



Tradewind Scientific

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Developing a Global RCR Solution: Lessons Learned

Symposium on Runway Surface Condition Assessment and Reporting

Paris, March 31st – April 1st 2016



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Introduction

- Leonard Taylor, President & CEO Tradewind Scientific
- Background as Scientist/Teacher, Environmental Officer with Transport Canada
- Founded Tradewind Scientific in 1980 with a focus on Airport Safety & Environmental issues
- Over 30 years experience using runway surface assessment equipment including the National Runway Friction Testing Program (100+ airports)
- Designed the TRACR II[®] Runway Condition Reporting Systems in 1986, now in service at 150+ airports across Canada, the U.S. and Europe.



Overview

- Runway condition reporting is both an art and a science
- Training, industry standards and best estimates
- Technical evaluation and objective measurement
- Combine in an effort to accurately and concisely describe runway surface condition



Why Are Runway Conditions Important?



- YVR (Vancouver)
- DC-10 Takeoff
- Engine Failure
- Limited Reverse Thrust
- No significant contaminant
- Good Runway Friction



Why Are Runway Conditions Important?



- YXT (Terrace, B.C.)
- BAe 146 Landing
- Low Visibility
- No Reverse Thrust
- Ice on surface
- Marginal Runway Friction





Why Are Runway Conditions Important?

LGA (LaGuardia), MD80 Landing, Contaminated Runway



Why Are Runway Conditions Important?

YYZ (Toronto), Dash 8 Landing, Contaminated Runway



The Four C's of Runway Condition Reporting

1. Correct
2. Complete
3. Current
4. Consistent





The Four C's of Runway Condition Reporting

1. Correct

- Trained & Experienced Personnel
- Defined Parameters
 - Contaminant Type, Depth and Extent
 - Friction
- Objective Measurement Tools









Friction Measurement Equipment



Original Saab-Scania
Friction Tester

Canadian Electronic
Decelerometer





Friction Measurement Equipment





Original Runway Friction Guidelines

Winter Testing Table from ICAO ANNEX 14

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



Runway Inspection Measurement Tools Sensor Fusion

- Airfield position (GPS)
- Ambient/surface temperature, humidity/dew point
- Continuous & spot friction devices
- Synchronized Database storage for later analysis

TSense

next-gen sensor technology

The screenshot shows a data dashboard with the following information:

2013/06/22 Date	43° 41.1107 N Latitude	114.0 m Altitude	23.0 °C Ambient	13.2 °C Dew Point
12:58:15 Z Time	079° 38.8732 W Longitude	60.0 km/h Speed	23.6 °C Surface	52 % Humidity

Map data:

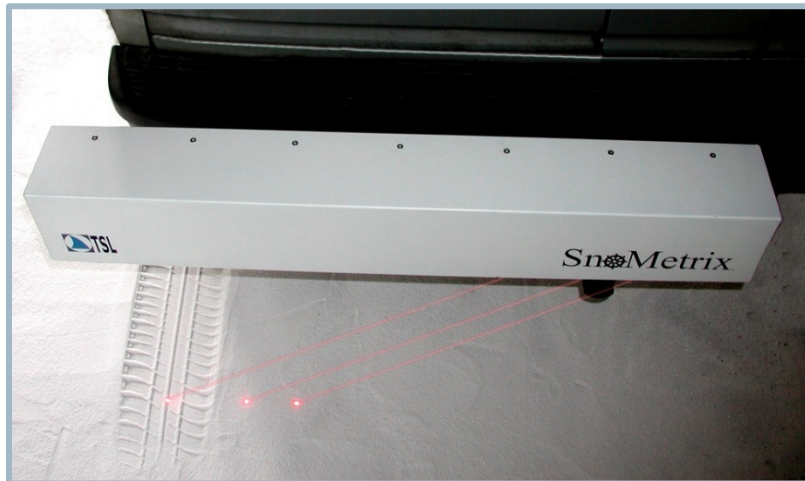
- Latitude: 43.683865
- Longitude: -79.64986
- Surface Temperature: 23.6 °C
- Humidity: 52%
- CRFI: 35

- GPS tracking
- ambient & surface temperature
- humidity & dew point
- CRFI/CFME
- database-backed
- searchable

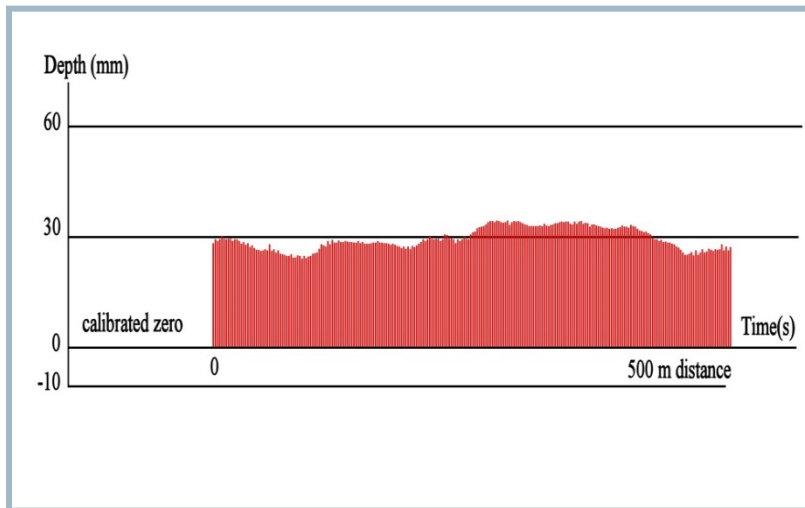


Runway Inspection Measurement Tools

Snow Depth Profiling



- Patented optical system measures continuous depth profiles of runway winter contaminants



