

19th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies
(2B)

Author: Dr. Vincent DUBANCHET

Thales Alenia Space France, France, vincent.dubanchet@gmail.com

Mr. Juan Antonio BEJAR ROMERO

GMV Aerospace & Defence SAU, Spain, jabejar@gmv.com

Dr. Iosif PARASKEVAS

National Technical University of Athens, Greece, isparas@central.ntua.gr

Mr. Pablo Lopez Negro

Thales Alenia Space France, 100 Boulevard du Midi, 06150 Cannes la Bocca, France, France,
pablo.lopez-negro@thalesalieniaspace.com

Mr. Aurélien Cuffolo

Thales Alenia Space France, France, aurelien.cuffolo@thalesalieniaspace.com

Mr. Florent Maye

Thales Alenia Space France, 100 Boulevard du Midi, 06150 Cannes la Bocca, France, France,
florent.maye@thalesalieniaspace.com

Mr. Andres Rodriguez Reina

G.M.V. Space and Defence, S.A., Spain, areina@gmv.com

Mr. Pablo Romeo Manrique

GMV Aerospace & Defence SAU, Spain, Spain, pablo.romeo.m@gmv.com

Mrs. Mercedes Alonso

GMV Aerospace & Defence SAU, Spain, Spain, mealonso@gmv.com

Mr. Sebastián Torralbo Dezainde

GMV Aerospace & Defence SAU, Spain, Spain, storralbo@gmv.com

Mr. Giorgos Rekleitis

National Technical University of Athens, Greece, grekleitis@mail.ntua.gr

Dr. Kostas Nanos

National Technical University of Athens, Greece, knanos@mail.ntua.gr

Prof. Evangelos Papadopoulos

National Technical University of Athens, Greece, egpapado@central.ntua.gr

Mr. Alexandros Konstantinidis

National Technical University of Athens, Greece, konstantinalex@gmail.com

Mr. Grégory Gaudin

Thales Alenia Space France, 100 Boulevard du Midi, 06150 Cannes la Bocca, France, France,
gregory.gaudin@thalesalieniaspace.com

Mr. Jonathan Courtois

Thales Alenia Space France, 100 Boulevard du Midi, 06150 Cannes la Bocca, France, France,
courtois.pauc.jonathan@gmail.comEROSS PROJECT - GROUND VALIDATION OF AN AUTONOMOUS GNC ARCHITECTURE
TOWARDS FUTURE EUROPEAN SERVICING MISSIONS

Abstract

The H2020 project “European Robotic Orbital Support Services” (EROSS) has been led since two years to mature an autonomous Guidance, Navigation and Control (GNC) architecture for future robotic servicing missions. This project is built upon the previous developments of the Operational Grants led by the Strategic Research Cluster in Space Robotics funded by the European Commission. In this regard, EROSS project aims at developing, integrating and demonstrating the key European robotic building blocks within an autonomous solution for the performance of servicing tasks.

The main usecase of EROSS project is to demonstrate the capability of a Servicer spacecraft to perform medium and close-range rendezvous, before capturing and manipulating a Client satellite with a high degree of autonomy. The client satellite is considered collaborative and prepared for servicing operations such as refuelling and payload replacement. EROSS timeline is based on four main steps covering the approach with an autonomous visual-based navigation using advanced processing and filtering techniques; the capture using state-of-the-art compliance control techniques to synchronize the robotic arm and its platform; the mating of the two spacecraft through a dedicated interface for refuelling; and the robotic exchange of a replacement payload designed with standard interfaces.

This paper will first summarize the technical progresses of EROSS project before going further into details on the experimental results by a three steps approach. A first functional integration allows the cross-check of all equipments on the ROBOTic orbital FacilitY (ROBY) test bench of Thales Alenia Space in France (Cannes). A second dynamic test on an air-bearing table assesses the performance of the compliance control behaviour during the capture by the robotic gripper on the Space Robots Emulator (SRE) test bench of the National Technical University of Athens (NTUA) in Greece. Eventually a fully integrated experiment with Servicer and Client mock-ups validates the overall architecture in closed-loop with a representative processor on the Platform-Art robotic test bench at GMV in Spain. This thorough validation allows to go through the different steps of Software-in-the-Loop then Hardware-in-the-Loop to reach the space standards.

This project is led by Thales Alenia Space with support from GMV, National Technical University of Athens, PIAP Space, SENER, SINTEF AS, SODERN, Space Application Services, with additional collaboration with MDA and QinetiQ.

EROSS project is co-funded by European Union’s Horizon 2020 research and innovation program under grant agreement N821904 and part of the Strategic Research Cluster on Space Robotics Technologies as Operational Grant n7.