

PDS Lessons Learned International Traffic in Arms Regulations (ITAR) issues

Overview:

"Spacecraft systems and associated equipment" is the 15th category in the U.S. Munitions List, meaning space hardware, software, and data are "defense articles" and subject to ITAR. "Defense articles" are not exclusively military or exclusively government.

A regulatory framework, including NASA licensing and Technical Assistance Agreements, exists for managing ITAR-controlled information. License exemptions (*e.g.*, 125.4 (b)(3) — technical data exports directed by a U.S. government agency) are possible; but about 30 countries are proscribed and a license is required if a person from any of them is involved.

Being an open, web-based system, PDS does not meet the licensing model; so all information available through PDS must be free of ITAR restrictions. In an earlier decision by HQ, the SPICE products provided by the PDS NAIF node are not restricted by ITAR.

General Procedures:

When dealing with ITAR issues, the first contact is usually through the lead node for the mission to the associated laboratory that manages the mission (APL, GSFC, JPL). Each institution has its own solution to meeting ITAR requirements: at JPL it is the Office of Export Compliance (OEC), at APL it may be a mission specific group, and within the government generally it may be a government code (*e.g.*, GSFC). The final authority is the NASA HQ Export Control Office.

In an earlier decision by HQ, the SPICE products provided by the PDS NAIF node are not restricted by ITAR.

PDS management located at GSFC becomes involved when problems are encountered. Management may take the individual case to its local GSFC export control "code" or directly to HQ as the situation dictates.

PDS is working with the HQ Export Control Office to craft a general procedure for meeting ITAR requirements in planetary exploration once revisions to ITAR have been completed by the Obama administration. In the meantime, the following may be helpful when preparing submissions to PDS.

Observation Based on Several Sources:

Documentation, not data, is the usual ITAR stumbling block for archives. Specifically,

Software Interface Specifications and Calibration Reports are the most common documents to fail initial ITAR review.

Telemetry for engineering purposes is usually not included in the PDS science archive unless it specifically supports the science.

Guidelines for Writing:

The following components of a Software Interface Specification (SIS) are not considered technical and do not usually fall under ITAR control:

- Identifications
- Document scope
- Notation used in the document
- Controlling documents
- Applicable documents
- Document update procedure
- Acronyms and abbreviations

In the sections on requirements and design which follow, think in terms of writing system, subsystem, and method descriptions at the level of 'basic marketing information' — why you would want one of these rather than how to build one and how it works. In particular, do not include technical details about design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification. Technical and other details can sometimes be maintained better in a data base (referenced by the document) rather than in the document itself.

Hardware and Software Interface Requirements: State requirements in terms of what test results are needed for acceptance. Interfaces and characteristics include:

- Name, purpose, source, destination, and priority level (if applicable),
- Communication protocols, data rate, and the responsible party for transfer initiation,
- Synchronization, timing, frequency, volume, sequencing, and other constraints,
- Routing, addressing, and any naming conventions,
- Data characteristics such as field name, data type, access type, range or set of permitted values, precision, accuracy, and unit of measure.
- Safety, Security and privacy constraints (if applicable),
- Structure of data item. For composite data items, describe the data structure. For 'elemental' data items, specify required characteristics such as name, data type, size, format, range or set of permitted values, precision, and unit of measure.

Hardware and Software Design: Specify a design that meets the interface requirements above. Hardware and software interfaces on the download (post-spacecraft) side are typically not controlled. The following should be included:

- Interface with devices (*e.g.*, memory mapped I/O, PCI, 1553B, serial I/O, GPIB, etc),
- Communication media and protocols,
- Synchronization, timing, frequency, volume, sequencing, and other constraints,
- Packaging, including fragmentation and reassembly (if applicable)
- Routing, addressing, and any naming conventions,
- Communication initiation details (*e.g.*, periodic, event driven, or both),
- Safety, security, and privacy constraints (if applicable)
- The detailed format of each message, including the name, physical representation, size, access type, byte ordering, bit numbering, etc. of each field within a message,
- Detection and handling of errors.

Other: Traceability to system requirements and verification tests should be documented either in an appendix (written at the level of 'basic marketing information') or a separate document. A glossary and waivers (covering non-compliance with requirements) can be included if they are also written at the same level.

The structure and content of a Calibration Report is more varied; follow the recommendations not to include technical details about design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification. Be careful when including testing sequences or software products so that they represent the common techniques or approaches in industry and academia.

High level documents (*i.e.*, mission plan, archive plan *etc.*) should never contain controlled information.

Avoid the temptation to have documents in 'public' and 'controlled' versions; the 'public' version will inevitably be out of date.

Other Considerations:

Make sure that the ITAR review and decision roles are clearly defined before the review process begins (who makes the ITAR decisions and what is the appeal/review process afterward). These can vary depending on the institution that manages the mission.

For example, if the instruments come under JPL control, the OEC makes the first determination on ITAR sensitivity. However, at JPL, there is an on site representative from NASA HQ who can review an appeal of an OEC decision. JPL's OEC is more cautious and errs on the side of exclusion. APL does not have such an on site person but

has vast experience with sensitive missions through its other work. In the case of Messenger , APL hired an additional person specifically to coordinate ITAR issues. GSFC also has a government code which is an Export Control office but as an arm of the government, Goddard may be more flexible to grant exemptions.

