

TECHNICAL

**D-ICE A/S DE-ICING
INFORMATION SYSTEM**

TECHNICAL EVALUATION

- In August 2003, APS was contracted by D-Ice to conduct an independent technical evaluation of the D-Ice System System
- Evaluate the system's ability to:
 - Compute a precipitation rate
 - Determine the prevailing meteorological conditions conditions
 - Determine a holdover time based on the prevailing prevailing conditions and computed rate



TEST SUMMARY – WINTER 2003-07

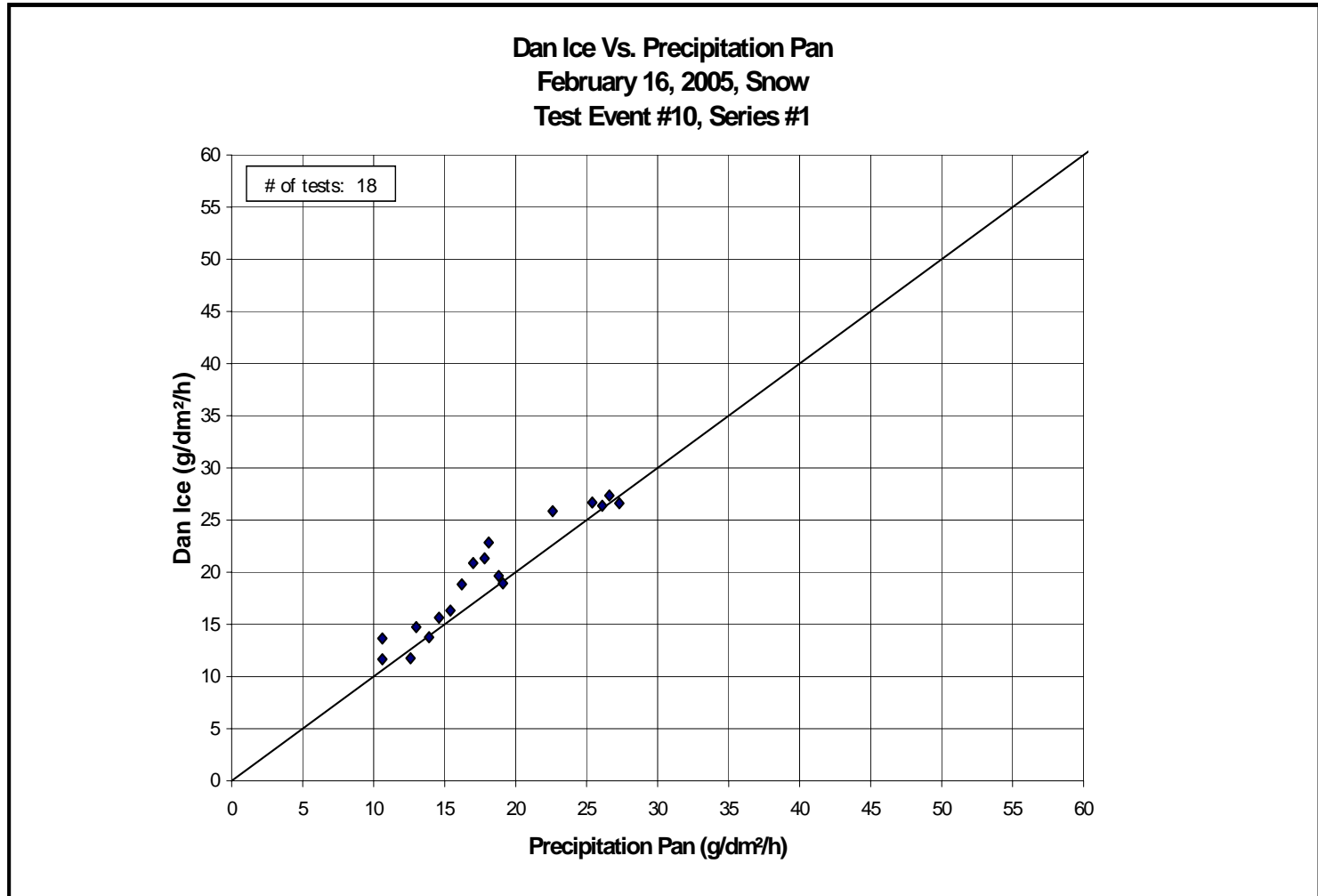


- **2003-04:** 409 data points were collected during 24 data collection events
- **2004-05:** 424 data points were collected during 20 data collection events
- **2005-06:** 700 data points collected during 23 data collection events; data collected with two units
- **2006-07:** Approximately 400 data points were collected during 15+ data collection events

