



International Civil Aviation Organization

DGP-WG/22-IP/10
22/11/22

WORKING PAPER

**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)

**THERMAL INCIDENT DATA RELATED TO CARGO OPERATIONS REPORTED THROUGH
THE VOLUNTARY THERMAL RUNAWAY INCIDENT PROGRAM (TRIP) RIP CARGO
DATA: SUMMARY OF DATA**

(Presented by the Secretary)

SUMMARY

Attached is the presentation delivered to DGP-WG/22 on TRIP Cargo Data:
Summary of data from 2017-2022.



TRIP Cargo Data

Summary of data from 2017 - 2022

ICAO Dangerous Goods Panel Working Group
22 November 2022

Safety Science in Action™

Current TRIP Participants

| | |
|-------------------|------------------------------|
| Air Canada | JetBlue Airways |
| Alaska Airlines | Omni Air International |
| Allegiant | PSA Airlines |
| American Airlines | SkyWest |
| Ameristar | Southwest Airlines |
| Delta Air Lines | Spirit |
| Emirates | United Airlines |
| Envoy | UPS Airlines |
| FedEx | US Postal Inspection Service |
| Hawaiian Airlines | |

Data constraints and limitations



1. Compilation of 548 reports thru 11/15/22.
2. 3 years of tailored reporting.
 - Lithium Battery/Aviation specific.
 - Passenger / Baggage / Cargo.
3. Includes “near miss” and non-reportable incidents (segregated).
4. Increasing participation and data availability.
5. TRIP Includes incidents from FAA lithium battery incident summaries.



Subset of airline industry – not a complete accounting, is not the full story.

Incident data capture process has “gaps.”

- Source is the crew – priority to safety, not data capture.
- Device ownership, damage, etc. limit detailed data capture.
- Lack of forensic process and resources at airlines limits root cause.

Structural and operational changes due to Covid complicate trending & analysis.

