



PRESERVING THE SPACE ENVIRONMENT COLLABORATIVELY

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- **Successful Collaboration among stakeholders**
- **Situations developing that would benefit from enhanced collaboration**
- **Call to action:**
 - **Establishment of the Institute for Prevention and Control of Space Debris (IPCSD)**



● Galaxy 15

- Six commercial competitors collaborated to prevent physical collisions and electromagnetic interference
- Manufacturer-Operator collaborative assessment of causes of loss of control and mitigation
- Assessments validated by return to service after months of continued collaborative operation

● Subsidiary Payload Deployment and Booster Disposal

- Delta II deployment of Suomi National Polar Orbiting Satellite launched with six cubesats deployed in different orbits than the major payload, and booster disposed of safely.
- Delta IV Medium launch vehicle during the DMSP-17 mission in 2006;
- H-IIB launch vehicle during Flight No. 2 in 2011;
- ARIANE 5 ES launch vehicle during the Flight VA205 in 2012



- **Deliberate consideration of collision avoidance in mission architectures**
 - SumbvandilaSat considered diligently and competently collision risks of Sun Synchronous satellites
- **Collaborative development of conjunction warning processes and elements of information**
 - Consultative Committee for Space Data Standards and ISO: industry and government of many nations
- **Codes of Conduct within industry for the purpose of mitigating interference among satellites.**



- **Briz booster debris**

- Four launch and deployment anomalies have deposited significant amounts of debris and errant satellites in low Earth orbit.
- The ISS is at some risk, and other satellites are more affected

- **AM-4 repurposing**

- Ekxpress-AM4 was deposited in an unintended orbit in August 2011 and declared a total loss
- Technically sound recommendations to repurpose the satellite for Antarctic communications were not entertained because authorities had low confidence in the risk and mission assessments for repurposing analyses

- **Satellite life extension justification**

- The remaining lifetime of satellites is sometimes perceived to increase as more propellant is consumed, conveniently accommodating delays in replacement satellites or unanticipated demand.
- Determining remaining propellant is more uncertain the more propellant that is consumed.



- **Actions during design and development phase**
 - Mitigation guidelines, development and production standards, and standard operating procedures
 - Interface control agreements between operators

- **Actions during launch and deployment**
 - Launch collision avoidance
 - Trajectory information sharing
 - Collaborative confirmations

- **Actions during operations**
 - Collaborative maneuver planning
 - Conjunction Assessment
 - Avoidance maneuver Assessment



- **Traditional government role in establishing safety regulations and certifying compliance is no longer suitable for highly advanced and fast evolving systems and operations**
- **The industrial community should take/maintain the lead in developing performance based and goal oriented policies and implementation standards**
- **The industrial community has in-house all skills and technical resources to thoroughly and efficiently verify compliance with policies standards, and would be more efficient and cost-effective than government agencies as long as such verifications are performed with the necessary independence and rigor**



The space industry should move towards developing a notion of space debris prevention and control as its own collective international responsibility

Industry should establish an “Institute for Space Debris Prevention and Control (ISDPC)”

This institute would be an industry created, independent, self-policing entity aimed at developing, adopting, and enforcing standards of excellence to ensure continuous improvement in space debris prevention, and operational integrity of space operations



The Institute ultimate goal is to build through experience and lessons learned collaborative mechanisms for more safe and productive near Earth space activity: In particular the Institute will:

- Make available to all stakeholders in space activity, whether large or small, expert assessments for safe space operations.
- Perform third party certification of space systems and operations procedures against ISO Space Debris Requirements (ISO 24113, etc.)
- Produce additional technical and management implementation guidelines
- Verify that best practices are known and systematically applied
- Assess risks of debris events. (Risks to all rather than risks to the operator's own satellites only)
- Examine planned repurposing or ad hoc major maneuvers and repositioning
- Assess uncertainties in maneuvers and plans near stated end of life
- Enable proactive accommodation of circumstances that would eventually become serious issues requiring ad hoc responses.



- **A collaborative consortium of industry, open to the participation of experts from government organizations, on the model of IAQG (International Aerospace Quality Group)**
- **With processes established for verifying compliance with voluntary international standards directly or through recognized certification services providers**
- **Issue:**
- **Objective operational assessments that are credible yet not binding and that confers no liability on the Institute**