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Subject: USML Categories IV and XV

Reference: 84 FR 8486 (March 8, 2019); RIN 1400-AE73; Docket No. DOS-2018-0048;

The Satellite Industry Association ("SIA")[1] hereby comments in response to the above-referenced Advanced Notice of Proposed Rulemaking, which seeks comments to assist the Directorate of Defense Trade Controls in reviewing USML Categories IV and XV.[2] SIA is a U.S.-based trade association providing representation of the leading satellite operators, service providers, manufacturers, launch services providers, remote sensing operators, and ground equipment suppliers. SIA is the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business.

To the Bureau of Industry and Security (BIS), thank you for inviting the public's comments on the advance notice of proposed rulemaking (ANPRM) for reviewing USML Categories IV and XV - in particular space technologies. Nine questions were addressed in the ANPRM, which SIA has commented on below.

SIA members build, launch and operate spacecraft for commercial and government sectors, including hundreds of satellites ranging from telecommunications to imagery to ship tracking to weather. These satellites, their ground elements, and data provide essential support to many

[1]SIA Executive Members include: AT&T Services, Inc.; The Boeing Company; EchoStar Corporation; Intelsat S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; Ligado Networks; Lockheed Martin Corporation; OneWeb; SES Americom, Inc.; Space Exploration Technologies Corp.; Spire Global Inc.; and Viasat, Inc. SIA Associate Members include: ABS US Corp.; Airbus Defense and Space, Inc.; Analytical Graphics, Inc.; Artel, LLC; Blue Origin; DataPath Inc.; Eutelsat America Corp.; ExoAnalytic Solutions; Globecomm; Globalstar, Inc.; Glowlink Communications Technology, Inc.; HawkEye 360; Hughes; Inmarsat, Inc.; Kymeta Corporation; Leonardo DRS; Panasonic Avionics Corporation; Peraton; Planet; SSL; Telesat Canada; Ultisat, Inc.; and XTAR, LLC.

[2]*See Review of United States Munitions List Categories IV and XV*, Advanced Notice of Proposed Rulemaking, Docket No. DOS-2018-0048 (rel., Mar. 08, 2019) ("Advanced Notice of Proposed Rulemaking").

sectors including in the US military, public safety, aviation, media, retail, shipping, agriculture, weather, natural resource, and banking. Our industry has had a significant experience with export control regulations and their impacts on industries which are growing and changing. The breadth of experience which informs out comments herein.

1. **Are there emerging or new technologies that warrant control in one of the referenced categories, but which are not currently described or not described with sufficient clarity?**
    a. **Encryption Carveout** - Like BIS, DDTC issued a proposed rule in June 2015 that would exclude certain end-to-end encrypted technical data/technology from the definition of export.[3] While BIS finalized the exclusion in June 2016, DDTC did not do so, and stated DDTC would "address controls on encrypted technical data in a separate rulemaking."[4]
        i. Now after almost four years since its proposed rule, DDTC has not finalized it. Other US government sources have indicated that the substance has been finished but the rule has been caught up in connection with other rules, and that the US government has indicated that "DDTC would like to hear from industry on the importance of [issuing] the carve-out as a separate rule."[5]
        ii. SIA encourages DDTC to finalize this carve out, whether as a standalone rule or not. Practically, the inconsistent regimes have raised challenges for members of the satellite industry, who often must work with both ITAR and EAR items. For example, some satellite operators – who may have very little ITAR data – still cannot feasibly store controlled information on Cloud services due to the risk of ITAR data being transmitted internationally. This goes against the very purpose of the definitional changes that were meant to harmonize definitions and limit the burden on industry.
2. **Are there specific defense articles described in the referenced categories that have entered into normal commercial use since the most recent revision of that category? If so, please include documentation to support this claim.**
    a. **Standard Separation/Integration Technologies** SIA recommends that USML Category IV(h)(11) be revised to include "specially designed" in its description to account for standard launch integration technologies that are usable with a wide variety of payloads and launch vehicles. In particular, SIA recommends that the Department should define two new terms and add guidance for a third to revise USML Category IV(h)(11) to classify them under CCL 9A515.x:

[3] See 80 FR 31505 & 31525 (June 3, 2015).
[4] See 81 FR 35611 (June 3, 2016) (interim final rule).

