CIVIL AVIATION PUBLICATION

CAP 35

PORTABLE ELECTRONIC DEVICES (PED)

CONTENTS

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1. INTRODUCTION

1.1 General

This Civil Aviation Publication (CAP) provides means to prevent Portable Electronic Devices (PEDs) on board aircraft adversely affecting the performance of the aircraft's systems and equipment.

This CAP is applicable for the expanded use of PEDs and it also provides information and CAA policy regarding the acceptable method of compliance for the operational approval for a Transmitting Portable Electronic Devices (T-PED). T-PEDs are generally used in devices for passenger entertainment connected to a wifi system inflight.

This CAP does not address controlled PEDs (C-PEDs), which are used by flight crew and addressed in CAP 06 – Electronic Flight Bag. However, it does address PEDs carried in the flight deck, which are not C-PEDs, such as personal phones, iPads etc.

Whilst the requirements are primarily aimed at applicants applying for operational approval of T-PEDs using a wifi system, the guidance material is also applicable to those operators using PEDs (non transmitting PED) in respect to training, operating procedures and necessary precautions.

1.2 Background

The problems associated with the use of PEDs by passengers has been a growing concern for the airline industry for a number of years. PEDs are not designed to the same stringent standards as aircraft avionics systems. As a result, a number of devices transmit electronic signals, either intentionally or unintentionally. These transmitted signals can affect aircraft navigation, communication and flight control systems.

Incidents reported have included minor deviations in navigation instruments, difficulties in communication, disconnection of auto-pilot and auto-throttle systems, through to un-commanded inputs to the auto-pilot resulting in a sometimes rapid, unintentional climb and/or turn of the aircraft.

There is evidence to show that certain types of devices generate Electro-Magnetic Interference (EMI). Devices most likely to cause interference are intentional transmitters (T-PEDs) like cellular telephones and CB radios. These devices often transmit on a frequency that is similar to aircraft communication systems and the operator policy should be that they cannot be used in flight unless approved by the CAA.

There are other digital devices which are unintentional transmitters. These devices will radiate signals due to the use of a high-frequency clock oscillator; such devices include laptop computers, hand-held electronic games, video cameras and tape recorders.

1.3 Regulatory Requirements

CAR OPS 1.110 states "The operator shall not permit any person to use, and take all reasonable measures to ensure that no person does use on board an aeroplane, a portable electronic device that can adversely affect the performance of the aeroplane's systems and equipment.

The same applies to helicopters in CAR OPS 3.110.

There is no such regulation applicable to General Aviation aircraft under CAR OPS 2A/H but the training, procedures and necessary precautions in this CAP are applicable. In addition, the use of approved wireless systems installed in CAR OPS 2A, Part II aeroplanes (corporate jets) requires an operational approval.

2. REFERENCES

This CAP is based on the following publications which have been accepted as defining references on this subject.

- RTCA DO-160; DO-294C; DO-307;
- ICAO Circular 340 – Guidelines for the Expanded Use of Portable Electronic Devices;
- EUROCAE ED-130;
- FAA Information to Operators InFO 13010 & Supplement.

3. DEFINITIONS

Controlled portable electronic device (C-PED). A C-PED may be a PED or T-PED, which forms part of an operator's approved electronic flight bag (EFB). It is not addressed in this CAP as it is covered in CAP 06 – Electronic Flight Bag.

Critical phases of flight. The period of high workload on the flight deck, normally being the periods between the beginning of taxiing until the aircraft is on the route climb phase and between the final part of descent to aircraft parking. (often presented as above 10000 ft agl)

Non-transmitting portable electronic device. A Portable Electronic Device that is not equipped with a radio frequency transmitting function or a portable electronic device that has all of the device's radio frequency transmitting functions turned off or is in airplane mode with the transmitting capability also turned off.

Portable electronic device (PED). Any lightweight, electrically-powered equipment. These devices are typically consumer electronic devices capable of communication, data processing and/or utility. Examples range from hand held, lightweight electronic devices such as tablets, e-readers, and smart phones to small devices such as MP3 players and electronic toys.

Note: The definition of PED encompasses both transmitting and non-transmitting PEDs.

Transmitting portable electronic device (T-PED). A PED that contains an intentional transmitter, which has some or all of the device's radio frequency transmitting functions turned on. Intentional transmitters may include devices enabled with cellular technology, wireless radio frequency network devices, and other wireless-enabled devices such as remote control equipment (which may include toys), two-way radios, cellular/mobile/smart phones and satellite phones.

Note: Intentional transmitters may also include computers with mobile phone data connection, wireless fidelity (WIFI) or Bluetooth capability. 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.

