

SpaceOps Conference Best Papers 2018 Overview

The titles of 33 best papers (including 2 from students) listed below were selected by the individual topic chairs and their associated review teams from over 338 technical papers according to peer review rules established by the SpaceOps Organization. They include:

Relevance: This topic is exclusively about space operations and many aspects of it. It is of broad interest to everyone at the conference.

Innovation: This topic is totally innovative, changes the whole game of space operations.

Substance: This topic is very important to all programs and projects in most agencies. It is very substantial.

Future: This topic is totally focused on enabling new space operations approaches for future programs and projects for most of all agencies.

The papers will be available and flagged accordingly in the AIAA online [SpaceOps archive](#) and will also be published as hardcover book and e-book in spring 2019 by Springer International Publishing. However, before they are published, the papers will be enhanced by the authors.

The selected papers are listed according to their session ID, the list does not represent a qualification order. *)

	SpaceOps2018 Conference Titles of the 33 Technical Best Papers	Session ID
1	The Cassini/Huygens Navigation Ground Data System: Design, Implementation, and Operations.	GSE-02
2	Ground Enterprise Evolution at NESDIS	GSE-01
3	CNES Mission Operations Systems roadmap : towards rationalization and efficiency with ISIS	GSE-09
4	Return Link Service Provider (RLSP) Acknowledgement Service to confirm the detection and localization of the SAR Galileo alerts	GSE-05
5	Enhanced Awareness In Space Operations Using Multipurpose Dynamic Network Analysis	DM-08
6	Analysis of automated techniques for routine monitoring and contingency detection of in-flight LEO operations at EUMETSAT	DM-04
7	The Added Value Of Advanced Feature Engineering And Selection For Machine Learning Models In Spacecraft Behavior Prediction	DM-05
8	Sentinels Optical Communications Payload (OCP) Operations: From Test to In-Flight Experience	OC-08
9	Model Based approach for test and operations procedures	OC-03
10	The Evolution of Interface Specification for Spacecraft Command and Control	OC-02
11	Flight Dynamics Operational Experience From Exomars TGO Aerobraking Campaign At Mars	GNC-01
12	The Cassini Mission: Reconstructing Thirteen Years of the Most Complex Gravity-Assist Trajectory Flown to Date	GNC-05
13	The EnMAP Mission Planning System	PS-02
14	Ant-based Mission Planning: Two Examples	PS-01
15	InSight Cruise and Surface Operations: Integrated Planning, Sequencing and Modeling using APGen	PS-03
16	New Ways to Fly an Old Spacecraft: Enabling Further Discoveries with Kepler's K2 Mission	FE-06
17	In-orbit experience of the Gaia and LISA Pathfinder cold gas micro-propulsion systems	FE-07
18	NEOSSat Recovery Following Magnetometer and Torque Rod Failure	SSO-02

19	Formation Flying of a Two-CubeSat Virtual Telescope in a Highly Elliptical Orbit	SSO-01
20	Ariane 6 Launch System Operational Concept - Main Drivers	LRBO-02
21	Next Generation Relay Services at Mars via an International Relay Network	CSIS-02
22	Space Mobile Network Concepts for Missions Beyond Low Earth Orbit	CAN-02
23	Toward a NASA Deep Space Optical Communications System	CAN-07
24	Recommendations Emerging from an Analysis of NASA's Deep Space Communications Capacity	CAN-06
25	Concept of Operations for the Gateway	HSO-01
26	Educational Outreach and International Collaboration Through ARISS---Amateur Radio on the International Space Station	ING-02
27	Space Education and Awareness in South Africa- Programs, Initiatives, Achievements, Challenges & Issues	ING
28	Improving Spacecraft Design and Operability for Europa Clipper through High-Fidelity, Mission-Level Modeling and Simulation	MDM-03
29	LUMIO: achieving autonomous operations for Lunar exploration with a CubeSat	MDM-05
30	Terrain-based Analysis as a Design and Planning Tool for Operations of a Lunar Exploration Rover for the TeamIndus Lunar Mission	MDM
31	Ethological Approach of the Human Factors from Space Missions to Space Operations	TKT-02
32	Statistical Methods for Outlier Detection in Space Telemetries	DM
33	Operational Benefit and Applicability of a 3D Printer in Future Human Mars Missions - Results from Analog Testing	ING

Nr = Student papers

As an example of the quality and actuality of the papers the abstract of one of the best two student papers is provided (#33, ING) :

Operational Benefit of a 3D Printer in Future Human Mars Missions - Results from Analog Simulation Testing

M. Müller* , S. Gruber† , M. D. Coen‡ , R. Campbell§ , D. Kim¶ , B. Morrell|| A3DPT-2-Mars Research Group

The remote nature of human missions to Mars requires a different paradigm for how operations should be performed. In particular, there is a need for greater independence from Earth, and the ability to adapt to evolving scenarios: needs that can potentially be assisted by integrating 3D printing technology into a Mars mission. A 3D printer can enable the production, repair and modification of tools on Mars to address needs that arise. A series of experiments were carried out on the AMADEE-18 Mars Analog Simulation to investigate the potential benefit of integrating a printer into operations. AMADEE-18 was a two-week-long activity which provided a high fidelity test environment, including communication delays between simulated Mars and Earth. The experiments involved production, repair and modification of custom-designed geological sampling tools using a 3D printer inside the Mars habitat. A set of modular procedures were used to integrate 3D printing into the flight plan and compare the operational performance between Earth-led and Mars-led operations. 17 planned printing runs were complete, with execution times recorded, and subjective feedback collected. The results showed the difficulty in scheduling 3D printing operations, which require numerous small tasks spread out over an extended period. It was identified that Earth-Led operations were superior with regards to crew workload, as they provided a more convenient way to manage the small, infrequent tasks required. In addition to the planned prints, there were 13 unplanned prints completed, including a clip for an EVA suit, showing the adaptability and utility granted by a 3D printer. The geological sampling tool used in the experiments was a hybrid of printed plastic and high quality printed metal produced on "Earth". This hybrid design was shown to be successful and presents an avenue for future research.



Fig. 2 Left: Analog astronaut performing the GBE using the 3D printed tools. Right: Crew member operating the 3D printer in the habitat. © OeWF (Florian Voggeneder)

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*) List of Abbreviations for the SpaceOps 2018 Conference Sessions:

CAN	Communications Architectures and Networks
CSIS	Cross Support, Interoperability, and Standards
DM	Data Management
FE	Flight Execution
GSE	Ground System Engineering
GNC	Guidance, Navigation, and Control
HSO	Human Systems and Operations
ING	Inspiring the Next Generations
LRBO	Launcher, Rocket, and Balloon Operations
MDM	Mission Design and Management
OC	Operations Concepts
PS	Planning and Scheduling
SSO	Small Satellite Operations
TKT	Training and Knowledge Transfer