Deployment of EVs for fuel handling at airports

Thomas Fairclough,
Risktec Solutions

Martin Hunnybun, EI

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Sustainability – reduce CO2 emissions in ground handling

- High level design requirements for EVs included in EI 1540 6th edition
- Is additional risk mitigation needed for EVs for aviation fuel handling operations at commercial airports?
- To answer question, an EI working group was established to oversee an independent hazard analysis study
- Outcomes intended to help facilitate safe EV deployment globally

Photo credit Air bp

Hazard analysis of EVs for fuel handling at airports

Working Group

- Steve Threadgold (Shell Aviation)
- Mohamad Ahmad (bp)
- Mario Arroyo Sendino (Exolum)
- Sindi Banda (A4A)
- Nicolas Becue (TotalEnergies)
- Joël Boiteux (TotalEnergies)
- Amy Carico (A4A)
- Paul Carmody (Q8Aviation)
- Marta Fernandez Arias (Exolum)
- Bill Geck (American Airlines)
- Peter Goco (United)
- Luc Maes (Skytanking)
- Alain Mansour (TotalEnergies)
- Oscar Sanabria (Skytanking)
- John Thurston (WFS)
- Martin Hunnybun (EI)

Potential contractors invited to tender

- BakerRisk Europe Ltd
- DNV
- ERM
- EPConsult Energies
- Lloyd's Register
- RAS Limited
- Ricardo
- RPS Group Limited
- **Risktec Solutions Ltd**
- TUV

Subject Matter Experts involved in hazard identification workshop

- aircraft operators
- airframe OEMs
- battery specialists
- chassis manufacturers
- chassis conversion to EV manufacturers
- component reliability specialists
- dispenser/vehicle assembler/builders
- EV charging installation specialists (equipment and operation)
- Fire & Rescue specialists (in EVs and Airport Fire and Rescue)
- fuel depot designers/operators
- fuel ignition properties specialists
- fuelling specialists
- service equipment specialists

Is additional risk mitigation required for EVs for aviation fuel handling operations at commercial airports?

Objective 1:

Identify hazards and consequences associated with a generic BEV for fuel handling operation activities at airports.

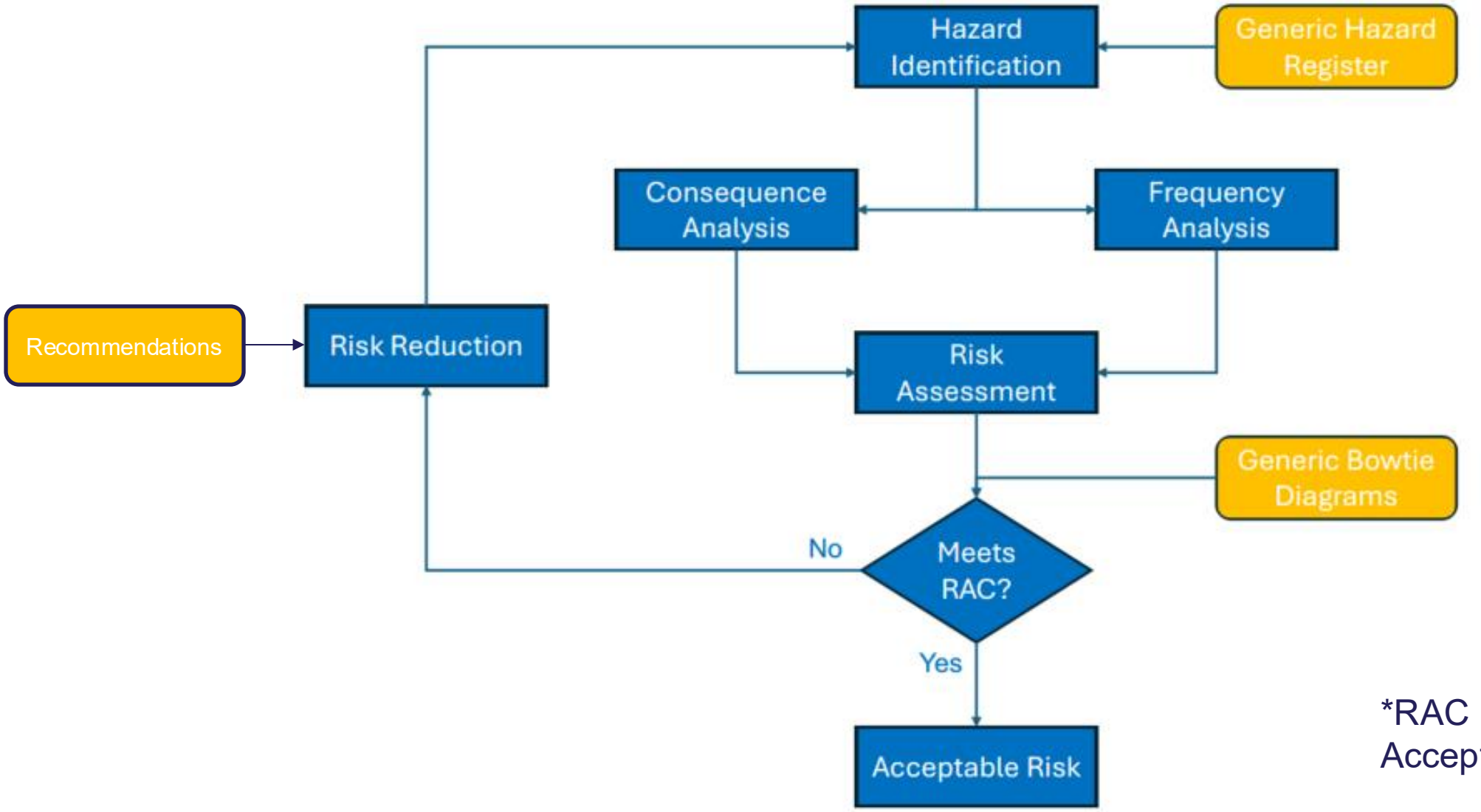
Objective 2:

