Runway Excursions: How can we avoid them?

Gerard van Es (方恒睿)
经理
航空安全及飞行操作

2019飛安資訊交流研討會
2019 Safety Information Exchange Seminar

Overview presentation

- General safety statistics
- Ways to avoid runway excursions
- Conclusions

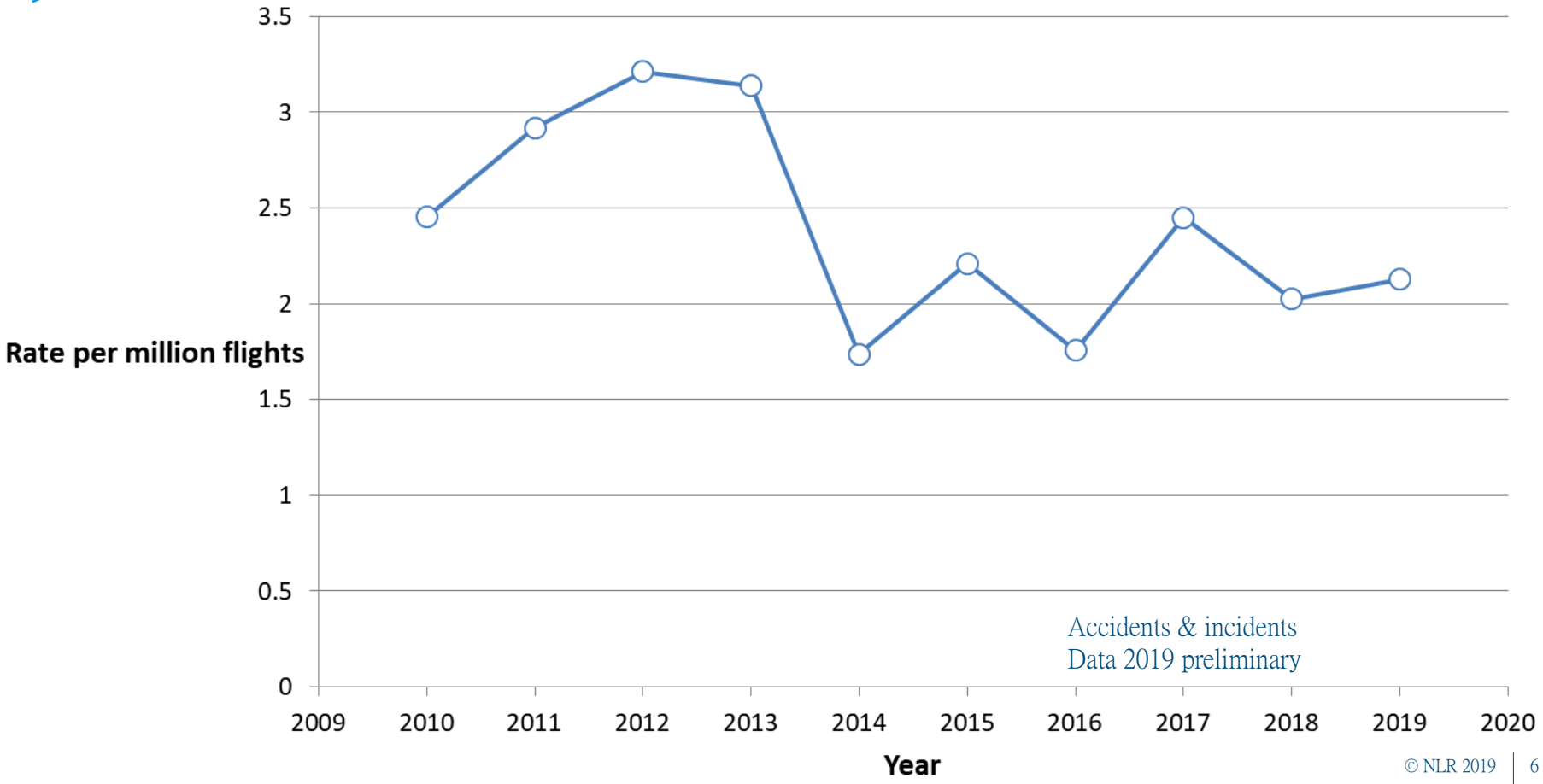

Overrun excursion

Veer-off excursion

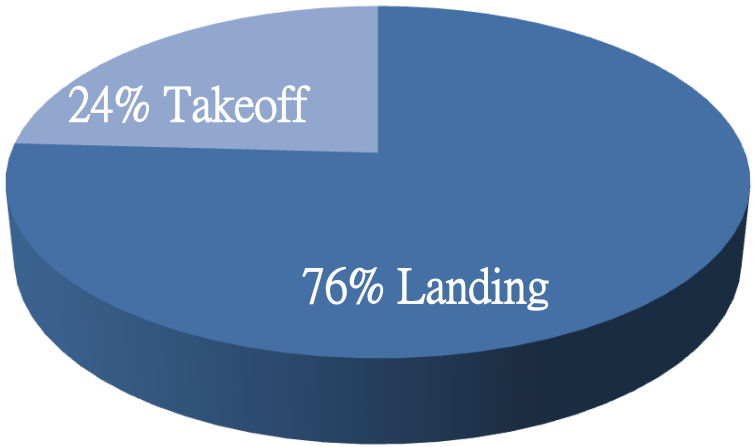
2019 Preliminary data (August 1st)

- 48 runway excursions with commercial flights (two per week);
- 1 fatal runway excursion.

