Engine Icing Simulation And Detection Nasa

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Engine Icing Simulation And Detection

Simulation of Engine Rollback •Impact of Engine Icing •Start from nominal conditions and increase the blockage level •Move from nominal LPC map to 20% blocked map •Effect: •Drop in EPR -> increase in fuel flow rate and thus increase in Fnet, Nf, Nc, TGT •No Rollback event Engine Icing Simulation and Detection – 2012 PCD Workshop 7

Engine Icing Simulation and Detection - NASA

Detection of Engine Ice Accretion • Typically 5 –7 control sensors present in an engine • Icing causes a change in the LPC operational characteristics –Decrease in flow rate –Generally a

decrease in efficiency –Decrease in surge line • Goal: use the available sensors to estimate the change in LPC performance

Engine Icing Modeling, Detection, and Mitigation

of ice accretion in the engine core and test potential detection and mitigation strategies. The key features that an engine simulation must have to be useful in this effort are: (1) highly accurate compressor surge margins, (2) an engine controller that is representative of that found on modern commercial gas turbine engines, and 3) a

Engine Icing Modeling and Simulation (Part 2): Performance ...

Using this capability to simulate engine rollback, a proof-of-concept detection scheme is developed and tested using only typical engine sensors. This paper concludes that the engine control system's limit protection is the

proximate cause of iced engine rollback and that the controller can detect the buildup of ice particles in the compressor section.

Engine Icing Modeling and Simulation (Part 2): Performance ...

Engine Icing Modeling and Simulation (Part I): Ice Crystal Accretion on Compression System Components and Modeling its Effects on Engine Performance 2011-38-0025 During the past two decades the occurrence of ice accretion within commercial high bypass aircraft turbine engines under certain operating conditions has been reported.

Engine Icing Modeling and Simulation (Part I): Ice Crystal ...

• Engine ice-crystal icing and simulation • Ground deicing/anti-icing fl uids, effects, facilities • Ice-protection systems and detection • Icing and ice-crystal test methods and facilities • Icing environment meteorolog y, diagnosis and forecasting • Icing related safety

and training • Remote sensing, detection and characterization

EVENT GUIDE INTERNATIONAL CONFERENCE ON ICING

ANSYS icing simulation enables companies and engineers to develop products faster, test designs earlier in the development cycle, reduce the number of physical prototypes and produce a better solution than would be possible using traditional design methods.

Simulating Aircraft Icing: CFD Modeling | ANSYS FENSAP-ICE

embodiment of the present invention. Engine icing mitiga-tion and/or avoidance process may involve the integration of icing computational tools into engine controls system. This process 100 may be used to mitigate the risk of an engine icing event through real-time simulation and control of the engine throttle setting.

US000000101844O5B120190122

Engine Icing: Characterization and Simulation Capability: Develop knowledge bases, analysis methods, and simulation tools needed to address the problem of engine ... technologies required for their detection. Relevance to National Needs 1. Engine icing incidents are occurring on a frequent basis with the aviation community calling for action. 2 ...

Aviation Safety Program Atmospheric Environment Safety ...

engine icing detection and control-based mitigation strategies. ... –Closed-loop controller allowing the simulation of engine transients –Heat extraction effects reflecting the heat loss the engine experiences as ingested ice crystals melt and vaporize in its compression system

A Dynamic Model for the Evaluation of Aircraft Engine ...

Aircraft and engine ice protection

systems are generally of two designs: either they remove ice after it has formed, or they prevent it from forming. The former type of system is referred to as a de-icing system and the latter as an anti-icing system. De-Icing Systems. A de-icing system has two very attractive attributes.

Aircraft Ice Protection Systems - SKYbrary Aviation Safety

The importance of the variation of relative humidity across turbomachinery engine components for in-flight icing is shown by numerical analysis. A species transport equation for vapor has been added to the existing CFD methodology for the simulation of ice growth and water flow on engine components that are subject to ice crystal icing.

Numerical Demonstration of the Humidity Effect in Engine Icing

Section IV presents a practical detection algorithm with the results shown in Section V. Some conclusions and future

work are discussed in Section VI. II. Modeling Engine Icing In order to simulate the effect of ice accretion on engine operation, LPC maps with various levels of ice blockage are integrated into a high-fidelity engine simulation.

Modeling and Detection of Ice Particle Accretion in ...

A process for mitigating or proactively avoiding an aircraft engine icing event may include detecting ice crystals in the atmosphere using one or more sensors on board an aircraft in real time. The...

US10184405B1 - Aircraft engine icing event avoidance and ...

NASA's icing research involves the development of tools and methods for evaluating and simulating the growth of ice on current and future aircraft surfaces or inside the engines and the effects that ice may have on the behavior of aircraft in flight. At NASA Glenn Research Center, "We Freeze to Please". Our icing research teams utilize

a refrigerated wind tunnel, an engine test cell, and ...

Icing Research | Glenn Research Center | NASA

The proposed approach for icing detection comprises a methodology used to identify and isolate the location of significant ice accretion on the reference aircraft. Knowledge of how the aircraft...

US6304194B1 - Aircraft icing detection system - Google Patents

In this paper, a simple detection scheme is developed and tested using a realistic engine simulation with approximate ice accretion models based on data from a compressor design tool.

(PDF) Engine Icing Modeling and Simulation (Part 2 ...

This aircraft engine wing doesn't have to be up in the air to fly through a cloud. Researchers at NASA Glenn can create a cloud on the ground at the Propulsion

Systems Lab where they are investigating a rare type of icing that can form inside jet engines when flying through ice-crystal clouds at high altitude.

Engine Icing | Glenn Research Center | NASA

Icing instrumentation and detection; Effect of SLD on aircraft; Engine icing considerations; Ice-testing methods; Certification and regulations; Conceptual methods; Course Schedule The course will meet for 8 live-online sessions, September 17 through October 13, 2020. Sessions will be held 2 times per week (Tuesdays and Thursdays) from 9:00 a.m ...

Aircraft Icing: Meteorology, Protective Systems ...

In this post, we explore how the Isaac SDK can be used to generate synthetic datasets from simulation and then use this data to fine-tune an object detection deep neural network (DNN) using the

NVIDIA Transfer Learning Toolkit (TLT). In addition, we show how the Isaac SDK accelerated inference components enable real-time object detection for a ...