Data analysis

All Incidents

Passenger Operators

Cargo Operators

Cabin /
Crew

Checked
Baggage

Cargo

Cabin /
Crew

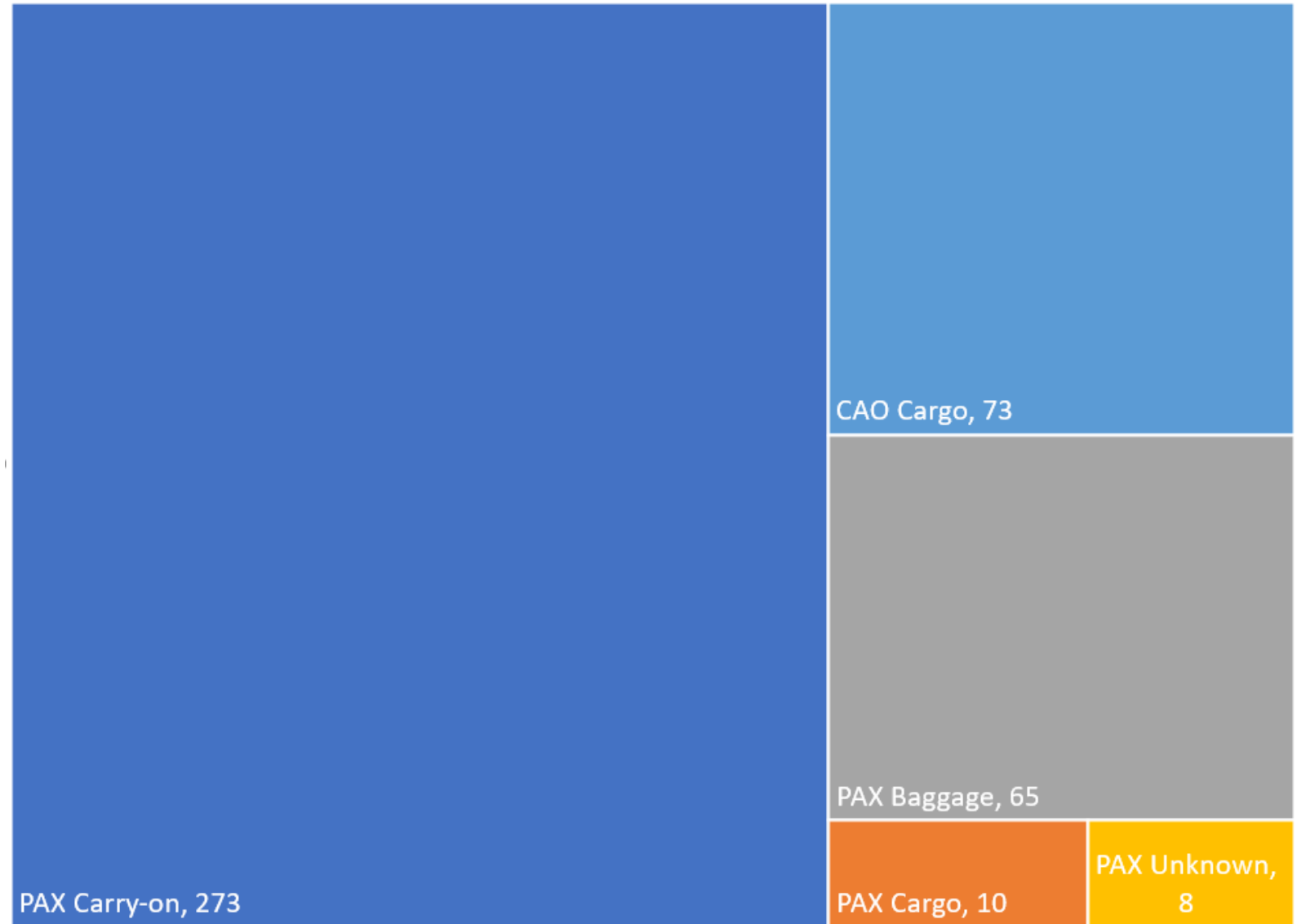
Cargo

All thermal incidents by carrier type and path, 2017-2022

429 thermal incidents

65 carriers + TSA

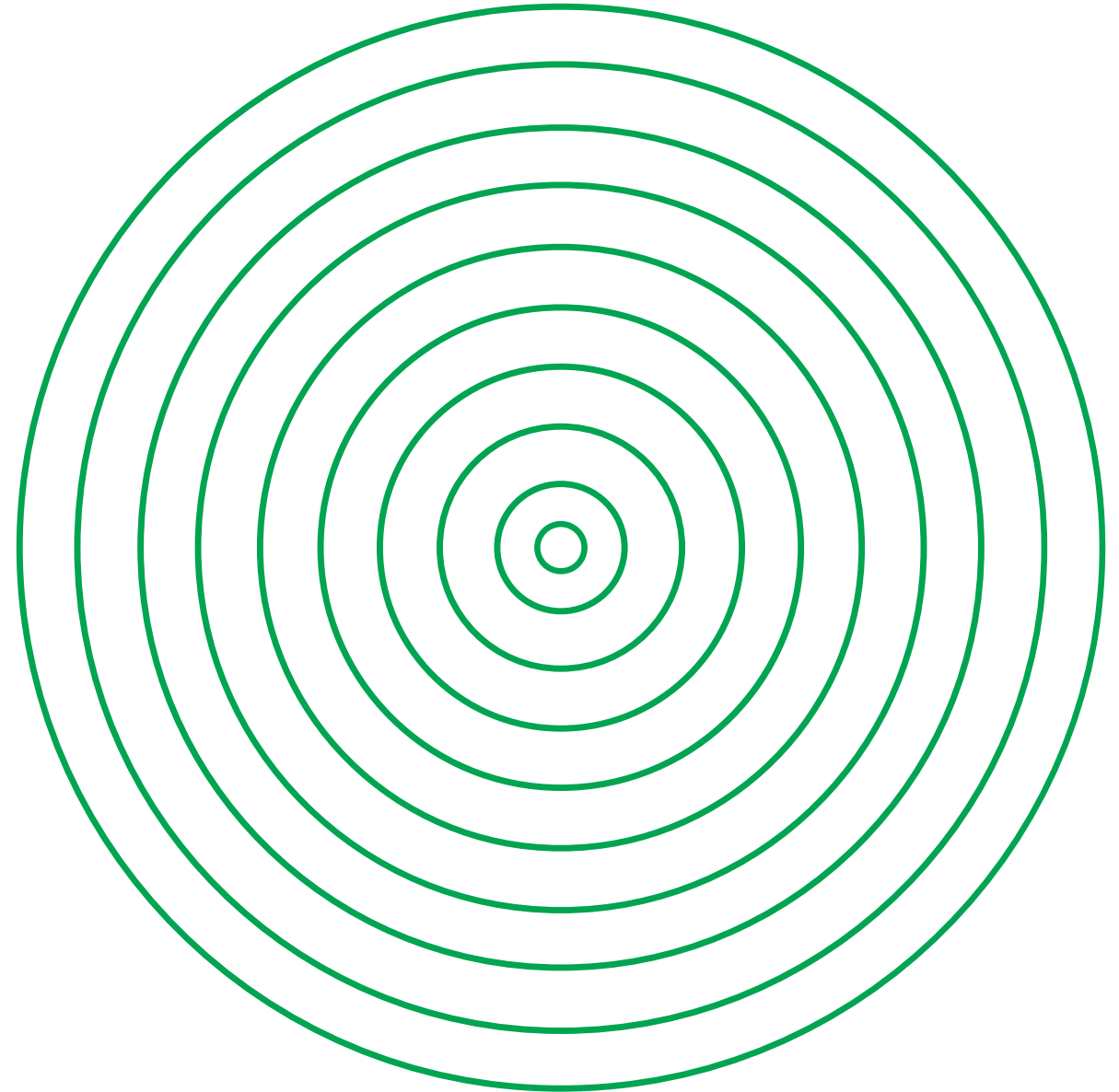
2017 - 2019 data include news and informal reports



Source: UL TRIP Database, participant reported thermal incidents from 2017-2022. As of 2022-11-15

