

Inter–Agency Space Debris Coordination Committee



The Inter-Agency Space Debris Coordination Committee (IADC)

An overview of the IADC annual activities

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IADC Chair**

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United Nations Committee on the Peaceful Uses of Outer Space

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Overview of IADC

- The IADC is an international forum of national and multi-national space agencies for the coordination of activities related to space debris.
- The 13 IADC member agencies are:
 - ASI (Agenzia Spaziale Italiana)
 - CNES (Centre National d'Etudes Spatiales)
 - CNSA (China National Space Administration)
 - CSA (Canadian Space Agency)
 - DLR (German Aerospace Center)
 - ESA (European Space Agency)
 - ISRO (Indian Space Research Organisation)
 - JAXA (Japan Aerospace Exploration Agency)
 - KARI (Korea Aerospace Research Institute)
 - NASA (National Aeronautics and Space Administration)
 - ROSCOSMOS (Russian Federal Space Agency)
 - SSAU (State Space Agency of Ukraine)
 - UK Space Agency (United Kingdom Space Agency)

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Membership

- IADC members are countries or national or international space organizations that carry out space activities, either through manufacturing, launching, and operating spacecraft, or manufacturing and launching rockets.
- IADC members should actively undertake space debris research activities and contribute to an increased understanding of space debris issues.
- The Korea Aerospace Research Institute (KARI) of the Republic of Korea became the latest IADC member in October 2014.

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Structure and Purposes of IADC

- The IADC consists of a Steering Group and four specialized Working Groups (WGs) covering measurements (WG1), environment and database (WG2), protection (WG3), and mitigation (WG4).
- The primary purposes of the IADC are
 - to exchange information on space debris research activities between member space agencies.
 - to facilitate opportunities for cooperation in space debris research.
 - to review the progress of ongoing cooperative activities.
 - to identify debris mitigation options.

(IADC Terms of Reference,
see <http://www.iadc-online.org>)

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Annual Meetings

- More than 100 technical experts from member agencies participate in the annual meetings to share information, address issues, and define and conduct studies on all aspects of space debris – measurements, modeling, protection, and mitigation.
 - ESA hosted the meeting in Darmstadt, Germany, in 2013.
 - CNSA hosted the meeting in Beijing, China, in 2014.
 - NASA will host the next meeting in Houston, Texas, USA, in late March 2015.



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Measurement Highlights (1/2)

- IADC members conduct regular 24-hour observation campaigns to compare data and characterize debris populations in different regions.
 - Low Earth orbit (LEO): radar campaigns.
 - Geosynchronous orbit (GEO): optical campaigns.

