

Oportunitati de cooperare internationala in domeniul Space Situational Awareness



Octavian CRISTEA^{1,2} (ROU)

¹ BITNET CCSS

² NATO RTO SET 147 & SCI 229

Bucuresti, 21-24 Sept. 2010

Conferinta Diaspora in Cercetarea Stiintifica...

DEFINITII:

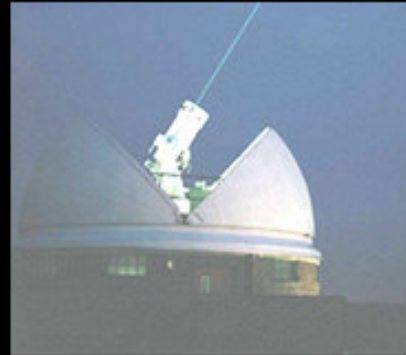
Space Situational Awareness (SSA): cunoasterea/constientizarea situatiei spatiale.

CELE 3 COMPONENTELE MAJORE ALE SSA:

1. Detectarea, supravegherea si identificarea obiectelor spatiale artificiale din vecinatatea Terrei (sateliti, deseuri, rachete);
2. Detectarea si supravegherea cometelor si asteroizilor potential primejdiosi (a caror traiectorie intersecteaza orbita Terrei);
3. Vremea spatiala (activitatea Soarelui, perturbatii electromagnetice care afecteaza comunicatiile sau transportul energiei electrice, radiatii cosmice, etc.).

SCOP: protejarea vietii pe Terra si a misiunilor spatiale civile si militare.

EXEMPLIFICARE: SENZORI DE SUPRAVEGHERE A OBIECTELOR SPATIALE



Satellite Laser Ranger-UK



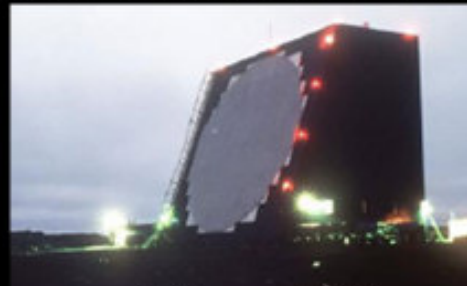
Starbrook - UK



Tracking Telescope - CH



GRAVES - F



Cobra - USA



SBV - USA



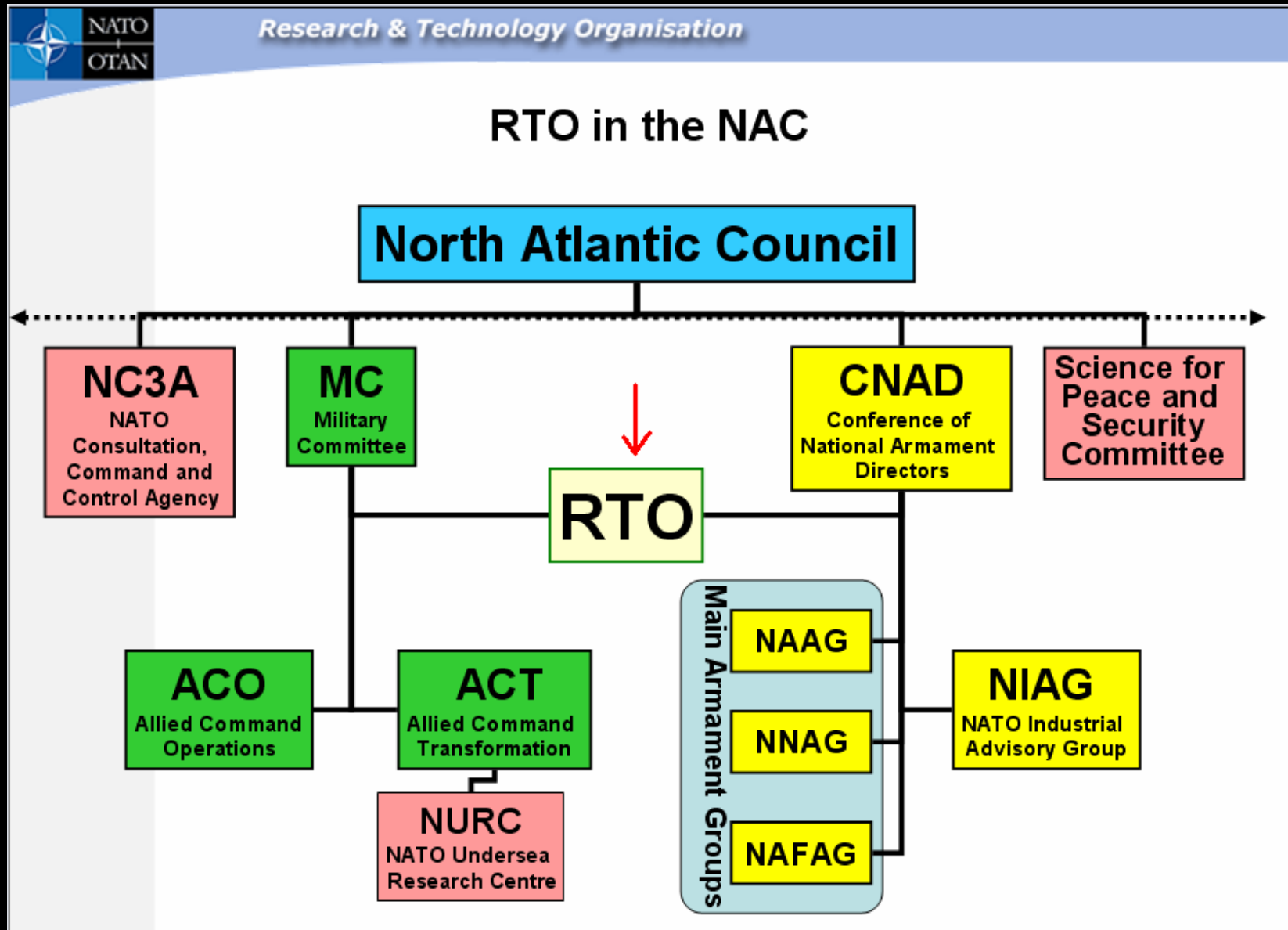
FGAN - D

PROIECTE PE ROL IN ROMANIA

1. Detectia radio pasiva a satelitilor activi aflati pe diverse orbite
2. Detectia optica a satelitilor si deseurilor spatiale
3. Reconstructia 3D a orbitelor terestre joase (LEO) pentru sateliti si deseuri spatiale.

