



AIRCRAFT RECOVERY

LESSONS LEARNED, RISK TRENDS AND PREPAREDNESS STRATEGIES

*AP-AA/WG/8 – Bangkok, Thailand
April 2026*

Presenter: Dennis Beck



INDUSTRY EXPERIENCE AND BACKGROUND

Dennis Beck

- Aircraft recovery specialist with field experience.
- Involved in real-life recovery operations and training programs.
- Experience with airports, airlines, and regulatory authorities.
- Focus on operational readiness and incident coordination.



INDUSTRY EXPERIENCE AND BACKGROUND



Runway
disruption
highlights aircraft
recovery gap in
India



DGCA asks
6 airports
to have disabled
aircraft recovery
kits



Regulator
instructs
major airports
to acquire aircraft
recovery kits



Chhatrapati Shivaji Maharaj
INTERNATIONAL AIRPORT
MUMBAI



THE IMPORTANCE OF PREPAREDNESS

A STRUCTURAL OPERATIONAL RISK



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AIRCRAFT RECOVERY STATISTICS OVERVIEW 2025

BY RESQTEC

A STRUCTURAL OPERATIONAL RISK

Preparedness is not about probability - but about consequence

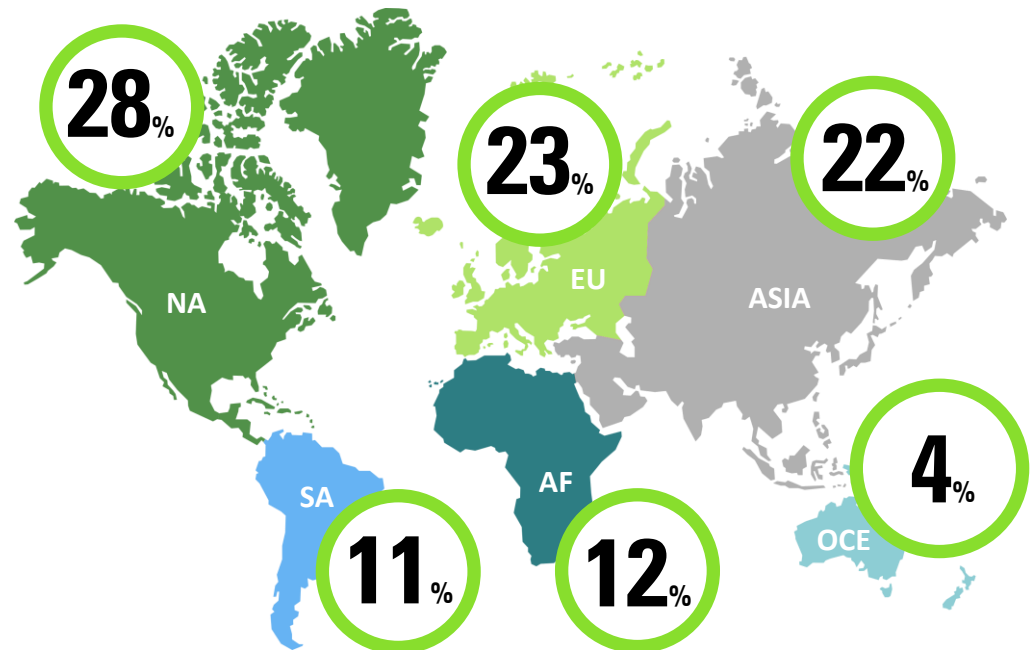
- Disabled aircraft incidents occur globally every week
- Incidents persist regardless of traffic volume
- Not a rare event, this is a recurring operational risk



