

# SPACE ENVIRONMENT SUPPORT TO NATO SPACE SITUATIONAL AWARENESS

*A NATO RTO Follow-on Activity from the Study  
by the RTO/SCI-229 Exploratory Team*

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and the RTO/SCI-229 ET Members

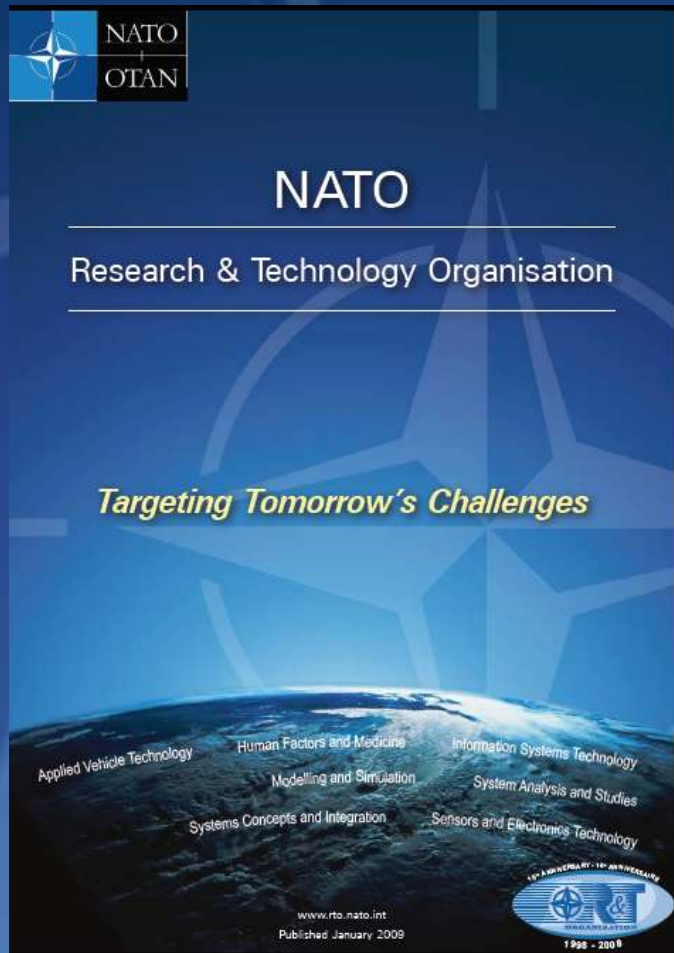
# OUTLINE OF THE TALK

- The NATO RTO framework
- The NATO RTO SCI-229 Exploratory Team Study
- The NATO RTO SCI-229 follow-on activity
- Perspectives
- Conclusions