TEST RESULTS – SNOW

0°C, winds 7 to 14 km

February 16, 2005

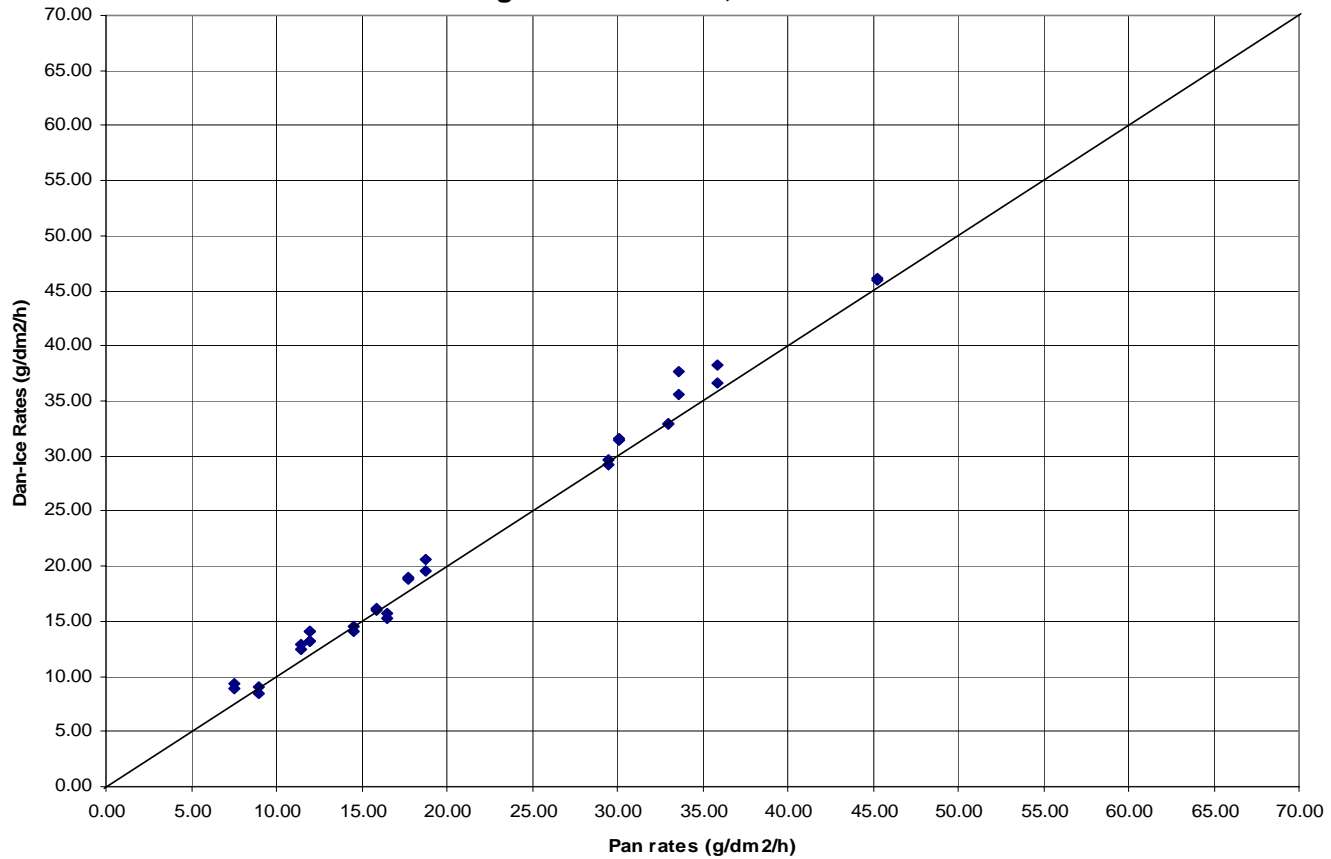


TEST RESULTS – FREEZING RAIN / ICE

0°C to -7°C, winds 20 to 30km

