Global Reporting Format
Reporting of Runway Conditions Relevant to Aeroplane Performance

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Webinar on the Global Reporting Format (GRF)
10/03/2021
Effects on Performance

Braking Performance reduced
- Wheel to ground friction
- Aquaplaning

Acceleration reduced
- Contaminant drag
Performance Relevant Reporting

The Operational Need
- What is on the runway?
- Does it cover a significant portion?
- How deep is it?
- Are in-built qualities of the surface deficient?

The Assessment and Reporting Method
- The essential information
- Updated according relevant criteria
- When there is a significant change
Runway Condition Report (RCR)

- Aircraft Performance Section (mandatory)
  - Airport Designator
  - Assessment Date and Time
  - Lower Runway Designator
  - RWYCC per third
  - Coverage per third
  - Depth of contamination per third
  - Contaminant type per third
  - Width for which assessment of RWYCC applies

- Situational Awareness Section (optional)
  - Reduced Runway length
  - Drifting Snow
  - Loose Sand
  - Chemical Treatment
  - Snowbanks on Runway
  - Snowbanks on Taxiway
  - Snowbanks adjacent to Runway
  - Taxiway Conditions
  - Apron Conditions
  - Measured Friction
  - Free-text Remarks

GG EADBZQZX EADNZQZX EADSZQZX
070645 EADDYNYX
SWEA0151 EADD 02170055
SNOWTAM 0151
EADD 02170055 09L 5/5/5 100/100/100 NR/NR/NR WET/WET/WET
EADD 02170135 09R 5/2/2 100/50/75 NR/06/06 WET/SLUSH/SLUSH
EADD 02170225 09C 2/3/1 75/100/100 06/12/12 SLUSH/WET SNOW/WET SNOW 30
RWY 09L SNOWBANK R20 FM CL. RWY 09C ADJ SNOWBANKS. TWY B POOR. APRON NORTH POOR.
End to End System

Common Language
- Contaminant Types
- Runway Condition Codes
- Direct Input to Performance Assessment

Performance Relevance
- Depth Thresholds & Temperatures
- Significant Changes

Industry Consensus
## RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)

<table>
<thead>
<tr>
<th>Runway condition code</th>
<th>Runway surface description</th>
<th>Downgrade assessment criteria</th>
<th>Pilot report of runway braking action</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>DRY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>WET (the runway surface is covered by any visible dampness or water up to and including 3 mm depth)</td>
<td>Braking deceleration OR directional control is between Good and Medium.</td>
<td>GOOD TO MEDIUM</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Braking deceleration OR directional control is noticeable reduced for the wheel braking effort applied OR directional control is noticeably reduced.</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>3</td>
<td>WET (&quot;slippery wet&quot; runway)</td>
<td>Braking deceleration OR directional control is between Medium and Poor.</td>
<td>MEDIUM TO POOR</td>
</tr>
<tr>
<td>2</td>
<td>More than 3 mm depth of water: • STANDING WATER</td>
<td>Braking deceleration OR directional control is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.</td>
<td>POOR</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.</td>
<td>LESS THAN POOR</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Runway Condition Assessment Matrix (RCAM)

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<td>6</td>
<td>DRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>FROST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WET (The runway surface is covered by any visible dampness or water less than 3 mm deep)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLUSH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DRY SNOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WET SNOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Less than 3 mm depth:</td>
<td></td>
<td>Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.</td>
<td>GOOD</td>
</tr>
<tr>
<td></td>
<td>COMPACTED SNOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-15°C and Lower outside air temperature:</td>
<td></td>
<td>Braking deceleration OR directional control is between Good and Medium.</td>
<td>GOOD TO MEDIUM</td>
</tr>
<tr>
<td></td>
<td>WET (&quot;Slippery wet&quot; runway)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DRY SNOW or WET SNOW (Any depth) ON TOP OF COMPACTED SNOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 mm and more depth:</td>
<td></td>
<td>Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is</td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>DRY SNOW</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Coverage**

**OAT**

**Contaminants**

**Depth**

**AIREPs**

**“Other” Observations**

**Measured Friction**

**RWYCC**
Reportable Contaminants

- RCAM covers only conditions with deterministic performance effect
- Other conditions (sanding/chemicals) addressed by down-/upgrade mechanism
  - Driven by Mu / Other observations / AIREPs

Layered associated with top contaminant or Less Than Poor

Not in the RCAM

- COMPACTED SNOW
- DRY SNOW
- DRY SNOW ON TOP OF COMPACTED SNOW
- DRY SNOW ON TOP OF ICE
- FROST
- ICE
- SLUSH
- STANDING WATER
- WATER ON TOP OF COMPACTED SNOW
- WET
- WET ICE

- WET SNOW
- WET SNOW ON TOP OF COMPACTED SNOW
- WET SNOW ON TOP OF ICE
- CHEMICALLY TREATED
- LOOSE SAND
- MUD
- DUST
- SAND
- VOLCANIC ASH
- OIL
- RUBBER

Situational Awareness
Depth

• Any fluid contaminant below 3mm = WET
  – Well constructed and maintained pavement allows tire to drain fluid from footprint and maintain contact with runway – NO dynamic AQUAPLANING
• Any fluid contaminant above 3mm = CONTAMINATED
  – AQUAPLANING occurs above aquaplaning speed

• Dry Snow and Wet Snow are not fluids
  • Same 3mm depth threshold
  • Below 3mm loose contaminant is compressed into macrotexture allowing contact of tire and runway surface
  • Caution - Some evidence shows that conditions may become slippery even below 3mm
Coverage

• Coverage reported for each third
• Coverage reported as 25% above 10% observed coverage
• Contaminated in terms of performance above 25% coverage

It has been demonstrated that, if performance calculated for dry condition, regulatory/recommended margins cover concentration of contaminant in worst location.
Temperature

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Better Braking Action</th>
<th>Worse Braking Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compacted Snow</td>
<td>Below -15°C</td>
<td>Above -15°C</td>
</tr>
</tbody>
</table>

- -15°C based historical industry testing
- Probably very conservative

- Braking Action is more closely correlated with surface temperature than with OAT
Measured Friction

- ICAO provides no friction scale due to poor correlation with aircraft braking action.
- CFME used is based on a method approved by the State.

