

**DEPARTMENT OF COMMERCE****Bureau of Industry and Security****15 CFR Parts 740, 772 and 774**

[Docket No. 080215206-81243-01]

RIN 0694-AE29

**Wassenaar Arrangement Plenary Agreements Implementation: December 2007 Categories 1, 2, 3, 5 Parts I and II, 6, 7, and 9 of the Commerce Control List, Definitions; December 2006 Solar Cells****AGENCY:** Bureau of Industry and Security, Commerce.**ACTION:** Final rule.

**SUMMARY:** The Bureau of Industry and Security (BIS) maintains the Commerce Control List (CCL), which identifies items subject to Department of Commerce export controls. This final rule revises the Export Administration Regulations (EAR) to implement changes made to the Wassenaar Arrangement's List of Dual Use Goods and Technologies (Wassenaar List) maintained and agreed to by governments participating in the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technologies (Wassenaar Arrangement, or WA). The Wassenaar Arrangement advocates implementation of effective export controls on strategic items with the objective of improving regional and international security and stability. To harmonize with the changes to the Wassenaar List, this rule revises the EAR by amending certain entries that are controlled for national security reasons in Categories 1, 2, 3, 5 Part I (telecommunications), 5 Part II (information security), 6, 7, and 9; adding new entries to the Commerce Control List (CCL), and amending EAR Definitions, as well as adding definitions.

The purpose of this final rule is to revise the CCL and definitions of terms used in the EAR to implement Wassenaar List revisions that were agreed upon in the December 2007 Wassenaar Arrangement Plenary Meeting and the Wassenaar List provisions regarding solar cells agreed upon in the December 2006 plenary meeting.

This rule also adds or expands unilateral U.S. export controls and national security export controls on certain items to make them consistent with the amendments made to implement the Wassenaar Arrangement's decisions.

**DATES:** *Effective Date:* This rule is effective October 14, 2008.

**FOR FURTHER INFORMATION CONTACT:** For questions of a general nature contact Sharron Cook, Office of Exporter Services, Bureau of Industry and Security, U.S. Department of Commerce at (202) 482 2440 or E Mail: [scook@bis.doc.gov](mailto:scook@bis.doc.gov).

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Comments regarding the collections of information associated with this rule, including suggestions for reducing the burden, should be sent to OMB Desk Officer, New Executive Office Building, Washington, DC 20503, Attention: Jasmeet Seehra, or by e-mail to [jseehra@omb.eop.gov](mailto:jseehra@omb.eop.gov) or by fax to (202) 395-7285; and to the Office of Administration, Bureau of Industry and Security, Department of Commerce, 14th and Pennsylvania Avenue, NW., Room 6883, Washington, DC 20230.

**SUPPLEMENTARY INFORMATION:****Background**

In July 1996, the United States and thirty-three other countries gave final approval to the establishment of a new multilateral export control arrangement called the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technologies (Wassenaar Arrangement or WA). The Wassenaar Arrangement contributes to regional and international security and stability by promoting transparency and greater responsibility in transfers of conventional arms and dual use goods and technologies, thus preventing destabilizing accumulations of such items. Participating states have committed to exchange information on exports of dual use goods and technologies to non-participating states for the purposes of enhancing transparency and assisting in developing common understandings of the risks associated with the transfers of these items.

**Expanded or New Export Controls**

This rule imposes new or expanded NS Column 1 controls. This rule

imposes a license requirement pursuant to section 742.4(a) of the EAR for exports and reexports to all destinations, except Canada, of certain commodities (and related software and technology) described in Export Control Classification Number 9A012.b.4 (certain air breathing reciprocating or rotary internal combustion type engines). This rule also imposes such a license requirement for certain software and technology controlled under ECCN 3D001 and 3E001 related to the development or production of certain solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays. These destinations have an "X" indicated in NS column 1 on the Commerce Country Chart of Supplement No. 1 to Part 738. The purpose of the controls is to ensure that these items do not make a contribution to the military potential of any other country or combination of countries that would prove detrimental to the national security of the United States. For designated terrorism supporting countries or embargoed countries, the applicable licensing policies are found in Parts 742 and 746 of the EAR, and Supplement No. 1 to Part 736 of the EAR for Syria.

This rule imposes new or expands NS Column 2 controls. This rule imposes a license requirement under section 742.4(a) of the EAR for exports and reexports of commodities (and related software and technology) described in ECCNs 1A006 (Equipment, specially designed or modified for the disposal of improvised explosive devices, and specially designed components and accessories therefor), 1A007 (Equipment and devices, specially designed to initiate charges and devices containing energetic materials, by electrical means), 3A001.e.4, solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays which are "space qualified," having an average efficiency exceeding 20% at an operating temperature of 301 K (28 °C) under simulated "air mass zero" illumination with an irradiance of 1,367 watts per square meter, and 3C002.e (all resists designed or optimized for use with imprint lithography equipment specified by 3B001.f.2. that use either a thermal or photo-curable process) to destinations other than Country Group A:1, cooperating countries (see Supplement No. 1 to Part 740 of the EAR), Bulgaria, Czech Republic, Estonia, Hungary, Iceland, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. This NS column 2 license requirement applies to destinations that have an "X" indicated in NS column 2

on the Commerce Country Chart of Supplement No. 1 to Part 738 of the EAR. The purpose of the controls is to ensure that these items do not make a contribution to the military potential of countries in Country Group D:1 that would prove detrimental to the national security of the United States. For designated terrorism supporting countries or embargoed countries, the applicable licensing policies are found in Parts 742 and 746 of the EAR, and Supplement No. 1 to Part 736 of the EAR for Syria.

The licensing policy for national security controlled items exported or reexported to any country except a country in Country Group D:1 (see Supplement No. 1 to Part 740 of the EAR) is to approve license applications unless there is a significant risk that the items will be diverted to a country in Country Group D:1. The general policy for exports and reexports of items to Country Group D:1 is to approve license applications when BIS determines, on a case by case basis, that the items are for civilian use or would otherwise not make a significant contribution to the military potential of the country of destination that would prove detrimental to the national security of the United States.

This rule imposes new or expands anti terrorism (AT) controls. This rule imposes a unilateral U.S. license requirement to export and reexport commodities (and related software and technology) controlled under ECCNs 1A006 (Equipment, specially designed or modified for the disposal of improvised explosive devices, and specially designed components and accessories therefor), 1A007 (Equipment and devices, specially designed to initiate charges and devices containing energetic materials, by electrical means), 3A001.e.4 solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays as described above, 3A991.o solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays which are "space qualified" and not controlled by 3A001.e.4, 3C002.e (all resists designed or optimized for use with imprint lithography equipment specified by 3B001.f.2. that use either a thermal or photo-curable process), and 9A012.b.4 (certain air breathing reciprocating or rotary internal combustion type engines) for AT reasons to Cuba, Iran, North Korea, Sudan and Syria, in addition to the national security controls imposed to implement the Wassenaar Arrangement's decisions. These unilateral export controls are necessary because under Section 6(j) of the Export

Administration Act of 1979 a license is required for items that could make a significant contribution to the military potential of such country or that could enhance the ability of such country to support acts of international terrorism. There is a general policy of denial for applications to export or reexport to terrorism supporting countries, as set forth in Part 742 of the EAR. In addition, certain of these countries are also subject to embargoes, as set forth in Part 746 of the EAR and Supplement No. 1 to Part 736 of the EAR for Syria. A license is also required for the export and reexport of these items to specially designated terrorists and foreign terrorist organizations, as set forth in Part 744 of the EAR; license applications to these parties are reviewed under a general policy of denial.

#### **Task Force on Editorial Issues (TFEI)**

The Wassenaar Arrangement Task Force on Editorial Issues (TFEI) made revisions, editorial in nature, to clarify or correct control text or remove extraneous text. The TFEI revisions (over 2,000) were agreed upon by the WA in December 2007. This rule implements only those TFEI revisions that coincide with the revisions to ECCNs affected by the 2007 WA agreements. Other TFEI revisions will be implemented in a separate rule.

#### **Revisions to the Commerce Control List**

This rule revises a number of entries on the Commerce Control List (CCL) to implement the December 2007 agreed revisions to the Wassenaar List of Dual Use Goods and Technologies. This rule also revises language to provide a complete or more accurate description of controls in certain ECCNs. A description of the specific amendments to the CCL pursuant to the December 2007 Wassenaar Agreement is provided below. Newly added ECCNs, as described below, are as follows: 1A006 and 1A007. The amended ECCNs, as described below, are 1A004, 1E001, 1E201, 2B001, 2B002, 2B006, 2B007, 2B008, 3A001, 3A002, 3A229, 3B001, 3C002, 3C005, 3C006, 3D001, 3E001, 5A001, 5A002, 6A001, 6A005, 6A995, 7A002, 7A003, 7A008, 9A012, and 9E003.

#### **Category 1 Materials, Chemicals, "Microorganisms," and Toxins**

ECCN 1A004 (Protective and detection equipment and components) is amended by:

a. Revising the Related Definitions paragraph of the List of Items Controlled section to move the definition for "adapted for use in war" from a Note in

ECCN 1A004 to the Related Definitions paragraph, and adding a new definition for "riot controls agents" to clarify the meaning of these terms as they are used in the control parameters of this entry;

b. Revising paragraphs 1A004.a (gas masks, filter canisters and decontamination equipment), 1A004.b (protective suits, gloves and shoes), and 1A004.c (Nuclear, biological and chemical (NBC) detection systems), to specifically list the agents and materials this equipment is designed or modified to defend against that would cause this equipment to be classified under this entry; and

c. Replacing the last Note of ECCN 1A004 with Technical Notes 1 and 2 to provide additional information about what ECCN 1A004 includes and does not include, as well as providing a technical definition of the term 'simulant'.

ECCN 1A006 is added to the CCL to control "Equipment, specially designed or modified for the disposal of improvised explosive devices, and specially designed components and accessories therefor."

*Rationale:* This ECCN is added to prevent potential terrorists from discovering how to defeat the devices and ensure they are used only by properly vetted end-users.

ECCN 1A007 is added to the CCL to control "Equipment and devices, specially designed to initiate charges and devices containing energetic materials, by electrical means"

*Rationale:* This ECCN is added to prevent potential terrorists from obtaining such devices and ensure they are used by properly vetted end-users.

ECCN 1E001 (development or production technology) is amended by:

a. Adding two new ECCNs 1A006 and 1A007 to the heading to control the "development" and "production" technology for those commodities; and

b. Revising the NS and NP controls to harmonize with the newly added ECCNs.

ECCN 1E201 (use technology) is amended by:

a. Adding 1A007 to the heading to control the "use" technology for NP reasons because 3A232.a was moved to 1A007.a and 1A007.b overlaps with 3A229; and

b. Revising the NP controls to clarify that NP applies only to those portions of the ECCNs that are controlled for NP reasons.

#### **Category 2 Materials Processing**

Technical Notes for 2B001 to 2B009 are amended by removing Notes 5 and 6, and adding new Notes 5 and 6 to

harmonize with the Wassenaar Arrangement's Technical Notes.

ECCN 2B001 (Machine tools) is amended by:

a. Revising the Heading to add "as follows" to harmonize with the Wassenaar Arrangement's List;

b. Redesignating Related Controls, Notes 1 through 3, as Related Controls Notes 2 through 4, and adding a new Note 1 to reference ECCN 2B002 for optical finishing machines;

c. Removing the word "parts" and adding an "or" after paragraph c in Note 2 at the beginning of the items paragraph of the List of Items Controlled section as part of the TFEI revisions, because the word "parts" is superfluous;

d. Removing a comma and the word "characteristics" from 2B001.a as part of the TFEI revisions, to correct the punctuation and remove a superfluous word;

e. Replacing the words "the production of" with "producing", removing the word "characteristics", and changing the outline format of the paragraphs from numeric to alphabetic, and in the Note to 2B001.a as part of the TFEI revisions to improve clarity and readability of this entry;

f. Removing a comma and the word "characteristics" from 2B001.b, 2B001.b.4, and 2B001.c, as part of the TFEI revisions to correct punctuation and remove a superfluous word;

g. Replacing the numeric outline with an alphabetic outline, adding a comma and the word "of" and removing the word "characteristics" in paragraph (a) in the Notes to 2B001.c as part of the TFEI revisions to improve clarity and readability;

h. Adding a comma and removing the word "characteristics" to 2B001.e as part of the TFEI revisions to correct punctuation and remove superfluous word;

i. Replacing the word "which" with "and all of the following" in 2B001.e.2 as part of the TFEI revisions to clarify the entry;

j. Removing the word "have" and capitalizing the word "A" in 2B001.e.2.b as part of the TFEI revisions to clarify the entry; and

k. Replacing the parameter "5,000 mm" with "5 m" in 2B001.f as part of the TFEI revisions to harmonize with Wassenaar style.

ECCN 2B002 (Numerically controlled machine tools using a magnetorheological finishing (MRF) process) is amended by:

a. Removing a comma and adding the phrase "for selective material removal" to the heading to better distinguish finishing tools that only remove

material from selected locations as opposed to polishing tools that are used to improve the finish of an entire surface;

b. Adding a definition for the two new terms "inflatable membrane tool finishing" and "Fluid jet finishing" to the Related Definitions paragraph of the List of Items Controlled section for reasons explained in the Rationale below;

c. Revising the number of axes from "three" to "four" in 2B002.c section for reasons explained in the Rationale below;

d. Adding single quotes around the terms listed in 2B002.d.1

'Magnetorheological finishing (MRF)' and d.2 'Electrorheological finishing (ERF)', because these terms are defined within this ECCN; and

e. Replacing the period with a semi-colon in 2B002.d.3; and adding two new finishing processes: 'Inflatable membrane tool finishing' and 'Fluid jet finishing' in 2B002.d.4 and 2B002.d.5 respectively, for reasons explained in the Rationale below.

