GRF Methodology

History and Development Process

Lars Kornstaedt / Rapporteur Annex 6/8 Subgroup, Friction Task Force

GRF Workshop, Frankfurt

10 December 2019

AIRBUS

Elizabethan Crash in Munich

- February 6th,1958 - BEA Airspeed Ambassador G-ALZU *Lord Burghley* crashed on the third attempt to takeoff from a slush-covered runway in Munich-Riem
- Aircraft carried Manchester United football team
- 23 fatalities
- Cause: Aircraft was unable to accelerate to flying speed due to precipitation drag

AIRBUS

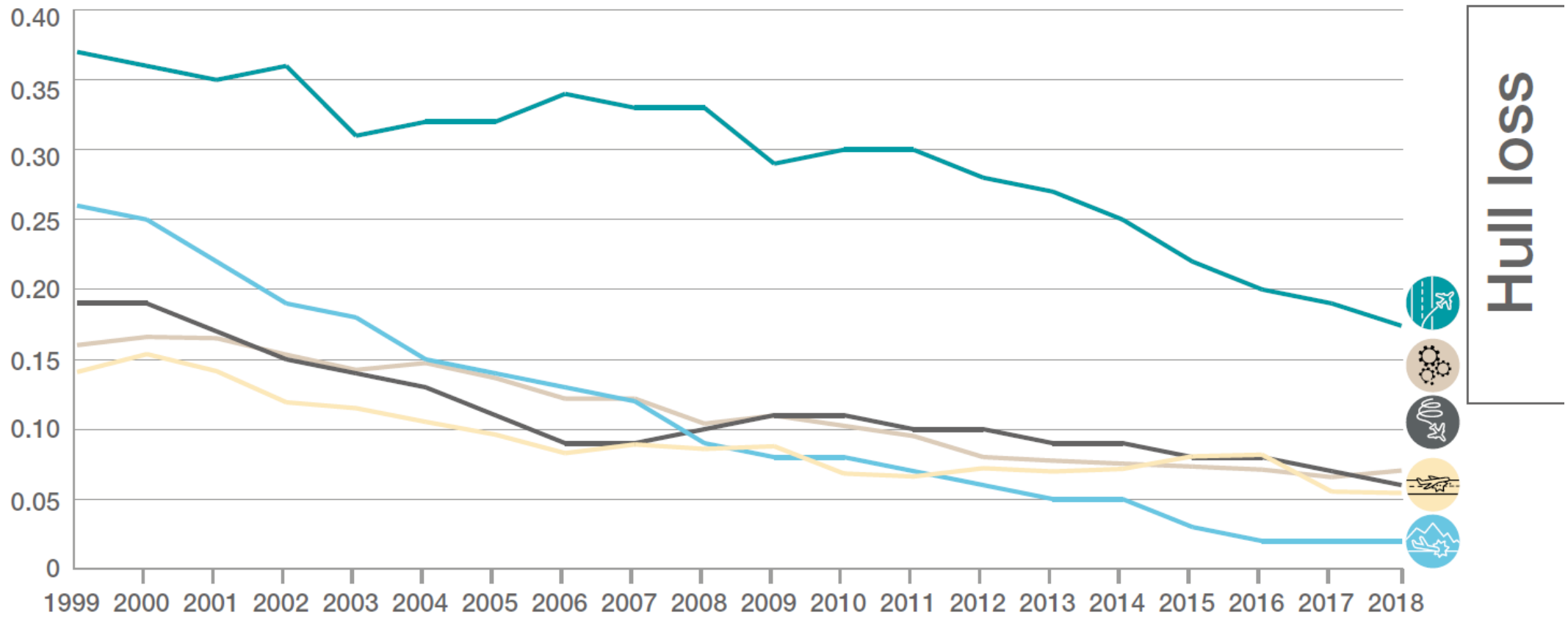
Runway Overrun Chicago-Midway

- December 8th, 2005 Southwest Flight 1248 slides off the runway while attempting to land in a snowstorm
- 1 fatality on ground

AIRBUS

Accident Statistics

10 year moving average hull loss rate by accident category per million flights



AIRBUS

Top 3 Safety Concern

- Runway Safety: A global safety priority
- Runway excursions: highest risk category
- Poor braking action: a top contributing factor
- Mitigation by ICAO's Global Reporting Format
  - World-wide implementation agreed