January 17-18, 2006

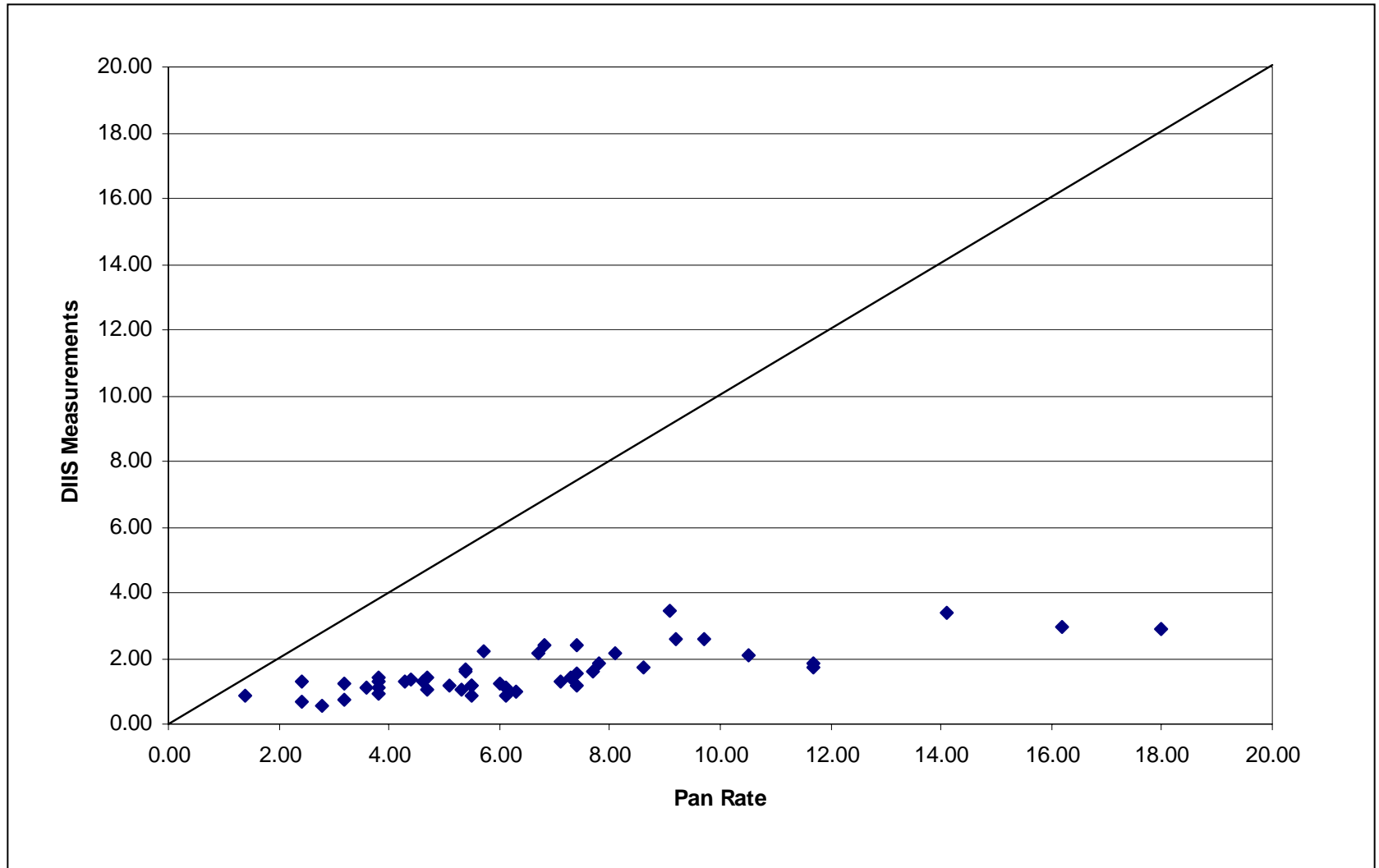
Correlation DIIS and Pan Rate, 17-18 January 2006
Freezing Rain/Ice Pellets, 0 to -7°C



