COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION TO THE
DEPARTMENT OF STATE REGARDING REMOTE SENSING TECHNOLOGY

The Satellite Industry Association (SIA), on behalf of its member companies,\(^1\) hereby files its comments in response to the U.S. Department of State interim final rule revising Category XV (Spacecraft Systems and Related Articles) of the U.S. Munitions List (USML).\(^2\) SIA is a U.S.-based trade association providing worldwide representation of the leading satellite operators, service providers, manufacturers, launch services providers, and ground equipment suppliers. Since its creation almost twenty years ago, SIA has advocated for the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business.

SIA appreciates the opportunity to provide additional comments on the proposed controls for remote sensing satellites and technology. SIA has long supported rigorous, effective, predictable, and transparent U.S. export control policies and practices, and appreciates the Department’s commitment to undertake a thorough review of this important technology area. We continue to see U.S. space leadership and competitiveness as a key national security objective. The reforms to the export control regulations pertaining to satellite technology put in place by the Interim Final Rules published by the U.S. Departments of State and Commerce on May 13 make important and significant progress towards this objective. These reforms will enhance the competitiveness of U.S. companies, bolster their capacity to innovate, and continue to

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\(^1\) SIA Executive Members include: The Boeing Company; The DIRECTV Group; EchoStar Corporation; Harris CapRock Communications; Intelsat S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; LightSquared; Lockheed Martin Corporation.; Northrop Grumman Corporation; SES Americom, Inc.; and SSL. SIA Associate Members include: Artel, LLC; Astrium Services Government, Inc.; ATK Inc.; Cisco; Cobham SATCOM Land Systems; Comtech EF Data Corp.; DigitalGlobe, Inc.; DRS Technologies, Inc.; Encompass Government Solutions; Eutelsat America Corp.; Globecom Systems, Inc.; Glowlit Communications Technology, Inc.; iDirect Government Technologies; Inmarsat, Inc.; Exelis, Inc.; Marshall Communications Corporation.; MTN Government; NewSat America, Inc.; O3b Networks; Orbital Sciences Corporation; Panasonic Avionics Corporation; Raytheon Space and Airborne Systems; Row 44, Inc.; TeleCommunication Systems, Inc.; Telesat Canada; The SI Organization, Inc.; TrustComm, Inc.; Ultisat, Inc.; ViaSat, Inc., and XTAR, LLC.

protect technologies critical to U.S. national security. However, while this progress is laudable, SIA and our member companies see further reform to the controls on remote sensing satellites and technology as important near-term step in support of U.S. national security.

**Technical Discussion**

§ 121.1 General. The United States Munitions List.

**Category XV—Spacecraft Systems and Related Articles**

Paragraph *(a)(7) “Have any of the following electro-optical remote sensing capabilities or characteristics:

(i) Electro-optical visible and near infrared (VNIR) (i.e., 400nm to 1,000nm) or infrared (i.e., greater than 1,000nm to 30,000nm) with less than 40 spectral bands having an aperture greater than 0.351.1 meters;

(ii) Electro-optical hyperspectral with 40 spectral bands or more in the VNIR, short-wavelength infrared (SWIR) (i.e., greater than 1,000nm to 2,500nm) or any combination of the aforementioned and having a Ground Sample Distance (GSD) less than 30 meters;

(iii) Electro-optical hyperspectral with 40 spectral bands or more in the midwavelength infrared (MWIR) (i.e., greater than 2,500nm to 5,500nm) having a narrow spectral bandwidth of Δλ less than or equal to 20nm full width at half maximum (FWHM) or having a wide spectral bandwidth with Δλ greater than 20nm FWHM and a GSD less than 200 meters; or

(iv) Electro-optical hyperspectral with 40 spectral bands or more in the longwavelength infrared (LWIR) (i.e., greater than 5,500nm to 30,000nm) having a narrow spectral bandwidth of Δλ less than or equal to 50nm FWHM or having a wide spectral bandwidth with Δλ greater than 50nm FWHM and a GSD less than 500 meters;

**Note 1 to paragraph (a)(7):** Ground Sample Distance (GSD) is measured from a spacecraft’s nadir (i.e., local vertical) position.

