Global Gateway

Workshop on Dangerous goods

11 - Safety Risks Analysis

EASA
European Union Aviation Safety Agency

EU-ASEAN Sustainable Connectivity Package Aviation Partnership Project (EU-ASEAN SCOPE APP)
This project is funded by the European Union and implemented by the European Union Aviation Safety Agency (EASA)

Your safety is our mission.

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11 - Safety Risks Analysis

1. **Regulation requirements**
2. **What is a safety risk analysis?**
3. **Example bowtie hazard analysis for lithium batteries**

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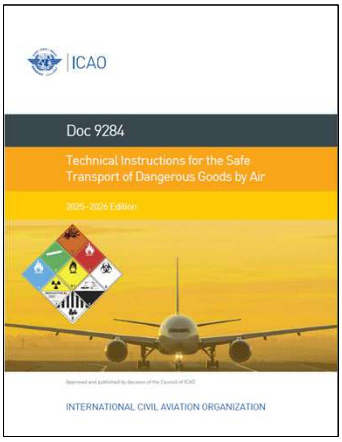
01 – Regulation requirements



Part 7. OPERATOR'S RESPONSIBILITIES

1.7 CONDUCTING SAFETY RISK ASSESSMENTS

Operators must include the transport of dangerous goods, including lithium batteries and cells as cargo, in the scope of their:

a) safety management system (SMS) in accordance with Annex 19; and

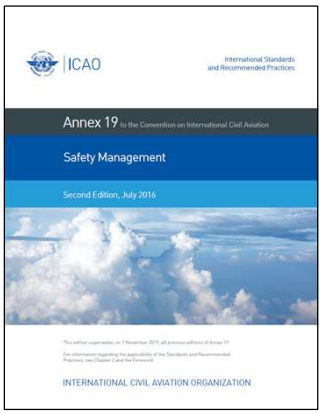
b) specific safety risk assessment on the transport of items in the cargo compartment in accordance with Annex 6 – *Operation of Aircraft*, Part I – *International Commercial Air Transport – Aeroplanes*.

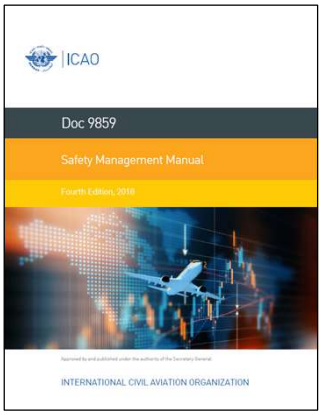
Note 1.— Guidance on implementation of an SMS is contained in the Safety Management Manual (SMM) *(Doc 9859).*

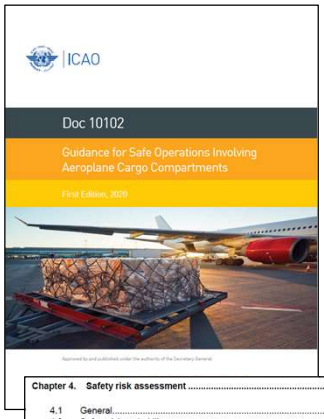
Note 2.— Guidance on the conduct of a specific safety risk assessment on the transport of items in the cargo compartment is contained in the Cargo Compartment Operational Safety Manual *(Doc 10102).*

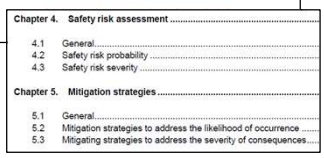
Note 3.— Specific guidance on safety risk assessments related to consignments containing COVID-19 pharmaceuticals is provided at www.icao.int/safety/OPS/OPS-Normal/Pages/Safety-transport-vaccines.aspx.

