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Subject: Comment on Advanced Notice of Proposed Rulemaking Regarding Review of Commerce Control List for Items Transferred From United States Munitions List Categories IV and XV

Reference: 84 FR 8485 (March 8, 2019); RIN 0694-AH66; Docket No. 181010936-8936-01;

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 Bureau of Industry and Standards in reviewing controls of items transferred from 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 controls of items transferred from USML Categories IV and XV, and in particular space technologies. Eight questions were addressed in the ANPRM, which SIA has commented on below.

[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 Commerce Control List for Items Transferred From United States Munitions List Categories IV and XV*, Advanced Notice of Proposed Rulemaking, Docket No. 181010936-8936-01 (rel., Mar. 08, 2019) ("Advanced Notice of Proposed Rulemaking").

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 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. **For technologies controlled under ECCN 9A515 – examples include habitats, planetary rovers, and planetary systems such as communications and power – what factors or specific technologies should be considered for movement to a different ECCN or paragraph under ECCN 9A515 with less stringent licensing restrictions?**
    a. No examples provided
2. **The USG is considering further refinement or updated controls on the various technologies listed [in the Federal Register Notice]. Are there additional specific space-related technologies not described in the list which warrant further review by State or Commerce given their current or anticipated near term commercial applications?**
    a. No examples provided
3. **NASA continues to pursue development of the future Lunar Gateway, which may be described in USML Category XV(a). If moved to the CCL, what would be the appropriate controls to apply to items associated with the Lunar Gateway, e.g., ECCNs 9A515 or 9A004?**
    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 of the associated USML review[3], that there be a unique ECCN for civil programs, such as the Lunar Gateway rather than individual ECCNs for each program designated this way.
4. **Are there technologies controlled in the USML for either Category IV and XV, which are not currently described with sufficient clarity which the commenter believes should be controlled under the EAR?**
    a. **Servicing and Refueling Satellites -** SIA recommends the USML define "servicing" as "to repair, provide maintenance, to augment, or enhance capabilities" in order

[3] a. Referenced text: **Civil Program Controls** - In order to address the challenges associated with early program classifications under the USML which are later reclassified under the 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.

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.

5. **Are there specific defense articles which have entered into normal commercial use since the most recent revisions? If so, please provide sufficient detail in describing and identifying the article to support your claim. Commenters may include documentation to support this claim, e.g., product information demonstrating what is currently in the market (web pages describing products and product brochures), or scientific and industry articles, in particular those also describing trends in commercial products, that resulted from new technologies or manufacturing methods.**

a. **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).

1. For example, the 1.35-kW SPT-100 at 300 V only produces 0.083 N of thrust,[4] the 4.5-kW XIPS produces a peak thrust of 0.18 N,[5] and the 4.50-kW SPT-140 at 300 V produces 0.25 N of thrust.[6] In comparison, a Moog-ISP 5-lbf thruster using NTO/MMH produces 22 N (or 88X the thrust of an SPT-140). [7]

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.[8] 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.

b. **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);

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[4] 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

[5]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

[6]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

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

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

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.

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.

1. If controlled under ECCN 7A004.c, SIA recommends revising associated ECCNs 7B001, 7E001, etc

c. **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 aperture size as satellite technology has evolved.

1. DigitalGlobe WorldView-3 – Aperture Size 1.1m[9]
2. Airbus Pleiades – Aperture Size 65cm[10]
3. Airbus Pleiades NEO (Launch planned in 2020) – Resolution will surpass Pleiades with a likely larger aperture[11]
4. JAXA ALOS-3 (Launch planned in 2020) – Aperture size 90x60cm[12]

ii. TripleSat constellation (Launched 2015) – Aperture size 42cm[13] 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.

d. **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 revise USML Category IV(h)(11) to classify them under CCL 9A515.x:

i. Standard Spacecraft/LV Adapter – "Separation mechanisms that are usable with a variety of Spacecraft and SLVs"

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

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

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

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

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

1. Example: Motorized Light Band[14]

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[15]

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 articles and technical data are understood to be a defense services, 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.