Worldwide RE occurrence rate, commercial flights

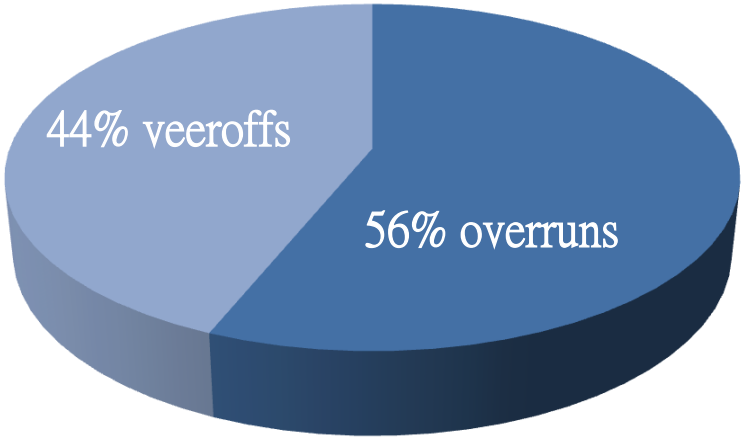


Runway excursion accidents by flight phase



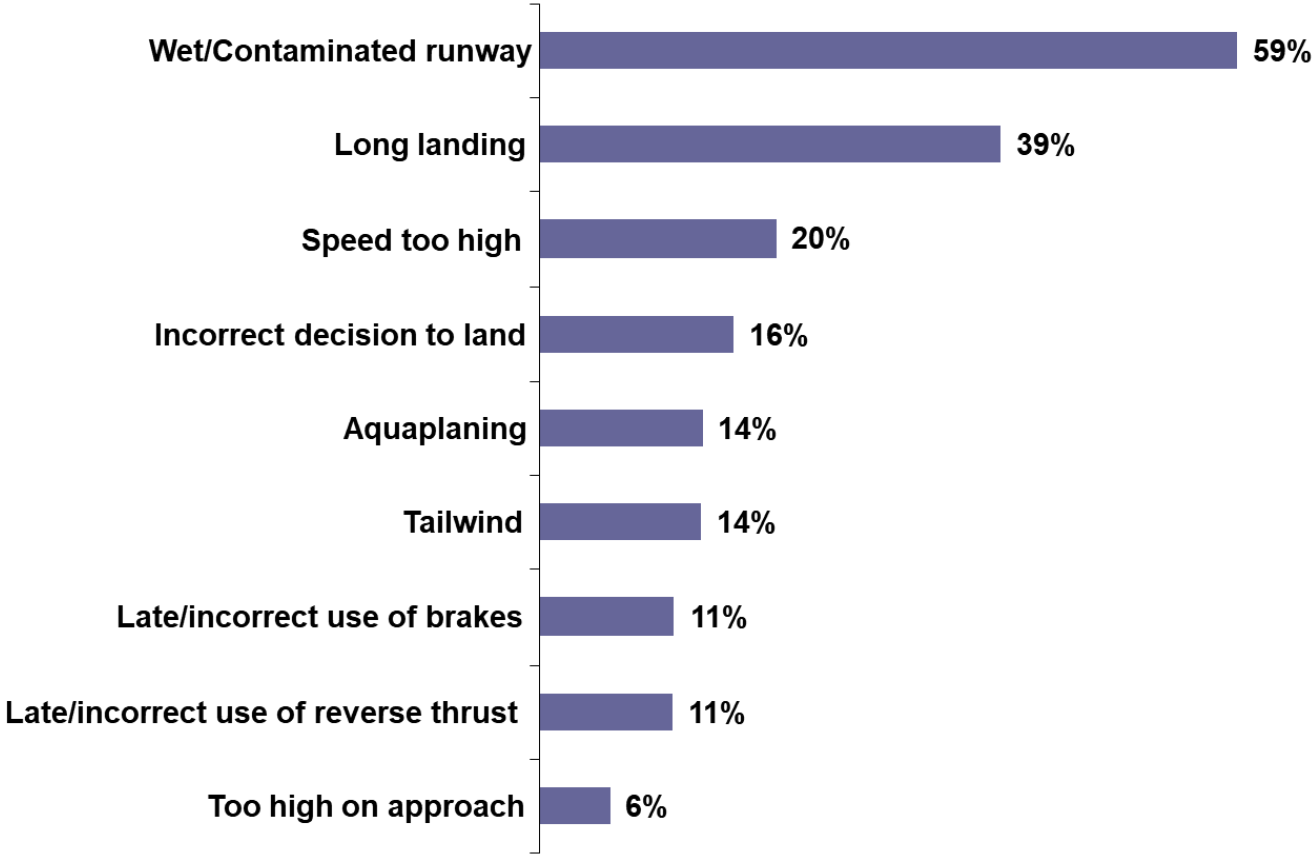
Worldwide, commercial flights

Runway excursion accidents by type

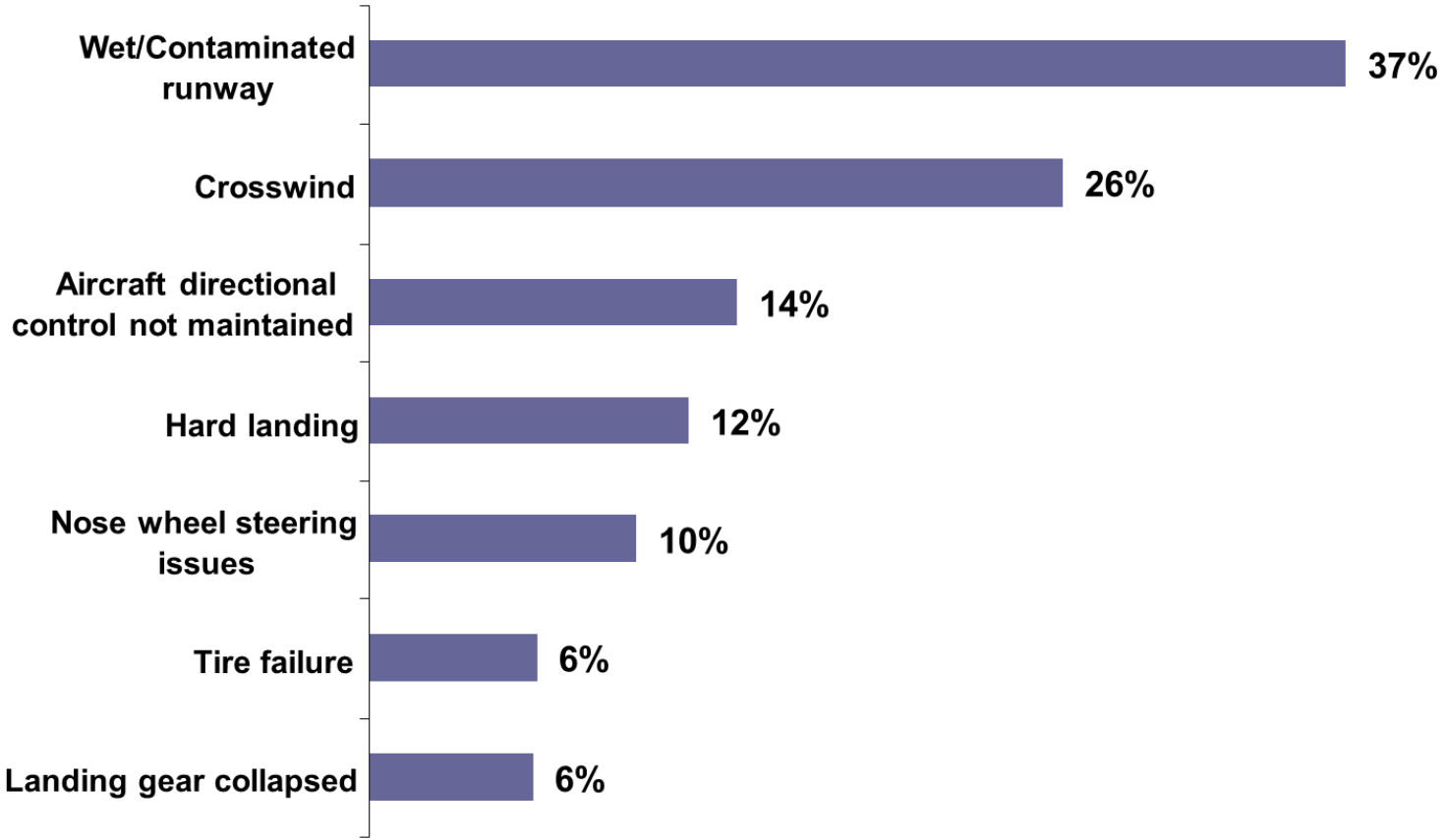


Worldwide, commercial flights

