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**The Amateur-Satellite Service and Export Regulations**

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**Prelude –** In the U.S., the Federal Communications Commission (FCC) governs the **(Radio) Amateur Service** and **Amateur-Satellite Service** in consonance with International Telecommunication Union (ITU) rules. Specifically, ITU Radio Regulations, Article 1.56 defines the Amateur Service as**: *“A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest****.****”***Likewise, Article 1.57 defines the Amateur-Satellite Service as: ***“A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service.”***

The U.S. Amateur-Satellite Service is proactively supported by the Radio Amateur Satellite Corporation (AMSAT), a non-profit, volunteer organization. For over 45 years AMSAT has played a major role in advancing the state-of-the-art in space science, space education, and space technology, specifically designing, building, securing launches, and operating on-orbit satellites under the rules of the amateur-satellite service.

**Purpose -** The Export Control System is used to balance U.S. interests in national security, the economy, and several other critical policy areas. In the U.S., as in other countries, export regulations govern what is permissible in foreign trade. Specifically, the United States controls the export of sensitive defense and dual-use items (having both commercial and military applications) to foreign governments and commercial entities. Such items can range from sophisticated technology designed for military use, such as fighter aircraft and satellite technology, to unsophisticated and commonly available electronic switches that have been used in improvised explosive devices by terrorists in Iraq and Afghanistan. Through such controls, the U.S. government limits the risk of sensitive items falling into the wrong hands, while facilitating legitimate trade.

U.S. exports are controlled primarily under two systems with different purposes and different regulatory structures.

1. The Arms Export Control Act (AECA)[[1]](#endnote-1) is the cornerstone of the U.S. munitions export control law. The Department of State implements this responsibility through the **International Traffic in Arms Regulations (ITAR)**[[2]](#endnote-2). The ITAR cover the import and export of defense-related items/articles, defense services, and information (related technical data) targeted at defense- or national security-related applications.
2. The Export Administration Act (EAA)[[3]](#endnote-3) authorizes the Department of Commerce to regulate the export or re-export of U.S. origin, dual-use goods, software, and technology. The Department of Commerce implements this authority through the **Export Administration Regulations (EAR)**[[4]](#endnote-4) which regulate the export of “dual-use” items. These items include goods and related technology, including technical data and technical assistance, which are designed for commercial purposes, but which could have military applications, such as computers, aircraft, and pathogens. The EAR also provide specific identification of particular foreign entities the U.S. Government designates as end-users of concern.

**Process –** Items requiring export attention are generally identified through Export Control Lists. Such lists form the basis of determining whether any products, software or technology intended for export are ‘controlled’ and therefore require an export license. Multiple federal agencies administer the laws, regulations, and processes that make up the regulatory compliance and enforcement framework governing the Export Control System. In considering whether or not a shipment to another country will require an export license, there is a need to consider both WHAT is being shipped and WHERE it is going. Export Control Lists deal with WHAT is being shipped. There are also [lists of export controlled or embargoed countries](http://research.ncsu.edu/sparcs/compliance/export-controls/exports-tree/exports-tree-embargo/) for guidance about WHERE certain shipments may be sent.

The U.S. Government (USG) currently maintains two primary Export Control Lists: (1) the **Commerce** **Control List (CCL)**[[5]](#endnote-5), and (2) the **U.S. Munitions List (USML)**[[6]](#endnote-6), administered by two different departments. These lists have fundamentally different structures, levels of specificity, and definitions. For instance, because the Department of Defense transitioned to more Commercial-Off-The-Shelf (COTS) procurement starting in the early 1990s, a growing overlap between the two control lists has fueled confusion and inefficiency throughout the U.S. Export Control System which affect uncertain exporters, the USG, and the U.S. industrial base.

* Generally, the U.S. State Department regulates the export of goods, services, and technical data specifically designed or modified for military or satellite applications.  Those items are controlled under the ITAR and the USML.
* The U.S. Department of Commerce controls the export of virtually all other goods with primarily commercial uses but with potential security or defense applications.  Those items are controlled by the EAR and the CCL. For goods and technology listed on the CCL, a license may be required for export, depending on the destination country, receiving party, and end use, unless an exclusion or exemption applies.

