IAF SPACE SYSTEMS SYMPOSIUM (D1)
Cooperative and Robotic Space Systems (6)

Author: Dr. Sebastian Bartsch
Airbus Defence and Space - Space Systems, Germany

Dr. Stéphane Estable
Airbus Defence & Space, Space Systems, Germany
Mr. Torsten Vogel
Airbus Defence and Space, Germany
Mr. Marc Manz
Airbus Defence and Space, Germany
Dr. Gwenaëlle Aridon
Airbus Defence & Space, Space Systems, France
Mr. Romain Caujolle
Airbus Defence & Space, Space Systems, France
Mr. Francisco Javier Colmenero Lechuga
G.M.V. Space and Defence, S.A., Spain
Mrs. Mercedes Alonso
GMV Aerospace & Defence SAU, Spain, Spain
Mr. Manuel Esquer
GMV Aerospace & Defence SAU, Spain
Mr. Daniel Silveira
GMV Aerospace & Defence SAU, Portugal
Ms. Carolina Serra
GMV Innovating Solutions, Portugal
Dr. Marko Jankovic
DFKI GmbH, Robotics Innovation Center, Germany
Mrs. Wiebke Brinkmann
DFKI Robotics Innovation Center Bremen, Germany
Mrs. Isabel Soto
SENER Aeroespacial, Spain
Mr. Gonzalo Guerra
SENER Ingenieria y Sistemas, S.A., Spain
Dr. Jeremi Gancet
Space Applications Services, Belgium
Dr. Pierre Letier
Space Applications Services, Belgium
Mr. Andrés Martín-Barrio
Space Applications Services N.V./S.A, Belgium
Mr. Mark Shilton
Airbus Defence and Space Ltd, United Kingdom
Dr. Elie Allouis
Airbus Defence and Space - Space Systems, United Kingdom
Mr. Björn Ordoubadian

ISIS - Innovative Solutions In Space B.V., The Netherlands
Mr. Eric Bertels
ISIS - Innovative Solutions In Space B.V., The Netherlands
Dr. Apostolos Chamos
EASN Technology Innovation Services BVBA, Greece

IN-ORBIT DEMONSTRATION OF ISMA ROBOTIC CAPABILITIES TO PAVE THE WAY FOR A NEW GENERATION OF SPACE SYSTEMS

Abstract

When one thinks about how satellites and spacecraft are built today, the picture which immediately springs to mind is the large clean room, the heavy personnel needs and the large launcher required to transport a volume-constrained payload to space. The project PERIOD seeks to disrupt the status quo by showing there is an alternative to the traditional approach of manufacturing, assembling and validating space hardware on-ground with direct in-orbit manufacturing and assembly using robotics, autonomy and modularity. The advantages are multiple. No more constraints on the overall volume and design of large-scale satellite antennas. Ample opportunities to construct larger space infrastructures such as modular space stations and lunar surface infrastructure. On top of this, the ISMA (In-Space Manufacturing and Assembly) technologies would allow for the upgrade and repair of existing spacecraft and satellites, thereby fostering the sustainable usage of space through plug and play modularity.

The ISMA industry can bring revolution to space market achieving a sustainable space ecosystem and offering new services. The PERIOD consortium is confident that a decade from now, considering a stepwise evolution, many different capabilities will be required. Large-antenna commercial satellites autonomously assembled in space will provide citizens with a wide range of services, and scientific satellites will allow us to see further into deep space than ever before. Payloads will be autonomously exchanged on standard reconfigurable satellites. Most satellites will be repaired, serviced or de-orbited in space, meaning that we will be able to better face the space debris issue. Advanced space robotics will be used for local and autonomously manufacturing and assembly on the space stations in LEO, lunar and mars orbits, and indeed on their surfaces. Even more remarkably, the same robotic technologies and autonomous industrial processes will be used for producing resources in space, even producing human organs for citizens on Earth.

This paper describes the results of the PERIOD project performing a phase A/B1 mission study aiming to prepare the paradigm shift for changing the way space systems are designed, built and operated, moving from mission-specific solutions to modular spacecraft optimised for the space environment. The envisaged ambitious demonstration will lead to the manufacturing of a functioning satellite in an ‘orbital factory’ accommodated on the ISS Bartolomeo platform by 2026 with the objective to prove robotic technologies and operations to convince all stakeholders about the readiness of capabilities to make this vision reality.