Cargo

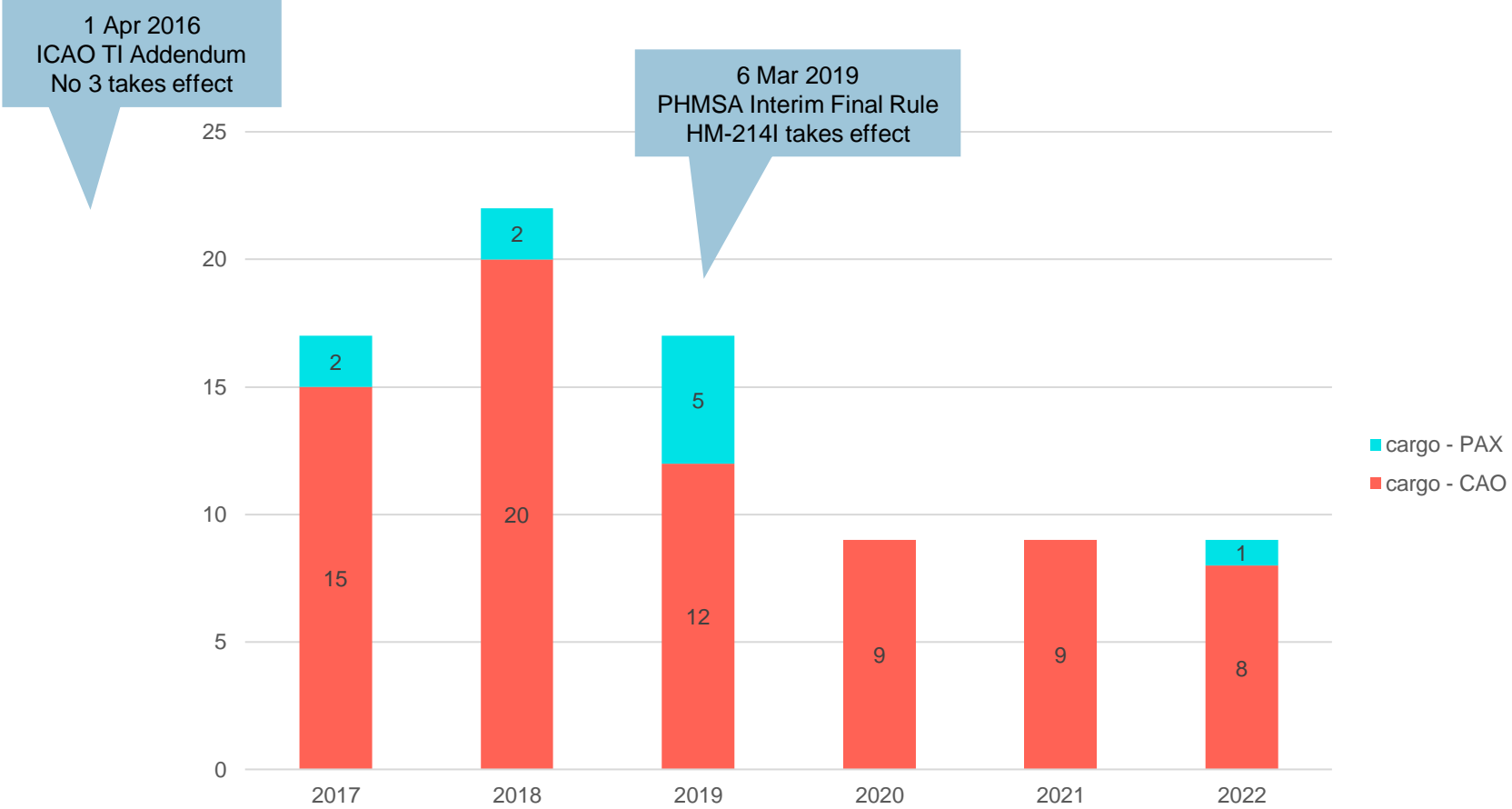
Thermal incidents, 2017 - 2022



Relevant rulemaking

- ICAO TI Addendum No 3, issued 15 Jan 2016
 - Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.
- PHMSA Interim Final rule HM-214I, issued 6 Mar 2019
 - The Pipeline and Hazardous Materials Safety Administration (PHMSA) issues this interim final rule (IFR) to amend the Hazardous Materials Regulations (HMR; 49 CFR parts 171-180) to (1) prohibit the transport of lithium ion cells and batteries as cargo on passenger aircraft; (2) require all lithium ion cells and batteries to be shipped at not more than a 30 percent state of charge on cargo-only aircraft; and (3) limit the use of alternative provisions for small lithium cell or battery to one package per consignment.

Time series trend, cargo thermal incidents, 2017-2022



83 thermal incidents

Incidents shown are events that involve a “a fire, violent rupture, explosion, or a dangerous evolution of heat.”

Swollen or damaged batteries and procedural issues are not included in this chart.

Source: UL TRIP Database, participant reported thermal incidents from 2017-2022. As of 2022-11-15

