



WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-FOURTH MEETING

Montréal, 28 October to 8 November 2013

Agenda Item 4: Development of recommendations for amendments to the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods (Doc 9481)* for incorporation in the 2015-2016 Edition

**UPDATE TO PROCEDURES FOR CABIN CREW TO ADDRESS CABIN INCIDENTS
INVOLVING LITHIUM BATTERIES**

(Presented by D. Brennan)

SUMMARY

This working paper proposes the adoption of some recommendations for cabin crew on the actions to be taken during and following an incident involving lithium batteries in the passenger cabin.

Action by the DGP: The DGP is invited to consider the proposed amendment to the cabin crew provisions in the *Emergency Response Guidance (Doc 9481)* as shown in the appendix to this working paper.

1. INTRODUCTION

1.1 A paper was presented at the 2013 Meeting of the Dangerous Goods Panel Working Group of the Whole (DGP-WG/13, Montreal, 15 to 19 April 2013) (DGP-WG/13-WP/61) that offered some text developed by the IATA Cabin Safety Task Force (CSTF) to address the post-incident considerations of a lithium battery fire in the aircraft cabin. Although some concerns were expressed on some of the language and text in the CSTF document, there was general support for the concept.

1.2 Based on that discussion paper and the discussions at DGP-WG/13, there has been discussion with a number of interested people and some text has been developed for inclusion into the *Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481)* to provide additional guidance to cabin crew on the actions to be taken in the event of an electronic device overheating or catching fire in the cabin.

1.3 What has been developed for consideration has been to:

- a) expand on the current guidance to include a lithium battery overheating or electrical smell emitting from a portable electronic device;
- b) expand on the current guidance to include *when and how* to safely move the device post event involving a fire. Operators have contacted IATA seeking guidance on what to do once the device is extinguished, including *when and how to move and store* the device until the first point of landing; and
- c) include offloading procedures for a device involved in a lithium battery event. These are suggested for the first point of landing of the aircraft. Any incident involving a lithium battery fire should be reported internally to the operator and externally to the appropriate national authority. This is to support the process of a post-incident investigation.

1.4 IATA is suggesting for the appropriate national authority to require the operator to retain the device involved in the event *on behalf of the authority* until the authority is able to retrieve it.

1.5 The retention of the device also prevents the device from inadvertently travelling onward by air. Removing the device from the aircraft at the first point of landing is important as some battery cells that were damaged may still be charged and affected and could potentially go into thermal runaway. The Technical Instructions in Special Provision A154, state, in part: *Lithium batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for air transport.*

APPENDIX

ROPOSED AMENDMENT TO EMERGENCY RESPONSE GUIDANCE FOR AIRCRAFT
INCIDENTS INVOLVING DANGEROUS GOODS

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Section 3

EXAMPLES OF DANGEROUS GOODS
INCIDENTS CHECKLISTS

3.3 CABIN CREW CHECKLIST FOR DANGEROUS GOODS INCIDENTS
IN THE PASSENGER CABIN DURING FLIGHT

~~INITIAL ACTION~~ **IMMEDIATE ACTIONS**

- Notify pilot-in-command
- Identify the item

In case of fire:

- Use Apply standard fire fighting procedure / check use of water

EVENTS INVOLVING LITHIUM BATTERIES

In case of overheat involving portable electronic device or an emitting electrical smell:

- Apply standard fire fighting procedure / check use of water
- Instruct passenger and/or crew member to turn off their device immediately
- If possible, disconnect power supply
- If applicable, turn off in-seat power
- Device must remain off for the duration of the flight
- Keep device visible and monitor closely; unstable batteries may ignite even after device is turned off

In case of fire involving a portable electronic device:

- Use standard procedure / obtain and use fire extinguisher
- Remove external electrical power from device (if applicable)
- Move passengers away from the area
- Douse device with water (or other non-flammable liquid) to cool cells and prevent ignition of adjacent cells (thermal runaway)
- Do not touch or move device (Note: the liquid turns to steam when applied to the hot battery)

Repeat the above steps as required and monitor for any re-ignition. If smoke re-appears, continue using water (or other non-flammable liquid).

