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## FIRST OPERATION OF ZARM'S NEXT-GENERATION MICROGRAVITY FACILITY

**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. At ZARM, about 100 scientists, engineers, administrative staff, and many students from different disciplines are employed.

Today, ZARM is one of the largest and well-known 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 this 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. Scientists may choose up to three times a day between a single drop experiment with 4.74 s in simple free fall and an experiment in ZARM's worldwide unique catapult system with 9.3 s in microgravity. Since the start of operation of the drop tower facility in 1990, over 9000 drops or catapult launches of more than 300 different experiment types from various research fields have been accomplished so far. In addition, more and more technology tests have been performed under microgravity conditions at the Bremen Drop Tower, in order to prepare single space instruments or appropriate space missions in advance.

In this paper, we report about the first operation of the GraviTower Bremen Pro (GTB Pro), ZARM's next-generation microgravity facility. The GTB Pro represents an actively driven drop tower system that is capable to perform over 12 short-term microgravity experiments per hour. The GTB Pro technology is based on a commercial hydraulic winch system with over 4000 horsepower. With its sophisticated Release-Caging-Mechanism (RCM), the powerful GTB Pro is also able to control massive payloads in a very smooth and precise way. Furthermore, its user-friendly software interface brings microgravity experimenting on a laboratory level. Due to the fact that the standard capsule of the Bremen Drop Tower can be used, high synergy effects are given for ZARM's drop tower users - simple change of the modes (drop, catapult, or GTB Pro).

In conclusion, the GTB Pro complements the Bremen Drop Tower and offers an excellent alternative to perform dedicated microgravity research. At a later development stage, partial-g experiments will also be feasible in the GTB Pro.