Australian Government
Australian Transport Safety Bureau

Personal electronic device fire in-flight involving Boeing 747, VH-OJS

500 km WNW of John F. Kennedy International Airport, United States, 21 June 2016

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Addendum

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What happened

On 21 June 2016, a Qantas Airways Boeing 747-438 aircraft, registered VH-OJS, operated flight QF11 from Los Angeles, California, United States to New York, New York, United States.

At about 0700 Coordinated Universal Time (UTC), a cabin crewmember responded to a request for assistance from a passenger seated in business class seat 3A. The passenger advised the crewmember of a missing personal electronic device (PED). The PED was identified as containing a lithium type battery. The crewmember, along with the passenger, searched around the seat for the missing PED. While searching, the seat position was moved. As the seat moved, the passenger in the next seat observed the PED within the seat mechanism. The seat was then inadvertently moved, resulting in the PED being crushed (Figure 1). The crushed PED immediately began hissing and emitting smoke. Moments later, the PED ignited. A second crewmember then initiated the basic fire drill.

The second crewmember obtained a fire extinguisher, and as they proceeded toward seat 3A, they advised a third crewmember of the incident and requested assistance. This crewmember also obtained a fire extinguisher, and proceeded toward seat 3A. The customer service manager (CSM) and another crewmember observed the activity and also followed, providing additional support.

When the cabin crewmembers carrying fire extinguishers arrived at seat 3A, they observed an orange glow emanating from the seat. A crewmember discharged a fire extinguisher into the seat, extinguishing the glow. At this time, the CSM acted as a communicator with the flight crew to inform them and keep them updated on the incident.

After confirming the PED fire had been extinguished, the cabin crew attempted to remove the PED in order to place the device in water, in accordance with lithium type battery fire procedures. The PED could not be removed without further damage and risk of fire. Therefore, the cabin crew elected to leave the device in place and position a crewmember with a fire extinguisher near seat 3A for the remainder of the flight. About 10–15 minutes after the incident, this crewmember identified further heat coming from the crushed PED. They again discharged the fire extinguisher onto the PED, eliminating the heat.

After confirming the incident was contained, the CSM advised the captain that the situation was under control. The captain discussed the incident with the first officer, and considered the event had been dealt with appropriately. The flight proceeded to New York and landed about 40 minutes later without further incident.

Two passengers reported feeling unwell after the event, but it was unclear if this was as a result of the incident. The aircraft seat sustained minor damage.

Figure 1: Crushed PED after removal from seat

Source: Qantas

Cabin crew comment

The responding cabin crewmember commented that the provision of designated storage close to the charging port could assist in preventing PEDs entering seat structure.

Passenger comment

The passenger in seat 3A commented that the amenities pack provided to passengers in this seat type could be changed to include PED storage. This could assist preventing PEDs entering the seat structure.

Operator investigation report

The aircraft operator investigated the incident and provided a copy of their investigation report to the ATSB. The report included the following:

- A review of reported events revealed 22 similar occurrences of trapped or crushed PEDs. Seven of these occurrences resulted in smoke and/or heat being produced. This incident was the first event to result in fire.
- The investigation determined that the likely area for the PED to intrude into the seat mechanism was adjacent to the seat belt anchor point. This area becomes more exposed as the seat reclines towards the flat position.
- Mesh netting within the seat structure is designed to capture objects that fall behind the seat. Damage to seat 3A consisted of an approximate 5 cm melt area to this mesh netting. There was no other damage noted to the seat structure.

Lithium battery thermal runaway

The United States Federal Aviation Administration (FAA) document *Safety alert for operators SAFO 09013: Fighting fires caused by lithium type batteries in portable electronic devices*, and the associated document *SAFO 09013 Supplement*, detail the risk of thermal runaway in lithium type batteries:

> Lithium batteries are capable of ignition and subsequent explosion due to overheating. Overheating may be caused by shorting, rapid discharge or overcharging. Overheating results in thermal runaway, which is a chemical reaction within the battery causing the internal temperature and pressure to rise. The result is the release of flammable electrolyte from the battery and, in the case of disposable lithium batteries, the release of molten burning lithium. Once one battery cell goes into thermal runaway, it produces enough heat to cause adjacent battery cells to also go into thermal runaway. This produces a fire that repeatedly flares up as each battery cell in turn ruptures and releases its contents.

SAFO 09013 Supplement also details the following information on fighting fires caused by lithium type batteries:

- Relocate passengers away from the device.
- Utilise a halon, halon replacement, or water fire extinguisher to prevent the spread of the fire to adjacent battery cells and materials.
- Pour water, or other non-alcoholic liquid, from any available source over the cells immediately after knockdown or extinguishment of the fire.

  Only water or other non-alcoholic liquid can provide sufficient cooling to prevent re-ignition and/or propagation of the fire to adjacent batteries. Water, though it may react with the tiny amount of lithium metal found in a disposable battery, is most effective at cooling remaining cells, stopping thermal runaway and preventing additional flare-ups. Significant cooling is needed to prevent the spread of fire to additional cells in a battery pack.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Seat manufacturer

As a result of this occurrence, the aircraft operator has advised the ATSB that the seat manufacturer is developing design solutions to prevent ingress of PEDs into the seat structure.

Aircraft operator

The aircraft operator has advised the ATSB that they are taking the following safety actions:

Changes to passenger briefings

An enhanced passenger briefing has been released to include:

If you lose your electronic devices at any time, it's important you don't move your seat as this could severely damage your device and may be a fire hazard. Please contact a crew member who will be able to recover your device.

A cabin crew service brief has been released which includes:

Passenger announcement to remind passengers not to move seats when devices have been lost.

Individual interactions between cabin crew and passengers when preparing the bed to include a discussion to raise passenger awareness of the possibility that the PED could be crushed if it is lost during the flight.

Establishment of working group

A working group has been established to develop further solutions for this issue.

Safety message

This incident serves as an excellent example of an effective response to an emergency situation. The cabin crew quickly implemented the basic fire drill procedure. This defined the roles and responsibilities of the responding crew, enabling a rapid and coordinated response to the incident using all available resources. As a result, the incident was quickly and effectively contained. The effective implementation of this procedure also ensured the flight crew were kept informed as the situation developed.

This incident also highlights the hazards of transporting lithium-ion battery powered PEDs aboard aircraft. The Civil Aviation Safety Authority has released information on the safe carriage of lithium

type battery powered devices aboard aircraft in the web page: *Travelling safely with batteries* and pamphlet: *Is your luggage safe?*

General details

Occurrence details

Date and time:	21 June 2016 – 0700 UTC	
Occurrence category:	Serious incident	
Primary occurrence type:	Fire	
Location:	500 km WNW of John F. Kennedy International Airport, United States	
	Latitude: 42° 16.000’ N	Longitude: 79° 22.500’ W

Aircraft details

Manufacturer and model:	The Boeing Company 747	
Registration:	VH-OJS	
Operator:	Qantas Airways	
Serial number:	25564	
Type of operation:	Air transport high capacity – Passenger	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Minor	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an

investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.