- Remove power to remaining electrical outlets until the aircraft's system can be determined to be free of faults, if the device was previously plugged in

Warning:

- Do NOT attempt to remove battery from device
- Do not touch, pick up or attempt to move a burning device that is emitting smoke or a burning electrical smell. Batteries may explode or burst into flames without warning
- Do not insulate the device as it could cause a thermal runaway: Do NOT cover the device and do NOT use ice or dry ice to cool the device

FOLLOW-UP ACTIONS

If device is still hot or smoking:

- Do not move the device; repeat procedures above
- If device has cooled:
- Move the device, using available Personal Protective Equipment only if there is no evidence of smoke or heat, and after a 15 minute monitoring period
- Completely immerse the device in water
- Secure selected container to prevent spillage
- Monitor the device and the surrounding area at 15 minute intervals
- Complete required documentation

First Aid:

- In case of a fire involving a portable electronic device in which a passenger or crew member sustains a burn should be treated as a chemical burn

In case of spillage or leakage:

- Collect emergency response kit or other useful items
- Don rubber gloves and smoke hood or smoke mask — portable oxygen
- Move passengers away from area and distribute wet towels or cloths
- Place dangerous goods item in polyethylene bags
- Stow polyethylene bags
- Treat affected seat cushions / covers in the same manner as dangerous goods item
- Cover spillage on carpet / floor
- Regularly inspect items stowed away / contaminated furnishings

AFTER LANDING – POST INCIDENT OFFLOADING PROCEDURES

- Identify to ground personnel dangerous goods item and where stowed. Deliver any portable electronic device involved in a fire or smoke event to ground personnel as per operator procedures
- Make appropriate entry in maintenance log

3.4 AMPLIFIED CABIN CREW CHECKLIST FOR DANGEROUS GOODS INCIDENTS IN THE PASSENGER CABIN DURING FLIGHT

INITIAL ACTION

NOTIFY PILOT-IN-COMMAND

Any incident concerning dangerous goods should be notified immediately to the pilot-in-command who should be kept informed of all actions taken and of their effect. It is essential that the cabin crew and the flight crew coordinate their actions and that each be kept fully informed of the other's actions and intentions.

Important:

Minimizing the spreading of smoke and fumes into the flight deck is critical for the continued safe operation of the aircraft, therefore it is important to keep the flight deck door closed at all times. Crew communication and coordination is of utmost importance. The use of the interphone for communication with the flight deck is strongly recommended.

IDENTIFY THE ITEM

Ask the passenger concerned to identify the item and indicate its potential hazards. The passenger may be able to give some guidance on the hazard(s) involved and how these could be dealt with. If the passenger can identify the item, refer to Section 4 for the appropriate emergency response drill.

On aircraft with only one cabin crew member, consult with the pilot-in-command as to whether the aid of a passenger should be sought in dealing with the incident.

IN CASE OF FIRE

USE APPLY STANDARD FIRE FIGHTING PROCEDURE / CHECK USE OF WATER

Standard emergency procedures must be used to deal with any fire. In general, water should not be used on a spillage or when fumes are present since it may spread the spillage or increase the rate of fuming. Consideration should also be given to the possible presence of electrical components when using water extinguishers.

EVENTS INVOLVING LITHIUM BATTERIES

IN CASE OF OVERHEAT INVOLVING PORTABLE ELECTRONIC DEVICE OR AN EMITTING ELECTRICAL SMELL

**APPLY STANDARD FIRE FIGHTING
PROCEDURE / CHECK USE OF WATER**

Standard emergency procedures must be used to deal with any fire. Although Halon has been shown to not be effective against lithium metal fires, Halon will be effective in fighting the subsequent fire of surrounding materials, or in fighting a lithium ion battery fire.

**INSTRUCT PASSENGER AND/OR
CREW MEMBER TO TURN OFF
THEIR DEVICE IMMEDIATELY AND
REMOVE EXTERNAL ELECTRICAL
POWER FROM DEVICE (IF
APPLICABLE)**

It is important to instruct the passenger or crew member to turn off their device immediately and if possible to disconnect the power supply. A battery has a higher likelihood of catching fire through thermal runaway during or immediately following a charging cycle, although the effects of thermal runaway may be delayed for some period of time. By removing external power from the device, it will be assured that additional energy is not being fed to the battery to promote a fire.

**DEVICE MUST REMAIN OFF FOR THE DURATION OF
THE FLIGHT. MONITOR DEVICE**

It is important to not remove battery from device and ensure that the device must remain powered off for the duration of the flight and that the device remains visible (not stowed such as in a bag or seat pocket or on a person (pocket)) and to monitor it closely. Unstable batteries may ignite even after device is turned off. Ensure device is stowed for take-off and landing

IN CASE OF FIRE INVOLVING A PORTABLE ELECTRONIC DEVICE

**USE ~~APPLY~~ STANDARD FIRE FIGHTING PROCEDURE / OBTAIN AND USE FIRE
EXTINGUISHER**

Standard emergency procedures must be used to deal with any fire. Although Halon has been shown to not be effective against lithium metal fires, Halon will be effective in fighting the subsequent fire of surrounding materials, or in fighting a lithium ion battery fire.

