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Stator-Induced Circumferentially-Varying Preswirl Propulsor JOHN FARNSWORTH, MICHAEL AMITAY, Rensselaer Polytechnic Institute, DAVID BEAL, STEPHEN HUYER, Naval Undersea Warfare Center — A propuslor capable of producing maneuvering forces in all directions effectively eliminates the need for additional control surfaces. Side forces can be generated by the propeller through the variation of the inflow swirl velocity to a conventional propeller. These control forces are generated based on the same geometric principles as a helicopter swash-plate. Instead of cyclically adjusting the propeller blade pitch angle, the relative pitch angle of a fixed pitch propeller is cyclically altered through a preswirled inflow generated by an upstream stator row. Experiments were conducted in a wind tunnel to quantify the effectiveness of an upstream stator row to generate a circumferentially varying swirled flow. Global flow measurements were acquired through static pressure and PIV measurements on a simplified propulsor model. From these and future measurements a full understanding of the fluidic interactions associated with the non-uniform upstream stator row and the propeller can be made.

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