Runway Weather Information Systems

State of the art and main issues for standardization

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BACKGROUND

- Challenge: prevent runway excursions at landing and take-off
**The Global Reporting Format (GRF)**

- **Challenge:** prevent runway excursions at landing and take-off

- **Objective:** reliable, standardized assessments of the runway surface condition
  - Contamination type
  - Contamination depth
  - Coverage
  - Aircraft braking action

- A new, worldwide ICAO regulation starting from November 2020

### Runway Condition Assessment Matrix (RCAM)

<table>
<thead>
<tr>
<th>Runway condition code</th>
<th>Runway surface description</th>
<th>Assessment criteria</th>
<th>Downgrade assessment criteria</th>
<th>Final report of runway braking advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>DRY</td>
<td></td>
<td></td>
<td>GOOD</td>
</tr>
<tr>
<td>5</td>
<td>FROST (Frost on runway surface)</td>
<td></td>
<td></td>
<td>GOOD TO MEDIUM</td>
</tr>
<tr>
<td>4</td>
<td>-5°C and lower outside air temperature:</td>
<td>COMPACTED SNOW</td>
<td></td>
<td>GOOD TO MEDIUM</td>
</tr>
<tr>
<td>3</td>
<td>WET (wet runway)</td>
<td>DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW</td>
<td></td>
<td>MEDIUM TO POOR</td>
</tr>
<tr>
<td>2</td>
<td>-3°C and lower outside air temperature:</td>
<td>COMPACTED SNOW</td>
<td></td>
<td>MEDIUM TO POOR</td>
</tr>
<tr>
<td>1</td>
<td>ICE</td>
<td>WATER ON TOP OF COMPACTED SNOW</td>
<td>WET SNOW or WET SNOW ON TOP OF ICE</td>
<td>POOR</td>
</tr>
<tr>
<td>0</td>
<td>WET ICE</td>
<td>WATER ON TOP OF COMPACTED SNOW</td>
<td>WET SNOW or WET SNOW ON TOP OF ICE</td>
<td>LESS THAN POOR</td>
</tr>
</tbody>
</table>
RUNWAY SURFACE CONDITION ASSESSMENTS

• Today:

- Visual inspections, ruler measurements
- 30’ runway closure to assess runway surface condition
RUNWAY SURFACE CONDITION ASSESSMENTS

• Tomorrow?

  - Mobile sensors
  - Embedded sensors
  - Aircraft data
  - Algorithms

  - Automatic reliable assessments
Road sensors: state of the art

- In 2017, STAC studied weather contamination sensors:
  - In lab and on-site tests of 3 mobile sensors
  - In lab tests of 2 embedded sensors
ROAD SENSORS: STATE OF THE ART

• Main conclusions
  - No sensor could discriminate between 8 contaminants
  - Embedded sensors have a too long response time (about 40’) for operational use
  - Mobile sensors are not accurate and repeatable enough for airport use
  - Water depth assessments are strongly affected by chemical treatment
SPACE AND TIME COVERAGE

• One of the most important issues
  - Continuous reliable assessment of a runway for each runway third
  - Continuous but localized measurement (embedded sensors) + one-time but track measurements (mobile sensors) + air traffic related measurement (aircraft data)

• Combination of various systems?
  - Sensors
  - Physical models
  - Optical evaluations
  - Artificial intelligence
SPACE AND TIME COVERAGE

- Example: OPHELIA

Rainfall predictions + terrain models = water accumulations assessment

Test campaigns at LFLL (Lyon) airport
STANDARDIZATION

• Objectives
  ➢ Understand airport needs to be sure that standards are relevant
  ➢ Determine technical limitations of current technologies
  ➢ Make sure that systems reach minimum level of performance

• Standardization efforts

  **WG-109 RWIS** *(chaired by STAC)*

  **E-17 Vehicle/Pavement Systems**
STANDARDIZATION

• Main topics

  ➢ Common terminology
    o Between different technologies
    o Between human operators and technologies

  ➢ Use cases and performance requirements, depending on:
    o Climate conditions
    o Airports needs and uses
    o Facility of runway closure

  ➢ Performance assessments procedures
    o Repeatability, accuracy
    o Reference contamination and reference values
STANDARDIZATION

• Key stakeholders
  ➢ Airport operators
  ➢ Airlines
  ➢ Aircraft manufacturers
  ➢ Pilots
  ➢ Sensors manufacturers
  ➢ Systems integrators
  ➢ Civil aviation authorities
PRÉPARONS LE CIEL DE DEMAIN

2035

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