4. PED USAGE CONSIDERATIONS

4.1 Interference

The operator is responsible for determining that PEDs will not cause interference with the on-board electronic systems and equipment of the aircraft on which they are to be used. The following provides examples of acceptable methods of compliance for this regulatory requirement.

(a) Operating mode of a PED.

"Airplane mode" turns off all of the transmitters in the device. The operator should continue to require passengers to place their PEDs in "Airplane mode" from the time the aircraft is ready for departure (e.g. door closure, pushback, etc.) until the end of the flight.

For aircraft equipped with on-board wireless services, the operator, once approved by the CAA, should address the acceptable times during which the passengers may enable their T-PEDs to transmit in Wi-Fi/Bluetooth mode, when they must be in "Airplane mode" and when they may connect to the wireless services.

Aircraft equipped with wireless systems that have operational approval have been tested to ensure that they will not interfere with the on-board electronic systems and equipment. T-PEDs such as smart phones, some e-readers, cameras and tablets may be operated with transmitters such as Wi-Fi mode through appropriate settings in the device set-up menu.

(b) Expanding the use of PEDs.

The operator must conduct a safety risk assessment prior to implementing a change in policy. This assessment outlines the mitigations and controls that an operator needs to implement in order to expand PED use into various phases of flight.

However, the operator can base its equipment-specific safety risk assessment using supporting evidence from previously conducted assessments (e.g. for a specific aircraft model/series).

The operator must cover the following items, when conducting a safety risk assessment of typical on- board electronic systems and equipment and their functions to determine potential interference;

(1) determine which functions are applicable to the operation;

(2) establish procedures to adopt the mitigations and controls necessary for those functions. If an operator does not use a function, then no action is necessary;

(3) evaluate operations to identify unique on-board electronic systems and equipment or functions not covered by this assessment. If any are identified, the operator must review those operations that have major, hazardous or catastrophic failure following the approach established by the assessment and adopt the necessary mitigations and controls for those systems; and

(4) incorporate the validation concepts into its operation to continuously monitor the impact that expanded use of PEDs may have on an operator's system safety operation (e.g. potential PED interference, if applicable).

4.2 Operational Conditions

In addition to the safety risk assessment of on-board electronic systems and equipment, the operator is required to conduct a safety risk assessment of operational conditions, including cabin safety considerations related to the expanded use of PEDs.

These considerations include, but are not limited to stowage requirements for devices, the revision of operator procedures and approved training programmes, and changes in information to passengers. The operator must enable the prohibition of PED use in certain phases of flight or in special circumstances. These may include, but are not limited to, the following:

(a) during low visibility operations (e.g. CAT II and CAT III);

(b) as per pilot-in-command authority;

(c) during turbulence; and

(d) during an abnormal or emergency situation.

If the operator provides on-board wireless services, it must develop a policy, and associated procedures that:

(a) specify which PEDs may be used for non-voice data services (email, text messaging and internet);

(b) specify when these PEDs may be used; and

(c) specify considerations related to the use of Wi-Fi data services for voice communications (e.g. WhatsApp, voice over internet protocol (VoIP), etc.).

5. OPERATIONAL APPROVAL OF T-PEDs

5.1 Application

The application for operational approval is Form SM 184, which requires evidence from all operators of the installed wireless system, the technical assessment as described below and supporting documentation. General Aviation operators, when signing the "Declaration of Compliance" are also declaring that the operations manual contains the policy, procedures and training for the use of T-PEDs.

The Appendix to Form SM 184 contains a checklist which must be completed as part of the application for all operators.

The operational approval will be issued on a Specific Approval Certificate for General Aviation operators and in the Operations Specifications for Commercial Air Transport (CAT) operators.

5.2 General

Operational approval from the CAA is only required for T-PEDs in aircraft equipped with an approved onboard wireless system that is installed under a Supplemental Type Certificate or an accepted approval basis. The system allows passenger T-PEDs to connect to the internet or on board in-flight entertainment systems.

The approval process is amplified in this Section under the following;

(a) PED Immunity/Aircraft Tolerance (Refer to Section 6):

(b) Safety Risk Assessment: (Refer to Section 7):

(c) EMC (Electromagnetic Compatibility) Data: (Refer to Section 8):

Note: EMC is the ability of a device to function properly in its environment without causing or being affected by EMI. It ensures a device doesn't emit excessive EMI and that device can operate correctly in the presence of external EMI from other devices.