# THE NATO RTO FRAMEWORK



# The NATO RTO Research & Technology Organisation



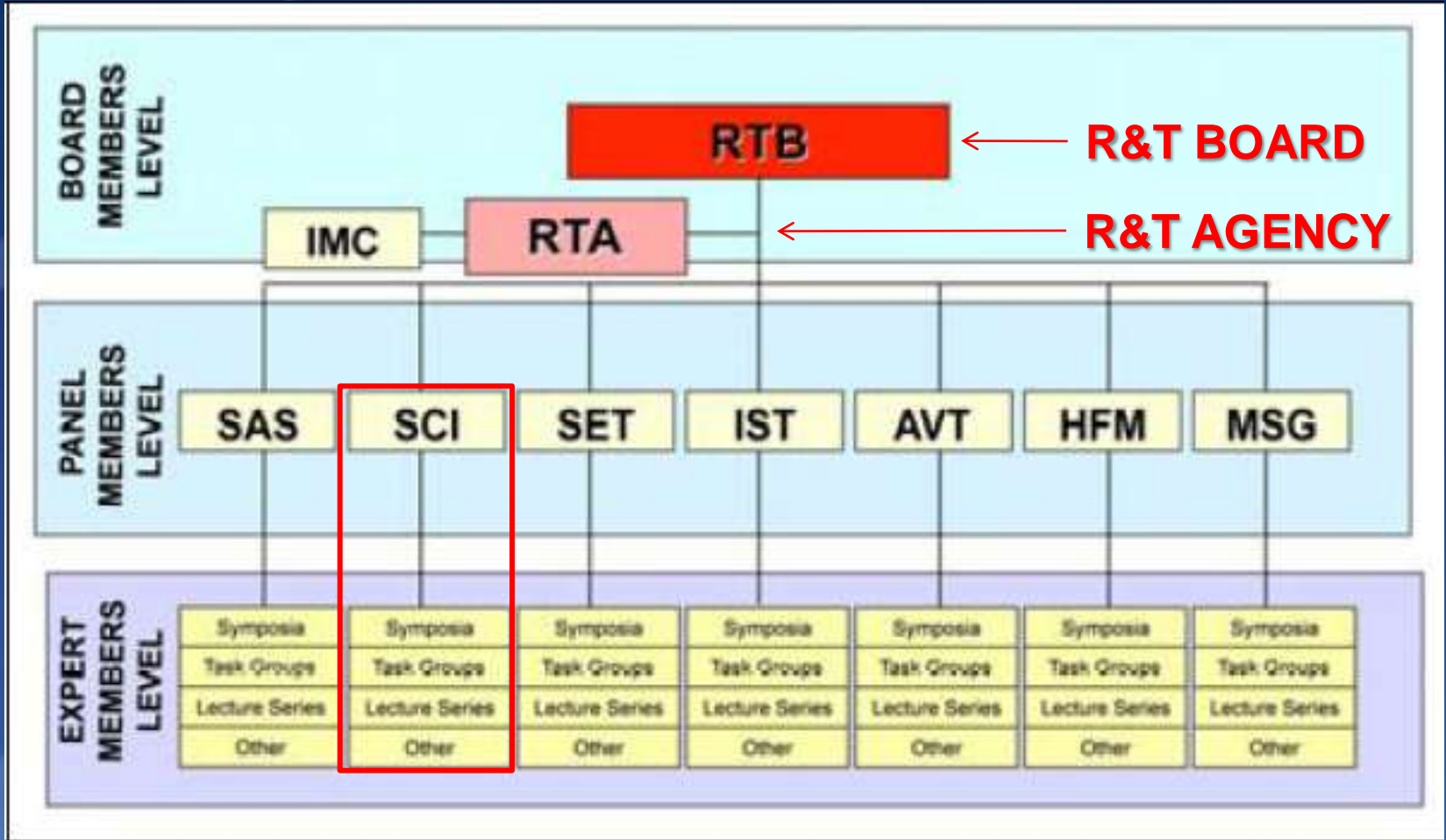
The **NATO Research and Technology Organisation (RTO)** promotes and conducts co-operative scientific research and exchange of technical information amongst 28 NATO nations and 38 NATO partners.

The largest such collaborative body in the world, the RTO encompasses over 3000 scientists and engineers addressing the complete scope of defence technologies and operational domains.

This effort is supported by an executive agency, the **Research and Technology Agency (RTA)**, that facilitates the collaboration by organising a wide range of studies, workshops, symposia, and other forums in which researchers can meet and exchange knowledge.

[www.rto.nato.int](http://www.rto.nato.int)

# NATO RTO Organisational Chart



# NATO RTO Technical Panels and Groups

Bodies made up of national representatives, world-class scientists and information specialists, that also provide a communication link to military users and other NATO bodies.

- **IMC** Information Management Committee
- **SAS** System Analysis and Studies Panel
- **SCI** **Systems Concepts and Integration Panel**
- **SET** Sensors and Electronics Technology Panel
- **IST** Information Systems Technology Panel
- **AVT** Applied Vehicle Technology Panel
- **HFM** Human Factors and Medicine Panel
- **NMSG** NATO Modelling and Simulation Group

# NATO RTO S&T Workflow – The ET

1. Under one or more of the RTO bodies an Exploratory Team (ET) is created
  - a. For specific activities
  - b. With specific duration
  - c. Composed by experts in the field(s)
    1. To explore the science and operation framework specific to the sub-domain(s) of interest
    2. To formulate both a **Terms of Reference (TOR)** document and a **Technical Activity Proposal (TAP)** propaedeutic to a structured follow-up activity

# NATO RTO S&T Workflow – TOR and TAP

2. When approved, a TAP involves the **formation of a Technical Team** to coordinate a **set of focus groups** performing dedicated research activities in their area of scientific expertise.