TEST RESULTS –

-5 to -6°C, winds 24 to 48km

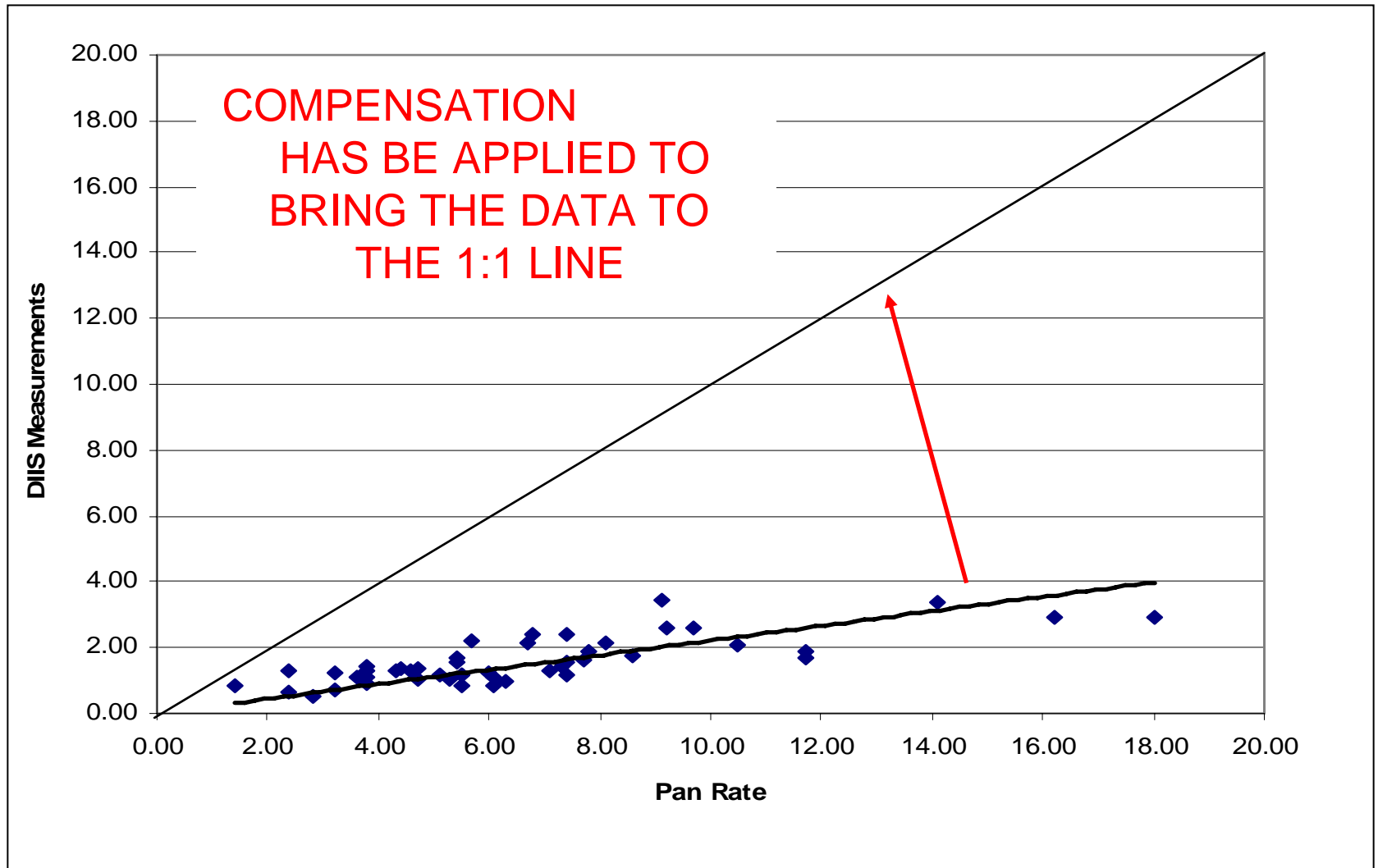
February 10, 2005



TEST RESULTS –

-5 to -6°C, winds 24 to 48km

February 10, 2005



TEST RESULTS SUMMARY

- ➔ Analysis of the rate outputs of the D-Ice system is very positive: rates positive: rates measured in snow, freezing rain, freezing drizzle, snow drizzle, snow pellets, ice pellets compare to those measured using using historical methodology
- ➔ High wind speeds result in decreased catch capability in snow conditions; compensation factors have been employed to calibrate the calibrate the snow data in this case
- ➔ Ability of the D-Ice system to measure accurate temperature and detect and detect and identify precipitation type was also very favorable favorable



CHANGING CONDITIONS



CURRENT WEATHER REPORTING

- One of the current deficiencies of the current METAR weather reporting is the frequency of updates
 - Hourly
 - SPECI
- Very poor at identifying changing conditions, especially as they pertain to ground deicing operations

CHANGING CONDITIONS

March 5, 2004, 15-16 GMT, YUL

Time (GMT)	Condition According to ATIS	Rate Measured by Precipitation Pans (g/dm ² /h)	Rate Obtained by DIIS (g/dm ² /h)
14:57	Rain, Fog	9.1	9
15:12	Rain, Fog	3.6	4.3
15:27	Rain, Fog	20.4	21.2
15:42	Rain, Fog	20.1	22.8

