

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Small Launchers: Concepts and Operations (7)

Author: Mr. Janusz Nicolau-Kukliński
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
janusz.nicolau-kuklinski@ilot.lukasiewicz.gov.pl

Mr. Stanisław Jama
Thorium Space, Poland, stanislaw.jama@thoriumspace.com

Mr. Tomasz Noga
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland, tomasz.noga@ilot.lukasiewicz.gov.pl

Mr. Michał Pakosz
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
michal.pakosz@ilot.lukasiewicz.gov.pl

Ms. Edyta Żak
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland, edyta.zak@ilot.lukasiewicz.gov.pl

Mr. Konrad Wojciechowski
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
konrad.wojciechowski@ilot.lukasiewicz.gov.pl

Mr. Cezary Kostrzewski
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
cezary.kostrzewski@ilot.lukasiewicz.gov.pl

Mr. Maciej Filipowicz
Lukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
maciej.filipowicz@ilot.lukasiewicz.gov.pl

NOVEL COMMUNICATION AND NAVIGATION SYSTEMS ONBOARD ILR-33 AMBER 2K ROCKET

Abstract

Reliable communication and navigation systems are essential for mission success of any space rocket. While such systems are well developed in the industry, making them highly reliable and tailored to specific requirements of given rocket flight while keeping their cost low enough for the whole system to remain competitive, continues to be a significant challenge. This paper presents development activities realized within a project, called "SUBCOM", led by Thorium Space Technology. The main purpose of this project is to develop novel communication systems, dedicated to space and rocket applications. A satellite communication module, a rocket communication module, a ground station, a localization beacon and a mobile beacon signal receiver are being developed and implemented to the ILR-33 AMBER 2K sounding rocket and to its supporting ground infrastructure. Launches will constitute to flight heritage of these newly developed systems and will be a milestone towards their commercialization.

The paper presents overall description of the launching platform (rocket and ground infrastructure), their capabilities and properties, performed modifications on the rocket and some preparations activities for next flight test. As the communication system will involve at least two objects - a rocket and a ground station, it was necessary to perform a detailed review of already developed rocket and ground infrastructure to define required modifications and new components. Paper provides description of following project deliverables, resulting from detailed design process, realized after successfully defined system requirements and preliminary design review:

- Payload Service Unit (PSU) for brand new Onboard Satellite Retransmission Unit (payload to be tested during flight test conditions);
- Rocket Radio Subsystem: Rocket Telemetric Telecommand Unit and Wraparound Antennas for uplink, downlink and GNSS communication;
- Tracking System with Monopulse Radar and Ground Telemetric Telecommand Unit as a part of Rocket Ground Station;
- Localization system for main rocket modules - Payload Module, Rocket Propulsion Module and Boosters.

Technical discussion provides design description, results obtained from performed analysis and breadboards verification, which will be verified by launch campaign that concludes the project.

New development activities and proposed modifications can significantly improve general reliability and performance of planned and potential rocket flights in longer term. Developed rocket and related infrastructure can become an affordable and easily accessible launch platform, for both commercial and science users.