(d) Operations Manual: (Refer to Section 9):

(e) Monitoring and Safety Assurance: (Refer to Section 10):

6. PED IMMUNITY/AIRCRAFT TOLERANCE

6.1 International Standard

The following standards are used to determine PED Immunity/Aircraft Tolerance

(a) RTCA/DO-294 or EUROCAE ED-130 identify processes for evaluating acceptable use of T-PEDs, particularly when considering specific types of T-PEDs. The operator may want to obtain the services of a person or facility capable of determining non-interference to the on-board electronic systems and equipment. Personnel specifically designated by the operator for this purpose may make this determination using the process described in RTCA/DO-294 or EUROCAE ED-130.

(b) RTCA/DO-307 defines methods to demonstrate that an aircraft model is tolerant to transmitting and non-transmitting PEDs. RTCA/DO-307 is most easily applied by aircraft manufacturers that have access to data that defines the on-board electronic systems and equipment qualification and the aircraft radio receiver antenna installations, but the methods in RTCA/DO-307 can be used by operators.

RTCA/DO-307 has separate methods for demonstrating tolerance to intentional transmissions from T-PEDs and demonstrating tolerance to spurious emissions from PEDs.

If an aircraft model has demonstrated tolerance for both transmitting and non-transmitting PEDs, the operator may allow PED use during all phases of flight on these aircraft models.

(c) If an operator does not have a PED-tolerant aircraft and chooses not to test its aircraft fleet types according to DO-307 or ED-130, then the operator may choose to conduct a safety risk assessment using the guidance RTCA DO-363. if it;

(1) does not have a designed and certified PED-tolerant aircraft; and

(2) chooses not to test its aircraft fleet types according to RTCA DO-307A or obtain supporting documentation from an aircraft manufacturer. The operator's assessment must evaluate the avionics configuration of its fleet and failure modes of communication, navigation, surveillance, and other electronic systems with respect to electromagnetic interference. This assessment ultimately outlines mitigations and controls the operator needs to adopt to expand PED use into various phases of flight.

The Aeroplane/Rotorcraft Flight Manual (or Supplement) should provide appropriate instructions regarding the PED tolerance approval of the aircraft (see Section 5 of RTCA/DO-307). Any continued airworthiness instructions required to maintain the level of tolerance should be specified in the instructions for continuing airworthiness (see Section 5.7 of RTCA/DO-307).

Note: Guidance equivalent to that in RTCA/DO-307 is presented in EUROCAE ED-130.

Documentation of PED tolerance approval may also be accomplished by service bulletin, service letter or other documentation acceptable to the CAA.

6.2 Aircraft with Demonstrated PED Tolerance

(a) The applicant must provide data that shows the aircraft has demonstrated PED tolerance using RTCA DO-307, RTCA DO-294C or EUROCAE ED-130.

(b) The applicant should use laboratory electromagnetic interference (EMI) tests in accordance with RTCA DO-160.

(c) EMI ground or flight tests should be performed with the onboard wireless system equipment transmitting to and receiving from T-PEDs. The T-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.