**Rationale:** *A common element of finishing machines is that the finishing tool is relatively small compared to the workpiece and makes contact over a small area within the aperture of the workpiece (typically an optical component) at any one point in time, as opposed to traditional finishing/polishing tools that make contact over a large area of the workpiece surface. For this reason, the terms 'sub-aperture finishing' and 'small tool' are sometimes used to describe these machines. Some examples of tools using sub-aperture/small tool processes are Magnetorheological Finishing (MRF), Eletrorheological Finishing (ERF), the Loh AII and Zeeko inflatable membrane, and fluid jet finishing machines. These machines use multiple axes (3-7) to manipulate the finishing tool and Computer Numerical Control (CNC) software to coordinate the axes.*

*Many of the applications of such machines are for flat or spherical components and the software could be restricted to this capability allowing export of less capable machines. These machines use proprietary software capable of producing aspheres or freeform surfaces. However, this software does not have to be part of the machine controller, but can be a standalone item that creates a CNC program for the finishing machine.*

*The free transfer of finishing machines to countries of concern would give those countries an improved ability to produce military critical optical components. An optical finishing machine can produce equal or better*

*quality aspheric optics than controlled diamond turning machines or high precision grinders, and can also produce freeform optics such as wavefront plates and conformal windows. The numerical control provides the ability to produce aspheric and non-spherical optics in minutes to hours as opposed to days of highly skilled labor for manual production. It is for this reason that inflatable membrane tool finishing and fluid jet finishing processes are being added to the CCL.*

ECCN 2B006 (Dimensional inspection or measuring systems and equipment) is amended by:

a. Adding a Note under the Nuclear non-Proliferation (NP) controls in the License Requirements section, stating "NP applies to measuring systems in 2B006.b.1.c that maintain, for at least 12 hours, over a temperature range of  $\pm 1$  K around a standard temperature and at a standard pressure, all of the following: A "resolution" over their full scale of 0.1  $\mu\text{m}$  or less (better); and a "measurement uncertainty" equal to or less (better) than  $(0.2 + L/2,000) \mu\text{m}$  (L is the measured length in mm)."

**Rationale:** *The Nuclear Suppliers Group has not adopted the revisions pertaining to measuring systems in 2B006.b.1.c that the Wassenaar Arrangement has adopted. Therefore, these measuring systems are controlled for nuclear non-proliferation reasons when they meet the criteria that were in place prior to the publication of this rule, which are outlined in the newly added NP note.*

b. Adding single quotes around the term 'Linear displacement' in 2B006.b.1 and replacing the double quotes with single quotes around the same term as it appears in the technical note to 2B006.1, as part of the TFEI revisions, because the term is defined in this ECCN;

c. Removing the word "characteristics" from 2B006.b.1.b as part of the TFEI revisions to remove a superfluous word;

d. Removing the word "or" from 2B006.b.1.b.2 as part of the TFEI revisions for clarity;

e. Revising the temperature parameter in 2B006.b.1.c.2, as explained in the Rationale below;

f. Revising the 'measurement uncertainty' parameter in 2B006.b.1.c.2.b, as explained in the Rationale below;

g. Replacing the period with a semi-colon in 2B006.b.1.d as part of the TFEI revisions to correct the punctuation; and

h. Adding a Note following paragraph 2B006.c that states, "Machine tools, which can be used as measuring

machines, are controlled if they meet or exceed the criteria specified for the machine tool function or the measuring machine function.” to conform to the Wassenaar List.

**Rationale:** Studies into laser interferometers concluded that the value of the measurement uncertainty in 2B006.b.1.c.2.b includes taking into account the refractive index of air in order to achieve a measurement uncertainty of  $0.2 + L/2,000 \mu\text{m}$ . Lasers used in these systems are now extremely stable and contribute very little to the overall measurement uncertainty, whereas the compensation for environmental conditions contribute approximately 4/5 towards the systems measurement uncertainty. Therefore it is important to acknowledge that the system measurement uncertainty includes compensation for the refractive index of air.

The reference to standard pressure in 2B006.b.1.c.2 has been removed as this would be difficult to achieve when testing longer ranges, and compensating for the refractive index of air negates this requirement. However, reference to temperature remains as it has an effect on the systems optics as well as the refractive index of air and contributes to the  $0.2\mu\text{m}$  component of the measurement uncertainty.

The term ‘capable of achieving’ in 2B006.b.1.c.2.b has been introduced to avoid laser interferometer systems being exported with poor environmental sensors in the compensation units, resulting in measurement uncertainty values outside the control parameters, which could then be replaced with compensator units with good environment sensors, making the system’s measurement uncertainty as good as or better than those of the control parameters after export.

ECCN 2B007 (Robots) is amended by:

- Replacing the double quotes with single quotes around the term ‘scene analysis’ in 2B007.a and the Technical Note that follows, as part of the TFEI revisions, because this term is a definition defined within ECCN 2B007, instead of a global definition in part 772 of the EAR;

- Adding the word “potentially” to 2B007.b and adding a Note after 2B007 that excludes robots specially designed for paint-spraying booths from control in this entry. The reason for this change is explained in the rationale below;

- Changing the NP controls from “2B007.b and 2B007.c and to specially designed controllers and ‘end effectors’ therefore” to “equipment that meets or exceeds the criteria in ECCNs 2B207.”

**Rationale:** Robots which can be used for a military purpose and should be

controlled are those with the capability of handling high explosives in potentially explosive atmospheres. To make the meaning of ‘explosive munitions environments’ clear, the term “potentially” is added before ‘explosive munitions environments’. In addition, a new Note to decontrol robots specially designed for paint-spraying booths is added. A spraying robot alone is not considered to be a military concern, and today spraying robots are widely used in automobile manufacturing.

ECCN 2B008 (Assemblies or units, specially designed for machine tools, or dimensional inspection or measuring systems and equipment) is amended by:

- Revising the reference in the Nota Bene (N.B.) following 2B008.a for laser systems from “Note to 2B006.b.1” to “2B006.b.1.c and d.” to conform with linear laser systems in 2B006; and
- Revising the reference in the Nota Bene (N.B.) following 2B008.b for laser systems from “Note to 2B006.b.1” to “2B006.b.2” to conform with rotary systems in 2B006.

### Category 3 Electronics

ECCN 3A001 (Electronic components) is amended by:

- Adding the phrase “and specially designed components therefor” to the heading to match the heading with the scope of the entry as part of the TFEI revisions;

- Revising the GBS paragraph of the License Exceptions section to fix a typographical error, i.e., “TWAS” to “TWTAs”;

- Revising the Note 2 in the Related Controls paragraph of the List of Items Controlled section to harmonize it with the revisions to the Items paragraph of this ECCN;

- Removing the second and third sentences in the “Related Definitions” paragraph of the List of Items Controlled section to harmonize it with the revisions to the Items paragraph of this ECCN;

- Removing paragraph 3A001.e.1.c (space qualified and radiation hardened photovoltaic arrays) in the “items” paragraph of the List of Items Controlled section to move controls to a more appropriate location in e.4, because batteries and photovoltaic devices reflect different technologies;

- Adding a new paragraph 3A001.e.4 and related technical note to the “items” paragraph in the List of Items Controlled section to explicitly list solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays in order to remove any ambiguity in the control of these technologies.