➢ Applicability November 2020

AIRBUS

Acronyms

- Global Reporting Format (GRF)
- Runway condition assessment matrix (RCAM)
- Runway condition code (RWYCC)
- Runway condition report (RCR)
- SNOWTAM - special series NOTAM
- AIREP (Air-report) - report from an aircraft

AIRBUS

Contents

AIRBUS

Contents

AIRBUS

FAA TALPA ARC Terms of Reference

a) Establish airplane certification and operational requirements (including training) for takeoff and landing operations on contaminated runways.
b) Establish landing distance assessment requirements, including minimum landing distance safety margins, to be performed at the time of arrival.
c) Establish standards for runway surface condition reporting and minimum surface conditions for continued operations.

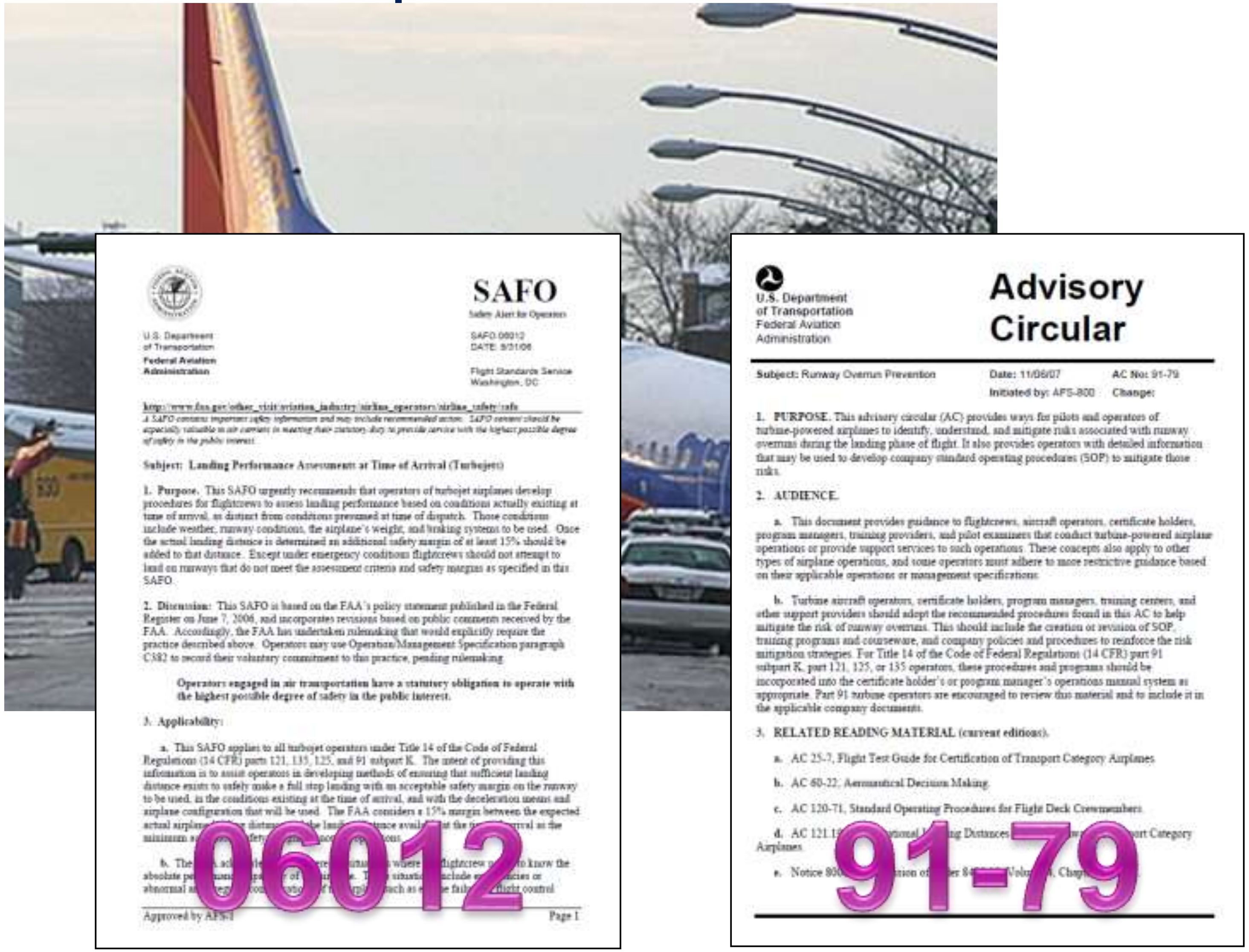
AIRBUS

FAA TALPA ARC

Takeoff and Landing Performance Assessment
Aviation Rulemaking Committee

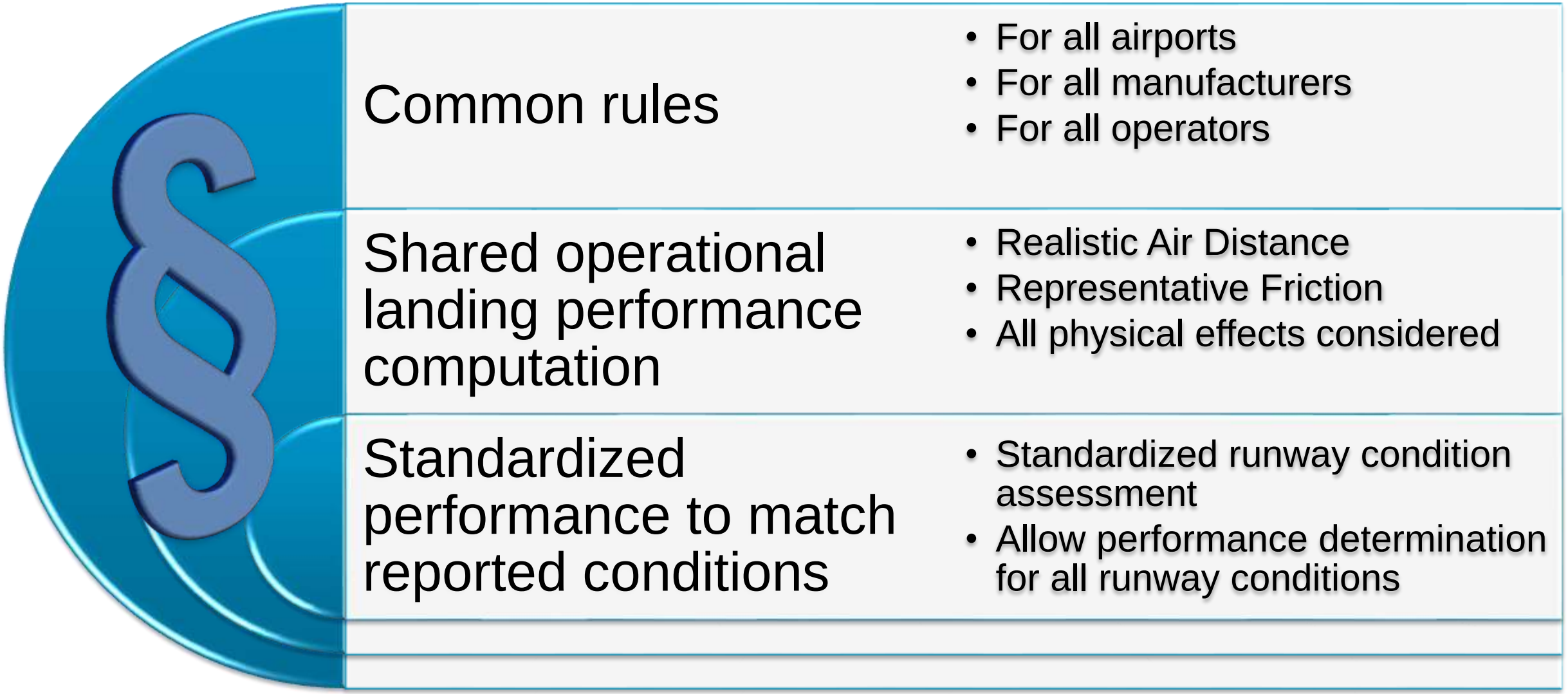
AIRBUS

TALPA Proposals



AIRBUS

TALPA ARC Concepts



Common rules	• For all airports • For all manufacturers • For all operators
Shared operational landing performance computation	• Realistic Air Distance • Representative Friction • All physical effects considered
Standardized performance to match reported conditions	• Standardized runway condition assessment • Allow performance determination for all runway conditions