[5] See, e.g. https://www.bis.doc.gov/documents/bis-annual-conference-2018/2208-cloudy-with-a-chance-of-technology-transfer-breakout-edits-11may/file.

i. Standard Spacecraft/LV Adapter – "Separation mechanisms that are usable with a variety of Spacecraft and SLVs"
    1. Example: Motorized Light Band[6]
ii. Deployer – "Commodities used to contain a spacecraft for integration to launch vehicle without requiring direct integration between the Spacecraft and SLV"
    1. Example: Isispace Quadpack[7]
iii. Interstage Adapter – Satellite-to-satellite interstage adapters facilitate the stacking of satellites in a single launch vehicle but do not interface directly with the launch vehicle. These adapters, or "interstages," and their respective interfaces between the stacked satellites should be controlled under ECCN 9A515.x. They are not part of the launch vehicle and are designed around the interfaces of the satellites. These items are not peculiarly responsible for any ITAR-controlled capabilities.
iv. While physical launch integration and payload-specific integration of? articles are understood to be a defense service, the introduction of USML controlled technical data in the form of a standard interface's documentation poses a significant challenge for otherwise fully EAR controlled satellite projects.

b. **Electric Propulsion -** SIA recommends electric propulsion systems and thrusters (including gridded ion, Hall effect, resistojet, and ArcJet thrusters) be move from current USML XV(e)(11)(iv) ("Plasma based propulsion systems") to CCL ECCN 9A515.x or to the reserved ECCN of 9A515.h.
    i. Electric propulsion systems and thrusters such as gridded ion thrusters (such as L3's XIPS), ArcJet thrusters, resistojet, and Hall-effect thrusters (such as the Fakel SPT-100 and Snecma PPS1350 models) have been included on a large number of commercial spacecraft in the past 10 to 15 years and are now a standard option offered by most U.S and international satellite manufacturers.
    ii. Electric propulsion systems are known for their high specific impulse but are equally notable for their low thrust.
        1. For example, using xenon as the propellant, operating voltage in the range of 300-1200 V enables specific impulse in the range of 1500-3600 seconds.
    iii. However, electric propulsion thrust is highly constrained by thruster power, which is ultimately constrained by available satellite power (i.e. the total amount of power generated by the solar panels of the spacecraft that is not required to operate the primary payload and/or other major sub-systems).

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[6] "2000785G MkII MLB User Manual", Planetary Systems Corporation, 22 April 2019, https://www.planetarysystemscorp.com/wp-content/uploads/2018/07/2000785G-MkII-MLB-User-Manual.pdf

[7] "QuadPack Cubesat Deployer", Innovative Solutions in Space, 22 April 2019 https://www.isispace.nl/product/quadpack-cubesat-deployer/

1. For example, the 1.35-kW SPT-100 at 300 V only produces 0.083 N of thrust,[8] the 4.5-kW XIPS produces a peak thrust of 0.18 N,[9] and the 4.50-kW SPT-140 at 300 V produces 0.25 N of thrust.[10] In comparison, a Moog-ISP 5-lbf thruster using NTO/MMH produces 22 N (or 88X the thrust of an SPT-140).[11]

iv. Generating thrust levels that would be useful for purely military, rather than dual-use, applications requires significant increases in satellite power, well beyond the current state of the art.

1. A significant benefit of electric propulsion units is their small size, often less than 1U, such as Enpulsion's line of nanothrusters.[12] Given the ongoing discussions around effective management of on-orbit debris, in addition to limited military utility, the USG should encourage adoption of electric propulsion technologies by reducing barriers to use.

v.

c. **Star Trackers -** SIA recommends removing star trackers currently controlled under USML Category XV(e)(16) due to their entry into common commercial use.

i. The technical parameters for star trackers controlled by USML XV(e)(16) – angular accuracy less than or equal to 1 arcsec per star coordinate and a tracking rate equal to or greater than 3.0 deg/sec – are likely to become obsolete in the next few years as commercial development of Low Earth Orbit expands dramatically and higher-accuracy pointing becomes a more standard commercial requirement and feature;

ii. Prior to export control reforms implemented in 2014, CCL ECCN 7A004 controlled primarily star trackers used in missiles and rockets. Afterwards, though the same category now controlled satellite star trackers, it remained subject to MT controls (and NS and AT), with the result that the satellite start trackers remained ineligible for License Exception STA while entire satellites themselves became STA eligible (9A515.a.5);

iii. SIA therefore recommends that star trackers be removed from the USML and transferred to the CCL under 7A004 or 9A515 because these items are designed for space application and not for weapons of mass destruction.