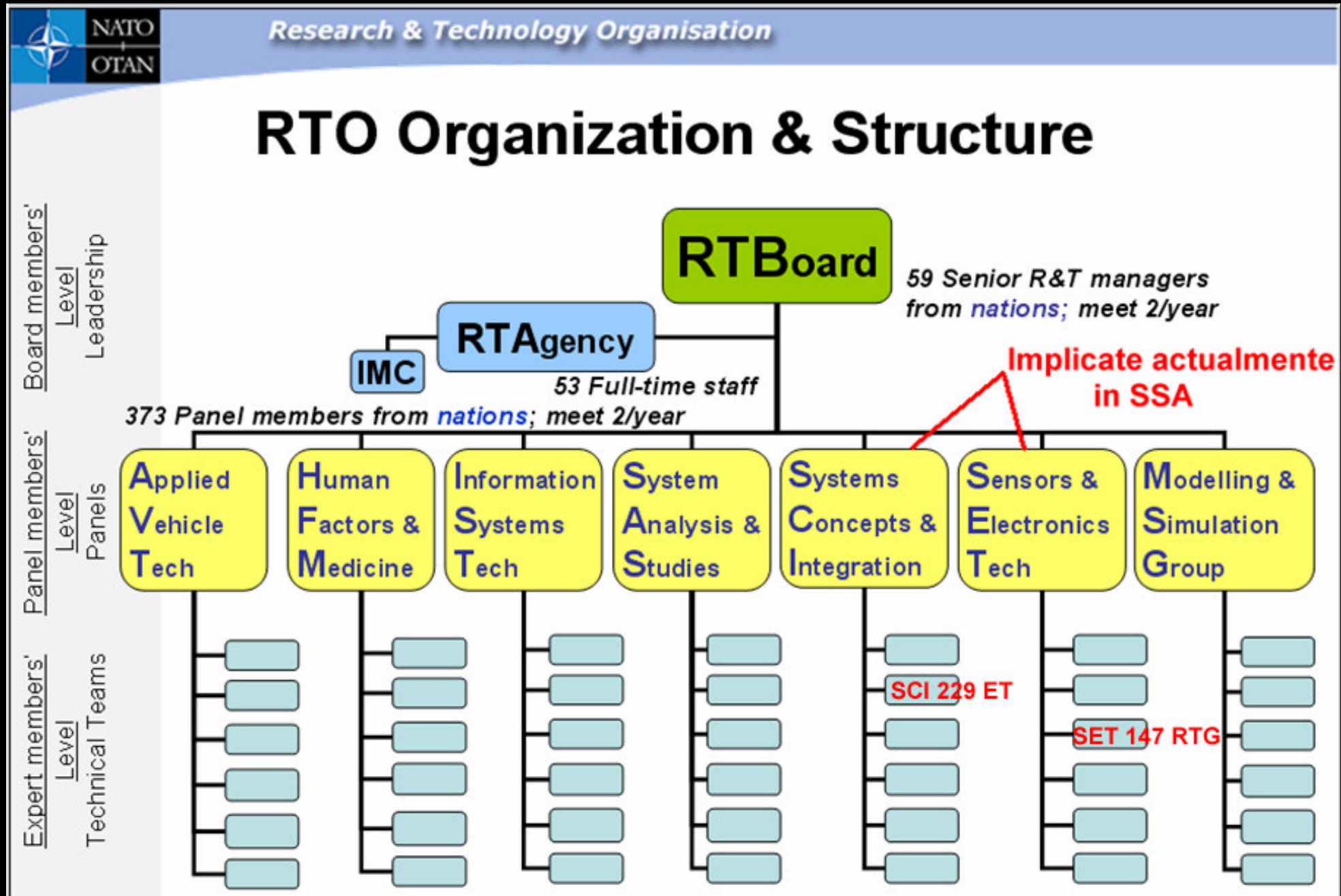


CONTEXTUL DEZVOLTARII ACTIVITATILOR SSA IN CADRUL NATO



MISIUNEA RTO: Sa conduca si sa promoveze cercetari efectuate prin cooperare in cadrul NATO si schimbul de informatii cu natiuni "Partenere".

CONTEXTUL DEZVOLTARII ACTIVITATILOR SSA IN CADRUL NATO





RTO TECHNICAL MEMORANDUM

TM-SPD-002

NATO RTO Space Science and Technology Advisory Group (SSTAG) Recommendations for Space Research Topics

Prepared by

RTO Space Science and Technology Advisory Group (SSTAG)



Published January 2006

CONTEXTUL DEZVOLTARII ACTIVITATILOR SSA IN CADRUL NATO



NATO RTO Space Science and Technology Advisory
Group (SSTAG) Recommendations for Space Research Topics

10 – Space Object Surveillance

MOTIVATION

Space Sensing has become a key part of the tool kit for today's warfighter. NATO uses information from space assets in most of its military operations from situational awareness to space weather. Better understanding and improved situational awareness has now been extended to space operations. The improvements in both ground and space based sensing to accomplish the full operational picture are required. Coalition forces must also understand the utility of new sensing techniques.

AREAS FOR COLLABORATION

- Space sensing needs and requirements.
- Phenomenology and field measurements.
- Physics based performance models.
- Combining sensor technologies.
- Calibration issues.
- Image/spectral processing and fusion.
- Military utility analysis.
- Observable quantities.

Ref: SET-105 Space Surveillance and Situational Awareness

NATIONAL INTEREST

BEL, FRA, GBR, NOR, ROU, USA, JAPCC (6)

In 2005, RTO SSTAG recomanda
supravegherea obiectelor spatiale si vremea
spatiala ca o prioritate pentru cercetarile
spatiale NATO.

