



THE LOADSTAR

LongRead

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Dangerous Goods

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Lithium ion batteries continue to dominate the discussion in the transport of dangerous goods by air. A series of high-profile incidents at the start of the decade saw carriers ban them from passenger services. Since then a string of regulations has been pushed through to both ease the fears and the return of batteries to bellyholds

But problems persist. There were two suspected incidents in February alone, one involving what was reportedly an entire payload of lithium ion batteries, and another thought to have involved a passenger's power bank.

It's not a problem which is going to go away. For one thing, in the modern era, lithium ion batteries are increasingly common, in home and portable electronics, cars, aircraft – in fact across a huge variety of sectors. They are contained in data-logging devices for time and temperature-sensitive goods.

Even your average 12-year-old will probably have one or two in their school bag. They have a high energy density, tiny memory effect and low self-discharge.

But amid all their efficiency, there are negatives. They pose unique safety hazards, since they contain a flammable electrolyte, and may be kept pressurised. If overheated or overcharged, lithium ion batteries may suffer thermal runaway and cell rupture, which in extreme cases can lead to leakage, explosion or fire. And those fires can be exceptionally hot, and hard to extinguish.

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Remember the Christmas 2015 craze for hoverboards? Many airlines banned their shipment after a series of fires. Amazon is currently facing a lawsuit from a buyer whose home burned down, while he suffered serious burns.



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As a result, along with other dangerous goods, they are strictly controlled by the International Air Transport Association's (IATA) Dangerous Goods Regulations and the International Civil Aviation Organisation's (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air, Doc 9284 AN/905.

"Dangerous goods are subject to compliance by all the supply chain stakeholders," says general director of AirBridgeCargo Airlines (ABC) Sergey Lazarev. "Nowadays, the most problematic issue with dangerous goods is transportation of lithium batteries, both separate and in equipment. Volumes of them are increasing every year, coupled with problems arising during the course of their transportation.

Strict compliance

"It is a multi-tiered process which requires precise and accurate action and strict compliance with all industry-related regulations. All the stakeholders should audit each step of the transport in order to identify critical points and develop action plans for further improvement and refinement."

For forwarders, the chief cause of concern appears to be undeclared or "hidden" lithium ion batteries within general cargo shipments. Standards and governance manager at Panalpina Gila Kropf sees this as a core battlefield.

"Identifying hidden and undeclared dangerous goods is a major challenge and key to ensuring safe transport of cargo," she says. "Although the shipper is legally responsible to declare, pack, mark and label the cargo correctly, we

check to rule out any possibility of hidden dangerous goods, for instance shipments offered for transport under the general description of 'spare parts'."

Kropf says such shipments could contain dangerous goods and, as a result, asks shippers not only to provide detailed information about the shipment, but also to be able to back this up with supporting documentation if required.

The head of cargo safety and standards at IATA, Dave Brennan, says further restrictions have been introduced in an attempt to combat problems posed by lithium batteries.

Notably, the regulations further restrict shippers from packing lithium batteries in packages with some flammable dangerous goods. These include explosives, but not flammable gases, flammable liquids, flammable solids and oxidisers. Nor are they allowed to overpack packages of lithium batteries with some flammable dangerous goods.

"There are also restrictions on operators being able to load packages or overpacks of lithium batteries in close proximity with these flammable dangerous goods in a unit load device (ULD) or aircraft cargo compartment," explains Brennan.

These heightened restrictions were introduced into the IATA Dangerous Goods Regulations (DGR) on 1 January 2018. Loading restrictions for operators were also introduced, albeit with a transition period until 1 January 2019.

Similarly, ICAO appropriated these changes for its own Technical Instructions, also due to take effect 1 January next year.

Getting smart

It's not only freight the DGR addresses. IATA's Dangerous Goods Board has also acted to address the potential risks associated with the carriage of "smart" luggage, which contains lithium batteries.

