KIBOCUBE PROGRAM FOR THE LAUNCH OF THE TUMNANOSAT NANOSATELLITE

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The TUM National Space Technologies Center team was selected by the Japan Aerospace Agency (JAXA) and the United Nations Office for Outer Space Affairs (UNOOSA) for the fourth round of the KiboCUBE Program for the launch of the TUMnanoSAT nanosatellite from the International Space Station (ISS) in 2020, with the help of the japanese experimental KiboCUBE module. KiboCUBE is a collaboration between UNOOSA and JAXA, dedicated to the use of ISS KiboLancer for the launch of CubeSat nanosatellites. KiboCUBE aims to provide the members of the United Nations Organization members – educational or research institutions, with the opportunity to launch CubeSat satellites from ISS KiboCUBE, developed for educational and research purposes.

The International Space Station was designed to be used as both a microgravity laboratory, as well as a launch pad for low-Earth-orbit services. The Japanese Space Agency's Kibo ISS module includes a small satellite-deployment system called the J-SSOD. Deploying CubeSats from ISS has a number of benefits. Launching the vehicles aboard the logistics carrier of ISS visiting vehicle reduces the vibration and loads they have to encounter during launch. In addition, they can be packed in protective materials so that the probability of CubeSat damage during launch is reduced significantly. In addition, for earth observation satellites, such as those of Planet Labs, the lower orbit of the ISS orbit, at roughly 400 km, is an advantage. In addition, the lower orbit allows a natural decay of the satellites, thus reducing the build-up of orbital debris.

Figure 1: Nanosatellites deployment from JAXA Kibo Module.

The National Space Technologies Center of TUM projected the family of TUMnanoSAT's nanosatellites, according to the international CubeSat standard. The mission of these nanosatellites is to verify the functionality of the various satellite modules and subsystems.

In the 2019 year, NCST participated in the fourth round of the KiboCUBE Program with the nanosatellite project from the "TUMnanoSAT" family, including the following basic missions:

– studying the functionality and behavior of sensors based on nano- and micro-wires in space conditions;

– testing subsystem sensors to determine satellite attitude (magnetometers, micro-gyroscopes, solar sensors) to optimize attitude control algorithms.

– the development of an efficient "satellite-terrestrial station" communication subsystem;

– testing of the solar energy system to obtain the optimal modes of distribution of the accumulated energy;

– testing the reliability of electronic components under the conditions of space radiation.

This project includes the launch of the first satellite of the Republic of Moldova under the KiboCUBE program under the auspices of UNOOSA and JAXA. It has a major impact on the improvement of the quality of engineering studies based on modern space technologies, attracting young students to develop and strengthen scientific research in space exploration. Also, it supports the integration of the Republic of Moldova into the community of countries which develop space technologies.

Keywords: *nanosatellite, International Space Station (ISS). Japan Aerospace Agency (JAXA), KiboCube module, United Nations Office for Outer Space Affairs (UNOOSA)*

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