IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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FINAL DESIGN SUMMARY AND HIGH-ALTITUDE TEST FLIGHT PLAN OF A REUSABLE SUBORBITAL PERUN ROCKET.

Abstract

PERUN is a reusable suborbital rocket designed to deliver 50 kg of scientific and commercial payloads to altitudes of up to 150 km. It is developed by a Polish company SpaceForest which aims to reduce the cost of suborbital flights by making PERUN entirely reusable. The development of the PERUN rocket has started in mid-2018. This paper shows the results of the development process by describing its final design and summarising the manufacturing process of the first unit. The design summary includes the description of each rocket subsystem. Major focus is given to the main hybrid rocket engine with an innovative thrust vector control system and the composite structure including an ultra-light oxidiser tank. The supersonic recovery system based on an isotensoid ballute is also discussed in details. The first PERUN rocket will be used in a high-altitude test flight to an altitude of 50 km scheduled in Q4 2022. This paper shows an expected mission profile, concept of operations and the overview of the ground equipment required to launch, control and recover the rocket. The entire ground segment is mobile in order to lower the cost of the launch campaign and to enable launch from almost any spaceport. Major

components of the ground segment are the mobile transporter-erector-launcher and the communication system called RASEL. The first high altitude test flight will be followed by a first suborbital flight. During its nominal flight PERUN will be able to provide up to 5 minutes of high-quality microgravity and access to high-speed testing environment. The results of these test flight will be used to validate the performance of PERUN before the start of commercial operation in 2023.