Norwegian Safety Investigation Authority

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REPORT AVIATION 2024/07

Air incident during approach to Bergen Airport Flesland, Norway 11 June 2022 with Airbus A320-232, HA-LWZ, operated by Wizz Air Hungary Kft

The Norwegian Safety Investigation Authority (NSIA) has compiled this report for the sole purpose of improving flight safety.

The purpose of the NSIA's investigations is to clarify the sequence of events and causal factors, elucidate matters deemed to be important to the prevention of accidents and serious incidents, and to make possible safety recommendations. It is not NSIA's task to apportion blame or liability.

Use of this report for any other purpose than for flight safety should be avoided.

Photo: Wizz Air

This report has been translated into English and published by the NSIA to facilitate access by international readers. As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

Factual information

This investigation had a limited scope. The NSIA has therefore chosen to use a simplified report format. A report format in accordance with the recommended practices in ICAO Annex 13 is only used when this is necessitated by the scope of the investigation.

Incident data

Aircraft:	
Type and reg.:	Airbus A320-232, HA-LWZ
Production year:	2014
Engines:	2 x International Aero Engines (IAE) V2500
Operator:	Wizz Air Hungary Kft.
Radio call signal:	WZZ
Date and time:	Saturday 11 June 2022, at 1328 hours
Incident site:	Approach to Bergen Airport Flesland (ENBR), Vestland county, Norway
ATS airspace:	Controlled airspace class C, Flesland TMA
Type of incident:	Incident, cell phone fire in cabin
Type of flight:	Commercial air transport, passenger airline
Light conditions:	Daylight
Personal injuries:	1 person suffered minor injuries
Damage to aircraft:	Burnt cabin carpet
Other damage:	Destroyed cell phone
Sources of information:	Incident reports from the operator, and from Avinor

All times in this report are local times (UTC + 2 hours), unless otherwise stated.

Course of events

On Saturday 11 June 2022, Wizz Air flight number W6-2151 was enroute from Szczecin Airport Goleniow (EPSC) in Poland to Bergen Airport, Flesland (ENBR). The aircraft was an Airbus A320, see Figure 1.

Figure 1: An Airbus A320 from Wizz Air. Photo: Wizz Air/NSIA

At top of descend to Flesland, the cabin crew was alerted by passengers about a fire in the forward part of the cabin. One of the passenger's cell phone had overheated, created smoke and caught fire without an obvious reason. The owner of the cell phone had suffered minor burns when trying to remove the battery.

The cabin crew members immediately initiated the procedure for fighting lithium-ion battery (LIB) fires, and equipped themselves with water, hand held BCF fire extinguishers[1], fire proof gloves and breathing equipment. Simultaneously, the flight crew was informed about the situation, and declared an emergency («MAYDAY»).

The cell phone was first cooled by water, which caused the fire and smoke to stop. Next, the phone was secured in a metal container and placed in one of the aft lavatories. The container was filled with water and monitored for the reminder of the flight.

There were no further incidents for the rest of the flight. The cell phone was completely destroyed, and the cabin carpet was damaged, see Figure 2. The passenger that suffered minor injuries did not want any medical assistance.

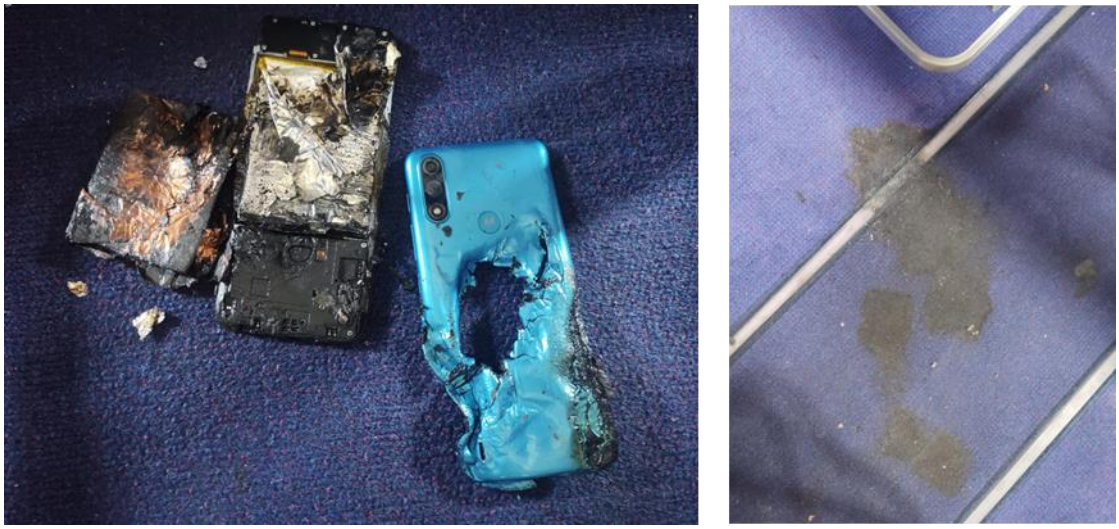

Figure 2: The cell phone and the carpet after the fire. Photo: Wizz Air/NSIA

[1] BCF (bromochlorodifluoromethane, also referred to as Halon 1211). Halon is a group of gases with a high level of fire suppression through stopping or inhibiting the chemical chain reaction in a fire.