Review for ITAR compliance should start as early as possible to ensure comments are back and edits are made in time to meet archiving schedules. This will be an issue for Calibration Reports since they typically are not done until flight data have been examined and measurements have been processed to reduced data records.

Writers should be aware of ITAR issues before starting; it is easier to write a document correctly the first time, and removing a 'controlled' classification is harder than getting an unclassified document through ITAR review.

Material that has been published and in the public domain typically may have cleared the ITAR hurdle and can be encapsulated or utilized in SIS and Calibration Report documents. This may include certain aspects of an instrument that were developed as part of an academic exercise, e.g., a PhD thesis. However, the individual institutions may find the posting not sufficient for an ITAR waiver.

Foreign instrument calibrations, component tests, *etc.* should be posted to the web at a foreign site so that these elements become public and not subject to ITAR control. For additional information, look over these appendices to PDS lead node, management , and mission perspective and references:

Attachment A **Lessons Learned from *PHOENIX* (PDS Lead Node perspective)**

1. Documentation, not data, are the stumbling blocks, because documentation can tell one how to design, fabricate, and utilize space articles of relevance to ITAR.
2. Documentation scrutiny will focus on SISs and Calibration Reports.
 - a. Data providers need a template for generation of these documents, along with guidelines as to what is allowable and what is not allowable so as to not violate ITAR.
 - b. Writers need to be made aware of ITAR issues before they start to write.
 - c. Material that has been published and in the public domain typically may have cleared the ITAR hurdle and can be encapsulated or utilized in SIS and Calibration Report documents.

- d. Review for ITAR compliance should start as early as possible to ensure comments are back and edits are made in time to meet archiving schedules. This will be an issue for Calibration Reports since they typically are not done until flight data have been examined and measurements have been processed to reduced data records.
3. Management of ITAR reviews and decisions for Phoenix proved to be difficult, with reviews at JPL, initial decisions made by NASA Headquarters, and then a change to decisions made at JPL by the NASA Headquarters representative.
 - a. Make sure that the ITAR review and decision roles are clearly defined before the review process begins.

Attachment B
Lesson's Learned from *PHOENIX* (PDS Management perspective)

1. Management gets involved when the Lead Node does not have an ITAR knowledgeable person at its institution or the initial review at the managing institution identifies significant revisions that are needed to make the document public on PDS.
2. Usually, one of its scientific staff will identify in the document any grouping or class of objections that are the cause of concern.
3. Management will then iterate with ITAR personnel at the managing institution to see whether there are solutions that can address the various groups; e.g., a simple rewrite by the author.
4. Together with the Lead Node, management will hold a teleconference with the ITAR Personnel at the managing institution, the HQ site representative (if any) , and/or pertinent HQ staff.
5. An appeal may be made at this juncture.
6. If the appeal is not successful, then management can lodge a formal request for an exemption directly to HQ.
7. The exemption can be made in oral form preferred as then the HQ staff can focus the questions. In either case, if the decision is that an exemption is feasible, then Management prepares a formal background document.
8. The HQ ITAR staff then judges on the content of the exemption, prepares the accepting the Memorandum for the Record and arranges for the necessary NASA Form

(NF) 1676 to be signed and the decision placed in the HQ Export Control database.

9. The Management staff then routes the 1676 through its home institution with the exemption MfR, and posts the approved approval on the PDS management site.

Attachment C

Lesson's Learned from DAWN (DAWN perspective, not PDS perspective)

1. Engineering data that are ITAR controlled should not be put into telemetry packets that contain data that are critical to the calibration/analysis of science data (interface temperatures, voltages, currents, etc.) — failure to do so complicates the creation of "public" telemetry data dictionaries and data distribution

2. High level documents (*i.e.*, mission plan, archive plan etc.) should never contain controlled information. If JPL engineers need this information, it should be contained in separate documents and referenced to eliminate the need for two versions of the documents. Otherwise, the "public" version of these documents will inevitably be out-of-date.

requires that the people writing these documents be aware of what information is controlled.

it's more difficult/expensive to get a "not for export" stamp removed from a document than it is to write it correctly the first time.

3. Foreign instrument calibrations, component tests, *etc.* should be posted to the web at a foreign site so that these elements become public and not subject to ITAR control. Once JPL takes ownership of these documents, they immediately fall under JPL document control. It's much easier to get JPL to release the documents if they were public before JPL took ownership.

4. Conduct separate meetings/reviews when ITAR controlled material needs to be discussed. It is very offensive to foreign collaborators to be kicked out of the room (at PDR, CDR, *etc.*) so that controlled subsystems can be reviewed. This may add expense, and push the review of certain subsystems outside of the logical time-order; but it's better than the alternative, which is alienating colleagues early in the mission.

References:

Brown, T. "PDS SIS Template", private communication, July, 2010

Geisz, P, and Hodgdon, K "ITAR and PDS", Management Council meeting, March 25, 2010.

Grayzeck, E.J. "ITAR and Phoenix SSI", Management Council meeting, March 25, 2010.