11 - Safety Risks Analysis
01 – Regulation requirements









No dedicated chapter but safety risk analysis are addressed in many

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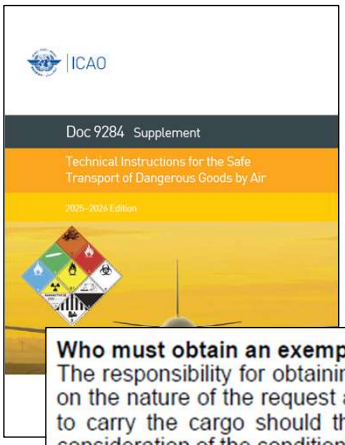
11 - Safety Risks Analysis
01 – Regulation requirements



S-1-1-4 Part S-1

ATTACHMENT I TO CHAPTER 1

GUIDANCE FOR PROCESSING EXEMPTIONS AND APPROVALS FOR THE SAFE TRANSPORT OF DANGEROUS GOODS BY AIR

Who must obtain an exemption or approval?
The responsibility for obtaining an approval or exemption may rest with the operator or with the shipper or with both depending on the nature of the request and on State procedures. The shipper should be requested to identify an operator that is prepared to carry the cargo should the approval or exemption be issued. It is also useful for States to include the operator in the consideration of the conditions that will apply to the approval or exemption so that the operator is able to conduct a specific safety risk assessment for the planned operation.

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01 – Regulation requirements

ORO.GEN.200 Management system

Regulation (EU) No 965/2012

(a) The operator shall establish, implement and maintain a management system that includes:

(3) the identification of aviation safety hazards entailed by the activities of the operator, their evaluation and the management of associated risks, including taking actions to mitigate the risk and verify their effectiveness;

(b) The management system shall correspond to the size of the operator and the nature and complexity of its activities, taking into account the hazards and associated risks inherent in these activities.

AMC1 ORO.GEN.200(a)(1);(2);(3);(5) Management system

ED Decision 2017/007/R

NON-COMPLEX OPERATORS — GENERAL

(b) The operator should manage safety risks related to a change. The management of change should be a documented process to identify external and internal change that may have an adverse effect on safety. It should make use of the operator's existing hazard identification, risk assessment and mitigation processes.

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1. **Regulation requirements**
2. **What is a safety risk analysis?**
3. **Example bowtie hazard analysis for lithium batteries**

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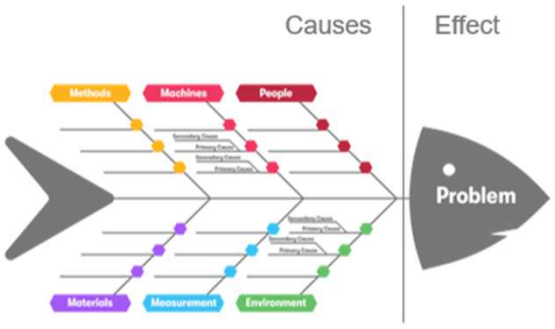
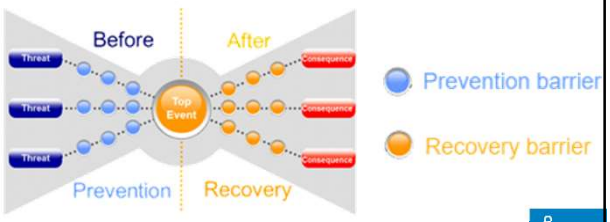
11 - Safety Risks Analysis
02 – What is a safety risk analysis?

There are a multitude of risk analysis models

JSA – Job Safety Analysis
PRA – Preliminary Risk Analysis
Fishbone diagram →
Tree of causes and consequences
FMECA – Failure Modes, Effects and Criticality
HAZOP – HAZard and Operability analysis
Kinney & Wiruth Method
LCA – Life Cycle based Analysis
SWOT matrix (Strenghts, Weaknesses, Opportunities, Threats)
Etc.



Example used for this presentation: bowtie →



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02 – What is a safety risk analysis?

Risk analysis forms part of the SMS, which is expected to:

- identify hazards/events that could have an impact on flight safety;
- implement preventive (and protective) measures;
- continuously monitor the level of safety and adjust the associated procedures;
- be adapted to the complexity and size of the operation and its specific features.

Risk analysis is the process of identifying and analysing potential future events that could have a negative impact on operations.

1) Identification of potential threats;
2) Assessment of the likelihood of an undesirable event occurring;
3) Assessment of the potential severity of its consequences;
4) Definition of risk mitigation procedures.

