



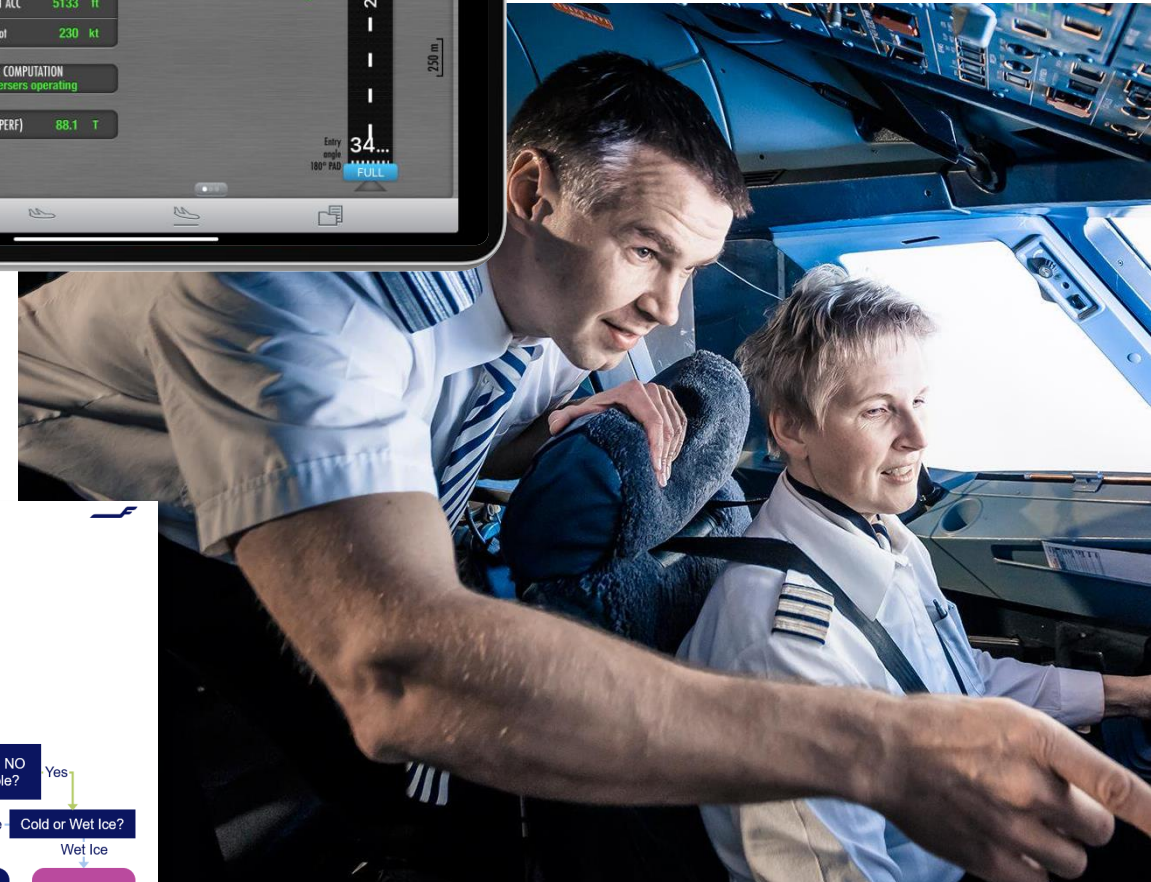
Training and Technology to Improve Winter Operations Safety and Efficiency



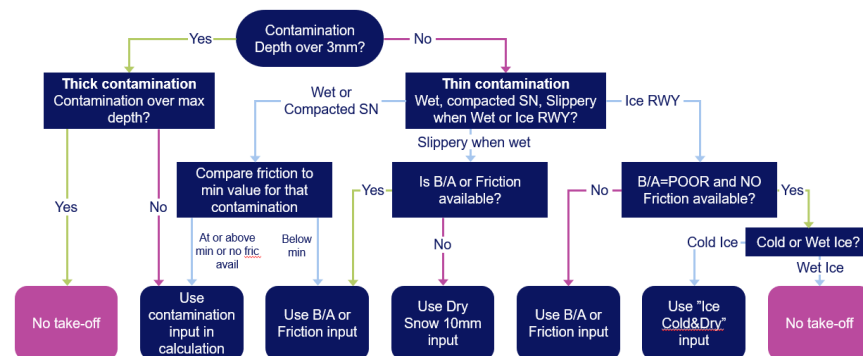
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Fleet Chief Pilot A320
Finnair Flight Operations

