

## An integrated approach aimed at developing innovative products for icing

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The design of many decision support systems has contributed to in-flight icing issues such as automation bias and trust miscalibration. The present lecture wants to examine whether these difficulties can be overcome by providing continually update information regarding the cloud system by means of nowcasting tools and remote sensors systems before the aircraft penetration. Improvements of the icing technologies such as in-situ ice detection systems and passive/active ice protection with low power consumption could be as much more efficient for aircraft icing safety related as much a continuous monitoring on icing contamination in terms of aerodynamic degradation will be possible. A status on CIRA nowcasting tool will be provided together with emerging technologies developed for aircraft ice protection with the goal to foresee how the envelope of protection and avoidance capabilities of an aircraft in critical icing condition can potentially be improved. Five areas will be tackled. **Ice Detection & Protection:** an overview of intelligent materials, smart structures, smart sensors and dedicated systems integration will be presented oriented to an easy detection and smart detection of ice formation. **Ice Avoidance:** an overview of potential integrated systems avoiding ice formation/accretion beyond admissible limits will be presented. The systems will be also oriented to optimize weight allocation, preserving aerodynamics performances and energy consumption. Moreover, safety requirements should be respected in accordance to current regulation (EASA/FAA, e.g. new specific issues will be highlighted). **Ice Monitoring:** environmental perception and situational understanding of ice phenomena will be highlighted. Integrated systems oriented to a constant monitoring of the ice conditions in each critical part of the aircraft will be presented. **Ice Forecast:** intelligent icing meteorological sounding alarm technologies will be analysed in order to dispose of powerful instruments to predict ice formation and safe navigation in all weather conditions. The core of the lecture then will be the analysis of an integrated approach aimed at developing innovative products, mainly oriented to **ice monitoring and forecasting of icing**. The approach will be based on different and integrated satellite products, on board local data coupled and crosschecked with available experimental ice phenomena knowledge/database.

### REFERENCES

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