Runway Incursion Risk in the Resource Sector

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What is a Runway Incursion?

ICAO defines a runway incursion to be:

Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take off of aircraft

(ICAO Doc 4444–PANS-ATM)

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Please note:

No reference to 'Controlled' or 'Uncontrolled' Aerodromes

Anatomy of a Runway Incursion

- *During the landing roll on runway 06, the pilot detected a vehicle on the runway. No radio calls were heard from the vehicle and the safety officer later advised that the incorrect radio frequency had been set.*

- *During the take-off run, a vehicle entered the runway. The crew rejected the takeoff at low speed.*

- *During the approach, the crew observed a vehicle on the runway and conducted a missed approach. The crew were unable to contact the vehicle operator.*

Resource Sector Aviation

- Almost exclusively from major controlled airfield to CTAF
- Often multiple CTAFs in close geographical proximity
- Flight schedules linked directly to FIFO rosters:
  - Multiple flights with identical departure times
  - Often on near-identical routes
  - Aircraft types identical or very similar performance (Fokker 100, BAe 146, AVRO RJ prevalent)
- Circa 400 000 flights of this type in 2013
  - Figures reasonably static over the preceding 10 year period

BITRE General Aviation Activity 2013

Resource Sector Airfields

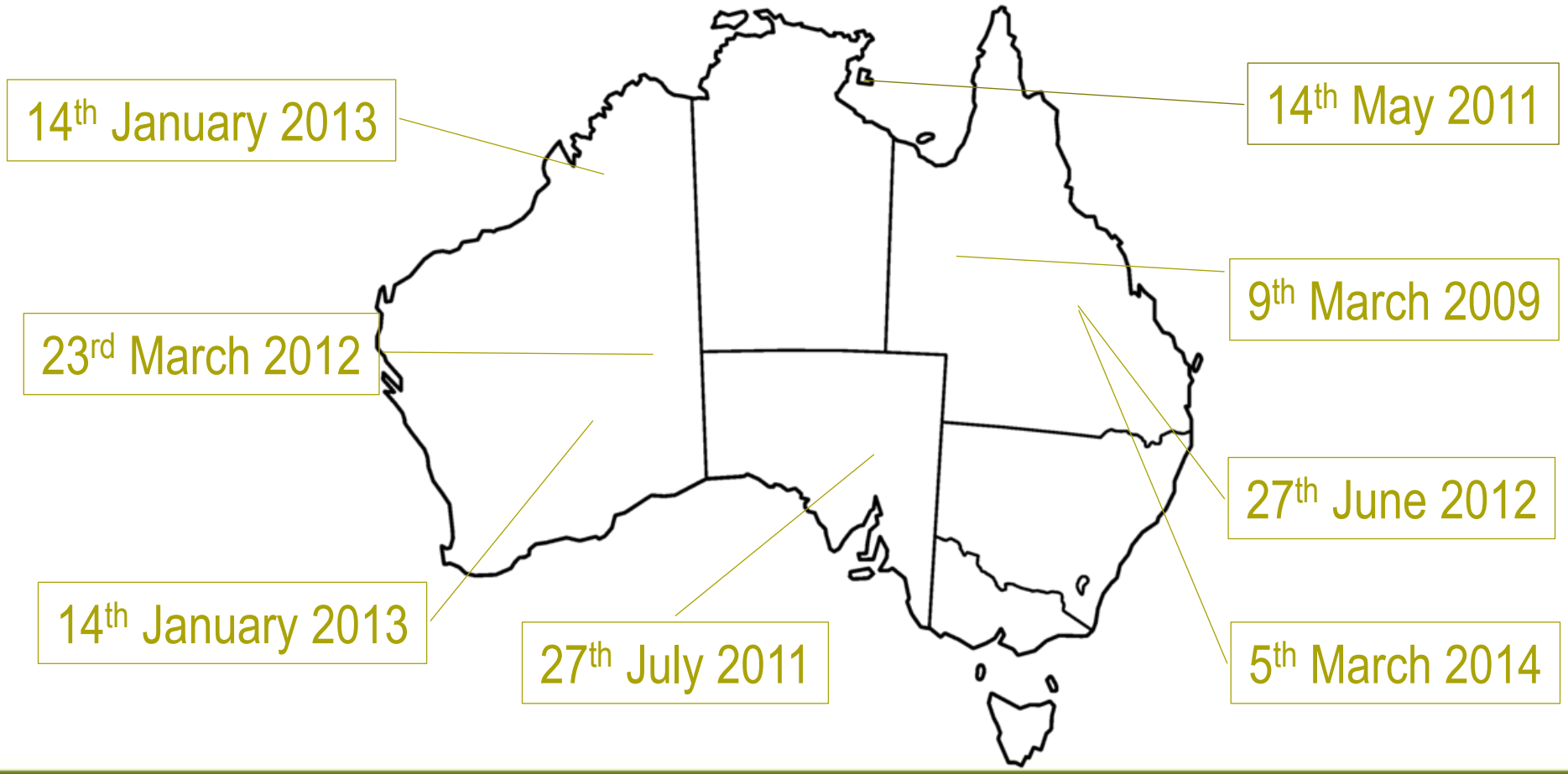
- Come in a variety of shapes and sizes, but:
  - Most classically, Code 3C (circa 100-seat jets)
  - Mostly Certified:
    - Aerodrome Manager,
    - Attendant staff,
    - Emergency Response capability,
    - Aerodrome Manual, and
    - Safety Management System