- Stand-alone unit can be interfaced RCR systems



The Four C's of Runway Condition Reporting

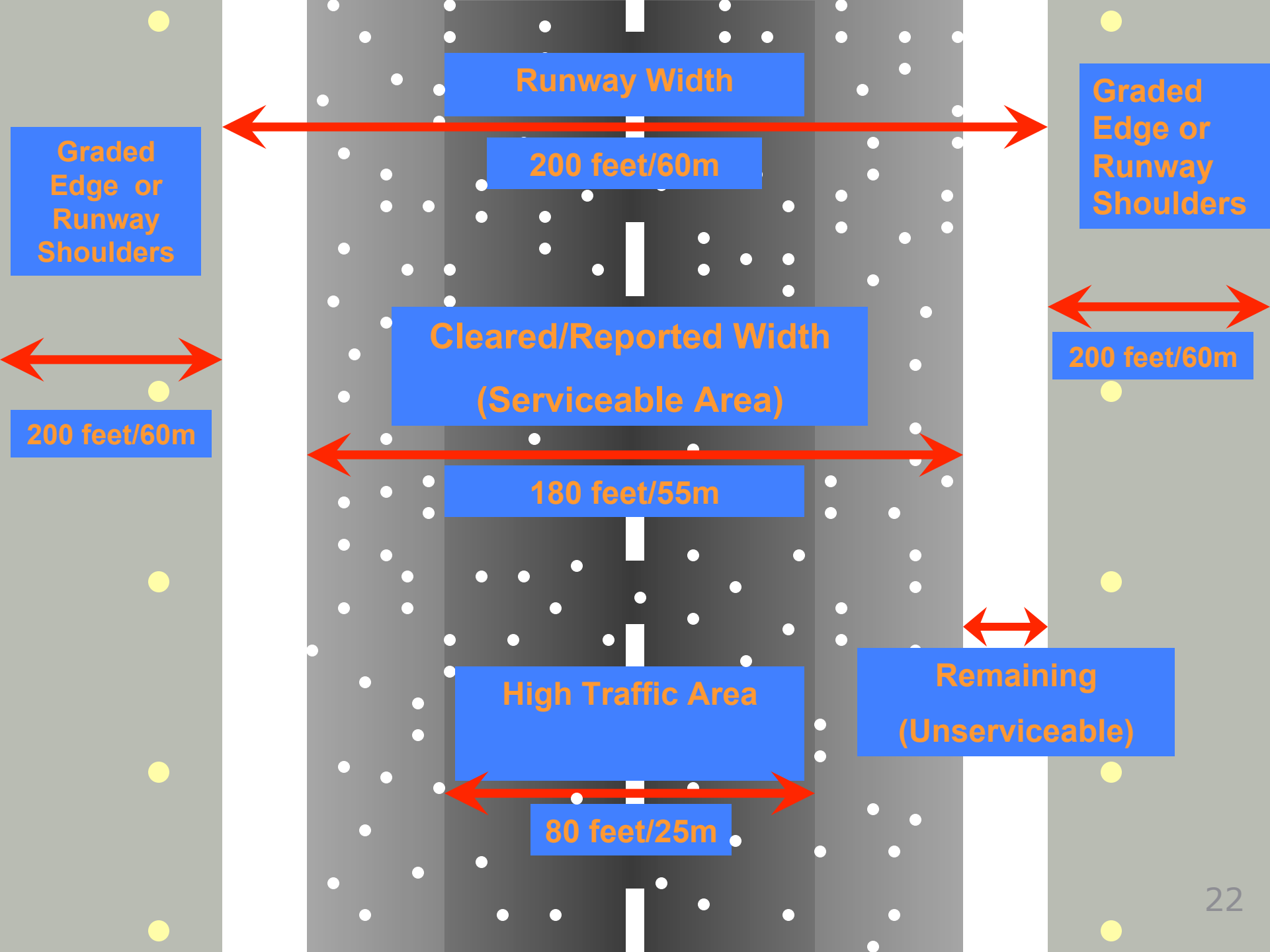
1. Correct

2. Complete











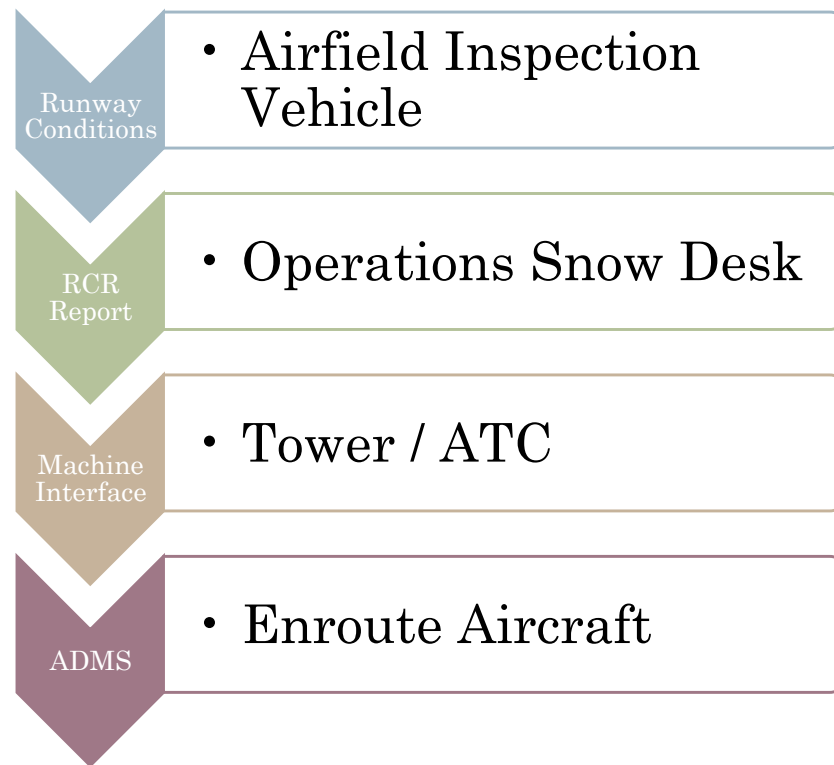
The Four C's of Runway Condition Reporting

1. Correct
2. Complete
3. **Current**





The Airport Winter Services Model





TORONTO - PEARSON

Creating Term File
2025/09/23 13:23

Lighting
Floor
Front
Condition Changing Priority
Control Previous Breach
Route 308 # 1
TRAC 3