CONTEXTUL DEZVOLTARII ACTIVITATILOR SSA IN CADRUL NATO

NORTH ATLANTIC TREATY ORGANISATION



RESEARCH AND TECHNOLOGY ORGANISATION

SPECIALISTS' MEETING

Emerging and Future Technologies for
Space Based Operations Support to NATO
Military Operations

RTB-SPSM-001

organized by the

NATO RTO

Space Science and Technology Advisory Group

Co-Sponsored by the

US Air Force European
Office of Aerospace
Research and
Development (EOARD)



Hosted by Romania and to be held at the

National Military Circle

Bucharest, Romania

Wednesday, 6 September to Thursday, 7 September, 2006

This Specialists Meeting is **Classified NATO Restricted**

Latest Enrolment Dates

NATO Nations Wednesday, 23 August, 2006

Enroll Online at:

<http://www.rta.nato.int>

Citizens from NATO nations may enroll for this Specialists Meeting via the internet at <http://www.rta.nato.int>. If you are unable to enroll via the internet, please contact the SSTAG Assistant at reboula@rta.nato.int or the Space R&T Executive Officer at woods-vedeleri@rta.nato.int

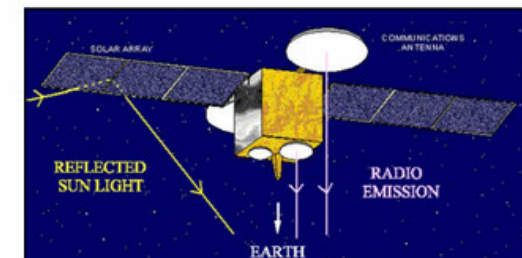
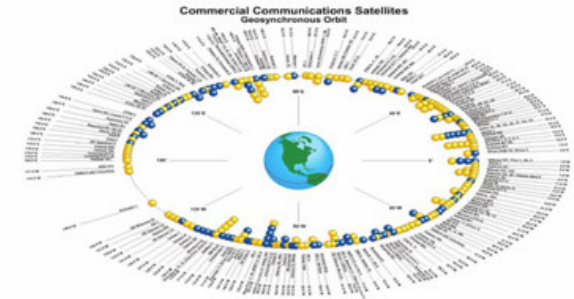
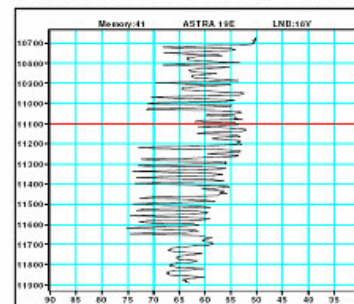
All presentations and discussions will be held in English.

In 2006 Romania organizeaza prima conferinta dedicata tehnologiilor suport pentru operatiuni spatiale ale NATO, incluzind supravegherea obiectelor spatiale.

In acest context, sunt prezentate experimente romanești privind detectia optica si radio a satelitilor geo-stationari (aflati la 36.000 Km deasupra Ecuatorului).



Astra GEO satellites constellation



The idea was to setup a Combined Radio Frequency & Optical Surveillance System (using a CCD-telescope and a small radio-telescope, both having automatic search and track capabilities) in order to find GEO satellites and scan their frequencies.



INTERNATIONAL MILITARY STAFF
ETAT-MAJOR MILITAIRE INTERNATIONAL



IMMEDIATE
HAND CARRY

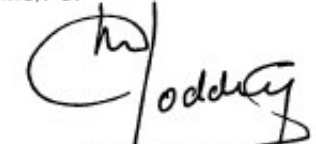
29 October 2008

IMSM-0625-2008

ALL MILITARY REPRESENTATIVES

LONG TERM CAPABILITY REQUIREMENTS (LTCR) STUDY 2008

1. MC 324/1 mandates ACT to "identify and prioritize the type and scale of future capability and interoperability requirements". In support of this, SCs developed in 2003 the Long Term Capabilities Requirements (LTCR) identifying a mix of capability requirements, technologies and solutions needed so that research, planning and procurement efforts could be focused and harmonized beyond 2010.
2. The last review of the LTCR was completed in 2005 and following MC notation, submitted to the CNAD and RTO for their consideration. Since that time ACT, assisted by SHAPE and supported by the widest possible network of stakeholders, has been conducting the Long Term Requirements Study (LTRS) in order to derive the next set of LTCR through a more structured and analytical process.
3. This study is now complete and is forwarded at Enclosure for Nations' initial consideration and as background information in anticipation of ACT's briefing on this subject at the MC/PS on 30 Oct 2008. It is intended to discuss the further staffing and way ahead of the new set of LTCR at the MC/PS.


P. J. M. GODDERIJ
Lieutenant General, NLD AF
Director
International Military Staff

Enclosure

1. 1500/SHJ5CMD/08-205478, Long Term Capability Requirements (LTCR) Study, 23 Oct 08

Copy To SDL T, IPMRs

Action Officer Col M. Fernandez Alvaro, L&R (5436), Col S. Tessaro, L&R (5511)

CONTEXTUL DEZVOLTARII ACTIVITATILOR SSA IN CADRUL NATO

Space Capability Preservation

Capability Description

Capable of preserving space as a sanctuary for NATO assets.

Effectiveness

The Alliance requires the capability to counter opponent's space denial operations, and hence preserve a space capability/situational awareness for NATO assets, through a combination of defensive measures of space- and ground-based assets and rapid, affordable replacement of space assets.

Rationale

NATO is transitioning to a global outlook, and future Alliance operations could occur anywhere around the world. This places more reliance on space based capabilities for communication, geo-positioning, and intelligence collection. Thus, ensuring access and functionality of these capabilities is paramount to successful NATO operations.

Assured access to and support from space capabilities such as satellite communications, geo-positioning, and overhead surveillance is critical to the successful employment of NATO forces at strategic distances. It is vital that NATO can assure access to these capabilities. The availability of space-based assets will be a decisive point in many NATO operations.

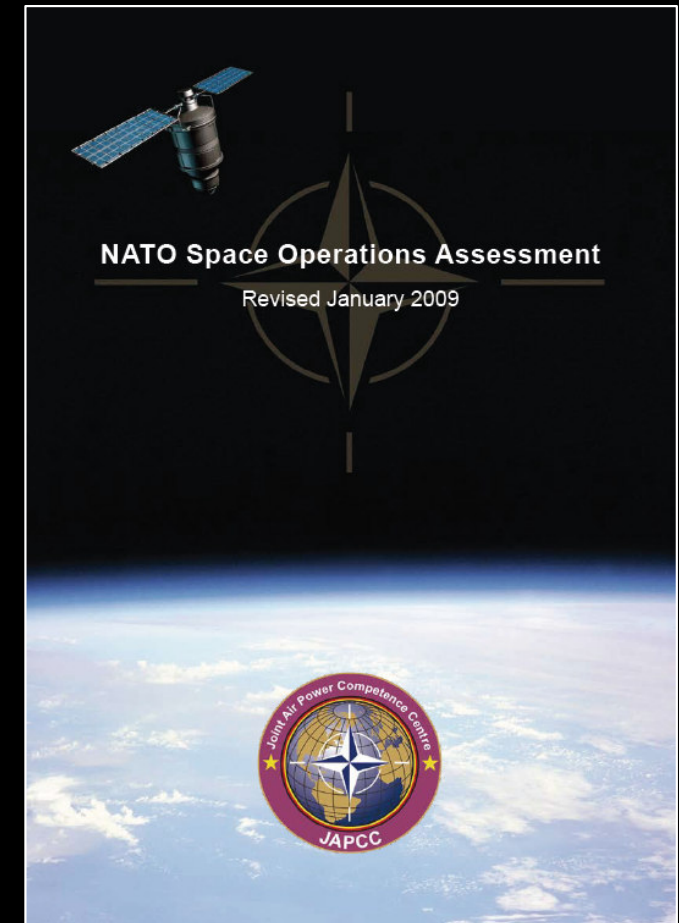
In studiul LTCR aprobat de NATO in octombrie 2008 este inclusa ca cerinta "prezervarea capabilitatilor spatiale", ceea ce implica dezvoltarea activitatilor SSA.

