

# Seminar on Implementation of the New Global Reporting Format (GRF) for Runway Surface Conditions

## Runway Condition Assessment Matrix (RCAM) Development/Background GRF Methods for Assessing and Reporting Runway Surface Conditions

Presented to: ICAO Africa Regional Seminar, Ghana

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**Federal Aviation  
Administration**



## •Regulatory Authorities

- FAA (Airports, Flight Standards, Certification, NOTAMS, Rulemaking, Legal)
- ICAO
- Transport Canada
- Brazilian Certification Authority
- EASA (Limited Participation)



## •Other Organizations

- Air Transport Association
- Airline Pilots Association
- Airports Council International
- Allied Pilots Association
- National Air Carrier Association
- National Business Aviation Association
- National Transportation Safety Board
- Neubert Aero Corporation
- Regional Airline Association
- Southwest Airlines Pilot Association
- Allied Pilots Association



## •Airplane Operators

### •*Part 121*

- ABX Air
- Alaska
- American Eagle
- American
- Continental
- Delta
- Express Jet
- Federal Express
- Northwest
- Pinnacle
- Southwest
- United
- UPS
- US Airways



## •Airports

- Chicago Airport System
- Cherry Capital
- Denver International
- Grand Rapids Regional
- Minneapolis/St. Paul Airport System



## •Airplane Operators

### •*Part 91-K/125/135*

- Alpha Flying, Inc
- Bombardier Flexjet
- Chantilly Air
- Flight Works
- Jet Solutions
- Conoco Phillips Alaska
- Net Jets
- Pogo Jet, Inc



## •Airplane Manufacturers

- Airbus
- Boeing
- Bombardier
- Cessna
- Eclipse
- Embraer
- Gulfstream
- Hawker



# TALPA ARC Recommendations

- **Methods for assessing runway conditions**
- **Standardized reporting of runway conditions through airport operators, the NOTAM system, and ATC agencies**
- **Reporting of braking action by pilots**
- **Airplane performance data**
- **Before landing/departing performance assessments**
- **Standardized condition reports and terminology**



# Runway Condition Assessment Matrix

## RCAM ICAO DOC9981 PANS Aerodromes Part II (Table 11-1-5)

## Airport Operator RCAM Version

Table 5 – Runway condition assessment matrix (RCAM)

Runway condition assessment matrix (RCAM)			
Assessment criteria		Downgrade assessment criteria	
Runway condition code	Runway surface description	Aeroplane deceleration or directional control observation	Pilot report of runway braking action
6	• DRY	---	---
5	• FROST • WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)  <i>Up to and including 3 mm depth:</i> • SLUSH • DRY SNOW • WET SNOW	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD
4	<i>-15°C and Lower outside air temperature:</i> • COMPACTED SNOW	Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM
3	• WET ("Slippery wet" runway) • DRY SNOW or WET SNOW (Any depth) ON TOP OF COMPACTED SNOW <i>More than 3 mm depth:</i> • DRY SNOW • WET SNOW <i>Higher than -15°C outside air temperature:</i> • COMPACTED SNOW	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
2	<i>More than 3 mm depth of water or slush:</i> • STANDING WATER • SLUSH	Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR
1	• ICE <sup>2</sup>	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	POOR
0	• WET ICE <sup>2</sup> • WATER ON TOP OF COMPACTED SNOW <sup>2</sup> • DRY SNOW or WET SNOW ON TOP OF ICE <sup>2</sup>	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR

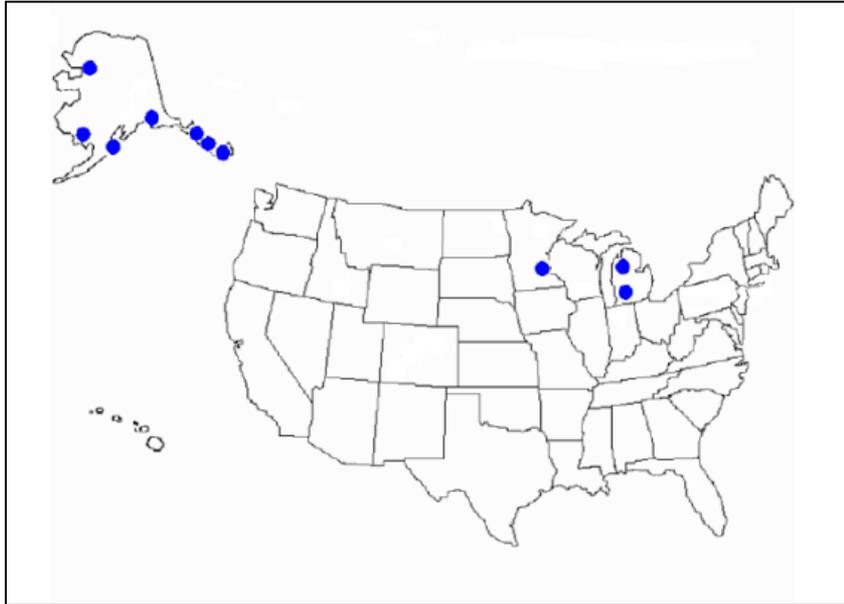
Assessment Criteria		Downgrade Assessment Criteria		
Runway Condition Description	Code	Mu (μ) <sup>1</sup>	Vehicle Deceleration or Directional Control Observation	Pilot Reported Braking Action
• Dry	6	40 or Higher	---	---
• Frost • Wet (Includes Damp and 1/8 inch depth or less of water)  <i>1/8 inch (3mm) depth or less of:</i> • Slush • Dry Snow • Wet Snow	5		Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	Good
<i>5° F (-15°C) and Colder outside air temperature:</i> • Compacted Snow	4	39	Braking deceleration OR directional control is between Good and Medium.	Good to Medium
• Slippery When Wet (wet runway) • Dry Snow or Wet Snow (Any depth) over Compacted Snow  <i>Greater than 1/8 inch (3mm) depth of:</i> • Dry Snow • Wet Snow  <i>Warmer than 5° F (-15°C) outside air temperature:</i> • Compacted Snow	3	10 to 30	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	Medium
<i>Greater than 1/8 (3mm) inch depth of:</i> • Water • Slush  • Ice <sup>2</sup>	2	29 to 21	Braking deceleration OR directional control is between Medium and Poor.  Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	Medium to Poor  Poor
• Wet Ice <sup>2</sup> • Slush over Ice <sup>2</sup> • Water over Compacted Snow <sup>2</sup> • Dry Snow or Wet Snow over Ice <sup>2</sup>	0	20 or Lower	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	Nil

<sup>1</sup> Runway surface temperature should preferably be used where available.

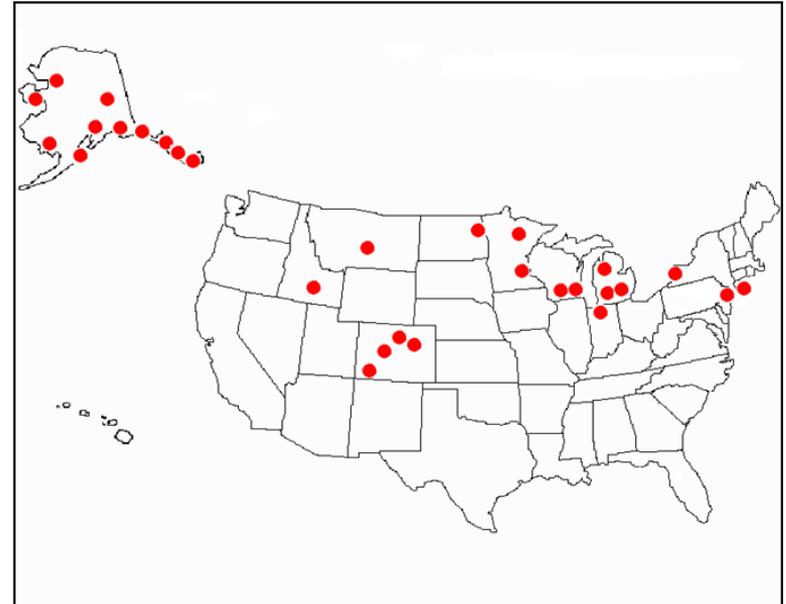
<sup>2</sup> The aerodrome operator may assign a higher runway condition code (but no higher than code 3) for each third of the runway, provided the procedure in paragraph 1.1.3.15 is followed.



## First Validation Winter 2009-2010



## Second Validation Winter 2010-2011



# Standardized Contaminant List

<b>DRY</b>	<b>WET SNOW</b> (more than 3 mm depth)
<b>FROST</b> <b>WET</b> (the runway surface is covered by any visible dampness or water up to and including 3 mm deep) <b>SLUSH</b> (up to and including 3 mm depth) <b>DRY SNOW</b> (up to and including 3 mm depth) <b>WET SNOW</b> (up to and including 3 mm depth)	<b>DRY SNOW ON TOP OF COMPACTED SNOW</b> (any depth) <b>WET SNOW ON TOP OF COMPACTED SNOW</b> (any depth) <b>COMPACTED SNOW</b> (outside air temperature above minus 15 degrees Celsius)
<b>COMPACTED SNOW</b> (Outside air temperature minus 15 degrees Celsius and below)	<b>STANDING WATER</b> (more than 3 mm depth) <b>SLUSH</b> (more than 3 mm depth)
<b>WET</b> (“Slippery wet” runway) <b>DRY SNOW</b> (more than 3 mm depth)	<b>ICE</b> <b>WET ICE</b> <b>WATER ON TOP OF COMPACTED SNOW</b> <b>DRY SNOW OR WET SNOW ON TOP OF ICE</b>