But no Air Traffic Control

Fokker 100 and BAe 146

Resource Sector Company Experience

- Eight runway incursion events over a five-year period:



Summary of Incidents and Operations

1. Fokker 50 and Safety Car
2. Light aircraft landing on closed runway during maintenance
3. Fokker 50 and safety team on runway
4. Cessna 441and runway maintenance vehicle
5. Dash-8 and Piper Saratoga
6. Metro 23 and runway maintenance vehicle
7. Beechcraft 200 landing on closed runway
8. ATR 72 and Safety Car

IFR Operations

Summary of Findings

- Only one event involved an aircraft to aircraft event
- Only one event involved an aircraft taking off, seven events involved aircraft landing
- Two events involved incorrect frequency selection
- Three events involved ground parties who were not radio equipped
- Two events involved ground parties who did not respond effectively and follow published procedures
- In one event, all published and recommended procedures were followed

ICAO Definitions - Frequency

Frequency	
Extremely Rare	Has never occurred yet throughout the total lifetime of the system
Rare	Only very few similar incidents on record when considering a large traffic volume or no records on a small traffic volume
Occasional	Several similar occurrences on record – has occurred more than once at the same location
Frequent	A significant number of similar occurrences already on record – has occurred a significant number of times a the same location
Very Frequent	A very high number of similar occurrences already on record – has occurred a very high number of times at the same location

ICAO Definitions - Severity

Severity	
Accident	Fatality or serious injury, major damage or missing
Serious Incident	An accident nearly occurred
Major Incident	Safety may have been compromised
Significant Incident	Incident could have occurred if risk was not properly managed
No safety effect	No safety significance
Not determined	No data

ICAO Runway Incursion Matrix

SAFETYWISE AVIATION

		Frequency				
		Very Frequent	Frequent	Occasional	Rare	Extremely Rare
Severity	Accident	AA1	AA2	AA3	AA4	AA5
	Serious Incident	A1	A2	A3	A4	A5
	Major Incident	B1	B2	B3	B4	B5
	Significant Incident	C1	C2	C3 X 2	C4	C5
	Not determined	D1	D2	D3	D4	D5
	No safety effect	E1	E2	E3 X 6	E4	E5

ICAM Analysis of Findings

ICAM

(Incident Cause Analysis Method)

- Use to classify the failure in the system
- Based on James Reason's *'Swiss Cheese'* model
- 4 major classifications:
  - Absent or Failed Defence
  - Individual or Team Action
  - Task or Environment Condition
  - Organisational Factor

Absent /Failed Defences

- Absent Defence:
  - Robust Alerting/Awareness System
- Failed Defence:
  - CTAF Broadcasts
  - ‘See and Avoid’
  - NOTAMS
  - Signal Circle

Individual/Team Actions

- In all cases:
  - Individual or Team (both ground and air) failed to detect and react appropriately to the threat
- Individual:
  - Inadvertent selection of incorrect frequency
  - Failure to understand NOTAM
  - Failure to observe signal circle

Task/Environmental Conditions

- Task Conditions:
  - Straight-in and practice instrument approaches do not provide as much opportunity for sighting hazards/signal circle as does flying a circuit
- Environmental Conditions :
  - Heat haze
  - Runway Markings
  - Cloud and Drizzle

Organisational Factors

- Previous incidents not reported
- Lack of training in how to respond
- Lack of supervision
- Inadequate risk assessment
- Handheld radio frequency selector prone to inadvertent operation
- No spare radios held on site
- Runway entry and inspection procedures inadequate
- Conflicting task information

Runway Incursion Risk - Summary

The risk of managing runway access at uncontrolled aerodromes is vested in those operating on the protected surfaces, not generally overseen by an independent agency (e.g. ATC)

What barriers exist to stop an event?