CONTEXTUL DEZVOLTARII ACTIVITATILOR SSA IN CADRUL NATO

Un studiu efectuat pentru NATO in 2008 de Joint Air Power Competence Centre recomanda:

- implementarea unor operatiuni spatiale aliate
- **dezvoltarea in comun a activitatilor SSA**
- protejarea suprematiei spatiale a NATO

Mission Control, we have a problem...





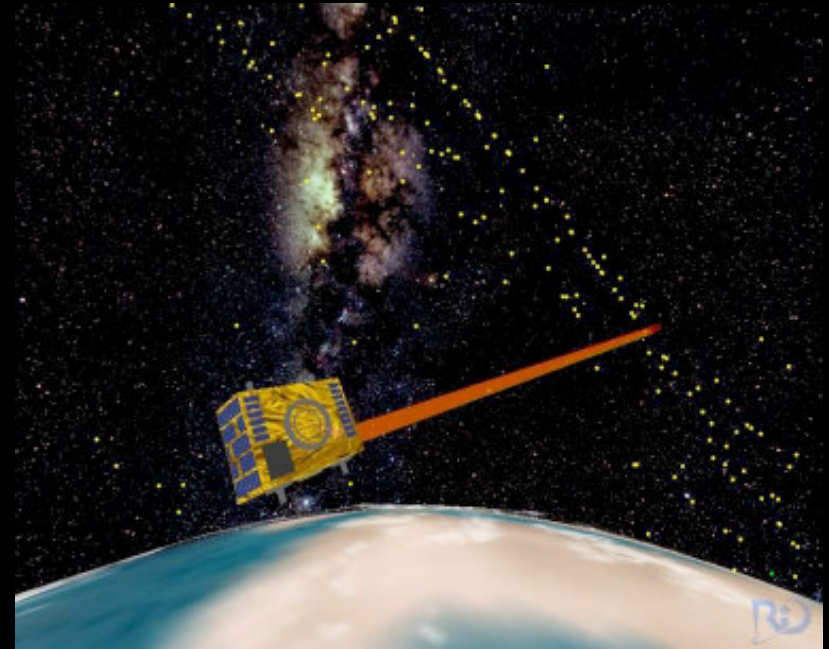
SET 147 RTG

EXPERIMENTUL NEOSSAT

Initiat si sustinut financiar in special de Armata Canadiana si Agentia Spatiala Canadiana.

OBIECTIVE:

1. Experimentarea unui microsatelit dotat cu un telescop capabil sa fotografieze sateliti aflati pe orbite inalte, asteroizi si comete.
2. Furnizarea de date in timp real Retelei de Supraveghere Spatiala a USA (US SSN).
3. Experimentarea in comun (si gratuit) a utilizarii satelitului de catre experti din tarile NATO participante la misiune.

