



DGP-WG/15-IP/10
29/4/15

**DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/15)**

Montreal, 27 April to 1 May 2015

Agenda Item 5: Development of mitigating measures to address risks associated with the transport of lithium batteries including measures that address recommendations from the Second International Multidisciplinary Lithium Battery Transport Coordination Meeting

5.6: Miscellaneous lithium battery issues

PRESENTATION ON THE FIRE-RESISTANT CONTAINER UPDATE

(Presented by the United Parcel Service (UPS))



Fire-Resistant Container Update

Spring 2015



Background

- Fire-resistant containers (FRCs) were introduced in late 2012
 - Collaboration between UPS and IPA
- Can contain intense fires for extended periods
- Standard configuration determined in 2013
 - Fiber-reinforced plastic panels on aluminum frame
 - Roll-up door made of fire resistant fabric
 - Sealed header
 - Side clamps on the lower half of the door
 - Seal at bottom of door
- Part of multi-layered approach



Testing to refine and validate

- More than 40 tests at private labs and FAA Tech Center
 - Continue to evolve FRC design
 - UPS and the FAA working together
 - Tests both with and without prototype fire-suppressing powder
- FRCs demonstrated to contain a fire with a peak temperature of 1200 degrees Fahrenheit (650 Celsius) for four hours
- UPS has conducted testing to mitigate combustible gas build-up



UPS Testing -- January 2015

Purpose

- Test gas venting properties of FRCs (AAY units)
- Create just enough airflow to burn off gases
- Focus on door seals and clamps
- FAA participated in the tests



Clamps

Seal
removed



Fire Load

- Lithium ion 18650 cells were packed in boxes then placed in an 18”X18”X18” cardboard overpack
 - 168 cells were packed in three boxes for a total of 504 cells
- The cardboard overpack was placed in the forward right corner of the ULD
- The remainder of the ULD was filled with 18”X18”X18” cardboard boxes, each containing 2.5 lbs of shredded paper
- Ignition was accomplished with a single 100W cartridge heater placed in the bottom battery box



UPS Test Footage



Test Results

- Visible smoke for two minutes before flashover at 20:00
- Test measurements terminated at 2 hr
- ULD opened at 3.5 hr
 - End of day
 - Flared up
- No breach
- All 504 batteries consumed



Confirmation Test



Confirmation Test Results

- Repeat of successful configuration using 968 cells
- A flashover occurred at 13:39
 - Event was contained
- Visible smoke at 14:33
- Significant fire from 14:35 – 16:30
 - Evident by internal temperatures and resin burn-off
- From there, temperatures cooled significantly
- Container never breached
- Only 40 batteries were consumed
- Test terminated. Container was opened after 4 hours with no flare up



Ongoing refinement

- UPS tests demonstrate that FRCs can mitigate gas buildup and contain a lithium battery fire.
 - Configuration must allow for adequate airflow.
- We continue to refine FRCs to address real-world contingencies.
 - Work with FAA and industry fire-safety experts
- FRCs already enhance safety and we continue to enhance



FRC Strategy Recommendations

- Given the success of Tests 2 and 4: UPS is retrofitting existing FRCs to remove seal from lower door clamp.
- UPS is pursuing program to convert existing polycarbonate containers to FRCs.



Multi-layered approach to cargo fire safety

- Cargo deck
 - FRCs
 - Fire containment covers for cargo pallets
 - Prototype fire-suppression units
- Flight deck
 - Quick donning, full-face oxygen masks
 - Emergency Vision Assurance System (EVAS)
 - Enhanced crewmember training and emergency checklists
- Training
 - Enhanced customer and employee training, audits
- Regulatory
 - ICAO, PHMSA, IATA



Thank you