Panasonic 079

MIVUD BRYTARE

VARNINGSLJUS AIRSIDE

VARNINGSLJUS VAG

ARBETSLJUS VANSTER

ARBETSLJUS HOGER

RA5444 NR1

FLYGRADIO

RA5444 NR2

OBICOM



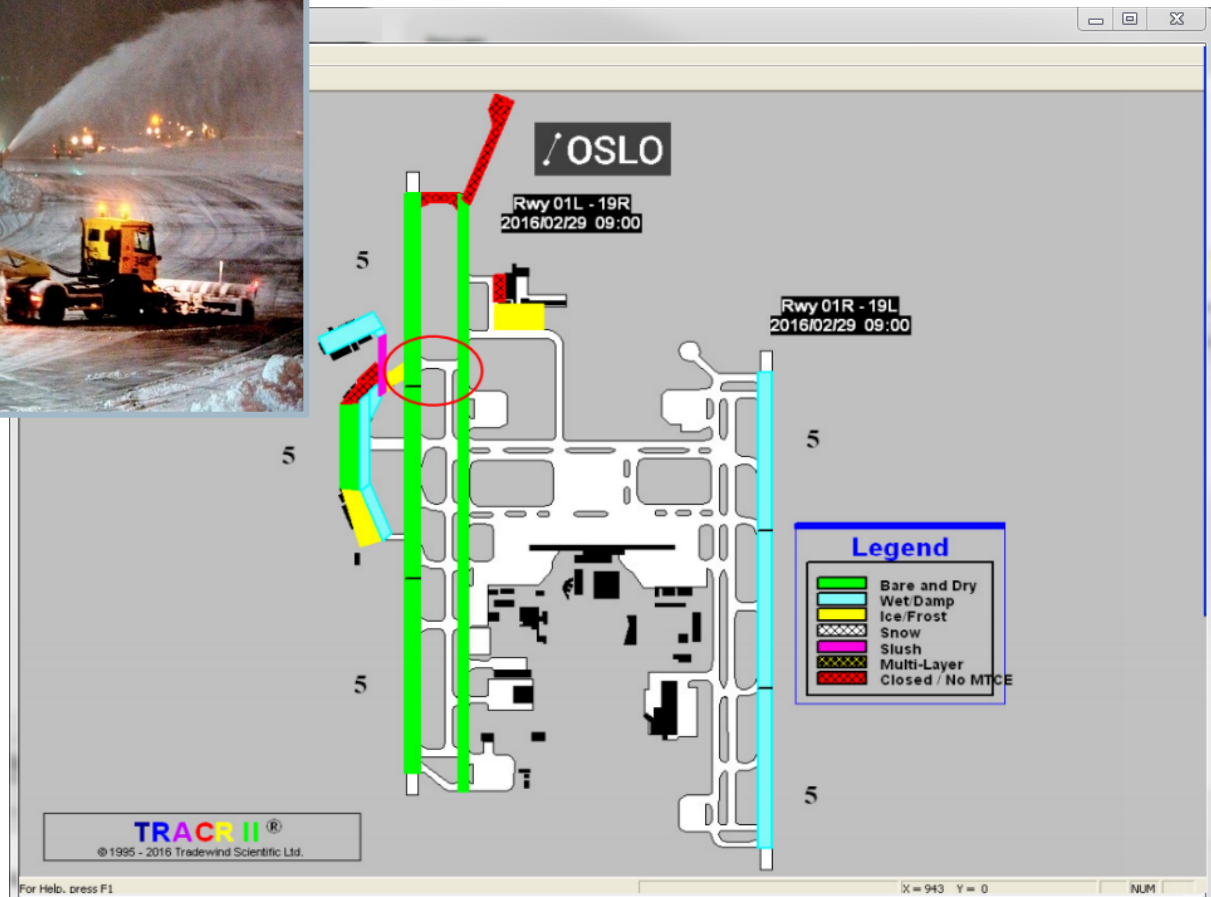
Reporting Frequency

- AMSCR are done:
 - A minimum of once every eight hours
 - If a significant change in the runway surface occurs
 - Following an incident or accident
- Routine AMSCR times should be published in your Airport Operation Manual





Integrated Airfield Inspection Systems – OSL (Oslo)





The Four C's of Runway Condition Reporting

1. Correct
2. Complete
3. Current
4. **Consistent**





Documents Driving Change

- Canada
 - TP 312 5th edition via AC 302-021 Issue 2
 - AC 300-005 Issue 5
 - AC 302-013 Issue 3
 - AC 302-017 Issue 2

- U.S.
 - N JO 7930.100 (cancelled)
 - AC 150/5200-30D (draft March 2016)

- Europe/ICAO
 - Eurocontrol
 - TALPA/ARC
 - ICAO AN 4/1.1.55-15/30 Amendment



Runway Condition Assessment Matrix

Assessment Criteria		Downgrade Assessment Criteria		
Runway Condition Description	Code	Mu (μ) 1	Vehicle Deceleration or Directional Control Observation	Pilot Reported Braking Action
<ul style="list-style-type: none"> Dry 	6	40 or Higher	---	---
<ul style="list-style-type: none"> Frost Wet (Includes damp and 1/8 inch depth or less of water) 1/8 inch (3mm) depth or less of: <ul style="list-style-type: none"> Slush Dry Snow Wet Snow 	5		Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	Good
-15°C and Colder outside air temperature: <ul style="list-style-type: none"> Compacted Snow 	4	39	Braking deceleration OR directional control is between Good and Medium.	Good to Medium
<ul style="list-style-type: none"> Slippery When Wet (wet runway) Dry Snow or Wet Snow (Any depth) over Compacted Snow Greater than 1/8 inch depth of: <ul style="list-style-type: none"> Dry Snow Wet Snow Warmer than -15°C outside air temperature: <ul style="list-style-type: none"> Compacted Snow 	3	30	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	Medium
Greater than 1/8 inch depth of: <ul style="list-style-type: none"> Water Slush 	2	29	Braking deceleration OR directional control is between Medium and Poor.	Medium to Poor
<ul style="list-style-type: none"> Ice ² 	1	21	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	Poor
<ul style="list-style-type: none"> Wet Ice ² Slush over Ice Water on top of Compacted Snow ² Dry Snow or Wet Snow over Ice ² 	0	20 or Lower	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	Nil



Towards a Global RCR Solution

Tradewind Scientific Ltd. TRACR II®



Canadian AMSCR



AIRCRAFT MOVEMENT SURFACE CONDITION REPORT
CANADIAN RUNWAY FRICTION INDEX (CRFI)

COMPTE-RENDU DE L'ÉTAT DES AIRES DE MOUVEMENT POUR AÉRONEFS
COEFFICIENT CANADIEN DE FROTTEMENT SUR PISTE (CRFI)