(d) Safety Risk Assessment

7. OPERATOR SAFETY RISK ASSESSMENT

7.1 Safety Risk Assessment In the Expanded Use of PEDs

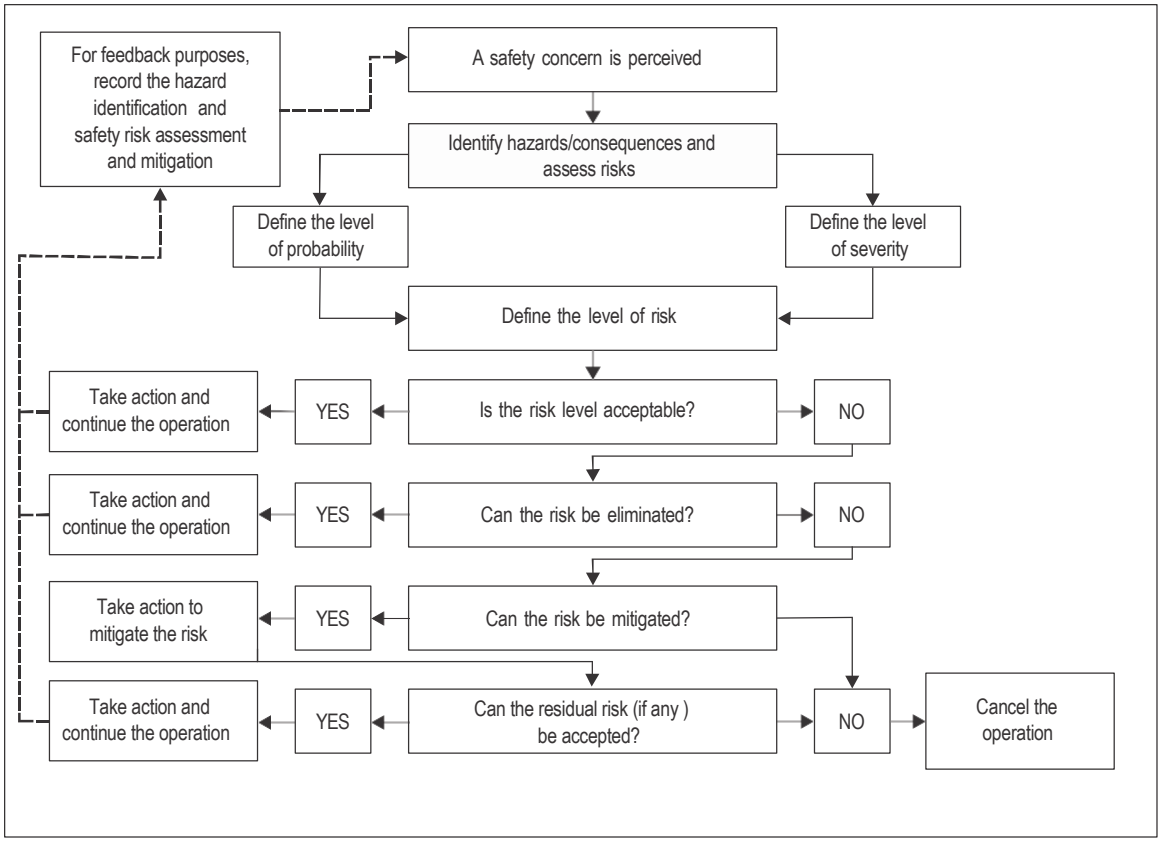
An operator of a CAR OPS 1 and CAR OPS 2A, Part II aeroplane is required to have a safety management system (SMS). In order for the CAA to consider allowing an operator to permit the expanded use of PEDs on board its aircraft, the operator must use a safety risk assessment process, based on SMS principles, to demonstrate to the CAA that the modified policy and procedures for the use of PEDs provide an acceptable level of safety performance.

7.2 Identifying the Hazards Associated with the Expanded Use of PEDs

As part of the operator's process for permitting the expanded use of PEDs, it should demonstrate to the CAA that hazard identification has been conducted, in accordance with its established SMS processes.

Each hazard can generate one or many consequences, and each consequence can be assessed as one or many safety risks. The first step in the process is hazard identification, then the safety risk assessment of potential consequences. When the operator develops procedures regarding the expanded use of PEDs, the identified hazards and their consequences must be considered, with the goal of determining potential issues associated with the anticipated policy change.

The following table presents an example of a generic SMS process which can be used for the expanded use of PEDs. The operator must conduct its own hazard identification exercise, including potential consequences, as a first step in the safety risk management process.



7.3 Examples of hazards and potential consequences associated with PEDs

The following table presents examples of hazards and potential consequences associated with the expanded use of PEDs.

Generic hazard: PED use permitted during all phases of flight	
Specific components of the hazard	**Hazard-related consequences**
Policy variations regarding the use of PEDs associated with State regulations and interlining operators (e.g. on international flights)	Unintentional passenger non-compliance with specific policy Unruly passengers Increased cabin crew workload Interference with on-board electronic systems and equipment
Policy variations regarding the use of PEDs associated with the operator's fleet/aircraft types (e.g. the operator's policy allows expanded use allowed on B737 but not on A320 fleet)	Unintentional passenger non-compliance with specific policy Unruly passengers Confusion for cabin crew members when determining fleet/aircraft specific policy Interference with on-board electronic systems and equipment
Improperly stowed/secured PEDs during take-off and landing	Injury to occupants if PEDs become loose and/or projectile Impeded evacuation PEDs being crushed in passenger seats
PED or lithium battery malfunction	Battery overheat/fire Damage to aircraft cabin, from fire Injury to occupants, due to fire/smoke/fumes
PED and/or headset use during passenger safety briefings	Failure to listen to/hear safety announcements/briefings Passengers not aware of safety information in the event of emergency; inability to respond appropriately in an emergency situation
Crew workload	Loss of situational awareness and ineffective crew member response
Passengers using PEDs during an abnormal or emergency situation or during an evacuation	Passengers not aware of safety information Reduced situational awareness for passengers Impeded/delayed evacuation
PED use during low visibility operations	Interference with on-board electronic systems and equipment Passenger non-compliance with request to shut off PED Injury to cabin crew members from standing during a critical phase of flight, while attempting to identify the PED suspected of causing interference Increase in crew workload at a time of high workload

7.4 Assessing Safety Risks Associated with the Expanded Use of PEDs

The operator must assess all safety risks associated with the identified consequences related to the expanded use of PEDs. The assessment of safety risks is expressed in terms of predicted probability and severity of the consequence(s) of a hazard, taking as reference the worst foreseeable situation.

