



CINEA

European Climate, Infrastructure and Environment Executive Agency

SENS4ICE Final Dissemination Event

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I guess all of you are familiar with these facts:



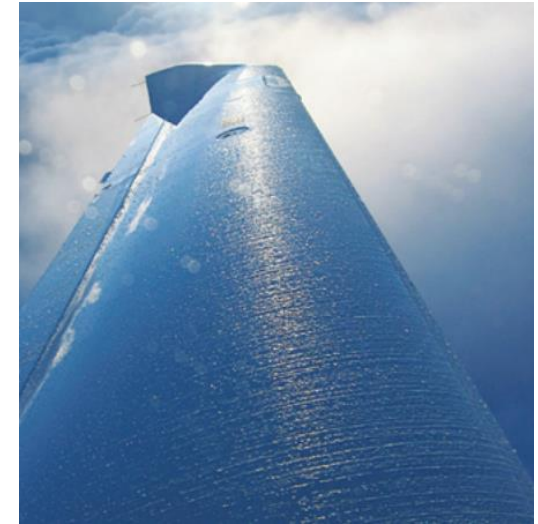
- **Icing occurs in air and on ground, whereas it is particularly dangerous in flight.**
- **Supercooled water droplets in air, freezing at aircraft surfaces, may lead to degradation or loss of aircraft control.**
- **Some of the icing effects consist of a reduced flight performance and a change of the dynamic of the aircraft behaviour.**
- **Simulation of icing effects on aircraft behaviour is difficult and validating models is a challenging task.**



Several research activities already addressed the issue of ice accretion on aircraft

- But they were mostly focused on airframe.
- Future advancements were necessary on the detection and the modelling.
- These advancements would also explore/propose/validate new certification methods, means of compliance.

➔ 2018: Mobility for Growth MG 2.5 (InCO Flagship)



2018: Mobility for Growth MG 2.5: Innovative technologies for improving aviation safety and certification in icing conditions

Areas to be addressed:

- Further advancements in the detection, understanding, sensing, modelling, simulation and testing of icing, de-icing and anti-icing of all types in aviation (e.g. mixed-phase, ice crystals, super cooled large droplets, etc).
- Explore/propose/validate new certification methods, means of compliance, standards and protection systems for all types of icing and air vehicles, engines and on-board systems.
- Address the overall system integration

2018: Mobility for Growth MG 2.5

Expected Impact:

- Contribute to increase passenger safety by fewer accidents and less in-flight events worldwide.
- Contribute to decrease costs for all parties (e.g. industry, authorities, research & test centres) by improved and internationally accepted certification, standards and means of compliance, covering all types of icing hazards.
- Contribute to decrease delays in operations thanks to more efficient avoidance of icing hazards and to fewer damages in need of inspection and repair.



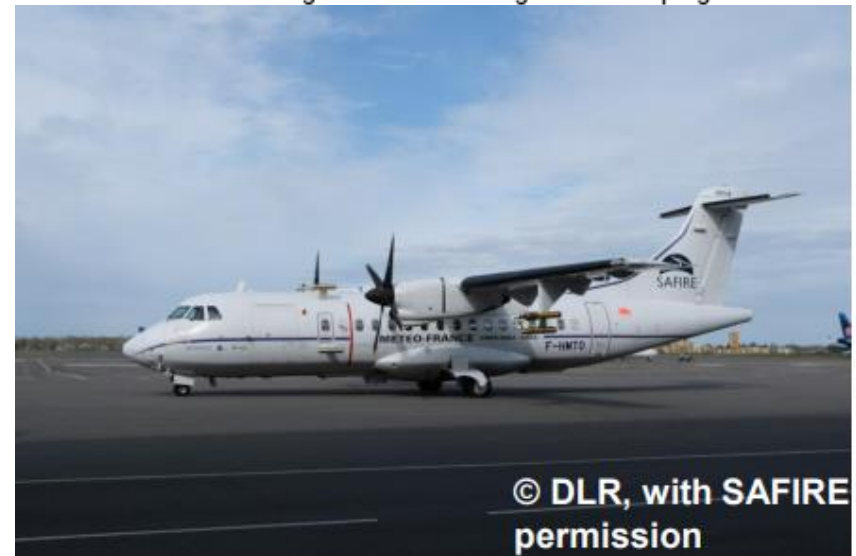
Appendix O icing conditions running back on wing surface of an aircraft.

SENS4ICE project contributions are important. Some of them:

- Detection technologies for early detection and information to flight crew were developed, matured and demonstrated successfully.
- Aircraft flight performance monitoring was developed, matured and demonstrated successfully allowing to monitor criticality of ice accretion and effectiveness of ice protection systems.
- SENS4ICE onboard ice detection technologies can serve to collect in-situ real-time information about detailed icing situations, that may be centralized and used to increase safety and efficiency of air traffic operations in harsh environments.



Embraer Phenom 300 during the SENS4ICE flight test campaign in North America



SAFIRE ATR-42

Although SENS4ICE, ICE GENESIS and MUSIC-haic have presented **real advancements** on the detection, the modelling, 3D numerical tools,, **these advancements have not yet been able to validate new certification methods, means of compliance.**

These real advancements were also possible thanks to the fruitful international participation of Brazil (Embraer), USA (Collins, Honeywell) and Canada (CNRC, Polytechnique de Montreal, Bombardier).

SAE conference in Vienna:

ICE GENESIS, SENS4ICE and MUSIC-haic were key contributors to the SAE conference in Vienna.

At the conference and afterwards, the “**Icing Community**” established a “**working group**” to

- **evaluate the remaining gaps to be covered**
- **evaluate how to face the challenges with:**
 - ✓ **the new generation of low CO2 aircraft and associated disruptive configurations**
 - ✓ **the new market of UAV/UAM.**

Thank you

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