Training & Standard Operating Procedures

- Winter Operations in initial and annual recurrent CBT and simulator trainings
- Winter Operations built into SOP
- Training + Attitude = Safe Winter Ops
- Evidence Based Training (EBT)
- Guidance material easily available for pilots



Contaminated RWY for take-off



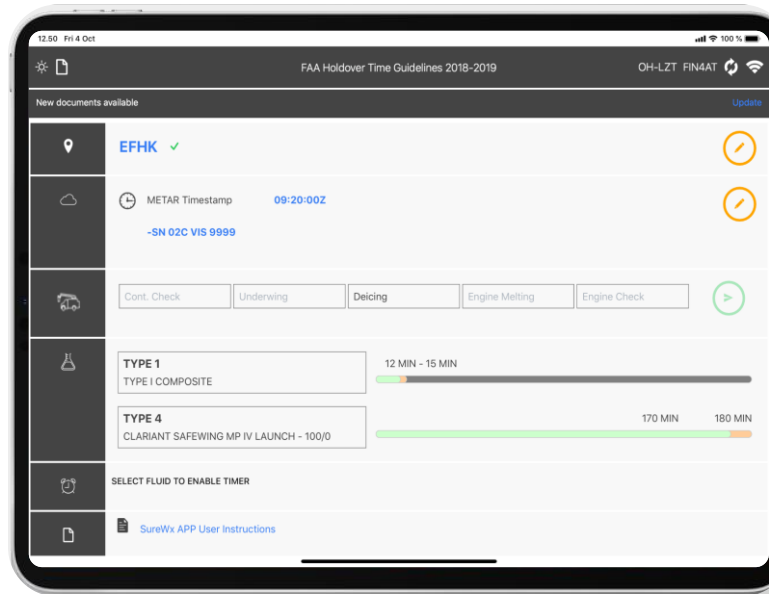
Notes:

- ESF/BA can be converted into a numeric friction value as instructed in the contamination table
- Observe Minimum numeric friction values for takeoff

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EFB Application for Holdover Time (HOT) Determination

- Traditionally from various tables, but now via EFB application (or ACARS)
- Accurate weather data from sensors to measure Liquid Water Equivalent rate
- Improved safety when correct input and correct holdover time used with less pilot workload
- Sustainability by limiting the excessive use of deicing fluids and time consumed per event

Table 1. Holdover Times For Sae Type I Fluid On Critical Aircraft Surfaces Composed Predominantly Of Composites

Outside air temperature (°C and °F)	Freezing (F)	Lowest Lethal Temperature (°F)	Upper Lethal Temperature (°F)	Maximum time to freeze (hours)	Freezing (F)	L95+ Survival (°F)	Rate of Survival (°F)	Notes
0°C and 32°F and above	0.00 - 0.04	0.00 - 0.01	0.00 - 0.04	0.00 - 0.01	0.00 - 0.13	0.02 - 0.05	0.10 - 0.30	
Between 0°C and 10°C (32°F and 50°F)	0.04 - 0.08	0.01 - 0.02	0.04 - 0.08	0.01 - 0.04	0.13 - 0.26	0.05 - 0.10	0.30 - 0.50	
Between 10°C and 20°C (50°F and 68°F)	0.08 - 0.16	0.02 - 0.04	0.08 - 0.16	0.04 - 0.08	0.26 - 0.50	0.10 - 0.20	0.50 - 0.70	
Between 20°C and 30°C (68°F and 86°F)	0.16 - 0.32	0.04 - 0.08	0.16 - 0.32	0.08 - 0.16	0.50 - 0.80	0.20 - 0.40	0.70 - 0.90	
Between 30°C and 40°C (86°F and 104°F)	0.32 - 0.64	0.08 - 0.16	0.32 - 0.64	0.16 - 0.32	0.80 - 1.00	0.40 - 0.60	0.90 - 1.00	CAUTION: Survival may be reduced
Between 40°C and 50°C (104°F and 122°F)	0.64 - 1.28	0.16 - 0.32	0.64 - 1.28	0.32 - 0.64	1.00 - 1.00	0.60 - 0.80	1.00 - 1.00	

