

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Space Exploration Overview (1)

Author: Mr. Jonathan Männel

Julius Maximilians Universität Würzburg, Germany, jonathan.maennel@uni-wuerzburg.de

Mr. Tobias Neumann

University of Bremen, Germany, tobias.neumann@daedalus-project.eu

Mr. Clemens Riegler

Julius Maximilians Universität Würzburg, Germany, clemens.riegler@uni-wuerzburg.de

Prof. Hakan Kayal

Julius Maximilians Universität Würzburg, Germany, hakan.kayal@uni-wuerzburg.de

Mr. Erik Borschinsky

University Würzburg, Germany, erik.borschinsky@stud-mail.uni-wuerzburg.de

SATEX: EXPLORING THE POSSIBILITIES OF SMALL SATELLITES FOR INTERPLANETARY
MISSIONS

Abstract

In recent years, small satellite technology has undergone significant advancements, creating new opportunities for dedicated, low-cost interplanetary exploration missions. The Cubesats launched as part of the Artemis-1 mission are a good example. Small satellites also offer a variety of possibilities to support larger interplanetary missions, such as serving as a communication relay as demonstrated by the MarCO mission or providing observational analysis like LICIA Cube as part of the DART mission.

The SATEX project is a comprehensive study aimed at investigating the current and future usage of small satellites within exploration missions beyond Earth's sphere of influence. Therefore, a detailed overview of the current state of small satellite hardware and its suitability for interplanetary exploration missions is provided and environmental factors in the solar system were analyzed to understand the areas that need improvement for small satellites to be viable for such missions. As a comprehensive study, the report also deals with various launch opportunities beyond the classic piggyback missions. In particular, micro-launchers and highly optimized trajectories in combination with electric propulsion systems are promising approaches for independent mission concepts that were investigated. In addition, a survey was conducted among German researchers from various fields in extraterrestrial science. The survey aimed to gather information on the most needed measurements within the community, current research interests and demands and desires for interplanetary missions to identify perspectives on the use of small satellites and rank different mission concepts based on scientific priority.

The results of the SATEX project are comprehensive and offer valuable insights into the most promising missions for small satellites beyond Earth and the associated challenges. The report highlights the potential of small satellites for interplanetary exploration and provides a roadmap for future mission designs and activity prioritization. The project also sheds light on the areas that need to be addressed for successful missions, such as key hardware components, environmental factors, and launch opportunities.

In conclusion, the results of the SATEX project provide valuable information for researchers, industry players, and policy-makers to better understand the opportunities and challenges associated with the use of small satellites for interplanetary missions.