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ACTIVITIES (D5)

For a successful space program : Quality and Safety! (1)

Author: Mr. Juan Gracia García-Lisbona
Luleå University of Technology, SwedenProf. Rene Laufer
Luleå University of Technology, Sweden
Dr. Cristóbal Nieto Peroy
Luleå University of Technology, Sweden
Mr. Lars - Olov Persson
Luleå University of Technology, SwedenFULL SYSTEM IN-HOUSE DEVELOPED MISSION ASSEMBLY, INTEGRATION AND
VERIFICATION CAMPAIGN FOR KVARKENSAT, A 2U CUBESAT AT THE KIRUNA SPACE
CAMPUS IN NORTH SWEDEN**Abstract**

The miniaturization of technology during the last 30 years have facilitated more access to space for agencies, private companies, research institutions and universities. During the last 11 years the number of orbital rocket launches has almost tripled, from 74 in 2011 to 185 launches in 2022, and the number is expected to keep increasing during the upcoming years. As a result of this, the number of artificial objects in Earth orbit is increasing exponentially: according to the Space Debris User Portal (ESA) out of 10000 satellites still in space, 7200 are still operational. One of the reasons behind the boost of number of missions planned by universities and research institutions is the use of Commercial Of-The-Shelf components, which allow to decrease exponentially mission cost. The approach during the satellite integration and testing phase in academic missions is usually more simpler and faster by testing in a proto-flight configuration on full-system and subsystem level. This approach usually relies on previous mission flight heritage without considering manufacturing failures. However, in novel and unexperienced projects this approach can lead to early-mission failure. For this reason, a balance must be found in which CubeSats and small satellite missions are robustly tested to ensure mission success, keeping the low-cost approach.

In this paper the Assembly, Integration and Verification campaign for the 2U CubeSat KvarkenSat will be presented. This CubeSat mission is part of the KvarkenSat Space Center, Finland, a collaboration between Aalto University, the University of Vaasa, the Swedish University of Agricultural Sciences, Novia University of Applied Sciences, the Swedish Institute of Space Physics and the Luleå University of Technology (LTU) in Sweden that aim to design, build and operate a CubeSat with the goal of acting as a technological demonstrator, and establish a long-term small satellite competence in the Kvarken region of Sweden and Finland. To achieve this, a simple but complete quality-management approach for satellite AIV has been implemented.

The integration and testing capabilities at LTU will allow further collaboration with both industry and academic organizations that will be able to use the Kiruna Space Campus facilities. Ultimately, this effort will support orbital missions from Esrange Space Center (Swedish Space Corporation): small satellites could be assembled and tested on campus and then be transported to the space center for launching. The LTU Kiruna Space Campus has developed the knowledge, resources, and tools to become the leading university in space research and technology.