# Defined Pilot Reported Braking Action Terminology

<i>Pilot report of runway braking action</i>	<i>Description</i>	<i>Runway condition code (RWYCC)</i>
N/A		6
GOOD	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal	5
GOOD TO MEDIUM	Braking deceleration OR directional control is between good and medium	4
MEDIUM	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced	3
MEDIUM TO POOR	Braking deceleration OR directional control is between medium and poor	2
POOR	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced	1
LESS THAN POOR	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain	0





# RCAM Similarities and Differences

Item	FAA RCAM	ICAO RCAM
RwyCC, Runway Surface Descriptions	Same	Same
Runway Surface Descriptions Modifiers	<ul style="list-style-type: none"> <li>• 1/8 inch depth or less of water</li> <li>• Warmer than -15 degree centigrade</li> </ul>	<ul style="list-style-type: none"> <li>• Water up to and including 3mm depth</li> <li>• Higher than -15 degree centigrade</li> </ul>
RwyCC = 0	Nil	Less Than Poor
Downgrades Allowed	Yes	Yes
Upgrades Allowed	0 or 1 may be upgraded to 3 Criteria provided	0 or 1 may be upgraded to 3 Criteria provided
Friction Column	Yes, “Soft” guidance for downgrades	No

# When is the RCAM Applicable?

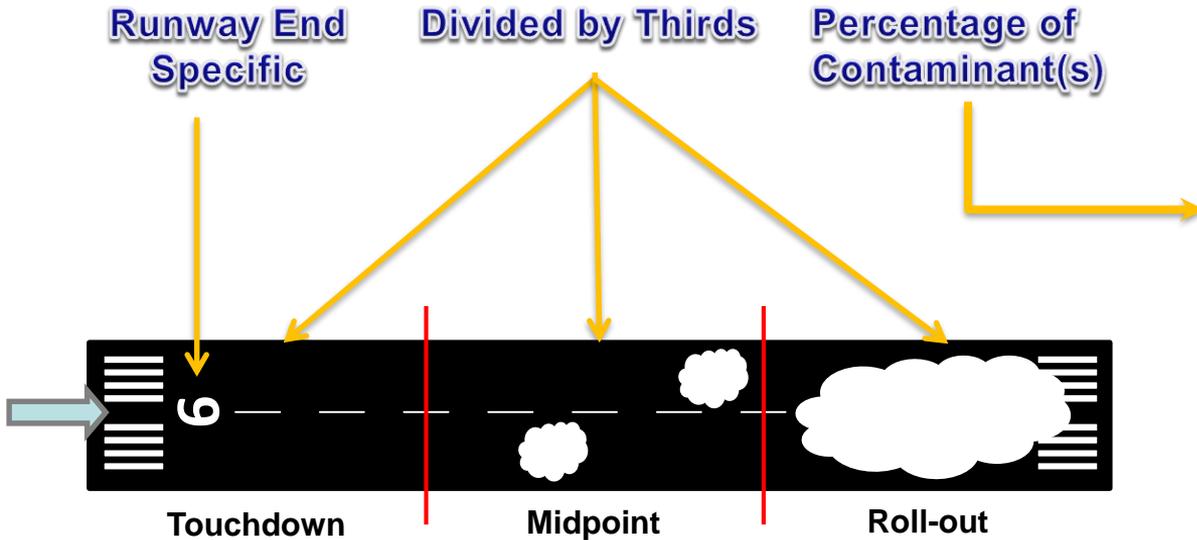
- **Only on Paved Runways**
  - Not on Turf, Dirt, Gravel, or Water Runways,
- **Runway Condition Codes are NOT generated on Taxiways, Ramps, Heliports, etc...**
- **Codes are generated only when the total runway surface (or cleared width) is contaminated by more than 25%.**



# Runway Condition Codes

- **Why is it better than Mu?**
  - Less subjective
  - More substantive
- **What does it mean to the Pilot?**
  - Location, type, and depth of contaminant(s).
  - Estimated aircraft braking action to be anticipated.
  - Calculative performance data.

