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Dynamic Impacts of Water Droplets onto Icephobic Soft Surfaces at High Weber Numbers LIQUN MA, YANG LIU, HUI HU, Iowa State University, WEI WANG, ARUN KOTA, Colorado State University — An experimental investigation was performed to examine the effects of the stiffness of icephobic soft PDMS materials on the impact dynamics of water drops at high weber numbers pertinent to aircraft icing phenomena. The experimental study was performed in the Icing Research Tunnel available at Iowa State University (ISU-IRT). During the experiments, both the shear modulus of the soft PDMS surface and the Weber numbers of the impinging water droplets are controlled for the comparative study. While the shear modulus of the soft PDMS surface was changed by tuning the recipes to make the PDMS materials, the Weber number of the impinging water droplets was altered by adjusting the airflow speed in the wind tunnel. A suite of advanced flow diagnostic techniques, which include high-speed photographic imaging, digital image projection (DIP), and infrared (IR) imaging thermometry, were used to quantify the transient behavior of water droplet impingement, unsteady heat transfer and dynamic ice accreting process over the icephobic soft airfoil surfaces. The findings derived from the icing physics studies can be used to improve current icing accretion models for more accurate prediction of ice formation and accretion on aircraft wings and to develop effective anti-/de-icing strategies for safer and more efficient operation of aircraft in cold weather.

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