Identify existing safeguards for the hazards identified in Objective 1.

Objective 3:

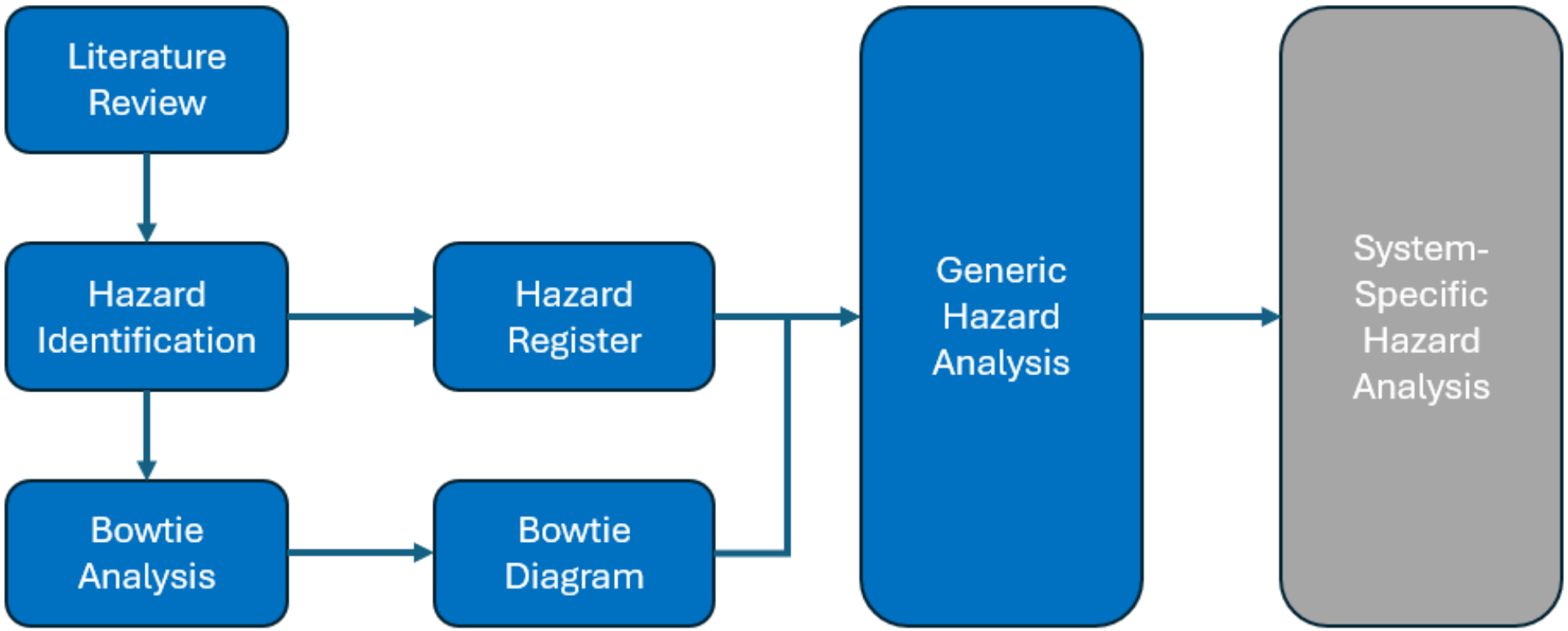
Where gaps in safeguards are identified, provide recommendations for development.

