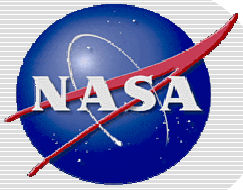
National Aeronautics and Space Administration

Space Debris Assessment for USA-193

Presentation to the 45th Session of the
Scientific and Technical Subcommittee
Committee on the Peaceful Uses of Outer Space
United Nations

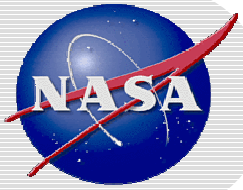
11-22 February 2008

Presentation Outline



- **Potential Space Debris from USA-193**
- **Space Debris Mitigation Guidelines of COPUOS STSC and the IADC**
- **Orbital Longevity of Debris**
- **Risk to Space Operations**

USA-193 Debris Cloud

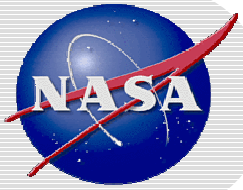


- **To be compliant with the COPUOS STSC and IADC space debris mitigation guidelines and to minimize any effect on the near-Earth space environment, the kinetic engagement of USA-193 would occur shortly before a natural reentry and at an altitude below 250 km.**

- **More than 50% of the debris created will not be orbital and will enter the Earth's atmosphere within 45 minutes of the event.**

- **Of the debris left in temporary orbits about the Earth, more than 99% will fall out of orbit within one week of the event.**

COPUOS STSC Space Debris Mitigation Guidelines



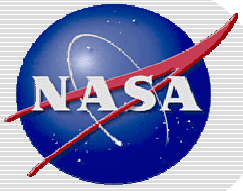
- **Guideline 4 of the COPUOS STSC Space Debris Mitigation Guidelines addresses those rare cases when "intentional destruction and other harmful activities" might be necessary:**

  "Recognizing that an increased risk of collision could pose a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided.

  "When intentional break-ups are necessary, they should be conducted at sufficiently low altitudes to limit the lifetime of resulting fragments."

- **Under the plan to neutralize the USA-193 spacecraft, the event will take place at a very low altitude and will result in space debris with extremely short orbital lifetimes to be <u>fully compliant</u> with Guideline 4 of the COPUOS STSC Space Debris Mitigation Guidelines.**

