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Ice Accretion for SUAS Flight Regime on 2D Cylinders. ALYSSA AVERY, JAMEY JACOB, Oklahoma State University — While the icing problem has been considered extensively for manned aircraft, the key physical parameters that determine ice accretion are vastly different in the robotic aircraft realm, where sizes and speeds are much smaller. The trajectories of droplets are moving in a significantly lower velocity, the wing is at a smaller scale, and the heat flux properties do not follow the assumptions in established icing models. The need for greater understanding of accretion physics at low speeds and low altitudes is obvious when considering the ways in which icing models for manned aircraft are unsuited for small unmanned aircraft systems (SUAS). In the various experimental and numerical investigations completed, this study has shed significant insight on SUAS icing. Flight tests and an atmospheric model were used to examine the impact of flight conditions. Experimental heat transfer results were used in conjunction with a numerical ice accretion algorithm developed to suit SUAS. The work done with collection efficiency and heat transfer advocate an accurate determination of the amount wet versus dry icing on each simulation. The results of the simulations show that in low velocities a low level of accretion is likely. Wet icing will only form at temperatures close to zero and relatively high liquid water contents. Even when wet icing is present notable horn shapes are unlikely.

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