Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

Presentation to NATA

Ian MacKay
Board Member
Transportation Safety Board

Whitehorse, Yukon
April 16-18, 2012

Canada

Outline

- TSB, mandate, investigation process
- Watchlist
  - Landing accidents and runway overruns
- TC planned action
- What's needed
- Q & A

About the TSB

- 5 Board Members, including the Chair
- 230 employees, 9 offices, 1 lab
- Independent agency with no powers of enforcement
- Mandate: investigate marine, pipeline, rail and air occurrences
- *CTAISB* Regulations define which types of occurrences (incidents or accidents) are reported to us

Our Investigations

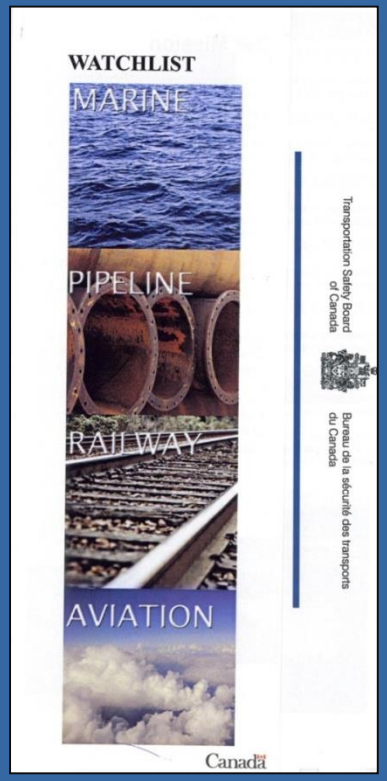
- 4000+ occurrences reported annually
- Air Branch: 1300-1500 occurrences reported annually
- Need for an in-depth investigation? (Yes / No)
- Key question: “Can it advance transportation safety?”
- Air Branch: 39 full investigations per year (five-year average)
- 33 investigations begun in 2011
- *All* occurrences tracked in database

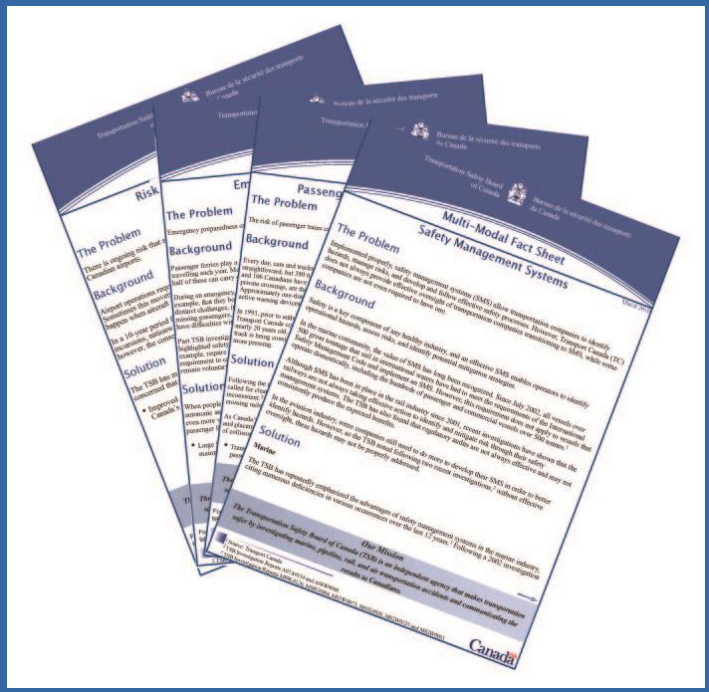
Board Responsibilities

- Safety-critical information is shared *ASAP*
- “Designated reviewers” comment on early drafts and provide feedback
- The Board approves all investigation reports
- Recommendations for difficult, systemic issues
- Safety Information Letters
- Safety Advisories

Watchlist

- Risk of collisions on runways
- Controlled flight into terrain
- Landing accidents and runway overruns
- Fishing vessel safety
- Emergency preparedness on ferries
- Passenger trains colliding with vehicles
- Operation of longer, heavier trains
- Safety Management Systems
- Data recorders





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Landing Accidents and Runway Overruns

Runway overrun, Cargojet Boeing 727, Moncton, NB

TSB Investigation report A10A0032

More Common Than You Might Think

- June 16, 2010. Embraer 145 (Ottawa)
- November 30, 2010. Boeing 737 (Montreal)
- March 12, 2011. Bombardier BD100 (Iqaluit)
- June 17, 2011. Falcon 10 (Buttonville)
- July 4, 2011. Cessna 208 (Pukatawagan)
- July 16, 2011. Boeing 727 (St. John's)
- September 4, 2011. EMB-145 (Ottawa)
- January 9, 2012. Boeing 737 (Ft. Nelson)
- January 15, 2012. Pilatus PC-12/45 (Timmins)