Data analysis

All Incidents

Passenger Operators

Cargo Operators

Cabin /
Crew

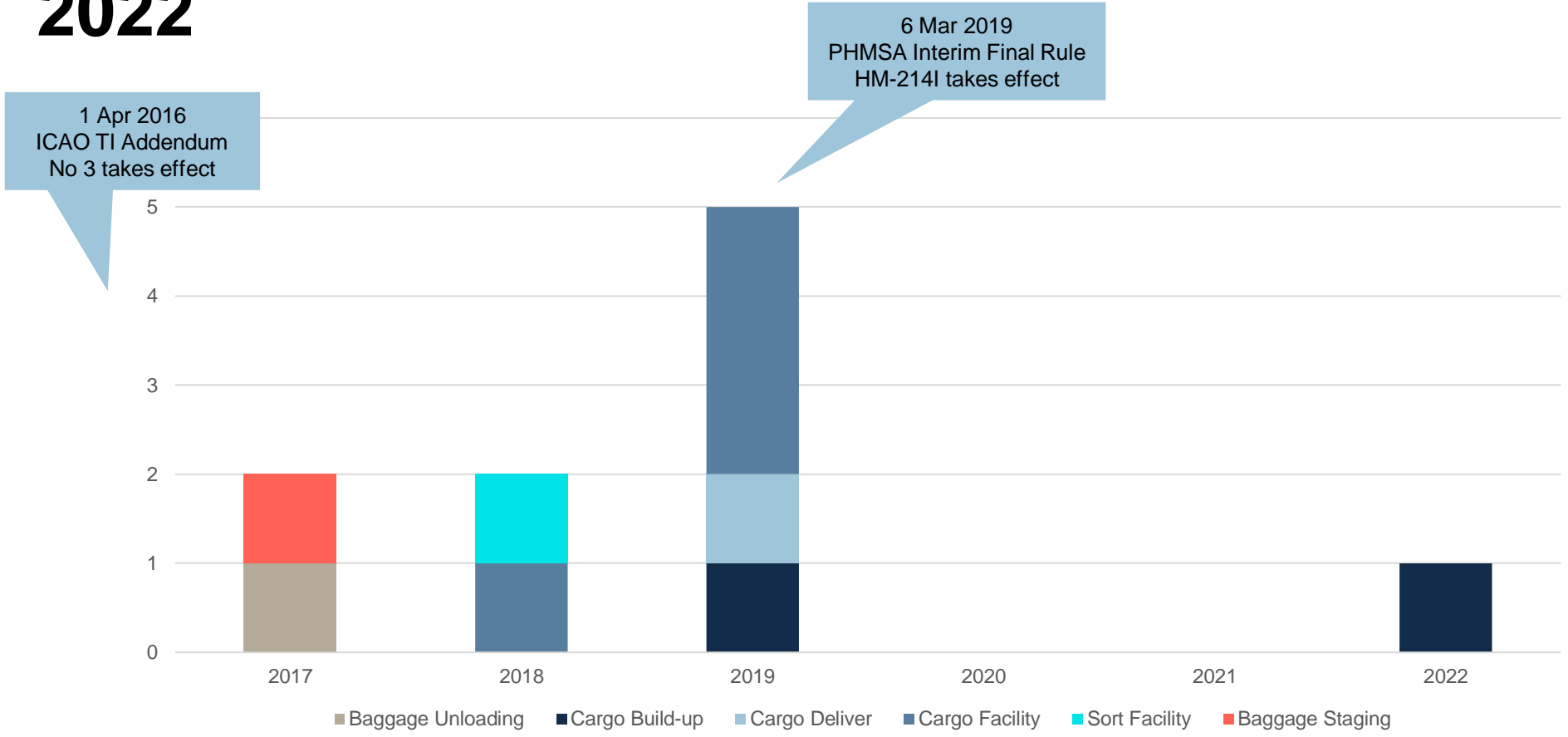
Checked
Baggage

Cargo

Cabin /
Crew

Cargo

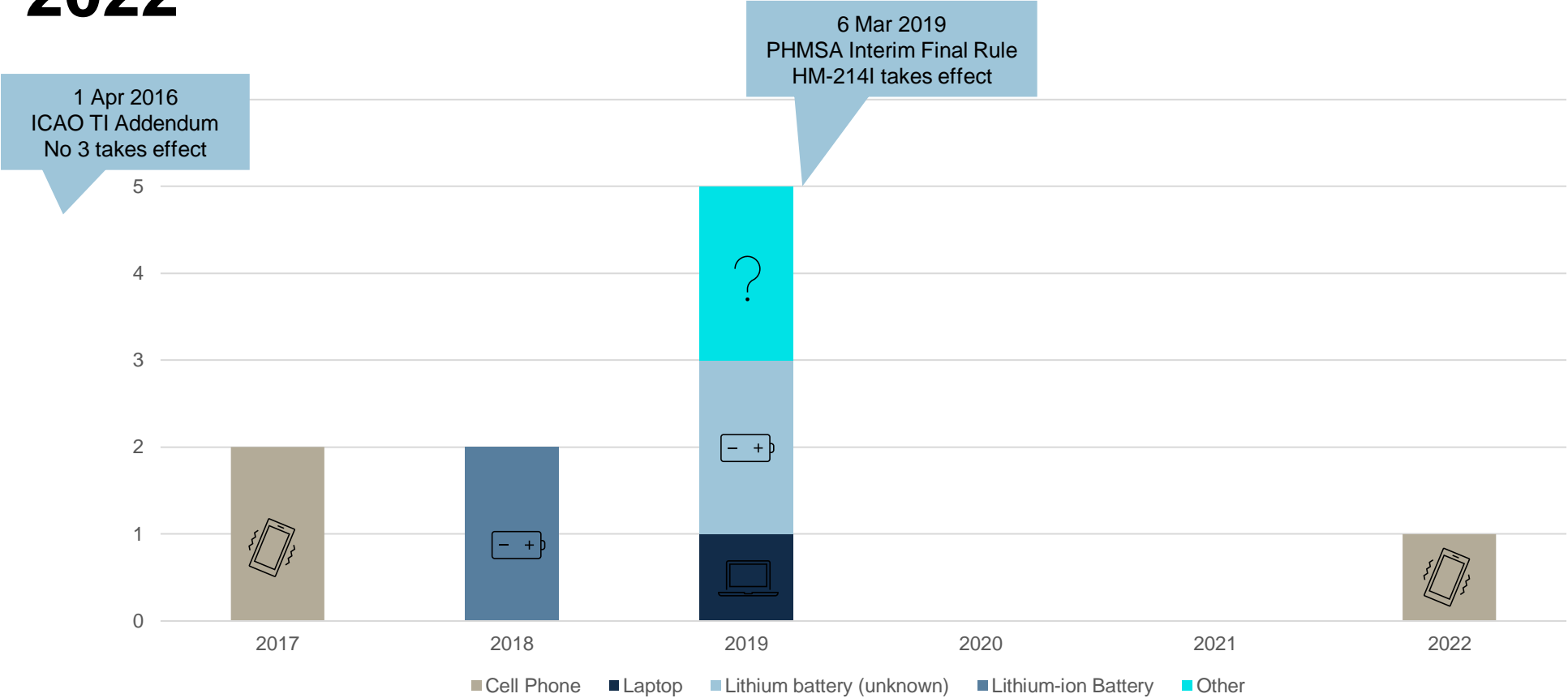
Passenger flights, cargo incidents, by location, 2017-2022



No incidents on the aircraft

Source: UL TRIP Database, participant reported thermal incidents from 2017-2022. As of 2022-11-15

Passenger flights, cargo incidents, by device, 2017-2022



No incidents on the aircraft

Source: UL TRIP Database, participant reported thermal incidents from 2017-2022. As of 2022-11-15