IADC Space Debris Mitigation Guidelines



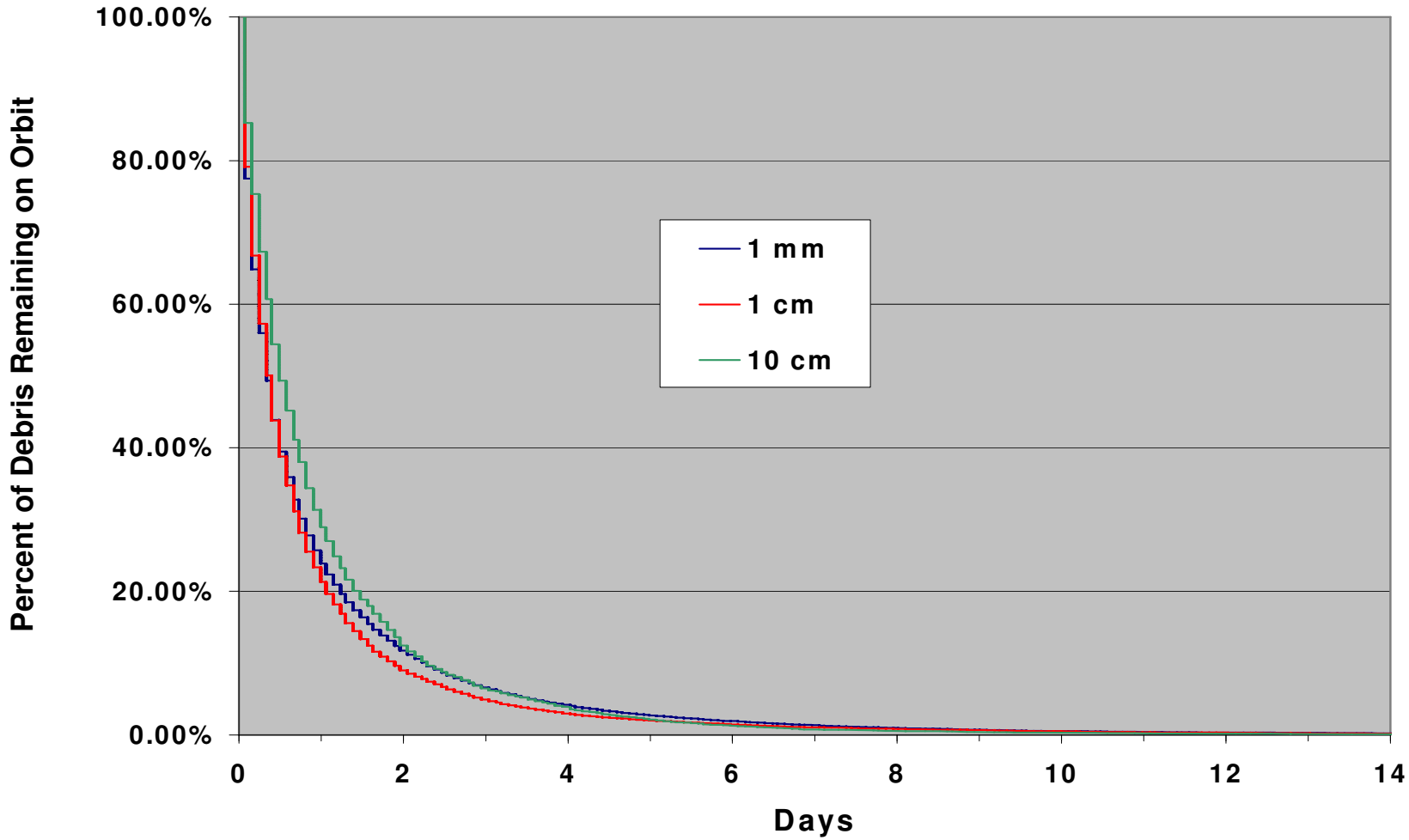
- **Paragraph 5.2.3 of the IADC Space Debris Mitigation Guidelines also addresses those rare cases when "intentional destruction and other harmful activities" might be necessary:**

  "Intentional destruction of a spacecraft or orbital stage, (self destruction, intentional collision, etc.), and other harmful activities that may significantly increase collision risks to other spacecraft and orbital stages should be avoided. For instance, intentional break-ups should be conducted at sufficiently low altitudes so that orbital fragments are short lived."

- **Under the plan to neutralize the USA-193 spacecraft, the event will not significantly increase collision risks to other spacecraft and orbital stages and will result in space debris with extremely short orbital lifetimes to be <u>fully compliant</u> with Paragraph 5.2.3 of the IADC Space Debris Mitigation Guidelines.**

