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Date: October 24th, 2024

File No.: **24/32304461**

Petitioner reference: **Roban Model Limited**
RM D 10/F Tower A, Billion CTR
1 Wang Kwong Rd Kowloon
HongKong

TEST REPORT

Date samples received: 24-05-2024

Date tests performed: 11-10-2024

1. OBJECT

Testing of a safety box for lithium batteries, which purpose is to control and prevent fire spread of lithium battery used for drones or other radio-controlled cars/aircraft.

2. MATERIAL RECEIVED

A safety box for lithium batteries was received with the following specifications provided by the petitioner. Additionally, a set of 5 lithium-ion batteries were provided by the petitioner.

BAT SAFE XXL:

- Max battery size: up to 7pc 6S (22.2V) 6000mAh or 777Wh equiv.
- Vault size (length x width x height): (24x16.5x61) cm
- Outer size (length x width x height): (30x22x68) cm
- Material: Steel sheet, non-flammable insulation materials.

a b

Image 1. *Material received: a) BAT SAFE XXL. b) Lithium-ion batteries.*

3. TEST PROCEDURE

The purpose of the test is to demonstrate the safety box is suitable to control and prevent fire spread of lithium batteries based on the P911 packing instructions from the ADR (International Carriage of Dangerous Goods by Road):

- The outside surface temperature of the completed package shall not have a temperature of more than 100°C. A momentary spike (<600 second) in temperature up to 200°C is acceptable;
- No flame shall occur outside the package;
- No projectiles shall exit the package;
- The structural integrity of the package shall be maintained;
- The packaging shall have a gas management system (e.g. filter system, air circulation, containment for gas, gas tight packaging etc.), as appropriate.

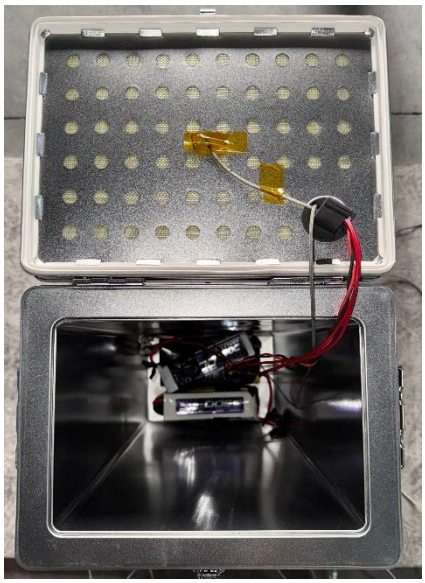
The test was carried out according to the following procedure:

- The batteries are placed inside of the safety box.

- Lithium-ion batteries thermal runaway will be induced inside the safety box via overcharge.
- Battery safety box must be completely closed.
- Up to 9 thermocouples are placed on both the battery and the outer surface of the safety box. Detailed measuring points are described further on this document.
- The entire test is video recorded from two sides as well as photographic images

3.1. Thermocouples layout

Thermocouples are placed according to the following configuration:

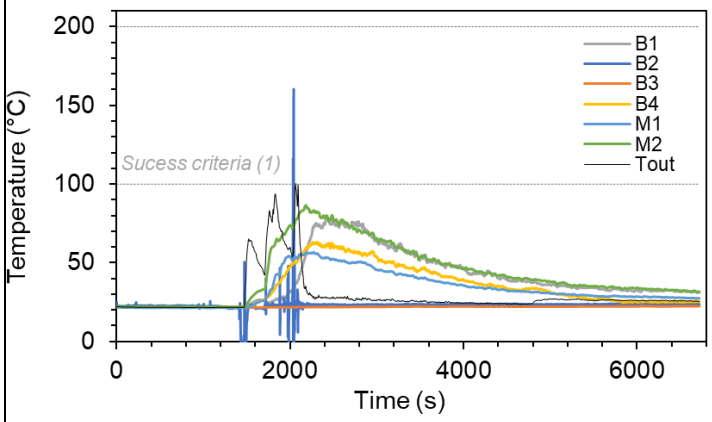
BAT SAFE XXL	
Thermocouple	
TC- outer battery surface **Tin-** inside of the box, centre of the lid	

