Appendix 4 to the RFQ no. 12/2021
Detailed functional requirements

OCS Requirements:

- OCS application shall provide ability to communicate with the propulsion module on the spacecraft by using telecommand and telemetry frames compliant with the chosen protocol stack.
- OCS application shall provide ability to perform automated tests of the propulsion module connected to the spacecraft, by executing external scripts
- OCS application shall be able to handle communication with the spacecraft propulsion module without communication failures
- OCS application shall be able to control and manage the on-board schedule of the propulsion system connected to the spacecraft (i.e maneuver execution)
- OCS application shall be able to update the software of the propulsion system connected to the spacecraft
- OCS application shall provide interface to the ground station in order to perform communication compatibility test
- OCS application shall be executable on local server in testing facility; cloud-based solution is not allowed
- OCS application shall be able to be executed on testing facility PC platform: based on Linux (preferably Mint Ulyana or Ubuntu 20.04) and Windows 10 operating system
- Software installation and usage support until 31.03.2022
- OCS application shall be provided with 36 months of warranty
- Software test report / test suite delivery along with instruction how to execute them

Work package name	Requirements	Due date

WP1	• OCS Application shall be able to communicate with the spacecraft platform:
	  ○ Application shall implement communication protocol stack matching the one used by the communication subsystems of the spacecraft platform:
	  ▪ CCSDS CLTU
	  ▪ CCSDS TC Transfer Frame
	  • Application shall provide ability to configure ‘Spacecraft ID’ field
	  • Application shall provide ability to change the value of the ‘Virtual Channel ID’ field at runtime
	  • Application shall provide ability to change the value of the ‘MAP ID’ field at runtime
	  • Application shall provide ability to utilize features of encryption and authentication according to the CCSDS Secure Data Link Protocol and guidelines from the Creotech Instruments S.A. utilization of those mechanisms shall be configurable (including disabling)
		30. 06.2021

	▪ CCSDS TM Transfer Frame • Application shall provide ability to configure 'Spacecraft ID' field • Application shall provide ability to change the value of the 'Virtual Channel ID' field at runtime • Application shall provide ability to utilize features of decryption and authentication according to the CCSDS Secure Data Link Protocol and guidelines from the Creotech Instruments S.A. utilization of those mechanisms shall be configurable (including disabling) ▪ CCSDS COP-1 • Application shall allow to retransmit packets which were lost or were requested to be retransmitted by the spacecraft platform • OCS application shall be able to receive data frames from external application, sent over TCP/IP protocol. The data shall be encapsulated in the lower protocol layers (CCSDS) and sent to the satellite platform. Utilization of this functionality shall not collide with operations stored in the internal OCS schedule. Each TCP/IP socket shall have assigned and reconfigurable at runtime 'Virtual Channel ID' field value. • OCS application shall provide external interface in the form of TCP/IP sockets set which would allow to send to external applications received telemetry frames, extracted from CCSDS layers. Each TCP/IP socket shall have assigned and reconfigurable at runtime 'Virtual Channel ID' field value. • OCS application shall provide ability to activate/deactivate usage of each communication layer for platform testing purposes • OCS application shall be able to receive data with bit rate of up to 50 MBit/s	
WP2	• OCS Application shall provide API for usage in scripts for system functional testing purposes • OCS Application shall provide ability to manage and control spacecraft platform schedule according to the following requirements: ○ Application shall provide graphical user interface to manage the schedule ○ Application shall provide scripting API to manage the schedule ○ Application shall be able to load external script file, containing telecommand frames compliant with the Packet Utilization Standard (ECSS-E-ST-70-41C) and encapsulate them in PUS Service 11 telecommand frames ("Time based scheduling"), configure the	30.09.2021

	execution time and send to the satellite platform ○ Application shall provide ability to clear the schedule content according to PUS Service 11 ○ Application shall provide ability to enable/disable the schedule according to PUS Service 11 ○ Application shall provide ability to time-shift the schedule execution according to PUS Service 11	
WP3	• Application shall implement file exchange protocol compatible with the spacecraft platform, allowing performing software updates ○ Application shall provide ability to use CFDP protocol: ▪ CFDP Class 1 – Unreliable Transfer ▪ CFDP Class 2 – Reliable Transfer ○ Application shall provide the user-friendly graphical user interface, preferably similar to FTP client application (e.g. Filezilla) ○ Application shall provide ability to execute the functionality from command line interface/script • OCS Application shall provide mechanism to communicate with the servers of the chosen ground station provider for future, commercial use. The mechanism shall allow to adopt new interface in case for necessity to use another ground station provided services ○ Application shall provide ability to send and receive data from spacecraft ○ Application shall provide functionalities to manage and control the ground station usage ▪ Application shall provide ability to reserve spacecraft communication time slot ▪ Application shall provide ability to cancel reserved communication time slot ▪ Application shall provide ability to list reserved spacecraft communication time slots ▪ Application shall be able to download up-to-date TLE data	31.12.2021