

Nucleus: the Norwegian Sounding Rocket for Experiments in the Mesosphere

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Abstract

Nammo, Norwegian company in the Defense and Space sector, has successfully completed the development of Nucleus, a single stage sounding rocket based on hybrid rocket propulsion technology. The motor and entire rocket development, carried out by Nammo over 5 years with the support of the European Space Agency, culminated with the successful launch of the first technology demonstrator from Andøya Space Center in northern Norway in September 2018. The demonstrator was designed to reach space (Karman line >100 km) lifting a payload section with a total mass (service module and fairing included) of 62 kg. The launch was a complete success both in terms of on-board experiments and performed trajectory and a final apogee of 107 km was achieved.

Nucleus is a 9 m long and 14" diameter rocket with spin stabilization, that can bring both scientific and technological experiments into the mesosphere.

The propulsive technology onboard Nucleus is based on the use of high concentration Hydrogen Peroxide (H_2O_2), a green and storable propellant, as oxidizer, and HTPB as fuel. This choice, combined to the intrinsic safety and simplicity of hybrids with respect to alternative solid and liquid propulsion solutions, makes Nammo's hybrid technology very attractive for a broad range of applications where low cost, good performance and responsiveness are paramount.

The Nucleus sounding rocket is now flight qualified and available to researchers and potential customers.

In the meantime, Nammo continues the development of its hybrid technology towards new capabilities, with the support of the European Space Agency: the focus is on motor (and thus rocket) dry mass reduction and reduction of rocket unitary price, in order to provide an even more competitive and commercially viable launch vehicle.



Figure Insert: Nucleus fully assembled and ready for launch demonstration on the left; Nucleus in flight. Andøya Space Center, 27th September 2018.