- Removing “neural network integrated circuits” from 3A001.a.2,

which removes the overlapping control between 3A001.a.2 and 3A001.a.9;

- Replacing the period with a semi-colon in 3A001.a.5.a.5 to correct the punctuation as part of the TFEI revisions;

- Adding a comma and an “and” to 3A001.a.6 as part of the TFEI revisions to clarify the meaning of the sentence;

- Adding single quotes around the term ‘field programmable logic devices’ as part of the TFEI revisions to indicate that the definition for this term is located in this entry;

- Revising the type of note from N.B. to Technical Note after the Note to 3A001.a.7 to correct the type of note and to add single quotes around the term ‘field programmable logic devices’ as part of the TFEI revisions to indicate that the definition for this term is located in this entry;

- Replacing the words “which meets” with “and having” and removing the word “characteristics” from Note 1 to 3A001.b.1 and from paragraph b of Note 2 to 3A001.b.1 as part of the TFEI revisions to clarify the entry;

- Replacing the words “which meets” with “having” and removing the word “characteristics” from Note 2 to 3A001.b.1 as part of the TFEI revisions to clarify the entry;

- Adding the word “Tubes” to 3A001.b.1.a.1 and 3A001.b.1.a.2 as part of the TFEI revisions to better describe the commodities;

- Replacing the word “with” with “having” and removing the word “characteristics” in 3A001.b.1.a.4 as part of the TFEI revisions to clarify the entry;

- Adding initial capitalization and double quotes around the term “Monolithic Integrated Circuit” as part of the TFEI revisions because it is an acronym and a defined term in part 772;

- Adding the words “solid state” and a comma after amplifiers in 3A001.b.4 to clarify the text, as described in the Rationale below;

**Rationale for g. through q. above:** In 2003 it was agreed by the Wassenaar Arrangement to update the control text for microwave solid state amplifiers and include text for assemblies containing these amplifiers. The existing control text, as written, goes beyond the original intent to control microwave assemblies/modules containing solid state amplifiers and can be interpreted to control traveling wave tube amplifiers, which are to be controlled as described in 3A001.b.8. The addition of the words solid state to describe the type of amplifiers contained in the microwave assembly will eliminate this interpretation.

r. Adding double quotes around the term “fractional bandwidth” in 3A001.b.4.f.2 as part of the TFEI revisions, because this is a global definition found in part 772;

s. Replacing the period with a semi-colon in 3A001.b.4.f.3 as part of the TFEI revisions to correct the punctuation;

t. Adding an “and” in 3A001.b.5 as part of the TFEI revisions to add clarity to the sentence;

u. Removing the words “Mixers and” and adding the words “and harmonic mixers,” and adding a reference to “3A002.d” in 3A001.b.7, as explained in the Rationale below;

**Rationale:** *As a consequence of the deletion of subparagraph 3A001.b.6 in December 2003, there is ambiguity regarding the distinction between “mixers” “converters” in 3A001.b.7. Prior to December 2003, generic mixers as standalone components were controlled in then-3A001.b.6 (microwave assemblies >31.8 GHz). As part of the deletion of 3A001.b.6, there was a deliberate decision to release controls on mixers that are standalone components. Thus, retention of the word “mixers” in 3A001.b.7 is confusing, and best modified with the term “harmonic mixers,” because such mixers are typically used to extend the frequency range of systems described in 3A002.c, 3A002.d, 3A002.e, and 3A002.f.*

v. Revising the reference in 3A001.b.8 from reading “3A001.b” to read “3A001.b.1” to correct the reference;

w. Adding double quotes around “monolithic integrated circuit”, removing a comma, adding an “and”, and removing the word “characteristics” in 3A001.b.9 as part of the TFEI revisions to clarify the entry and make it clear that “monolithic integrated circuit” is a global definition in part 772 of the EAR;

x. Adding single quotes around the term ‘turn-on time’ in 3A001.b.9.a and Technical Note 2 following paragraph 3A001.b.9.c.2 as part of the TFEI revision, because this term is defined in this entry;

y. Adding the word “having” in 3A001.b.9.c and 3A001.g.2 as part of the TFEI revisions to clarify the entry;

z. Removing the word “having” from 3A001.b.9.c.2 as part of the TFEI revisions to clarify the entry;

aa. Removing the word “control” from Technical Note 1 following paragraph 3A001.b.9.c.2 as part of the TFEI revisions, because the word is superfluous;

bb. Replacing a semi-colon with a comma in Technical Note 2 following paragraph 3A001.b.9.c.2 to fix the

punctuation as part of the TFEI revisions;

cc. Removing commas before and after “as follows” in 3A001.c. to fix punctuation as part of TFEI revisions;

dd. Revising the frequency from “2.5 GHz” to “6 GHz” in 3A001.c.1.a and 3A001.c.1.b, as explained in the rationale below;

ee. Removing the comma in 3A001.c.1.b as part of the TFEI revisions;

ff. Removing a comma and adding an “and” in 3A001.c.1.c and 3A001.e.3 as part of the TFEI revisions to clarify the entry;

gg. Revising the bandwidth from “50 MHz” to “100 MHz” in 3A001.c.1.c.3, as explained in the Rationale below;

hh. Revising the frequency from “1 GHz” to “2.5 GHz” in 3A001.c.2, as explained in the Rationale below;

**Rationale:** *Use of acoustic wave devices in civilian application is indeed becoming predominant between 1 and 6 GHz. However, they usually do not require high rejection and/or high bandwidth. Therefore, this rule has changed the frequency upper limit in paragraphs 3A001.c.1.a and 3A001.c.1.b to 6 GHz without changing bandwidth or rejection. Below 1 GHz, there is an increasing civilian need for bandwidth of 100 MHz, but once again, these civilian applications do not usually require high rejection. Bulk acoustic wave devices above 2.5 GHz are considered military significant (e.g., S-band and X-band radar). Therefore this rule has limited the frequency extension to 2.5 GHz, allowing the exclusion of most of the items used only in civilian applications (2.4 GHz and below) from control in this entry.*

ii. Adding a comma after “materials” and replacing “with” with “and having” in 3A001.d as part of the TFEI revisions to clarify the entry;

jj. Removing the comma in 3A001.e as part of the TFEI revisions to correct the punctuation of the entry;

kk. Adding single quotes around the term ‘Cells’ and removing the comma in 3A001.e.1 as part of the TFEI revisions to indicate that ‘cells’ are defined in the entry and to clarify the entry;

ll. Adding single quotes around the terms ‘primary cells’ and ‘energy density’ in 3A001.e.1.a, 3A001.e.1.b and Technical Note 1 as part of the TFEI revisions, because these terms are defined in the entry;

mm. Adding the abbreviation of “Ah” for the term “ampere-hours” in Technical Note 1 after paragraph 3A001.e.1.b as part of the TFEI revisions to clarify the entry;

nn. Replacing “and” with “an” in front of “electrolyte” in Technical Note

2 after paragraph 3A001.e.1.b to correct grammar as part of the TFEI revisions;

oo. Removing a comma from 3A001.e.2 as part of the TFEI revisions to correct the punctuation in the entry;

pp. Adding an “and” to 3A001.e.2.a and 3A001.e.2.b as part of the TFEI revisions to clarify the entry;

qq. Adding a comma after “solenoids” and replacing a comma with “and” in 3A001.e.3 as part of the TFEI revisions; and, replacing a period with a semi-colon at the end of 3A001.f.2 as part of the TFEI revisions;

rr. Adding single quotes around the term ‘thyristor modules’ and a comma after this term in 3A001.g as part of the TFEI revisions to indicate that these modules are defined in the entry, and replacing a comma with an “and” as part of the TFEI revisions to clarify the entry;

ss. Correcting the numbering of the paragraphs in 3A001.g;

tt. Adding “having” in 3A001.g.2 as part of the TFEI revisions to clarify the entry; and

uu. Adding single quotes around the term ‘thyristor modules’ in Note 2 to 3A001.g as part of the TFEI revisions to indicate that these modules are defined in the entry, and to clarify the entry.