} risk assessment phase → risk level

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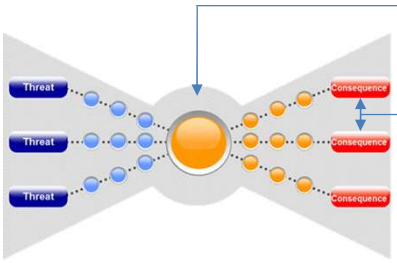
11 - Safety Risks Analysis
02 – What is a safety risk analysis?

1) Identification of potential threats

There are different types of threats:

- Technical — repetitive breakdown, failure, contradicting standards, etc.
- Human — performance level, stress, overconfidence, communication, etc.
- Environmental — weather conditions, equipment ergonomics, etc.
- Organisational — unsuitable procedures, training problems, service provider, etc.
- Economic — lack of resources, important growth, etc.
- Temporal — e.g. customer pressure.

If they are not controlled, they can lead to…



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02 – What is a safety risk analysis?

The risk assessment is carried out by taking into account existing systems and by estimating for each undesirable event:
- The probability of occurrence;
- The potential or actual severity of its consequences.

2) Assessment of the likelihood of an undesirable event occurring

The aim is to establish the likelihood of an event occurring.
To do this, historical data, external conditions, human factors, etc. can be taken into account.

Example

Safety risk probability table			
Likelihood	Meaning	Frequency	Value
Frequent	Likely to occur many times (has occurred frequently)	5 times per year	5
Occasional	Likely to occur sometimes (has occurred infrequently)	5 times per year	4
Remote	Unlikely to occur, but possible (has occurred rarely)	once every 3 or 5 years	3
Improbable	Very unlikely to occur (not known to have occurred)	We don't know if it already happened	2
Extremely improbable	Almost inconceivable that the event will occur	-	1

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02 – What is a safety risk analysis?

3) Assessment of the potential severity of its consequences

Assessment of the impact on operations, personal safety, infrastructure safety, etc.

Example

Safety risk severity table				
Severity	Meaning	Cost	Image	Value
Catastrophic	• Aircraft/equipment destroyed • Multiple deaths		worldwide media coverage	A
Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely • Serious injury • Major equipment damage		media coverage of a single country	B
Major	• A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons		regional or local media coverage	C
Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident		information to the Authorities	D
Negligible	• Few consequences		little or no impact	E

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02 – What is a safety risk analysis?

3) Assessment of the potential severity of its consequences

Taking the previous examples, the level of risk is obtained by entering the determined levels of severity and likelihood in the risk assessment matrix below, at the intersection of the two values:

Safety risk		Severity				
Probability		Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

The result is used to determine the acceptability of the risk:

Safety risk index range	Safety risk description	Recommended action
5A, 5B, 5C, 4A, 4B, 3A	INTOLERABLE	Take immediate action to mitigate the risk or stop the activity. Perform priority safety risk mitigation to ensure additional or enhanced preventative controls are in place to bring down the safety risk index to tolerable.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	TOLERABLE	Can be tolerated based on the safety risk mitigation. It may require management decision to accept the risk.
3E, 2D, 2E, 1B, 1C, 1D, 1E	ACCEPTABLE	Acceptable as is. No further safety risk mitigation required.

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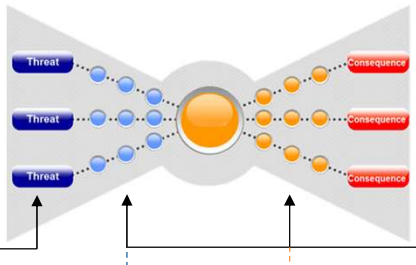
02 – What is a safety risk analysis?

4) Definition of risk mitigation procedures

Depending on the level of risk, mitigation actions may need to be defined.
These mitigation actions consist of:

- adding prevention barriers (e.g. creation of a new operational procedure);
- adding recovery barriers (e.g. creation of emergency procedures);
- reinforcing existing barriers (e.g. additional training, communication campaign).



Risks
(and associated levels)

Mitigation procedures
Reducing the likelihood of occurrence
Mitigating the severity of the outcomes

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02 – What is a safety risk analysis?

For an efficient risk analysis, it is necessary to:

- keep up to date with the regulations and latest safety directives;
- collaborate with experts (if necessary) to obtain information and advice;
- use information from data collection (occurrence reports, audit results, crash investigation reports, Authorities recommendations or bulletins, etc.);
- constantly monitor the levels of safety and adjust the associated procedures/barriers;
- adapt the risk assessment to the complexity and the size of the operator and its specific features;
- etc.

