

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

Author: Mr. Andreas Gierse
ZARM University of Bremen, Germany

Mr. Ulrich Kaczmarczik
ZARM University of Bremen, Germany

Dr. Thorben Könemann
ZARM Fab GmbH, Germany

Mr. Christian Eigenbrod
University of Bremen, Germany

Mr. Peter von Kampen
ZARM Fab GmbH, Germany

Mr. Marc Avila
ZARM Fab GmbH, Germany

REPORT ON PROGRESS OF THE GRAVITOWER BREMEN - PROTOTYPE

Abstract

The Center of Applied Space Technology and Microgravity (ZARM) founded in 1985 is part of the Department of Production Engineering at the University of Bremen, Germany. ZARM is mainly concentrated on fundamental investigations of gravitational and space-related phenomena under conditions of weightlessness as well as questions and developments related to technologies for space and their applications on Earth. At ZARM about 100 scientists, engineers, and administrative staff as well as many students from different disciplines are employed. Today, ZARM is one of the largest and most important research center for space sciences and technologies in Europe.

With a height of 146 m the Bremen Drop Tower is the predominant facility of ZARM and also the only drop tower of its kind in Europe. ZARM's ground-based laboratory offers the opportunity for daily short-term experiments under conditions of high-quality weightlessness at a level of 10^{-6} g - microgravity. Scientists may choose up to three times a day between a simple drop experiment with 4.74 s or an experiment in ZARM's worldwide unique catapult system with 9.3 s in free fall. Since the start of operation of the drop tower facility in 1990, over 8000 drops or catapult launches of more than 200 different experiment types from various scientific fields like fundamental physics, combustion, fluid dynamics, planetary formation / astrophysics, biology and material sciences have been accomplished so far. In addition, more and more technology tests have been conducted under microgravity conditions at the Bremen Drop Tower in order to prepare appropriate space missions in advance.

This paper will report on the progress of the development of the GraviTower Bremen - Prototype (GTB-PRO) that represents a novel class of drop tower system. With the GTB-PRO technology based on an actively driven rope system this new drop tower facility will be capable to perform over 100 microgravity experiments per day. In its first developmental stage the prototype will offer 2.5 s for short-term experiments in weightlessness. It is expected by the applied rope drive technology that an extension of the microgravity duration up to approx. 8 s will be feasible in the further planned facility - GraviTower Bremen.