ECCN 3A002 (General purpose electronic equipment) is amended by:

a. Revising the heading to implement the TFEI to clarify the scope of the entry;

b. Revising a reference to “3A002.g.2” to read “3A002.g.1” in the Related Controls paragraph of the List of Items Controlled section to correct this paragraph reference;

c. Removing a comma and adding an “and” to 3A002.a.3, 3A002.a.4, and 3A002.a.6, as well as removing commas from 3A002.a, as part of the TFEI revisions to clarify the entry;

d. Adding single quotes around the term ‘continuous throughput’ in 3A002.a.5.b and 3A002.a.b.6 as part of the TFEI revisions, because it is a defined term within the Technical Note that follows this paragraph;

e. Revising “Technical Note” to read “Technical Notes” and separating the technical note that follows 3A002.a.5.b into two separate Technical Notes and adding single quotes around ‘continuous throughput’ as part of the TFEI revisions, for the purpose of clarity;

f. Adding double quotes around “signal analyzers” in the Note that follows 3A002.b, as part of the TFEI revisions, because this is a global term that is defined in part 772 of the EAR;

g. Adding a hyphen between the words “radio” and “frequency” and

removing a comma in 3A002.c, as part of the TFEI revisions to add clarity;

h. Adding single quotes around the term 'pulse duration' in 3A002.d.1 to indicate this is defined within this ECCN, as part of the TFEI revisions;

i. Removing "the term" from Note 1 after 3A002.d.4 as part of the TFEI revisions to remove superfluous words;

j. Revising 3A002.g (atomic frequency standards) to make adjustments based on technical advancements in this area, as explained in the Rationale below;

**Rationale:** *Precision timing sources enable precision navigation and precision sensor array synchronization. Miniaturized precision timing sources are a potential enabling technology for small unmanned vehicles.*

*Miniaturization has also transformed the applications for which rubidium standards can be used. Advances in technology have now made possible very small atomic clocks—which happen also to be based on energy state transitions of rubidium. Unfortunately, the control text in Category 3 did not anticipate the new technology and specifically exempted all so-called "rubidium clocks" that are not space-qualified from control, thus decontrolling atomic clocks and technology of concern. This revision to 3A002.g is intended to avoid capturing rubidium clocks, which are based on the older lamp-pumped technology, because those clocks require more power to operate. This revision is also intended to control emerging technology (so-called coherent population trapping (CPT) technique or laser-pumped gas cell technique) that has far more significant military applications.*

ECCN 3A229 (Firing Sets) is amended by revising the Related Controls paragraph to add a reference to 1E001 for "development" and "production" technology and 1E201 for "use" technology.

ECCN 3A232 (Detonators and multipoint initiation systems) is amended by:

a. Redesignating Related Controls notes 1 and 2 to 2 and 3, and adding a new note 1 that reads "See 1A007 for electrically driven explosive detonators."; and

b. Removing and reserving 3A232.a and all but the last sentence of the technical note, because electrically driven explosive detonators are now controlled in ECCN 1A007.

ECCN 3B001 (Equipment for manufacturing of semiconductor devices or materials, and specially designed components and accessories therefore) is amended by:

a. Removing a comma from the heading as part of the TFEI revisions to correct punctuation;

b. Adding initial capitalization to the term 'Metal Organic Chemical Vapor Deposition' in 3B001.a.2 as part of the TFEI revisions to correct format and to indicate the meaning of the acronym MOCVD;

c. Removing a comma and adding an 'and' to 3B001.b and 3B001.f.1 as part of the TFEI revisions to correct grammar;

d. Adding 'Chemical Vapor Deposition' in front of the acronym (CVD) in 3B001.d as part of the TFEI revisions to add clarity;

e. Removing the comma after "equipment" in 3B001.f. as part of the TFEI revisions to add clarity;

f. Removing a comma and adding an "and" in 3B001.f.1. as part of the TFEI revisions to add clarity;

g. Adding single quotes around 'minimum resolvable feature size' in 3B001.f.1.b and in the Technical Note that follows, to indicate that this term is defined in the Technical Note that follows that paragraph;

h. Revising 3B001.f.3 (equipment specially designed for mask making or semiconductor device processing) to clarify the scope of the control;

i. Adding a comma to 3B001.g as part of the TFEI revisions, to correct the punctuation; and

j. Replacing the period with a semi-colon at the end of 3B001.h as part of the TFEI revisions to correct the punctuation.

ECCN 3C002 (Resist materials) is amended by:

a. Revising the heading as part of the TFEI revisions, to clarify the scope of the entry; and

b. Revising the reference to "3C002.b through .d" to read "3C002.b through .e" in the eligibility paragraphs for License Exceptions GBS and CIV to reflect the new paragraph 3C002.e; and

c. Adding a new paragraph 3C002.e to control "all resists designed or optimized for use with imprint lithography equipment specified by 3B001.f.2 that use either a thermal or photo-curable process".

**Rationale:** *With the tools used for imprint lithography now being controlled as a result of the 2006 Wassenaar Arrangement agreements, for completeness, the resists materials used with these controlled tools are being controlled through this new paragraph 3C002.e. Resists for imprint lithography equipment is now controlled in the same manner as controls on optical lithography equipment. Resists are indispensable materials for the exposure process in semiconductor*

*manufacturing. These semiconductors are used in many military items.*

ECCN 3C005 (Silicon carbide (SiC) wafers) is amended by revising the heading to add controls resulting from technical advancements and to make technical clarifications, as explained in the Rationale below.

**Rationale:** *Gallium nitride (GaN) transistors have demonstrated performance at power densities well beyond microwave transistors based on gallium arsenide (GaAs). Power levels achieved from GaN transistors have also exceeded by a factor of four to five those obtained from comparable GaAs transistors at frequencies up to 40 GHz.*

*GaN substrates may also be used to produce high brightness Light-Emitting Diodes (LEDs) and semiconductor blue laser diodes. The resistivity parameter (10,000 ohm-cm) of this ECCN was chosen to control GaN substrates and wafers used to produce microwave devices with significant military potential, while excluding GaN substrates and wafers for LED or diode production from control. Substrates for LED or diode production are generally lower in resistivity. Some substrates for commercial microwave products may be controlled under this revision.*

*Aluminum nitride (AlN) substrates have also shown great promise as a substrate for the deposition of GaN epitaxial layers. They possess high thermal conductivity, low thermal expansion mismatch, as well as relatively low lattice mismatch with GaN, and have great potential for use in military high power microwave applications.*

*It is also important to control the ingots and boules of SiC, GaN and AlN that have the resistivity of the wafers sliced from the ingots and boules. Otherwise, there would be a loop-hole in the controls. For this reason, ingots, boules and other preforms of those materials have been added to the Heading of this entry.*

*This revision to ECCN 3C005 also makes a technical clarification, which is also applied to the new ECCN 3C006, noting that the resistivity parameter is a substrate resistivity measurement made at room temperature (20°C).*

ECCN 3C006 is added to control "Substrates" specified in 3C005 with at least one epitaxial layer of silicon carbide, gallium nitride, aluminum nitride or aluminum gallium nitride.