PER INCIDENT



IN THE WORLD IN 2025

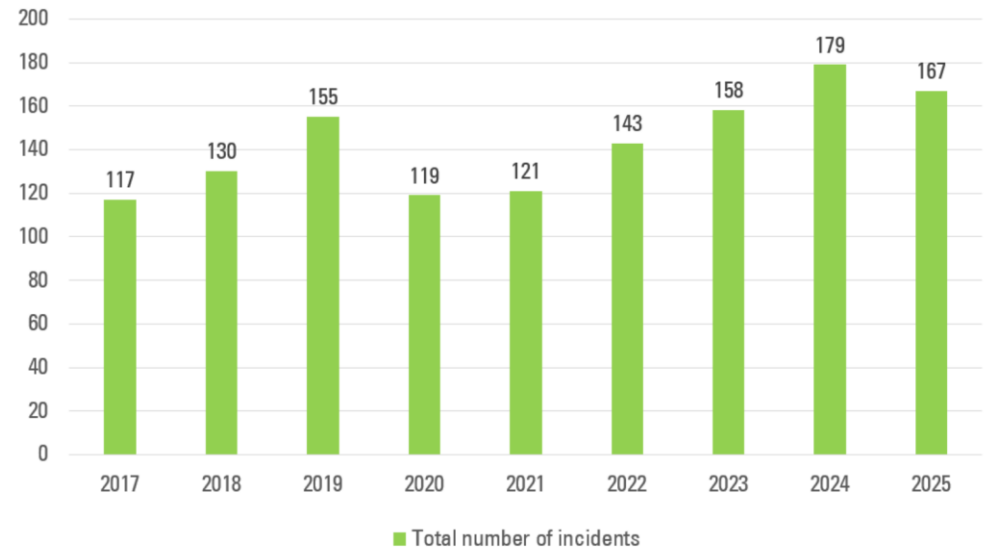


INCIDENT TREND (2017 - 2025)

Even during low traffic periods, incidents remain constant - this confirms structural risk.

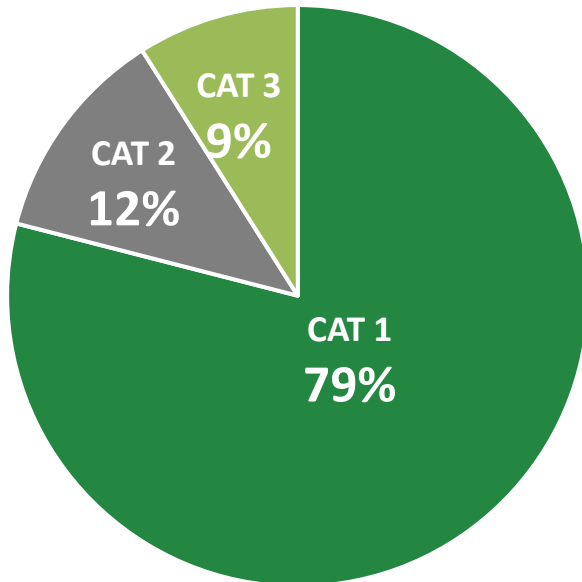
- Continuous increase in disabled aircraft incidents
- Peak observed in recent years
- Rapid recovery after COVID-related dip
- Structural minimum number of incidents remains

GLOBAL



TYPE OF DISABLED AIRCRAFT INCIDENTS

Most incidents are operationally manageable - yet highly disruptive



CAT 1: Light

- When an aircraft departs the runway with one or more of its landing gears.
- The landing gears are fully extended and locked.
- The aircraft can be towed on its own

CAT 2: Medium

- When one or more landing gears are not or only partially extended.
- After lifting the aircraft, gears can be extended / locked or repaired.
- The aircraft can be towed on its own.

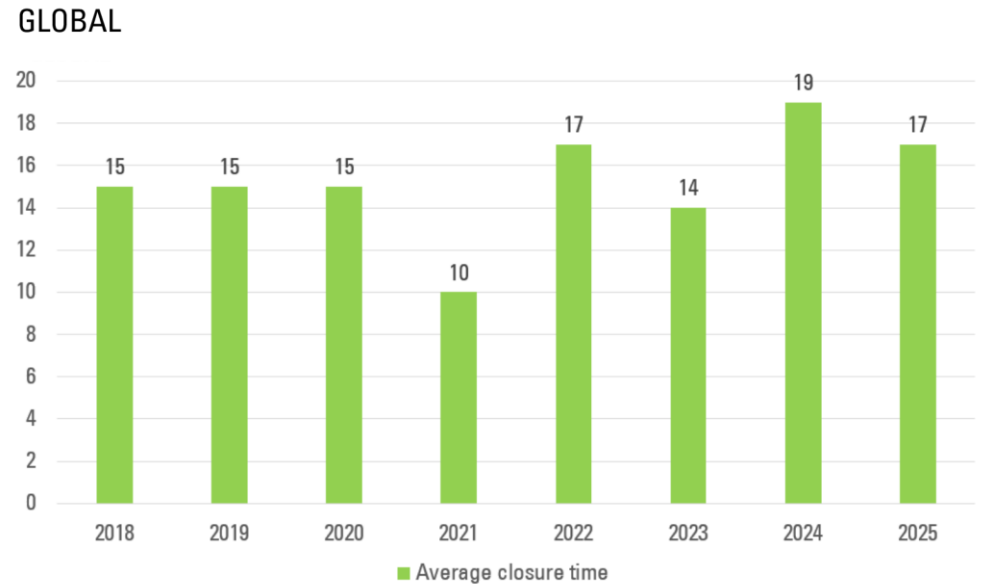
CAT 3: Heavy

- When one or more landing gears are separated from the aircraft structure or are heavily damaged.
- The aircraft cannot be towed on its own landing gears.