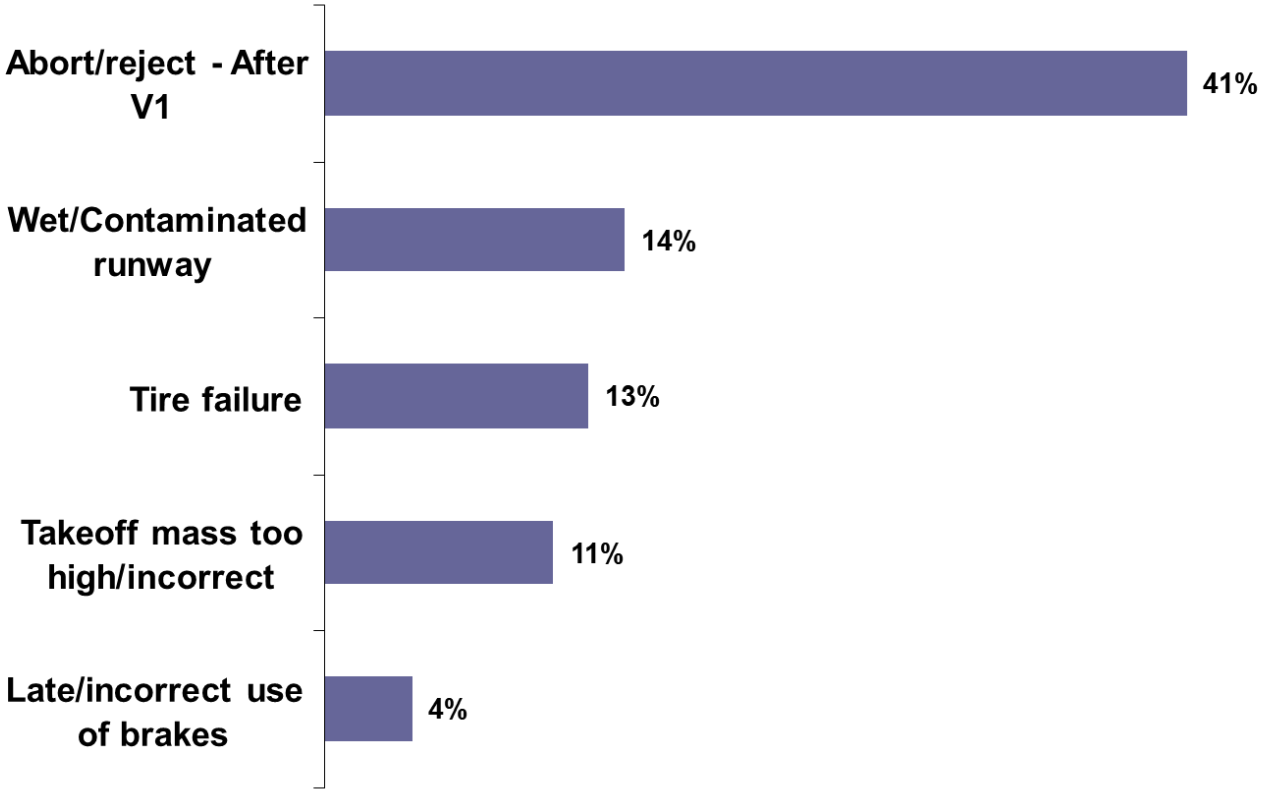
Landing overruns: Main causal factors



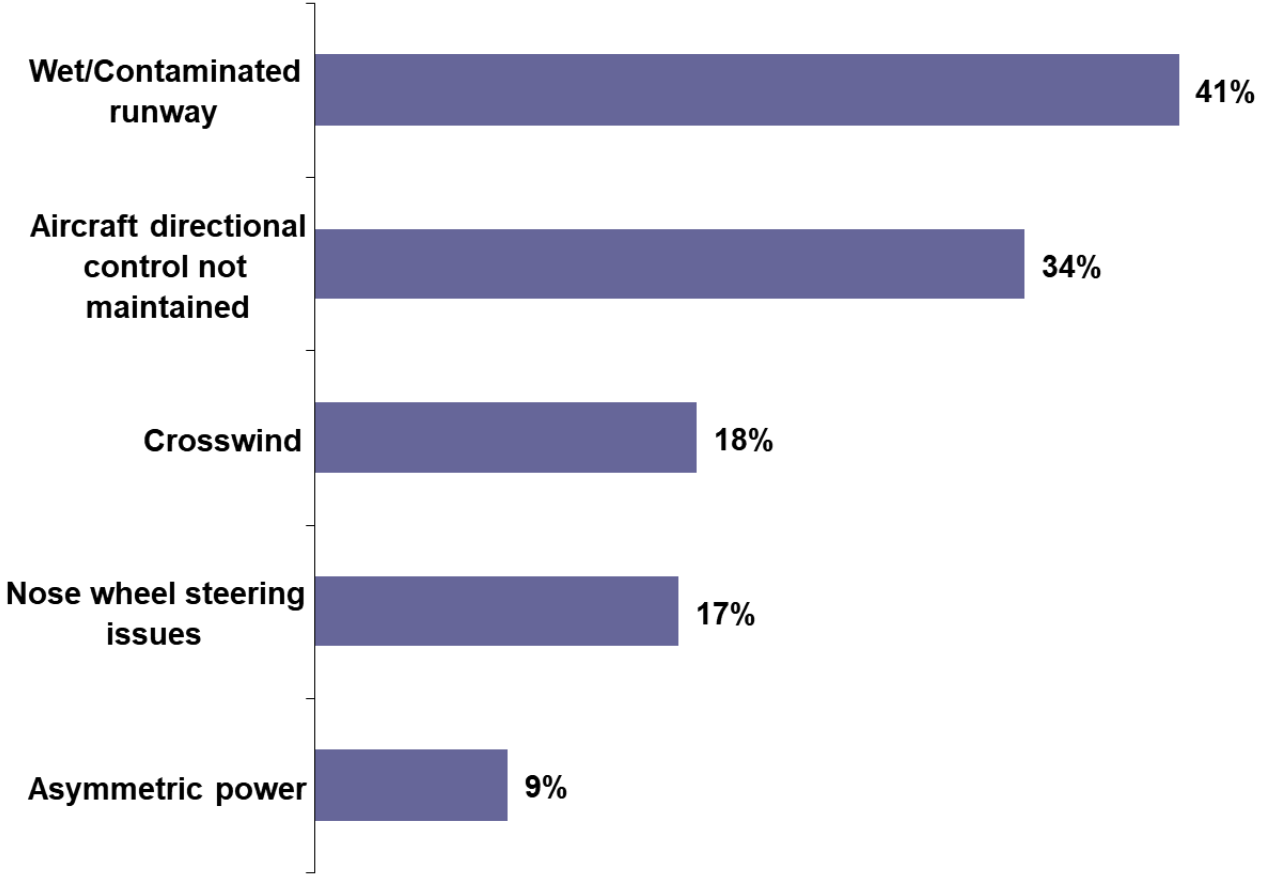
Landing veeroffs: Main causal factors



Takeoff overruns: Main causal factors



Takeoff veeroffs: Main causal factors

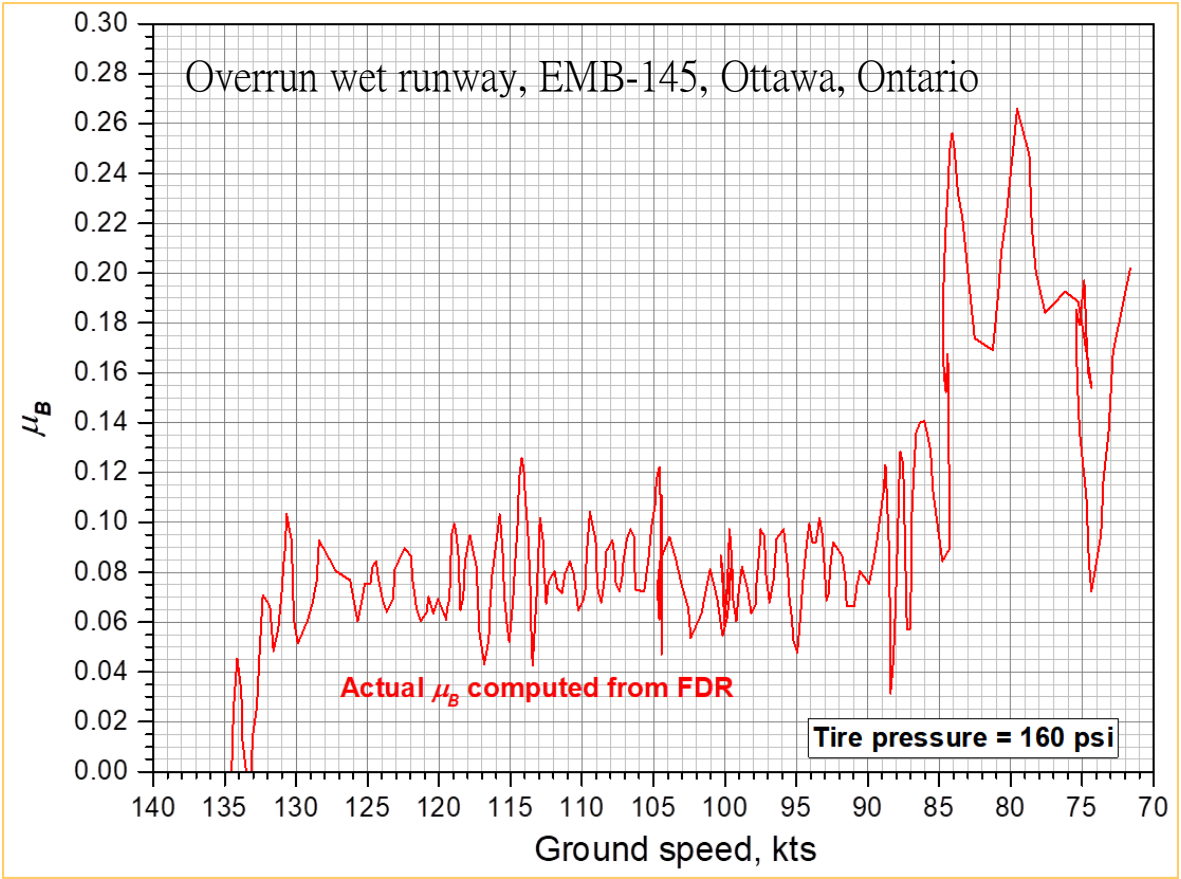


Who can help reducing runway excursions from happening?