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[8] Delgado, J.J., Baldwin, J.A., and Corey, R.L., "Space Systems Loral Electric Propulsion Subsystem: 10 Years of On-Orbit Operation", 2015, SSL, 22 April 2019 http://erps.spacegrant.org/uploads/images/2015Presentations/IEPC-2015-04_ISTS-2015-b-04.pdf

[9]Tighe, W., Chien, K.R., and Spears, R., "XIPS Ion Thrusters for Small Satellite Applications", L-3 Communications Electron Technologies, Inc., 22 April 2019 https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1459&context=smallsat

[10]Pollard and Beiting, "Ion Energy, Ion Velocity, and Thrust Vector Measurements for the SPT-140 Hall Thruster", 2000, 3rd Spacecraft Propulsion Conference,22 April 2019, http://adsabs.harvard.edu/full/2000ESASP.465..789P

[11]"Monopropellant Thrusters", MOOG, 22 April 2019 https://www.moog.com/content/dam/moog/literature/Space_Defense/Spacecraft/Monopropellant_Thrusters_Rev_0613.pdf

[12] Enpulsion, 22 April 2019, https://www.enpulsion.com/

iv. SIA further recommends the creation of a new ECCN subcategory 7A004.c or 9A515.i to control all star trackers specially designed for satellites controlled under 9A004 or 9A515 that is eligible for license exception STA.

d. **Telemetry for Launch Vehicles** – SIA requests a note identical in nature to Note 3 to USML Category XV(f) and Note 2 to EAR Category 9E be added to USML Category IV and EAR Category 9E.

e. **Rocket Engines** – Remove references to rocket engines and motors in USML Category XV(e)(12)
   i. USML Category IV(d) covers rocket, SLV, and missile motors and engines and includes a note to clarify that "this paragraph does not control thrusters for spacecraft."
   ii. Rocket engines and motors are sufficiently controlled under USML Category IV(d), and including references to them in USML Category XV(e)(12) creates unnecessary ambiguity.

f. **Aperture Size –** Revise USML Category XV(a)(7)(i) technical parameters to be 1.0m clear aperture size to reflect improvements of commercially available satellite imagery.
   i. Over the past 5 years, there has been a drastic increase in commercially available satellite imagery as satellite technology has evolved.
      1. DigitalGlobe WorldView-3 – Aperture Size 1.1m[13]
      2. Airbus Pleiades – Aperture Size 65cm[14]
      3. Airbus Pleiades NEO (Launch planned in 2020) – Resolution will surpass Pleiades with a likely larger aperture[15]
      4. JAXA ALOS-3 (Launch planned in 2020) – Aperture size 90x60cm[16]
      1. TripleSat constellation (Launched 2015) – Aperture size 42cm[17]
   ii. Though the above satellites were developed with governments' involvement, the imagery has become wide commercially available and competes with the US commercial remote sensing industry
   iii. CCL ECCN 9A515.a.1 should subsequently be revised to read "Have electro-optical remote sensing capabilities and having a clear aperture greater than 0.65 meters, but less than or equal to 1.0 meters" to reflect this change.

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[13] "WorldView-3", eoPortal, 22 April 2019, https://directory.eoportal.org/web/eoportal/satellite-missions/v-w-x-y-z/worldview-3

[14] "Pleiades", eoPortal, 22 April 2019, https://earth.esa.int/web/eoportal/satellite-missions/p/pleiades

[15] "Pleiades Neo", Airbus Defense and Space Intelligence, 22 April 2019, https://www.intelligence-airbusds.com/files/pmedia/public/r51130_9_leaflet-pleiadesneov2.pdf

[16] ALOS-3, eoPortal, 22 April 2019, https://directory.eoportal.org/web/eoportal/satellite-missions/a/alos-3