AIRPORT-AÉROPORT														REPORT NO - COMPTE RENDU N°			AVERAGE CRFI - CRFI MOYEN				
SURFACE CONDITION DATA - RENSEIGNEMENTS SUR L'ÉTAT DE LA SURFACE																					
RUNWAY PISTE	PORTION PARTIE	WIDTH LARGEUR	BARE & DRY NUÉ ET SÈCHE	BARE & WET NUÉ ET MOUILLÉE	LOOSE SNOW NEIGE POUDREUSE		COMPAC- TED SNOW NEIGE DURCIE	SNOW DRIFTS CONGÈRES		SLUSH/WET SNOW NEIGE FONDANTE/ NEIGE MOUILLÉE		FROST GVRE	ICE PATCHES PLAQUES DE GLACE	ICE CONTROL MATERIAL APPLIED AGENT DE FUSION EMPLOYÉ		REMARKS REFERS TO ANY SURFACE CONDITION WHETHER REMOVAL IS IN PROGRESS AND ESTIMATED COMPLETION TIME	OBSERVATIONS MENTIONNER TOUT ÉTAT DE LA SURFACE PRÉCISER S'IL Y A UN DÉBLAIEMENT EN COURS ET LE TEMPS D'ACHÈVEMENT ESTIMÉ	RUNWAY PISTE	AMBIENT TEMP. (°C) AMBIANTE	TOTAL RUNWAY AVERAGE MOYENNE POUR TOUTE LA PISTE	TIME ZULU HEURE ZULU
		FEET PIEDS	%	%	%	IN. POUCES	%	%	IN. POUCES	%	%	%	%	SAND SABLE	CHEMICAL CHIM.						
	CLEARED DÉGAGÉE																				
	REMAINING RESTANTE																				
	CLEARED DÉGAGÉE																				
	REMAINING RESTANTE																				
	CLEARED DÉGAGÉE																				
	REMAINING RESTANTE																				

NOTE: IF THE CLEARED PORTION OF THE RUNWAY IS OFF CENTER
THE REMAINING WIDTH ON BOTH SIDES IS TO BE REPORTED

À NOTER : SI LA PARTIE DÉGAGÉE DE LA PISTE N'EST PAS CENTRÉE, LA
LARGEUR RESTANTE DES DEUX CÔTÉS DOIT ÊTRE RAPPORTÉE.

TAXIWAYS AND APRONS	VOIES DE CIRCULATION ET AIRES DE TRAFIC																				

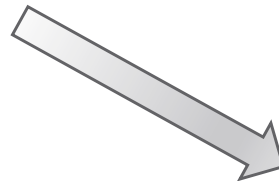
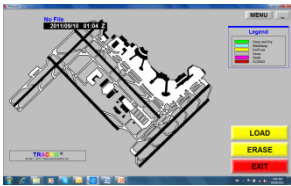
TAXIWAY/APRON
INFORMATION FOR
LOCAL
DISTRIBUTION
ONLY