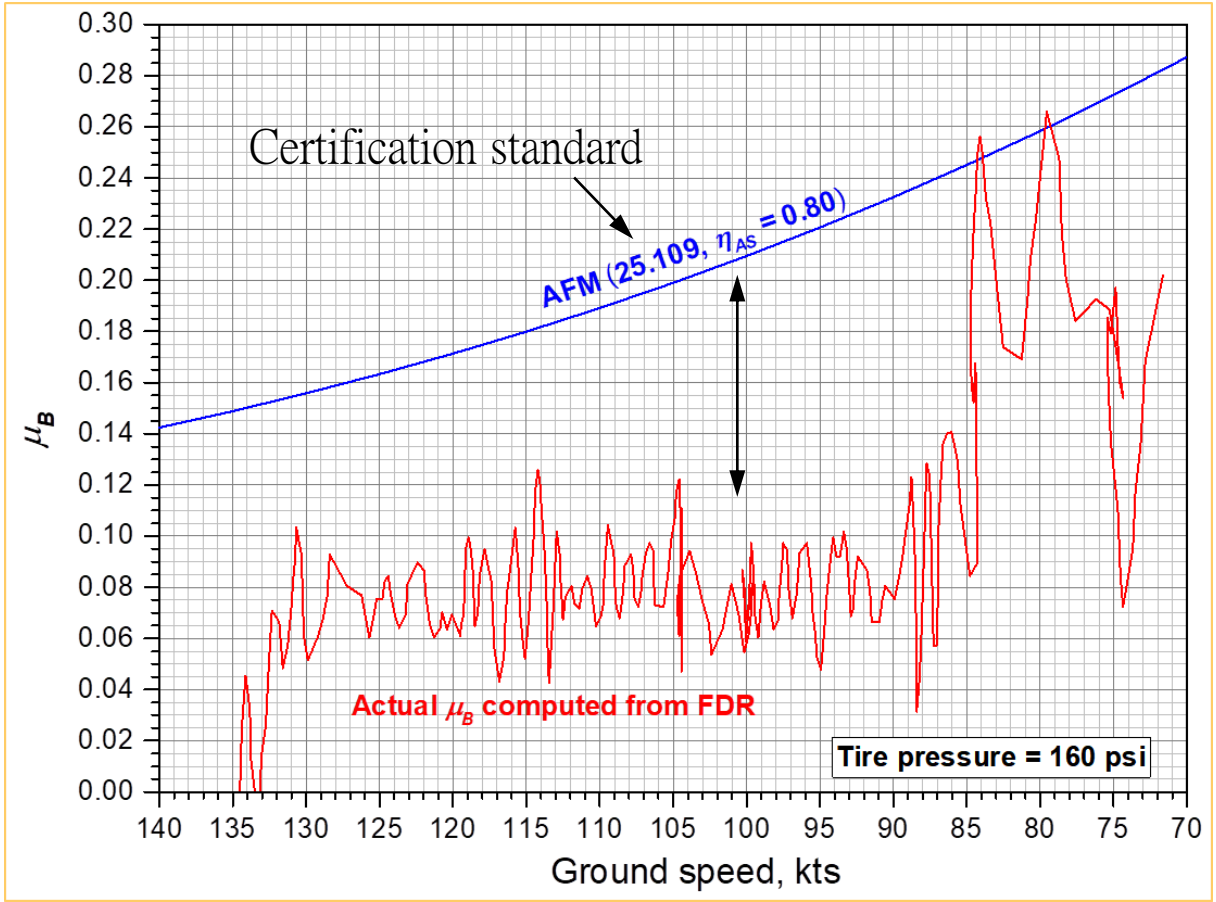
What can regulators do?

- Improve certification standards;
- Provide (better) guidance material;
- Promptly react to recommendations from AIBs;
- Finance research into runway friction.

Example improve certification standards



Example improve certification standards



Example of new guidance: Runway Condition Matrix

- Common description of runway conditions;
- Common way to calculate aircraft takeoff and landing performance.

Runway Condition Assessment Matrix

Runway Condition Description	Runway Condition Code	Control / Braking Action
- Dry	6	---
- Frost - Wet (includes damp and less than 1/8" (3mm) depth of water) **Less than 1/8" (3mm) depth:** - Slush - Dry Snow - Wet Snow	5	Good
-15°C and colder OAT: - Compacted Snow	4	Good to Medium
- Slippery when wet (wet runway) - Dry or Wet Snow (any depth) over Compacted Snow **1/8" (3mm) depth or greater:** - Dry Snow - Wet Snow **Warmer than -15°C OAT:** - Compacted Snow	3	Medium
1/8" (3mm) depth or greater: - Water - Slush	2	Medium to Poor
- Ice	1	Poor
- Wet Ice - Water on top of Compacted Snow - Dry Snow or Wet Snow over Ice	0	Nil

What can airports do?

Provide adequate:

- Macro and micro texture;
- Cross slope (1.0-1.5%).

Install accurate and sufficient wind sensors;

Clear runway from contaminants (snow/ice);

Accurately monitor and report runway condition;

Tools for real-time estimating runway wetness.

What can ATC do?

- Timely provide flight crew with accurate reports on wind and runway conditions;
- Make sure that arrival procedures don’ t introduce unstable approaches.

What can research do?

- Study deficiencies in current knowledge;
- Explore innovative ideas;
- Study human behaviour related to runway excursions.

