

Navigating Export Controls and Regulations for Small Satellites

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ABSTRACT

Payload providers often have limited resources to support the extensive paperwork and launch certification processes required to put their payload on orbit. Understanding and complying with the myriad of Governmental regulations and processing the associated compliance paperwork is daunting, complex and costly. This paper summarizes regulatory challenges encountered by most satellite developers as well as lessons learned by Spaceflight arranging launch solutions for customers on both domestic and international launch vehicles.

THE REGULATORY PROCESS

Issues often encountered include FCC Licensing and its required compliance with space debris mitigation standards, NOAA licensing of remote sensing payloads, registration of space objects through the Department of State and ultimately the ITU, navigating country specific liability limitation schemes, and compliance with export regulations, including the ITAR.

FCC LICENSING OF THE SATELLITE

If your payload is experimental, or a tech demo, the FCC process is relatively straightforward. However, these licenses are not meant for revenue producing satellites or constellations. The FCC permits experimental licensing in two situations: (1) Special Temporary authority (STA), for operations intended not to exceed six months; and (2) regular experimental authority (RTA), for operations intended to continue for longer than six months and up to two years or more.

FCC Registration

All applicants for licenses are required to have an FCC Registration Number (FRN). The applicant should be the party that ultimately controls decisions about the satellite's mission objectives, design, construction, tendering of the satellite to a launch service provider or designated launch integrator, and operations of the satellite once on orbit. Once you obtain an FRN, you access the filing system at the following location: <https://apps.fcc.gov/oetcf/els/forms/STANotificationPage.cfm>

Applications

The format of the STA application is fairly basic, although some amount of supporting documentation is required. Applicants complete a generic form in which contact information, duration of operations, and technical details are specified. In addition, applicants

must describe the purpose of the operations (e.g., testing, demonstration, experimental research) and an explanation as to why an experimental STA is necessary and appropriate.

Grants of permanent or Regular Experimental Authority are for anticipated use of greater than six months, and are renewable for programs of study or experimentation which may last several years. The preparation of a RTA application is more involved than a STA. As with the experimental STA, applicants are required to provide descriptions, in this case generally more detailed, of the purpose of the experimentation and the objectives sought in the operation of the devices. In addition, the form calls for fairly detailed technical specifications, including power, frequency range, bandwidth, and emissions.

In addition to general justification and description of the nature of operations, the FCC specifically requires the following details of proposed small satellite operations:

Technical information including frequency, power, emission, latitude and longitude coordinates of the launch site or test operations.

Proposed launch schedule including launch date, requested grant date and any critical go/no go dates relevant to the licenses.

An overview of the proposed testing.

A 24-hour contact for interference issues.

Description of the anticipated orbital parameters or range of orbital parameters (altitude, inclination) in which the satellite will operate.

A list of earth stations with which the satellite will communicate.

If the satellite will operate in bands allocated to the amateur satellite service, but will provide no amateur

service, the information required in connection with an amateur pre-launch notification and the results of any notification to or coordination with the IARU.

An orbital debris mitigation statement, showing the satellite will adhere to the policy that atmospheric drag will limit its lifetime to no longer than 25 years after completion of its mission. The FCC refers to the NASA Debris Assessment Software, as well as NASA handbooks and standards for debris assessment, available at <http://orbitaldebris.jsc.nasa.gov>. An orbital debris assessment report prepared consistent with NASA standards is generally sufficient to meet FCC requirements. However, the FCC also notes these exceptions:

For satellites that will maneuver at altitudes used by inhabitable orbital objects, the applicant should indicate whether any measures have been taken to coordinate operations with the operator of such object.

Although most small satellites can be expected to burn up entirely upon re-entry, if the satellite is constructed with high melting point materials some components may survive re-entry and present a casualty risk. Satellite designers are expected to follow a “design to demise” approach in choosing materials. If it’s likely that spacecraft materials will survive re-entry, the applicant should provide a detailed discussion of the need for use of high melting point materials, demonstrating that mission objectives cannot be met with an alternative spacecraft design.

Once a payload provider passes the threshold from experimental to commercial, as is often the case when moving from tech demo satellites to constellations, licensing falls within a different section of the FCC, and is much more involved. At this point, if you haven’t already, I would suggest engaging a law firm that specializes in the subject.

