Borui Zheng, J Aeronaut Aerospace Eng 2018, Volume 7
DOI: 10.4172/2168-9792-C2-025

Borui Zheng
Xi'an University of Technology, China

Comparisons of anti-/de-icing performance of DBD plasma actuators with different power supplies

Ice accretion on aircraft surfaces has been widely recognized as a significant safety hazard in cold weathers, especially when aircraft travel through clouds with supercooled water droplets suspended. Dielectric-Barrier-Discharge (DBD) plasma actuator, as a burgeoning type of active flow control technology, also has a thermal effect on the surrounding air during the high-voltage discharge. Two NACA0012 airfoil models embedded with a DBD plasma actuator and a conventional electrical film heater over the airfoil surface were tested in the icing research tunnel under typical glaze/rime icing conditions pertinent to aircraft inflight icing phenomena. The anti-/de-icing performance of DBD plasma actuators stimulated by alternate current (AC), nanosecond (NS) and radio frequency (RF) power supply were compared. While a high-speed imaging system was used to record the dynamic ice accretion and transient surface water transport processes over the airfoil surface, an infrared (IR) thermal imaging system was also utilized to map the corresponding surface temperature distributions over the airfoil surface simultaneously to quantify the unsteady heat transfer and phase changing process over the ice accreting airfoil surface. The findings derived from the present study demonstrated the potential of a new class of anti-/de-icing strategy by leveraging the integral effect of aerodynamic impact and thermal effect for aircraft in-flight icing mitigation.

Biography

Borui Zheng graduated from Northwestern Polytechnical University, China, in 2013 with a Ph.D. degree in fluid dynamics. Since then, he has been working as a Researcher Staff Member at Science and Technology on Plasma Dynamics Lab of Air-Force Engineering University. He is currently enrolled as an associate professor in School of Automation and Information Engineering at Xi'an University of Technology, where he is investigating the plasma active flow control. His articles have been published in journals such as AIAA Journal, Journal of Aircraft, IEEE,Transaction on Plasma Science, Plasma Science & Technology, Journal of Experimental in Fluid Mechanics etc. His present work is aiming at active flow control of UAV attitude, aircraft icing mitigation and closed-loop control of asymmetric vortices over slender bodies at high angles of attack. His theory of icing mitigation utilizing the integral effect of aerodynamic impact and thermal effect of high frequency plasma actuation creates new pathways for aircraft icing mitigation.

narcker@163.com

Notes: