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DEVELOPMENT AND FLIGHT TESTING OF A ROCKET POWERED UAV AS PATHFINDER FOR
A REUSABLE SOUNDING ROCKET.**Abstract**

Dawn Aerospace is developing a winged, reusable, liquid-rocket-powered UAV with the goal of serving sounding rocket mission scenarios more responsively and more cost effective than traditional expendable, multi-stage solid rocket systems. This goal is achieved by employing a UAV operations model in combination with a uniquely designed fixed wing vehicle. The vehicle features a semi- and fully autonomous guidance system, and is equipped with a bi-propellant rocket propulsion unit allowing it to employ trajectories unattainable by traditional fixed-wing UAV as well as traditional sounding rocket systems.

Technological and operational aspects in this new vehicle class are explored through a pathfinder project, which comprises of an experimental airframe carrying all subsystems such as avionics, reusable liquid rocket propulsion, propellant management, and communication. The pathfinder vehicle consists of a composite airframe that equipped with a customized avionics suite that allows for full autonomous flight operations and is propelled by a reusable liquid rocket engine with a nominal sea-level thrust of 120N. A flight test campaign has been carried out in 2018 to characterize all relevant technical and operational metrics on pathfinder level.

The paper outlines the design of the pathfinder vehicle as well as the first results of the rocket powered UAV flight test campaign and discusses these results in light of overall flight performance as well as cost reduction in comparison to traditional expendable sounding rocket systems.