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Wind Tunnel Measurements of the Prandtl-D Research Aircraft in Preparation for a Stereoscopic Particle Image Velocimetry Flow Survey[1] BRADLEY ZELENKA, XIAOFENG LIU, San Diego State University, ERIK OLSON, NASA Langley Research Center — We will present experimental measurements of the Prandtl-D, a flying wing type of glider whose wings were designed using Prandtl's minimum induced drag with the bending moment as the design constraint. The Prandtl-D exhibits several novel aerodynamic characteristics, including the design's ability to make coordinated turns without the use of a rudder for yaw correction. This yawing behavior is the result of an induced thrust near the wingtips of the design, which our future studies will validate. In preparation for these future studies, a sting-mounted 24.4" wingspan model of the design has been built and tested in the San Diego State University Low Speed Wind Tunnel. Load measurements were taken using an external force balance through a range of angles of attack and sideslip at wind speeds of 100 and 120 mph to fully characterize the Prandtl-D's overall aerodynamic behavior. These results will be used for set-up and validation of a planned Stereoscopic Particle Image Velocimetry (SPIV) three-dimensional flow survey to analyze the fundamental flow structures contributing to the design's novel behaviors. Our SPIV study will serve as ultimate validation of the predicted aerodynamic phenomena that the Prandtl-D, and other similar designs, generate.

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