Generic Approach to Management of Risks and Hazards



*RAC = Risk Acceptance Criteria

Project overview



Hazard Identification

- **A Hazard Identification (HAZID) workshop was facilitated in early December 2024, with attendees representing a variety of stakeholders and expertise**

- **The objective of the workshop was to identify reasonably foreseeable hazards associated with the deployment of EVs for aircraft fuel handling**

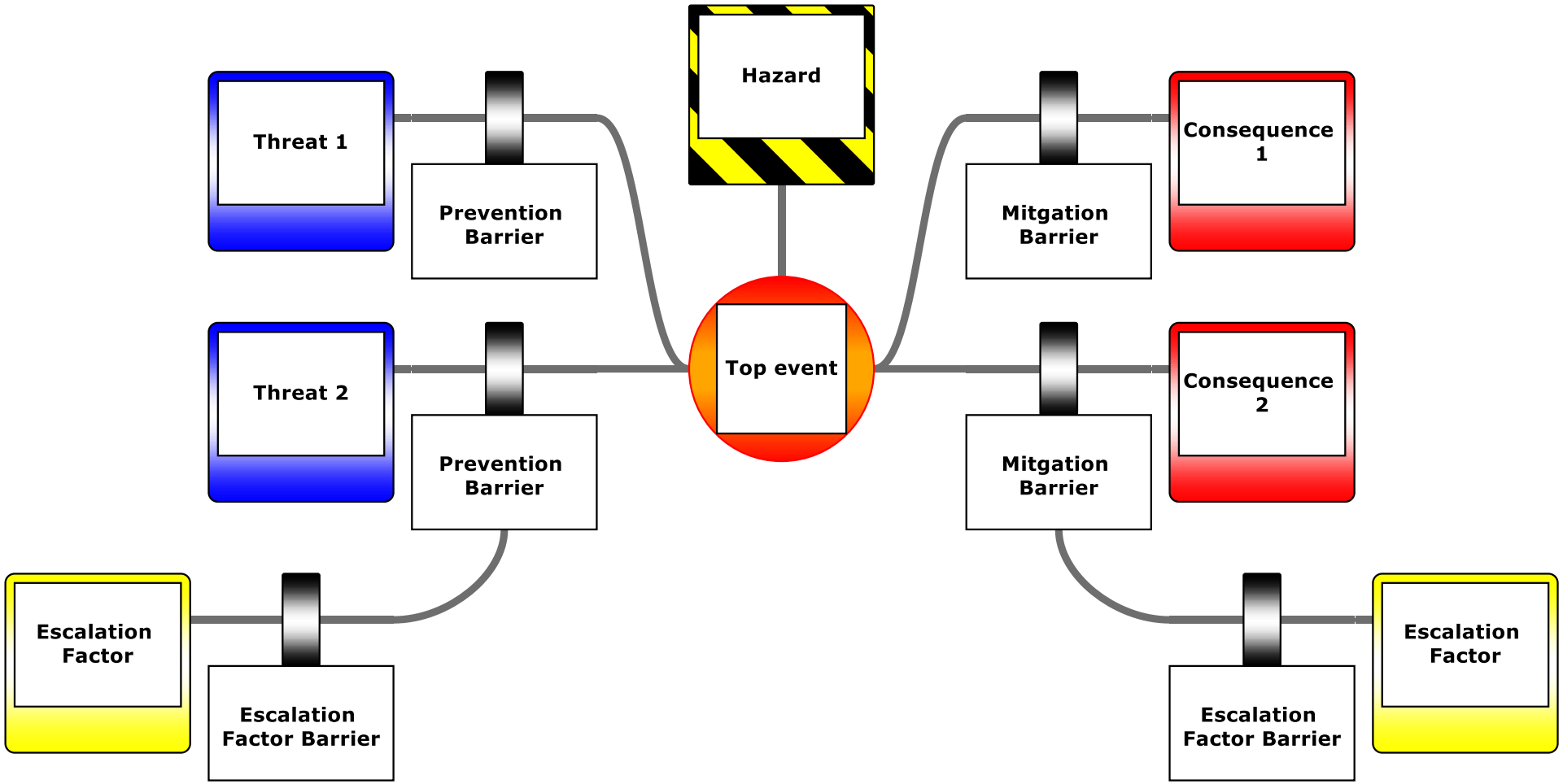
- **A generic hazard register was produced from the outputs of this workshop with identified hazards and high-level risk ranking**
  - Major accident hazards (MAHs) were identified in post-workshop processing

HAZID Findings

- **A total of 58 generic hazards related to EVs were identified:**

Top-Level hazard	Hazards / threats
Battery fire*	15
High Voltage systems in conjunction with fuel spill / vapour collection*	13
High Voltage – shock / electrocution*	4
Loss of power	3
Other	11
Not unique to EV / not impacted by EV powertrain	12

- **3 Bowtie diagrams were drafted for the 3 MAHs and reviewed in a workshop**



Recommendations

- **High level categories of recommendations related to the implementation of safeguards:**
  - Development of training for personnel
  - Development of maintenance programmes
  - Development of operating procedures
  - Updates to emergency response plans

  - Specific considerations for vehicle Original Equipment Manufacturers (OEMs) and fuel system integrators

Is additional risk mitigation required for EVs for aviation fuel handling operations at commercial airports?

Hazard analysis of EVs for fuel handling at airports – key takeaways

- Work will be published, July/Aug 2025
- It is an independent safety specialist-led analysis, based on collaboration of varied subject matter experts
- It provides a generic framework/methodology that can be used to assess hazards and risk mitigation for specific designs
- All stakeholders are encouraged to make use of this resource in discussions on EV deployment – to assist with safe deployment
- Further EI work likely in this evolving area

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Thank you for your attention

mhunnybun@energyinst.org

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