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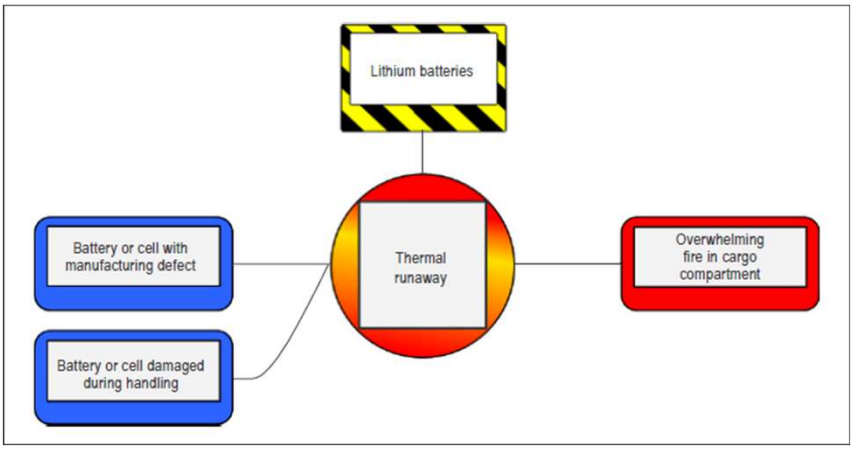
03 – Example bowtie hazard analysis for lithium batteries

Bowtie diagram for example threats and consequences for the hazard of lithium batteries (mitigation measures not implemented yet)



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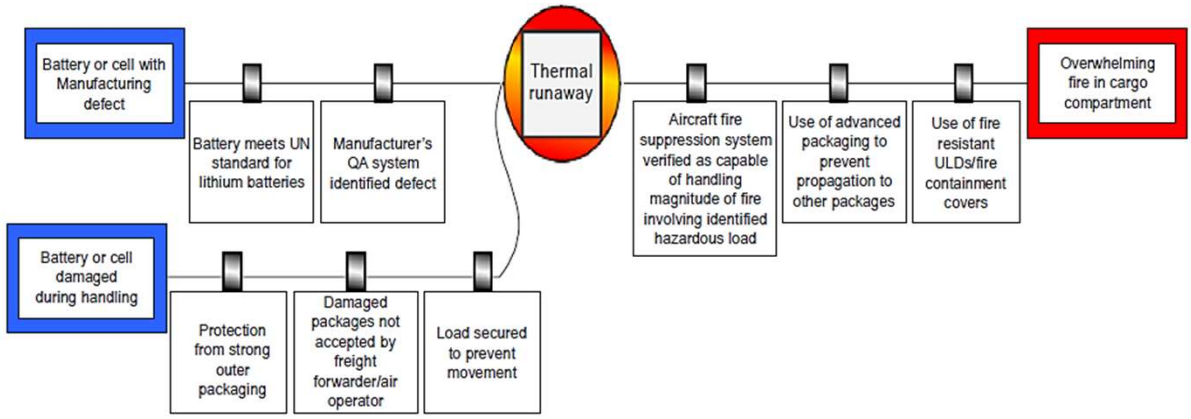
03 – Example bowtie hazard analysis for lithium batteries

Bowtie diagram with mitigation measures identified



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For more information you can also visit the ICAO Safety Management Implementation website
https://www.unitingaviation.com/publications/safetymanagementimplementation/content/#

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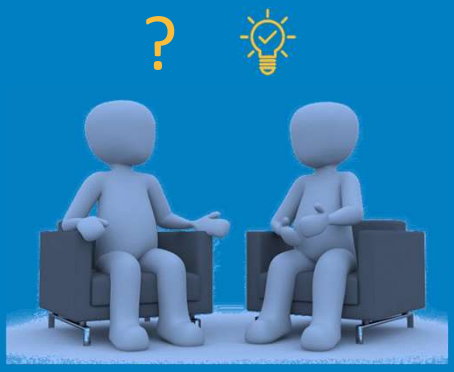
Thank you for your attention



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