

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Facilities and Operations of Microgravity Experiments (5)

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A SOUNDING ROCKET FOR COST EFFECTIVE MEASUREMENTS AND ACCESS TO
MICROGRAVITY

Abstract

The Nimbus Project team, made of young engineers and university students, has developed a sounding rocket with the main aim to engineer a reusable, cost-effective test bench. This makes possible to field test many aerospace technologies as guidance or reentry systems, enable airborne atmospheric measurements, high altitude students' experiments and enhancing access to microgravity. The modular architecture allows the use of different payloads, composite material structures increase lightness and off-the-shelf components reduce costs; ease of transportation and usability qualify it as an extremely versatile platform. A technology demonstrator with reduced thrust and payload capability is going to be finished. Main frame and fuselage are composites manufactured with VA-RTM technology (Vacuum Assisted Resin Transfer Moulding) to achieve an optimal balance of lightness, mechanical properties and production costs. Avionics is based on an Arduino board and custom made electronics. Ground segment is composed of a laptop loaded with rocket's telemetry and telecommands GUI, and by a transportable launch pad. The system is scalable to carry heavier payloads and to perform scientific tests at higher altitudes. The technology demonstrator is going to reach a height of 1000m with a mass at launch of 3.5kg. Its systems and subsystems are: solid rocket motor, main frame and fuselage, chute deployment system, control electronics and payload sensors. Each one has been ground and/or flight tested showing optimal accordance between theoretical model and testing. The rocket motor thrust curve was extensively characterized in its low power version, the main frame was studied in a thesis work with correlation between Finite Element Analysis and a mockup, a stripped down rocket successfully flew five times acquiring precious data of accelerations, angular velocities and attitude. The sounding rocket demonstrator will fly for the first time within March and a second launch is scheduled for July 2015.