AIRBUS

FAA Validation of TALPA ARC Proposals

TALPA ARC transmitted proposals to FAA in May 2009

TALPA ARC was closed in Nov 2009

FAA conducted two Winter Validation Trials 2009/10 & 2010/11

Debrief of TALPA members 2011

Final report was issued Apr 2013

Release of updated AC91-79A in Sept 2014

AIRBUS

FAA Implementation by Voluntary Compliance

- Effective October 2016
- Advisory documents
  - SAFO 16009
  - Part 25 ACs
  - Part 150 ACs
  - Joint Orders, AIM, …
- Compulsory reporting
  - NOTAM Manager

TALPA Industry Day – Washington June 9, 2016

AIRBUS

Contents

AIRBUS

Leading up to the Friction Task Force

AOSWG/1 – June 2005

Need to standardise information to pilots

ICAO State letter - May 2006 – Questionnaire

Aerodrome Panel - 1 December 2006

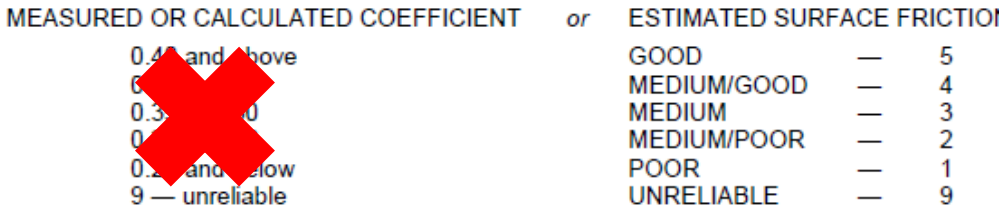
AOSWG/5 – April 2008

ICAO Friction Task Force - April 2008

FTF Phase 1 (2008 – 2011)

- Annex 14 and (Annex 15)

- Revised Reporting Procedure
- Revised SNOWTAM



MEASURED OR CALCULATED COEFFICIENT	*or*	ESTIMATED SURFACE FRICTIOI		
0.4[illegible] and [illegible]bove		GOOD	—	5
[illegible]		MEDIUM/GOOD	—	4
0.3[illegible]0		MEDIUM	—	3
0[illegible]		MEDIUM/POOR	—	2
0.2[illegible] and [illegible]elow		POOR	—	1
9 — unreliable		UNRELIABLE	—	9

Since 14 November, 2013

- Circular 329 – Assessment, Measurement and Reporting of Runway Surface Conditions

AIRBUS

No longer reporting μ

Friction measuring equipment values are no longer used to determine and report surface conditions because joint industry and multi-national government tests have not established a reliable correlation between runway friction values and the relationship to airplane braking performance.