Notes:

- 1) 0°C and 32°F would not be selected as the freezing point of the mixture is at least 10°C (18°F) outside air temperature.
- 2) The lowest temperature of supercooling (L95+) is expected (L95+ for Type 1 and 2 is 32°C as in Field). When not of Fielded, required L95+ for the used Field.
- 3) See Lethal time - below zero time and duration of time of high air humidity and low humidity.
- 4) See Lethal time - below zero time and duration of time of freezing time is not possible.
- 5) No freezing time production exist for the conditions of 3°C (32°F) and below.

Conclusion:

High humidity for the application of these results requires with the use:

- 1) Time of protection will be shortened in heavy moisture. Heavy precipitation rates at high moisture content. Heavy precipitation rate will reduce below zero time below the lowest time in the case. Heavy time may be reduced with the use of high humidity and low humidity.
- 2) High humidity and low humidity will reduce the time of protection and the time of protection.
- 3) High humidity and low humidity will reduce the time of protection and the time of protection.

[illegible]

Time	Free Light (% of total light)	Light Penetration (% of total light)	Algal Biomass (mg of Chlorophyll a per liter)	Freezing Depth (cm)	Light Penetration Rate (cm day ⁻¹)	Rate on SAE Depth (cm)	Other
08:00	100	100	0.00	0.00	0.00	0.00	
09:00	100	100	0.00	0.00	0.00	0.00	
10:00	100	100	0.00	0.00	0.00	0.00	
11:00	100	100	0.00	0.00	0.00	0.00	
12:00	100	100	0.00	0.00	0.00	0.00	
13:00	100	100	0.00	0.00	0.00	0.00	
14:00	100	100	0.00	0.00	0.00	0.00	
15:00	100	100	0.00	0.00	0.00	0.00	
16:00	100	100	0.00	0.00	0.00	0.00	
17:00	100	100	0.00	0.00	0.00	0.00	
18:00	100	100	0.00	0.00	0.00	0.00	
19:00	100	100	0.00	0.00	0.00	0.00	
20:00	100	100	0.00	0.00	0.00	0.00	
21:00	100	100	0.00	0.00	0.00	0.00	
22:00	100	100	0.00	0.00	0.00	0.00	
23:00	100	100	0.00	0.00	0.00	0.00	
24:00	100	100	0.00	0.00	0.00	0.00	

[illegible]

Outlets in the Sample (N = 7 and above)	Concentration Percentiles of the Volume	Type 1	Type 2 ^a	Type M
1-10 and above	0.005	8.20	8.00	12.00
11-20 and above	0.025	8.20	8.00	8.00
21-30 and above	0.075	8.20	8.00	7.00
Median (N = 7)	0.005	8.20	8.00	12.00
Median (N = 7)	0.025	8.20	8.00	8.00
Median (N = 7)	0.075	8.20	8.00	7.00
Median (N = 7)	0.005	3.20	3.20	3.00
Median (N = 7)	0.025	3.20	3.20	3.00
Median (N = 7)	0.075	3.20	3.20	3.00
Median (N = 7)	0.005	1.00	1.00	1.00
Median (N = 7)	0.025	1.00	1.00	1.00
Median (N = 7)	0.075	1.00	1.00	1.00
Median (N = 7)	0.005	0.50	0.50	0.50
Median (N = 7)	0.025	0.50	0.50	0.50
Median (N = 7)	0.075	0.50	0.50	0.50
Median (N = 7)	0.005	0.20	0.20	0.20
Median (N = 7)	0.025	0.20	0.20	0.20
Median (N = 7)	0.075	0.20	0.20	0.20
Median (N = 7)	0.005	0.10	0.10	0.10
Median (N = 7)	0.025	0.10	0.10	0.10
Median (N = 7)	0.075	0.10	0.10	0.10



VHF 121.50

Braking Action Computation Function (BACF)

- Aircraft itself is used to compute the actual deceleration and runway braking action
- Objective reporting via pilot reports or automatically via ACARS
- Improves reporting reliability in rapidly changing weather conditions
- How to use this valuable data in the future?