**Rationale:** *A single layer of epitaxy that is of the same material as the substrate should be controlled, as this type of epitaxy ("homo-epitaxy") can be used to make RF devices. Presently, the CCL only controls epitaxy material, which is different than the substrate*

material (“hetero-epitaxy”). The creation of ECCN 3C006 closes this loop-hole by controlling these substrates.

ECCN 3D001 (Development and production software) is amended by changing Related Controls Notes 1 and 2 to conform to the new 3A001 Related Controls for solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays in order to remove any ambiguity in the control of these technologies.

ECCN 3E001 (Development and production technology) is amended by:

- a. Revising the Heading to add ECCN 3A999 to the list of excluded ECCNs controlled by this entry, because this Wassenaar created ECCN did not intend to control ECCN 3A999 items;

- b. Revising the national security control text in the License Requirement section to add ECCN 3C006 in order to control the “development” and “production” technology for this newly controlled commodity;

- c. Removing “The term” from the Technical Note in the Items paragraph of the List of Items Controlled section of 3E001, as part of the TFEI revisions, because these words are superfluous; and

- d. Revising Related Controls Note 2 to conform to the new 3A001 Related Controls for solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays in order to remove any ambiguity in the control of these technologies.

#### Category 5 Part I Telecommunications

ECCN 5A001 (Telecommunications systems, equipment, and components) is amended by:

- a. Adding the words “and accessories” to the heading as part of the TFEI revisions, to more correctly state the scope of this entry;

- b. Replacing a period with a semi-colon in 5A001.a.3 as part of the TFEI revisions, to correct the punctuation;

- c. Revising 5A001.b.1 (underwater communications systems) by adding “untethered” and by adding a new paragraph 5A001.b.1.d to control systems using lasers or light-emitting diodes (LEDs) because of technical advancements for this type of equipment;

**Rationale:** The existing control text in this entry was written years ago and was written with regard to underwater communications technologies which were known at the time. New technologies have emerged that are not specified by the current controls but which have capabilities similar to, or even exceeding, those currently

specified. The addition of paragraph 5A001.b.1.d is necessary to close the loophole for underwater untethered optical communications using laser or LED.

- d. Removing the word “characteristics” from 5A001.b.1, 5A001.b.2, 5A001.b.3, and 5A001.e as a part of the TFEI revisions because it is superfluous;

- e. Replacing a comma with the word “and” in 5A001.b.3 and 5A001.b.4 as part of the TFEI revisions to correct the grammar;

- f. Replacing “1.0 Watt” with “1 W” in the Note to 5A001.b.3 as a part of the TFEI revisions, because this is the standard way of stating such a parameter;

- g. Adding single quotes around the term ‘voice coding’ in 5A001.b.6 and the Technical Note that follows as a part of the TFEI revisions because this term is defined within the entry;

- h. Adding single quotes around the term ‘proof test’ in 5A001.c.1 and the Technical Note that follows as part of the TFEI revisions because this term is defined within the entry;

- i. Adding a comma and replacing the period with a semi-colon in 5A001.c.2 as part of the TFEI revisions to correct the punctuation;

- j. Replacing a period with a semi-colon in 5A001.d. as part of the TFEI revisions to correct punctuation;

- k. Adding initial capitalization to “Microwave Landing Systems” because it is followed by the acronym (MLS) in the Note to 5A001.d and replacing a period with a semi-colon as part of the TFEI revisions;

- l. Adding initial capitalization to “Line Of Bearing” because it is followed by the acronym (LOB) in 5A001.e.2, and replacing the period with a semi-colon to correct the punctuation as part of the TFEI revisions;

- m. Removing the word “cellular” from 5A001.f to account for technical advancements of this equipment;

**Rationale:** Manufacturers are being asked to design jamming equipment for satellite telephony systems that are being used in warfare. The systems are not specially designed for military use. This equipment is not currently controlled by 5A001.f. These systems are being used by insurgents to command and control activity in conflict areas. Therefore, this revision to paragraph 5A001.f is made to expand the scope of control to include jammers for any mobile telecommunications device in order to prevent the users of the equipment from obtaining this type of jamming device, or related technology used to defeat it.

- n. Replacing a comma with an “and” in 5A001.f as part of the TFEI revisions to correct the grammar;

- o. Replacing a period with a semi-colon in 5A001.f.2. as part of the TFEI changes to correct punctuation;

- p. Adding the acronym (PCL) after Passive Coherent Location in 5A001.g as part of the TFEI revisions as this is a commonly used acronym; and

- q. Adding “or” in the note to 5A001.g as part of the TFEI revisions to correct the format.

#### Category 5 Part 2 “Information Security”

ECCN 5A002 (“Information security” systems, equipment and components) is amended by:

- a. Revising the Heading, as part of the TFEI revisions to clarify the scope of the entry;

- b. Adding the words “any of” in the heading of the Note to 5A002 as part of the TFEI revisions to clarify the heading;

- c. Adding “having any of the following” after the word “cards” in paragraph (a)(1) of the Note to 5A002 as part of the TFEI revisions to clarify the text;

- d. Replacing the reference to paragraph f with a reference to paragraph g in paragraph (a)(1) of the Note to 5A002 to harmonize this paragraph with the addition of a new paragraph g in the Note to 5A002;

- e. Adding single quotation marks around the term ‘money transactions’ in paragraph d of the Note to 5A002;

- f. Replacing “N.B.” with “Technical Note” after paragraph 5A002.d and replacing the double quotation marks with single quotation marks around the term ‘money transactions’ in this Technical Note as part of the TFEI changes to add clarity to the text;

- g. Replacing the phrase “that are not capable of end-to-end encryption” with “that are not capable of transmitting encrypted data directly to another radiotelephone or equipment (other than Radio Access Network (RAN) equipment), nor of passing encrypted data through RAN equipment (e.g., Radio Network Controller (RNC) or Base Station Controller (BSC))” in paragraph e of the Note to 5A002 at the beginning of the items paragraph in the List of Items Controlled section;

