

Autorotating Pararotor Decelerator Technology for Miniature Atmospheric Entry Probes

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Research has been conducted on the feasibility and modeling of a pararotor decelerator platform for atmospheric and planetary science as part of a masters degree in Mechanical Engineering at the University of Idaho. The specific application for pararotor technology, as presented, is miniaturized entry probes. A summary of research methods and results will be presented and discussed.

The research methods include developing a mathematical model for pararotor aerodynamics/dynamics to predict decelerator performance and to assist in pararotor design. The models developed as part of the research, as well as other pre-existing models, are validated in a series of small scale wind tunnel experiments. A full scale instrumented microprobe prototype is also being designed for the purpose of model validation in Earth's atmosphere.

The specific goal of the research is to understand the relationship between the fluid properties of the atmosphere and the dynamics of the descending probe. If a well defined relationship is constructed, dynamics of the probe can be measured directly and correlated with atmospheric properties as the probe descends through an atmosphere. Scientists could then use these profiles to learn about planetary processes such as boundary layer interactions.