Flooded runway braking tests – Future Sky Safety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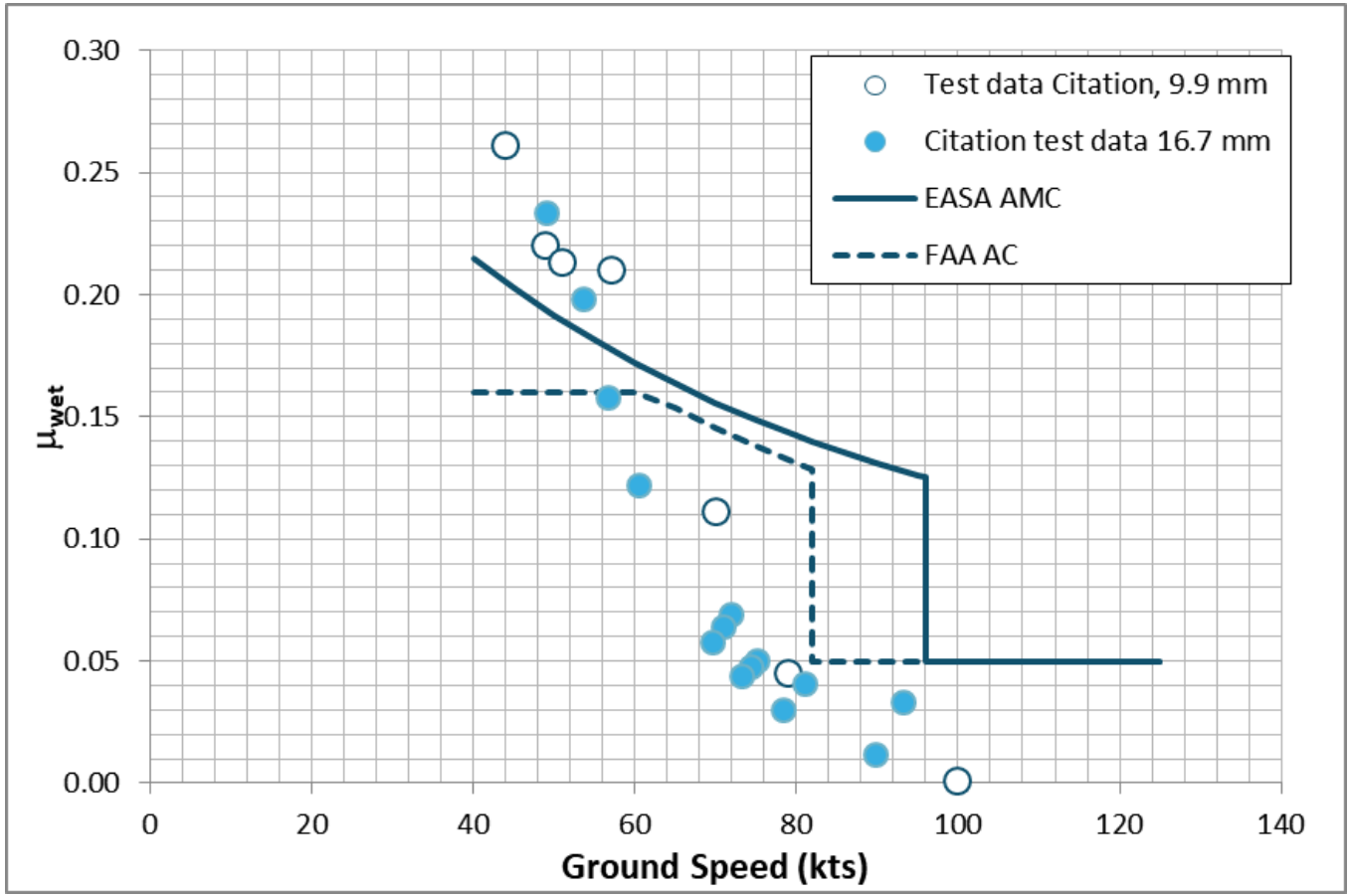
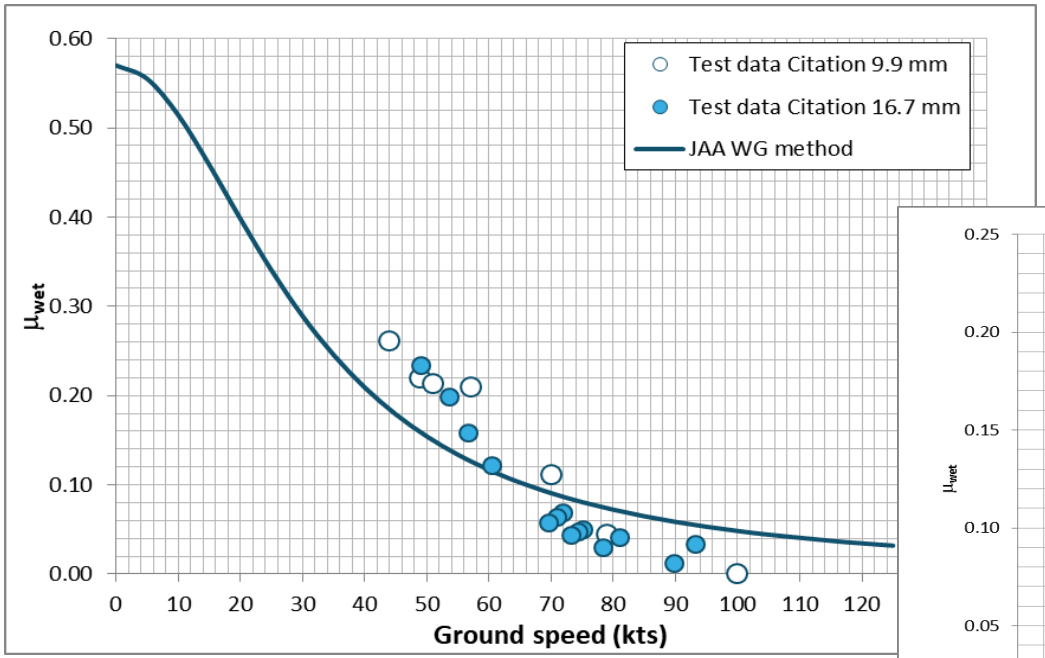
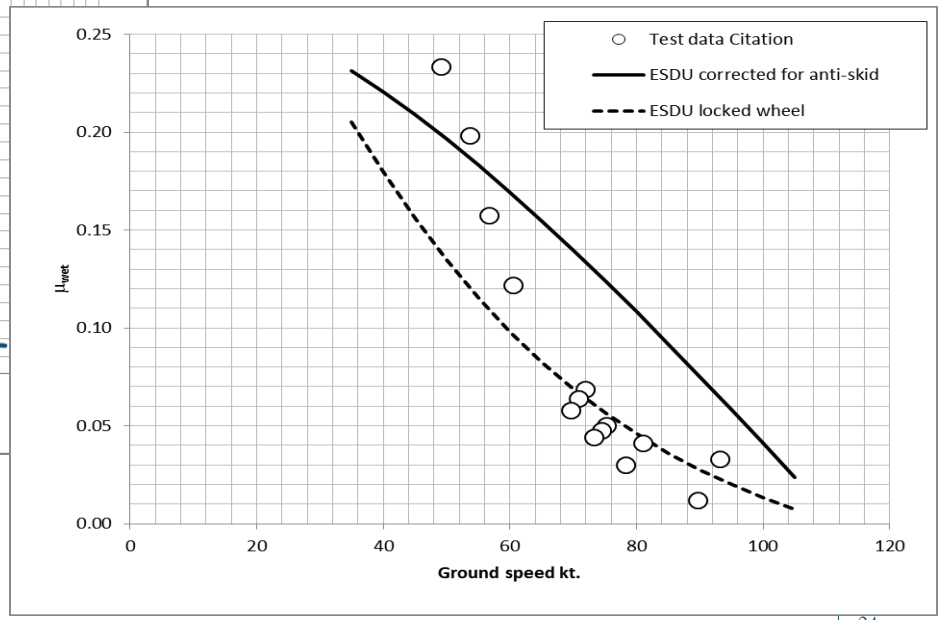
Example EASA AMC and FAA AC methods – Citation



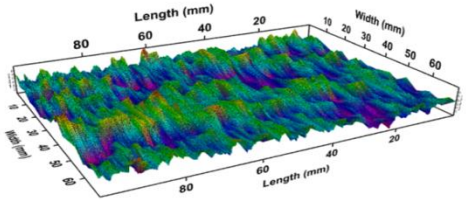
Improved modelling





NLR/FAA research project on micro texture

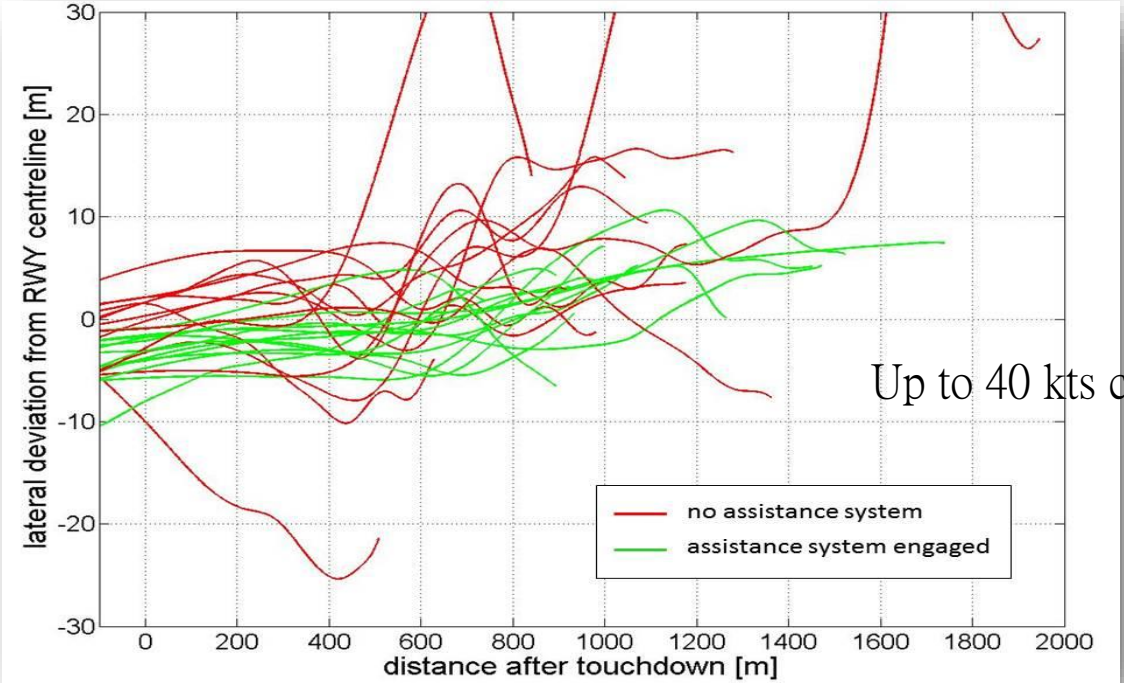
Micro texture



Validate by correlating with braking on wet runways

Example result: Crosswind Landing Assistance System (CLAS)