LES DONNÉES
RELATIVES AUX
VOIES DE
CIRCULATION ET
AUX AIRES DE
TRAFIC SONT
RESERVES A LA
DIFFUSION
LOCALE
SEULEMENT

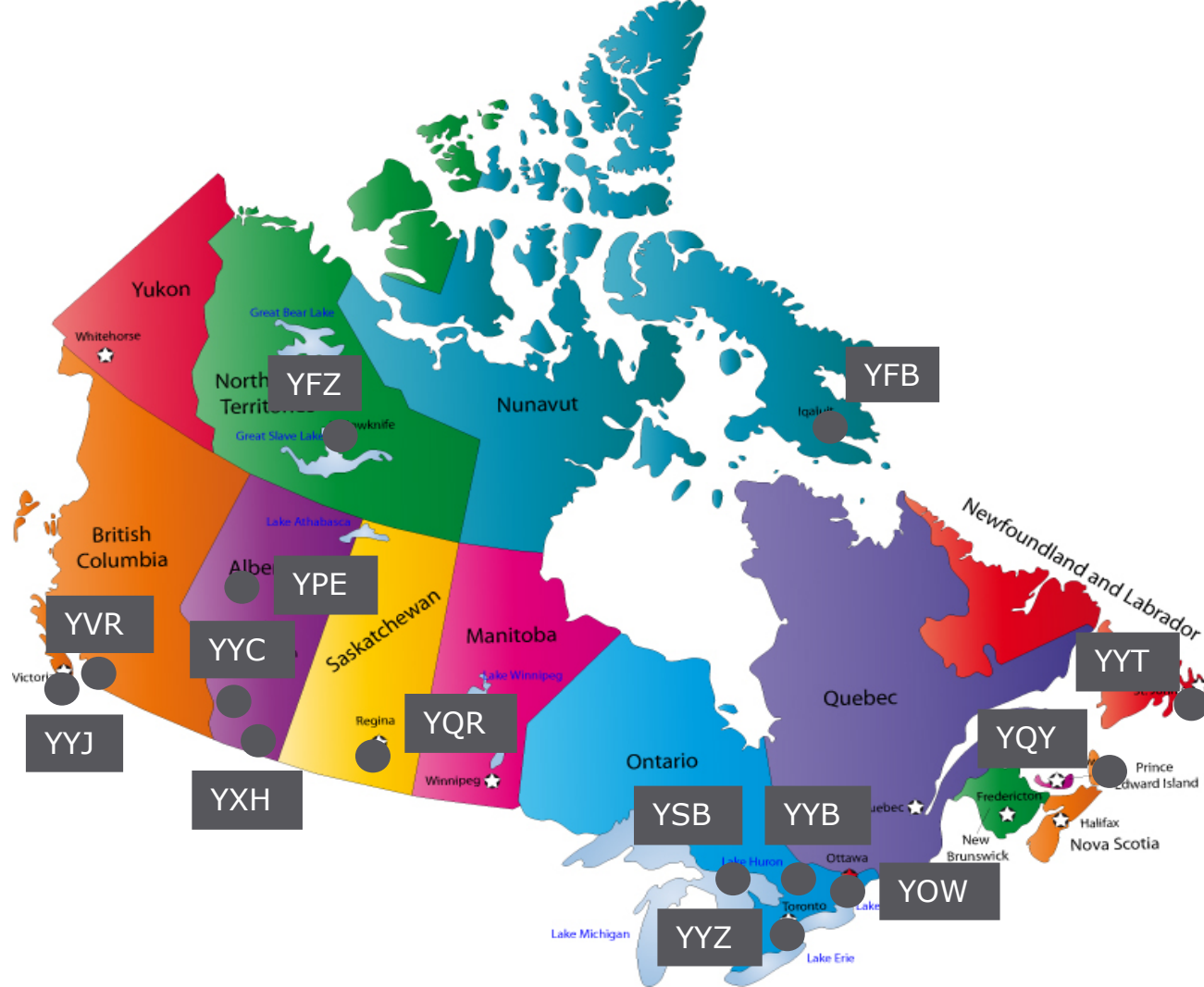
VOICE REPORT TO - COMPTE RENDU ORAL A	HOUR (LOCAL) HEURE (LOCALE)	DAY/JOUR	MONTH/MOIS	YEAR/ANNÉE	SIGNATURE
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Canada: TRACR II® NavLink Solution



Fax Backup



Digital Snowtam – Select Sites



ICAO SNOWTAM



(COM heading)	(PRIORITY INDICATOR)	(ADDRESSES)										⏪
	(DATE AND TIME OF FILING)	(ORIGINATOR'S INDICATOR)										⏪
(Abbreviated heading)	(SWAA* SERIAL NUMBER)	(LOCATION INDICATOR)	DATE/TIME OF OBSERVATION				(OPTIONAL GROUP)				⏪ (
	S W * *											

