

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

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REX – FREE FLYER: A REUSABLE ORBITAL RETURN VEHICLE FOR EXPERIMENTS UNDER
MICROGRAVITY CONDITIONS

Abstract

It is assumed that the microgravity research community, as well as the involved industry, is and will be missing an opportunity for experiments under microgravity with a highly variable time frame in between that of sounding rockets (approx. 10-20 minutes) and the International Space Station ISS (several months). Consequently the REX – Free Flyer (Returnable EXperiments in Space) was proposed by a team of DLR institutes.

The REX – Free Flyer is a DLR R&D concept for a returnable and reusable orbital experiment facility. It features a very high quality level of microgravity during its missions, whose durations may vary from approximately 30 minutes up to several weeks. Another key feature is the reliable return of samples, data and experimental equipment. REX payloads will be comparable in size and weight to TEXUS sounding rocket payloads. It will be launched and operated like a small satellite, but will additionally return its payloads back to earth. This non-destructive return will be performed using latest reentry technology in the fields of thermal protection systems as well as active control of reentry and landing. The concept also aims at maximum reusability of system and payload to realize minimum turn around times.

This paper reflects the current status of the project, regarding the pre-phase A study, which surveyed the market driven aspects, and the phase A, which focuses on the technological and organisational feasibility. Technologically the system splits up into several subsystems, each of which existing (and non-existing) know-how is identified and valued. Identification of missing technology leads to a first estimation of development effort. Regarding organisational aspects, scenarios for mission profiles and experiment campaigns are presented. Here as well suitability of existing organisational structures is valued within the objectives of the project.

A preliminary project schedule, culminating in the inaugural flight of a demonstration vehicle in 2015, is given.