BRKG ACTION COMPUTED

ROLLOUT	UNIT
02000M	M/FT*
AVERAGE	
2-MEDIUM TO POOR	0800M
WORST	
1-POOR	0100M
AT 0700M FROM TOUCHDOWN	
ONLY REPORT IF EQUAL OR WORSE THAN GIVEN BY ATS	
<RETURN	MORE>

DETAILED IDENT ZONES

FROM TOUCHDOWN

0600M/1000M

2-MEDIUM TO POOR

1200M/1400M

3-MEDIUM

1800M/2000M

4-GOOD TO MEDIUM

<RETURN

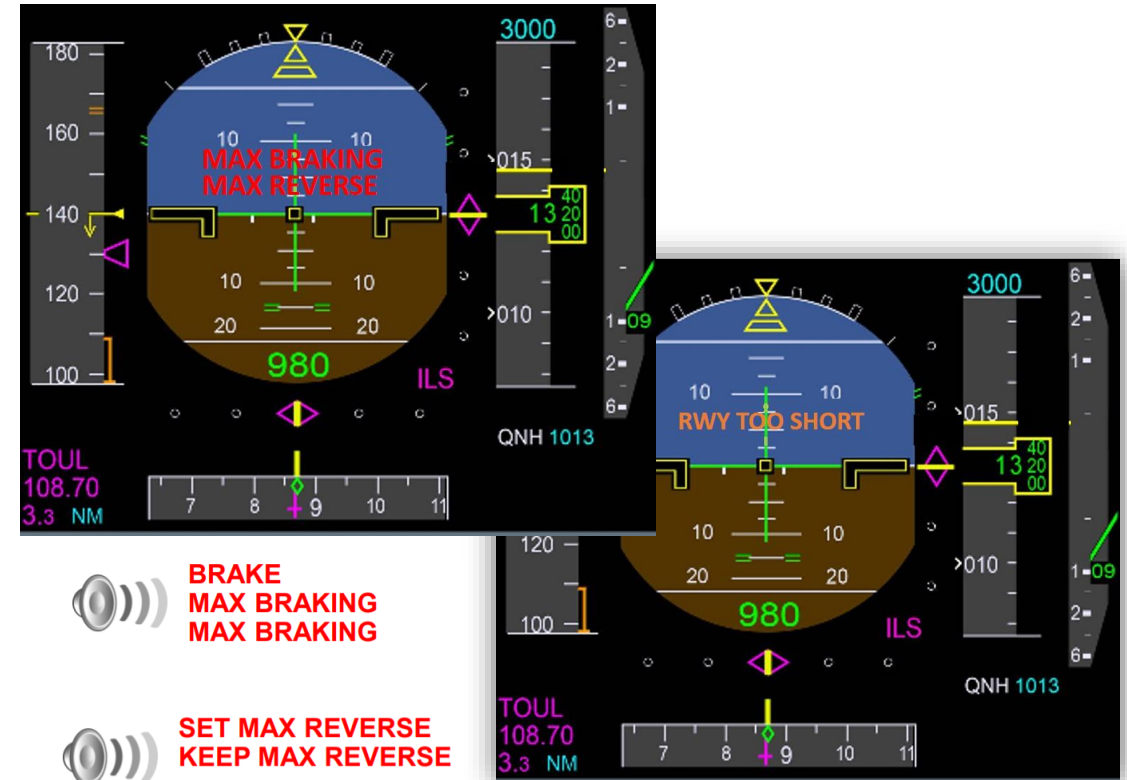
Runway Surveillance

- Takeoff Surveillance (TOS)
- Takeoff Monitoring (TOM)
- Landing Surveillance+
- Runway Overrun Prevention System+ (ROPS+)
- Brake To Vacate (BTV)
- Proposed EASA Runway Overrun Awareness and Alerting System (ROAAS)

T.O SPEEDS TOO LOW
T.O V₁/V_R/V₂ DISAGREE
T.O SPEEDS NOT INSERTED

NAV ON TAXIWAY
NAV NOT ON FMS RUNWAY
T.O RWY TOO SHORT

T.O ACCELERATION DEGRADED





Key Takeaways

- Training both flying and non-flying skills
- Enable the use of technological improvements
- Teamwork with all stakeholders