**Rationale:** This change in paragraph e of the Note to 5A002 clarifies that portable handheld devices (such as 3G cellular phones) providing secure Web browser, e-mail and other encryption capability across networks such as the Internet are controlled by the Wassenaar Arrangement, unless they are otherwise decontrolled as ‘mass market’ products

according to the provisions of the Cryptography Note (Note 3 of Category 5—Part 2). The technical language of this revised Note e clarifies that encrypted phone-to-server (e.g., Internet) connections are treated the same as encrypted phone-to-phone connections. Meanwhile, portable handheld devices (such as 2G cellular phones) where encryption is limited to airlink encryption to base stations (RAN equipment) remain eligible for the provisions of Category 5—Part 2 (ECCN 5A002) Note e.

h. Adding a new paragraph g to the Note to 5A002 to exclude from ECCN 5A002 certain portable or mobile radiotelephones and similar client wireless devices for civil use, as well as adding an “or” to the end of the preceding paragraph f;

**Rationale:** Paragraph g was added to 5A002 to make clear that mass market mobile devices that are adapted for a particular civil industry application, with features that do not involve any changes to the cryptographic functionality of the original device, are not intended to be controlled under ECCN 5A002. Examples of such customized products are CDMA/GSM/GPRS/Wi-Fi (IEEE 802.11)/Bluetooth devices for the transportation (including automotive parts and equipment) and service industries, Personal Digital Assistants (PDAs) and Pocket PCs for health care professionals, and wireless water/gas/electric utility meter readers. These customized products are not intended for retail sale to the general public, and therefore were not clearly excluded from control under previous Category 5 Part 2 text. However, the technical details of the original (non-customized) mass market platforms are not affected by such adaptations for a particular civil application operating over publicly accessible commercial networks.

i. Adding initial capitalization to “Global Navigation Satellite Systems”, adding the acronym (GNSS), and replacing the abbreviation “e.g.” with “i.e.” in the Nota Bene (NB) after 5A002.a, as part of the TFEI revisions to clarify the entry;

j. Adding an “and” in 5A002.a.1 as part of the TFEI revisions to clarify the entry;

k. Adding an “and” and removing “characteristics” from 5A002.a.6 as part of the TFEI revisions to clarify the entry; and

l. Adding initial capitalization to “Quantum Key Distribution” in Technical Note 2 after 5A002.a.9, as part of the TFEI revisions to clarify the term in the entry.

## Category 6 Sensors

ECCN 6A001 (Acoustics) is amended by:

a. Revising the Heading as part of the TFEI revisions to clarify the scope of the entry;

b. Removing a comma and adding an “and” in 6A001.a.1.a, as part of the TFEI revisions for clarity;

c. Removing the word “Being” in 6A001.a.1.a.1, 6A001.a.1.a.2, and 6A001.a.1.a.3, as part of the TFEI revisions for clarity;

d. Removing a comma and adding an “and” in 6A001.a.1.c, as part of the TFEI revisions for clarity;

e. Adding single quotes around the term ‘acoustic power density’ in 6A001.a.1.c.2 and the Technical Note that follows 6A001.a.1.c.2 to indicate that the term is defined within the entry, as well as correcting unit of measurement “Mw” to read “mW”, as part of the TFEI revisions;

f. Adding a comma in 6A001.a.1.d, as part of the TFEI revisions;

g. Deleting the word “characteristics” from 6A001.a.2.a. as part of the TFEI revisions;

h. Removing the “or” at the end of 6A001.a.2.a.3.a, as part of the TFEI revisions;

i. Adding single quotes around the terms ‘Piezoelectric polymer films’, ‘flexible piezoelectric composites’, ‘hydrophone sensitivity’ in 6A001.a.2.a.3.b, 6A001.a.2.a.3.c, and 6A001.a.2.a.4, respectively, to indicate these terms are defined within the entry, as part of the TFEI revisions;

j. Removing the word “When” in 6A001.a.2.a.5, as part of the TFEI revisions for clarity;

k. Adding single quotes around the term ‘hydrophone sensitivity’ in Technical Note 3 that follows 6A001.a.2.a.6 to indicate that the term is defined in the entry, as part of the TFEI revisions;

l. Replacing double quotation marks around the phrase “able to be modified” with single quotations marks in the Technical Note after 6A001.a.2.b.2 as part of the TFEI revisions;

m. Replacing the double quotes with single quotes around the term “able to be modified” in the technical note after a.2.b.2, because the term is locally defined in the ECCN;

n. Adding a comma after the word “systems” in 6A001.a.2.e as part of the TFEI changes to add clarity to the text;

o. Removing and reserving paragraph 6A001.a.2.b.6 as explained in the Rationale below;

**Rationale:** Paragraph 6A001.a.2.b.6 is removed because the depth control of the streamer itself, combined with the

control on hydrophones that already exist in 6A001.a.2.b.2 are robust enough to cover the multiplexer module depth limit.

p. Revising “Correlation-velocity sonar log equipment” to read “Correlation-velocity and Doppler-velocity sonar log equipment”, adding “as follows” to 6A001.b, and moving the parameter “at distances between the carrier and the sea bed exceeding 500 m” from 6A001.b to a new paragraph 6A001.b.1.a as explained in the Rationale below;

q. Adding two new paragraphs: 6A001.b.1 for correlation-velocity sonar log equipment, and 6A001.b.2 for doppler-velocity sonar equipment, as well as adding 2 new exclusion notes as explained in the Rationale below.

**Rationale:** The revision to 6A001.b and the addition of 6A001.b.1 and 6A001.b.2 were necessary because velocity sonar logs can be either correlation-velocity sonar logs (CVSL) or Doppler-velocity sonar logs (DVSL). They are being used increasingly in both commercial and military underwater applications. Although the specific techniques used by the CVSL and DVSL are different, they both determine the horizontal speed of surface vessels, underwater vehicles or swimmers in both fore and aft and athwartship (at right angles).

ECCN 6A005 (Lasers) is amended by:

a. Revising the citation “6A005.b.2, b.3, or b.4” to read “6A005.a.4, b.2, b.3, b.4” in paragraph g of the License Requirements Note to correct an oversight; and

b. Revising the text in the GBS and CIV paragraphs of the License Exception section to match the license exception eligibility in place prior to the November 5, 2007 **Federal Register** publication of the 2006 Wassenaar implementation regulation (72 FR 62524) and to correct an error.

**Rationale:** Dye and liquid lasers controlled by 6A005.c.3, except for a pulsed single longitudinal mode oscillator having an average output power exceeding 1W and a repetition 1 kHz if the pulse duration is less than 100 ns, were eligible for License Exception GBS and CIV prior to the 11/05/07 publication. When ECCN 6A005 was completely revised in the November 5, 2007 **Federal Register** publication these lasers were inadvertently removed from being eligible for License Exceptions GBS and CIV. This rule corrects that error.

ECCN 6A995 is amended by correcting the reference “6A995.e.1.b” to read “6A995.e.2.b” in the Note following 6A995.e.2.b.



**Category 7 Navigation and Avionics**

ECCN 7A002 (Gyros or angular rate sensors) is amended by replacing the term “drift rate” with “bias” in 7A002.a and 7A002.c.1 in the Items paragraph of the List of Items Controlled section, as explained below.

**Rationale:** The “bias” component of “drift rate” is the error term that is usually listed on the manufacturer’s specification sheets. Although “drift rate”, “stability”, and “bias” “stability” are sometimes used interchangeably, “bias” “stability” is more often used on the gyro data sheet.