**Note 2 to paragraph (a)(7):** Optical remote sensing spacecraft or satellite spectral bandwidth is the smallest difference in wavelength (i.e., Δλ) that can be distinguished at full width at half maximum (FWHM) of wavelength λ.

**Note 3 to paragraph (a)(7):** An optical satellite or spacecraft is not SME (see § 120.7 of this subchapter) if non-earth pointing.”

Paragraph *(e)(2) “Space-qualified optics” (i.e., lens or mirror), including optical coating, having active properties (e.g., adaptive or deformable), or having a largest lateral clear dimension greater than 0.351.1 meters”

SIA continues to believe that changes to the minimum aperture size of electro-optical satellites subject to ITAR control are necessary. We believe that a higher threshold of 1.1
meters is more appropriate than the specified threshold of 0.35 meters, and that this threshold should apply to both paragraph (a)(7)(i) and paragraph (e)(2).

The proposed aperture size threshold of 0.35 meters is dramatically out of step with the current market for commercial earth observation (EO) satellites. The first U.S. commercial EO satellite system, IKONOS, had a telescope aperture of 0.70 meters, and was developed in the mid-1990s. Today’s U.S. commercial EO satellites have a much greater aperture size of 1.1 meters, a level that is required to satisfy the demand for imagery products that U.S. and other companies have observed in the international commercial marketplace. Moving systems with apertures of 1.1 m or less – the level of technology available in the mid-1990s – to the CCL would be keeping with the central objective of export control reform and enhance the competitiveness of U.S. firms in international markets. Increased competitiveness of the U.S. space industrial base would be enhanced at no cost to U.S. national security, because, as demonstrated by Figure 1, this level of EO technology is already widely available to international customers from multiple non-U.S. manufacturers for civil government or commercial end-uses. Several other similar optical payloads ordered for dual use by military and civil government customers or for meteorological satellites were omitted from the chart, but have very similar parameters.3

<table>
<thead>
<tr>
<th>Country</th>
<th>System</th>
<th>Aperture (m)</th>
<th>Launch</th>
<th>Optics Company/Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>Bilsat-1</td>
<td>0.40</td>
<td>2003</td>
<td>Surrey Satellite Tech. Ltd. (SSTL)</td>
</tr>
<tr>
<td>Japan</td>
<td>Solar-B</td>
<td>0.50</td>
<td>2006</td>
<td>Mitsubishi Electric Corp.</td>
</tr>
<tr>
<td>India</td>
<td>CartoSat-2A</td>
<td>0.70</td>
<td>2007</td>
<td>Indian Space Research Organisation (ISRO)</td>
</tr>
<tr>
<td>Thailand</td>
<td>THEOS</td>
<td>0.60</td>
<td>2008</td>
<td>EADS Astrium SAS (France)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>RazakSAT</td>
<td>0.30</td>
<td>2009</td>
<td>Satrec Initiative (Korea)</td>
</tr>
<tr>
<td>UAE</td>
<td>DubaiSat-1</td>
<td>0.30</td>
<td>2009</td>
<td>Satrec Initiative (Korea)</td>
</tr>
<tr>
<td>Spain</td>
<td>Deimos-1</td>
<td>~0.31</td>
<td>2009</td>
<td>Surrey Satellite Tech. Ltd. (SSTL)</td>
</tr>
<tr>
<td>India</td>
<td>CartoSat-2B</td>
<td>0.70</td>
<td>2010</td>
<td>Indian Space Research Organisation (ISRO)</td>
</tr>
<tr>
<td>Nigeria</td>
<td>NigeriaSat-2</td>
<td>~0.31</td>
<td>2011</td>
<td>Surrey Satellite Tech. Ltd. (SSTL)</td>
</tr>
<tr>
<td>Korea</td>
<td>Kompsat-2</td>
<td>~0.60</td>
<td>2012</td>
<td>Korea, Elbit Systems Electro-Optic (ELOP), OHB (Germany)</td>
</tr>
<tr>
<td>Korea</td>
<td>Kompsat-3</td>
<td>0.72</td>
<td>2012</td>
<td>Thales Alenia Space</td>
</tr>
<tr>
<td>UAE</td>
<td>DubaiSat-2</td>
<td>0.42</td>
<td>2013</td>
<td>Satrec Initiative (Korea)</td>
</tr>
</tbody>
</table>