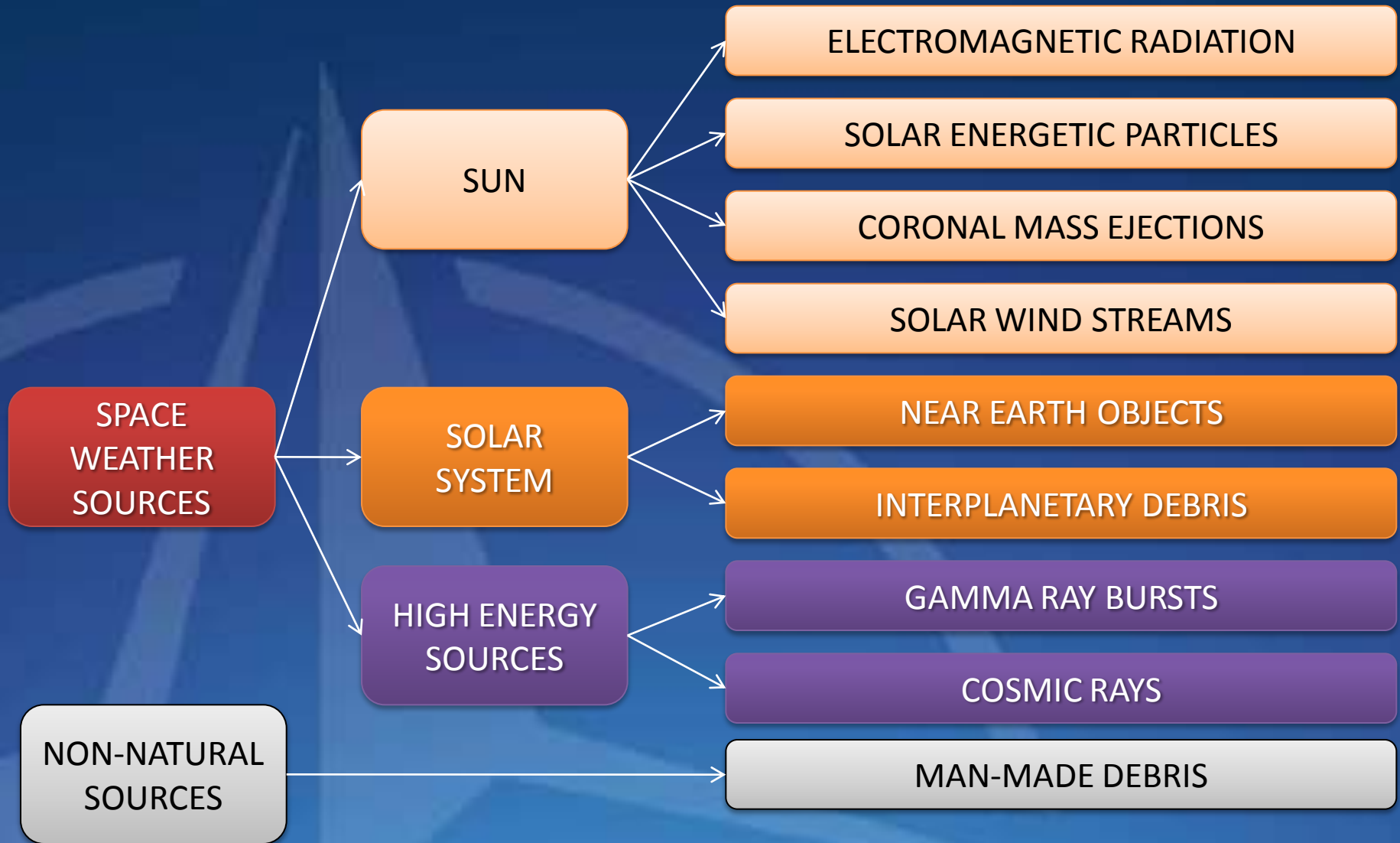
Research activities often involve workshops, symposia, field trials, lecture series and training courses, in all cases leading to the publication of highly valued scientific literature, much of which is published in the general scientific research outlets as well as specific peer-review journals.