# Contaminant Visual



Coverage	Range
Not Reported	Less than 10%
25%	10% thru 25%
50%	26% thru 50%
75%	51% thru 75%
100%	76% thru 100%



# Standards and Guidance Changes

- **Runway closure triggers, friction testing subjectivity**
- **Published Reportable Contaminant List**
- **Standardized terminology and reporting methods**
- **Expanded NOTAM System for filing Field Condition NOTAMs**  
**(similar to SNOTAMs)**
  - Sortable FICON Information for end users
  - Domestic and International Compatibility
  - Real-time / Instantaneous reporting.



# Standards and Guidance Changes

- No longer reporting friction values (Mu).
- No longer reporting vehicle braking for Runway conditions.
- Percentage Based Reporting
- Reporting runway conditions in thirds.



# Reporting Airport Condition Information

- **Runway Condition Codes are disseminated via one or more of the following methods:**
  - Federal NOTAM System,
  - Airport Traffic Control Facility (corresponding Tower, Center, Tracon, etc.);
  - Flight Service Station (FSS) (as applicable); and
  - Directly from airport operator via Common Traffic Advisory Frequency (as applicable).



# Example of Global Reporting Format

[COM header and Abbreviated header] (Completed by AIS)

GG EADBZQZX EADNZQZX EADSZQZX  
 070645 EADDYNYX  
 SWEA0151 EADD 02170055  
 SNOWTAM 0151

[Aeroplane performance calculation section]

EADD 02170055 09L 5/5/5 100/100/100 NR/NR/...R WET/WET/WET  
 EADD 02170135 09R 5/4/3 100/50/75 NR/06/06 /ET/SLUSH/SLUSH  
 EADD 02170225 09C 3/2/1 75/100/100 06/12/12 SLUSH/WET SNOW/WET SNOW

[Situational Awareness section]

RWY 09L SNOWBANK R20 FM CL. RWY 09R ADJ SNOWBANKS. TWY B POOR.  
 APRON NORTH POOR.

- Airport
- Runway Designator (lower direction only)

- RWYCC by runway thirds

- % coverage by runway thirds

- Depth by runway thirds

- Contam description by runway thirds

Source: PANS Aerodrome



# SNOWTAM & FICON Comparison

## GRF SNOWTAM

**KXXX** 02170225 16L 5/5/5 100/100/100 NR/NR/NR WET/WET/WET  
**KXXX** 02170135 16R 5/2/2 100/50/75 NR/06/06 WET/SLUSH/SLUSH  
**KXXX** 02170055 16C 2/3/1 75/100/100 06/12/12 SLUSH/WET SNOW/WET SNOW

## FAA Equivalent FICONS

**XXX** RWY 16L FICON 5/5/5 100 PRCT WET  
**XXX** RWY 16R FICON 5/2/2 100 PRCT WET, 50 PRCT 1/4 IN SLUSH, 75 PRCT 1/4 IN SLUSH  
**XXX** RWY 16C FICON 2/3/1 75 PRCT 1/4 IN SLUSH, 100 PRCT 1/2 IN WET SNOW, 100 PRCT 1/2 IN WET SNOW  
**XXX** RWY 34R FICON 5/5/5 100 PRCT WET  
**XXX** RWY 34L FICON 2/2/5 75 PRCT 1/4 IN SLUSH, 50 PRCT 1/4 IN SLUSH, 100 PRCT WET  
**XXX** RWY 34C FICON 1/3/2 100 PRCT 1/2 IN WET SNOW, 100 PRCT 1/2 IN WET SNOW, 75 PRCT 1/4 IN SLUSH



# FAA FICON NOTAM versus GRF SNOWTAM

## Performance Information Differences

Item	FAA FICON NOTAM	ICAO GRF SNOWTAM
Airport RWY Designator	<ul style="list-style-type: none"> <li>• Airport - FAA 3 letter code</li> <li>• Runway – Information for active runway</li> </ul>	<ul style="list-style-type: none"> <li>• Airport – ICAO 4 letter code</li> <li>• Runway – Lowest numbered direction only</li> </ul>
RWYCC	Assigned when 25% of the entire runway contaminated	Assigned when 25% of any third is contaminated
Percentage, Depth	Part of contaminant/wet descriptor	Separate input by thirds with slash separator prior to contaminant/descriptor
Runway Contaminant Wet Descriptor	<ul style="list-style-type: none"> <li>• Two contaminants per third may be included</li> <li>• Includes % and depths</li> <li>• Wet FICON NOTAM may be published</li> </ul>	<ul style="list-style-type: none"> <li>• One contaminant per third only</li> <li>• Wet only reported in conjunction with contaminant</li> </ul>
NOTAM origination	Electronic NOTAM manager	Process in individual state
Friction Usage	<ul style="list-style-type: none"> <li>• Not reported</li> <li>• Used for downgrade/upgrade</li> </ul>	<ul style="list-style-type: none"> <li>• Not reported</li> <li>• Used for downgrade/upgrade</li> <li>• May be reported in Remarks</li> </ul>
Slippery Wet	Entire runway reported slippery wet	Slippery wet may be reported by third