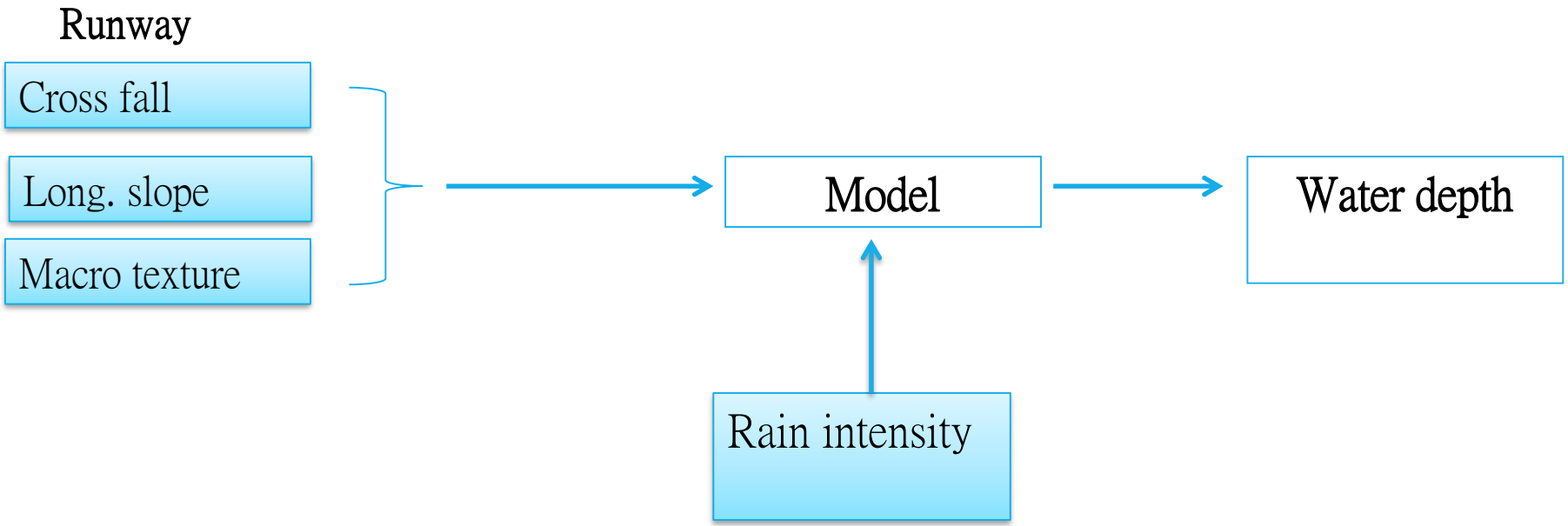
- Steerable main landing gear and CLAS implemented in A320-simulator



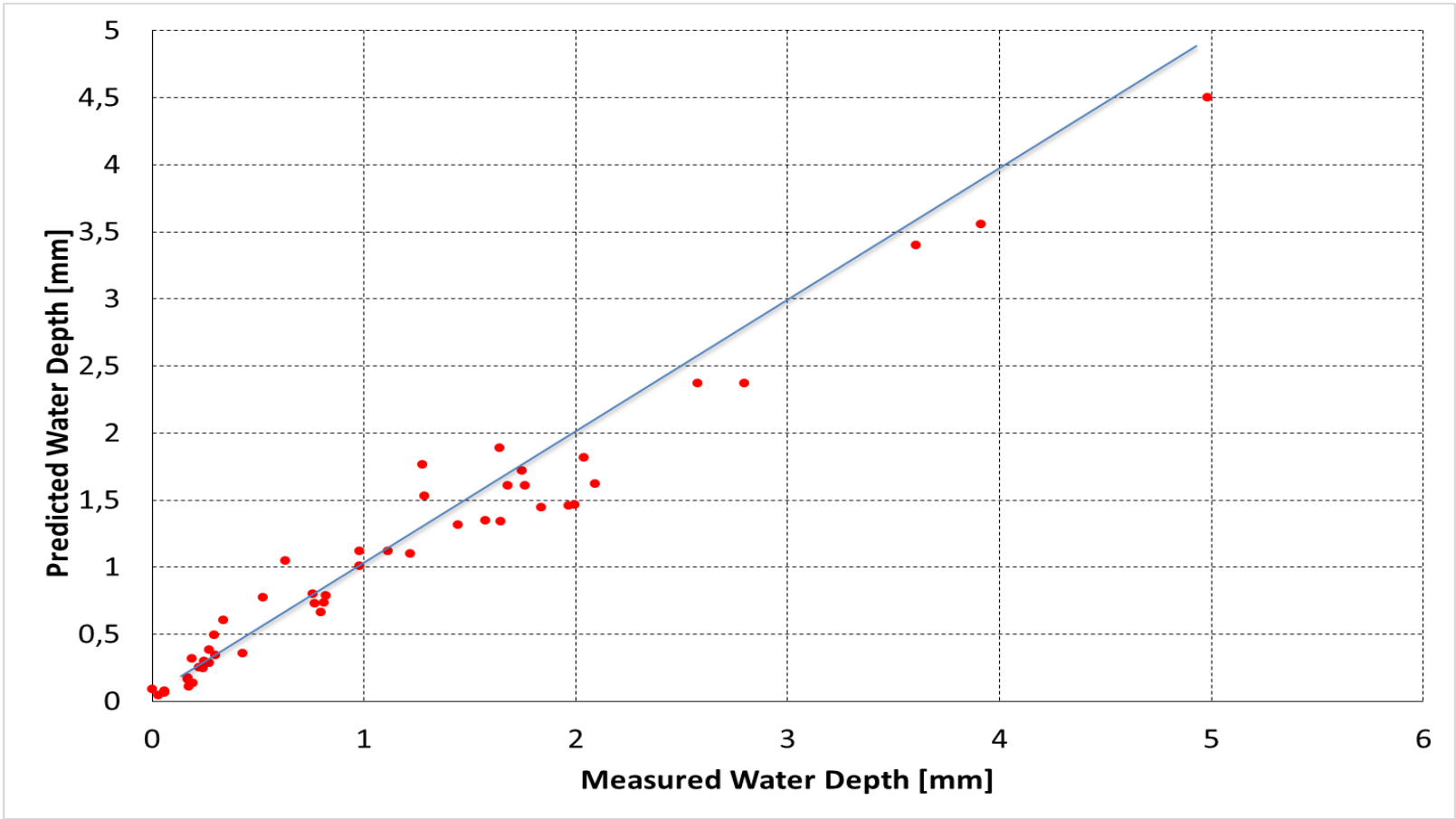
Up to 40 kts crosswind


How wet is this runway?

Runway water depth predictive model



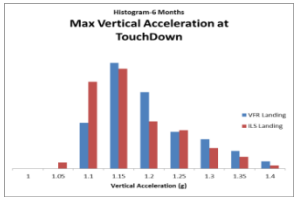
Example of the accuracy of the model (CDG airport)



What can operators do?

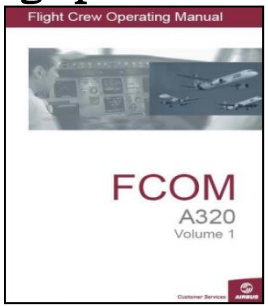
- Simple answer is a lot!
- Significant part of causes is related to crew actions (or lack of);
- Training and instruction of flight crews is important;
- Extensive analysis of flight data;
- Use Safety Management System approach to address hazards;
- Installing warning tools on aircraft.