Safety risks which are assessed as acceptable require no action to bring or keep the probability and/or severity of the consequences of hazards under organizational control.

If the safety risks are assessed as intolerable, the following questions become relevant:

(a) Can the hazards and related safety risk(s) be eliminated? If the answer is yes, then action as appropriate is taken and documented. If the answer is no, the next question is;

(b) Can the safety risk(s) be mitigated? If the answer is no, related activities must be cancelled. If the answer is yes, mitigation action as appropriate is taken and the next question is:

(c) Do any residual safety risks exist? If the answer is yes, then the residual risks must be assessed to determine their level of tolerability as well as whether they can be eliminated or mitigated as necessary to ensure an acceptable level of safety performance.

7.5 Example of a Safety Risk Management Process

The operator must develop safety risk mitigation strategies to address the identified safety risks. The following table presents an example of a safety risk management process, specific to the expanded use of PEDs. As part of the process, specific components of the generic hazard (in this case, allowing the use of PEDs during all phases of flight) should be identified. For each specific component of the hazard, the operator must clearly identify consequences.

As part of the safety risk assessment, existing defences (if applicable) should be identified. Existing defences should be assessed to determine how they help mitigate the risk(s) associated with each consequence. If further action is needed, the follow-up action should be identified (e.g. revise procedures) and the risk re-assessed. Finally, each action should be clearly assigned to a person within the organization, who will be responsible for its implementation (e.g. the operations manager will modify existing procedures in the Operations Manual).

As part of the approval/acceptance process, the CAA must be satisfied with the safety risk assessment prior to allowing the operator to implement policy changes regarding the use of PEDs.

Type of operation or activity	*Generic hazard*	*Specific components of the hazard*
Flight/cabin operations	PED use permitted during taxi-out	Improperly stowed and secured devices during take-off

Hazard-related consequences	*Existing defences to control risk(s) and risk index*	*Further action to reduce risk(s) and resulting risk index*	*Responsible person*
Injury to occupants	Passenger safety briefing *Risk tolerability: Unacceptable under the existing circumstances*	Include proper securing and stowing of devices in safety briefing *Risk tolerability: Acceptable after review of the operation*	Operations Manager
	Cabin checks by crew *Risk tolerability: Unacceptable under the existing circumstances*	Revise procedures regarding cabin checks and specify appropriate securing and stowage of PEDs *Risk tolerability: Acceptable after review of the operation*	Manager of cabin safety

8. EMC (ELECTROMAGNETIC COMPATIBILITY) DATA

Non-interference testing for T-PEDs consists of two separate test requirements:

(a) Test Requirement 1. Each T-PED model should have an assessment of potential electro-magnetic interferences (EMI) based on a representative sample of the frequency and power output of the T-PED. This EMI assessment should be in accordance with applicable processes set forth in ED-130()/DO-294(). The applicable DO-160() section 21 Category to be considered in the ED-130() process for an EFB used as a T-PED, is Cat M. This EMI assessment should confirm that no interference with aircraft equipment will occur as a result of intentional transmissions from these devices.

(b) Test Requirement 2. Once an EMI assessment determines there will be no interference from the T-PED's intentional transmissions, test each T-PED model while powered but not deliberately transmitting using either Method 1 or Method 2 for basic non-interference testing requirements. This basic non-interference testing is applicable to both an EFB-integrated T-PED and a T-PED that is remote to an EFB. When an EFB has an integrated T-PED, complete the basic non-interference testing both with and without the T-PED transmit function being operative. If a T-PED is located remotely from the EFB, the T-PED basic non-interference testing is independent from the EFB non-interference testing. T- PED position is very critical to T-PED non-interference testing. Clearly define and adhere to the operating/testing locations of a T-PED in T-PED operating procedures.

Note: Refer also to FAA Information to Operators InFO 13010 & Supplement

Any restriction in the use of the transmitting capability should be documented in the operator manual.

9. OPERATIONS MANUAL

9.1 General

All operators must ensure the following procedures and requirements are addressed. A General Aviation operator must make a declaration in the application form that the Operations Manual complies whereas a Commercial Air Transport operator must submit the Operations Manual (or amendment) to the CAA for approval.