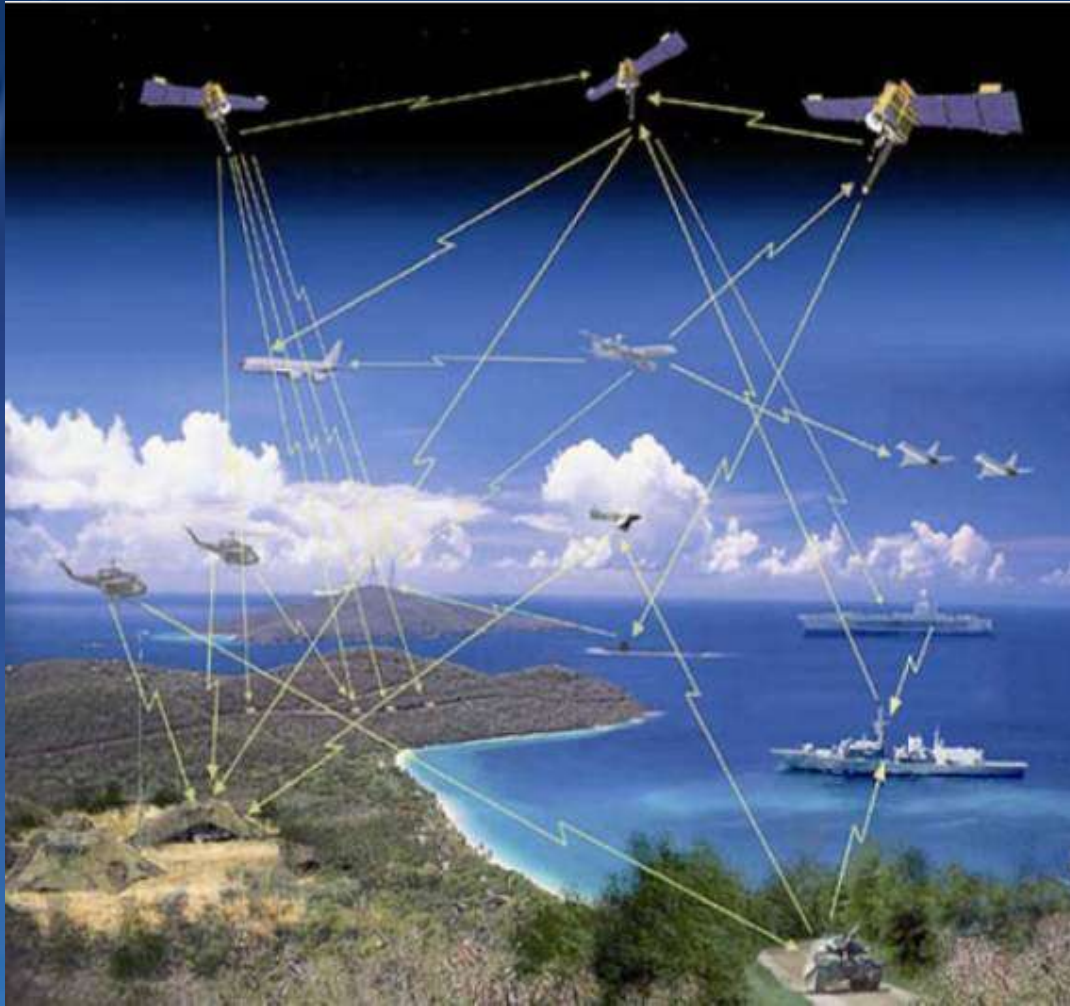
# RATIONALE FOR THE NATO RTO SCI-229 ET STUDY



