

# **Use of an Asymmetric Propeller for Unmanned Underwater Vehicles**

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This thesis describes the development and execution of a test program to determine the suitability of an asymmetric propeller for unmanned underwater vehicles (UUV). The idea to utilize a single blade propeller had been pioneered in the past for aviation as an attempt to generate greater thrust, but was quickly abandoned. Recently, Woods Hole Oceanographic Institute reevaluated the concept for use on a UUV, but for two different objectives. The first was a possible improvement in propulsive efficiency. For UUVs meant to operate for long periods without recharging, any increase in propeller efficiency can result in more time on station. The second object was to allow for an alternate method of steering the UUV. By controlling the speed of the propeller through each revolution, the thrust at any given point can be controlled. This allows for a non-uniformly distributed thrust about the longitudinal axis of the UUV which can be used to steer the UUV.

This thesis evaluated the efficiency of using such a propeller as well as the control authority it provides along a variety of speeds. This data was used to determine the suitability for UUVs and in which use cases an asymmetric propeller used for propulsion and steering could outperform a traditional propeller with a rudder.

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