3 In addition to the size of the aperture, SIA notes that the orbital parameters of the satellite also affect the quality of the resulting imagery products. SIA has developed a data set that describes the orbital parameters of earth observation satellites, which can be made available upon request.
Additionally, as demonstrated by Figure 2, past and present satellite contracts demonstrate a clear increase in market demand for large aperture earth observation satellites. Transferring commercial EO satellites with apertures below 1.1 m to the CCL would allow U.S. firms the ability to better compete in key international competitions and help stem the proliferation of foreign electro-optical satellite systems.

**Figure 2: U.S. and International Electro-optical Satellite Aperture Size Trends**
Selecting an aperture size at the lower range of what is currently available internationally (as proposed by the interim final rule) would come at the expense of U.S. competitiveness and the health of the remote sensing industrial base. This in turn would undermine long-term U.S. national security interests. As foreign remote sensing satellite manufacturing capabilities continue to improve, the U.S. EO technology available through a Commerce license will gradually become obsolete in comparison, which would in turn place negative pressure on U.S. competitiveness in this area. If an aperture size of 1.1 m is selected as the threshold for inclusion on the USML, U.S. competitiveness would be enhanced for the foreseeable future, enabling the United States to remain at the forefront of this technology and invest in future technologies. However, this would obviously entail making U.S. EO satellites with larger aperture sizes more available on the international market. It is, however, important to recognize that a transition of commercial EO systems to the CCL would not result in the decontrol of these exports; U.S. law, regulation, and policy would continue to exercise control over any sensitive aspects of all technology exports, and the most sensitive military technologies would continue to be controlled on the USML. In our view, an aperture size of 1.1 meters would appropriately reflect the changes in the global marketplace. It would also continue to protect vital U.S. national security interests by encouraging exports of U.S. systems and correspondingly decrease incentives for international customers to either seek non-U.S. systems (which are generally not as tightly controlled and monitored) or develop their own technology indigenously.

SIA also notes that the U.S. export control system is not the only U.S. policy tool that is used to control the proliferation of EO technology. U.S. government policy requires a “government to government” Satellite Cooperation Agreement as a prerequisite for the export of an EO system. This policy is an additional layer of control specific to the remote sensing sector and puts limits on satellite end-use (GSD), technical data transfer, and other sensitive areas. Led by the State Department, the process includes a U.S. government determination that any remote sensing export is in the U.S. national interest. This policy would not be affected by the changes to U.S. export controls on satellites and related items currently under discussion. Given the globalization of the marketplace for earth observation data and technology, and especially its adoption and use by non-government actors, this policy too should be re-evaluated. However, it would provide an additional layer of review as the U.S. government becomes more comfortable with the revised export control system. Therefore, SIA believes that a modernization of the export controls for EO technology can be accomplished without the creation of additional national security risks.