REMOVE EXTERNAL ELECTRICAL POWER FROM DEVICE (IF APPLICABLE)

A battery has a higher likelihood of catching fire through thermal runaway during or immediately following a charging cycle, although the effects of thermal runaway may be delayed for some period of time. By removing external power from the device, it will be assured that additional energy is not being fed to the battery to promote a fire.

**MOVE PASSENGERS AWAY FROM
THE AREA**

Cabin crew should take prompt action if smoke or fumes develop to move passengers away from the area involved and, if necessary, provide wet towels or cloths and give instructions for passengers to breathe through them.

**DOUSE DEVICE WITH WATER (OR OTHER NON-FLAMMABLE LIQUID)
TO COOL CELLS AND PREVENT IGNITION OF ADJACENT CELLS**

If available, a water extinguisher should be used to cool the cells in a battery that have ignited, preventing the spread of heat to adjacent cells. If a water extinguisher is not available, any non-flammable liquid may be used to cool the cells and device (Note: the liquid turns to steam when applied to the hot battery).

DO NOT MOVE OR TOUCH DEVICE

A battery pack involved in a fire has been shown to reignite and emit flames multiple times as heat is transferred to other cells in the pack. It is preferable to cool the device using water (or other non-flammable liquid); injuries may occur if the device reignites while it is being moved.

Important:

- Do not attempt to remove the battery from the device;
- Do not handle device; batteries may explode or burst into flames without warning;
- Do not insulate the device as that may aggravate the build-up of heat;
- Do not cover the device;
- Do not use ice or dry ice to cool the device.

WARNING:

Do not pick up or attempt to move a burning device or a device that is emitting smoke. The device must not be moved if displaying any of the following: Flames/flaring, smoke, unusual sounds (such as crackling), debris, or shards of material separating from device.

**REMOVE POWER TO REMAINING ELECTRICAL OUTLETS UNTIL THE AIRCRAFT'S
SYSTEM CAN BE DETERMINED TO BE FREE OF FAULTS,
IF THE DEVICE WAS PREVIOUSLY PLUGGED IN**

By removing power to the remaining electrical outlets, it can be assured that a malfunctioning aircraft system does not contribute to additional failures of the passengers' portable electronic devices.

FOLLOW-UP ACTIONS

If device is still hot or smoking do not move the device; procedures above should be repeated until crew are satisfied that the device is cool.

MOVE THE DEVICE

The device can be moved, with caution once it has cooled, and if there is no evidence of smoke or heat after a 15 minute monitoring period. It is important to wear available personal protective equipment for moving any portable electronic device involved in a fire event.

**COMPLETELY IMMERSE THE
DEVICE IN WATER**

Consider submerging the electronic device in the most appropriate container such as pot, jug, galley unit or container. Then select the most appropriate container and fill with enough water or non-flammable liquid so that it would completely immerse the device. Once it is immersed it is deemed safe.

**SECURE SELECTED CONTAINER TO
PREVENT SPILLAGE**

Any receptacle used to contain an affected device must be secured to prevent spillage.

**MONITOR THE DEVICE AND THE
SURROUNDING AREA AT 15
MINUTE INTERVALS**

Monitor the device and the surrounding area at 15 minute intervals to ensure that the device remains inert..

AFTER LANDING

**IDENTIFY TO GROUND PERSONNEL
DANGEROUS GOODS ITEM AND
WHERE STOWED**

Upon arrival, take the necessary steps to identify to the ground staff where the item is stowed. Pass on all information about the item. Request that ground staff advise the appropriate national authority of the dangerous good item involved in the event, and any other pertinent information related to the to the event.