[17] "TripleSat Satellite Sensor", Satellite Imaging Corporation, 22 April 2019, https://www.satimagingcorp.com/satellite-sensors/triplesat-satellite/

3. **Are there defense articles described in the referenced categories for which commercial use is proposed, intended, or anticipated in the next five years? If so, please provide any documentation.**
    a. No recommendations provided
4. **Are there other technical issues for these categories which the Department should address?**
    a. **Antenna Systems –** SIA requests the Department review control language for antenna systems controlled under USML Category XV(e)(1) to include technical parameters commensurate with military use-cases.
    b. **Space Vehicles –** SIA requests a definition of a "Space Vehicle" to define the difference between a "Space Launch Vehicle," a "Spacecraft," and a "Space Vehicle."
    c. **Thermal Batteries** – SIA requests removing thermal batteries from USML Category XIII(h)(3)
        i. Thermal batteries are sufficiently controlled under the CCL, and the new CCL category 9A604.a was created for them when USML Category IV was revised in 2014.[18]
5. **The export control system uses the size of space-based optical telescopes as the technical parameter differentiating between items controlled by the Department of Commerce in Commerce Control List (CCL) Export Control Classification Number (ECCN) 9A515.a.1 and by the Department of State in USML Category XV(a)(7) and XV(e)(2). This is based on physics, and specifically the fact that larger optical telescopes generally can generate higher-resolution images than smaller ones. NASA tends to use larger optical telescopes for astrophysics missions because the celestial bodies these missions observe are many light years away, and smaller optical capabilities cannot physically meet the relevant science requirements. At the same time, because NASA missions are designed and calibrated to observe distant celestial objects, they are physically incapable of observing the Earth, which is so bright relative to distant objects that NASA's telescopes would suffer permanent physical damage if pointed at Earth. Essentially, NASA astrophysics missions form a class of spacecraft which meet the technical definition for national security-sensitive spacecraft regulated by the Department of State, but are incapable of observing the Earth.**

    **In the past, this issue has been addressed by creating separate regulatory categories for specific missions. For example, the James Webb Space Telescope, NASA's next flagship astrophysics mission, was the subject of specific regulatory activity (see, 82 FR 2875 and 2889, Jan. 10, 2017) to ensure that it is controlled by the Department of Commerce under ECCN 9A004 even though it otherwise meets the control text of USML Category XV. However, since it would be impractical to issue an updated regulation every time NASA initiates a new astrophysics mission, the Department is seeking comments from the public on a way to provide technical differentiation within U.S. export control regulations between the space-based optical telescopes for astrophysics missions and those used for Earth observation.**
    a. **Civil Program Controls -** In order to address the challenges associated with early program classifications under the USML which are later reclassified under the

[18] https://www.govinfo.gov/app/details/FR-2014-01-02/2013-31323/context

CCL, SIA recommends the creation of an additional entry under ECCN 9A004 for civil programs designated by an interagency review as well as a new classification under USML Category XV for NASA programs missing this designation. DDTC and BIS can publicly provide a list of all programs classified this way on their website, and later update the CCL when reasonable without creating ambiguity in control status.

