

Event report



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1. Organization of the conference

The 7th IAA Conference on Space Systems as Critical Infrastructure has been jointly organized by the International Academy of Astronautics and the Romanian Space Agency. The event has been steered by the Scientific Program Committee, as follows:

- Dr. Marius---Ioan Piso (President and CEO, Romanian Space Agency; Chairman, Trustees Section 4, IAA) Chair Dr. Jean---Michel Contant (SG IAA)
- Prof. Dr. Adrian Gheorghe (Old Dominion University, Virginia, USA)
- Dr. Peter Jankowitsch (Chairman of IAA)
- Dr. Detlef Koschny (SSA Office, ESA)
- Dr. Marius-Eugen Opran (Principal Senior Scientific Advisor for Security & Defence Projects, Romanian Space Agency)
- Dr. Dumitru-Dorin Prunariu (Cosmonaut, Romanian Space Agency)
- Dr. Alexandru Badea, Director Space Applications, Romanian Space Agency
- Prof. Dr. Mihai Datcu, German Aerospace Center, DLR
- Dr. Mircea Cernat, Romanian Space Agency

Participation to the event was opened to all decision makers, technical representatives from all organizations interested in understanding the complex interdependencies between space technologies and other critical sectors, as well as academia and the research environment. The Call for Abstracts was issued in early July, 2018, proposing a list of topics like:

- dependency of critical infrastructure sectors on space systems: Water, Food, Agriculture, ICT, Transport, Financial, Health, Energy, Nuclear Industry, Chemical Industry
- external threats of space critical infrastructure: space weather, atmosphere, natural cosmic debris, artificial space debris, natural terrestrial debris
- local threats of space critical infrastructure on: electronic interference, laser attack on satellite sensors destruction, electromagnetic pulse from a nuclear explosion, cyber attacks

The abstracts received by July 20th 2016, have been reviewed by the appointed Scientific Program Committee and authors have been notified by July 23rd 2018.

The participants of the 7th IAA Conference on Space Systems as Critical Infrastructure came from institutions like the European Space Agency, Observatoire de Paris, Old Dominion University, USA and Romanian Ministry of National Defense, private companies and think tanks among others.

1.1. Objectives

Space systems have become key enablers for a wide variety of commercial, scientific and military applications. The rapid growth of their capabilities has offset some of the size of the required investment and new developments promise an even greater reduction in the cost of space infrastructure. As such, some of the extant space systems have become deeply embedded in the functioning of advanced societies, supporting economies, lifestyles and governance processes. The increasing dependence on certain space systems places them firmly in the area of critical infrastructure, whose disruption or destruction would generate lasting damage. This inclusion into critical infrastructure theory is even more warranted as space systems have become a technological backbone for existing recognized critical infrastructures, such as energy, transportation, administration and others. The reliance of infrastructure systems-of-systems on space based command, coordination and control capabilities during normal functioning, but especially during emergency and crisis situation management processes, means that space systems fulfil the requirements for critical status.

This edition of the IAA Conference on Space Systems as Critical Infrastructure tackled the concept of resilience in connection to the ground and space segments of space technologies. Improving the net resilience of space capabilities is increasingly recognized by global leadership as being a critical imperative. The scope of options for increasing resilience is quite broad, but each option comes with economic and operational costs as well as its unique effectiveness against specific threats and risks.

To ensure maximum resilience to hostile, environmental and unintentional interference impacts to critical space capabilities provided to nation-states and the commercial sector, it is imperious that a common shared perspective be established on the resilience enhancing options available, the implications of existing gaps in resilience, and interoperability implications as well as the priorities for investment in solutions (both material and non-material).

1.2. Program

This year's theme Space and Security was selected due to the increasing importance of resilience in the context of space operations. Resilience (derived from the Latin *resalire*, to spring back) has become an important term in the language of many disciplines. Unfortunately, there is no commonly accepted definition of resilience that is used across all disciplines.

The definitions which are most valuable in terms of improving the ability to recover after disasters explicitly or implicitly contain the following five core concepts:

- **Attribute:** resilience is an attribute of the community.
- **Continuing:** a community's resilience is an inherent and dynamic part of the community.
- **Adaptation:** the community can adapt to adversity.
- **Trajectory:** adaptation leads to a positive outcome for the community relative to its state after the crisis, especially in terms of its functionality.
- **Comparability:** the attribute allows communities to be compared in terms of their ability to positively adapt to adversity.¹

Thus, on a general level, resilience represents the ability or the capability of entities, organizations, or societies to cope with shocks and stresses and then reflect the idea of "Resistance vs. Adaptation".

In terms of defense and security, resilience is defined as "the ability of an architecture to support the functions necessary for mission success with higher probability, shorter periods of reduced capability, and across a wider range of scenarios, conditions, and threats, in spite of hostile action or adverse conditions."²

The meeting began with welcome speeches by Prof. Dr Marius-Ioan PISO, President and CEO, Romanian Space Agency (ROSA), as well as Toma-Florin PETCU, President of the Sub-Committee for Space, Chamber of Deputies, Manuela CATRINA, State Secretary, Ministry of Communication and Informational Society, Ciprian PREDA, Secretary of State, Ministry of Research and Innovation, Lucian GEORGESCU, Secretary of State, Ministry of Research and Innovation. All speakers highlighted how important resilience is for governmental and commercial operations and to the ability to sustain continued access and use of required functions provided by space.