**COMPLETE REQUIRED
DOCUMENTATION**

Complete any required document such as company incident report of trip log and ensure device is stowed for landing. If required, make an entry in the aircraft maintenance log so that proper maintenance action is undertaken and that the emergency response kit or any aircraft equipment used is replenished or replaced when appropriate

IN CASE OF SPILLAGE OR LEAKAGE

COLLECT EMERGENCY RESPONSE KIT OR OTHER USEFUL ITEMS

Collect emergency response kit, if provided, or collect for use in dealing with the spillage or leakage:

- a supply of paper towels or newspapers or other absorbent paper or absorbent fabric (e.g. seat cushion covers, head rest protectors);
- oven gloves or fire-resistant gloves, if available;
- at least two large polyethylene waste bin bags; and
- at least three smaller polyethylene bags, such as those used for duty-free or bar sales or, if none available, airsickness bags.

**DON RUBBER GLOVES AND SMOKE HOOD OR
SMOKE MASK — PORTABLE OXYGEN**

The hands should always be protected before touching suspicious packages or items. Fire-resistant gloves or oven gloves covered by polyethylene bags are likely to give suitable protection.

Gas-tight breathing equipment should always be worn when attending to an incident involving smoke, fumes or fire.

MOVE PASSENGERS AWAY FROM AREA

The use of therapeutic masks with portable oxygen bottles or the passenger drop-out oxygen system to assist passengers in a smoke- or fume-filled passenger cabin should not be considered since considerable quantities of fumes or smoke would be inhaled through the valves or holes in the masks. A more effective aid to passengers in a smoke- or fume-filled environment would be the use of a wet towel or cloth held over the mouth and nose. A wet towel or cloth aids in filtering and is more effective at doing this than a dry towel or cloth. Cabin crew should take prompt action if smoke or fumes develop and move passengers away from the area involved and, if necessary, provide wet towels or cloths and give instructions to breathe through them.

PLACE DANGEROUS GOODS ITEM IN POLYETHYLENE BAGS

Note.— In the case of a spill of known or suspected dangerous goods in powder form:

- *leave everything undisturbed;*
- *do not use fire agent or water;*
- *cover area with polyethylene or other plastic bags and blankets;*
- *keep area isolated until after landing.*

With emergency response kit

If it is absolutely certain that the item will not create a problem the decision may be made not to move it. In most circumstances, however, it will be better to move the item and this should be done as suggested below. Place the item in a polyethylene bag as follows:

- prepare two bags by rolling up the sides and placing them on the floor;

- place the item inside the first bag with the closure of the item, or the point from which it is leaking from its container, at the top;
- take off the rubber gloves while avoiding skin contact with any contamination on them;
- place the rubber gloves in the second bag;
- close the first bag while squeezing out the excess air;
- twist the open end of the first bag and use a bag tie to tie it sufficiently tight to be secure but not so tight that pressure equalization cannot take place;
- place the first bag (containing the item) in the second bag, which already contains the rubber gloves and secure the open end in the same manner as that used for the first bag.

With no emergency response kit

Pick up the item and place it in a polyethylene bag. Ensure the receptacle containing the dangerous goods is kept upright or the area of leakage is at the top. Using paper towels, newspaper, etc., mop up the spillage, after having ascertained there will be no reaction between what is to be used to mop up and the dangerous goods. Place the soiled towels, etc., in another polyethylene bag. Place the gloves and bags used to protect the hands either in a separate small polyethylene bag or with the soiled towels. If extra bags are not available, place the towels, gloves, etc., in the same bag as the item. Expel excess air from the bags and close tightly so as to be secure but not so tight that pressure equalization cannot take place.

STOW POLYETHYLENE BAGS

If there is a catering or bar box on board, empty any contents and place the box on the floor, with the door upward. Place the bag(s) containing the item and any soiled towels, etc., in the box and close the door. Take the box or, if there is no box, the bag(s) to a position as far away as possible from the flight deck and passengers. If a galley or toilet is fitted, consider taking the box or bag(s) there, unless it is close to the flight deck. Use a rear galley or toilet wherever possible, but do not place the box or bag(s) against the pressure bulkhead or fuselage wall. If a galley is used, the box or bag(s) can be stowed in an empty waste bin container. If a toilet is used, the box can be placed on the floor or the bag(s) stowed in an empty waste container. The toilet door should be locked from the outside. In a pressurized aircraft, if a toilet is used, any fumes will be vented away from passengers. However, if the aircraft is unpressurized there may not be positive pressure in a toilet to prevent fumes from entering the passenger cabin.

Ensure when moving a box that the opening is kept upward or when moving a bag that either receptacle containing the dangerous goods is kept upright or the area of leakage is kept at the top.

Wherever the box or bag(s) have been located, wedge them firmly in place to prevent them from moving and to keep the item upright. Ensure that the position of the box or bags will not impede disembarkation from the aircraft.

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