

# DEVELOPMENT OF A WINGED RESUABLE SOUNDING ROCKET

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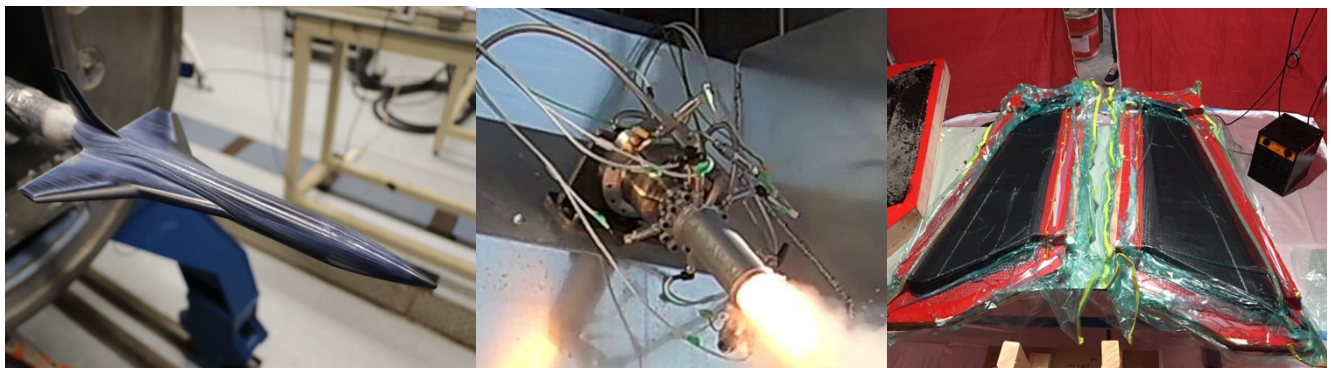
Dawn Aerospace develops a winged, liquid rocket powered Unmanned Aerial Vehicle to serve as a small reusable sounding rocket. The objective of the vehicle is to be highly responsive, flexible and cost-effective alternative to traditional expendable solid rocket systems. This goal is achieved by employing 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 were explored through a pathfinder project, which included an experimental airframe carrying all subsystems such as avionics, reusable liquid rocket propulsion, propellant management, and communication. Dawn Aerospace conducted flight test activities over the course of 2018, to characterize all relevant technical and operational metrics on pathfinder level<sup>1</sup>.

Based on these encouraging results, Dawn Aerospace has initiated the development of a new generation rocket powered UAV, dubbed Mk.2, to enable suborbital access and hypersonic flight time. This vehicle will have a take-off mass of 250 kg and will be able to carry a 3 kg payload to altitudes in excess of 100 km and to velocities of Mach 3. Future versions of this vehicle will feature larger payload capacities.

Currently prototype airframe, propulsion system and avionics have been developed and tested. The first flight test vehicle is under construction. Dawn Aerospace will initiate flight tests on the Mk.2 vehicle in the beginning of 2020 and expect to be ready for payload carrying flights from the second half of 2020.

This paper outlines the design of the Mk.2 vehicle, reports on the current development status, presents simulated flight trajectories and will discuss those matters in light of overall flight performance as well as cost reduction in comparison to traditional expendable sounding rockets.



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<sup>1</sup> J. Wink & all. Development and Flight Testing of a Rocket Powered UAV as Pathfinder for a Reusable Sounding Rocket. 69<sup>th</sup> International Astronautical Congress, 2018, Bremen, Germany