A Worldwide Challenge

Between 2000-2010:

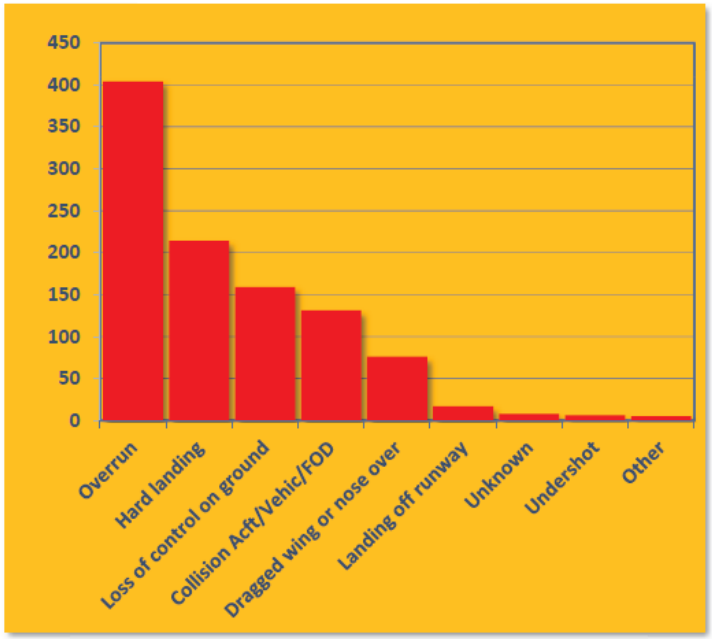
- **ICAO: 32 overruns per year**
  (average, does not include veer-offs)
- **1038 fatalities**

A Worldwide Challenge (cont'd)

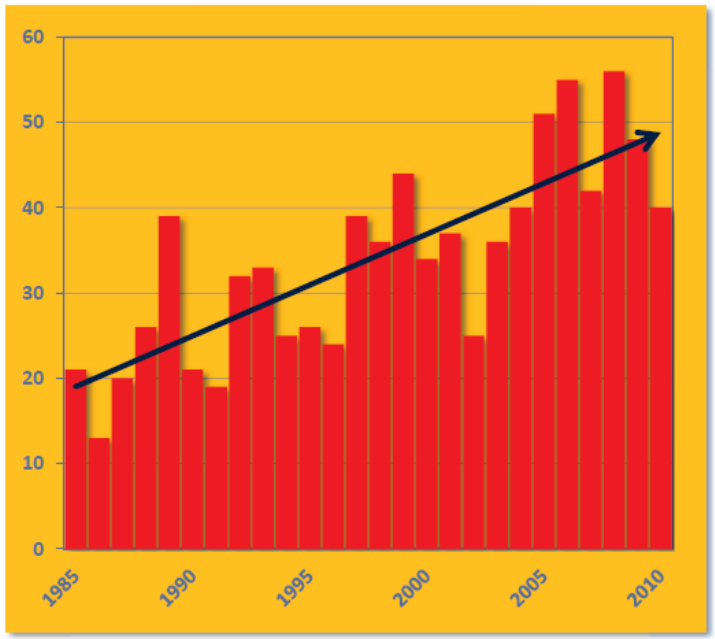
Safety at Landing: the n° 1 Air Transportation Safety Issue

AIRBUS-WILLIS Analysis on 1985-2010 Period : Incidents Statistics

Landing Roll Incidents #
Breakdown



Landing Roll Incidents #
Time History



Landing roll safety, a deteriorating situation

AIRBUS

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Approximate Runway Overrun Accident Rates (1990-2006)

		All Runway Conditions		Wet Runway Conditions	
Country	**Annual Landings**	**Number of Accidents**	**Rate/Million Landings**	**Number of Accidents**	**Rate/Million Landings**
Canada	929,000	4	0.25	3	1.7
US	11,332,000	18	0.09	5	0.2
Rest of World	13,683,000	37	0.16	20	0.6
Total - World	25,944,000	59	0.13	28	0.4

•Source: Jacobs Consultancy, Risk and Benefit-Cost Analyses of Procedures for Accounting for Wet Runway on Landing, prepared for Transport Canada, July 2008.