"The DGB adopted requirements in the DGR on lithium batteries installed in the baggage item which are designed to charge other devices," says Brennan. "In these cases, the lithium battery must be user-removable, or the baggage is forbidden for carriage."

The European Aviation Safety Agency (EASA) and the Federal Aviation Administration (FAA) are also very active in this area. Famously, rules introduced by the US banning the carriage in aircraft cabins of portable electronic devices larger than a smartphone, from some countries, raised some eyebrows in DG circles. EASA warned against the move in April last year, and in July, the FAA, noting it had little research on the issue, conducted tests to ascertain the safety of placing them in the hold.

It wanted both to determine the effectiveness of the cargo compartment Halon 1301 fire suppression system in fires involving such devices in checked baggage; and also to determine whether there are potential mitigation options, such as the use of enhanced packaging to contain flames and gas.

It conducted a variety of tests, and concluded: "This test condition yielded the most troubling results. As a result of this, it was concluded that if a PED is packed in a suitcase with permitted hazardous materials and a thermal runaway event occurs, there is the potential for the resulting event to

exceed the capabilities of the airplane to cope with it.”

It added: “Therefore ... devices containing lithium metal or lithium ion batteries (laptops, smartphones, tablets, etc) should be transported in carry-on baggage and not placed in checked baggage.”

Honesty box

While welcome, rule changes still rely on honesty from shippers. Security screening such as x-rays helps those in the supply chain to detect hidden dangerous goods, such as lithium batteries, and is performed in every country. The party responsible for this is dictated by the National Security Programme, and can fall to airport authorities, approved third parties, carriers or the forwarder.

“In regard to other systems capable of specifically screening lithium batteries, we do not know of any officially new product or device,” says Kropf. “Therefore, x-ray remains a reliable instrument for screening high volumes of shipments.”

Kropf says as a forwarder, Panalpina plays an important role in the transport of dangerous goods. But while it will scan shipments if so advised, it does not perform physical checks. It relies on the documentation provided by the shipper with the packages to ensure compliance with the Dangerous Goods Regulations. Ultimately, the shipper bears responsibility for the shipment. But that doesn't always mean much.

E-commerce threats

Remember the Christmas 2015 craze for hoverboards? Many airlines banned their shipment after a series of fires. Amazon is currently facing a lawsuit from a buyer whose home burned down, while he suffered serious burns. He claims Amazon knew that it was facilitating the shipment of poor-quality hoverboards from China that contained lithium ion batteries which could be dangerous.

In 2016, more than 500,000 hoverboards were recalled by 11 different companies, according to the US Consumer Product Safety Commission. The commission's website says it is aware of more than 250 hoverboard incidents related to fires or overheating since 2015. Many may have stemmed from batteries which did not comply with safety standards, which were nevertheless easily available through e-commerce sites.

Surging volumes of e-commerce

Surface transport should step up



Risk management director at logistics insurer TT Club Peregrine Storrs-Fox has urged the ocean freight sector to take some pointers from its airborne colleagues. As far as modes go, Storrs-Fox says air freight suffers from very few issues as a result of dangerous goods shipments.

“IATA regulates with regularity, leaving air freight better regulated than other modes,” he says. “From our point of view, we see very few problems, occasionally misdeclared or wrongly packaged shipments – often this misdeclaration is ignorant rather than wilful.”

Storrs-Fox says the spread of e-commerce will, inevitably, increase the risks, but even so he is of the view that the threat posed by air is more apparent, and as such, prone to tighter restrictions. With this in mind, he believes the other modes need to look up and listen.

“Repeatedly, I have said that from our experience – and the perception that has wrought – the greater problem comes from maritime shipments,” he says. “And this is where we are putting greater efforts into risk management.”

His biggest concern surrounds the “lesser” controls in the maritime sector and the associated risks these bring. Furthermore, he points to a societal perception that threats to ships at sea are just that: they don't have a wider bearing on the public at large in the same way air disasters do.