6. **The control in USML Category XV(a)(7) and XV(e)(2) is based, in part, on the size of the clear aperture of the telescope's optics. However, not all space-based telescopes use a disc-shaped viewer and thus it is not always possible to definitively determine the size of the "clear aperture" of a specific space-based electro-optical/infrared (E.O./IR) remote sensing system for the purpose of the regulations. Are there suggested revisions that would clarify the scope of Categories XV(a)(7) and XV(e)(2), such as a definition of "clear aperture"?**
    a. Given that the most commonly used aperture will likely continue to be disc shaped, SIA recommends clarifying that the current scope of Categories XV(a)(7) and XV(e)(2)(ii) refer to disc-shaped viewers, and that "clear aperture" only pertains to disc-shaped viewers.
    b. SIA further recommends the creation of a new Category or Subcategory for space-qualified, non-disc shaped viewers where the technical parameter refers to projected GSD. This clarification will not only clarify the definition of "clear aperture" but also remove ambiguity surrounding the definition of "active properties."
7. **Many spacecraft are designed to provide supplies to the International Space Station and other future space stations. This activity is commonly referred to as "servicing" the space stations, which is an activity that can lead to USML control under Category XV(a)(12). Are there suggested revisions that would clarify the scope of this paragraph, such as a definition of "servicing"?**
    a. SIA recommends the USML define "servicing" as "to repair, provide maintenance, to augment, or enhance capabilities" in order to differentiate articles and commodities that are designed to add value to the spacecraft (repair, maintenance, augmentation, etc.) from those with other purposes such as extending life, refueling or docking for resupply to the ISS which should be controlled under CCL ECCN 9A515.a.4.
        i. Additionally, SIA recommends expanding the scope of CCL ECCN 9A515.a.4 to include spacecraft specially designed for life extension or refueling of a spacecraft that do not otherwise provide additional capabilities that would be captured under USML's definition of "servicing."
        ii. Note to USML Category XV(a)(12) states that "spacecraft that dock exclusively via the NASA Docking System (NDS)" are not controlled under the USML and are classified as 9A515.a.4. SIA suggests that in order to avoid misclassifying future space station resupply docking mechanisms under the USML, the Department considers designating all spacecraft that dock with any space station such as the Lunar Gateway under 9A515.a.4.

iii. Lastly, SIA suggests the Department consider removing the worldwide licensing requirement for spacecraft controlled under 9A515.a.4 that are designed for resupply of the ISS or another US space station such as the Lunar Gateway be controlled similarly to category 9A515.a.5.

8. **NASA continues to pursue development of the future Lunar Gateway, which may be described in Category XV(a). Are there any public comments regarding the potential control status of the future Lunar Gateway?**
    a. SIA recommends that the control status of the future Lunar Gateway mirror the controls on the JWST and ISS, under CCL ECCN 9A004.
    b. SIA further recommends that in furtherance of its recommendation above to question 5, that there be a unique ECCN for civil programs, such as the Lunar Gateway rather than individual ECCNs for each program designated in this way.
9. **What are the cost savings to private entities from shifting control of a suggested specific item from USML to the CCL? To the extent possible, please quantify the current cost of compliance with USML control of an item and any cost savings if a particular change was implemented. Cost savings could include time saved in terms of regulatory uncertainty over whether a certain item is regulated as on the USML or the CCL. This reduced uncertainty, under the "bright line" approach described in the Administration's Export Reform Initiative, would allow both State and industry to avoid spending hours and resources on case by case determinations for certain items. As much as possible, please quantify time saved, reduction in compliance costs, and reduction in paperwork for a particular change.**
    a. SIA recommends State revise USML XV(f) and 22 CFR 124.15 to align the ITAR with standardization and growth in the small satellite industry by revising the controls such that launch integration campaigns for a non-USML satellite where US-persons are not involved in launch vehicle integration activities, and the satellite is integrated to the launch vehicle using a standard deployer or separation mechanism are not subject to DTSA monitoring conditions given DTSA's review and approval of shipping and security controls.
        i. The introduction of standard form factors (e.g. CubeSats) and associated deployers have in many cases completely shielded the spacecraft from launch integration activities. In most such instances, there is no technical exchange of any kind between the satellite owner/manufacturer and the launch provider, and the launch provider has no physical, nor electrical, access to the satellite itself at any time during the integration process and throughout the launch activity. In addition, no US persons are present during deployer integration to the launch vehicle.
        ii. Current and future small launch vehicles offer increasing flexibility in launch scheduling and herald an increasing volume of launches, especially for standard form-factor satellites (e.g. CubeSats).
        iii. Providing a notification-based process or revising the scope of the DTSA monitoring requirement to focus on foreign launches of USML controlled spacecraft or an otherwise USML controlled defense services such as integration activities or integration related technical data rather than foreign launches of fully containerized EAR-controlled satellites where no

US persons are present for integration will enable the current and increasing volume of the commercial satellite industry, while serving as a resource and cost-saving measure for both DTSA/DDTC and commercial companies and enabling the former to focus on higher priority and higher security-risk activities.

iv. DTSA monitoring requirements can add months in campaign timelines that would otherwise be weeks, and tens of thousands of dollars in costs to the satellite operator.

Respectfully submitted,

*/s/ Tom Stroup*

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