OPERATIONAL IMPACT: RUNWAY CLOSURE

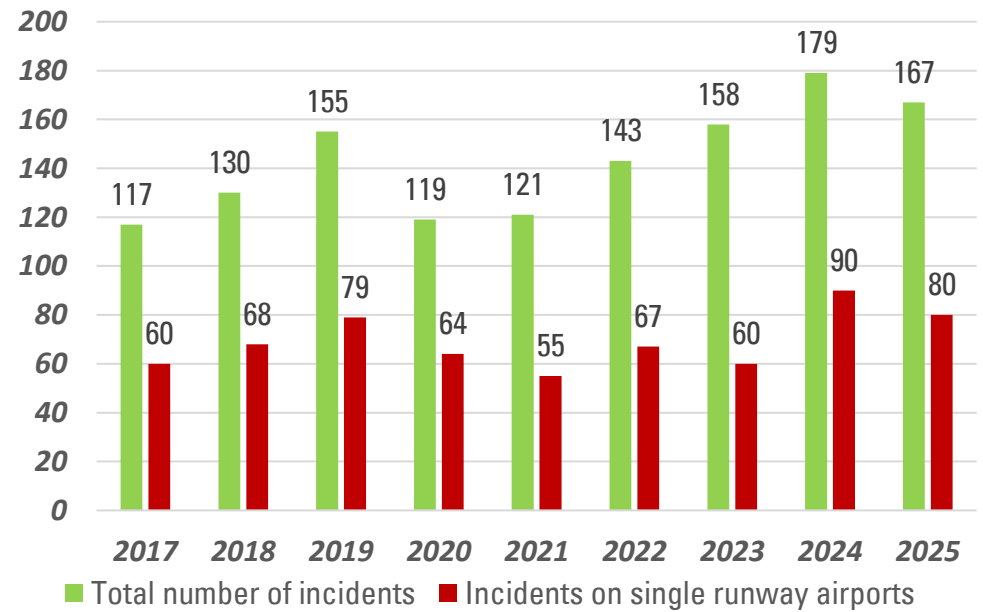
Delays are driven by recovery operation - not by the incident itself

- Average closure time: 15 - 19 hours
- Significant variation depending on preparedness
- Extended closures impact entire airport operations



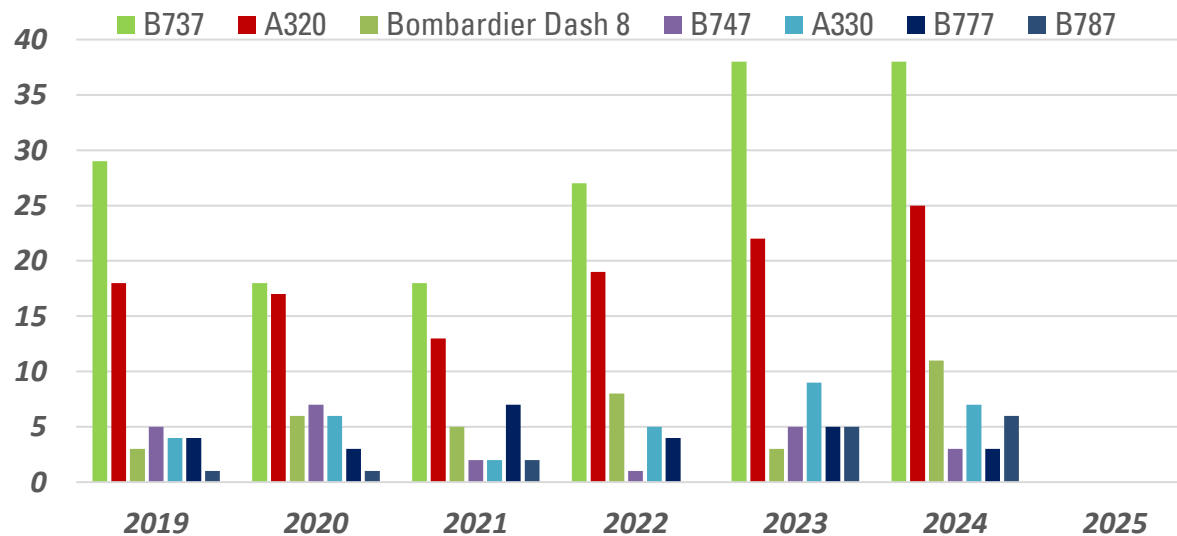
HIGH-RISK OPERATIONAL ENVIRONMENTS

- ~45 - 50% of incidents occur at single runway airports
- Limited redundancy increases operational impact
- Regional and capacity-constrained airports most vulnerable



