Space Debris Mitigation Activities in Indonesia

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Outline

1. Why do we need to be concerned?
2. The development of standard operating procedure for mitigating risks from reentry of space debris
3. Our notes on monitoring reentry of space debris in Indonesia
4. Our notes on debris population
5. Implementation of the space debris mitigation guidelines
6. Final words
Why do we need to be concerned?

- With a large geographical region extending in the equator, every large reentering space objects always have potential to fall in Indonesia regardless of their inclination.

- The probability of collision between space debris and Indonesian satellite is getting bigger because of the increasing number of them both.
The development of standard operating procedure for mitigating risks from reentry of space debris

- The SOP involves LAPAN for monitoring and identifying the reentering space debris (natural and main-made) together with other stakeholders
- Analysis of space debris related problems is carried out mainly by using TLE (two-line elements) and TIP (tracking and impact prediction) report from Space-Track
- Utilizing popular tracking software only (before 2011)
- Utilizing our own information and dissemination system beside popular tracking software (since 2011)
Information system

Diagram:
- TLE retriever
  - SSR file (raw)
  - Catalog file (raw)
    - Batch process
  - SSR file
  - Catalog file
    - Data process
      - Display
      - Report

Image:
- Track it 2.0 software interface for monitoring space objects.
Dissemination system

Information
- General
  - Reentry time
  - Reentry location
  - Probable risk
- Detail
  - Reentry time
  - Reentry location
  - Potential hazard

LAPAN Website

Stakeholders
- BNPB (National Disaster Management Agency)
- Bapeten (Nuclear Energy Regulatory Agency)
- Local police

http://orbit.dirgantara-lapan.or.id/

Sample report: reentry of BSAT-2B satellite in January 2014


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* Berdasarkan Satiko v0.31
Our notes on monitoring and identification of reentry of space debris before 2011

- Gorontalo, Mar 1981 (SL-8)
- Lampung, Apr 1988 (SL-4)
- Flores, Feb 2007 (Okean 3 deb)
- BeppoSax, Pacific, Apr 2003
- Bengkulu, Oct 2003 (CZ-3)
Our notes on monitoring reentry of space debris since 2011

One day before reentry we could predict that Indonesia will be safe from the impact of UARS and ROSAT but not until less than 4 hours before reentry for Phobos-Grunt which, as we experienced, had an unusual and limited Tracking and Impact Prediction Report on Space-Track.
Our notes on debris population

We notice that the number of reentered space debris related with the increasing solar activity in the latest solar cycle is incomparable with the increasing number of fragmentation debris after 2007. In fact, we now face a lot more challenging situation compare with the previous two cycles.

Our study found that if we consider only objects with nearly circular orbits, their spatial density trends for altitude from 400 until 700 km in 100 km bin were increasing from 2009 until late of 2013 despite the decreasing number of the total number of space objects in that period.
Implementation of the space debris mitigation guidelines

Efforts to minimize the threat from existing debris in GEO region have been done since 1981 by sending Palapa 1 to its disposal orbit. However, no implementation of space debris mitigation guidelines in LEO region has been conducted so far.
The issue on space debris is important for Indonesia due to its large regional coverage in the equator (with large population) and increasing number of space objects (including Indonesian satellites).

Currently, analysis of space debris related problems in Indonesia can only be carried out by using available data from other institutions (especially USSTRATCOM).

Nevertheless, efforts have been carried out in Indonesia to minimize risk from space debris including the disposal of GSO satellites since 1981 and development of information system and dissemination of reentering space debris in 2010.

Current technology and system of monitoring and cataloging artificial space objects needs to be improved to be able to assess the risk from a new fragmentation better.
Acknowledgements

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Thank you