DGP-WG/22-IP/8 21/11/22



DANGEROUS GOODS PANEL (DGP) WORKING GROUP MEETING (DGP-WG/22)

Montréal, 21 to 25 November 2022

Agenda Item 4: Managing safety risks posed by the carriage of lithium batteries by air (Ref: Job Card DGP.003.04)

FIRE SAFETY TESTING LITHIUM CELL POWERED TRACKING DEVICES

(Presented by Federal Aviation Administration (FAA))

SUMMARY

This information paper contains the presentation given at DGP-WG/22 containing some recent FAA Testing on Lithium Battery Tracking Devices and Large Coin Cells

FAA Fire Safety Testing Lithium Cell Powered Tracking Devices

Presented to: ICAO Dangerous Goods Panel (DGP) Working Group (WG/22)

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Federal Aviation Administration

Lithium Cell Powered Tracking Devices

- The goal of the testing:
 - Heat lithium cells into thermal runaway
 - Document results (i.e. fire, smoke, peak temperature)
- A total of six (6) devices were tested
- Additional testing was conducted on two different CR2477 coin cells (0.3 g lithium metal)



Lithium Cell Powered Tracking Devices

 Three (3) were Bluetooth Tracking devices powered by lithium metal coin cell (CR2032, 0.1 g lithium metal)



Lithium Cell Powered Tracking Devices

 Three (3) were GPS/Cellular Tracking devices powered by lithium ion pouch cells (2.2 Watt-hours (Wh), 5.5 Wh, & 17.2 Wh)















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Lithium Metal Coin Cells (CR2477)

• Two (2) were different brands of CR2477 lithium metal coin cells (0.3 g lithium metal)





Tracking Device Setup

- A ribbon type heater was placed against the cell in the device
- Modifications were made to allow the wires to exit the device
- Each cell/device was tested three (3) times



Tracking Device Setup

• Two (2) of the three (3) tests were covered with cheesecloth to detect flame/fire





Bluetooth Tracking Device – BT-1

- All three (3) tests did not result in a fire
- Device was powered by a CR2032 Lithium metal cell





Bluetooth Tracking Device – BT-2

- All three (3) tests did not result in a fire
- Device was powered by a CR2032 Lithium metal cell





Bluetooth Tracking Device – BT-3

- All three (3) tests did not result in a fire
- Device was powered by a CR2032 Lithium metal cell





- All three (3) tests did not result in a flame/fire, but produced smoke
- In one (1) test, the cell was ejected from the device
- Device was powered by a 2.2 Wh lithium ion pouch cell





- All three (3) tests did not result in a flame/fire, but produced smoke
- Device was powered by a 5.5 Wh lithium ion pouch cell





- One (1) of the tests resulting in a large flames and fire
- Device was powered by a 17.2 Wh lithium ion pouch cell





- One (1) of the tests resulting in a large flames and fire
- Device was powered by a 17.2 Wh lithium ion pouch cell









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CR2477 Coin Cells

- The CR2477 coin cells were tested by themselves (not in any device)
- Brand-1 CR2477 coin cell was tested 5 times
- Brand-2 CR2477 coin cell was tested 4 times
- Additional propagation tests were conducted for both brands of CR2477 cells



- Brand-1 was tested 5 times
- One (1) of the tests resulting in flame/fire
- All tests resulted in a generation of smoke





- Brand-1 was tested 5 times
- One (1) of the tests resulting in flame/fire
- All tests resulted in a generation of smoke





- Brand-2 was tested 4 times
- Two (2) of the tests resulting in flame/fire
- All tests resulted in a generation of smoke





- Brand-2 was tested 4 times
- Two (2) of the tests resulting in flame/fire
- All tests resulted in a generation of smoke





CR2477 Coin Cells







- Additional propagation tests were conducted for both brands of CR2477 cells
- Six (6) cells were placed in a line in an insulated box
- The first cell in the line was heated into thermal runaway







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- Brand-1 and Brand-2 were both tested once
- Both tests resulted in flame/fire and complete propagation of the cells







Conclusion

- No Surprise: the larger the lithium cell, the larger the potential for flame/fire
- The Bluetooth Tracking Devices powered by the CR2032 cells (0.1 gram lithium metal) did not produce any flames/fire.



Conclusion

- The two (2) GPS/Cellular Tracking Devices powered by a 2.2 Wh and 5.5 Wh lithium ion pouch cell did not produce any flames/fire.
- The two (2) brands of CR2477 cells (0.3 gram lithium metal) produced flame/fire in 3 out of 9 tests



FAA Testing

 The testing in this presentation was conducted by the <u>FAA</u> <u>Fire Safety Branch</u>, William J. Hughes Technical Center, Atlantic City International Airport, New Jersey, USA





QUESTIONS?

