

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

Author: Dr. Thorben Könemann
ZARM Fab GmbH, Germany

Mr. Peter von Kampen
ZARM Fab GmbH, Germany
Prof. Hans Rath
ZARM Fab GmbH, Germany

THE DROP TOWER BREMEN - EXPERIMENT OPERATION

Abstract

The idea behind the drop tower facility of the Center of Applied Space Technology and Microgravity (ZARM) in Bremen is to provide an inimitable technical opportunity of a daily access to short-term weightlessness on earth. In this way ZARM's european unique ground-based microgravity laboratory displays an excellent economic alternative for research in space-related conditions at low costs comparable to orbital platforms. Many national and international experimentalists motivated by these prospects decide to benefit from the high-quality and easy accessible microgravity environment only provided by the Drop Tower Bremen. Corresponding experiments in reduced gravity could open new perspectives of investigation methods and give scientists an impressive potential for a future technology and multidisciplinary applications on different research fields like Fundamental Physics, Astrophysics, Fluid Dynamics, Combustion, Material Science, Chemistry and Biology. Generally, realizing microgravity experiments at ZARM's drop tower facility meet new requirements of the experimental hardware and may lead to some technical constraints in the setups. In any case the ZARM Drop Tower Operation and Service Company (ZARM FAB mbH) maintaining the drop tower facility is prepared to assist experimentalists by offering own air-conditioned laboratories, clean rooms, workshops and consulting engineers, as well as scientific personal. Furthermore, ZARM's on-site apartment can be used for accommodations during the experiment campaigns related to the drop tower facility.

While defining a microgravity project at the Drop Tower Bremen, interesting experimentalists should keep in mind generally reducing dimensions and masses of their common laboratory setups to meet the capsule constraints: overall payload height 980mm/1730mm (short/long drop capsule) and 950mm (catapult capsule); area of each capsule platform 0,359sqm; maximum payload mass 274kg/234kg (short/long drop capsule) and 163,8kg (catapult capsule). The base equipments of each capsule are the Capsule Control System (CCS) to remote control the experiment and the rechargeable battery pack (24V/40A) for the experiment operation. Moreover, the experiment components must be able to withstand maximum decelerations of 50g while the short capsule impact of about 200ms, and maximum accelerations of 30g while catapult launch with a duration of about 300ms.

In our second talk concerning ZARM's drop tower facility we will go on with detailed informations about the technical base setups of the drop and the catapult capsule structure to completely handle a freely falling experiment. Furthermore, we will summarize interesting current drop tower projects as an outlook to present you the range of opportunities at the short-term microgravity laboratory of ZARM.