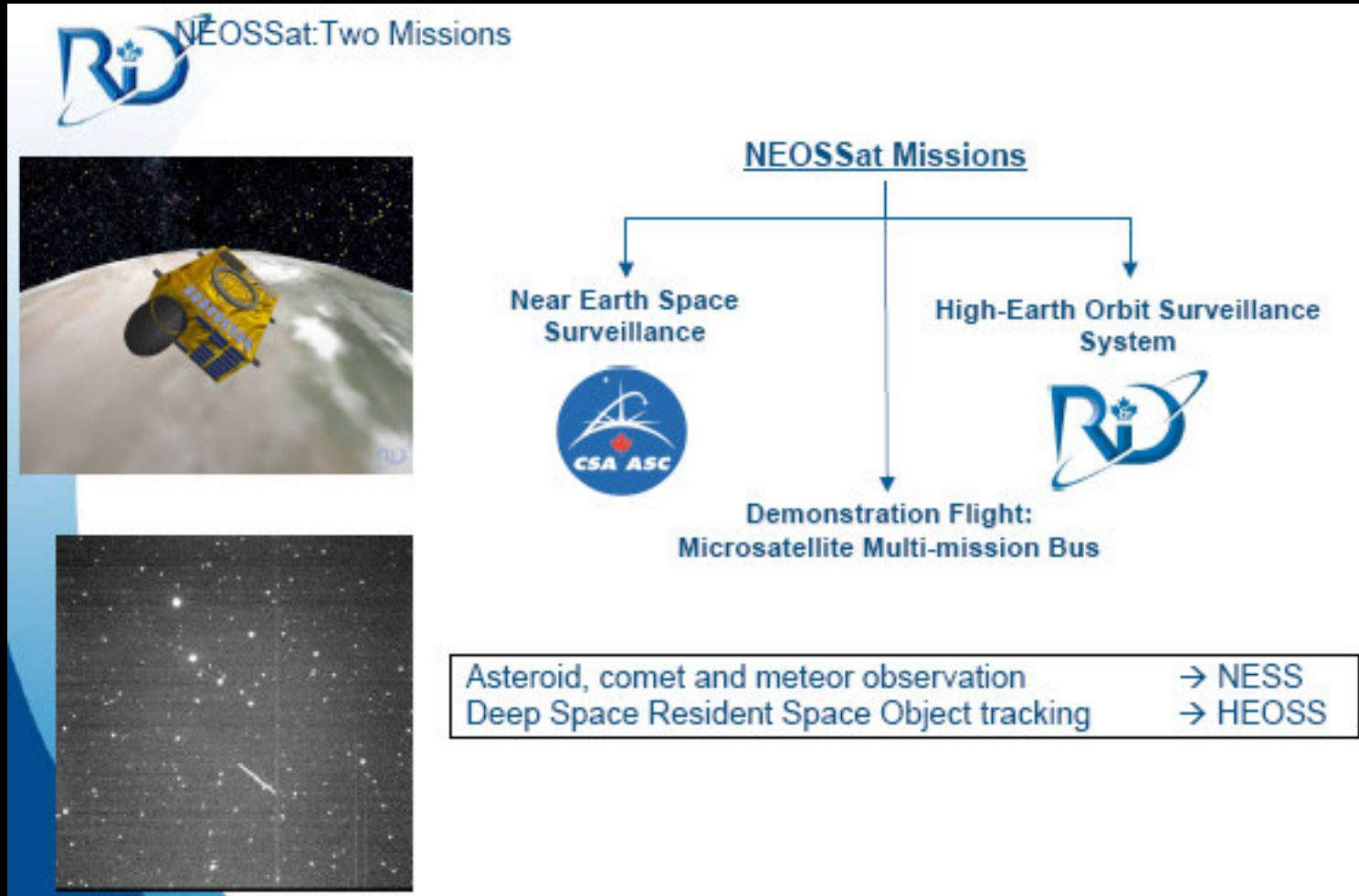




PROIECTE SSA DESFASURATE SUB EGIDA NATO RTO

SET 147 RTG

Lansare prevazuta pentru 2011



Satelit dezvoltat de Canadian Space Agency (CSA) impreuna cu Defence Research and Development Canada (DRDC)
Experimentele de interes NATO sunt dezvoltate de SET 147 RTG



SET 147 RTG

PROIECTE SSA DESFASURATE SUB EGIDA NATO RTO

CONTRIBUTII POTENTIALE ALE ROMANIEI

- operarea unei statii la sol capabile sa receptioneze date de telemetrie si imagini transmise de NEOSSAT
- experimente comune de observare optica a tintelor spatiale de la sol si de pe satelit
- prelucrarea datelor experimentale
- conceperea de noi experimente de observare a obiectelor spatiale.

MIZA PROIECTULUI

Pentru NATO RTO: - experimentarea unei tehnologii detinute actualmente exclusiv de USA

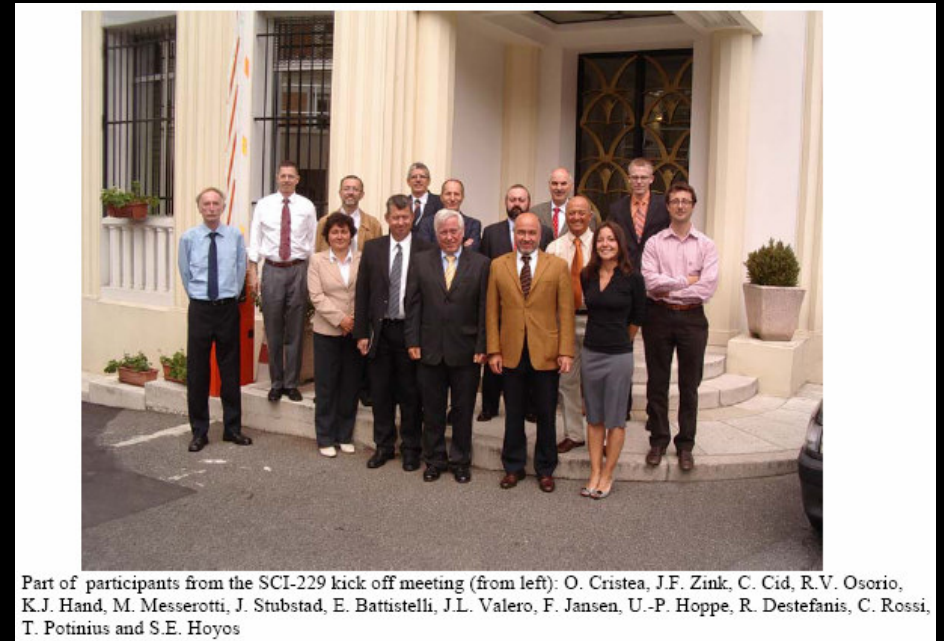
Pentru ROMANIA: - participarea la primul experiment NATO de supraveghere a obiectelor spatiale din spatiu
- dezvoltarea capabilitatilor nationale in domeniu.

O initiativa noua, prima intalnire a echipei:
RTA, Paris 2-4 sept. 2009.

Romania este natiune participante.

SCOP: identificarea expertizei si a resurselor
necesare infiintarii unui RTG care sa abordeze
incepind cu 2011 urmatoarele activitati:

- Raport privind instrumentele SSA existente si relevante pentru NATO;
- Identificarea unor prototipuri demonstrative de SSA utilizabile in operatiuni NATO;
- Recomandari privind arhitectura unui viitor centru NATO in domeniul SSA;
- Schitarea unui plan de activitati NATO in domeniul SSA;
- Organizarea de workshopuri si a unei conferinte comune cu actorii importanti in domeniul SSA (ESA, EDA, CE, Agentii Spatiale Nationale, etc.).



Part of participants from the SCI-229 kick off meeting (from left): O. Cristea, J.F. Zink, C. Cid, R.V. Osorio, K.J. Hand, M. Messerotti, J. Stubstad, E. Battistelli, J.L. Valero, F. Jansen, U.-P. Hoppe, R. Destefanis, C. Rossi, T. Potinius and S.E. Hoyos

**ROMANIA INVITATA SA OFERE EXPERTIZA IN ORICARE DIN URMATOARELE
TEMATICI: supravegherea obiectelor spatiale inclusiv NEO, vremea spatiala.**

ALTE PROGRAME SSA

- Exista diverse programe si initiative europene complementare: ESA, CE/FP7, EDA
- De asemenea, proiecte SSA dezvoltate de natiuni NATO (USA, Franta, UK, Germania, Canada, Italia, Spania);
- **PINA IN 2009 ROMANIA A FOST SINGURA NATIUNE EST EUROPEANA PARTICIPANTA LA ATIVITATI SSA DESFASURATE DE NATO**
- NATO RTO este in cautare de sinergii si mecanisme de cooperare in domeniul spatial si in particular al SSA.