Data analysis

All Incidents

Passenger Operators

Cargo Operators

Cabin /
Crew

Checked
Baggage

Cargo

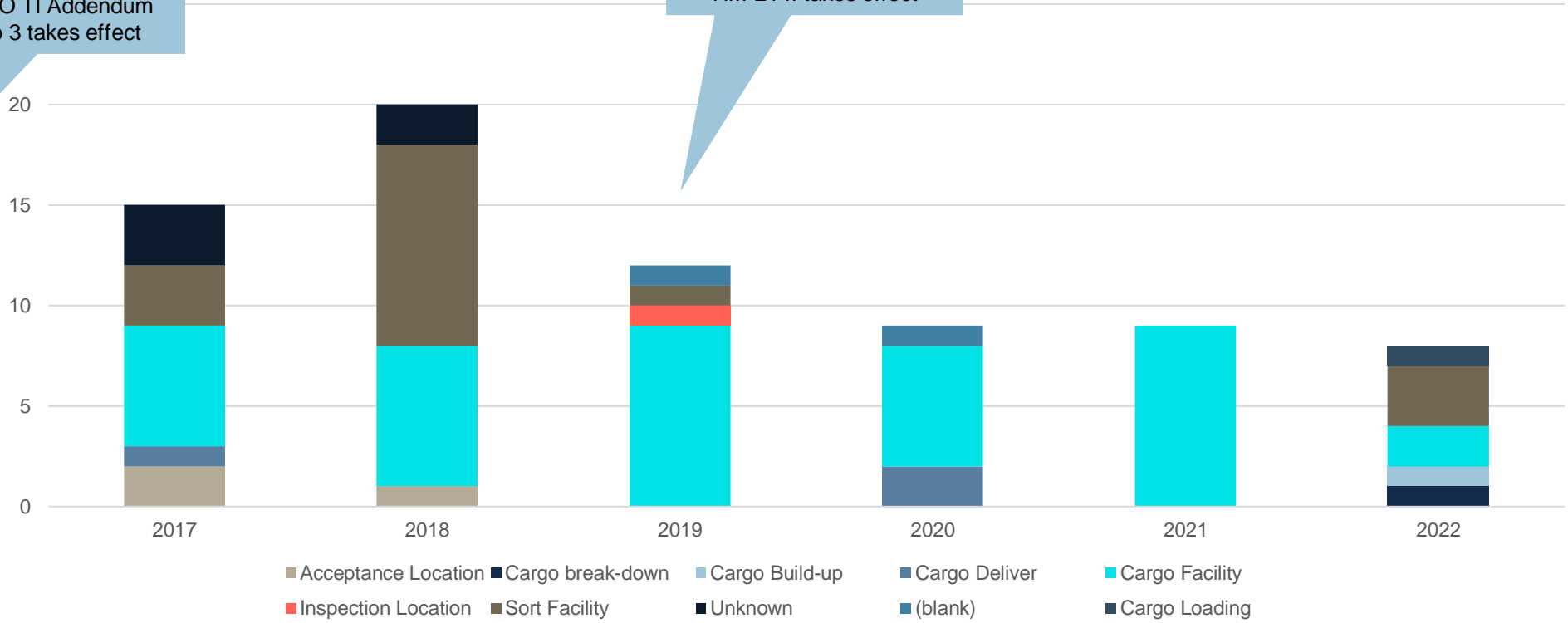
Cabin /
Crew

Cargo

Cargo flights, cargo incidents, by location, 2017-2022

1 Apr 2016
ICAO TI Addendum
No 3 takes effect

6 Mar 2019
PHMSA Interim Final Rule
HM-214I takes effect



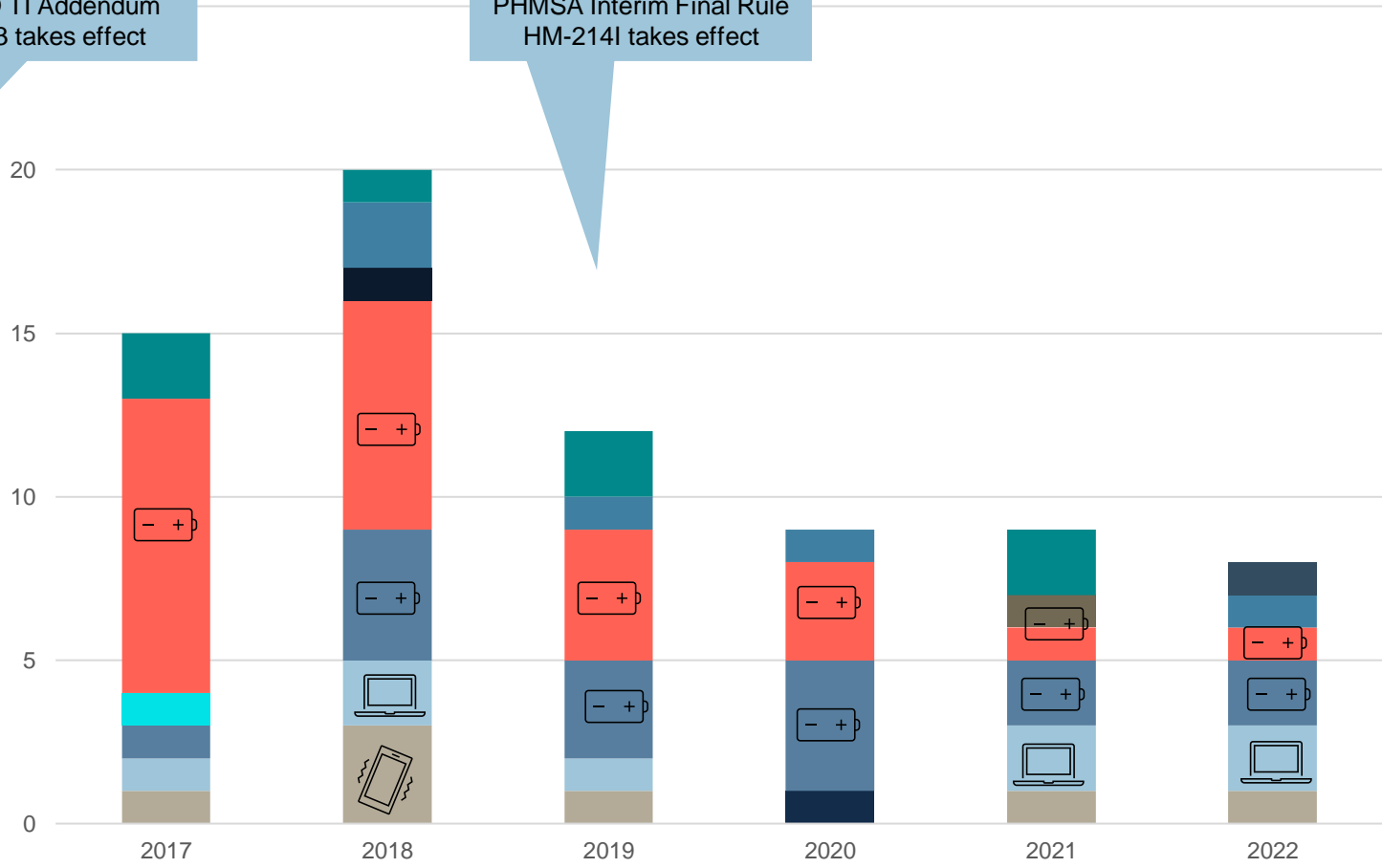
No incidents on the aircraft

Source: UL TRIP Database, participant reported thermal incidents from 2017-2022. As of 2022-11-15