“A lot – not all – but a lot of the catastrophies we have seen on the ocean side have come from either the misdeclaration or non-declaration of dangerous goods,” he says.

“Counterfeiting is adding to this with issues surrounding composition, declaration, and packaging of cargo.”

These issues have not been overlooked by the shipping sector. In 2015, container line Hapag-Lloyd launched a system that helped to sift misdeclared dangerous goods from the supply chain. At the time, it was suggested the system could be adapted to meet the needs of the air freight industry.

But standards and governance manager at Panalpina Gila Kropf says that as far as she is aware the industry has yet to develop a system specifically designed to weed out any wrongful or misdeclared dangerous goods.

Hapag-Lloyd's intelligent software uses a database of more than 6,000 keywords to identify conspicuous terms and word combinations in declarations. If the so-called ‘watchdog’ barks, the dangerous goods team check the consignment. In 2015, the system detected 2,620 cases of incorrectly declared dangerous goods.

“[By misdeclaring] these customers endanger our crews, the ship, the cargo of our honest customers and, above all, the environment,” said Ken Rohlmann, head of the dangerous goods department at Hapag-Lloyd, at the time.

Despite his concerns, Storrs-Fox sees some positive signs. Notably he points to changing cultural perceptions surrounding the need for improved regulations on ships at sea. Whereas air disasters have an immediate impact on human life and are therefore highly debated, the threat from disasters at sea has, largely, been overlooked.

“This, however, appears to be changing,” he says. “At a societal level people are starting to recognise the impact disasters can have from an environmental and emissions perspective. And this can only be a positive as, ideally, we all want modes to be harmonised and in sync when it comes to transport.”

have further complicated matters – particularly as the amount of consumer electronics shipped is rapidly increasing. ABC's Lazarev says e-commerce is undeniably a main driver of growth in the air cargo industry.

"As a carrier, we are aimed at developing this emerging market, offering our value-added services powered by industry technologies," says Lazarev. "We are not only pushing the e-commerce volumes, but work on the qualitative side – introducing additional safety measures, working only with reliable partners, who share our values and work in strict compliance with industry regulations, not accepting those shipments contradicting safety rules and posing risk to the whole transportation process."

Kropf also acknowledges that problems with hidden dangerous goods have been exacerbated by e-commerce. She says part of the problem hinges upon e-commerce platforms neither manufacturing the goods they offer for transport, nor holding more than limited know-how on the commodities in question.

"Therefore, we have put in place additional controls, which require shippers to verify that they have checked commodities and reviewed their shipments to ensure that no hidden dangerous goods are present in the cargo," she says.

Brennan accepts that in such an environment, compliance cannot be guaranteed. He notes that all parties downstream from the shipper – forwarders, designated postal operators, ground handlers and carriers – have staff whose responsibilities include being alert to potentially undeclared dangerous goods.

"Where undeclared dangerous goods are identified then the ground handling

agent or airline is required to report the incident to their civil aviation authority (CAA)," he continues.

"It is expected that the CAA will take appropriate action against shippers who fail to comply with the regulatory requirements."

IATA believes CAAs should bring criminal proceedings against shippers it identifies as having "knowingly offered" undeclared dangerous goods for air transport. Furthermore, it expects more from the online platforms – including the likes of Amazon – to help stamp out any dangerous practices.

"Responsibility for compliance with the regulatory provisions rests with the shipper," says Brennan. "We also expect online portals to have some control over what sellers can offer, and are made aware of the need to comply with applicable regulations if the seller is offering dangerous goods for sale."

Fake news

There also needs to be greater acceptance among the community of the role counterfeit goods play in disturbing safety protocol. Though the carriers and forwarders *The Loadstar* spoke to claimed they had had no safety breaches from counterfeit products, it is widely known as an endemic problem; particularly with shipments coming out of China.