Canada

Overrun Accidents Involving Airplanes Over 5,700 kg in Canada (1985-2011)

Year	Location	Aircraft Type
1993	Tofino, BC	Convair CV440
1993	Big Sand Lake, MB	Hawker Siddely HS 748
1995	Jasper/Hinton, AB	Mitsubishi MU-300
1995	Snare Lake Village, NT	Douglas DC 3C S1C3G
1998	Gander, NL	Antonov AN-124
1998	Kasabonika, ON	BAe 748
1998	Peterborough, ON	Dassault Mystère E20
1999	Dryden, ON	Fairchild SA 227 AC
1999	St. John's, NL	Fokker F-28
2001	St. John's, NL	Boeing 737
2003	Mildred Lake, AB	Beech 300 King Air
2004	Oshawa, ON	Shorts SD3-60
2005	Toronto, ON	Airbus A340
2005	Hamilton, ON	IAI Astra SPX
2006	Montréal, QC	Learjet 35A
2006	Lupin, NU	McDonnell Douglas C54
2010	Ottawa, ON	Embraer EMB-145

•Total landing overrun occurrences involving airplanes over 5,700 kg: 88
Source: TSB database

A Complex Problem

- Runway length is not the only factor
- Numerous lines of defence are needed to:
  - Prevent overruns from happening
  - Prevent injury or loss of life when overruns *do* happen

Pukatawagan

Previous Recommendations

- **Approach/landing standards:**
  Establish clear standards limiting approaches and landings in convective weather for all air transport operators at Canadian airports. (A07-01)

- **Pilot training:**
  Mandate training for all pilots involved in Canadian air transport operations to better enable them to make landing decisions in deteriorating weather. (A07-03)

- **Procedures:**
  Require crews to establish the margin of error between landing distance available and landing distance required before conducting an approach into deteriorating weather. (A07-05)

Surface-Condition Reporting

2.5.1.2 Standard - The condition of the movement area and the operational status of related facilities shall be monitored and reports on matters of operational significance or affecting aircraft performance given, particularly in respect of the following: …

3. snow, slush or ice on a runway, a taxiway or an apron;

4. standing water on a runway, a taxiway or an apron;

Source: TP 312

Wet Runways

- Identified as a factor in the majority of aircraft accidents on landing
- Jets and large turboprop aircraft are seven times more likely to overrun when landing on a wet un-grooved runway versus one that is dry.
- Risk of overrun increases during heavy rainfall
- Information needs to be reported to pilots

Friction Testing

Source: *Airport International* magazine

What Else Can We Do?

"The severity of runway excursion accidents depends primarily on the energy of the airplane as it departs the runway, and the airport's layout, geography and rescue capability."