Cargo flights, cargo incidents, by device type, 2017-2022

1 Apr 2016
ICAO TI Addendum
No 3 takes effect

6 Mar 2019
PHMSA Interim Final Rule
HM-214I takes effect

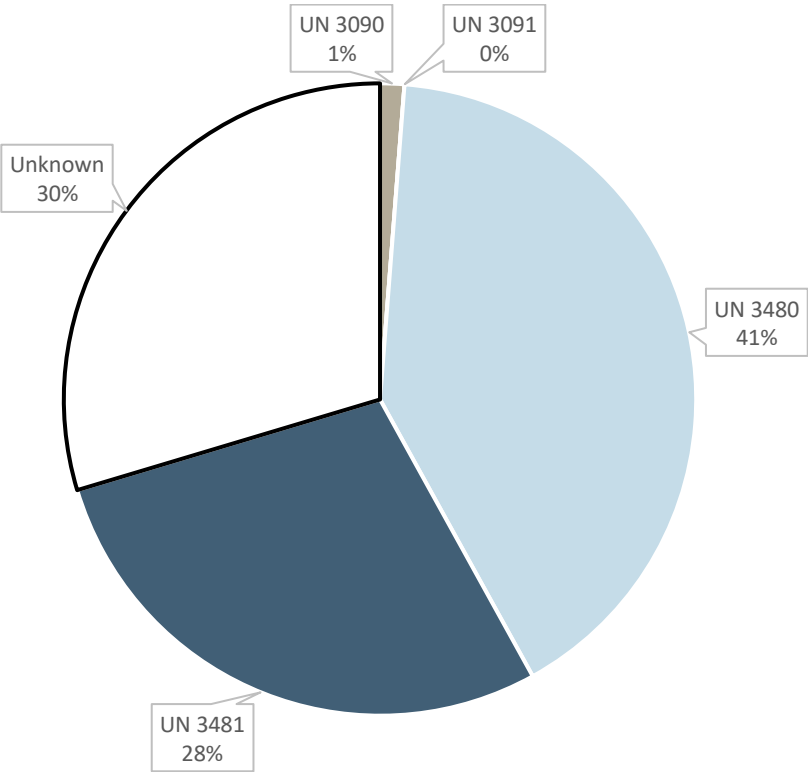
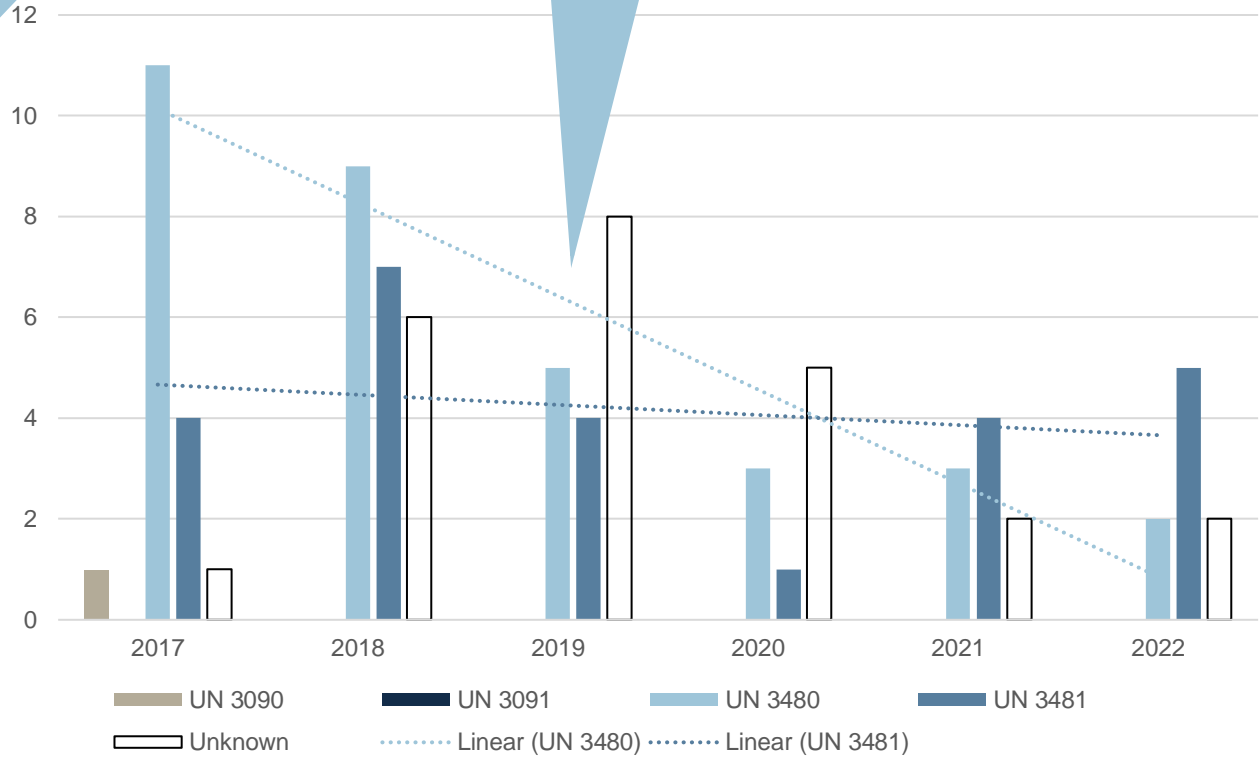


