

MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Processes onboard the International Space Station and Beyond (7)

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ROCKET SEPARATION AND RECOVERY SYSTEM ACTUATION USING DYNEMA WIRE

Abstract

The Stratos II sounding rocket will be the first Dutch build sounding rocket to go higher than 50 km. It is build by the Delft Aerospace Rocket Engineering, or DARE for short as successor of the Stratos I rocket. Stratos I set the new European altitude for amateur rockets to 12.2 km.

Stratos II needs to have an apogee altitude at least four times as high. The Stratos project is run by students and members from DARE, in combination with help and expertise of the Delft University of Technology. Since the project is funded by sponsors, one of the biggest objectives is to minimize the production and engineering cost.

The only part of the Stratos II rocket which is recovered is the capsule section. For this procedure the capsule section needs to be separated from the spend propulsion system via a clamp-band system. The separated capsule will deploy a recovery system in the form of a (steer-able) parachute. In order to reduce development cost, a common actuation system is needed for both applications This system is referred to as the Multi Purpose Release System (MPRS) This release system design will be the back bone these types of systems within DARE.

The system requirements for a sounding rocket actuation system are identified via a system engineering approach. Apart from low cost, operability and survivability, the actuation system should be able to operate in every phase of the flight (also complete vacuum). Due to certification problems pressure vessels are not allowed on the rocket. Therefore, gas generating options, such pressurized containers with gas, or even low explosives are prohibited.

The option which looks very promising as a very low cost release-system via the melting of a polymeric fibre such as Dynema. This material (Ultra High Molecular Weight Polyethylene) melts at a temperature range from 144C to 150C which is easily obtainable with a low powered electronic system. The current design for the MPRS is a fully redundant system using Dynema, which can release 4 KN and which is able to be actuated in a time under 3 seconds with a power consumption of less than 10 Watts.

The MPRS system is going to be used to release a clamp-band separation for the capsule and as release for the parachute deployment bag for the Stratos II rocket.