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Measurement of Tangential Momentum Accommodation Coefficient (TMAC) using a Disc Spin-Down Experiment in Low Pressure Gas TATHAGATA ACHARYA, JORDAN FALGOUST, MICHAEL MARTIN, Louisiana State University, RICHARD RASMUSSEN, Guidance Dynamics Corporation — The objective is the measurement of TMAC for gas versus surface interactions. An experimental facility is built to accommodate a disc spin-down experiment in various gas pressures. The experiment measures the drag on the surface of the disc through measurement of its rotational speed during spin-down. Computational fluid dynamics is used to determine an acceptable shape and size of the facility and to estimate the pressure at which free molecular flow regime may be reached. The spin-down speed is translated to angular deceleration. Torque is obtained from disc moment of inertia and the angular deceleration. Data shows that the torque is a linear function of angular velocity. Torque is non-dimensionalized and is plotted against Reynolds number (Re). Between atmospheric pressure and a pressure of 357 Pa, the non-dimensional torque decreases with Re. At 2.7 Pa, the non-dimensional torque does not show any change with Re and the system presumably attains continuum breakdown. At a pressure of 0.71 Pa the free molecular flow regime is reached. The measured TMAC between air and aluminum shows the range between 0.7209 and 0.7355. Future work will measure the TMAC of materials commonly used in aerospace systems such as titanium, kapton, and carbon fiber.

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