FAA SAFO 19001 - Landing Performance Assessment at Time of Arrival
11 March 2019

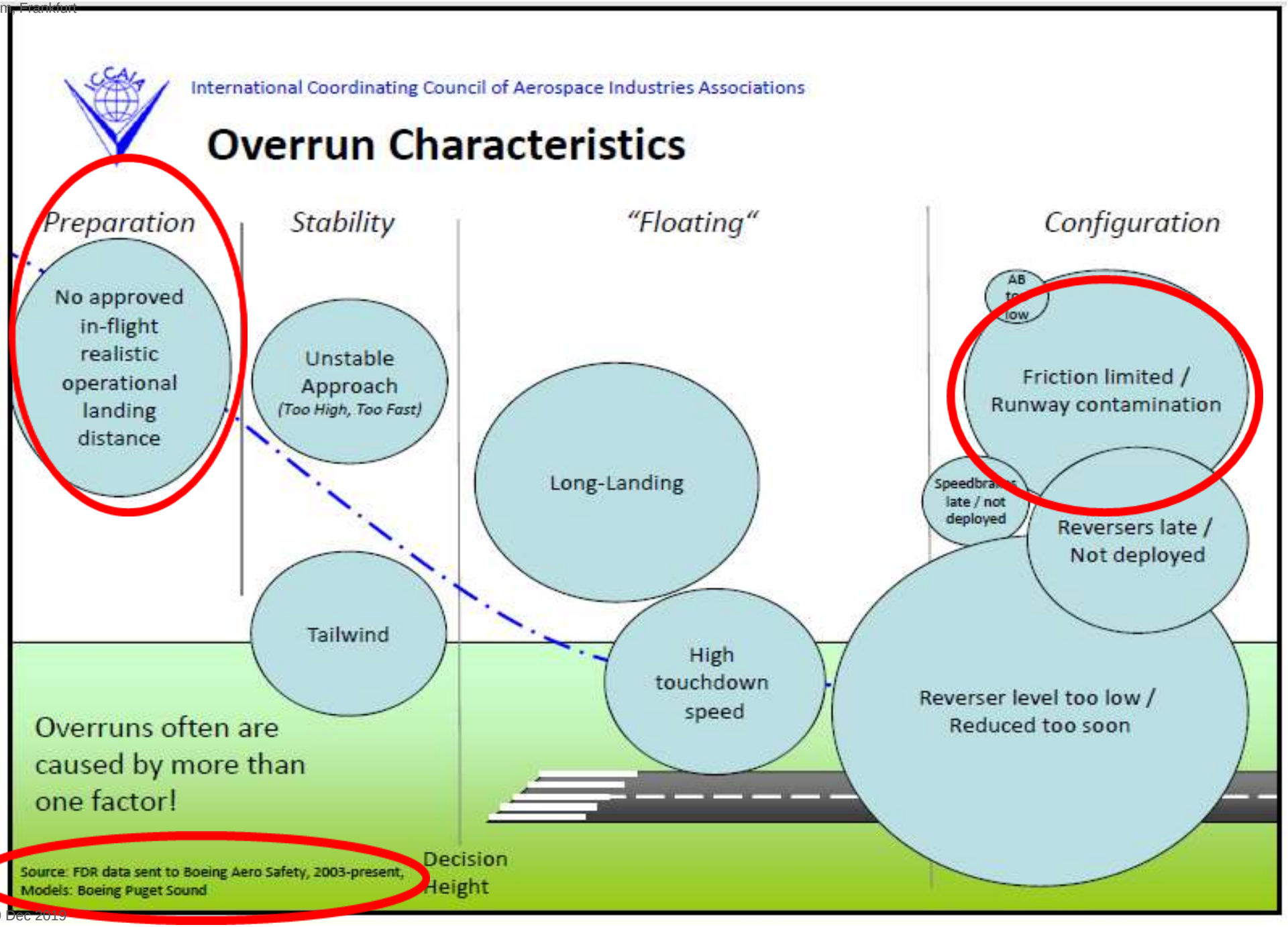
AIRBUS

ICAO Friction Task Force Phase 2 (2011 – 2019)

Problem Statement

Runway surface conditions have contributed to many safety events and investigations have revealed **shortfalls in the accuracy and timeliness of assessment and reporting methods** currently provided for in ICAO provisions and guidance material.

AIRBUS


International Coordinating Council of Aerospace Industries Associations
Overrun Characteristics
Preparation
Stability
"Floating"
Configuration
No approved in-flight realistic operational landing distance
Unstable Approach
(Too High, Too Fast)
Long-Landing
Tailwind
High touchdown speed
Friction limited / Runway contamination
Speedbrake late / not deployed
Reversers late / Not deployed
Reverser level too low / Reduced too soon
Overruns often are caused by more than one factor!
Source: FDR data sent to Boeing Aero Safety, 2003-present, Models: Boeing Puget Sound
Decision Height

AIRBUS

International Coordinating Council of Aerospace Industries Associations

Overrun Risk Mitigations

Suggested Operation and Procedural enhancement:

- Runway conditions reporting
- In-flight realistic landing distance calculation
- Stabilized approach
- Touchdown zone marking
- "De-stigmatize" Go- Around
- Use *all* deceleration devices
- Maintain thrust reverser deployment

Suggested equipage enhancements:

- Stability alerting
- Real time dynamic performance prediction
- Aural and visual Go-Around decision aids
- Head-Down and Head-Up visual cues
- Real time dynamic performance prediction
- Aural and visual Go-Around decision aids
- Head-Down and Head-Up visual cues
- Flare guidance
- Real time dynamic stopping distance estimation
- Aural and visual deceleration devices usage aids
- Head-Down and Head-Up visual cues
- Deceleration alerting

Jobcard

PART I

Category	**Safety**	Sustainability	Implementation	Reference: AP001
Title	Assessment and reporting of runway surface conditions			
Proposed by	Secretariat/WG-PDP			
Problem Statement	Runway surface conditions have contributed to many safety events and investigations have revealed shortfalls in the accuracy and timeliness of assessment and reporting methods currently provided for in ICAO provisions and guidance material			
Specific Details (including impact statements)	While techniques for the measurement of runway friction provide useful information for runway surface friction maintenance purposes, they are not suitable in all weather conditions when the runway is contaminated and the information when used in reports could be misleading to pilots. Reports used by p… also need reports that are directly related to the perf… on and assessing conditions for reports. In addition, both… e terms "damp" and "slippery when wet", and how to use … e now available or under development, and need to be i… n and construction that aid friction and drainage. The			

…need reports that are directly related to the performance of the aircraft.

Runway surface conditions have contributed to n… d shortfalls in the accuracy and timeliness of assessment and reporting methods currently pro…

Action already in progress	Curr…		edition of PANS-Aerodromes	
Interdependencies/References	AN-…			
Required Action				Timescales (for deliverable)
1	Develop provisions for the reporting…		…endments to Annex 14 Volume 1 and other related Annexes Proposed amendments to PANS-Aerodromes and PANS-ATM	Q2/2014 Q2/2015
2	Develop guidance material for the assessment of runway surface conditions, including friction level and where contamination exists	AP/PASG	Proposed amendments to PANS-Aerodromes Proposed amendments to Doc 9137	Q2/2015 Q1/2016
3	Develop guidance material for the measurement and maintenance of runway friction	AP/PASG	Proposed amendments to PANS-Aerodromes Proposed amendments to Doc 9137	Q2/2015 Q1/2016

AIRBUS

Development of GRF SARPs

ADOP/1
17 Member States
7 IOs

SL Replies
59 States
6 IOs

Approval by
ANC
19 Members

Adoption by Council
36 Members States

2008 — Q1 2015 — Q2 2015 — Q1 2016

AIRBUS

Development of GRF SARPs (cont'd)

- Proposals for the amendment of Annexes 3; 6, Parts I and II; 8; 14, Volume I; 15; PANS-Aerodromes; PANS-ATM and PANS-AIM
- State and International organizations consultation from 29 May to 28 August 2015
- 59 States and 6 international organizations replied
- Adoption of amendment during the 207th Session of the Council (February 2016)
- Effective on 11 July 2016