# Example: Aircraft Operator Perspective



# Airplane Performance

- **FAA Goal – Data Basis**
  - Same basis for all manufacturers and operators
    - One set of assumptions when manufacturers create data
    - One set of guidelines for operators
  - ICAO adopted same time-of-arrival landing performance basis
    - Manufacturer supplied performance data is based on the same assumptions (one minor exception)
    - Operator guidance the same



# Airplane Performance

- **Two important parts**

- Manufacturer data to support implementation of TALPA
  - Takeoff – non-issue, AC's consistent as possible with EASA contaminated runway certification requirements (AC 25-31)
  - Landing – Time of Arrival performance data (AC 25-32)
- Guidance for operators on implementation of performance data
  - Safety Alert For Operators
    - Operational guidance for TALPA operations - SAFO 19001
      - » Guidance also in FAA Order 8900
    - Recommendations for ops in heavy rain - SAFO 15009



# Airline Operating Manuals

## Landing

Inflight		Landing Data						
5.4.1		RCC	6	5	4	3	2	1
Pressure Altitude Feet	Gross Weight 1000 lb	DRY	GOOD	GOOD to MEDIUM	MEDIUM	MEDIUM to POOR	POOR	
Sea Level	100	3770	4330	4990	5590	6140	10260	
	110	3880	4460	5220	5820	6480	10720	
	120	4070	4670	5450	6050	6830	11180	
	130	4230	4860	5680	6280	7170	11640	
	137.7	4360	5020	5860	6460	7440	12000	
	140	4410	5070	6130	6800	8030	13620	
	150	4860	5360	6370	7230	8380	14680	
	166.4	5440	5940	6920	7980	9330	15690	
2000	100	3890	4480	5430	6070	6820	11180	
	110	4020	4620	5660	6300	7260	11640	
	120	4220	4860	5890	6530	7610	12100	
	130	4390	5050	6120	6760	7950	12560	
	140	4580	5270	6300	6940	8220	12920	
	150	4930	5670	6710	7470	8700	14540	
	160	5480	6310	7270	8170	9470	15570	
	166.4	5750	6610	7610	8510	9910	16610	
4000	100	4030	4830	5870	6560	7700	12100	
	110	4170	4790	6100	6790	8040	12560	
	120	4380	5040	6330	7020	8390	13020	
	130	4560	5250	6560	7250	8730	13480	
	137.7	4720	5420	6730	7420	9000	13840	
	140	4770	5490	9000	9570	10600	15460	
	150	5230	6020	9580	10260	11750	16490	
	166.4	6000	7000	10150	10950	12900	17530	
6000	100	4170	4800	6300	7040	8480	13020	
	110	4330	4980	6530	7270	8830	13480	
	120	4550	5230	6760	7500	9170	13940	
	130	4750	5460	6990	7730	9520	14400	
	137.7	4920	5660	7170	7910	9790	14760	
	140	4990	5740	9440	10050	11380	16380	
	150	5550	6380	10020	10740	12530	17410	
	166.4	6420	7380	10590	11430	13680	18450	
8500	100	4540	5360	6850	7680	9480	14170	
	110	4540	5220	7080	7870	9800	14630	
	120	4780	5500	7310	8100	10150	15090	
	130	5010	5760	7540	8330	10490	15550	
	137.7	5250	6030	7720	8510	10760	15910	
	140	5360	6170	9990	10650	12360	17530	
	150	5960	6860	10560	11340	13510	18560	
	166.4	6570	7550	11140	12030	14660	19600	
VAPP	VLS+10 VLS+15	+ 0 + 0	+ 0 + 0	+ 357 + 713	+ 381 + 762	+ 587 + 1173	+ 541 + 1081	
	per knot of TW	+110	+120	+140	+166	+209	+263	
	per 10° ABV ISA	+ 0	+ 0	+196	+242	+380	+564	
	No Reversers	+ 0	+ 0	+575	+759	+828	+2436	
	Autoland	+ 0	+ 0	+1035	+1058	+ 1208	+ 1173	



# Comments and Questions?

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**Office of Airport Safety & Standards**



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Administration**