These opening remarks were followed by the keynote speech by Prof. Adrian GHEORGHE, Old Dominion University, detailing how space should be resilient for integrated operations and subsequently, how space capabilities should be used in support of operations, such as navigation, communications. Resilience is built on reliable, available space capabilities, which are not only critical to operators, but it also means to

¹ Carri report (2013) *Definitions Of Community Resilience: An Analysis*. Community and Regional Resilience Institute [online] <http://www.resilientus.org/wp-content/uploads/2013/08/definitions-of-community-resilience.pdf>, last accessed August 2018

² As defined in DoDD 3100.10

have an alternative to providing services, redundancy, easy instructions and policies to ensure coherence of actions. Therefore, some of the topics to be discussed to address resilience are: knowledge on countering threats, accelerating the pace of innovation, role of space satellites, and effective space traffic. As the commercialization of space increases and with the wide range of threats and hazards, space domain awareness becomes vital. Resiliency of space architectures requires education and a System-of Systems approach, where other sectors, e.g. the nuclear, can be used for inspiration.

Among social events meant for facilitating a vivid conversation among participants were two hosted meals.



7th IAA Conference on Space Systems as Critical Infrastructure

Ways, Means, Resilience

2-3 August 2018

Poseidon A Hall, 1st floor, Hotel Zenith Conference, Mamaia, Romania

Agenda

Thursday 02.08.2018

09:00 - 09:30

Registration and welcome coffee

09:30 - 10:00

Welcoming remarks

Marius – Ioan PISO, President & CEO, Romanian Space Agency

Manuela CATRINA, State Secretary, Ministry of Communication and Informational Society

Toma-Florin PETCU, President of the Sub-Committee for Space, Chamber of Deputies

10:00 - 13:00

Space Systems as Critical Infrastructure

IAA Study Group 5.13

Status Report

Marius – Ioan PISO

Critical Space Infrastructures and UNISPACE +50

ROSA

Adrian GHEORGHE
Old Dominion University, USA
Mircea CERNAT et al
ROSA

Resilience and Space Infrastructures

Romania's accession to EU SST Consortium

Coffee break

Round table – Global/European trends on space critical infrastructure

13:00-14:30

Working Lunch (Restaurant H. Zenith)

14:30 - 17:30

Technical presentations

Mirel BÎRLAN et al
Observatoire de Paris, France

Observational opportunities for Near-Earth Objects

Ionuț GROZEA
Deimos

ESA SSA-NEO: new data processing capabilities and expected effects of an asteroid entry P3-NEO-XIII and P3-NEO

Cristian Corneliu CHIȚU
Bogdan BIJA
GMV

Convergence in industrial development of SST tools and applications within the frame of the Romanian SST initiative

Flaviu RĂDUCANU
ROSA

GOVSATCOM vs. ECI: a Case for Reflection

Roberto SCAGNOLI
RARTEL

GovSatCom participation scenarios for Romania

Mugurel BĂLAN

FDIR on Proba 3 Rendez-vous experiment

Victor VEVERA et al
National Institute for Research
and Research in informatics

Critical Infrastructure Protection and Blockchain – potential and threats

Călin POPOVICI
ROSA

Systems of Critical Infrastructure in Healthcare

Adrian GHEORGHE
Farinaz Sabz Ali POUR
Old Dominion University

Ontology for Sand Governance Employing Space and Blockchain Technologies

Bogdan MIHALCEA

Quantum technology based on ultracold atoms.

National Inst. For Laser, Plasma
and Radiation Physics

Applications in global sensing

Chiara MANFLETTI

Jan WÖRNER

ESA

Laurentiu ASIMOPOLOS et al
Geological Institute of Romania

Space Safety for Europe: A proposal for the protection of
our planet, of humanity, and assets in space and on Earth
from dangers originating in space

Dependency of critical infrastructures from energy,
transportation and communications sectors on geomagnetic
storms

19:00

Dinner and networking event (Restaurant H. Zenith)

Friday 03.08.2018

09:30 - 11:30

**ROSA Center for space critical infrastructures: prospects and
development**

Coffee break

12:00 - 13:00

Concluding remarks

2. Main themes

The debates surrounding the 7th edition of the IAA Conference on Space Systems as Critical Infrastructure attempted to untangle the following themes:

Space Threats and Risks – the differences between space threats, actively trying to affect the systems, and hazards, that are parts of the environment. These are, inter alia:

- The anti-satellite systems of some countries which can threaten satellites in MEO and GEO;
- The atmospheric nuclear threats;
- The RF weapons including spoofers, jammers, high-energy RF to damage systems, as well as the on-going interference issues; also, Space-based particle beam weapons-charged and neutral particle beams proposed for future weapons and laser weapons;
- Cyber threats can include the “demon” satellites that deliberately lower the capabilities of other satellites.

The Scope of Resiliency with Respect to Space - resilience issue means governance and improving redundancy in the system of systems. The system of systems is a collection of task-oriented or dedicated systems that pool their resources and capabilities together to create a new, more complex system which offers more functionality and performance than simply the sum of the constituent systems.

Resilience for various sectors – the discussions centered on the commercial, military and governmental use of space technologies and implications of the concept of resilience. Debates focused on the limiting factors, the ownership of space infrastructure, and the military space capabilities.

Policy Issues on Resilience - this presentation approached the need of Securing Civilizational Resilience, as human society development to other planets tends to swing between science-fiction and science-fact. The main issue was related to the need of resilience through education as an informed society constitutes a resilient society.

3. Proceedings

The proceedings of the conference will be published on Romanian Space Agency’s dedicated virtual space, by the end the 2018. The papers will be peer reviewed and organized according to themes, in line with the requirements of IAA. Authors will be notified in due time.

4. Conclusions

The aim was to provide an overview of current initiatives, an update on the implementation and adherence to existing regulatory framework and instruments and a view of the way ahead to the security, safety and sustainability of space activities. In particular, the conference addressed and

discussed the present issues of space security, as a result of the current challenges and its impact on the present and future space activities.

