Current status of ESA’s Space Situational Awareness Near-Earth Object programme

Reminder: The European SSA Programme
The SSA-NEO segment
Link to UN activities
Precursor service setup
Current status
Conclusions

Detlef Koschny,
European Space Agency,
Solar System Missions Division
Keplerlaan 1
NL-2201 AZ Noordwijk ZH
Detlef.Koschny@esa.int
What is Space Situational Awareness?

The objective of the Space Situational Awareness (SSA) initiative is to support the European independent utilisation of and access to space for research or services, through providing timely and quality data, information, services and knowledge regarding the environment, the threats and the sustainable exploitation of the outer space.

From the SSA Programme Declaration, ESA/C/SSA-PP(2008)2
The European SSA Programme

Three ‘segments’:

- Survey and Tracking (= Space Debris)
- Space Weather
- Near-Earth Objects

ISS Station from 400 km, VSW Munich, 80 cm aperture

Proton and electron fluxes (NOAA)
The European SSA Programme

- Preparatory phase (2009 – 2011) approved by ESA’s Ministerial Council in Nov 2008 as an optional programme
- After confirmation: Nominal phase (10 years)

ISS Station from 400 km, VSW Munich, 80 cm aperture

Proton and electron fluxes (NOAA)
The European SSA Programme

- Network of sensors (ground- and space-based)
- Data centres
- Common data policy and standardization
Why should we care?

‘No doubt about it... an asteroid killed the dinosaurs!’
Sudan – 2008 TC3

Discovery
Catalina Sky Survey 06 Oct 2008 – impact in 19 h!

Great Shefford Observatory 06 Oct 2008 – impact in 3h16m
Sudan - 2008 TC3
The European SSA-NEO segment
- main requirements

The SSA-NEO segment shall provide information on the impact probability and/or miss distances of NEOs including associated uncertainties. To do this properly, it shall assess impact analyses, results, and perform its own impact risk assessments.

Classify the risk of a NEO impact and issue warnings if the risk is higher than the background risk.
SSA-NEO – link to UN activities

- **United Nations Security Council**
- **MAOG** Mission Authorisation and Oversight Group
- **IAWN** Information, Analysis, and Warning Network
- **MPOG** Mission Planning and Operations Group

From the ASE report “Asteroid Threats: A call for global response”
Action Team 14 recommendations are followed
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SSA-NEO - link to UN activities

United Nations Security Council

MAOG
Mission Authorisation and Oversight Group

IAWN
Information, Analysis, and Warning Network

MPOG
Mission Planning and Operations Group

ESA’s ops directorate
Advanced Concept Team
(spacecraft operations, deflection missions)

SSA-NEO segment
– direct tasks
Current activities

- Customer Requirements
- System Requirements
- Architectural Design
- Final Service Definition
- Precursor Service
- Agreements w/ telescopes
- Agreements w/ data centers
- SSA-related studies paid from other ESA programs
- Policy, interfaces with other international players

2009

TIME

2011
Current activities

Customer Requirements
- finished

System Requirements

Architectural Design

Final Service Definition

2010
- OGS, Spitzer – 54 kE
- Space debris study on optical design, 150 kE
- Discussion ongoing
- Spitzer data 15 kE
- Agreements w/ data centers
- ITT issued, 600 kE (complete SSA)
- 2nd half of 2010: 3 ME (complete SSA)

2011
- Precursor Service
- 600 kE contract scheduled for spring 2010
- 600 kE contract scheduled for end 2010

2011
- SSA-related studies
  - paid from other ESA programs
  - Architecture study, system req’ts
  - Telespazio 500 kE

2010 2011
- Final Service Definition
- OGS, Spitzer – 54 kE
- Space debris study on optical design, 150 kE
- Discussion ongoing
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- ITT issued, 600 kE (complete SSA)
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Policy, interfaces with other international

Contracts for data policy, ICT requirements etc. will start in spring 2010
The European SSA-NEO segment precursor service setup

Data acquisition
- Telescopes from participating countries
- Optical Ground Station (ESA)
- Radar systems in participating countries

Data processing
- Done by telescope operators
- Observation planning support maintenance
  - Univ. Rome
- Orbit and risk computation development and maintenance
  - Pisa, Italy
  - Valladolid, Spain

Data collection
- Minor Planet Center (USA) (external)

Front desk @ ESRIN
- Front desk operator, system adm.
- NeoDys service system
- Spaceguard service system
- Planetary dB

Political decision process
- Action Team 14, United Nations

SSA-NEO precursor service setup
End 2010

SSA-NEO-ESA-HO-028/1.0  14 Feb 2010
Ongoing activities

SSA-wide studies

- On data policy, computer infrastructure requirements, web design – are approved and start now
- Studies on optical telescopes, mainly for space debris application – also useful for NEOs

Directly linked to the NEO segment

- Study on requirements/architecture for NEO ground segment + test system ongoing
- Regular asteroid observations have started at Optical Ground Station (follow-up of objects on ‘critical list’; physical characterisation; testing survey); support to science teams for Spitzer asteroid analysis
- ITT for contract to set up ‘precursor service’ will come out in spring 2010
Approved studies from the ‘General Studies’ programme of ESA

- Study an alternative orbit propagator – partially supported
- Build a visible-infrared camera optimised for NEO observations at ground-based telescopes – partially supported
- Set up a robotic telescope demonstrator – supported
Conclusion

Europe has started to contribute to the efforts of setting up a proper impact threat warning system – several Mio Euros have been committed for the Space Situational Awareness programme with the NEO warning system being one of three segments.

SSA-NEO should to be part of an UN-sanctioned world-wide system.

COPUOS can help by acknowledging the activity and comment on program contents – members of Action Team 14 are involved in the precursor service setup.