<table>
<thead>
<tr>
<th>Measured coefficient</th>
<th>Estimated braking action</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.40 and above</td>
<td>Good</td>
<td>5</td>
</tr>
<tr>
<td>0.39 to 0.36</td>
<td>Medium to good</td>
<td>4</td>
</tr>
<tr>
<td>0.35 to 0.30</td>
<td>Medium</td>
<td>3</td>
</tr>
<tr>
<td>0.29 to 0.26</td>
<td>Medium to poor</td>
<td>2</td>
</tr>
<tr>
<td>0.25 and below</td>
<td>Poor</td>
<td>1</td>
</tr>
</tbody>
</table>

- Used basically for **downgrade**
- **Upgrade** only with significant margins.

Differences with Aircraft:
- Tire Size
- Tire Load
- Tire Press
- Speed
- Slip Ratio
- Drag
Robustness to Misreported RWYCC

• Pilots are encouraged to apply 15% distance margin to distance assessment at time of arrival

• Computation not systematically robust to optimistic classification by 1 RWYCC

• Particular attention required for transition
  • Dry to Wet (6 to 5)
  • Wet to Standing water (5 to 2)
  • To Poor or Less Than Poor (1 or 0)
Transition Damp to Wet to Slippery Wet

- Why is “Damp” now “Wet”? An example…
  - Airbus A320 & A350 Flight Tests on runway at commercial airport in France
  - Light to Medium Rain, Runway reported Damp
  - Runway surface fulfills new construction criteria according to CFME
  - Aircraft data identifies substandard surface
Performance at Time of Landing

- In-flight LDG DIST
- V<sub>APP</sub>
- Operational
- V<sub>TD</sub>
- Reverse Thrust
- Autobrake

15% MARGIN

- STOP
- DRY - RWYCC 6
- GOOD – RWYCC 5
- GOOD TO MEDIUM – RWYCC 4
- MEDIUM – RWYCC 3
- MEDIUM TO POOR – RWYCC 2
- POOR – RWYCC 1

OAT

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Runway Condition Code (RHWYCC) – Direct Input to Computation

<table>
<thead>
<tr>
<th>Runway condition code</th>
<th>6 - DRY</th>
<th>5 - GOOD</th>
<th>4 - GOOD TO MEDIUM</th>
<th>3 - MEDIUM</th>
<th>2 - MEDIUM TO POOR</th>
<th>1 - POOR</th>
</tr>
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**6 - DRY**

- Reverse thrust, manual landing, VAPP=VLS without APPR COR.

**5 - GOOD**

- Corrections on Landing Distance (ft)
- Maximum MANUAL
- AUTOMATIC LOW

**4 - GOOD TO MEDIUM**

- Corrections on Landing Distance (ft)
- Maximum MANUAL
- AUTOMATIC LOW

**3 - MEDIUM**

- Corrections on Landing Distance (ft)
- Maximum MANUAL
- AUTOMATIC LOW

**2 - MEDIUM TO POOR**

- Maximum MANUAL
- AUTOMATIC LOW

**1 - POOR**

- Maximum MANUAL
- AUTOMATIC LOW

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Impact on Dispatch

• Nominally, dispatch is unchanged
• Dry runway dispatch distances systematically longer than LDTA
• Wet runway also, if reverse thrust is available
• Contaminated runway dispatch distances by construction shorter than LDTA
• EASA rules give exemptions for Dry and Wet (grooved/PFC)
  – Computation only in case of changes
    – Runway
    – Weather/Surface condition
    – Failures with performance impact
• Systematic approach
  – Crosscheck Dispatch with LDTA before every flight
  – Calculate in-flight only in case of changes
Impact on Takeoff

• Takeoff performance for contaminated surfaces
  – Available in line with EASA AMC 25.1591
  – Some RCAM contaminant types missing
  – Downgraded RWYCC in combination with fluid contaminants problematic

• Industry working on operational solutions
  – Double input of Contaminant Type and Depth + RWYCC
  – Recommendation to provide downgraded performance
Benefits for Operators

- Harmonized Global Standard
- Easier to understand than current SNOWTAM
- Direct Relation to Operational Procedures and Performance
- Improved Reporting Relevance and Timeliness
- Better situation awareness for Pilots
- Same information on RCR/SNOWTAM, ATIS, ATC
- AIREPs for continuous observation of changes
Aeroplane Performance Manual

• Introduction to Operations on Contaminated Runways
• 4 Flight-Phase oriented Chapters
  – Take-off
  – En-Route
  – Landing
  – Missed Approach

• Clear Focus on GRF

• Other information considered as non-controversial
• Based on existing national guidance and practices

• Now available on ICAO Store