6. **Are there defense articles for which commercial use is proposed, intended, or anticipated in the next five years? If so, provide sufficient detail in describing the article to support your claim. Commenters may include documentation to support this claim, e.g., product development or marketing information describing what products will soon to be in the market (web pages describing products under development, press releases related to products under development) or scientific and industry articles, in particular those describing new products that may soon enter the market place as a result of new technologies or manufacturing methods.**
    a. No examples provided
7. **Are there other technical issues for these items which BIS should address, e.g., the addition of technical notes or defined terms used in the control parameters to make the control easier to understand and apply consistently?**
    a. **Anomaly Responses**
        i. 9E515 includes repair (including on-orbit anomaly resolution and analysis beyond established procedures).[16]
        ii. This has led to confusion regarding the status of operations in response to an anomaly or repeated anomalies, including operations that a satellite operator might internally develop.

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[14] "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

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

[16] See 79 FR 27417 ("the control of repair technology includes on-orbit anomaly resolution and analysis, beyond established procedures. However, standard post-launch operations (*e.g.,* orbit-raising), orbit maintenance and other movement of the spacecraft on-orbit do not fall within the controlled technology.").

iii. There is no reason to treat such operations differently: commanding is commanding, even in response to an anomaly. Once a satellite is launched there is very little that can be changed, so operations in response to an anomaly have the same limited options of commands as during standard operations (turn units on/off, point in a different direction, adjust power, etc.). Changing the order and timing of commands in order to respond to an anomaly does not warrant control, since the options for commanding do not change.

iv. BIS should limit such repair technology to things like "investigations into" anomalies, and exclude specific operations in response to them.

b. **Baseband Units (BBUs) –** Add a note to 9A515.b and 9A515.x, clarifying that BBUs that do not perform TT&C are not controlled under ECCN 9A515.

i. BBUs that do not fully perform TT&C are in some cases being viewed as 9A515.b or 9A515.x TT&C ground system equipment or components when they perform merely physical layer type operations with no knowledge of spacecraft content:

ii. For example they are not generating and/or building the content of the spacecraft bus control or monitoring functions, unlike for example, the software system and databases at the control system, nor decommutating the telemetry 1s and 0s and assembling them into engineering data.

iii. Currently, a wide array of non-sensitive devices can demodulate a telemetry carrier and modulate a command one. There are digital spectrum analyzers to demodulate and synthesizers to handle just about any signal type; these are subject to anti-terrorism-controls only.[17]

iv. Accordingly, BBUs with similar limited functionality should not be controlled by 9A515.b or 9A515.x

c. **9A004.b-.f Controls –** Add a clarification or short guide via a website FAQ clarifying these are classified under 9A515.

i. It is easy to misclassify 9A515 items as 9A004.b through .f , even with the License Requirement Note in 9A004 pointing to 9A515. Specifically, ECCN 9A004.e. refers to "On-board systems or equipment, specially designed for 'spacecraft'…." which leads some to classify "specially designed" spacecraft equipment under 9A004.e instead of applying the 9A515 classification. A clarification via a website FAQ would be helpful for the satellite community.

d. **9A004.a Space Launch Vehicles Note** – Add a note that indicate that this category covers SLVs not described in Category IV of the USML.

[17] For example, the following 3A991 or 3D991 Keysight products can perform the same functions as the BBU: Keysight MXG RF Generators FM/PM Modulators; Keysight MSA Signal Analyzers (FM/PM demodulators, signal processing); and Keysight 89601A Vector Signal Analysis software used with the above.

e. **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."
f. **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.
g. **9A515.y –** Please provide a note to clarify the scope of ECCN 9A515.y
    i. Currently, 9A515.y components are added as a result of an interagency review (CCATS), though only the requesting company has access to the CCATS documentation. For example, 9A515.y.1 – Discrete electronic components not specified in 9A515.e could apply to any transistor, diode, inductor, etc. As the leading paragraph does not include "specially designed," 9A515.y would ostensibly capture any and all discrete electronic devices. As a result, SIA requests amplification of the technical parameters in the entries under 9A515.y or access to CCATS documentation.
    ii. SIA further requests clarification on the scope of ECCN 9A515.y. In particular, it asks the Department to address whether the exact items classified as 9A515.y as a result of a CCATS are controlled under the ECCN or if the entry applies to those types of items described in the entry under 9A515.y.

8. What are the cost savings to private entities by shifting control of additional specific commercial items from the USML to the CCL?

b. 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,

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