METAR DID NOT CHANGE FOR THE HOUR

METAR: 05009KT 1 1/2SM -RA BR



ENGINE DEICING CONDITIONS

ENGINE ICING APPLICATION

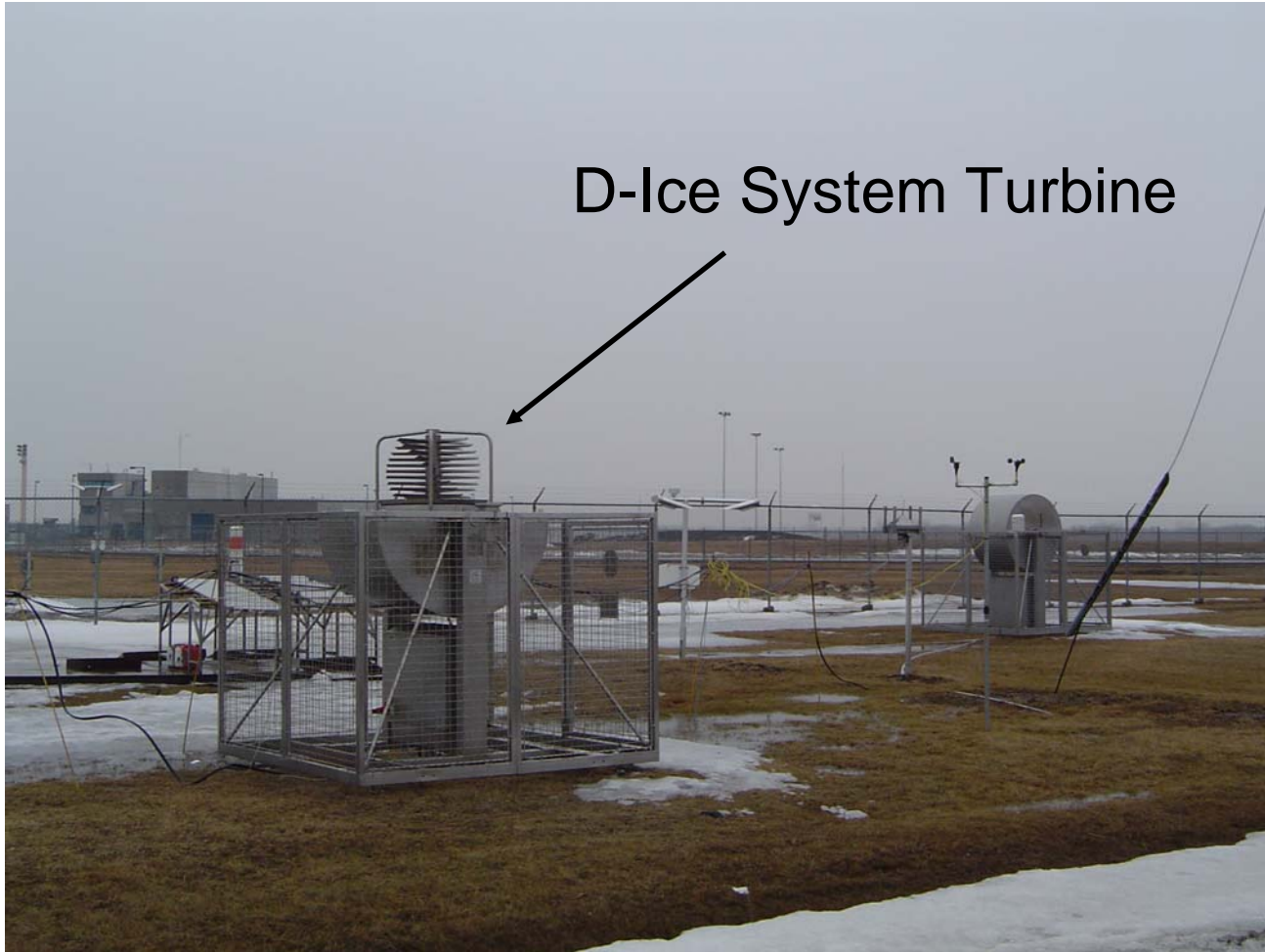
- Numerous events of engine damage have been reported in recent years due to engine icing
- Weather reporting deficiencies were identified in many of the cases
- Engines are especially prone in periods of freezing precipitation (super-cooled liquid)



ENGINE ICING

- D-Ice system measures precipitation that accumulates on the on the turbine and in collection pan
 - Enables the computation of accurate rates at 10-minute minute intervals
- Transitional precipitation and changes in conditions may be may be measured accurately using this system
- D-Ice system turbine is representative of a spinning fan blade blade

D-ICE SYSTEM TURBINE



ICE ACCRETION ON TURBINE



ICE ACCRETION ON TURBINE



ICE ACCRETION ON TURBINE



PRESENTATION SUMMARY

- Technical evaluation of the D-Ice system has demonstrated excellent results. System would enable:
 - More accurate identification of icing conditions
 - More accurate determination of fluid holdover times
 - Reduction of human factor involvement in holdover time assessment assessment
 - Expanded use of current holdover time information
- D-Ice system is capable of identifying changing weather conditions and and measuring accurate precipitation rates during these periods
- D-Ice system outputs could be employed by air carriers for determination of risk determination of risk of engine icing conditions





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