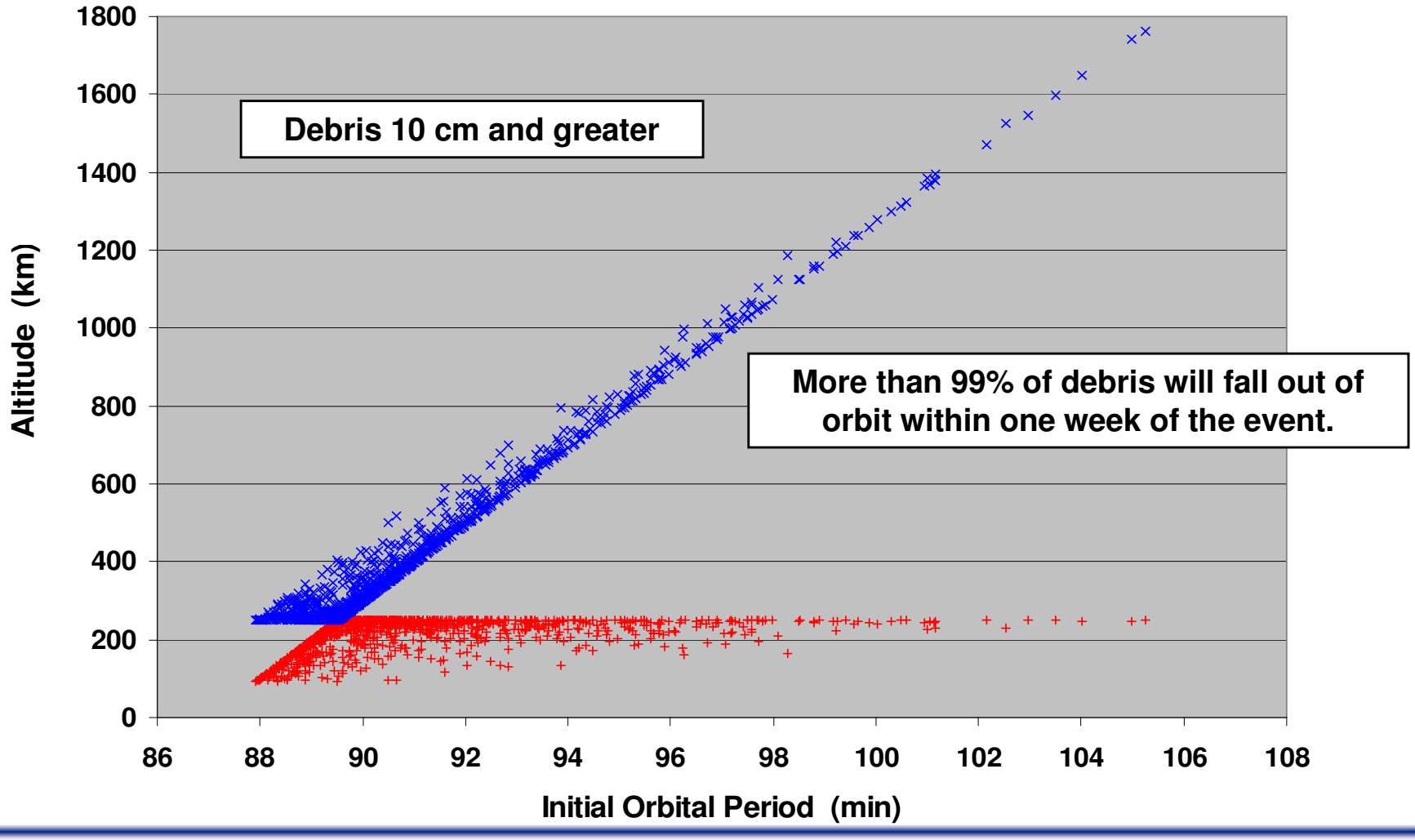
Maximum Longevity of Debris

- **Assuming a worst case scenario of fragmentation at 250 km, 99% of the debris placed in orbit will reenter within one week.**

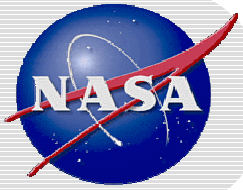


Initial Extent of Debris

- **Again assuming a worst case scenario of a fragmentation at 250 km, the majority of the orbital debris cloud would be confined to low altitudes.**



Risk to Space Operations



- **A principal consideration in planning for the engagement of USA-193 was the safety of on-going and future space operations, especially those associated with human space flight.**

- **The International Space Station operates in the second lowest orbit of all functioning spacecraft in Earth orbit at a mean altitude of approximately 335 km.**

- **The cumulative risk to ISS due to debris from USA-193 would be equivalent to about 2-3 days of exposure to the normal space debris environment. ISS, by far the largest operational spacecraft in Earth orbit, is now in its 10th year of operations and has not experienced any significant damage due to space debris.**

- **Any risks to robotic spacecraft due to debris from USA-193 is assessed to be considerably less than that calculated for ISS.**