# CHARACTERISATION OF THE SPACE ENVIRONMENT

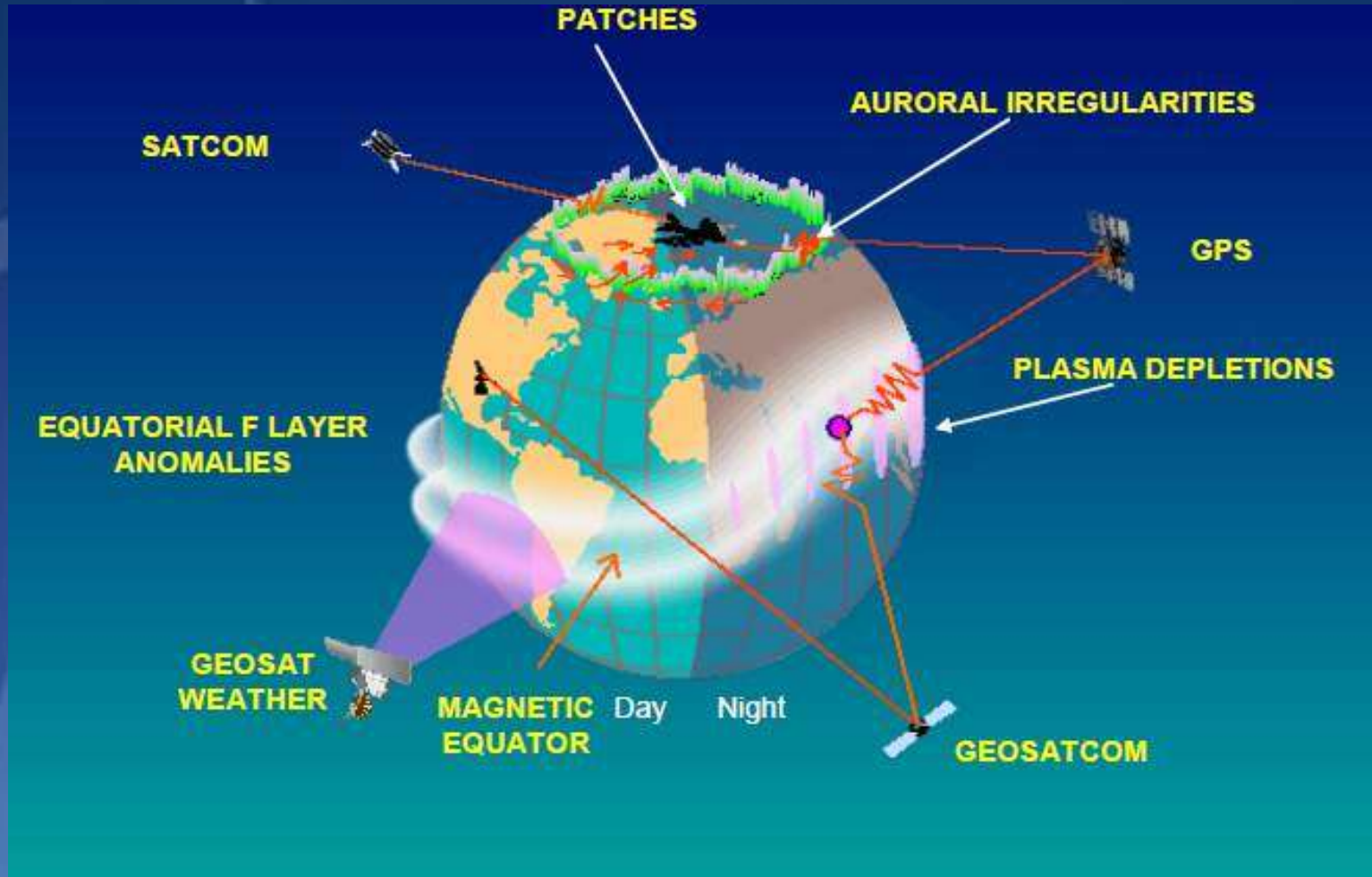


# NATO Wide Information Exchange Scenario



From  
NATO RTO  
Pamphlet

# Global Satcom Outage Regions



Courtesy H.C. Carlson

# DIVERSITY OF RISK ASSESSMENT



**CIVIL  
APPLICATIONS**

**MILITARY  
APPLICATIONS**

# THE NATO RTO SCI-229 ET STUDY



# NATO RTO SCI-229

## “NATO Operations and Space Situational Awareness”

- The Mission of the **Systems Concepts and Integration (SCI) Panel** is to advance knowledge concerning advanced systems, concepts, integration, engineering techniques and technologies across the spectrum of platforms and operating environments to assure cost-effective mission area capabilities.
- In this context, the **SCI-229 ET** has been formed to consider:
  - a. The study of Space Weather, Space debris and Near-Earth Objects for NATO needs
  - b. Co-operative research and information;
  - c. Development of technological lead related to SSA purposes within the Alliance
  - d. Development of SSA tools for NATO
  - e. SSA education for NATO space operation officers.

