A Novel Aircraft De-icing System: Smart Piezoelectric Skin

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Every year more than three billion air travellers get in danger because of the aircraft icing. Today every single De-icing system (DIS), such as de-icing boots, electro-thermal system and de-icing fluids, has its own technical shortcomings. In harsh weather conditions it leads to tragic consequences. In this research we put forward the idea of using piezoelectric materials for the new unique and all-purpose De-Icing system. Due to the special technology this system controls the icing process and removes ice from external aircraft surface at the same time. It comprises a thick piezoelectric layer consisting of two bonded plates metalized on both sides. System uses the deviation of the output voltage and ultrasonic waves to control the ice build-up on the surface and remove the ice layer respectively. Ultrasonic vibration destroys the adhesion strength and gets rid of 1 mm thick ice stratum in 3-5 seconds. This innovative approach promotes a rapid ice removal. With this system it is possible to reliably protect the external aircraft surface due to 84% more sensitive ice detection method and using 40 times less power consumption than electro-thermal system. It is non-flammable unlike de-icing fluids and protects the whole aircraft surface unlike all other de-icing systems. Moreover, this DIS can be used on land and in the air, both for aviation and fleet as well as for oil and gas transportation and even for public utilities.

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