— James M. Burin
Flight Safety Foundation

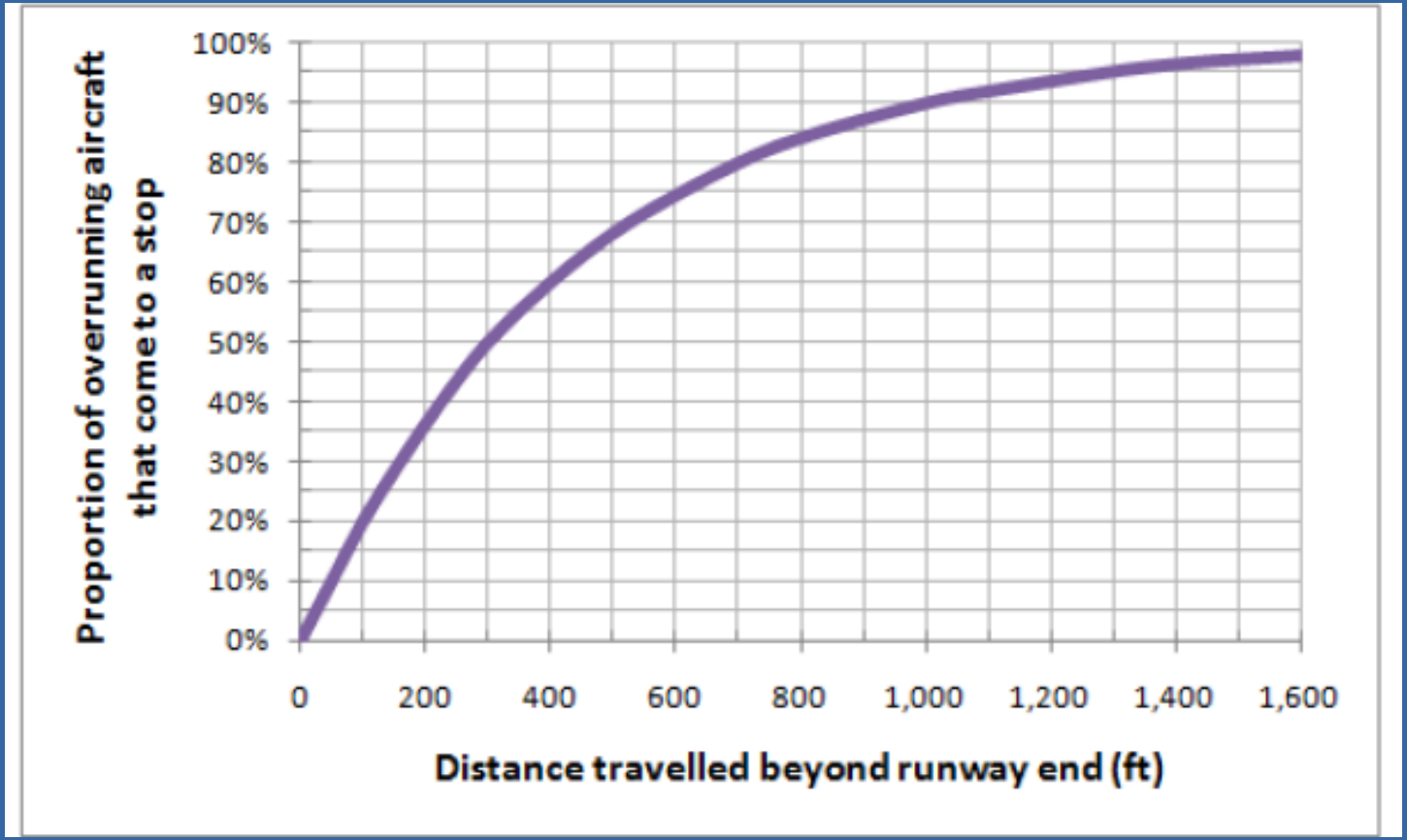
Recommendation A07-06

- *The Department of Transport require all Code 4 runways to have a 300 m runway end safety area (RESA) or a means of stopping aircraft that provides an equivalent level of safety.*

Recommendation A07-06
TSB Investigation Report A05H0002

Why 300 m?

Stopping Distance Following a Runway Overrun (FAA 1975-1987 study)



Source: ATSB, *Runway excursions, Part 2: Minimising the likelihood and consequences of runway excursions. An Australian perspective*, (2009).

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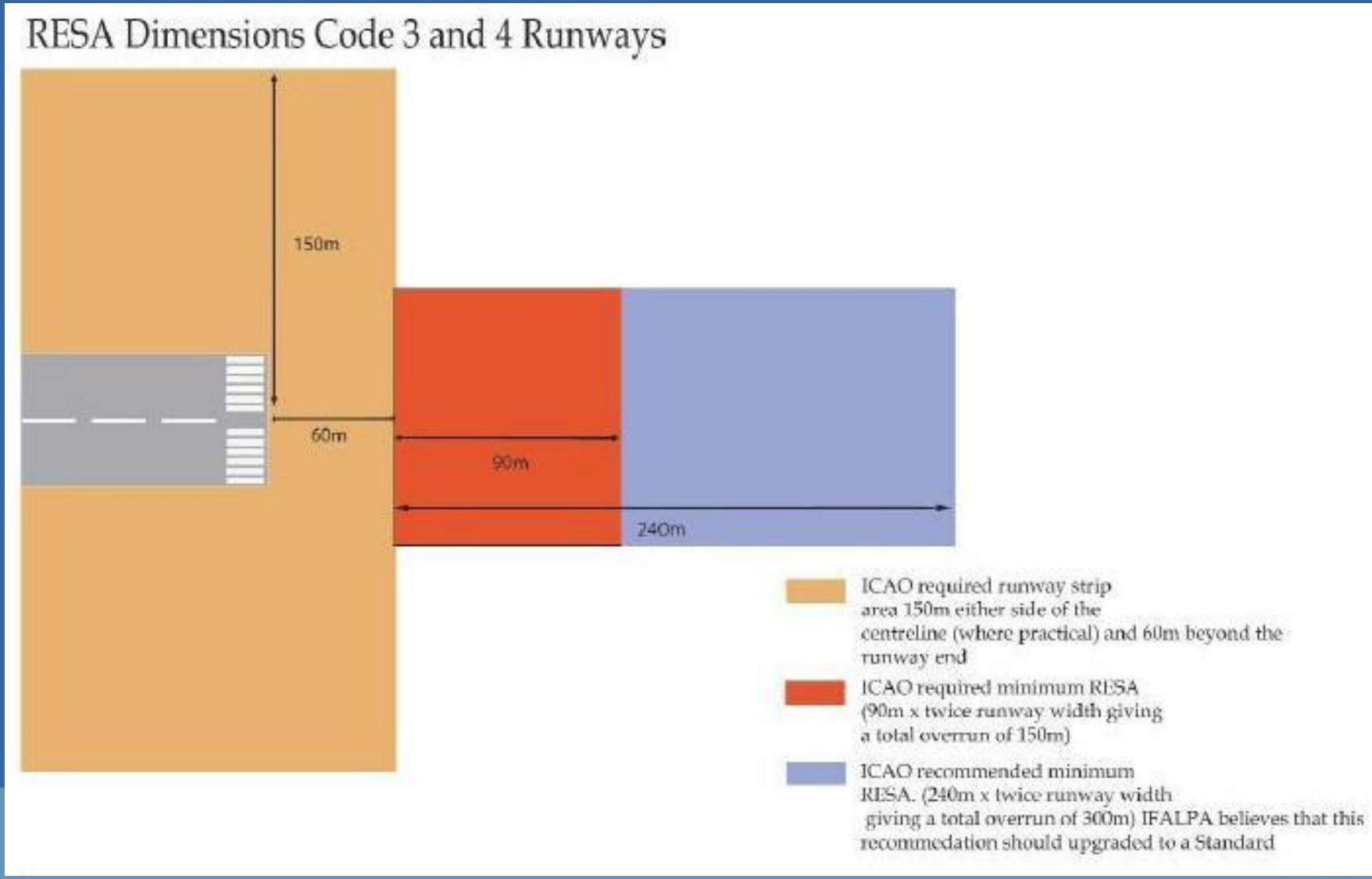
ICAO RESA Standards



Source: IFALPA Statement, Runway End Safety Areas (RESA)

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Recommendation A07-06 (Update)

- TC does not yet meet current international standard (ICAO, FAA)
- TC's new standard will require runways 1200 m or greater—or those under 1200 m where the runway is certified as precision / non-precision—to have a 150m RESA, or an arrestor system.
- TC standard will apply to runways used by scheduled operators with planes designed to carry over 9 passengers
- TC standard will not apply to airports serving small aircraft north of 60

EMAS

EMAS (cont'd)

Date	Aircraft Type	Location
May 1999	Saab 340	KJFK
May 2003	McDonnell-Douglas MD-11	KJFK
January 2005	Boeing 747	KJFK
July 2006	Dassault Falcon 900	KGMU
July 2008	Airbus A320	KORD
January 2010	Bombardier CRJ-200	KCRW
October 2010	Gulfstream G-IV	KTEB
November 2011	Cessna Citation 550	KEYW

Cost v$ Safety

Safety at Landing: the n° 1 Air Transportation Safety Issue

AIRBUS-WILLIS Analysis on 1985-2010 Period : Claims Data

Flight Phase	Incident Count #	Passenger Fatalities	Crew Fatalities	Hull Loss USD m	Liability USD m
En Route (Cruise)	287	3,766	462	1,576	2,727
Ground (Taxi)	301	24	18	473.89	76.74
Landing - Approach	1,120	8,718	1,802	2,937.49	3.316.70
Landing - Go Around	107	1,324	209	511.22	498.68
Landing - Initial Descent	178	2,450	415	442.46	948.56
Landing Roll - Excursions	**1,020**	**970**	**112**	**5,429.54**	**1,133.26**
Landing – Landing Roll Others	1,567	291	90	1,139.66	186.05
Take Off - Climb to Cruise*	298	5,250	722	1,324.16	6,976.04
Take Off - Initial Climb	541	3,936	854	1,231.18	1,860.20
Take Off Aborted	113	146	20	352.43	61.55
Take Off Run	407	725	106	1,237.67	989.55
Total	**5,939**	**27,600**	**4,810**	**16,655.69**	**18,774.32**

* Includes WTC

Source : ASCEND Database

Excursions, the n° 1 source of claims (mainly hull losses)

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What's Needed?

- Pilots to calculate required landing distance
- SOPs about landing in deteriorating conditions
- Pilots need to receive timely information about runway surface conditions
- Airports should evaluate runways for RESA requirements, without waiting for TC's aggregate assessment data

Conclusions

- Airport operators to carry out risk assessments on individual runways—followed by appropriate mitigation
- Regulators to establish clear standards to limit landings in bad weather
- Operators to require crews to establish margin of error between landing distance available and landing distance required
- Pilots need to receive timely information about runway surface conditions.


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