Flight data as pro-active tool

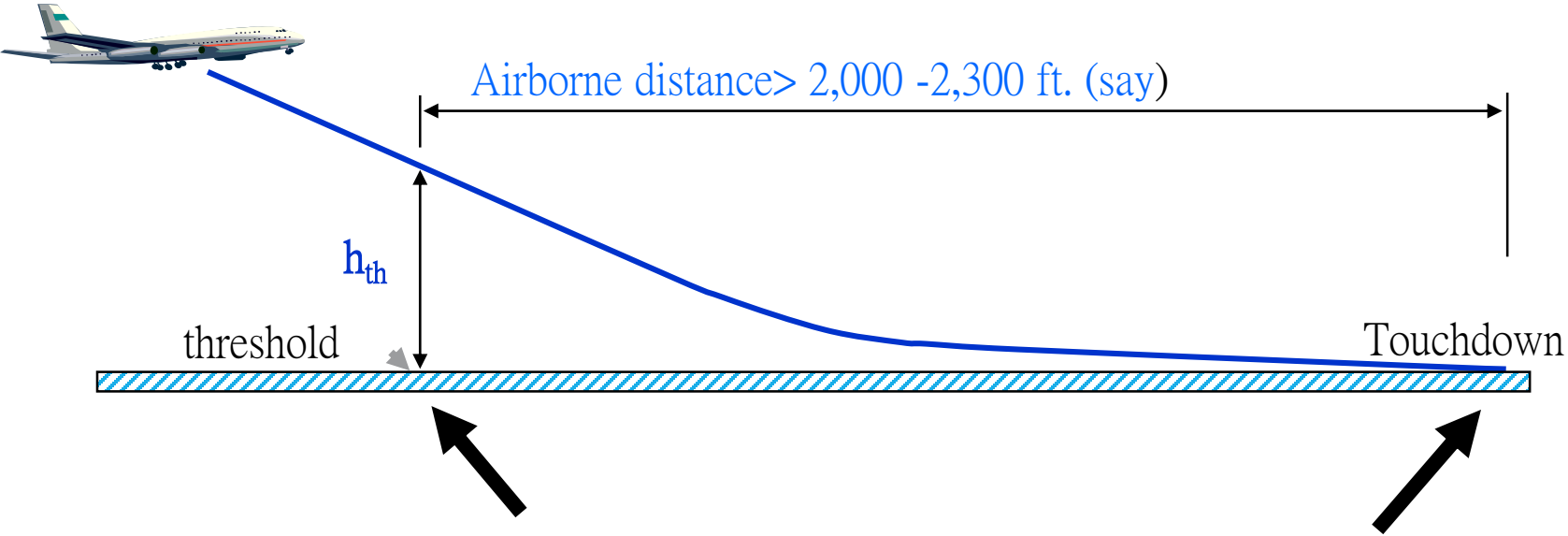


Improve training

Change procedures



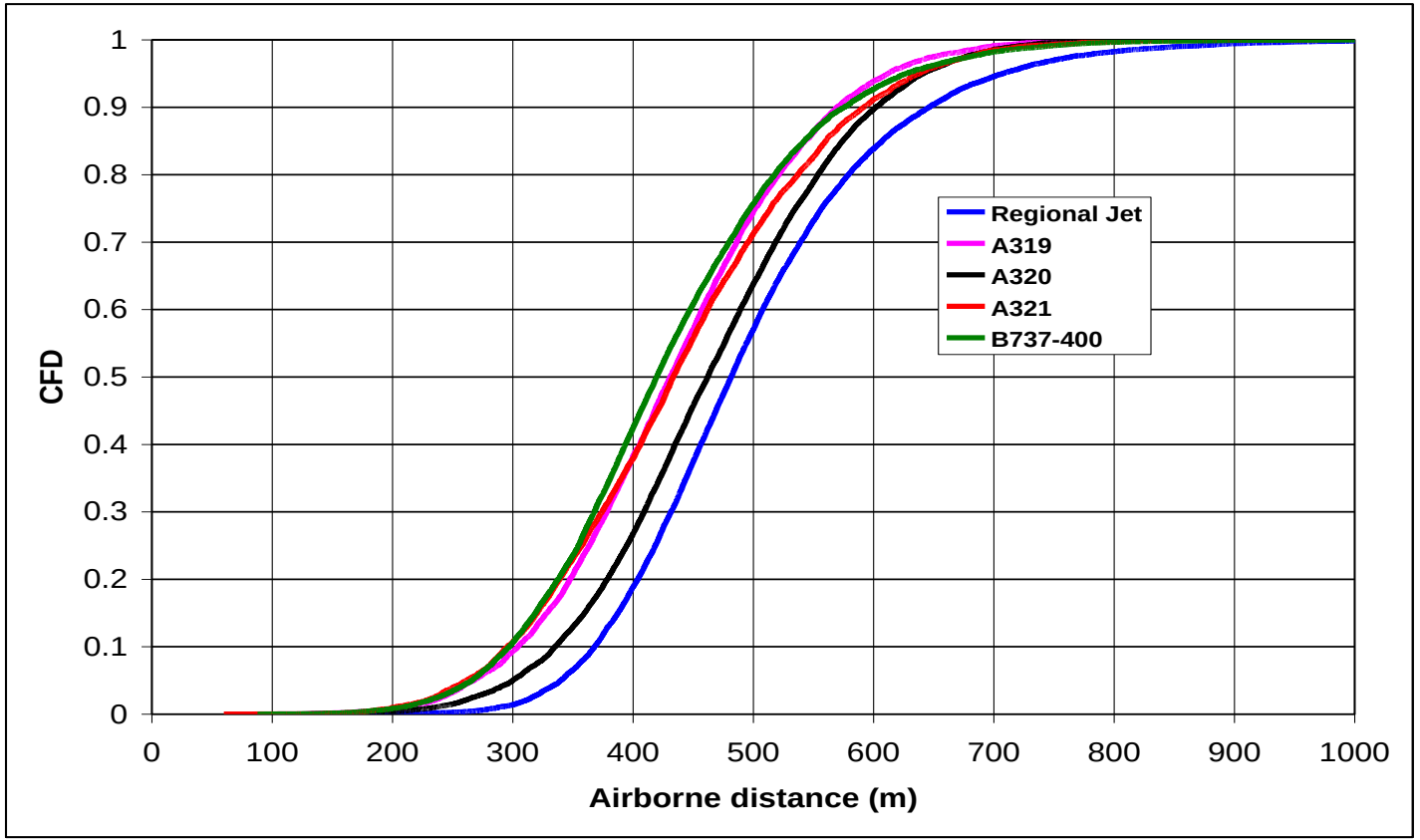
Long landings in FDM



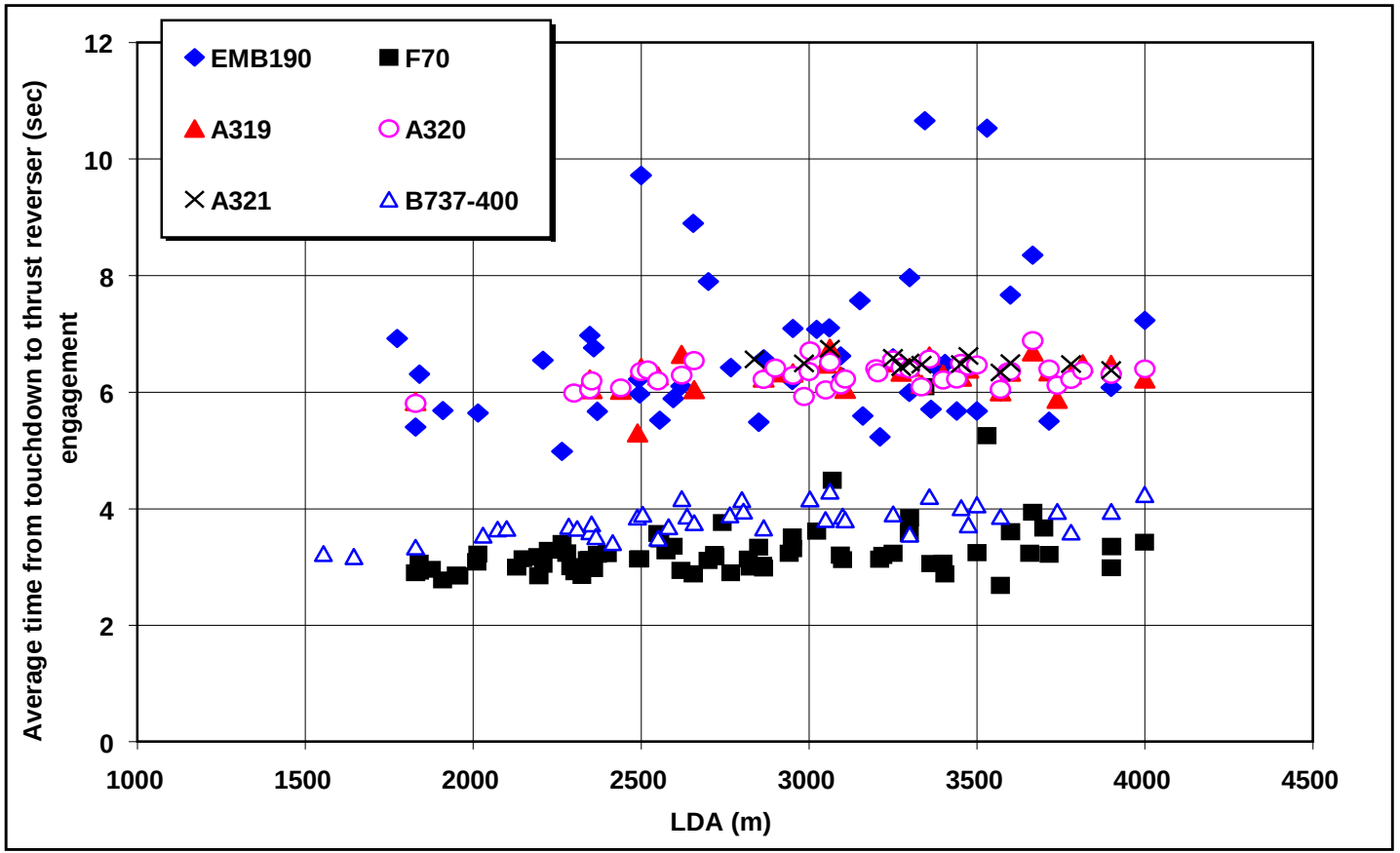
FDM software can have difficulties in defining:

- Threshold crossing
- Touchdown point

Airborne distance distribution



Average time from touchdown to thrust reverser engagement versus LDA

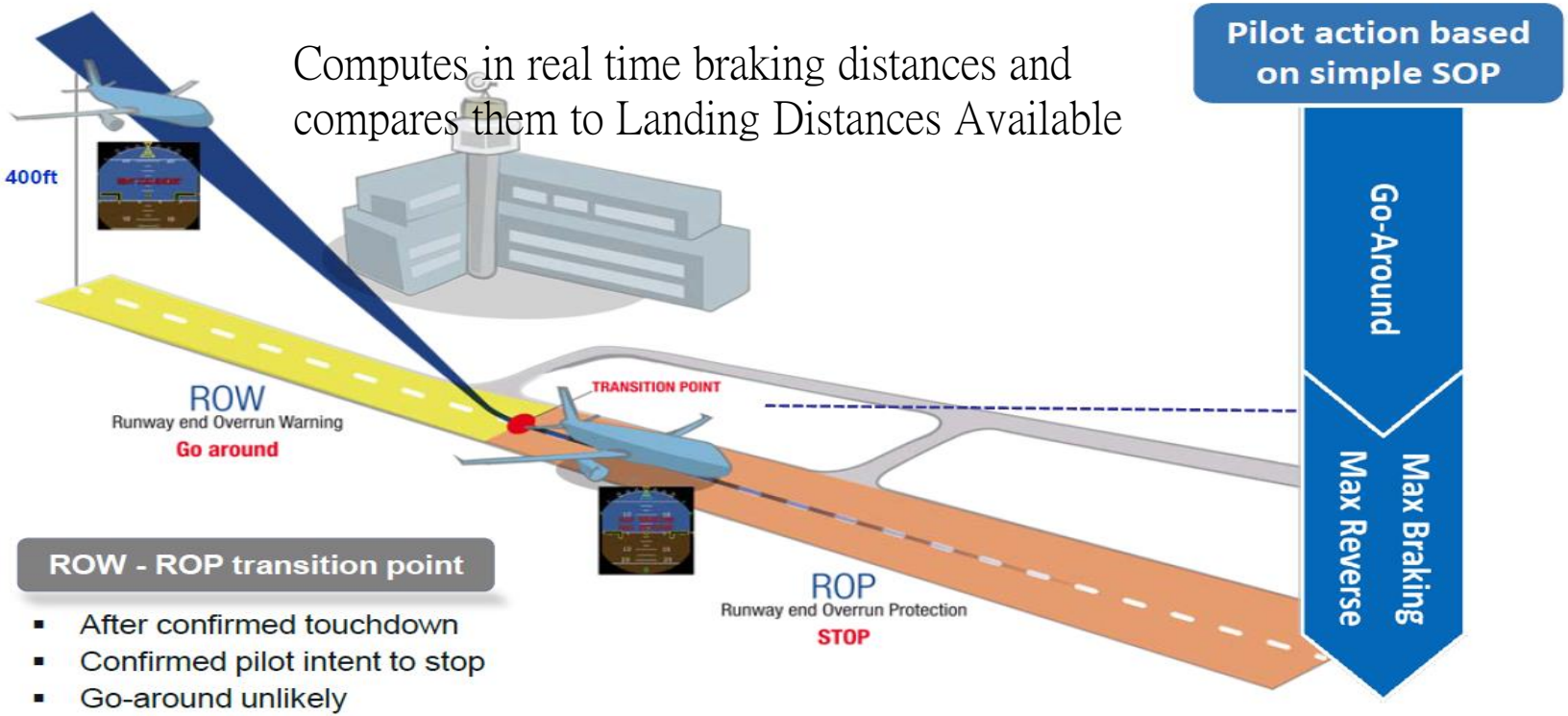


What can manufacturers do?

- Develop new technologies that warns crews:
  - During landing for unstable approaches, long landings or insufficient braking;
  - During takeoff for wrong weight, wrong T/O position or thrust setting.
- Improve flight procedures and training material (FCOM/FCTM).

Airbus Runway Overrun Prevention System

Computes in real time braking distances and compares them to Landing Distances Available



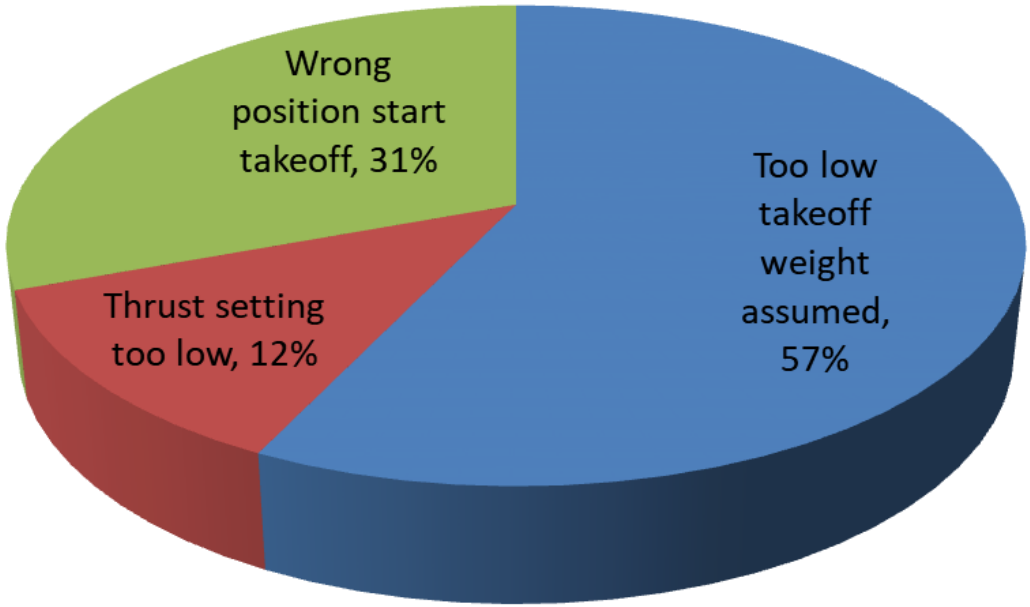
ROW - ROP transition point

- After confirmed touchdown
- Confirmed pilot intent to stop
- Go-around unlikely

Honeyweel Smartlanding

- Smartlanding is a software upgrade of the Honeywell E-GPWS:
  - Monitoring A/C speed and position vs. runway threshold;
  - Providing visual/aural annunciations to enhance crew awareness of unstabilised approach;
  - Based on tuning defined by Honeywell (speed, glideslope) or set by airlines (long landing distance).

Takeoff performance errors – continued concern



Example takeoff overrun due to wrong TO weight

Vmu = 160 kt

Takeoff weight error of 38% (too low)

Collision with localizer antenna

Source: Airbus/ATSB

Airbus Take-Off Securing pack

- Checks that the speeds inserted by the pilot in the FMS are consistent (V1/VR/V2);
- Checks aircraft position at take-off initiation (compares required and available takeoff distance).

Runway excursions are an old problem

Can we avoid all runway excursions?

- Runway excursions will never disappear completely;
- We can still reduce the number of excursions by new technology, better training and awareness.

Questions?

Dedicated to innovation in aerospace

Fully engaged

Royal Netherlands Aerospace Centre

NLR Amsterdam
Anthony Fokkerweg 2
1059 CM Amsterdam
The Netherlands

p) +31 88 511 31 13
e) info@nlr.nl i) www.nlr.org

NLR Marknesse
Voorsterweg 31
8316 PR Marknesse
The Netherlands

p) +31 88 511 44 44
e) info@nlr.nl i) www.nlr.org