- Power bank / Battery charger
- Potable Media Player (MP3 player, e-reader, gaming device, entertainment device)
- Other
- Medical device
- Lithium-polymer Battery
- Lithium-ion Battery
- Lithium metal Battery
- Lithium battery (unknown)
- Laptop
- e-Cigarette (vape pen, electronic cigarette, vaping device)
- Cell Phone

Cargo thermal incidents, by UN classification, 2017-2022

1 Apr 2016
ICAO TI Addendum
No 3 takes effect

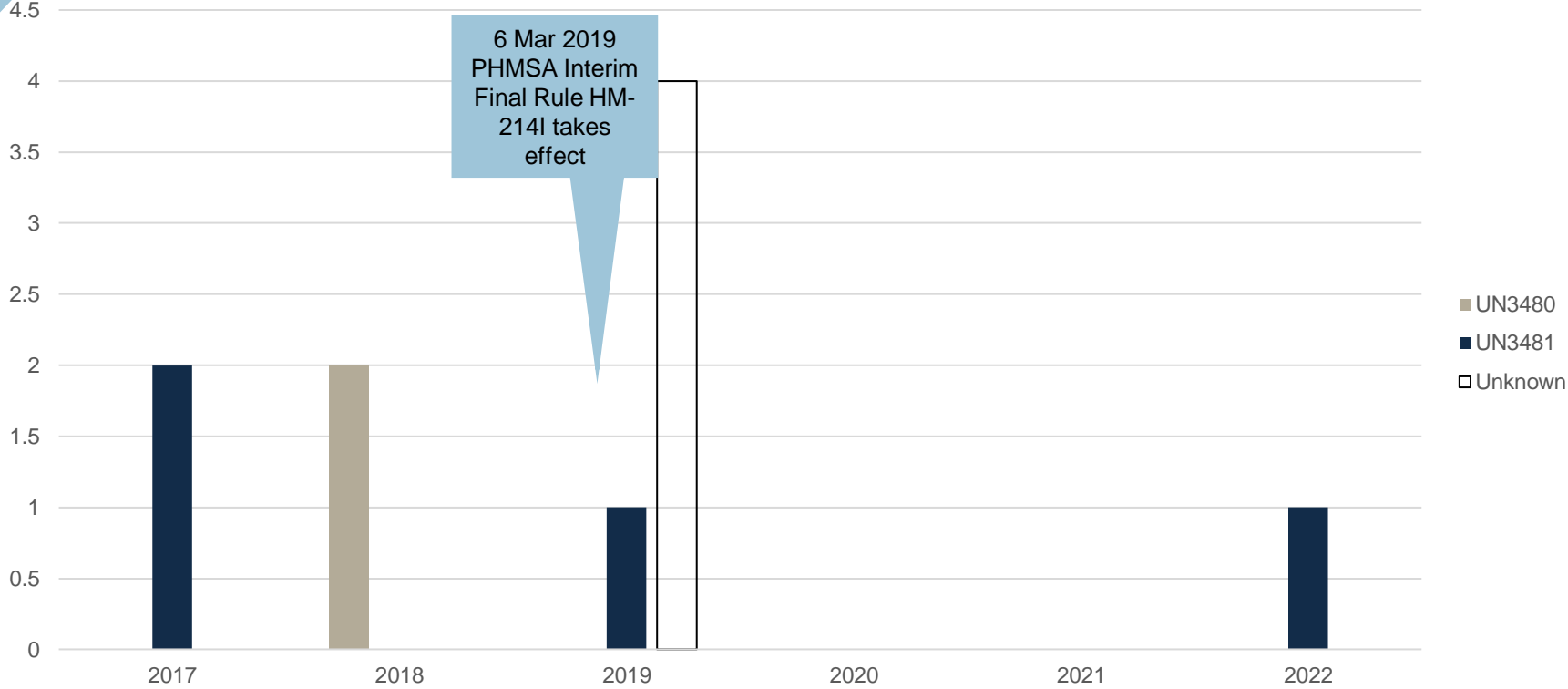
6 Mar 2019
PHMSA Interim Final Rule
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PAX cargo incidents, by UN classification, 2017-2022