The EAR include a “catch-all” category, “EAR99”, which applies to any goods or technologies that are “subject to the EAR,” but are not on the CCL, where ‘**subject to the EAR’** is defined[[7]](#endnote-7) as:

**subject to the EAR** ≡ a term used to describe those items and activities over which the Department of Commerce’s Bureau of Industry and Security (BIS) exercises regulatory jurisdiction under the EAR.

**NOTE**: Just because an item is declared “subject to the EAR,” should not be confused with licensing or other requirements imposed in other parts of the EAR, i.e., if an item or activity is subject to the EAR, this does not mean an export license or other requirements automatically apply. Indeed, an export license or other requirements apply only in those cases where other parts of the EAR impose such direction. Items and activities that are *not subject* to the EAR are outside the regulatory jurisdiction of the EAR and are not affected by those regulations.

Of greatest interest and effect on the Amateur-Satellite Service is one particularly sensitive export area specifically called out under both ITAR and EAR involving satellites and their associated technologies. Specifically, ITAR Category XV - Spacecraft and Related Articles, defines[[8]](#endnote-8) *spacecraft, including satellites and space vehicles, whether designated development, experimental, research, or scientific, or having a commercial, civil, or military end-use*. This category specifies 13 satellite capability functions involving advanced technologies directly beneficial to military applications. Of particular interest, however, is Note 1 appended to Category XV which states, “*Spacecraft not identified in this paragraph are subject to the EAR [see* Export Control Classification Number (ECCN)[[9]](#endnote-9) *9x515].”* Consequently, EAR ECCN 9x515e addresses satellites and spacecraft, ground station equipment, parts/components, and associated technologies.

These two Export Control List sections form the basis for export control of amateur radio satellites, ground stations, etc. developed under the auspices of the Amateur Satellite-Service. Indeed, the designation of such ‘controllable’ items brought the matter of export control of Amateur-Satellite Service items/technology to the fore.

**Predicament –** One difficulty the amateur radio community faces with respect to advancing the Amateur-Satellite Service arises from the U.S. definition of “Exports” under the Export Control Laws. Generally, an ‘export’ is considered as the conveyance of some type of material commodity from one country or region to another for the purpose of trade. However, the U.S. Amateur-Satellite Service does **NOT** ‘export’ satellites to anyone! Therefore, under this commonly held definition, there IS no Amateur-Satellite Service export issue.....**WRONG!** The problem is that the Export Administration Regulations (EAR) have adopted a more encompassing definition[[10]](#endnote-10):

**export** ≡ an actual shipment or transmission of items **subject to the EAR** out of the United States, or **release of technology,** or software subject to the EAR to a foreign national in the United States,….

The term ‘**technology’** is defined[[11]](#endnote-11) as:

**technology** ≡ specific information necessary for the **development,** production, or use of a product. Such information can take the form of **technical data** or technical assistance.

As used in this definition, ‘**development’** relates to all end-item (design) stages prior to production, such as research, analyses, concepts, assembly and testing of prototypes, pilot production schemes, data, process of transforming data into a product, configuration, integration, and layouts. Furthermore, ‘**technical data**’ may take the form of blueprints, plans, diagrams, models, formulae, tables, engineering designs and specifications, and manuals/instructions written or recorded on other media or devices such as disk, tape, and read only memories.

A “**release of technology**” is defined[[12]](#endnote-12) as:technology or software “released” for export through:

* Visual inspection of U.S.-origin equipment and facilities by foreign nationals;
* Oral exchanges of information in the United States or abroad; or
* The application to situations abroad of personal knowledge or technical experience acquired in the U.S.

The EAR further complicates its export definition terminology by defining[[13]](#endnote-13) the term **“deemed export”** as any release of technology (or source code) subject to the EAR to a foreign national within the United States. Such a release is deemed to be an export to the home country or countries of the foreign national. This deemed export rule does not apply to (receiving) persons lawfully admitted for permanent residence in the United States and does not apply to persons who are protected individuals under the Immigration and Naturalization Act. Otherwise, the intent to execute a deemed export of technology subject to the EAR requires obtaining an export license from the Department of Commerce’s Bureau of Industry and Security (BIS). Typical organizations using deemed export licenses include universities, high technology research and development institutions, bio-chemical firms, as well as the medical and computer sectors.