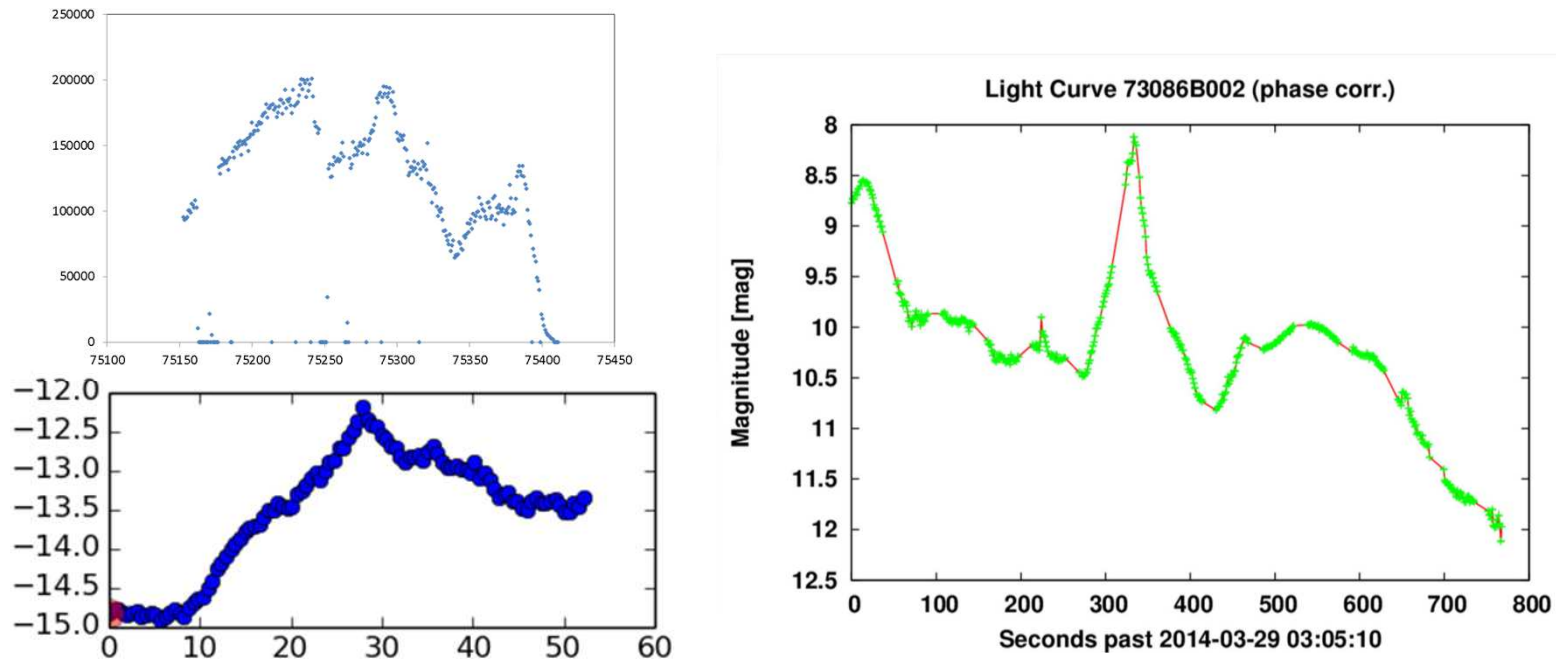


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Measurement Highlights (2/2)

- An effort to conduct light curve observations of launch vehicle upper stages is underway. The objective is to characterize the attitude tumble motions of massive objects in LEO for potential remediation consideration.



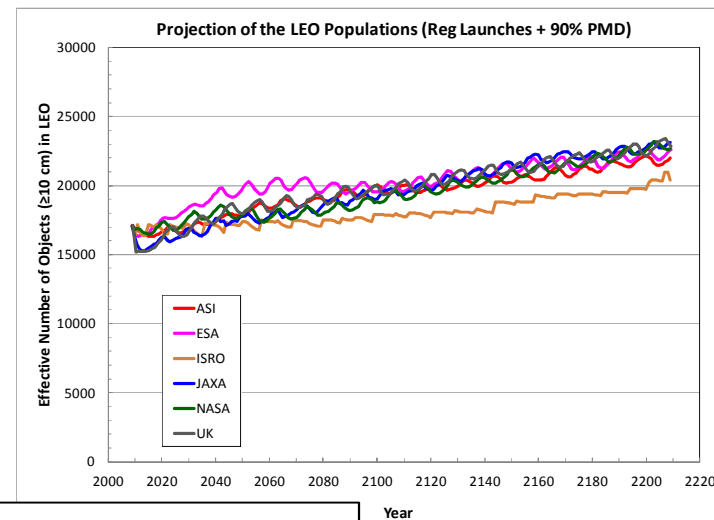
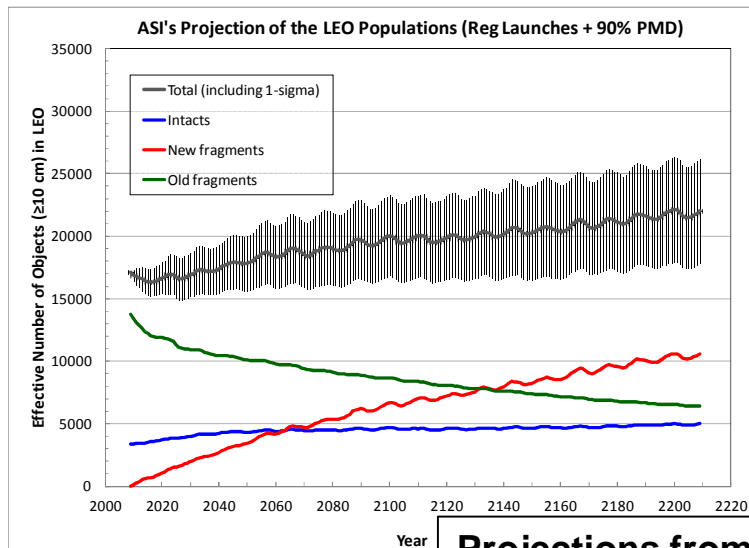
Three light curve examples

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Modeling Highlights

- After the conclusion of a major modeling study on the stability of the future LEO orbital debris environment in 2013, several follow-up studies have been initiated to
 - characterize the uncertainties in future environment projection, such as launch traffic, solar activity, and breakup models.
 - quantify the benefits of active debris removal.



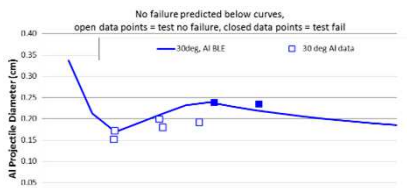
Projections from the 2013 IADC study

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Protection Highlights (1/2)

- The IADC Protection Manual provides
 - A standard framework to assess space debris risks.
 - Validated ballistic limit equations.
 - Benchmark results for cross-calibration impact facilities and tests.
 - Reference cases for validation of numerical simulations.
 - Design guidelines for the protection of space assets.
- The most recent revision efforts include
 - Providing updates to damage equations.
 - Identifying techniques to increase impact speeds in tests.
 - Including additional benchmark cases for risk assessment tools.