AIRCRAFT INVOLVED IN INCIDENTS

- Majority: narrow-body aircraft (B737, A320)
- Widebody aircraft also consistently involved
- Increasing aircraft size and complexity





Plan

+



Equip

+



Train

=



**Efficiency &
Reduced
Revenue Loss**

LESSONS LEARNED FROM INCIDENTS

LESSONS LEARNED FROM INCIDENTS

These lessons are consistent across regions and operators, including in Asia -Pacific:



Preparedness is often overestimated by airports, airlines and CAA



Incorrect recovery strategies applied



Coordination gaps delay response



Training does not reflect real scenarios

LESSON 1: PREPAREDNESS IS OVERESTIMATED

Having a plan is not the same as being prepared

- Plans exist but are not (regularly) validated
- Plans are not aligned with operation and possible recovery scenarios
- Limited practical readiness of all stakeholders involved





Increasing Aircraft Recovery Preparedness

GUIDELINES & CHECKLISTS

A Collaboration Between



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Checklist 1: Management & Organization

Item	Questions / Requirements	N/A	Yes	Partial	No
1.	Has an Aircraft Recovery Coordinator been appointed in accordance with ICAO doc 9137 Airport Services Manual Part 5?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Does the airport have a plan for the removal of disabled aircraft in accordance with ICAO doc 9137 Airport Services Manual Part 5, Annex 14?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Are procedures for the removal of disabled aircraft recovery identified in the Airport Emergency Plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	What agency or organizations at the airport are responsible for disabled aircraft recovery?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Does the Airport User's Regulation identify who is responsible for the removal of disabled aircraft?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Do the airlines operating at the airport have plans, procedures and resources to ensure the expedient removal of disabled aircraft?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Do the airlines have access to the IATA Recovery Equipment Pool?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Has the airport experienced disabled aircraft recovery incidents in the past? (If yes, what category of recovery and how was the aircraft removed?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	What is the ICAO Aerodrome Reference Code?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	How many operational runways does the airport have? (Specify runway length/width and designations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	What is the over-all length of the over-run areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	What is the predominant wind direction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Does the airport have a dedicated disabled aircraft recovery team available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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Checklist 3c: Tools, Equipment and Special Purpose Vehicles (Aircraft Lifting & Tethering Equipment)

Indicate if equipment is available at airport (AP) or available off-site

Item	Questions / Requirements	Yes	No	AP	OS
1.	High-Pressure R2S Lifting Columns?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Low-Pressure Aircraft Lifting Bags?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Aircraft Lifting Bags (other)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Mobile air compressor available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Tethering equipment available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Hand-operated winches/Trifor?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Fuselage slings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Special tethering fittings? (Aircraft Specific)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Earth anchors?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Tubular ropes/slings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Load Indicating Devices/Load Cells? (analog/digital)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	High-Reach Work Platforms?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Shape/contour adaption equipment available ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	Aircraft maintenance jacks available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	Aircraft jack fittings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LESSON 2: COORDINATION DRIVES RECOVERY TIME

THE FIRST HOURS DETERMINE THE TOTAL CLOSURE TIME

- Roles and responsibilities are often unclear
- Delays in decision-making
- Lack of joint procedures



LESSON 3: RECOVERY STRATEGIES

EVERY INCIDENT IS DIFFERENT

- Different incidents require different recovery approaches
- Industry over-reliance on single method or third party solutions
- Lack of scenario-based planning



LESSON 4: TRAINING VERSUS REALITY

AIRCRAFT RECOVERY IS A “TEAM” ACTIVITY OF ALL STAKEHOLDERS INVOLVED

- Training is often non-existent or expired
- Lack of joint exercises between all stakeholders
- Limited exposure to practical training and complex scenarios



STRATEGIES TO IMPROVE PREPAREDNESS

IMPROVING PREPAREDNESS



1. RISK-BASED PLANNING

- Based on aircraft mix and traffic profile
- Scenario-based approach
- Alignment with ICAO guidance



