUROCAE ED-130 and an approval has been granted. See paragraph 4.2.

(ii) The corresponding on board wireless systems would need to be approved by AACM. See paragraphs 4.3 and 4.4.

(iii) This refers to PEDs with low power consumption, such as heart pacemakers, hearing aids and digital watches.

(iv) See Paragraph 4.4.

4.2 Unintentionally Transmitting PEDs and intentionally transmitting PEDs with transmitting function switched off

(a) Spurious emission from PEDs as received by the aircraft antenna could potentially lead to misleading information and compromise the operation of navigation instruments such as the localizer and glideslope systems, used during low visibility operations. Hence, the use of such PEDs when the aircraft is flying at or less than 10,000ft in altitude is only permitted if an approval has been granted by AACM. To obtain AACM approval, the operator must submit a safety risk assessment and implement operational procedures to control the use of these PEDs. Guidance on the safety risk assessment and procedures are detailed in paragraph 5.

(b) For the purpose of paragraph 4.2, operators procedures should ensure the PEDs used are either unintentionally transmitting or have their transmitting functions switched off. Unless otherwise stated in the approval granted by AACM, the procedures should prohibit the use of PEDs during LVO.

(c) For an approval that permits the use of PEDs during LVO, the operator will have to demonstrate that the aircraft systems are tolerant of "front door" interference effects in accordance with:

(1) RTCA DO-307 "Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance"; or

(2) EUROCAE ED-130 "Guidance for the Use of Portable Electronic Devices (PEDS) On Board Aircraft".

Note: "Front door" interference refers to coupling mechanism that occurs in the operational band of the avionics receivers. The spurious emissions from PEDs can potentially distort low level desired signals or create erroneous signals received by the aircraft radio receiver antennas.

4.3 Intentionally Transmitting PEDs (T-PEDs) with transmission functions in the active mode

(a) Intentional RF emissions from T-PEDs have the potential to interfere with aircraft electrical and electronic systems by means of coupling to cables or directly into the aircraft system equipment. As such, the use of T-PEDs with transmissions in the active mode is prohibited on board an aircraft. The operator shall implement operational procedures to require passengers to switch off the T-PED, or disable its transmitting functions (i.e. put to "flight" or "airplane" mode), from the start of the flight when all passengers have boarded and all doors have been closed until the aircraft has exited the runway.

(b) The use of T-PEDs with transmission functions in active mode may be permitted if the aircraft is equipped with on board wireless systems that facilitate the use. Operators

intending to equip their aircraft with such systems must obtain an approval from AACM for the installation. The installation approval granted by AACM for the onboard wireless system normally involves safety assessment, functional tests, EM compatibility tests and EM interference tests. It is recommended that an appropriate design organization be engaged or equivalent be engaged to apply for the certification approval for the installation of onboard wireless system.

(c) The technical demonstration to determine the acceptable use of T-PEDs should be performed in accordance with the applicable processes set forth as below:

(1) Aircraft with Demonstrated PED Tolerance

(i) The applicant should provide data that shows the aircraft has demonstrated PED tolerance using RTCA DO-307 or EUROCAE ED- 130.

(ii) The applicant should use laboratory Electromagnetic Compatibility (EMC) tests in accordance with RTCA DO-160, to qualify the on board wireless system equipment.

(iii) Standard aircraft EMC ground or flight tests should be performed with the on board wireless system equipment transmitting to and receiving from T-PEDs. The transmitting PEDs should be operated in all areas of the aircraft that passengers or crewmembers can occupy, and the number of T-PEDs selected should cause the system to operate at high capacity.

(2) Aircraft without Demonstrated PED Tolerance

(i) Standard aircraft EMC ground tests or flight tests should be performed. Appropriate pass/fail criteria for these aircraft EMC tests should be defined by the applicant in the respective test plan.

(ii) In addition to the aircraft EMC ground or flight tests, the applicant should perform aircraft RF susceptibility demonstrations. Aircraft RF susceptibility demonstrations should expose the aircraft electrical and electronic systems to RF fields that represent the fields from the T-PEDs that communicate with the on board wireless system. These demonstrations must show acceptable performance for all aircraft systems that perform functions that are required by regulation or that have major, hazardous and/or catastrophic failure conditions. The RF susceptibility tests should be performed using a transmitter and antenna operating at the maximum effective isotropic radiated power (EIRP). The following standards provide acceptable guidance on performing the RF susceptibility demonstrations.

a) RTCA DO-294C “Guidance on Allowing Transmitting Portable

Electronic Devices (T-PEDs) on Aircraft".

b) EUROCAE ED-130 "Guidance for the Use of Portable Electronic Devices (PEDs) On Board Aircraft".

(iii) The EIRP should be increased by a multiple equipment factor for systems where the EIRP seen at the aircraft systems increases when multiple T-PEDs can transmit simultaneously. The multiple equipment factor should be determined assuming that the number of T-PEDs is equal to the number of passenger and crew member seats in the aircraft, unless a different number is justified by the applicant.

(iv) A transmitter emulator and antenna may be used to generate the RF fields. The emulator should operate using modulations similar to the authorized modulations for the T-PEDs intended for communication with the on board wireless system. The T-PEDs or emulator antenna should be positioned to expose electrical and electronic equipment in all locations of the aircraft that passengers or crewmembers can occupy.

(d) This assessment must confirm that there is no interference to aircraft equipment as a result of both "back door" interference effects caused by intentional transmission as well as "front door" interference effects caused by spurious transmission from the T- PEDs.