# The NATO RTO SCI-229 ET Structure

- Start: June 2009
- End: December 2010
- Chair: F. Jansen (DLR, DE)
- Vice-Chair: C. Cid (Uni Alcalà, ES)
- Secretary: M. Messerotti (INAF, IT)
- *Mentor*: LTC Erwin Duhamel, BE
- *Executive*: LTC James Zink, FR
- Members from: CZ, DE, ES, FR, HU, IT, ES, NO,  
• RO, SK, USA



# Key Topics Studied by SCI-229 ET

- a. Space weather and NEO state of the art for NATO needs
- b. Co-operative research and information exchange in SSA between civil security applications (EU, ESA) and NATO defence requirements
- c. Development of technological lead related to SSA purposes for NATO
- d. Development of selected operational SSA tools
- e. Education and conferences for NATO

# THE WORK BY THE SCI-229 ET

# SCI-229 ET Meetings

1. Kick Off Meeting  
NATO RTA Headquarters, Paris, 2-4 September 2009
2. 1st Progress Meeting  
DLR, Bremen, DE, 14-16 December 2009
3. 2nd Progress Meeting  
FFI, Kjeller, NO, 9-10 February 2010
4. 3rd Progress Meeting  
JAPCC, Kalkar, DE, 6-8 September 2010

# SCI-229 ET Deliverables

1. NATO Space Situational Awareness Definition
2. NATO SSA Terms Of Reference (TOR) Document
3. NATO SSA Technical Activity Proposal (TAP)

# SCI-229 ET

## NATO Space Situational Awareness Definition

*NATO Space Situational Awareness is the knowledge and the understanding of military and non-military events, activities, circumstances and conditions within and associated with the space environment or space related systems that are relevant for current and future NATO interest, operations and exercises*

# NATO SSA Scope

- NATO SSA applies whenever and wherever NATO plans, conducts own operations, exercises and NATO activities; as directed by the NAC and in accordance with international law.
- NATO SSA considers the integrity of space assets and space-related systems affected by space-originated natural or artificial hazards. NATO SSA also comprises such effects on society and individuals.

# NATO SSA Technical Activity Objectives

1. Identify potential NATO SSA needs and conduct studies and analyses to evaluate tools, techniques, methodologies or approaches that can be employed to satisfy those needs.
2. Identify potential gaps and shortfalls, as well as research or other activities that could be performed to mitigate them.
3. Recommend potential tools by demonstration and recommended responses.
4. Conduct educational activities to support greater awareness of NATO SSA needs among the Alliance members.

# NATO SSA Technical Activity Topics

1. Effects of space hazards on NATO interests, including civilian capabilities.
2. Assessment of space hazard prediction tools and products.
3. Proof of concept and demonstration of selected space hazard tools and recommended responses.
4. Identification of potential gaps and shortfalls.
5. Education of NATO space operation officers, including a NATO SSA workshop and specialist meeting.



# NATO SSA Technical Activity Deliverables

1. Technical Report
2. NATO SSA workshop and specialist meeting proceedings

# NATO SSA Technical Activity Coordination

Chair: Prof. Mauro Messerotti (INAF & UniTS, Italy)

Vice-Chair: Prof. Ulf-Peter Hoppe (FFI, Norway)

Lead Nation: Italy

# NATO SSA Technical Activity

## Nations Willing/Invited to Participate

- **Nations that have already expressed their interest:**

1. Czech Republic
2. Germany (as observer)
3. Hungary
4. Italy
5. Norway
6. Romania
7. Spain
8. United Kingdom
9. United States

- **Nations that will be invited by RTG:**

- Canada
- France
- Slovakia
- Any other interested NATO nations

- **Non-NATO nations can participate by invitation only**

# NATO SSA Technical Activity Timeline

- Entry: 01 January 2011
- First Report: 2011
- Second Report: 2012
- Final Report: 2013
- Type/Distribution: Unclassified/Unlimited

# PERSPECTIVES

# NATO SSA Technical Activity Proposal

The NATO SSA TAP submitted by the SCI-229 ET has been endorsed by the NATO SCI Panel in October 2010 with the final title:

**“SPACE ENVIRONMENT SUPPORT  
TO NATO SPACE SITUATIONAL AWARENESS”**

# Planned Activities

- Kick-off Meeting in January 2011
- Definition of work plan based on objectives
- Formation of Research Task Group
- Formation of Focus Groups
- Identification of nations and organisations to be invited

# CONCLUSIONS

- A NATO RTG “Space Environment Support to NATO SSA” has been approved by the NATO RTO SCI Panel in October 2010, as a follow-on activity of SCI-229 ET study
- This scientific programme addresses SSA for NATO needs with special attention to Space Weather, NEOs and space debris
- Synergies with EU and ESA projects in the field are expected
- Both civilian and defence applications will benefit
- Interested NATO member nations are encouraged to join the RTG activities



**THANK YOU  
FOR YOUR ATTENTION !**