IMAGING SATELLITES

Earth imaging or remote sensing of any kind is subject to license by NOAA. NOAA’s jurisdiction is very broad, providing that every person who is subject to the jurisdiction or control of the U.S. may not operate any private remote sensing space system without a license. NOAA licenses are also conditioned upon adherence to the “25 year rule.” A NOAA remote sensing satellite operator’s license requires that the satellite and any ground-based operations systems and facilities be operated in a way which preserves national security.

License holders are required to create and follow a Data Protection Plan which will prevent sensitive remote sensing data (e.g., high-resolution pictures of military bases) from falling into the wrong hands. License holders must keep NOAA informed of foreign entities

that have received remote sensing data. NOAA may require that the Data Protection Plan give them the ability to exercise “shutter control.” Shutter control allows NOAA or another government agency to prevent a satellite from imaging a sensitive area or force the satellite operator to withhold images from the public for a specified time.

NOAA takes a “trust but verify” approach with its license holders. They conduct audits and on-site inspections of license holders at least once a year to ensure that the license conditions are being complied with and any deviations or satellite anomalies are reported. License holders must also make the remote sensing data they collect available to the Department of the Interior for the National Archive.

Application Process

The first step in getting a license is submitting an Initial Contact Form, found at <http://www.nesdis.noaa.gov/CRSRA/files/InitialContactForm.pdf>. NOAA will then determine if you even need a license. Although there is no set form, the applicant must submit detailed information on their corporate structure, financial information, plans for launch, satellite design and capabilities, and ground operations. A complete list of what’s required can be found at: <http://www.nesdis.noaa.gov/CRSRA/generalApplication.html>. Creation of the aforementioned data protection as well as a deorbiting plan is also required. The good news is there is *no* licensing fee!

NOAA must approve or deny a license application within 120 days; therefore determining one’s need for a license and preparing the application should occur well before a satellite’s planned launch! To date, several CubeSat and smallsat operators have received imaging licenses. You can see the list of licensees at: <http://www.nesdis.noaa.gov/CRSRA/licenseHome.html>

REGISTRATION OF SPACE OBJECTS

The 1974 UN Convention on Registration of Objects Launched into Outer Space provides for the national registration by launching states of space objects launched into outer space, and for the maintenance of a central register of objects launched into outer space by the Secretary-General of the United Nations. The United States, as a party to the Registration Convention, maintains an official U.S. Registry of Space Objects Launched into Outer Space and provides quarterly updates to the UN Secretary-General on each space object carried on the US Registry. As part of the launch licensing process, payloads launched via U.S. launch vehicles are generally automatically included in the

registry, but if your payload is launched from a foreign launch vehicle, foreign launch providers will require a U.S. payload be registered on the U.S. registry. The U.S. Department of State's Space & Advanced Technology Office (<http://www.state.gov/e/oes/sat/>) maintains the U.S. Registry. The principal point of contact at the Space & Advanced Technology Office (<http://www.state.gov/e/oes/sat/>), is Foreign Affairs Officer Amber Charlesworth, who is very helpful.

LAUNCH LICENSE

As a payload provider, this will be a non-issue for you. The U.S. Launch Service Provider is required to obtain a license from the FAA, not individual payload providers. However, the LSP will need your signature on the Cross Liability Waiver which is a required element of the LSPs launch license application. The federal regulations which spawned the need for the cross liability waiver, and language similar to a waiver you will likely be asked to sign, is set forth at: <http://www.law.cornell.edu/cfr/text/14/part-440/appendix-C>

EXPORT REGULATIONS

Finally, for situations in which a foreign launch will be preferred or necessary, or where a non-U.S. payload is launched on a U.S. Launch Service Provider, the International Traffic in Arms Regulations (ITAR) come into play. Payloads to be launched into space are covered by the ITAR and a license from the Department of State's Directorate of Defense Trade Controls must be obtained to export the payload AND to carry on most discussions of a technical nature with regard to the payload. In order to communicate the technical aspects of the payload to a foreign person, both parties must enter into a technical assistance agreement (TAA), which is filed with the Department of State. Preparation and filing of these TAAs is more art than science, and requires a thorough understanding of the process and players involved. Export of the payload and ground support equipment requires an additional but related export license.