It should be noted that similar export definitions exist in the ITAR. For example, **technical data** is defined[[14]](#endnote-14) in the ITAR as “Information…which is required for the design development, production, manufacture, assembly, operation, repair, test, maintenance or modification of defense articles. This includes information in the form of blueprints, drawings, photographs, plans, instructions and documentation.” However, it is interesting to note that “This definition….does **not** include information concerning general scientific, mathematical or engineering principles commonly taught in schools, colleges and universities, or information in the **public domain**…(or)...of telemetry data as defined….(in)… Category XV(f)”[[15]](#endnote-15) Where public domain is defined[[16]](#endnote-16) as “…information which is published and which is generally accessible or available to the public…….through unlimited distribution at a conference…(and)…through **fundamental research -** defined to mean basic and applied research in science and engineering where the resulting information is ordinarily published and shared broadly within the scientific community.”

**So herein lies the rub! Under these definitions, Radio Amateur - Satellite Service developers DO ‘export’ satellite technology, i.e., technical data relating thereto.**

**Penalty Paralysis –** Radio amateurs have always complied with the statutes and regulations governing the operation of the radio Amateur Service and the Amateur-Satellite Service. Consequently, the awareness of the Export Control Laws and their ‘apparent” applicability to the Amateur Satellite-Service became a major concern of the U.S. amateur radio community. Furthermore, with respect to these Export Control Laws, U.S. amateurs became acutely aware of the USG’s enforcement mechanisms and the severe criminal and civil penalties for violating those regulations. Specifically, for (ITAR) munitions export control violations, the statute authorizes a maximum criminal penalty of $1 million per violation and, for an individual person, up to 10 years imprisonment. In addition, munitions violations can result in the imposition of a maximum civil fine of $500,000 per violation. For dual-use (EAR) export control violations, criminal penalties can reach a maximum of $500,000 per violation and, for an individual person, up to 10 years imprisonment. Dual-use violations can also be subject to civil fines up to $12,000 per violation.

Consequently, prudent concern for the Export Control Laws and the significant potential penalties for violating the (questionably) applicable export control regulations regarding Amateur-Satellite Service technologies led the U.S. amateur radio community to cease direct collaboration pursuant to amateur satellite development with fellow radio amateurs in foreign countries. This was/is extremely unfortunate as theretofore, the International Radio Amateur-Satellite Service community, working together, had made great progress in advancing state-of-the-art satellite development resulting in extending operational capabilities beyond simple Low Earth Orbit (LEO) repeaters to HEO-based satellites offering world-wide coverage available to most of the planet’s radio amateurs.

**Pacification –** The U.S. Amateur Satellite-Service community is able to comply with the export control regulations by adhering to **allowable** **exemptions**. Specifically, the EAR section on “Items subject to the EAR[[17]](#endnote-17)” contains a sub-section which enumerates four specific (exportable) information instances **not** subject to the EAR. Of those four exemptions[[18]](#endnote-18), at least two are directly applicable to the U.S. Amateur Satellite-Service predicament previously described. Those two relate to publically available technology that:

1. Is already **published** or will be published[[19]](#endnote-19); or
2. Arises during, or results from **fundamental research**[[20]](#endnote-20).

AMSAT is following this first exemption as codified by the EAR by making information regarding Fox Cubesat satellite technology development publically available by “…release at an open conference, meeting, seminar, trade show, or other open gathering.”[[21]](#endnote-21) The means to accomplish this is through yearly publication of Fox satellite design technology details in the *Proceedings of the AMSAT-NA Annual Space Symposium and AMSAT-NA Annual Meeting.*

**Therefore AMSAT is satisfying current U.S. Export Administration Regulations (EAR) by answering the question, Is the technology I am planning on exporting PUBLICALLY AVAILABLE? , with a YES in accordance with exemptions allowed by the EAR.**

**Promise –**In August 2009, the President directed a broad-based interagency review of the U.S. Export Control System, with the goal of strengthening national security and the competitiveness of key U.S. manufacturing and technology sectors by focusing on current threats, as well as adapting to the changing economic and technological landscape. This review determined that the current Export Control System is overly complicated, contains too many redundancies, and, in trying to protect too much, diminishes our ability to focus our efforts on the most critical national security priorities. Indeed, the complexity and burdensome nature of the Export Control Laws has long been decried by the military, commercial industry, and university research community. Within the last few years this situation has affected the U.S. radio Amateur-Satellite Service community and is being presently mitigated by the “pacification” solution just described.