- **Applicable on 5 November 2020**

AIRBUS

Friction Task Force subgroup

Regular subgroup meetings

Dec 2015 – Frankfurt

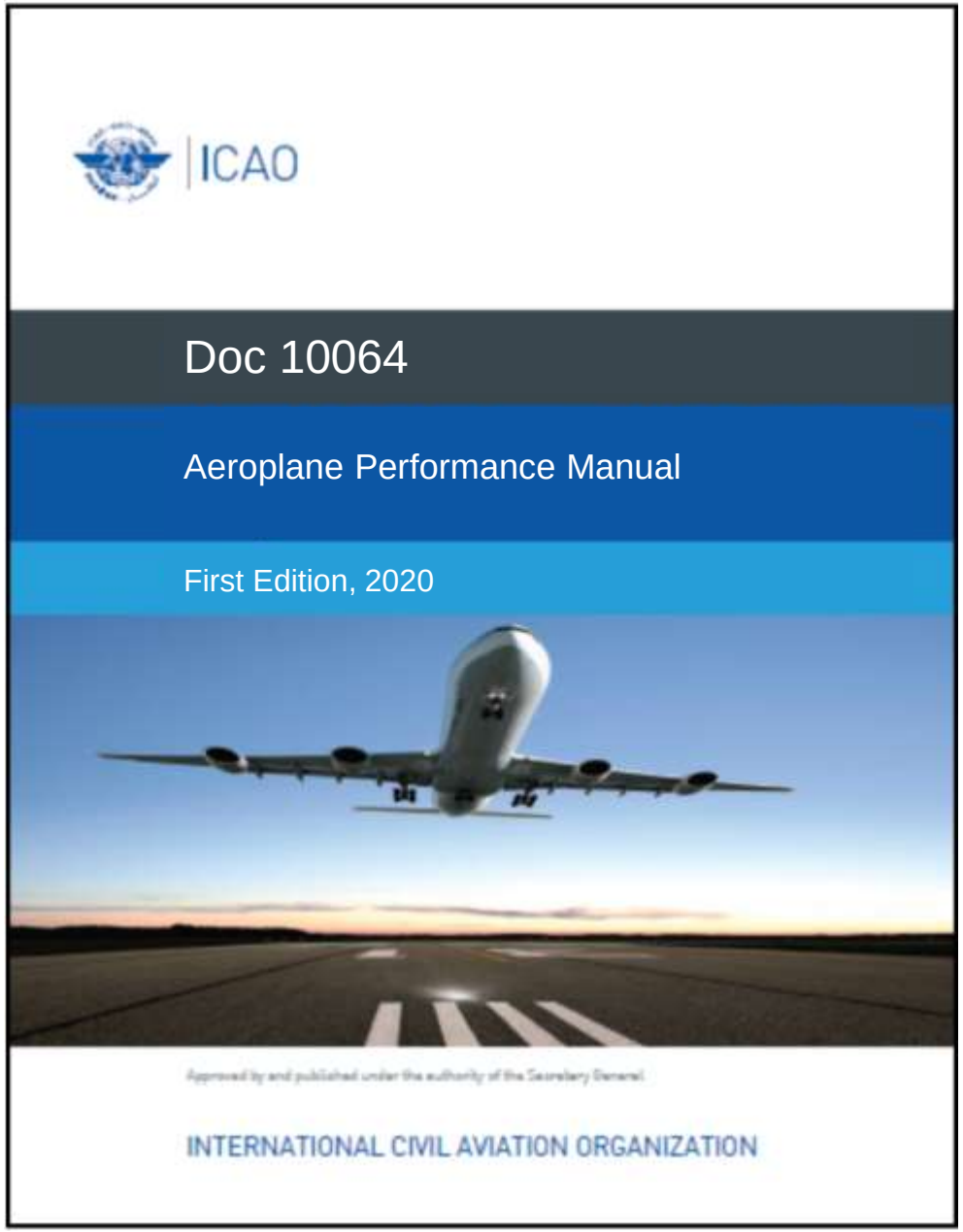
Mar 2016 – Cologne

Jun 2016 – Frankfurt

Sep 2016 – Toulouse

Feb 2017 – London

- adopted by FTF/18 in Mar 2017
- adopted by ADOP WG/3 Jul in 2017
- Master Document transferred to ICAO FLT OPS section on Aug 28, 2017
- “final” draft review July 2019
- “unedited version” publication early 2020



AIRBUS

Methodology – Runway Condition Report (RCR)

- Designed to report runway surface condition in a standardized manner
- Common language between all actors of the system: aircraft manufacturers, aerodrome operators, aircraft operators, ANSPs, AIM, MET and other stakeholders.
- Allow flight crew to accurately determine aeroplane take-off and landing performance
- Based on the impact on aeroplane performance of the runway surface condition

Runway Condition Report

a) **an agreed set of criteria** used in a consistent manner for runway surface condition assessment, aeroplane (performance) certification and operational performance calculation;

b) **a unique runway condition code (RWYCC)** linking the agreed set of criteria with the aircraft landing and take-off performance table, and related to the braking action experienced and eventually reported by flight crews;

c) **reporting of contaminant type and depth** that is relevant to take-off performance;

d) **a standardized common terminology and phraseology** for the description of runway surface conditions that can be used by aerodrome operator inspection personnel, air traffic controllers, aircraft operators and flight crew; and

e) **globally-harmonized procedures** for the establishment of the RWYCC with a built-in flexibility to allow for local variations to match the specific weather, infrastructure and other particular conditions.