9.2 Policy

The operator must establish a policy in the operations manual that allows the expanded use of PEDs, including T-PEDs, without adversely affecting operational safety. The goal of this policy is to instil a common understanding among passengers and the operator's personnel regarding the expanded use of devices, including which PEDs are permitted and how they should be handled while passengers are on board the operator's aircraft. The following aspects should be included in the operations manual:

(a) types of devices accepted by the operator on board its aircraft;

(b) restrictions/prohibitions of PED use;

(c) specific considerations and/or restrictions regarding certain device capabilities, such as text messaging and voice communications;

(d) stowage and securing of devices, especially during critical phases of flight;

(e) specific aspects related to the use of crew members' personal PEDs and operator-issued PEDs, if applicable;

(f) PED-related passenger distractions for pre-flight safety briefings as well as emergency exit row briefings and the preparation of the cabin for an emergency landing;

(g) SOPs for normal, abnormal or emergency situations

(h) crew reporting and investigation of occurrences or anomalies associated with PED use, including but not limited to, passenger behaviour disruption, suspected or confirmed PED interference, and PED or stand-alone battery failure that produced smoke or fire or resulted in abnormal or emergency situations; and

(i) the charging of a PED using aircraft power during critical phases of flight;

(j) monitoring, safety assurance and reporting actions; and

(k) training of flight and cabin crew.

9.3 Types of PEDs Accepted by the Operator

The operator must define the types of PEDs that it allows passengers to use on board its aircraft. These should be defined in broad categories and may include, but are not limited to, the following:

(a) cellular/mobile/smart phones;

(b) e-readers;

(c) medical portable electronic devices;

(d) tablets;

(e) personal digital assistants (PDAs);

(f) laptop computers;

(g) gaming devices (e.g. electronic games and toys);

(h) wearable technology;

(i) global positioning system (GPS) devices;

(j) MP3 players;

(k) bluetooth enabled devices; and

(l) Wi-Fi enabled devices.

9.4 Passenger Briefing

If the operator allows the expanded use of PEDs, the following information should be communicated to passengers prior to departure:

(a) a concise summary of the policy regarding PED use (e.g. the use of PEDs is permitted only during non-critical phases of the flight);

(b) overview of devices allowed during the flight;

(c) times when devices may and may not be used;

(d) special instructions regarding text messaging and voice communications (e.g. if phone calls are prohibited throughout the flight);

(e) proper stowing and securing of devices and times when this should be done;

(f) the importance of complying with all crew member instructions at all times.

(g) prohibited types of PEDs;

(h) restrictions on use according to phase of flight (e.g. pictorial depicting prohibition of PED use for take-off/landing or prohibition of voice communications); and

(i) permitted stowage location(s) for PEDs.

Note: Some of the above information could be included in the passenger safety information card.

9.5 Restrictions in Flight Compartment

Due to the higher risk of interference and potential for distracting crew from their duties, PEDs should not be used in the flight compartment. However, the operator may allow the use of PEDs, e.g. to assist the flight crew in their duties, if procedures are in place to ensure the following:

(a) The conditions for the use of PEDs in-flight are specified in the operations manual, otherwise they should be switched off and stowed during all phases of flight.

(b) The PEDs do not pose a loose-item risk or other hazard.

(c) During critical phases of flight only approved C-PEDs are operated.

9.6 Restrictions on Non-Assessable Areas

PEDs should be switched off, when not accessible for deactivation during flight. This should apply especially to PEDs contained in baggage or transported as part of the cargo.

Refer also to Section 11 – Lithium Battery Precautions.

9.7 Normal Operations Training

In addition to the operator policy, acceptable (and prohibited) PEDs and passenger briefing requirements, crew members should be trained to include the following:

(a) stowage and securing of devices. The operator's procedures should define proper stowing and securing of PEDs. Crew members should verify passenger compliance with the operator's policy and procedures when securing and checking the cabin;

(b) use of prohibited PEDs. Crew members should monitor the cabin to check that prohibited PEDs are not in use during the flight;

(c) for aircraft fitted with wireless services. In addition to the policy for the use of wireless services, the operator must develop specific procedures regarding their use. These procedures may include shutdown of the system in the event of any abnormal or emergency situation;

(d) procedures in the event of turbulence. The operator must verify existing turbulence procedures to ensure that they include considerations on the use, stowage and securing of PEDs, as well as the associated cabin crew announcements and cabin checks;

(e) use of PEDs during refuelling. Informing passengers (e.g. by means of passenger announcements) that the use of PEDs is prohibited while the aircraft is being refuelled, as well as verification by crew members that devices are not in use;