Note: "Back door" interference refers to interference from intentional RF emissions from T-PEDs with aircraft electrical and electronic systems by the emitted signal coupling to cables or directly into the aircraft system equipment.

(e) Some Operators may operate aircraft equipped with on board wireless systems that are installed in the factory. These systems will also need to meet the requirements as stated in paragraphs 4.3(c) and 4.3(d). To obtain AACM approval to permit the use of T-PEDs in conjunction with these systems above 10,000ft, the operator must submit a safety risk assessment and implement operational procedures to control the use of these PEDs. Guidance on the safety risk assessment and procedures are detailed in paragraph 5.

4.4 Medical PEDs

(a) Medical portable electronic devices refer to PEDs such as automated external defibrillators (AEDs), portable oxygen concentrators and airborne patient medical telemonitoring equipment.

(b) The use of medical PEDs may be permitted for all phases of flight, including low visibility operations, if they are designed and tested in accordance with RTCA DO-160, current edition.

(c) Laboratory RF emission test should be performed using procedures detailed in RTCA DO-160 "Environment Conditions and Test Procedures for Airborne Equipment". Section 21, Category 'M' of the RTCA document should be used to test and establish the RF emission limits. The RF emissions should be measured in all modes of operation.

(d) Medical PEDs that have been tested and found to be within the RF emission limits may be used on board the aircraft without further testing by the operator.

5 OPERATIONAL POLICY AND PROCEDURES

5.1 The safety risk assessment required in the above paragraphs should address the changes and possible hazards, and identify the mitigating measures regarding the implementing expanded usage of PED. The operational policy and procedures for crew training and cabin safety management should be correspondingly updated in the operations manuals, checklists, training programmes, associated documents and relevant safety materials such as safety briefing cards whose revision must be submitted for the approval or acceptance by AACM prior to use.

5.2 Updates, to the abovementioned operations documents, relating to the expanded use of PED should include:

(a) normal, non-normal and emergency procedures for all crew;

(b) cabin management procedures to include, but not limited to the following:

(1) providing passengers information of the permissible times, conditions and limitations when various PEDs may be used. This may be through:

(i) pre-flight safety briefings and in any other ad hoc safety briefings; and

(ii) supplementary information on expanded use of PED policy prior to flight and in flight.

(2) ensuring passengers remained seated with their seat belt fastened during taxi, take-off and landing.

(3) ensuring passengers are aware that voice communication using PEDs is only permitted after the aircraft has landed and exited the runway.

(4) ensuring the proper stowing and securing of PED items, including the identification of phases of flight during which PEDs are to be stowed and the determination of suitable stowage locations taking into account and the following general concerns should be addressed:

(i) device size and weight - large PEDs such as full-size laptops must be safely stowed so as to prevent them from becoming projectiles in an emergency. Small PEDs may be used as long as they are secured during take-off and landing,

(ii) PED cords and accessories must not impede emergency egress.

(5) locating and terminating the operation of any PED suspected of causing interference to aircraft systems.

(6) coordination between flight crew and cabin crew on how to recognize and deal with suspected interference from PEDs.

5.3 The operator should demonstrate that all crew are adequately briefed and trained on the policy, procedures and crew responsibilities in regard to permitting the expanded use of PEDs. The training should include, but is not limited to cabin management of PEDs and the provision of a list of PEDs that can/cannot be used on board, permissible times of use, when voice communication is permitted, etc.

5.4 The operator will need to report to AACM any events or anomalies associated with the use of PED. Reportable items include but are not limited to suspected or confirmed electromagnetic interference, and malfunctions in PED unit that results in smoke emitted or fire. The report should include such as the time of event, effect on aircraft, aircraft location and the phase of flight that the event occurred, the suspected PED Make, Model, location, actions taken, and effect of action taken.

5.5 For additional guidance on conducting risk assessment and establishing operational procedures, please refer to EASA SIB 2013-21 and EASA AMC1 CAT.GEN.MPA.140.

6 BATTERY SAFETY

6.1 Passenger PEDs

(a) Batteries installed in PEDs pose a fire hazard and safety concerns include the possibility of explosion caused by failures of the batteries.

(b) The operator should refer to the ICAO TI for the carriage requirements of PEDs installed with batteries.

6.2 PED Provided by the Operator

(a) The operator may provide PEDs to passenger for use as entertainment devices. The batteries contained in these devices pose a fire hazard and the potential large amount of PEDs that the operator may carry on board for this purpose would result in an increased risk of a battery fire.

(b) To mitigate the risk of battery fire, the following procedures should be adhered to:

(1) PEDs installed with lithium metal or lithium ion batteries

(i) The PEDs should be stored in a manner to prevent consecutive thermal runaway.

(ii) The containers, drawers and peripherals used to store the PEDs should be able to contain fire that is generated from PEDs.

(iii) The lithium metal or lithium ion batteries installed in the PEDs must be of the type that meet the requirements of each test of the UN Manual of Test and Criteria, Part III, subsection 38.3 and manufactured under a quality management programme as described in the ICAO TI.

(iv) The capacity of the main and spare lithium metal or lithium ion batteries of the PEDs must be within the watt-hour limitations permitted for passengers and crew as specified in the ICAO TI.

(v) Spare lithium metal or lithium ion batteries not installed in PEDs must be protected from external short circuit and stored in the cabin only.

(2) PEDs installed with other non-spillable batteries

(i) PEDs containing batteries that meet the requirements of special provision A67 stipulated in ICAO TI may be permitted provided the battery must not have a voltage greater than 12 volts and a Watt-hour (Wh) rating of not greater than 100Wh.

(ii) Spare batteries must be protected from external short circuit and stored in the cabin only.

-END-