



OPERATIONAL CIRCULAR 43/2021

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JUNE 2021

INCIDENTS INVOLVING LITHIUM-ION BATTERIES IN WA

Key Message

The number of fires determined to be caused by Lithium-ion (Li-ion) batteries has risen rapidly and is likely to continue to rise as more Li-ion equipment is introduced into homes and businesses.

The Fire Investigation and Analysis Unit (FIAU) requires accurate information to be recorded on the Incident Reporting System (IRS) to allow further analysis of this trend.

What happened?

Fire cause analysis is noting an increase in the number of fire incidents initiated by Li-ion batteries in WA. Li-ion batteries are commonly used to power electronic items used in everyday life. These include items such as power tools, toys, phones, laptop and tablet computers, electric scooters and battery energy storage systems.

There are four main causes of Li-ion batteries failing:

- Mechanical abuse e.g. denting, dropping – damage may be visually undetectable
- Thermal abuse e.g. external heating;
- Electrical abuse e.g. overcharge, external short circuit, over discharge and using a charger not designed for the battery; and
- Poor cell electrochemical design e.g. manufacturing defects, contamination by metallic particles, poor electrode alignment.

Fires started by Li-ion battery cells is due to 'thermal runaway'. This is a chemical reaction within the battery cell which firstly emits smoke, potentially explode or burn intensely and ignite combustible items nearby.

The battery cap can fail due to pressures created by the reaction inside, or the battery casing may rupture. It is difficult to determine if the battery damage was caused by thermal runaway or from an external heat source.

Target Audience: All fire related operational personnel.				
A	B	C	D	Vol
O.I.C. is to communicate content to all relevant personnel under their command, discuss implications, and sign appropriate box above. Circulars shall be filed on station and forwarded to Information Resources at the end of each financial year.				
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Battery cap blown due to thermal runaway



Battery exploded due to thermal runaway

Examples of fires starting from Li-ion thermal runaway can be viewed in real-time footage at the following hyperlinks:

<https://www.youtube.com/watch?v=2Z9190ruyIM>

<https://abcnews.go.com/WNT/video/laptop-explosion-caught-security-camera-45275096>

What does it mean for me?

Due to the prevalence of Li-ion battery powered devices crews should consider them a potential cause at every structure fire.

A Li-ion battery may start a fire several metres from its original position because 'thermal runaway' of the cell may expel flame or hot products away from the battery. This makes fire origin determination considerably more difficult. It is possible that one or several cells may fail, causing multiple points of ignition.

When Li-ion batteries are determined to be damaged or involved in fires, Incident Controllers (IC) should endeavour to identify the brand of battery involved so that the FIAU can monitor trends.

A checklist has been added to [Field Guide 3.2 – Fire Investigation Response](#) to assist ICs to identify whether a Li-ion battery is likely to have caused a fire. Information such as the battery age, if it was being charged and where it was located will assist the IC in fire cause determination.

The Incident Reporting System (IRS) has been amended with provisions to record information for incidents involving Li-ion batteries to enable more accurate collection of data.

Please contact the on-call FIO on 0417 842 407 for further information or assistance.

CRAIG WATERS AFSM DEPUTY COMMISSIONER OPERATIONS COMMAND

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