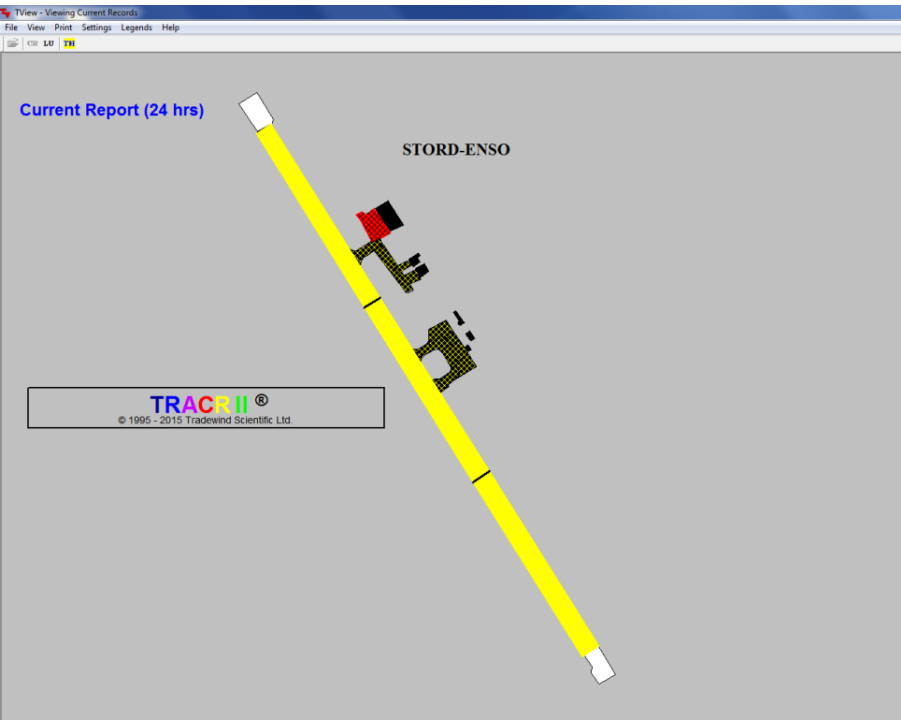
SNOWTAM	(Serial number)	→
(AERODROME LOCATION INDICATOR)	A)	→
(DATE/TIME OF OBSERVATION (<i>Time of completion of measurement in UTC</i>))	B)	→
(RUNWAY DESIGNATORS)	C)	→
(CLEARED RUNWAY LENGTH, IF LESS THAN PUBLISHED LENGTH (m))	D)	→
(CLEARED RUNWAY WIDTH, IF LESS THAN PUBLISHED WIDTH (m; if offset left or right of centre line add "L" or "R"))	E)	→
(DEPOSITS OVER TOTAL RUNWAY LENGTH (Observed on each third of the runway, starting from threshold having the lower runway designation number) NIL — CLEAR AND DRY 1 — DAMP 2 — WET or water patches 3 — RIME OR FROST COVERED (<i>depth normally less than 1 mm</i>) 4 — DRY SNOW 5 — WET SNOW 6 — SLUSH 7 — ICE 8 — COMPACTED OR ROLLED SNOW 9 — FROZEN RUTS OR RIDGES)	F)	→
(MEAN DEPTH (mm) FOR EACH THIRD OF TOTAL RUNWAY LENGTH)	G)	→
(FRICTION MEASUREMENTS ON EACH THIRD OF RUNWAY AND FRICTION MEASURING DEVICE MEASURED OR CALCULATED COEFFICIENT or ESTIMATED SURFACE FRICTION 0.40 and above GOOD — 5 0.39 to 0.36 MEDIUM/GOOD — 4 0.35 to 0.30 MEDIUM — 3 0.29 to 0.26 MEDIUM/POOR — 2 0.25 and below POOR — 1 9 — unreliable UNRELIABLE — 9 (When quoting a measured coefficient, use the observed two figures, followed by the abbreviation of the friction measuring device used. When quoting an estimate, use single digit)	H)	→
(CRITICAL SNOWBANKS (If present, insert height (cm)/distance from the edge of runway (m) followed by "L", "R" or "LR" if applicable))	J)	→
(RUNWAY LIGHTS (If obscured, insert "YES" followed by "L", "R" or both "LR" if applicable))	K)	→
(FURTHER CLEARANCE (If planned, insert length (m)/width (m) to be cleared or if to full dimensions, insert "TOTAL"))	L)	→
(FURTHER CLEARANCE EXPECTED TO BE COMPLETED BY . . . (UTC))	M)	→
(TAXIWAY (If no appropriate taxiway is available, insert "NO"))	N)	→
(TAXIWAY SNOWBANKS (If more than 60 cm, insert "YES" followed by distance apart, m))	P)	→
(APRON (If unusable insert "NO"))	R)	→
(NEXT PLANNED OBSERVATION/MEASUREMENT IS FOR) (month/day/hour in UTC)	S)	→
(PLAIN-LANGUAGE REMARKS (Including contaminant coverage and other operationally significant information, e.g. sanding, de-icing))	T)) ⏪
NOTES: 1. *Enter ICAO nationality letters as given in ICAO Doc 7910, Part 2. 2. Information on other runways, repeat from C to P. 3. Words in brackets () not to be transmitted.		

SIGNATURE OF ORIGINATOR (not for transmission)



Norway: TRACR II® AVRB Solution

- RCR system integrates directly with AVINOR IPPC
- Runway reports disseminated electronically automatically from centralized NAIS processing centre



AVINOR IPPC Internet Pilot Planning Center

HOME IPPC MOBILE AVINOR CAA - NORWAY EUROCONTROL ICAO VFR-GUIDE

IPPIC

- AIS Publications >
- Briefings >
- Flightplanning >
- Help & Information >

Login to Flightplanning

Username

Password

Logon New User

IPPIC News & History

Wed, 07 Jan 2015

New functions in FPL Formular...
Read more...

Wed, 02 Jul 2014

Browser problems with the new FPL module...
Read more...

Tue, 26 Nov 2013

Pilot Reports - Turbulence, icing etc...
Read more...

Wed, 10 Jul 2013

How to use Narrow Route Briefing...
Read more...

Tue, 15 Jun 2010

Requirement for PPR at Norwegian Airports...
Read more...

Select an Aerodrome or a FIR

BODØ OFIR

NORWAY FIR

ENSO - Stord/Serstokken

Briefing Selection Criteria

Always check for updated information before start up.