- Awareness (schedules, radio broadcasts, visual acquisition, ground signals)
- ?

Current procedures at uncontrolled airfields are entirely reliant on the individual and/or teams' awareness. There is no second line of defence…

Avoidance of a Runway Incursion is a shared responsibility

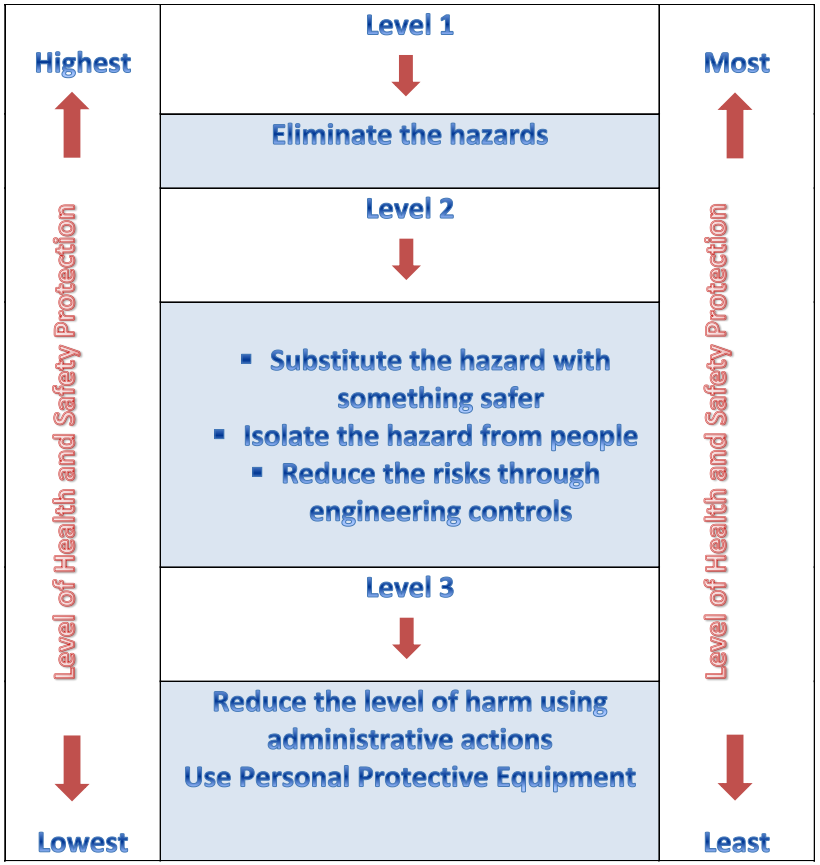
How widespread is the problem?

- ATSB Database 1st July 2003 – 23rd May 2016
  - 190 Runway Incursions
  - 0 Accidents
  - 176 Incidents
  - 14 Serious Incidents (investigated by ATSB)
  - 69 out of 190 incidents (36%) involved vehicles or personnel on the runway or flight strip

Likely that these figures under-represent the magnitude of the problem due to under-reporting