Lithium-ion battery (LIB) fires

If the temperature in a LIB-cell increases to above about 80 °C, a self-sustaining chemical heat reaction will occur internally in the cell. This is called a *thermal runaway* (TR).

High temperature in a cell can be caused by external heat, over load, over charging, deep discharge, or external or internal short circuit. An internal short circuit can be due to cell contamination during production, deformation from external damage, or the formation of dendrites during low temperature charging. A TR can occur immediately after damage, or after a long time.

A TR will create a lot of heat that will propagate to other cells, and an increasing number of cells will reach the critical threshold temperature. During a TR, flammable, toxic and acidic gases will form, as well as oxygen. First, the electrolyte will ignite, and then the metals and other solids will catch fire. Due to the release of oxygen, a fire will be completely or partly self-sustaining. The development is illustrated in Figure 3.

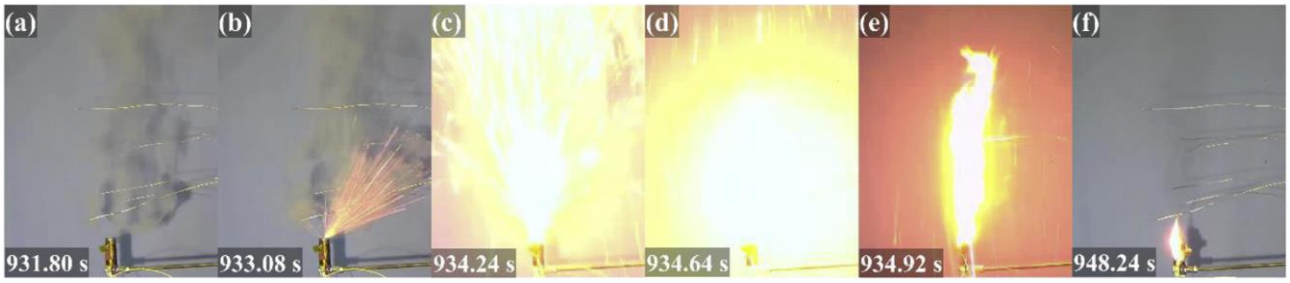

Figure 3: The last part of a TR in a LIB cell. The left picture shows when the cell starts to release gases, and then ignition and fire. The time stamp in seconds down to the left in each picture is with reference to the start of the experiment. Source: «An experimental study on thermal runaway characteristics of lithium-ion batteries with high specific energy and prediction of heat release rate», Haodong Chen, Jonathan E.H. Buston, Jason Gill, Daniel Howard, Rhiannon C.E. Williams, Chandra M. Rao Vendra, Ashish Shelke, Jennifer X. Wen / NSIA.

During a fire, the temperature in the cell can reach 900 °C, and the jet flame can exceed 1,000 °C.

Protective equipment on board

For these types of aircrafts, hand held fire extinguishers and portable breathing equipment are mandatory both in the cabin and in cockpit[2]. It is also required to have the standard emergency equipment as specified by the aircraft manufacturer. Boeing and Airbus, for instance, include fireproof gloves in the standard cockpit equipment, but not in the cabin.

There is a requirement to have procedures and equipment to handle a TR and fire in a LIB. The contents of the fire kit is not specified, just that the operator must include the necessary items. Wizz Air includes the following in their battery fire kit:

- Heat resistant gloves.
- 2 special extinguishers that also provide cooling.
- Fire resistant containment bag that also cushions an explosion.

In addition, Wizz Air has an extra pair of fireproof gloves in the cabin of all their aircrafts.

[2] *E.g. in ICAO Doc 9481 AN/928 and EASA (EU) 965/2012.*

The Norwegian Safety Investigation Authority's assessments

A thermal runaway (TR) and a subsequent fire in a lithium-ion battery (LIB) develops differently than other types of fires, and can be challenging to handle. A TR represents a significant health risk and damage potential, and can start a long time after an external or internal battery cell damage.

Flammable, toxic and acidic gases will develop rapidly, and the temperature will increase quickly. Due to the release of oxygen, the fire will become completely or partly self-sustaining and virtually impossible to stop if early measures are not taken.

It can be possible to achieve sufficient cooling and suffocation to stop a TR and an electrolyte fire in a LIB cell. That requires the crew to have relevant equipment readily accessible, being trained in adequate procedures, and able to act quickly. The equipment must protect against hazardous gases and high temperatures, and allow the crew to isolate and secure a damaged LIB. A TR and possible fire can restart at any time in a damaged LIB.

The cell phone battery on board HA-LWZ had a TR and released gases, and it is plausible that there was an electrolyte fire. It is unlikely, however, that metals or other solids ignited.

The crew members on board Wizz Air flight W6-2151 handled the situation quickly and in a very good way. They had relevant equipment available, and followed the necessary procedures to cool down the cell phone battery, and to keep it under control until the aircraft had landed.

Protective gloves are important in order to handle hot or burning batteries. Thus, the NSIA recommends that all operators involved in passenger transport equip both the cabin and the cockpit with easily accessible fire protective gloves to enable crew members to handle a battery with TR without delay, in addition to relevant TR and LIB fire equipment kits. It is also important that crew regularly perform TR handling procedure training.

The Norwegian Safety Investigation Authority does not propose any safety recommendations.

Norwegian Safety Investigation Authority
Lillestrøm, 2 September 2024