(f) procedures for the use, stowage and securing of operator-issued PEDs for crew and/or passengers, if applicable, including phases of flight and stowage locations;

(g) procedures related to the charging of a PED using aircraft power during critical phases of flight;

9.8 Abnormal and Emergency Training

Abnormal and emergency procedures for crew members should include the following;

(a) reporting, coordinating, and managing response to suspected or confirmed PED interference events, including transient or intermittent problems;

(b) fires related to PEDs or stand-alone lithium batteries. The increase in quantities and use of PEDs increases the probability of an on-board fire originating from these devices. Lithium battery fires differ from other types of fires and require specific crew responses to manage them.

The operator must verify that its fire-fighting procedures address specific aspects for dealing with PED fire/smoke occurrences, including how the crew should handle and stow affected devices. Refer also to Section 11 - Lithium Battery Precautions;

(c) passenger management. Passengers who do not adhere to the operator's policy regarding the expanded use of PEDs may fall under established policies and procedures for the management of unruly passengers.

The operator may include passenger issues related to PED use in its examples of unruly behaviour, if this subject is not already covered as part of unruly passenger management procedures.

The operator must define the content to be included in the approved flight and cabin crew training programmes. The operator's policy and procedures related to the use of PEDs should be included in all relevant training for flight and cabin crew. In addition, the operator must update flight and cabin crew members of any changes to the policy and/or procedures related to PEDs.

10. MONITORING AND SAFETY ASSURANCE

10.1 General

(a) The operator must abide by CAA policy in relation to the safety assurance process, promote voluntary reporting of hazards and occurrences from crew members and provide corrective action(s), if necessary. Additionally, the operator must continue to monitor PED-related occurrences and, if applicable, collect data to assess the effectiveness of the established mitigation strategies.

(b) As part of the operator's SMS, crew members should report hazards and occurrences through existing reporting processes. The following occurrences should be reported and investigated, if applicable, for follow-up action by the operator;

(1) suspected PED interference with on-board electronic systems and equipment;

(2) security concerns related to expanded use of PEDs; and

(3) safety concerns related to expanded use of PEDs, including but not limited to:

(i) non-compliance with regulatory requirements;

(ii) non-compliance with operator policies (e.g. stowage issues, failure to comply with crew member instructions, etc.);

(iii) fire/smoke occurrences caused by PEDs; and

(iv) evacuation process, as related to PEDs.

10.2 Review & Continuous Monitoring

10.2.1 General

The safety risk management process allows the operator to identify, analyse, assess and control the safety risks associated with identified hazards, as part of its SMS. The safety risk management process may result in the establishment of mitigation strategies.

Once mitigation strategies have been approved and implemented, any associated impact on safety performance should be directed to the operator's safety assurance process. Safety assurance must be considered as a continuous, on-going activity aimed at;

(a) ensuring that the initial identification of hazards and assumptions in relation to the assessment of the consequences of safety risks, and the mitigation strategies that exist in the system as a means of control, remain valid and applicable over time; and/or

(b) introducing changes in the mitigation strategies, as applicable to existing and/or new risks.

10.2.2 Interference Handling

In accordance with regulatory requirements, if interference from a PED is suspected, the operator must have established procedures to terminate the operation of PEDs suspected of causing interference with on-board electronic systems and equipment.

Where interference with on-board electronic systems and equipment is suspected from use of a PED, crew members should:

(a) instruct passenger(s) to terminate the use of PED(s);

(b) confirm with flight crew members that use of PEDs has been terminated;

(c) if interference has ceased, no further immediate action is needed except continued monitoring of the situation for possible re-occurrence of interference;

(d) if interference has not ceased, cabin crew members should check for passengers' compliance with further instructions to discontinue using devices/turn off devices;

(e) prohibit the use of PED(s) suspected of creating interference;

(f) verify the status of the on-board electronic systems and equipment with flight crew members; and

(g) once device(s) has been identified, communicate with the flight crew members on use of non-suspect PEDs for the remainder of the flight.

10.2.3 Reporting

The pilot-in-command should report incidents of suspected PED interference and include the following information in the report;

(a) flight information. Aircraft type, registration date and UTC time of incident, aircraft location (VOR bearing/DIST/LAT/LONG), altitude, weather conditions, pilot name and telephone number;

(b) description of interference. Description of effects on flight deck indicators, audio or on-board electronic systems and equipment, including radio frequency, identification, duration, severity and other pertinent information;

(c) crew response. Action taken by the flight crew/cabin crew members to identify cause or source of interference;

(d) identification of PED. Description of device, brand name, model, serial number, mode of operation, device location (seat location), and regulatory approval number (FCC, IMEI (International Mobile Equipment Identity) or any other type of certification).