PROGRAMUL SSA PROPUȘ DE ESA (2009 – 2019)

Programul are doua faze:

Faza 1, de pregatire (2009 – 2011) → Faza 2 (2012 – 2019) va fi supusa aprobarii in 2011

Tari participante in 2009 la faza 1: Austria, Belgium, France, Germany, Greece, Italy, Norway, Portugal, Spain, Switzerland, UK

Cele patru module componente a sistemului european SSA abordate in faza 1:

- Elementul central al sistemului
- Modulul vreme spatiala
- Modulul radar
- Centre de date pilot (gazduite in Belgia-vreme spatiala, Italia-NEO, Spania-space debris).

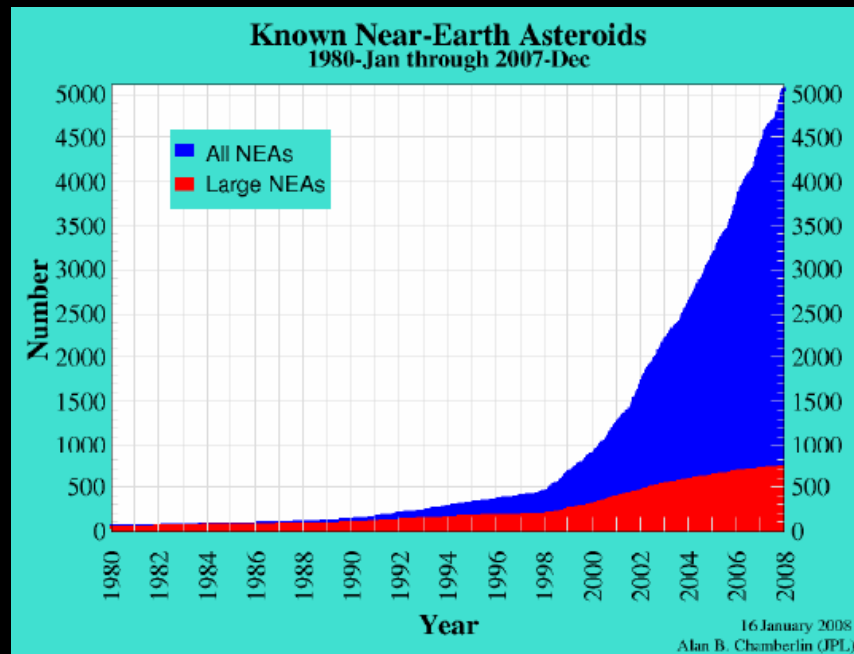
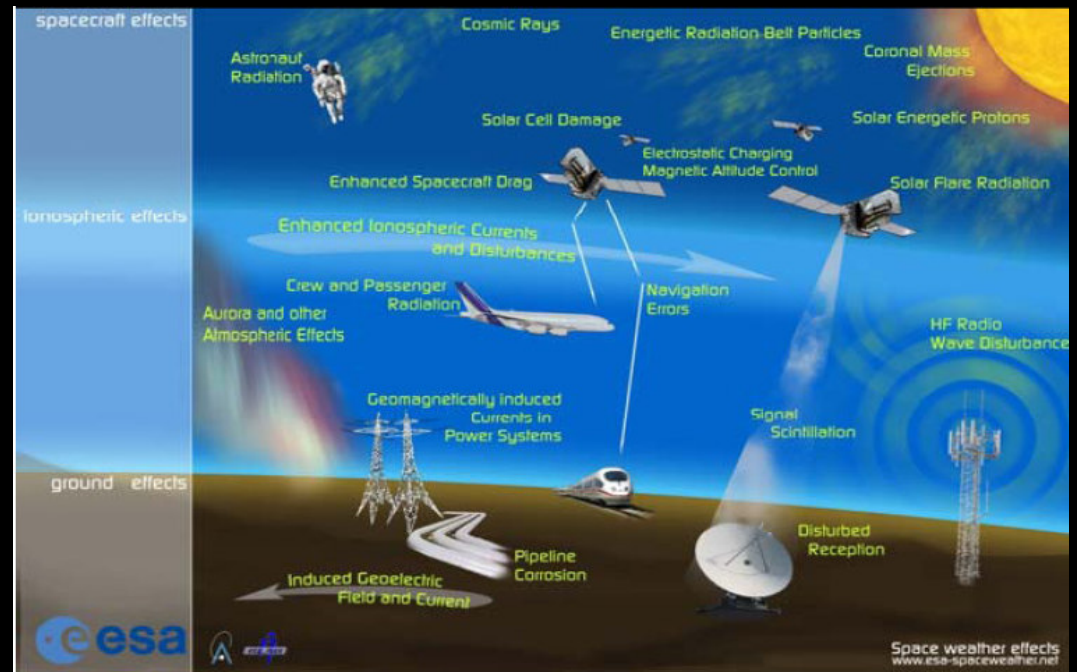
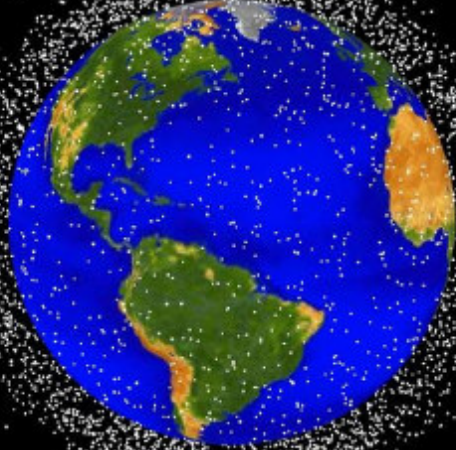
Aplicatii abordate in faza 1:

- Detectarea, identificarea si urmarirea obiectelor artificiale aflate pe orbite circumterestre
- Vremea Spatiala
- NEOs (obiecte din vecinatatea Terrei: asteroizi, comete).