2. ROLES AND RESPONSIBILITIES

- Clear definition of roles and responsibilities of all stakeholders involved
- Clear discussion on procedures and expectations during planning phase
- Defined decision-making and communication structures



3. *PLANNING FOR RECOVERY CAPABILITIES*

- Clear definition of risk-appetite and in house and third-party capabilities
- Compliance with ICAO and OEM guidance
- Accessibility to ICAO and OEM guidance
- Flexibility in availability of recovery methods



4. VALIDATION AND EXERCISES

- Regular exercises and simulations
- Scenario-based validation
- Continuous improvement



PLAN

+



TRAIN

+



EXECUTE

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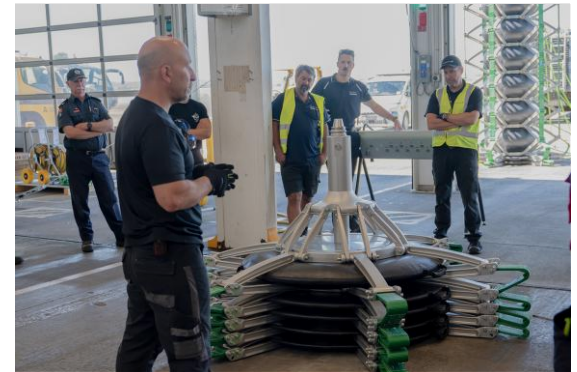


REVIEW

TRAINING BEST PRACTICES

Training must reflect reality, not theory

- Practical, scenario-based training
- Regular joint exercises (airport + airlines + authorities)
- Recurrency is essential
- Focus on real operational conditions



PREPARATION MODELS - BEST PRACTICES

Recognizing the significant operational and financial impact of disabled aircraft incidents, a number of airports have taken a proactive approach to preparedness.

These airports have:

- Developed structured disabled aircraft removal plans
- Invested in dedicated recovery equipment
- Established trained recovery teams
- Defined clear coordination with airlines and stakeholders

PREPARATION MODELS - BEST PRACTICES

Airport / Airport Group	Primary Responsibility for DAR	Airport-Owned DAR Equipment	Trained Airport DAR Team	Airline / Third-Party Support Role	Activation Scope
Singapore Changi Airport (SIN)	Airport operator, in coordination with aircraft operator	Yes	Yes	National airline and aircraft maintenance service providers support technical operations	Local (airport-specific)
Auckland Airport (AKL)	Airport operator, in coordination with aircraft operator	Yes	Yes	National airline, AMOs, and GHAs provide personnel support	Local (airport-specific)
Curaçao International Airport (CUR)	Airport operator, in coordination with aircraft operator	Partial (phased procurement)	Yes	AMOs, GHAs, and Coast Guard provide personnel and operational support	Local (airport-specific)
Aena S.M.E., S.A. (Spain)	Airport group (corporate-level coordination)	Yes (distributed and pooled)	Yes	Airlines supported by local airport RFFS and regional DAR response teams	Network-wide (regional and national)
Jeju International Airport (CJU)	Airport operator, supporting aircraft operators	Yes	Yes	Aircraft operators utilize airport-owned equipment	Local (airport-specific)
Istanbul Airport (IST)	Airport operator, supporting aircraft operators	Yes	Yes	Aircraft operators supported under contractual arrangements	Local (airport-specific)
Kigali International Airport (KGL)	Airport operator, in coordination with aircraft operators	Yes (transportable kit)	Yes	Local aircraft operators provide personnel support	Local and deployable to national / regional airports
Montréal–Pierre Elliott Trudeau International Airport (YUL)	Airline-led under informal airport designation	No (airport-owned)	No (airport-led team)	Air Canada provides trained personnel and specialized equipment	Local (airport-specific)

PREPARATION MODELS - BEST PRACTICES



FUTURE DEVELOPMENTS ASIA-PACIFIC

Operational complexity and growth increase the need for preparedness

- Asia represents a significant share of global disabled aircraft incidents
- High traffic growth and operational density increase exposure

Mix of:

- Major international hubs
- Single runway and regional airports
- Diverse operating environments:
- Climate (rainfall, heat, soft ground)
- Infrastructure variability



CONCLUSION

Preparedness defines recovery performance

- Disabled aircraft are a structural risk
- Operational impact driven by preparedness
- Coordination and training are critical
- Continuous improvement is essential



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