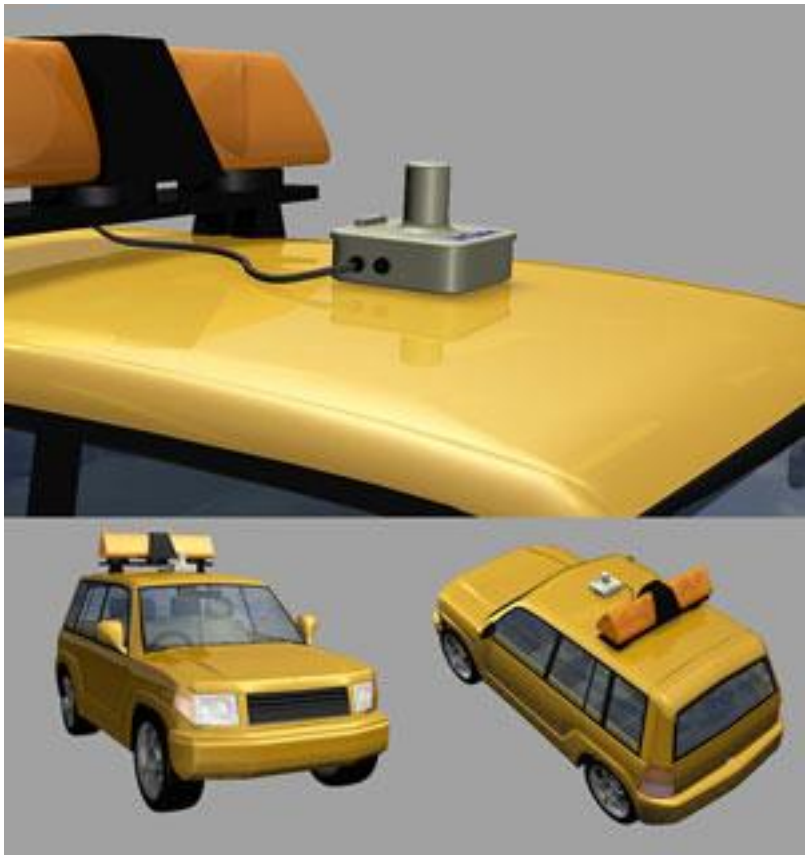
Hierarchy of Controls

What can we add to the model to make it more robust?

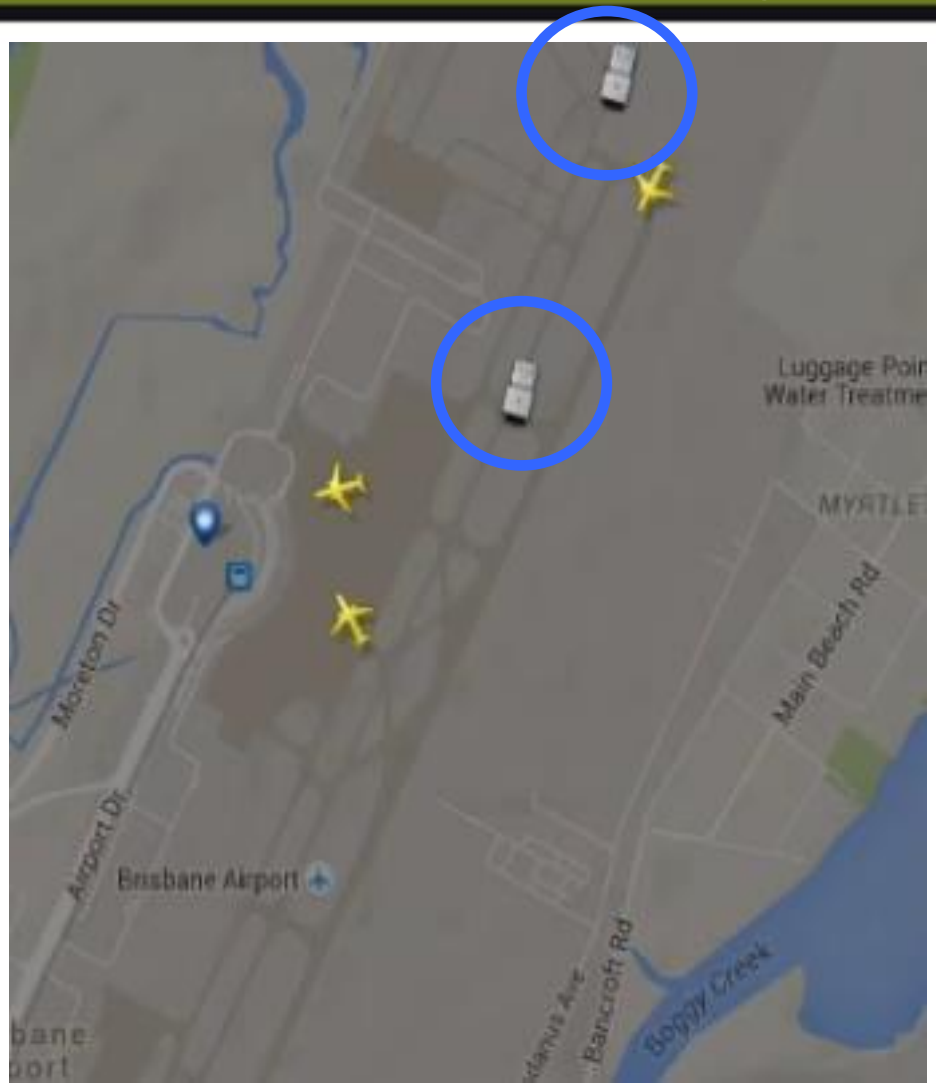


Option #1 – Flight Crew Awareness

- Make the flight crew aware that there is a vehicle on the runway
  - Vehicle mounted transponder