"Counterfeit batteries present a greater risk of fire in transport," Brennan says. "As with undeclared lithium batteries, any incident, such as a fire or smoke from packages of lithium batteries, is a reportable incident and again there is an expectation CAAs will take appropriate action against shippers of counterfeit batteries."

Lazarev says, like any carrier, AirBridgeCargo might face some "risky situations", especially when it comes to transporting dangerous goods and lithium batteries. This, he says, is the

main reason why strict compliance with IATA, ICAO and countries' regulations is of paramount importance for all stakeholders.

"Furthermore, AirBridgeCargo has developed and introduced additional internal safety procedures for shipments, which are aimed at taking extra care and control," he continues.

"Each dangerous goods shipment is monitored not only by a 24/7/365 Control Tower (CT) operation, to proactively respond to service disruptions and ensure it consistently meets customers' delivery deadlines, but is also supported by ABC's dangerous goods team of logistics experts at each ABC station worldwide.

"It is also important to guarantee appropriate training of specialists involved in dangerous goods transportation and to work with trustworthy and long-term partners, who share our values for honesty and business transparency."

Talk may abound of lithium dangers, but supply chain parties do not believe this is distracting regulators from other problems posed by dangerous goods travelling by air. Over the past 60 years, IATA has developed and continuously defined – an ongoing process – its dangerous goods manual.

This manual has been described by many as definitive, with few changes made for various other cargoes. Lithium batteries may, of course, continue to be a work in progress, but that progress is what makes the manual stand out.

Panalpina's Kropf says: "Flammable liquids, for example, have been regulated for a long time, so no major changes are expected for the moment. Therefore, I believe that regulators are not overlooking other safety threats but working simultaneously on all dangerous goods while focusing on the ones that pose the highest risks."

The ACID test

IATA is planning to establish an Air Cargo Incidents Database (ACID), which would amalgamate de-identified airline incident reports, offering a secure environment for airlines and ground handlers to pool safety and operations information.

The database, which should be launched early next year, would be used to predict trends, mitigate risk and improve processes.

The scope of 'incidents' would include dangerous goods, ULDs, lithium batteries and general cargo, and would enable IATA Cargo to see which areas need attention, and track the progress of campaigns and awareness initiatives.

Head of cargo transformation at IATA Celine Hourcade said 74% of 241 airlines and handlers polled felt ACID would benefit the industry, with 69% seeing a direct benefit for their own company.

Support for the project was further cemented by 64% of respondents stating they would accept the sharing of their incident data, if the association opted to pursue the programme.

"However, if we are to go ahead with it, we must meet three industry requirements, with data protection mechanisms critical for backing of the project," said Ms Hourcade. "Alongside this, the other top two requirements are system simplicity and both accuracy and a quality of data they can rely on."



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Creating standards in lithium battery transport

Executive director of the Rechargeable Battery Association (PRBA) George Kerchner believes part of the problem in transporting lithium batteries lies in the lack of harmonisation. He rejects the notion that legislation on shipping the batteries by air is “excessive”. Instead, he says, it is more a case of carriers and civil aviation authorities not singing from the same song sheet.

“A great example came in 2012 when we were advocating the US sign up to international standards, and again we find ourselves in this same situation – having just written to the Trump administration.”

But contrary to Kerchner’s claims, head of cargo safety and standards at the International Air Transport Association (IATA) Dave Brennan believes there are few concerns surrounding harmonisation. He suggests there is a “high degree” of harmonisation for the transport of all dangerous goods.

“Recently, the UN Subcommittee of Experts adopted a lithium battery mark that must be applied to packages containing lithium batteries prepared in accordance with special provision 188 in the UN Model Regulations,” he says.

But risk management director at logistics insurer TT Club Peregrine Storrs-Fox also suggests there could be more standardisation. “There is a lack of harmony to some extent at the national level and between the modes,” he says. “The UN has spent the better part of the last decade trying to regulate this.”

Brennan agrees there are also “regional variations”, describing the US as a “little special”. Unlike almost every other country in the world, the US decides piece by piece whether or not it will align with the UN Model Regulations and ICAO Technical Instructions.