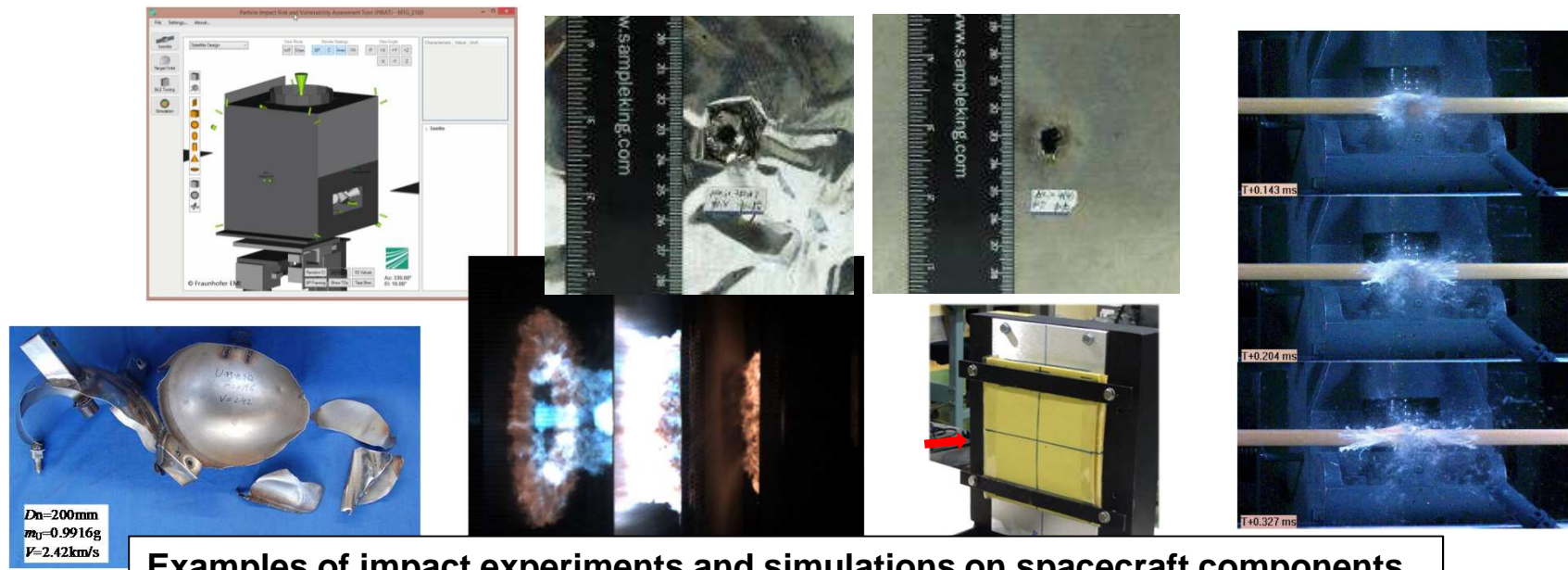
Damage equation, impact test facility, and risk assessment tool examples

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Protection Highlights (2/2)

- A new action item to collect information on spacecraft component vulnerability was established in 2013.
 - Components to be documented include solar arrays, batteries, pressure vessels, electronic boxes, structures, multi-layer insulation, fluid lines, and cables.



Examples of impact experiments and simulations on spacecraft components

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Mitigation Highlights

- Two official action items were finalized in 2014:
 - An update to the “Support to the IADC Space Debris Mitigation Guidelines” document in areas such as the prevention of break-ups, post-mission disposal of geostationary objects, and practices for the injection and operation of geostationary objects.
 - A compilation of approaches to re-entry casualty risk assessment, including assumptions, re-entry criteria, and applicable models.
- Reviews of the long-term presence of objects in the geosynchronous orbit region, options for satellite disposal in the geostationary transfer orbit region, and various aspects of active debris removal are underway.

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Re-entry Prediction Campaigns

- To prepare for and respond to high risk satellite re-entry events, the IADC members conduct annual object re-entry prediction campaigns for data sharing and coordination.
 - Seventeen campaigns have been conducted since 1998, including the Gravity field and steady-state Ocean Circulation Explorer (GOCE) in 2013 and Cosmos 1939 in 2014.



GOCE



Cosmos 1939

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Conclusions

- The IADC is the internationally recognized technical authority on space debris.
- The IADC participates in and contributes to the UN space debris activities at the Scientific and Technical Subcommittee (STSC) of the Committee on the Peaceful Uses of Outer Space (COPUOS).
- The IADC will continue to advance the knowledge of space debris and to develop environment management strategies to preserve the near-Earth space for future generations.

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