Occurrences of suspected or confirmed interference that have potential safety implications should be reported to the CAA. Where possible, to assist follow-up and technical investigation, reports should describe the offending device, identify the brand name and model number, its location in the aircraft at the time of the occurrence, interference symptoms and the results of actions taken by the crew. The cooperation of the device owner should be sought by obtaining contact details.

11. LITHIUM BATTERY PRECAUTIONS

11.1 General

Lithium batteries are used as power sources in many different types of portable electronic devices (PEDs) such as phones, tablets, e-cigarettes, power banks and laptops. The benefits of lithium battery technology include a high energy density, longevity and inexpensive cost compared to other battery chemistries.

However, lithium batteries are classified as a Class 9 (Miscellaneous) Dangerous Good due to their associated hazards. Lithium batteries are known to undergo a process known as thermal runaway, an uncontrollable and self-sustaining process in which a sudden increase in temperature occurs, often expelling toxic gases and flame to the surrounding area.

A thermal runaway event may occur when cells are overheated, overcharged, mishandled, or have a manufacturing defect leading to an internal short circuit. Thermal runaway is a particularly prominent problem in air transportation, both as cargo and carry-on luggage.

To minimise the risk of a battery failure, passengers should be discouraged from plugging in PEDs for the sole purposes of charging a battery. Additionally, passengers should be reminded that once their device is charged, the device should be unplugged. Passengers should be reminded that to charge devices, they should only be connected to the aircraft electrical system, which can be controlled by crew members. Operators should develop procedures to reduce or eliminate the number of passengers using external battery charging devices to charge PEDs.

11.2 Location of Battery

Data demonstrates significant fire risk to aircraft when PEDs are placed in checked baggage in an inaccessible area. Tests have demonstrated serious risks when a single lithium battery installed in a PED goes into thermal runaway inside a checked passenger baggage that also contains other allowable dangerous goods. The seriousness of this risk should not be underestimated and operators should research accidents and incidents caused by lithium batteries.

For this reason many operators would rather have PEDs in an overhead locker, where it can be located and dealt with. Trials have confirmed the average passenger carries an average of four lithium batteries in the cabin.

11.3 Thermal Runaway Signs

Signs that a thermal runaway is imminent or has commenced include, but are not limited to the following:

(a) Alert warning on the PED screen that the PED has overheated and must be cooled down;

(b) Excessive heat when touched;

(c) Discoloration or deformation of the display including a rainbow effect;

(d) Smell of burning plastic;

(e) Smoke emitting from the PED;

(f) Sizzling or hissing sounds from the PED;

(g) Sparks from the PED; and/or

(h) Loud popping sounds or explosion similar to the sound of a fire cracker.

11.4 Thermal Runaway Actions

When faced with a lithium battery-powered PED, in which at least one cell has gone into thermal runaway, flight and cabin crews should first ensure all other personnel are moved away from the device to the maximum extent possible.

If flames are present, they should be extinguished using the nearest fire extinguisher. After the fire is extinguished, the firefighting crewmember, with adequate personal protection, should pour water or other non-flammable liquid on to the PED to cool the device, reducing the likelihood of additional cells from thermal runaway. The device should not be covered with ice; tests show that ice increases the likelihood of additional thermal runaway.

A smoking or burning PED should not be moved to another part of an aircraft or for placement in a containment device unless adequate protection of the firefighting crewmember is assured and moving the device is the safest action in the professional judgment of the crew.

Moving the device can coincide with the venting of a cell, or cells, causing the risk of serious injury to nearby persons, including the crewmember. Adequate protection includes, but is not limited to, heat resistant gloves, eye protection, and a means of shielding the crewmember from the device.

If, in the judgment of the flight-crew, moving the PED is safer than attempting to cool it in place, or if the PED is inaccessible, use of personal protective equipment should be used to move the PED to a location where it can be contained and cooled.

If a containment device is required, the containment device should be placed as close as practical to the overheating PED. Containment technology should be considered as a safe place in which the device can be stored during and after a thermal runaway event.

If adequate protection is not available then after dousing the device with water and monitoring it for no additional thermal runaway for a minimum of fifteen minutes, the overheating device should be moved and contained. There is a wide range of containment bags or boxes and/or gloves that should be considered to be provided for crew member use as part of their Dangerous Goods smoke or fire response kits to deal with PED thermal runaway.