“Most other countries simply have national regulations that point to the Technical Instructions and therefore, as these are amended, their provisions for air transport are kept in alignment,” says Brennan.

As an example, the ICAO Technical Instructions were revised on 1 April 2016 to implement a requirement for lithium ion cells and batteries (UN 3480 only) to be shipped at a state of charge not exceeding 30% of their rated capacity, and that these be prohibited as cargo on a passenger aircraft. The US has yet to formally adopt this into its national regulations, Code of Federal Regulation Title 49.

Requirements for lithium battery markings on all packages containing them – across all modes – took effect on 1 January 2017. This replaced regulations requiring such markings only for air transport.

Brennan notes that regulation for air transport is “by necessity” more stringent than surface modes – in particular, he highlights the prohibition of the transport of lithium ion and lithium metal cells and batteries as cargo on passenger aircraft. And Kerchner accepts and agrees that air regulations will always need to be “more stringent”.

“But I do believe there are certain circumstances where sending lithium in the bellyhold of passenger aircraft is acceptable,” he argues. “The ban on passenger aircraft has been refuted by ICAO, which has said that with the right packaging and approach this can easily be made to work.”

General director of AirBridgeCargo Airlines (ABC), Sergey Lazarev, says existing ICAO and IATA regulations are “sufficient, consistent and, most importantly, functioning”.

“The main hurdle the industry is facing now is non-compliance with these regulations by some stakeholders,” he adds. “We need to encourage all stakeholders to follow the rules, which will harmonise the whole process of transportation, make it more transparent and manageable.”

Complying with the additional limitations applied by states and carriers is also the responsibility of supply chain partners. The standards and governance manager at Panalpina, Gila Kropf, says managing the complete set of regulations and limitations on lithium batteries is a major issue.

“Due to the increasing number of incidents, the regulations are constantly adapted to minimise the risks,” she says. “Lithium batteries pose multiple risks. When exposed to heating, overcharging, crushing or any other structural damage, the batteries may leak, explode or produce smoke, gas or flames. During flight, such reactions would hardly leave flight crews with enough time to respond with emergency measures. And incidents do occur, some of them fatal.”

As a consequence, Kropf says, carriers perform their own risk assessments and file their own limitations in addition to those in the IATA dangerous goods

manual. They vary from one carrier to the other. Certain types of batteries are forbidden on both passenger and cargo-only aircraft.

Brennan adds: “In some locations freight forwarders and airlines demand additional documents, such as evidence of the UN 38.3 tests and safety data sheets. IATA does not support this, although we understand the concerns in some parts of the world where there may be a history of non-compliance by shippers.”

Kropf says people can argue about the interpretation of a certain regulation, but notes that this happens only occasionally, adding that IATA continuously improves the wording of the latest edition of the dangerous goods manual.

“The lithium battery market is still evolving so we expect more changes in the future,” she continues. “I think that the regulations are also clear for the manufacturers of lithium batteries because they consolidate the ICAO and IATA dangerous goods regulations with clear UN standards for testing and classifying the batteries. When regulations are missing, unclear or contradicting, it is possible to file for



discussion and change the regulations later on. The regulations are discussed with industry stakeholders on a regular basis.”

Despite some minor disagreements, Kerchner says he wholeheartedly supports the regulators. As far as PRBA is concerned, the cornerstones are compliance, enforcement, and the support of “reasonable” regulations.

“As a trade association, our members are working closely to encourage the enforcement of dangerous goods regulations,” he says. “Together with IATA we have called for greater enforcement and to get the world to keep non-compliant batteries off the market and off the planes.”



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To come in 2018

April	Chinese Logistics
May	Innovation & Technology
June	Project Cargo
July	The Capacity Crunch Crisis
August	The Flower Story
October	Express Logistics
	Gateway Georgia
November	Automotive Logistics
December	Pharmaceutical Logistics

