



# ITAR Issues Connected with Space Debris Remediation and Refueling Satellites

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# ITAR Overview

- Administered by Dept. of State's Directorate of Defense Trade Controls
- Controls “export” of defense articles, services, and technical data subject to US Munitions List (USML)
- 21 categories on the USML –Category XV is spacecraft systems and associated systems



# Definitions

Defense article=those on the US Munitions List

Technical data=information required for design, development...operation, repair... of defense article

Defense service=furnishing of assistance in the design, development...repair, maintenance, operation or use of defense articles



# Export Defined

- Taking defense article outside US
- *Transferring control* or ownership of satellite to non-US person
- *Disclosing or transferring* technical data to non-US person
- Performing defense service on behalf of, *or for benefit of*, non-US person



# USML Category XV

- Spacecraft, including communications satellites, scientific satellites, research satellites, navigation satellites and experimental and multi-mission satellites
- All specifically designed or modified systems, components, parts, accessories, attachments and associated equipment related to spacecraft
- Technical data and defense services directly related to spacecraft, including design, development, manufacturing or production data



# Country Bans

Countries for which ITAR controlled exports are absolutely prohibited include several countries that have satellites in space including **Belarus, Iran, North Korea, Venezuela, and, most importantly, China**

For other countries with satellites in space, exports are possible but must obtain a license, creating extra expense and potentially onerous conditions at a minimum





# ITAR Reform

Reform: Four Singularities

Single List (with tiers)

Single Licensing Agency

Single Primary Enforcement Agency

Single Information Technology System



# Those By Law Under ITAR: Would Require Congressional Action to Remove from ITAR

- Commercial satellites and “related parts,” including the satellite fuel, ground support equipment, test equipment, payload adapter or interface hardware, replacement parts, and non-embedded solid propellant orbit transfer engines





# ITAR Application to Debris Removal and Satellite Refueling

Three Categories of Technology:

- 1) Vacuum, Nets, Balloons (for redirection and causing object to de-orbit or even potential collection and return to Earth)
- 2) Laser (to deflect and cause object to de-orbit)
- 3) Refuel satellite (to propel to graveyard orbit or create longer life or de-orbit the object quicker and more controlled)



# Likely that Vacuum, Net, and Balloon Technologies Will Raise ITAR Issues

- a) Will transfer control of the US satellite or space debris to the foreign entity employing the technology, even if only temporarily, prior to de-orbiting and will thus likely be considered an export of the satellite or space object.
- b) If US company utilizing the technology on a foreign satellite, it may be considered export of defense service.
- c) If any technical data is shared with foreign entity in order to allow vacuum, net or balloon to catch the US satellite or space article, it will also be an export; and alternatively, if US entity providing the space debris remediation, they may need to share technical data with foreign satellite or space object owner.



# Likely that Lasers Will Raise ITAR Issues

- a) Operation of laser may requiring sharing of technical data on US satellite or space object with foreign entity or require US laser to share technical data with foreign satellite or space object.
- b) Unclear whether enough control gained by foreign entity employing laser to constitute an export of article itself, although laser can presumably direct de-orbit in some fashion.
- c) If foreign satellite or space object owner receives laser debris remediation by US may be considered export of defense service.



# Likely that Satellite Refueling Will Raise ITAR Issues

- a) US technology refueling foreign satellite and foreign technology refueling US satellite will likely require exchange of technical data
- b) If foreign technology docks with US satellite and temporarily controls the US satellite, this may be sufficient to be considered an export
- c) If US technology refuels foreign satellite this will likely be considered export of defense service



# Hypos to Consider

- 1) US debris remediation technology used on China space debris
- 2) China space debris remediation technology used on US space debris



# Countries with the Most Space Debris

- 1) Russia
- 2) United States
- 3) China (who maintains the worst debris to payload ratio)

Note: A recent Russia study suggests the order is 1) China (40%); 2) USA (27%); 3) Russia (25%)





# Conclusion 1

- ITAR is likely a significant obstacle to international space debris remediation efforts and satellite refueling efforts and technology development and use, particularly given that much of space debris is Chinese or US and no ITAR controlled exports are allowed from the US to China. This is unfortunate if most debris will simply burn up in atmosphere if remediation technology is employed on it or is such outdated technology so as to not raise reverse engineering concerns.



# Conclusion 2

- However, to the extent some debris is recent technology (satellite or launch vehicle part) and/or would actually be collected and returned to Earth, then the result may not be unwelcome. Constraints on a global satellite refueling market may be unwelcome if keeps satellites from safer graveyard orbits or from controlled de-orbiting or from longer life and if no significant data is required to be shared for refueling.



# Important Note

These conclusions are preliminary pending a fuller discussion of technologies involved at conference



# Possible Solutions

- 1) Commodity Jurisdiction Request (CJ): Build on Bigelow CJ that concluded that the space tourist passenger experience did not require a license; seek a CJ that would not require a license for space debris removal
- 2) Remove certain articles (non-functional space objects) from the USML and thus subjecting them to less-restrictive Commerce Control List: Problem here is removal of commercial satellites and parts/components would require Congressional action
- 3) Seek a license for the exports created by space debris remediation and satellite refueling activities: Problem here is that could be very expensive and time consuming, and, of course, not possible with respect to China and several other active space nations







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