World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:12, No:01, 2018

Experimental Characterization of Anti-Icing System and Accretion of Re-Emitted Droplets on Turbojet Engine Blades

Authors : Guillaume Linassier, Morgan Balland, Hugo Pervier, Marie Pervier, David Hammond

Abstract : Atmospheric icing for turbojet is caused by ingestion of super-cooled water droplets. To prevent operability risks, manufacturer can implement ice protection systems. Thermal systems are commonly used for this purpose, but their activation can cause the formation of a water liquid film, that can freeze downstream the heated surface or even on other components. In the framework of STORM, a European project dedicated to icing physics in turbojet engines, a cascade rig representative of engine inlet blades was built and tested in an icing wind tunnel. This mock-up integrates two rows of blades, the upstream one being anti-iced using an electro-thermal device the downstream one being unheated. Under icing conditions, the anti-icing system is activated and set at power level to observe a liquid film on the surface and droplet re-emission at the trailing edge. These re-emitted droplets will impinge on the downstream row and contribute to ice accretion. A complete experimental database was generated, including the characterization of ice accretion shapes, and the characterization of electro-thermal anti-icing system (power limit for apparition of the runback water or ice accretion). These data will be used for validation of numerical tools for modeling thermal anti-icing systems in the scope of engine application, as well as validation of re-emission droplets model for stator parts.

Keywords : turbomachine, anti-icing, cascade rig, runback water
Conference Title : ICADO 2018 : International Conference on Aerospace Design and Optimization
Conference Location : Zurich, Switzerland
Conference Dates : January 15-16, 2018