OVERVIEW ON 2012 SPACE DEBRIS ACTIVITIES IN FRANCE

F. ALBY

IAA-Beijing
21 September 2013
End of life operations

Collision risk monitoring

Atmospheric reentries predictions

R/D studies

Regulatory activities

National Register of Space Objects

Workshops and meetings
END OF LIFE OPERATIONS

LOW EARTH ORBIT:

- Helios 1A (18 February 2012)
  - Remaining orbital lifetime about 18 years

GEOSTATIONARY ORBIT:

- EUTELSAT 4A (23 February 2012)
  - Graveyard orbit 500 km above GEO

- Telecom 2D (18 November 2012)
  - Graveyard orbit 450 km above GEO

  compliance with French law and international recommendations
Operational service called CAESAR (Conjunction Analysis and Evaluation, Assessment and Recommendations)

- Analysis of all CSMs available corresponding to a conjunction
- Risk evaluation and avoidance recommendations
- Use of tracking radars or telescopes when necessary

Open to:

- Satellites controlled by CNES
- External customers (AstroTerra-Spot 6 for the time being)
- Additional customers expected in 2013
ATMOSPHERIC REENTRIES MONITORING

■ Objects monitored:
  « French » objects that could fall on foreign countries (Launching State responsibility)
    - satellites and launcher stages registered by France
    - launcher stages registered by ESA

  « foreign » objects that could fall on the national territory:
    Potentially dangerous objects registered by other countries:
    - Mass > 5T
    - dangerous materials

■ Particular cases:
  IADC or governmental requests

■ «debris » objects not considered
SPACE DEBRIS R/D ACTIVITIES

● ON-ORBIT SITUATION:
  ✷ Debris observation from space and ground
  ✷ Catalog management

● PROTECTION:
  ✷ Effect of debris impacts on satellites, protection
  ✷ Aero-thermodynamics models for reentry

● MITIGATION:
  ✷ Electric and fluidic passivation
  ✷ Reentry survivability

● REMEDIATION:
  ✷ Long term evolution of the space debris population
  ✷ Optimal orbital transfer for active debris removal missions
REGULATORY ACTIVITIES

- French Space Act applicable since December 2010
- Technical compliance is checked by CNES before launch or critical operations
- Methods and tools are developed and proposed to support the implementation of the Technical Regulations:
  - Fragmentation modeling during reentry: DEBRISK
  - Estimation of ground risk in case of reentry: ELECTRA
  - Determination of compliance with the 25-year rule: STELA
  - Long term stability of the GEO graveyard orbit
  - Collision risk during launch phase: ARCL
305 space objects, end 2012, in the French Register

- 191 launcher elements (LEO, MEO, GTO)

- 114 satellites:
  
  operational satellites: 63
  
  LEO: 35
  GEO: 28

  inactive satellites: 51
  
  LEO: 24
  GEO: 23
  GTO: 4
MEETINGS AND WORKSHOPS

• annual national meeting on space debris: Space Debris Synthesis Group
  ✦ 27 June 2013, CNES Toulouse
  ✦ 80 participants: Administrations, Defence, Industry, Operators, Research, Insurance companies,…
  ✦ Objective: to inform all partners about national space debris activities and international discussions (IADC, COPUOS, ISO)

• 5th satellites end of life workshop:
  ✦ 28 January 2014, CNES HQ, Paris
  ✦ Participants: industry, operators, space agencies
  ✦ Objectives:
    » To inform operators and industry on regulatory issues and evolution
    » To get feed-back from operators/industry in implementing the guidelines
MEETINGS AND WORKSHOPS

3rd European workshop on Space Debris Remediation:

- 16-18 June 2014, CNES HQ, Paris
- Participants: industry, academics, laboratories, space agencies
- Programme Committee: CNES, DLR, ESA-HQ, ESOC
- To be contacted soon: NASA, JAXA, Roscosmos
- Objectives:
  - Follow-up of workshops held in 2010 and 2012
  - More general than previous ADR thematics