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Author: Ms. Fabiana Milza
T4i, Italy

Dr. Elena Toson
T4i, Italy
Dr. Nicolas Bellomo
T4i, Italy
Prof. Daniele Pavarin
T4i, Italy
Mr. Riccardo Di Roberto
G.A.U.S.S. Srl, Italy
Mr. Nicola Sparvieri
G.A.U.S.S. Srl, Italy
Prof. Filippo Graziani
G.A.U.S.S. Srl, Italy
Dr. Fabio Trezzolani
T4i, Italy
Dr. Marco Manente
T4i, Italy
Mr. Devis Paulon
T4i, Italy
Dr. Alessandro Barbato
T4i, Italy
Dr. Mirko Magarotto
University of Padova - DII/CISAS, Italy
Dr. Riccardo Mantellato
T4i, Italy
Mr. Lorenzo Cappellini
T4i, Italy
Dr. Antonio Selmo
T4i, Italy
Mr. Marco Minute
T4i, Italy
Dr. Matteo Duzzi
T4i, Italy

A CASE STUDY OF A MOTORISED FLEXIBLE IOD PLATFORM: THE UNISAT-7 AND REGULUS MISSION.

Abstract

The rise of the New Space economy and the ever-increasing development of commercial space have

brought new players in the space industry ecosystem. This evolution of the space market is characterized by the necessity of rapid integration and testing phase, to minimize the time-to-market. The growth of opportunities of IOD missions and their performances play a key role in enabling this progress of the industry.

GAUSS Srl and Technology for Propulsion and Innovation Spa (T4i) decided in 2018 to join forces and forge a strategic alliance to motorise a flexible platform designed to allow New Space companies to fulfil their IOD mission.

Gauss (a spin-off company of Scuola di Ingegneria Aerospaziale, Sapienza University of Roma) has been working on small satellites since 1990s, when they started the development of the first UNISAT satellite, then launched in 2000.

T4i, born as spin-off of propulsion research group of the University of Padua, has a thorough expertise on chemical and electrical propulsion systems for small satellites.

The latest addiction to the GAUSS UNISAT series is UNISAT-7, a 32 kg microsatellite built on the extensive experienced gained from previous missions. It includes several GAUSS proprietary subsystems developed for Earth Observation applications, sat-to-ground optical links, navigation, power, RF, and Smallsat in-orbit-deployments. All these subsystems are tested in orbit in specific IOD missions.

Moreover, UNISAT-7 integrates a precise ADCS solution and the brand new T4i electric propulsion system, named REGULUS. REGULUS will allow UNISAT-7 to modify its final orbit, as well as to execute housekeeping manoeuvres for drag compensation.

REGULUS is a propulsive unit based on MEPT (Magnetically Enhanced Plasma Thruster) technology and is T4i very first product that has ever flown into space. Its envelope is 1.5 U of volume, it is equipped with solid iodine propellant and its main features are a thrust level of 0.55 mN and Isp of 550 s at 50 W of input power, and wet mass of 2.5 kg at 3000 Ns of Itot. REGULUS is designed to serve nanosatellite platforms from 6U to 24U and CubeSat carriers.

The integration took place in GAUSS white chamber in Rome in December 2020 and the launch is scheduled in March 2021 from Baikonur as a secondary payload of Soyuz-2-1a/Fregat.

Performances of REGULUS propulsion system are evaluated after the initial commissioning of UNISAT-7.

In this paper the results and performances of this mission will be analysed and shared with the IAC community.