Avinor/AVRB SNOWTAM



AIS NORWAY - PREFLIGHT INFORMATION BULLETIN: 110213/2021
GENERAL BULLETIN
INCLUDES NOTAM VALID FROM: 131925 FOR: 24 HOUR(S)
FIRS: ENOR
AERODROMES: ENTC
HEIGHT: 000/999
PERM NOTAM CUTOFF: 365 DAY(S)
TRAFFIC: IV PURPOSE: NBO SCOPE: AEW
SNOWTAM: YES MET: NO

>>> FIR: ENOR (NORWAY FIR) <<<

>>> ENTC (TROMSO/LANGNES) <<<

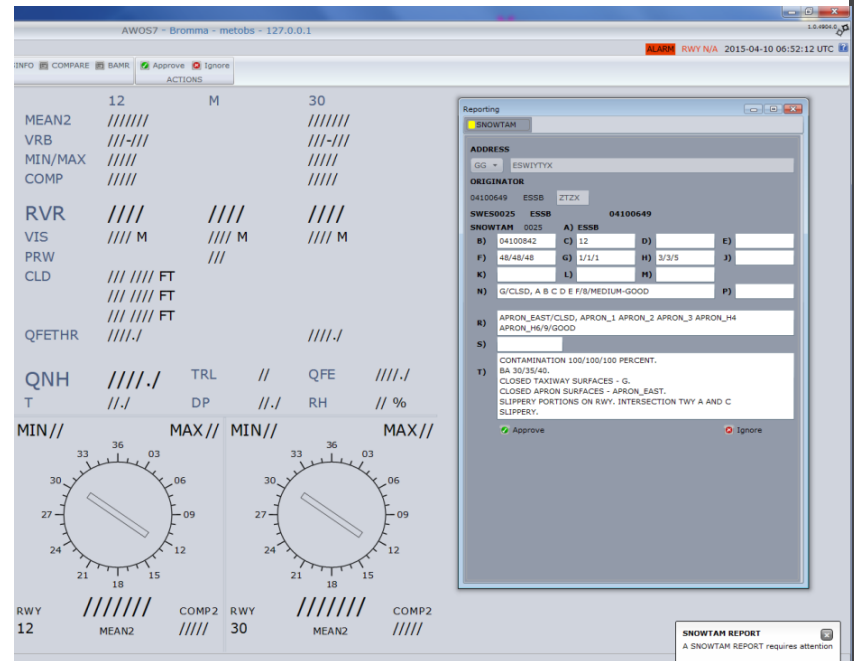
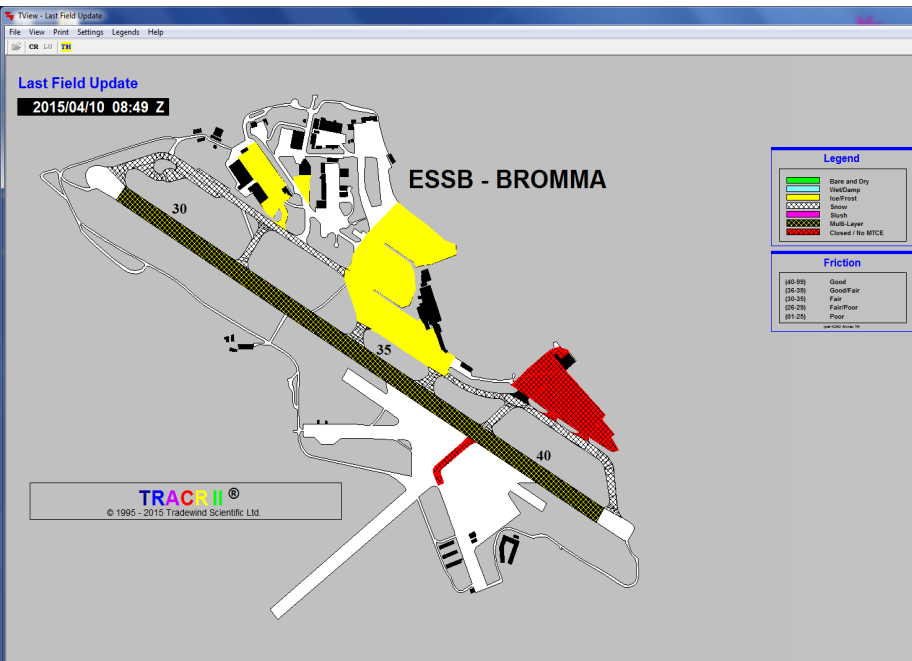
SWEN1091 ENTC 02131633
(SNOWTAM 1091 A) ENTC
B) 02131633 C) 01
F) 79/79/79 H) 4/4/5
N) A/789 B/789 C/789 D/789 E/789 Y/789 J/CLSD I/789
H/789
R) NO
T) F/100/100/100/PCT.
SANDED OLD APPLICATION.
SLIPPERY PORTIONS ON RUNWAY. TAXIWAYS SLIPPERY.
APRONS SLIPPERY. SLIPPERY THRESHOLDS. WARM SAND
APPLIED.)

>>> END-OF-BULLETIN <<<



Sweden: TRACR II® AWOS Solution

- Direct integration with SWEDAVIA AWOS system
- Electronic dissemination through airport network





The Four C's of Runway Condition Reporting

1. Correct
2. Complete
3. Current
4. Consistent





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Questions?



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Thank You / Merci

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