

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

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THE IMPROVED ORION SOUNDING ROCKET AS A VEHICLE FOR STUDENT EXPERIMENTS.

Abstract

The Improved Orion rocket is used for the REXUS programme by DLR/SNSB, containing up to 5 student experiments per launch. This vehicle is a cost effective sounding rocket, with a maximum payload capacity of 100 kg. The maximum apogee reached with this vehicle in a single stage configuration is approximately 115 km. Together with a yo-yo de-spin system this rocket is capable of reaching “milli-gravity conditions” ($10E-2$ g) for periods up to 100 seconds. The rocket model is aerodynamically stabilized as well as spin stabilized by means of canted fins. The nominal diameter of the vehicle is 14 inch (355.6 mm).

In 1964, an improvement programme was started for the HAWK Surface to Air Missile [SAM], which resulted among other electronic upgrades the introduction of the Aerojet M112 dual thrust motor. This motor, produced in great numbers for the HAWK system is now used to propel the Improved Orion sounding rocket. The dual thrust motor gives the small aerodynamically stabilized sounding rocket a very high start acceleration and a long sustaining phase in the less dense atmosphere. This combines a low weather cocking tendency with a low drag loss, ideal for a small sounding rocket. Since this rocket motor is still widely available throughout the western world, the Improved Orion sounding rocket will be in use for some time to come.

A complete infrastructure is developed around this motor by DLR MORABA for supporting one or more 14 inch payload modules.

- The payload module system, based on 14 inch diameter, with different heights.
- Motor adapter, which can house, if necessary, a de-spin system.
- Service module, which supports the payload with power and telemetry.
- Recovery module, which provides for the recovery of the payload itself.
- Ejectable nosecone system.

For the REXUS programme now 10 launches have been performed with this vehicle, all of which were successful. At least two more launches will be performed under the current REXUS programme, but it is expected to be at least a dozen more. The Improved Orion proved to be a cost effective and reliable carrier for student experiments, and its availability and performance encourages its continued use into the future.