Technical Assistance Agreements (TAAs)

Suffice it to say, the export of spacecraft for launch overseas is a heavily regulated endeavor! For U.S. payloads launching on foreign launch vehicles:

- A TAA is required in order to share details about spacecraft for fit check, interface, and other purposes
- A Technology Transfer Control Plan (TTCP) is required as part of the TAA and necessitates extensive coordination with the host facility

- An approved hardware license is required to ship spacecraft and ground support equipment overseas
- Foreign launch campaigns of U.S. payloads are subject to mandatory monitoring by DTSA, with limited exceptions
- Certain foreign launch locations are off-limits (e.g., China and India)
- The process is designed to protect spacecraft operations from foreign interception and/or control

For foreign payloads launching on U.S. launch vehicles:

- Detailed launch, separation or deployer specifications & interfaces may not be provided without a license
- A TAA is usually required in order to share details about interface requirements and technical details, among other things
- Additionally, U.S. companies are prohibited from engaging in business with "embargoed" or "denied parties"

For those interested in a more in-depth treatment of export regulations what follows is a practical, but in no way comprehensive, guide to U.S. export regulations as they effect aerospace.

Controlling Regulations

The three main sets of regulations which cover export of space related products and services are the Export Administration Regulations, the International Traffic in Arms Regulations and the Office of Foreign Assets Control regulations. The Export Administration Regulations ("EAR") are administered by the Bureau of Industry and Security within the Department of Commerce and governs export of commercial and "dual use" commodities, software, and technology on the Commerce Control List ("CCL"). The International Traffic in Arms Regulations ("ITAR") governs export of defense articles, services and technical data on the United States Munitions List ("USML"), and are administered by the Directorate of Defense Trade Controls within the Department of State ("DDTC"). The Office of Foreign Assets Control bars transactions (including exports) involving embargoed or specially restricted countries or designated individuals and entities on the Specially Designated Nationals and Blocked Persons List ("SDN List"). It doesn't matter whether the EAR or ITAR applies to the transaction; U.S. parties cannot do business with any party that appears on the SDN List.

Only the ITAR or EAR will apply to a given transaction /product/tech data transfer, not both. The initial classification is the key. If it is not subject to the ITAR, EAR automatically applies. Only the State Department (DDTC) has authority to issue “Commodity Jurisdiction” determination, meaning they alone can declare a transaction/product/tech data transfer covered by the ITAR (or not).

Export Administration Regulations

The EAR governs exports of commodities, technology and software that are purely commercial / civil in nature or have both commercial and military applications (without specific design or modification for a military or space application) – i.e., “dual use.” Note, however, that the current U.S. regulatory framework places control over all satellites, including purely commercial satellites, with the U.S. Department of State under the ITAR. That being said, certain satellite components, attachments and accessories that are not specifically designed for satellites are subject to control under the EAR.

EAR licensing is product and circumstance specific. A license is required if the product is classified under an ECCN on the CCL and an “x” is present in the relevant “reason for control” column in the Country Chart: http://www.access.gpo.gov/bis/ear/ear_data.html

General prohibitions always apply in situations where there is an embargo, the product or service is shipped to or via a “listed” person or entity, shipped via a restricted country, is exported with knowledge that a violation will or may occur (beware of red flags), or involves a prohibited end-use, such as a chemical, biological or nuclear weapon or missile use.

The ITAR

The ITAR controls exports of hardware, technical data and defense services designated under the USML. For Spaceflight’s purposes, these would include payloads, the SSPS, the SHERPA and other specifically designed systems, subsystems and components thereof (i.e., propulsion system and wheels). The intended end-use after export is not relevant for purposes of determining if ITAR applies (other than in initial classification design phase). Once an item is classified as subject to the ITAR, it is always covered by the ITAR, even if its final end use is a foreign civil one.

Some key ITAR definitions include: “Technical Data”, “Defense Article”, “Defense Service”, “Foreign Person” and “Export.” “Technical Data” means any information required for the design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification of defense articles.

For example, an “ICD” or Interface Control Document for satellites and launch vehicles, any information about how to make, assemble, or code a spacecraft-related item, and details about launch vehicles. Other technical data includes:

- Classified or unclassified information related to defense articles and services
- Tangible articles (e.g., models, mock-ups) that convey technical data related to listed articles
- Software directly related to defense articles
- Information subject to invention secrecy order

ITAR-controlled technical data does **not** include:

- Information concerning general scientific, mathematical or engineering principles commonly taught in colleges and universities
- Information in the public domain (but beware of providing defense services using this information)
- Basic marketing information on function or purpose and general system descriptions (i.e., “what” an item does, not “how” it does it; “what” an item is, not “how” it is made)