ILUSTRARE A TEMATICII ABORDATE DE PROGRAMUL ESA SSA

Vremea spatiala

Space debris



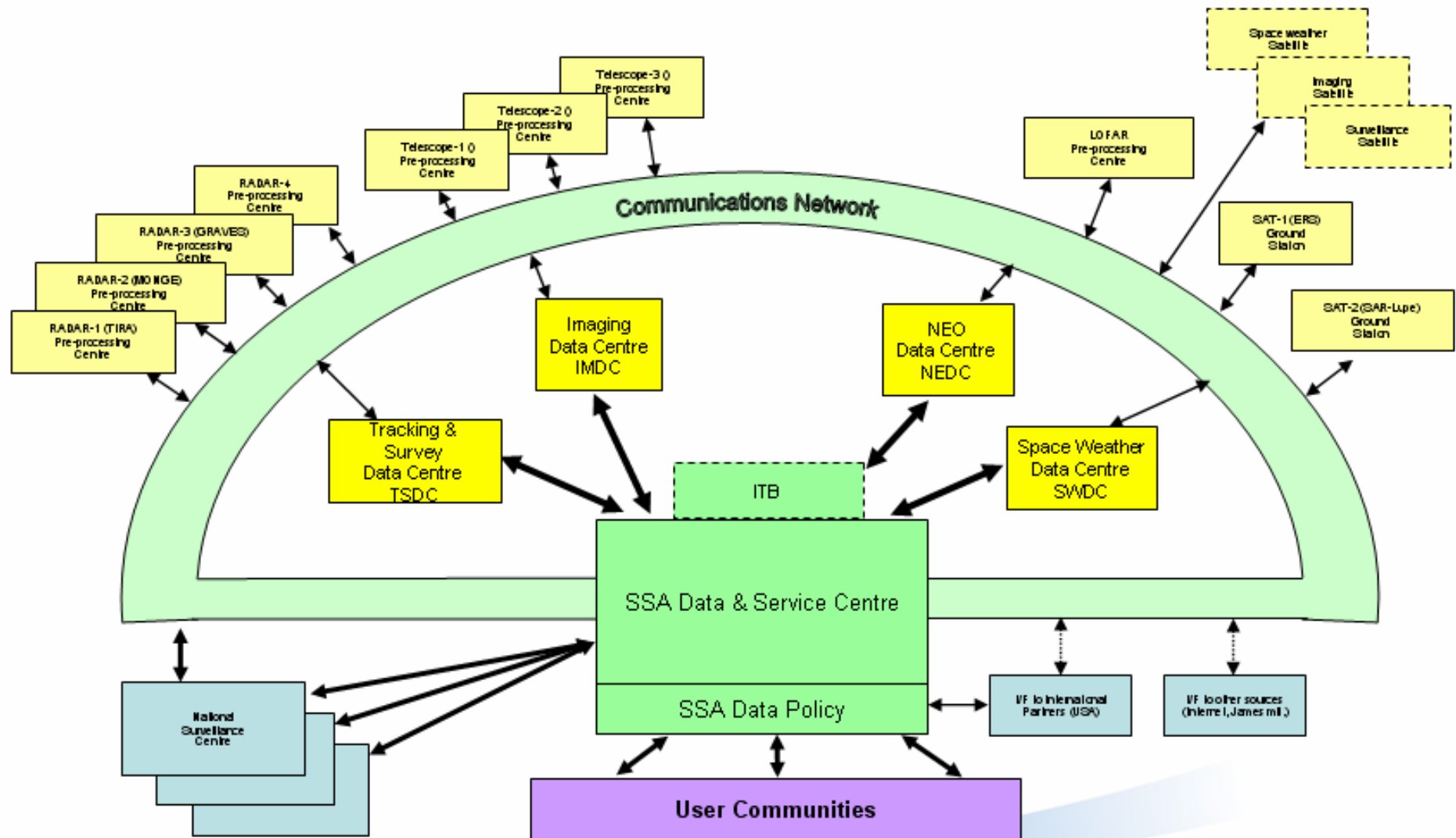
Probabilitatea si efectul impactului unui NEO

| NEO diameter | MT* | Average interval |
|--------------|-------------------------|------------------|
| 75 m | 10 to 100 | 1,000 years |
| 350 m | 1,000 to 10,000 | 16,000 years |
| 3 Km | 1,000,000 to 10,000,000 | 1,000,000 years |

* MT: Explosive power of 1 Mega Tonne of TNT
The Hiroshima bomb had an explosive power of 15 KT

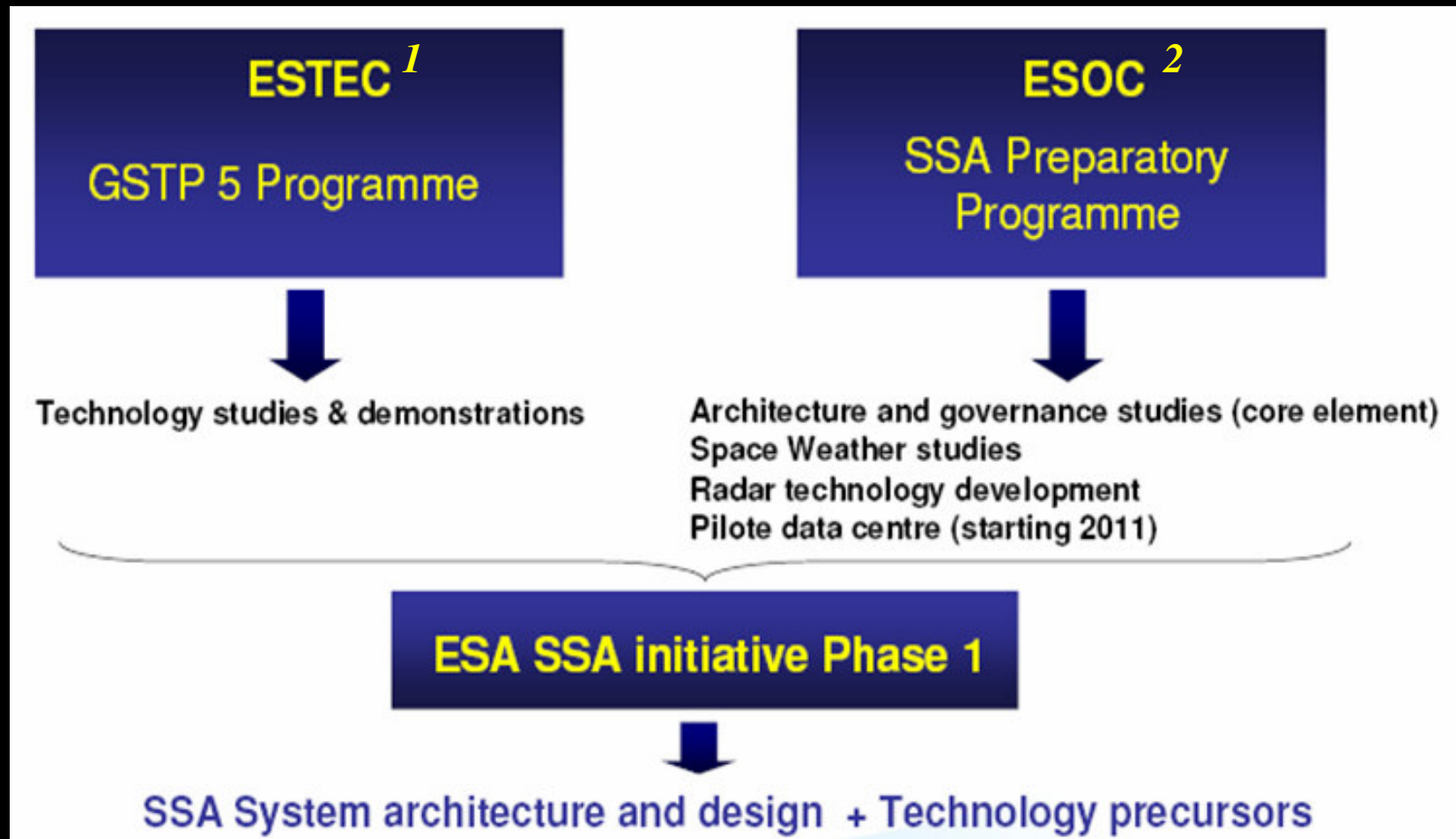
POSSIBILA ARHITECTURA A VITORULUI SISTEM SSA EUROPEAN

