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Future Actions of Research

Introduction

- Major progress, far beyond the state of the art, already achieved in the framework of the HAIC project
- However, additional actions of research are needed to fill the remaining gaps
 - ▶ Capabilities:
 - Large test facilities, calibration/instrumentation, standardisation
 - Modeling of particle/wall interaction, accretion, 3D tools
 - ▶ Detection & Awareness technologies
 - Satellite based detection and integration (weather on-board, ATM)
 - Detector

Future R&D projects opportunities

Future Sky Safety 2

- High IWC Numerical tools
- Topic included in **Futur Sky Safety 2** proposal (P11 subproject led by ONERA) and submitted to H2020 call 2016 end of January 2016
- Pending evaluation
- T0 expected by early 2017

Future R&D projects opportunities

Future Sky Safety 2

H2020 Call 2016

- Coordination: ONERA
- Topic **MG 3.1 Addressing aviation safety challenges**

Top Level Objectives

The proposed action builds on the outcomes of the HAIC project and ambitions to increase the maturity level of the models and numerical tools that were developed in HAIC.

Despite this large amount of work performed during in the last years, **the current understanding of the underlying physics of both ice crystal impact and accretion phenomena is still incomplete and several gaps still have to be filled to be able to build accurate models.** In addition **the models need to be implemented in 3D numerical icing tools and their capability to simulate ice crystal icing of engines, S-ducts and probes has to be assessed.** The aim of the present proposal is to close these gaps.

Duration

- Duration: **48months** project / To start early 2017

Partnership



WBS & Roadmap

P11: Reducing the effect of environmental hazards (icing)

WP11.1- Experimental investigation of ice crystal impact and accretion phenomena

WP11.2 - Model development, calibration and selection

WP11.3 – Model implementation in existing 3D icing numerical tools

WP11.4 – Application of 3D tools to industrial configurations

Future R&D projects opportunities

Cleansky 2

- High IWC Detection technologies
 - Topic included in **Cleansky 2 / WP6.2** through the strategic topic « Icing Detection & Characterization »
 - Call closed and evaluation completed
 - T0 expected by Sep 2016

Future R&D projects opportunities

Cleansky 2

Cleansky 2

- Coordination: Airbus
- Strategic Topic: Detection and Characterization of Icing Conditions Contributing to Ice Protection Optimization

Top Level Objectives

The aim of the project is to develop **mature in-Flight Ice / Icing Detection System for the detection, discrimination and characterization of icing conditions.**

Primary function for the automatic activation of Ice Protection System should be also investigated including opportunity for advanced control of the Ice Protection System.

Duration

- Duration: **60 months** project / To start 09/2016

Partnership



WBS & Roadmap

Detection and Characterization of Icing Conditions

WP1 Ice Accretion Rate Function develops, validates and implements an Ice Accretion Rate function within existing PFIDS technology (Primary in-Flight Ice Detection System) for advanced control of the Ice Protection Systems.

WP2 Primary in-Flight Icing Conditions Detection System develops advanced on-board detection systems complying with the industrial requirements of performance, operability, reliability, weight and cost, and able to detect, discriminate and characterize the different icing conditions encountered.

WP3 Consortium & Technical Management is in charge of the project monitoring, administration, dissemination and reporting and ensures the technical consistency and convergence towards project high level objectives. It implements the TRL process and roadmap agreed with WP leaders. It also ensures consistency with on-going standardisation activities as part of the EUROCAE WG95.

- High IWC Spaceborne detection & nowcasting application
- Topic included in the **French DGAC SONIC project (Studies Of New Innovative Configurations)** to investigate 2nd generation's tools and define concept for integration into A/C.
- Proposal limited to French organisations and to be complemented, if possible, by a new proposal in H2020 call 2017 or through EASA / DG MOVE
- Proposal submitted on 29/02/2016
- T0 expected by end 2016 / early 2017

Future R&D projects opportunities

DGAC SONIC

SONIC - Studies Of New Innovative Configurations

- Coordination: Airbus
- Topic: Detection, Characterization et Modeling of glaciated icing conditions

Partnership



Top Level Objectives

The proposed action builds on the outcomes of the HAIC SP3 project.

Activities will address the following aspects:

- **Cloud modeling** to support analysis of satellite and in-situ measurements
- **LEO satellite**: to complement analysis of HAIC/HIWC campaigns based on A-TRAIN passive and active measurements
- **GEO satellite**: to develop IWC mask and improve RDT product for the detection of high IWC regions
- **Airborne remote sensing**: statistical analysis based on RASTA measurements and evaluation of the Appendix D/P

WBS & Roadmap

Detection, Characterization et Modeling of glaciated icing conditions

WP1 Cloud modeling

WP2 Polar orbiting satellite and characterization of high IWC regions

WP3 Geostationary satellites and detection of high IWC regions

WP4 Airborne remote sensing and characterization of high IWC regions

Duration

- Duration: **26 months** project / To start in 2016

Conclusion & Way Forward

- Plan to fill remaining gaps and secure skills beyond HAIC is being set-up with HAIC partners
- International collaboration is promoted to leverage skills and resources
- Additional actions are to be investigated on
 - ▶ Instrumentation
 - ▶ Large test facilities, calibration and standardisation

High Altitude Ice Crystals (HAIC, 314314)

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