The result of this situation is that the Administration launched the Export Control Reform (ECR) Initiative to fundamentally reform the U.S. Export Control System. The ECR Initiative is designed to enhance U.S. national security and strengthen the United States’ ability to counter threats such as the proliferation of weapons of mass destruction. In the ECR Initiative, new “criteria” for determining what items need to be controlled is to be based on a set of coordinated policies for determining when an export license is required. The tiered system will also include a “catch all” control for sanctioned end-users and destinations, proscribed entities, proliferation, and counterterrorism end-uses. The control list criteria will be based on transparent rules, which will reduce the uncertainty faced by our allies, U.S. industry, and our foreign partners.

Most importantly, the ECR is intended to develop a new single Export Control List that will allow the USG to erect higher walls around the most sensitive items in order to enhance national security. In the interim, however, the USG is working to create a “bright line” between the U.S. Munitions List and Commerce Control List to clearly identify the jurisdiction of controlled items therein.

The ECR is being implemented in three phases:

* Phase I is intended to reconcile various export control definitions, regulations, and policies in order to develop a methodology for rebuilding the control lists *(completed in 2010).*
* Phase II involves restructuring the USML and CCL into identical tiered and positive lists utilizing the Phase I developed methodology *(ongoing and nearly complete).*
* Phase III will merge the USML and CCL to create a single control list which will be administered by a single control agency under a unified information technology system, and an enforcement coordination center (requires completion of the Phase II list review as well as Congressional Legislation).

The goal of the ECR Initiative is to eventually create a Single Licensing Agency (SLA), which will act as a “one stop shop” for businesses seeking an export license and for the USG to coordinate review of license applications. The result will be a licensing process that is transparent, predictable, and timely.

**Prognostication –** Beginning with Congressional approval of the Radio Act of 1912, which required amateurs to be licensed and restricted to the single wavelength of 200 meters, to the FCC’s present regulatory measures,[[22]](#endnote-22) radio amateurs have long been administered by governmental statutes and regulations. Today, U.S. radio amateurs number over 700,000 and continue to be subject to regulation at the international and national levels with regard to telecommunications and at the state and local levels with respect to land use regulations. Represented by the American Radio Relay League (ARRL) national organization and other advocacy groups, radio amateurs have learned to vigilantly monitor any proposed legislation/rules that could potentially affect hard-fought for operating rights and frequency privileges. Some ongoing examples of such potentially restrictive legislation are:

* Spectrum Defense from commercial wireless (and other services) seeking additional frequency allocations,
* Mobile Cell Phone operational prohibitions encompassing amateur radio mobile operation,
* Covenants, Conditions, and Restrictions (CCRs) on Amateur Radio operations from local authorities, Home Owners Associations, et al (Amateur Radio Parity Act of 2015),
* Software Defined Radio (SDR) adaptive programming and Cognitive Radio capability restrictions,
* Antenna erection restrictions arising from local government zoning ordinances,
* Local and State government Radio Frequency Interference (RFI) ordinances (P.L. 97-259), and
* (Modified) Export Control Laws, à la ITAR and EAR.

Regarding the last bullet item above (the primary subject of this paper), although the Amateur Satellite-Service has a temporary way-forward approach to complying with the current (ITAR/EAR) export regulations, this accommodation still does NOT permit “a priori” collaboration with foreign radio amateurs (or other foreign nationals) while developing initial plans and designs for future amateur radio satellite capabilities.