Brisbane Airport – Flight Radar24



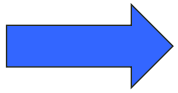
- Surface Movement Radar
- Vehicles equipped with transponders
- Primarily designed to allow the Surface Movement Controller to identify vehicles on the airfield

Option #2 – Ground Crew Awareness

- Make the ground vehicles aware that there is an aircraft in the vicinity:
  - ADS-B (in) and ADS-B (out)
  - Traffic Alerting System (PCAS/FLARM)

CASA, Airservices and ADS-B

- 12th December 2013: ADS-B mandated for operations at or above FL290
- 6th February 2014: New aircraft flying IFR must be equipped for GNSS and ADS-B
- 6th February 2016: Aircraft operating Classes A, C or E north of Perth must be equipped with ADS-B



We are here

- 2nd February 2017: All IFR aircraft must be equipped with ADS-B

ADS-B (in)

ADS-B Receiver

Equivalent of CDTI (Cockpit Display of Traffic Information)

PCAS

- Like TCAS only smaller
- Portable
- But…out of business!

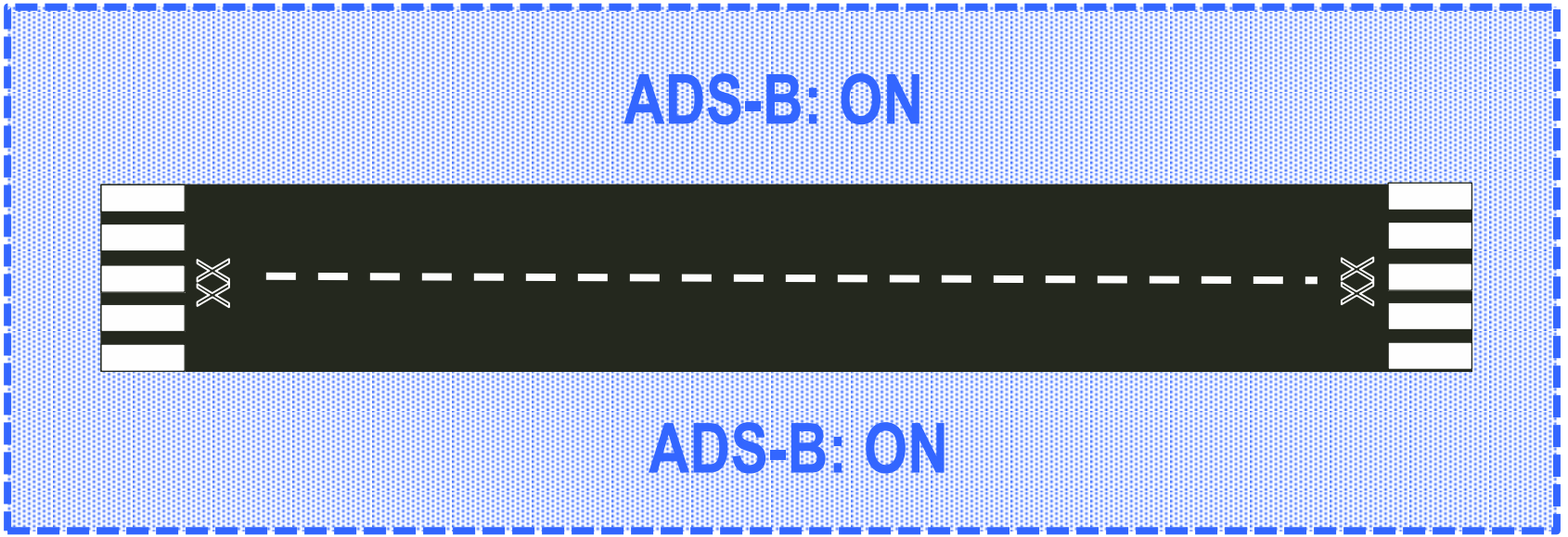
Portable Collision Avoidance System

FLARM

- Developed as a solution for glider to glider collision risk management
- Acts as a DTI (Directed Traffic Information) source
- Provides awareness of traffic and some alerting capability

ADS-B (Out) Concept of Operations

ADS-B: OFF



ADS-B: OFF

Summary

- Still working with avionics providers to find the optimum solution…
- Demonstrated need to add in an additional layer of defence
- Requirements:
  - Portable
  - Robust
  - Reliable
  - Backed up with easy to apply SOPs

Any Questions?