

The North Star Rocket Family

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ABSTRACT

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In more than 50 years, sounding rockets have been launched from Andøya Space Center. The accessibility of suitable rocket motors for these scientific experiments has become increasingly more difficult. In 2008, the rocket range and the rocket motor manufacturer Nammo Raufoss conceived the vision to cooperate on the realization of a family of rockets based on hybrid rocket propulsion. They conceived a plan to develop and introduce environmentally friendly, flexible and safe rocket motors to the market. The family of rockets created was called the North Star Rocket Family.

The North Star Rocket Family is based on a modular concept existing of hybrid rocket motors clustered together to form 2-stage sounding rockets for scientific research. There are plans for two sizes of these 2-stage sounding rockets. Together, these “launcher elements”, form the basis of a small launcher as well. The launcher should be able to serve a market for the dedicated launch of 20-25kg in a 250-350km SSO orbit. It is crucial for the concept that the component cost is kept at the cost levels acceptable to the sounding rocket market. This is where the economy-of-scale is achieved. There are at this moment many more sounding rocket launches than micro-launcher campaigns. If the selection of the components is tailored towards “space qualified” components, a dedicated micro-launcher for such small payloads will not be feasible: non-recurring and recurring costs will be too high. However, the potential market for a low cost dedicated launcher is such, that if successful, the launcher market could overtake the sounding rocket market really quickly. But only if the cost can be kept under control!

This launcher will be really small and size alone will already keep the cost down. Only if the launcher is small enough, can the propulsion system also serve the sounding rocket market which is urgently looking for new motors. Based on the two markets and the modularity of the hybrid propulsion engines, enough parts will be built to create a value chain which will keep the recurring cost of the micro-launcher down to a minimum. New parts and components will have to be developed with either an industrial or aeronautical or defense heritage as the starting point. To reach our goal, disruptive thinking is needed to assemble a whole new rocket based on a new propulsion system. But the success also relies heavily on the modularity aspects of the hybrid propulsion, the ease of upgrading it and the inherent safe behavior. The North Star project is the only project around, which attacks the launch cost from below, i.e. by developing an efficient, safe and cost effective propulsion system first, and let the launcher design be a result of that.