1 Apr 2016
ICAO TI Addendum
No 3 takes effect

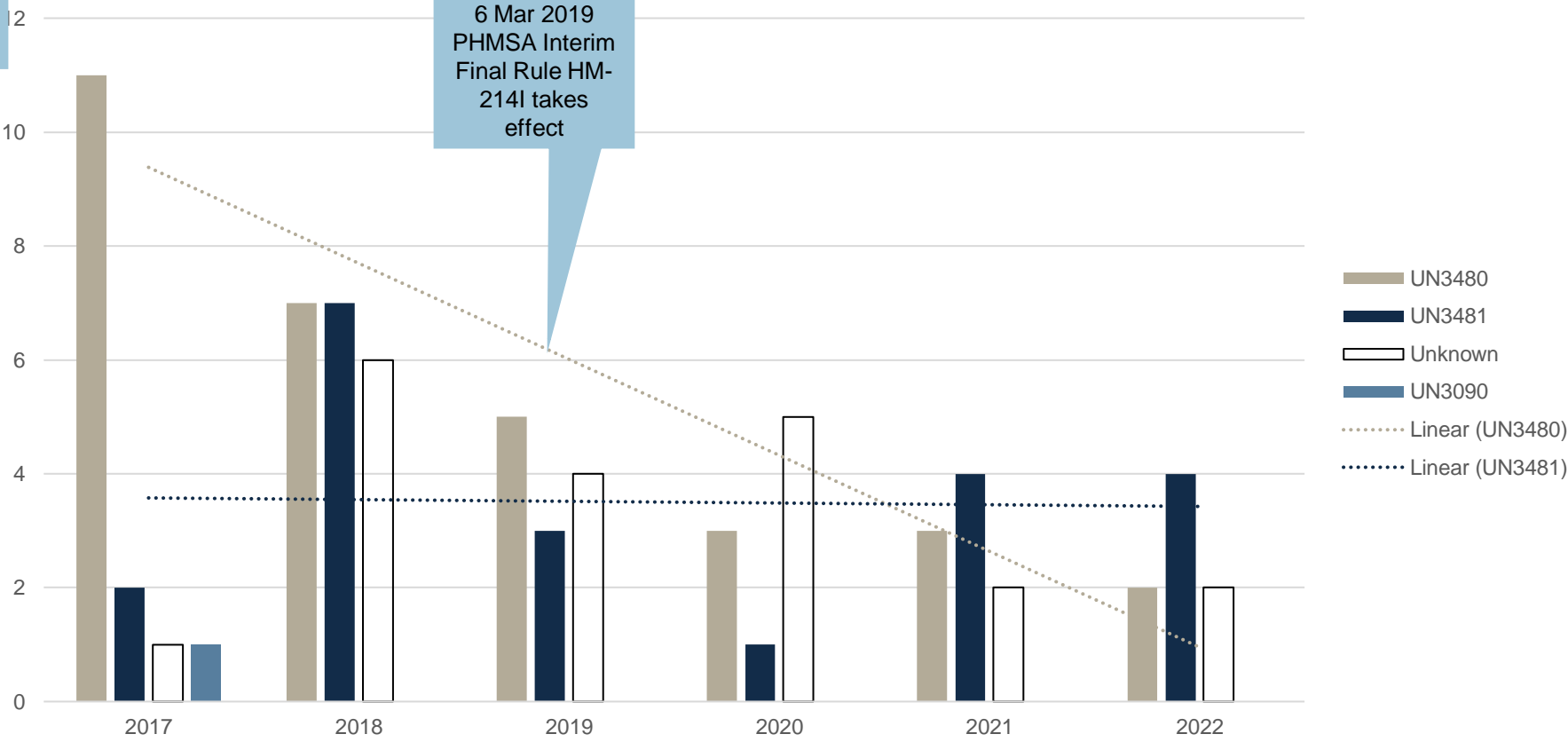
6 Mar 2019
PHMSA Interim
Final Rule HM-
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effect



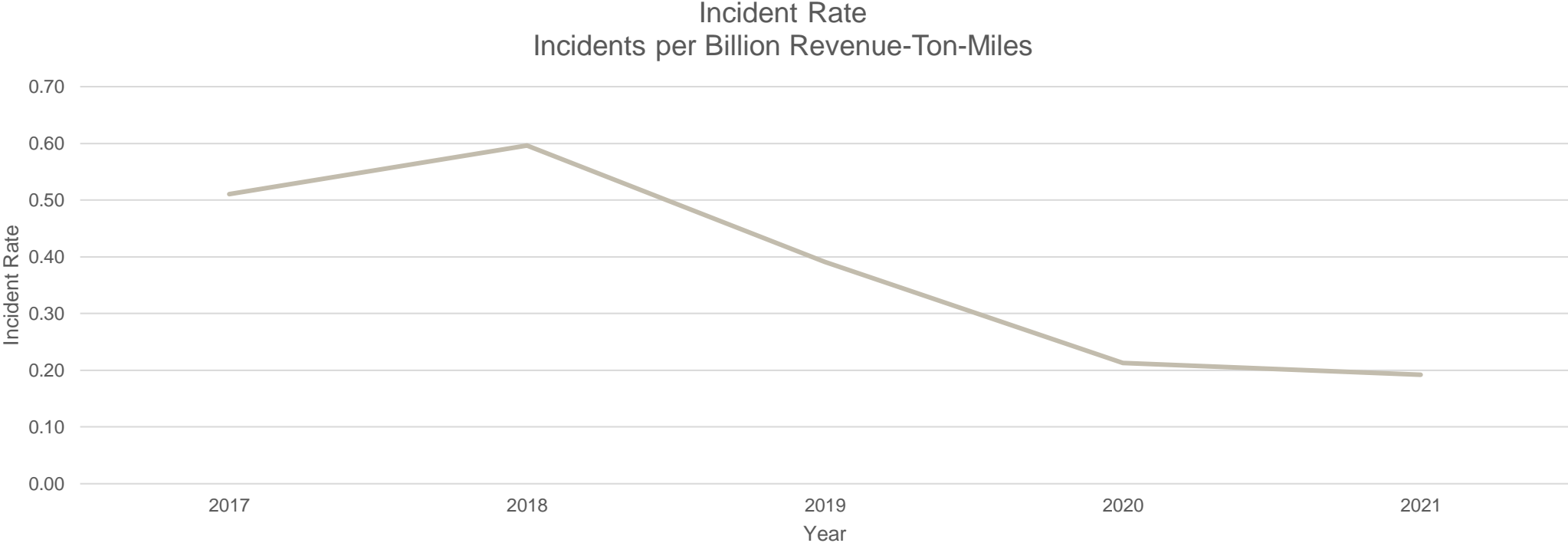
CAO cargo incidents, by UN classification, 2017-2022

1 Apr 2016
ICAO TI Addendum
No 3 takes effect

6 Mar 2019
PHMSA Interim
Final Rule HM-
214I takes
effect



Cargo thermal incident trend, 2017-2021



Sources: UL TRIP Database, participant reported incidents from 2017 – 2021. As of 2022-11-15
U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information. Cargo volumes 2017-2021. Accessed 2022-09-11

Insights

- **Cargo**

- 19% of incidents since 2017.
- Passenger flights with cargo
 - 7 of 10 incidents involve US mail
 - No incidents on the aircraft
- Cargo freighter operations
 - No cabin/crew incidents
 - At least 28% UN 3481, during 2017-2022
- Incident rates declining for UN 3480 since 2017
- No clear pattern for UN 3481