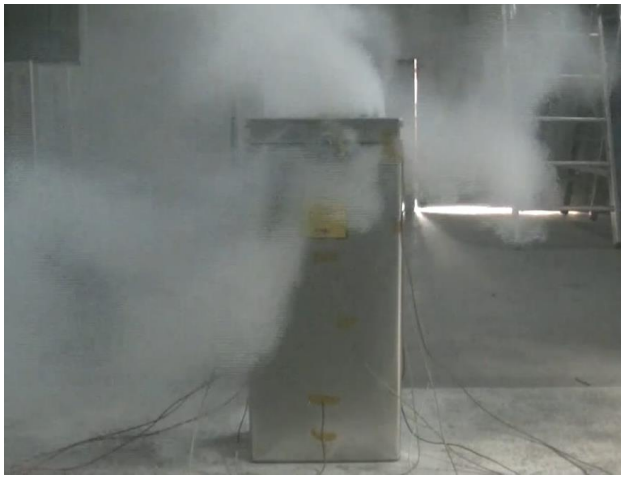
Tout- outside of the box, centre of the lid **B1-** outside of the box, centre bottom area **B2-** outside of the box, left side bottom area **M1-** outside of the box, centre middle area **M2-** outside of the box, left side middle area	
B3- outside of the box, right side bottom area	

B4- outside of the box, rear bottom area	

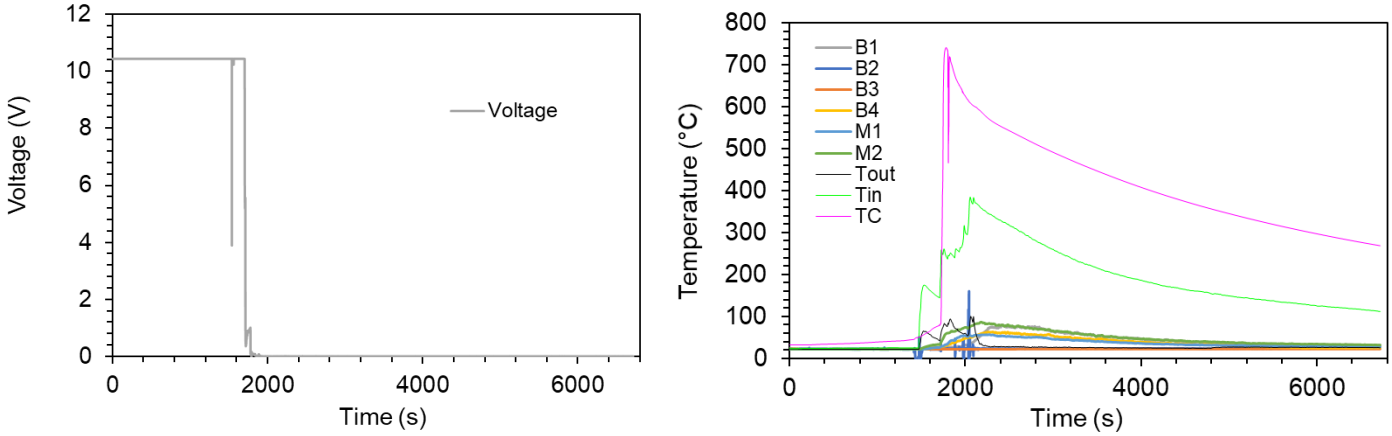
4. RESULTS

According to the success criteria mentioned in section 3 of this report, based on the P911 packing instructions from the ADR (International Carriage of Dangerous Goods by Road), the results are described as follows.

BAT SAFE STANDARD			
Success criteria	**Fulfilled**	**Observations**	
1	Yes	The outside surface temperature of the package has neither exceeded 100ºC during >600 seconds nor reached 200ºC. This can be observed in the outside temperatures chart of battery safety box.	
2	Yes	During the test, no flame has leaked outside the safety box.	
3	Yes	No projectiles were observed to exit the box during the test.	

4	Yes	The structural integrity of the safety box was maintained.	
5	Yes	The safety box is equipped with a system of holes placed in the lid of the box, working as a gas management system. The system was able to deal properly with the gases released as observed in the images.	

Some additional data from the test is attached to understand and analyse the behaviour of the thermal runaway and the battery safety box.



a b

Figure 1. *Thermal runaway behaviour. a) Battery voltage. b) Battery safety box temperatures.*

According to the criteria mentioned, the **SAFETY BOX XXL fulfils** the P911 packing instructions from the ADR under the conditions indicated in the present report.

Digitally signed by
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Responsible of Reaction to Fire
LGAI Technological Center S.A. (APPLUS)