Finally, with respect to paragraph (e)(2), SIA recommends the insertion of quotation marks around the term “space-qualified” to provide consistency with other paragraphs, and to reference the definition of this term applicable to paragraph (e). While not a major policy priority for SIA, this clarification would be helpful.
Commercial Demand for Earth Observation Products

While earth observation satellites were originally developed for governmental purposes, today the demand for imagery products is spread across a much more varied group of users. SIA’s 2014 State of the Satellite Industry Report reported that $1.5 billion in revenue was earned by the global remote sensing industry in 2013.\(^4\) We estimate that at least 30% of that revenue was due to sales to non-government customers. Among the commercial customers driving sales of imagery products are the following industries and non-governmental sectors:

- **Mapping, charting, and geodesy:** Companies like Google Earth and TerraServer use high-resolution imagery and other forms of remote sensing data to offer various services, including route planning and business locators. Spectral bands often used for mapping are visible, near-infrared and radar.\(^5\)
- **Agricultural:** Remote sensing data is used by farmers for the economic optimization of crop production and increased efficiency of chemicals used. Spectral bands often used in agriculture are visible and infrared (IR).\(^6\)
- **Natural Resources:** Remote sensing data is used by numerous companies and non-governmental organizations for monitoring plant health, forest fire risk management, water resource management, the mapping of coastlines, and a multitude of conservation efforts. Spectral bands often used for environmental assessment are visible, near-IR and radar.\(^7\)
- **Oil & Gas:** Remote sensing imagery is a crucial part of exploring and determining drill sites for oil and gas companies. High resolution images assist in site modeling, vegetation reclamation, facilities and environmental monitoring. Spectral bands often used in nonrenewable resource exploration are visible, near-IR, and radar.
- **Utilities/Land Use Planning:** The utility industry and land use planners make use of remote sensing imagery alongside demographics and other information to create current maps that monitor capacity and assist in identifying planning goals. Spectral bands often used in land use planning are visible, near-IR and radar.
- **Insurance:** Insurers use remote sensing data to more accurately determine risk to properties and other insured objects from various potential threats (e.g. floods,

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fires). Higher resolution imagery provides more accurate risk modeling, damage assessment, and increased insurance fraud protection.

- **Architecture, engineering & construction**: Remote sensing imagery is used in land development as it can provide developers with a better understanding of a site while requiring fewer site visits. Higher resolution imagery can conserve time and resources.

- **Humanitarian**: Remote sensing imagery is used for humanitarian purposes by a variety of NGOs and governments. Satellite imagery and data is used for crisis prevention, imaging inaccessible and damaged sites, as well as a tool for war crimes investigations and recovery management. Remote sensing has applications throughout the timeline of humanitarian interventions. The spectral band most often used for humanitarian purposes is visible.\(^8\)

- **Media**: The media is a user of remote sensing imagery, particularly the news media. Satellite imagery is often used to monitor and convey information pertaining to a developing situation. The value of satellite images for the media can often increase during crises which prohibit the collection of information, such as military conflict. The spectral band often used by the news media is visible.

- **Private Research**: Numerous think tanks and related non-governmental organizations use visible imagery to conduct independent assessments of key international security and public policy questions, including those related to the proliferation of nuclear fuel cycle technologies and cruise and ballistic missiles. The spectral band often used for private research purposes is visible.\(^9\)

In addition to these industries, several companies have recently announced an interest in developing commercial weather forecasting capabilities using privately-owned satellite networks. As this market and others for which no public announcements have been made emerge, the share of remote sensing revenues attributed to government sales may very well continue to fall.

**Conclusion**

SIA continues to support and welcome the efforts made by the Department of State to reform USML Category XV. SIA continues to believe that further adjustments to the controls on electro-optical remote sensing technologies will better support U.S. national security by controlling sensitive technologies and promoting the international competitiveness of the U.S. space industry.

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SIA thanks the Department for the opportunity to comment on these important changes to USML Category XV, and would welcome the chance to discuss our comments in greater detail should further clarification be required.

Respectfully Submitted,

[Signature]

Patricia Cooper
President
Satellite Industry Association
1200 18th Street N.W., Suite 1001
Washington, D.C. 20036