Runway Condition Report (cont'd)

- The RCR consists of two sections:
  - aeroplane take-off and landing performance calculations; and
  - situational awareness of the surface conditions on the runway, taxiways and aprons.
- Aeroplane performance calculation section (for each runway third)
  - a one digit number identifying the runway condition code
  - the percentage coverage of the contaminant
  - the depth of loose contaminant
  - a harmonized term for runway surface condition description
- Situational awareness section (including, but not limited to): reduced runway length; presence of drifting snow, snowbanks, loose sand or chemical treatment on the runway; taxiway and apron conditions; State approved and published use of measured friction coefficient; and plain language remarks

Table II-1-3. Assigning a runway condition code (RWYCC)

Runway condition description	*Runway condition code (RWYCC)*
DRY	6
FROST **WET** (the runway surface is covered by any visible dampness or water up to and including 3 mm deep) **SLUSH** (up to and including 3 mm depth) **DRY SNOW** (up to and including 3 mm depth) **WET SNOW** (up to and including 3 mm depth)	5
COMPACTED SNOW (Outside air temperature minus 15 degrees Celsius and below)	4
WET ("Slippery wet" runway) **DRY SNOW** (more than 3 mm depth) **WET SNOW** (more than 3 mm depth) **DRY SNOW ON TOP OF COMPACTED SNOW** (any depth) **WET SNOW ON TOP OF COMPACTED SNOW** (any depth) **COMPACTED SNOW** (outside air temperature above minus 15 degrees Celsius)	3
STANDING WATER (more than 3 mm depth) **SLUSH** (more than 3 mm depth)	2
ICE	1
WET ICE **WATER ON TOP OF COMPACTED SNOW** **DRY SNOW OR WET SNOW ON TOP OF ICE**	0

AIRBUS

Information String

[Aeroplane performance calculation section]

09111400 09L 3/3/2 50/50/50 NR/NR/30 COMPACTED SNOW/COMPACTED SNOW/DRY SNOW ON TOP OF COMPACTED SNOW.

[Situational awareness section]

LDA RWY 22 REDUCED BY NOTAM TO 1150. DRIFTING SNOW. TWY B POOR.

Contents

AIRBUS

Stakeholder responsibilities

- **Aerodrome operators** assess the runway surface conditions, including contaminants, for each third of the runway length, and report them by means of a uniform runway condition report (RCR)
- **Air traffic services (ATS)** convey the information received via the RCR and/or special air-reports (AIREP) to end users (voice communications, ATIS, CPDLC)
- **Aeronautical information services (AIS)** provide the information received in the RCR to end users (SNOWTAM)
- **Aircraft operators** utilize the information in conjunction with the performance data provided by the aircraft manufacturers to determine if landing or take-off operations can be conducted safely and provide runway braking action special air-reports (AIREP)
- **Aircraft Manufacturers** provide the necessary performance data in the aeroplane flight manual

Simple Concept But Still Some Discussion Points

Up- and Downgrading at Takeoff

Treated Runways for Takeoff

Performance Assessment for Reporting by runway thirds / layered contaminants

Aircraft without data / business jets / general aviation

Wet runway reporting

Airborne phases for specific operations (short field/steep approach)

Classification of Contaminants in RCAM

- 15ºC Temperature threshold on Compacted Snow

Reverser accountability

AIRBUS

Challenges

Implementation

Training

Simultaneous Global Roll-Out

Willingness to change

Implementation task list

- Updating State's **regulatory framework**
  - updating National regulations (transposition of ICAO provisions to the national regulations)
  - filing differences / publishing significant differences in AIP (if required)
- Establishment of a **national implementation plan** that takes into account the modified ICAO provisions;
- Notification to affected aerodromes, ATS units and users of the new requirements and changes;
- **Training of inspectors** and oversight by the State of the implementation of regulations;
- Encourage the establishment of a **GRF Implementation Team** to ensure proper planning and coordination at the State and/or regional level.

AIRBUS

What can YOU do now?

- Gather all the information you can from new ICAO Circular 355/Annex 14/PANS ADR/ICAO GRF Symposium presentations/ICAO Doc 10064
- Plan a National (State) event or regional events
- Work closely with all stakeholders
- Promote ACI/IATA/IFATCA/IFALPA/ZODIAC/NBAA training courses all of which should eventually become CBT
- Update your AIP before Nov 2020
- Run a parallel test of the GRF this coming winter
- Ensure GA/BA and Military are also included in the communications

AIRBUS

Safe Landings!

AIRBUS

Thank you

AIRBUS