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VIBES PIONEER: HOW BREMEN'S FIRST STUDENT-BUILT SATELLITE IS TAKING THE CONSUMER ELECTRONICS REVOLUTION TO SPACE

Abstract

VIBES Pioneer is a 3U CubeSat currently being developed by the VIBES Research Team of the City University of Applied Sciences Bremen (HSB), Germany. The VIBES team currently consists of over 30 students of the HSB from different Bachelor and Master study programs, including Aerospace Engineering and Computer Sciences as well as Mechatronics. In November of 2023, the German Aerospace Centre selected VIBES Pioneer as one of eight European projects to be launched on the second flight of Rocket Factory Augsburg's RFA ONE. The mission aims at taking the consumer electronics revolution to space to improve the optical performance of its instruments. The spacecraft hosts an optical payload equipped with a light and cost-effective disturbance measurement and management system that was derived from components usually found in smartphones. During each image acquisition, accelerometers log the perturbations emitted by a reaction wheel and their propagation along the satellite structure. Passive isolators placed on the structural path between reaction wheel and camera will reduce the disturbances. An active line of sight system for fine pointing control of the payload will further improve the performance. The generated image data and satellite status information will be delivered to ground with a software defined radio. The data will be used on ground to adapt the operation modes and improve the final products with specialized post-processing algorithms.
VIBES Pioneer is Bremen's first student-built satellite and the first of a family of spacecraft built as part of the VIBES satellite research program. The program's research objective is to determine if and how consumer electronics can be adapted to all subsystems of a spacecraft. Therefore, each of these future spacecraft will adapt modern technologies to enhance performance. In this endeavour, the VIBES team is closely collaborating with OHB System AG, one of Europe's Large System Integrators, as well as research institutions such as DLR and the Center of Applied Space Technology and Microgravity Bremen (ZARM).