Furthermore, perhaps of greater concern to the export authorities in the future would be U.S. only (or U.S. and foreign) amateur-developed advanced capability satellite designs involving state-of-the-art technologies and hosting highly advanced scientific payloads from partner universities. The degree (“export misuse” value) of such capabilities could very well invoke (‘subject to’) export regulations reconsideration of several specific (illicit concern) functional capability areas, currently considered military-only applications, e.g.,

* Constellation or formation flight ops involving multiple satellites,
* Advanced electro-optical remote sensing capabilities,
* Emission of precise Position, Navigation and Timing (PNT) signals,
* Integrated propulsion capability utilized for OTHER than attitude control or initial orbit achievement,
* Null steering, electronically steerable antennas,
* Space-qualified atomic clocks,
* Attitude Determination and Control Systems (ADCS) providing geolocation to certain accuracies in the absence of Ground Location Points,
* Plasma-based propulsion systems, e.g., electromagnetic (MPD, PPT, etc.),
* Certain Rad-Hard designed microcomponents, ASICs, etc. specially designed, & normal MIL-use,
* Microwave solid state power amplifiers (SSPA) and Travelling Wave Tube (TWT) Amplifiers, and
* …possibly others…..

Certainly, there is much more to come in this chronicle!

**References**

* 1. *Overview of U.S. Export Control System*, A Resource on Strategic Trade Management and Export Controls, Department of State, [www.state.gov/strategictrade/overview/](http://www.state.gov/strategictrade/overview/)
  2. *Streamlining the System: More Baby Steps Toward Reducing Export Compliance Burdens*, Scott Maberry and Reid Whitten, April 2, 2013 <http://www.globaltradelawblog.com/2013/04/02/streamlining-the-system-more-baby-steps-toward-reducing-export-compliance-burdens/>
  3. Title 47, Chapter 1, Subchapter D, Part 97 – Amateur Radio Service
  4. Arms Export Control Act (AECA), 22 U.S.C. 2778.
  5. The International Traffic in Arms Regulations (ITAR), 22 CFR § 120-130.
  6. Export Administration Act (EAA) of 1979 as amended 3 Oct 1979.
  7. Export Administration Regulations (EAR), 15 CFR § 730 - 774

1. 22 U.S.C. 2778 provides the authority to control the export of defense articles and services, and charges the President to exercise this authority. Executive Order 11958 (18 Jan 1977), as amended (42 FR 4311), delegated this statutory authority to the Secretary of State. [↑](#endnote-ref-1)
2. 22 CFR §§ 120-130 [↑](#endnote-ref-2)
3. 50 U.S.C. app. 2401 – 2420 (expired); an act to provide authority to regulate exports, to improve the efficiency of export regulation, and to minimize interference with the ability to engage in commerce. The EAA is not permanent legislation, and when it lapsed, Presidential Executive Orders under the IEEPA (International Emergency Economic Powers Act – 50 U.S.C. 1701 – 1706) have directed and authorized the continuation in force of the EAR. [↑](#endnote-ref-3)
4. 15 CFR Chapter VII, Subchapter C, §§ 730-774 [↑](#endnote-ref-4)
5. 15 CFR § 774, Supplement 1 [↑](#endnote-ref-5)
6. 22 CFR § 121.1 [↑](#endnote-ref-6)
7. 15 CFR § 734.2(a)(1) [↑](#endnote-ref-7)
8. 22 CFR § 121.1, USML, Category XV(a) [↑](#endnote-ref-8)
9. 15 CFR § 738.2(d)(1) [↑](#endnote-ref-9)
10. 15 CFR § 734.2(b)(1) [↑](#endnote-ref-10)
11. 15 CFR § 772 – Definition of Terms [↑](#endnote-ref-11)
12. 15 CFR § 734.2(b)(3) [↑](#endnote-ref-12)
13. 15 CFR § 734.2(b)(2)(ii) [↑](#endnote-ref-13)
14. 22 CFR § 120.10(a)(1) [↑](#endnote-ref-14)
15. 22 CFR § 120.10(b) [↑](#endnote-ref-15)
16. 22 CFR §§ 120.11(a)(6,8) [↑](#endnote-ref-16)
17. 15 CFR § 734.3 [↑](#endnote-ref-17)
18. 15 CFR §§ 734.3(b)(3)(i – iv) [↑](#endnote-ref-18)
19. 15 CFR § 734.7 [↑](#endnote-ref-19)
20. 15 CFR § 734.8 [↑](#endnote-ref-20)
21. 15 CFR § 734.7(a)(4) [↑](#endnote-ref-21)
22. 47 CFR § 97 [↑](#endnote-ref-22)