A “Defense Article” is any item (or technical data) designated on the USML, all specifically designed, developed, configured, adapted or modified systems or subsystems, components, parts, accessories for item in question, for example launch adapters, SSPS, SHERPA, satellites. Satellites are designated as Significant Military Equipment (SME) and consequently you need a DSP-83 signed by a Foreign Party in order to export them out of the United States. Off-the-shelf parts are not ITAR-controlled until space-relevant modifications are made to that part. However, the technical information (drawings, etc.) about how to modify the part is ITAR-controlled. *In summary, if a part has been specifically designed or modified for use in a satellite, then it is ITAR-controlled. If a part was originally designed for a non-military terrestrial system and it can be used in a satellite without any modification, then it is EAR controlled.*

A party is providing a “Defense Service,” if it is providing a “Foreign Person,” whether within the U.S. or abroad, with: assistance (incl. training) in the design, development, repair, maintenance, modification or use of defense articles, technical data controlled under ITAR (includes software), or military training of foreign units and forces. The ITAR applies even if all technical data used to perform the service is in the public domain or otherwise exempt. Examples could include services provided to a foreign payload provider in connection with launch of their satellite in the US.

A “Foreign Person,” means any individual that is not one of the following: a U.S. citizen, a permanent resident (green card holder), a protected individual (asylee or refugee). A Foreign Person also means any entity, association or group not organized to do business in the U.S., including any foreign government, agency or subdivision. U.S. citizens employed by foreign companies, and foreign persons employed by U.S. companies are considered Foreign Persons. In scenarios we commonly face, foreign launch service providers, foreign satellite providers and hardware vendors are all “Foreign Persons.”

An “Export” under the ITAR includes:

- Sending or taking a defense article or technical data out of the U.S. in any manner (except mere travel by a person with knowledge of technical data)
- Transferring registration, control or ownership to a foreign person of any satellite, whether in the United States or abroad
- Disclosing or transferring technical data to a foreign person, whether in the U.S. or abroad
- Performing a defense service for a foreign person, whether in the U.S. or abroad
- Delivering a product or technical data domestically with knowledge that it will be exported out of the U.S.

Included in the above are so-called deemed exports, or the release of technical data or source code to a foreign person within the U.S. is considered an export to that person’s home country. The deemed export rule covers virtually any means of communication with a foreign person, from phone conversations to email to site tours)

The term export also bizarrely includes re-transfers and re-exports (e.g., communications to a foreign person abroad of U.S. origin technology legally exported from the U.S. in the first place).

ITAR Registration

Compliance with the ITAR begins with registration with DDTC. All manufacturers, exporters and brokers of defense articles, defense services, or related technical data are required to register with DDTC. If you only manufacture defense articles and don’t actually export them out of the U.S. you are still required to register. Registration is a precondition to the issuance of any license or approval under the ITAR; **not** an actual license to export. All registrations **MUST** be renewed annually (if registration lapses, current approvals are suspended).

Technical Assistance Agreements

Basically, a Technical Assistance Agreement or TAA is required whenever you wish to engage in technical discussions with any foreign party regarding defense articles, including satellites. As mentioned above, all things “space” are so designated, and a more detailed description of likely scenarios is set forth above.

Black Listed Countries

Countries to which exports subject to the ITAR are prohibited include those subject to embargo, including Burma, ***China***, Liberia, Libya and Sudan. Countries with whom the DDTC has a policy to deny license applications include Belarus, Cuba, Eritrea, Iran, North Korea, Syria and Venezuela, and those countries subject to United Nations Security Council embargoes (the above and others, such as Iraq and Somalia). Violations by export to these countries require mandatory reporting to the DDTC.

Penalties for Non-Compliance

The consequences of non-compliance with the ITAR can be severe, including **individual criminal** and civil liability for unauthorized exports and for misrepresentations, seizure and forfeiture of attempted illegal exports, and corporate “death sentences,” meaning export license suspension and debarment, and/or federal contract suspension and debarment. The ITAR is a “strict liability” regulatory regime, meaning the government need not prove a specific intent to violate to prove culpability. Therefore, U.S. businesses, individuals, owners, managers and employees may be penalized for violating laws they did not know they were violating or believed they were complying with fully.

ADDITIONAL DOCUMENTATION

Additional documents that may be required include: Statements of peaceful or non-military use and liability waivers for international launch providers beyond those which domestic launch providers require.

Overcoming the regulatory hurdles associated with putting payloads in space can be intimidating the first time through and is always subject to change. Spaceflight, Inc. seeks to demystify the process for our customers and the small satellite community, explain the typical challenges encountered and provide tips for successful compliance.

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