Possible Architecture of an European SSA System Result of Astrium study



MODALITATEA DE IMPLEMENTARE A INITIATIVEI ESA SSA

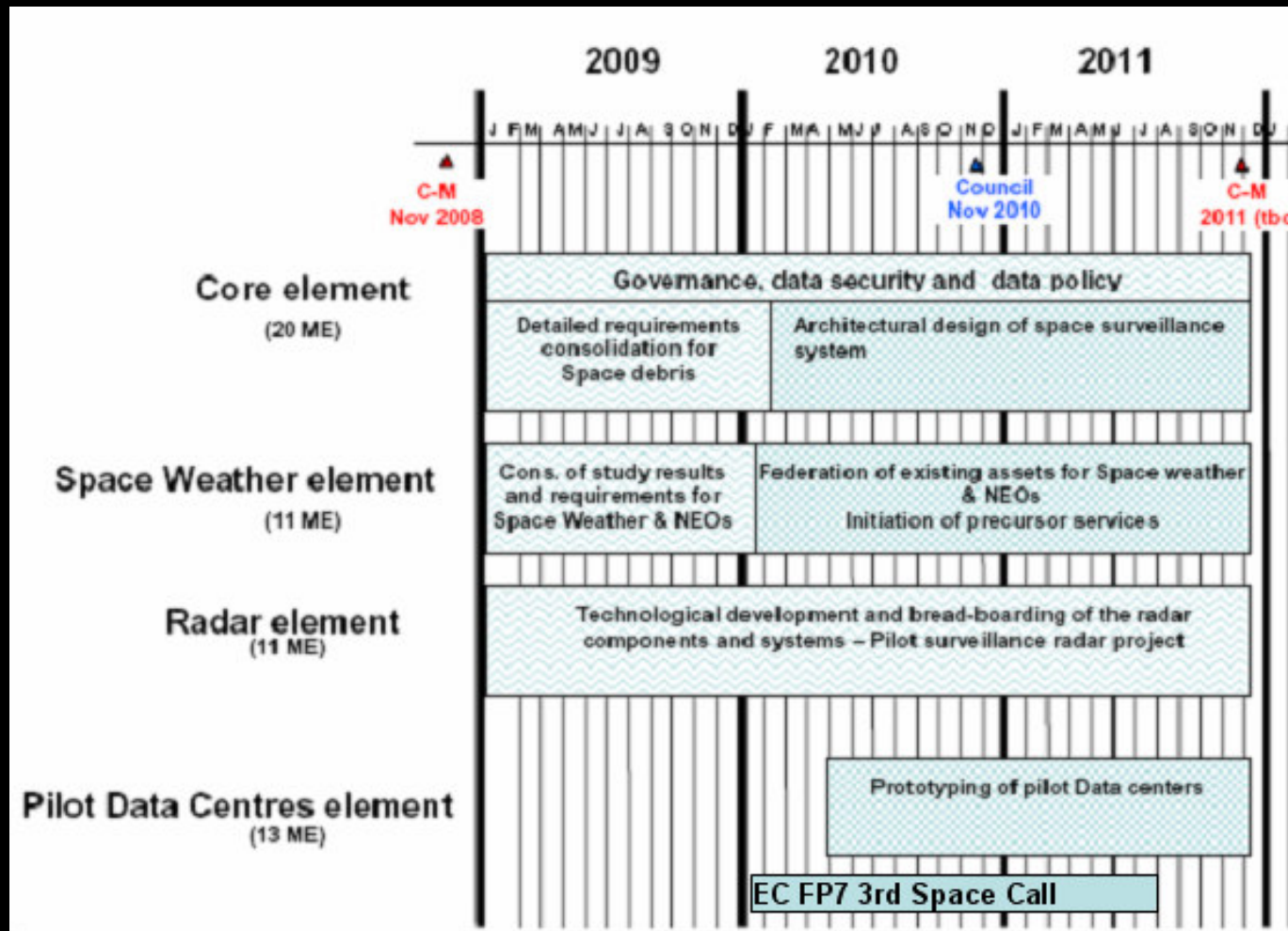
Faza 1



1. European Space Research and Technology Centre

2. European Space Operations Centre

PLANUL DE IMPLEMENTARE A PROGRAMULUI ESA SSA – Faza 1



Odata cu aderarea Romaniei la ESA, devine posibila participarea organizatiilor de cercetare si industriei romanesti la acest program.

POTENTIALUL DE PARTICIPARE A ROMANIEI LA PROGRAMUL ESA SSA

| TEMATICA SSA | OBSERVATII |
|--|--|
| Supravegherea obiectelor spatiale circumterestre (optic si radio pasiv) | Exista competente si dotari minimale pentru inceput. Trei organizatii din Romania desfasoara de cativa ani activitati de cercetare in acest domeniu. Exista experienta colaborarii in domeniu cu NATO RTO |
| Supravegherea NEO | Posibila, dar necesita din start investitii semnificative intr-un observator astronomic performant. |
| Vremea spatiala | Exista competente in domeniul masurarii radiatiei cosmice. Pot fi dezvoltate cu costuri rezonabile instrumente pentru monitorizarea perturbatiilor radio induse de Soare. |
| Oricare | Identificarea expertizei existente in domenii de interes pentru SSA si a unor mecanisme de cooperare cu diaspora stiintifica. |



Multumesc pentru atentie!