16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Interactive Presentations - 16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (IP)

Author: Mr. JAVIER VINALS
SENER Ingenieria y Sistemas, S.A., Spain, javier.vinals@sener.es

Mr. Eduardo Urgoiti
SENER Ingenieria y Sistemas, S.A., Spain, eduardo.urgoiti@sener.es
Mr. Gonzalo Guerra
SENER Ingenieria y Sistemas, S.A., Spain, gonzalo.guerra@sener.es
Dr. Ignacio Valiente
Spain, ivaliente@magosar.com
Mrs. Judit Esnoz-Larraya
Spain, jesnoz@magosar.com
Mr. MICHEL ILZKOVITZ
Space Applications Services NV/SA, Belgium, michel.ilzkovitz@spaceapplications.com
Mr. Dogu Cetin
Space Applications Services (SAS), Belgium, dogu.cetin@spaceapplications.com
Mr. Pierre Letier
Space Applications Services (SAS), Belgium, pierre.letier@spaceapplications.com
Prof. Xiu-Tian Yan
University of Strathclyde, United Kingdom, x.yan@strath.ac.uk
Mr. Gwenole Henry
University of Strathclyde, United Kingdom, gwenole.henry@strath.ac.uk
Mr. Albino Quaranta
Thales Alenia Space Italia, Italy, albino.quaranta@thalesaleniaspace.com
Mrs. Wiebke Brinkmann
DFKI Robotics Innovation Center Bremen, Germany, wiebke.brinkmann@dfki.de
Mr. Marko Jankovic
German Research Centre for Artificial Intelligence, Germany, marko.jankovic@dfki.de
Dr. Sebastian Bartsch
DFKI GmbH, Germany, sebastian.bartsch@dfki.de
Dr. Alessandro Fumagalli
Selex ES, Italy, alessandro.fumagalli@selex-es.com
Mr. Manfred Doermer
Airbus DS GmbH, Germany, manfred.doermer@airbus.com

MULTI-FUNCTIONAL INTERFACE FOR PAYLOAD INTERCONNECTION OF ROBOTIC SYSTEMS IN SPACE

Abstract

The development of standard payload modules for applications such as on-orbit satellite servicing or

planetary exploration, strongly depends on the realization of a standard interface (IF) that allows the necessary mechanical interconnections with the possibility of electrical and data connection as well as thermal transfer between these "building blocks". Within this context the developed IF in the SIROM (Standard Interface for Robotic Manipulation of payloads in future space missions) project is a solution that combines the four required functionalities in an integrated and compact form. With a mass lower than 1.5kg and having an external diameter of 120mm and a height of 30mm, this novel interface permits not only mechanical coupling but also electrical, data and thermal connectivity between so called Active Payload Modules (APMs) as well as other involved operators like the robotic end-effectors. This multi-functional IF is based on an androgynous design to allow replacement and reconfiguration of the individual modules in any combination desired. It consists of the following sub-assemblies: mechanical IF, electrical IF, data IF, thermal IF and IF controller. A clear advantage of SIROM design is that its mechanical IF consists of a latching and a guiding systems for misalignment correction capable of withstanding certain robotic arm positioning inaccuracies: +/-5mm translation and +/-1.5º rotation in all axes. Regarding the electrical and data IFs, SIROM transfers up to 150W electrical power and provides a data rate transfer of 100Mbit/s via SpaceWire and a command communication with a speed up to 1Mbit/s via CAN bus. The thermal IF provides fluidic ports for flow transfer and has the potential to transfer 2500W between APMs provided with the corresponding close-loop heat exchange system. Although not envisaged for SIROM current design, a possible variation could be to use these ports for satellite re-fueling. Apart from that, SIROM exhibits redundant coupling capabilities. It can match and couple another SIROM with the only need to actuate and control just one of them, while the other stays passive. It is provided with main and redundant connectors for thermal, electrical, data and control flow in case of one of the lines fails. All in all, SIROM will allow long duration with no logistic support missions, reparability and reconfiguration of satellites, cost efficiency and simplification of the tool exchange in scientific exploration missions, among others.