ECCN 7A003 (Inertial Systems and specially designed components therefor) is amended by:

a. Adding the word “navigation” to the listed purposes: attitude, guidance or control in 7A003.a and 7A003.b for clarification;

b. Adding double quotation marks around “Circular Error Probable” and “CEP” in 7A003.a.1 and 7A003.b as part of the TFEI changes to clarify the text;

c. Removing the Technical Note 2 at the end of 7A003, and adding the definition for “Circular Error Probable (“CEP”)” to the definition section 772.1 of the EAR, because this term is used in both 7A003 and 7A008;

d. Revising certain terms used in 7A003.c and 7A003.c.1 to more commonly used terms, because removed terms are not usually specified on data sheets;

e. Changing the “e” in “equipment” and the “h” in heading from upper case to lower case and deleting the word “characteristics” in 7A003.c. as part of the TFEI revisions to clarify the text;

f. Changing “RMS” and “Heading” from upper case to lower case in 7A003.c.1. as part of the TFEI revisions to clarify the text;

g. Replacing the period with a semi-colon in 7A003.a.2, b., and c.2, as part of the TFEI revisions to correct the punctuation;

h. Deleting the comma after “msec” in 7A003.c.2. as part of the TFEI changes to clarify the text;

i. Revising the outline format from numeric to alphabetic and adding the words “all of” in Note 1.a, as part of the TFEI revisions for clarity;

j. Replacing “half”, “one and a half” and “three” with numeric notation in Note 1.a. as part of the TFEI revision for clarity;

k. Capitalizing “Power Spectral Density” to signify the acronym “PSD” in Note 1.a.1. as part of the TFEI revision to clarify the text;

l. Replacing “A roll and yaw rate” with “An angular rate capability about one or more axes” in Note 1.b in Note

1 to include pitch, as well as roll and yaw, and to clarify that angular rate capability is the parameter of concern; and

m. Replacing references to “1” and “2” with “a” and “b” in new sub-entry “c” of Note 1 to conform with the changed outline format as part of the TFEI revisions.

ECCN 7A008 (Underwater sonar navigation systems) is amended:

a. Deleting the comma and adding “and” after “source” in the heading as part of the TFEI changes to clarify the text;

b. Adding double quotes around the term “Circular Error Probable (“CEP”)” in the heading, because this rule adds this term to section 772.1 of the EAR;

c. Revising “Correlation-velocity sonar log equipment” to read “Correlation-velocity and Doppler-velocity sonar log equipment” in the Nota Bene to correspond with the revision in 6A001.b.1.a.

**Category 9 Propulsion Systems, Space Vehicles and Related Equipment**

ECCN 9A012 (Non-military “unmanned aerial vehicles,” (“UAVs”), associated systems, equipment and components) is amended by:

a. Adding a comma to the Heading as part of the TFEI revisions to correct the punctuation;

b. Replacing a period with a semi-colon in 9A012.a.2 and 9A012.b.3, as part of the TFEI revisions to correct the punctuation;

c. Adding a comma after “components” in 9A012.b. as part of the TFEI revisions to correct the punctuation; and

d. Adding a new paragraph 9A012.b.4 for “Air breathing reciprocating or rotary internal combustion type engines \* \* \*” as explained in the Rationale below.

**Rationale:** Paragraph 9A012.b.4 is added because commercial and military UAVs are increasingly used in a wider range of application types and in steadily increasing numbers. As a result, UAV engine designs have also broadened to include reciprocating systems. Modern reciprocating engine technology including use of turbochargers can enable UAVs to reach altitudes exceeding 60,000 feet.

ECCN 9E003 (Other “technology”) is amended by:

a. Removing a comma in the Heading, as part of the TFEI revisions to correct the punctuation;

b. Adding a comma and an “and” in 9E003.a.1, as part of the TFEI revisions for clarity;

c. Replacing a period with a semi-colon in 9E003.a.3.c, as part of the TFEI revisions to correct the punctuation;

d. Adding “total (stagnation)” and “at sea-level static take-off (ISA) in a ‘steady state mode’ of engine operation” to 9E003.a.4 and 9E003.a.5 for clarification, as well as adding a

Technical Note to define the term ‘steady state mode’ within the ECCN;

e. Adding a comma in 9E003.b.2 as part of the TFEI revisions to correct the punctuation;

f. Adding the term “Electro-Chemical Machining” and parentheses around the acronym “ECM”, and adding the term “Electrical Discharge Machines” and parentheses around the acronym “EDM” in 9E003.c, as part of the TFEI revisions to clarify the entry and the related term;

g. Deleting the term “sets of characteristics” and adding single quotes around the term ‘Incidence angles’ in 9E003.c.1.c and 9E003.c.2.c, as part of the TFEI revisions, because it is defined within the entry’s Technical Note that follows 9E003.c.2.c;

h. Removing the article “A” and adding single quotes around the term ‘Box volume’ in 9E003.e.1 and 9E003.e.3, as part of the TFEI revisions for clarity and to indicate the term is defined within the entry;

i. Adding single quotes around the term ‘Box volume’, and replacing a colon with the word “is” in the Technical Note that follows 9E003.e.3, as part of the TFEI revisions for clarity and to indicate that ‘Box volume’ is defined within the entry;

j. Adding the words “any of” to the width and height statements in the Technical Note that follows 9E003.e.3, as part of the TFEI revisions for clarity;

k. Adding a comma and the words “as follows” in 9E003.f, as part of the TFEI revisions for clarity;

l. Adding the word “and” in 9E003.f.2, as part of the TFEI revisions for clarity;

m. Deleting a comma and removing the article “A” in 9E003.f.2.b, as part of the TFEI revisions for clarity;

n. Replacing a comma with an “and” and replacing the word “both” with “all” in 9E003.f.3, as part of the TFEI revisions for clarity;

o. Moving the words “Specially designed” from in front of the phrase “electronic control features” to behind this phrase in 9E003.f.3.b, as part of the TFEI revisions to clarify the scope of the control;

p. Adding single quotes around the term ‘high output diesel engines’, replacing a comma with an “and”, and replacing a period with a semi-colon in 9E003.g, as part of the TFEI revisions to indicate the term is defined in the entry and to correct the punctuation; and

q. Adding a Technical Note after 9E003.g that defines 'high output diesel engines' within the entry to conform to the Wassenaar Dual-Use List.

#### Part 740 "License Exceptions"

Supplement No. 1 to Section 740.11 "License Exception GOV" is amended by making minor editorial revisions, such as removing text and inserting "consisting of" and "controlled by" as clarifying text under paragraph (a)(1)(i), that conform to the Wassenaar Arrangement edits on the Very Sensitive List.

#### Definitions in Part 772

Section 772.1 is amended by:

a. Revising the definition of the term "Bias" (accelerometer), as set forth below;

b. Adding in alphabetical order the term "Bias" (gyro), as set forth below;

**Rationale:** The "bias" component of "drift rate" is the error term that is usually listed on the manufacturer's specification sheets. Although "drift rate" "stability" and "bias" "stability" are sometimes used interchangeably, "bias" "stability" is more often used on the gyro data sheet. "Bias" "stability" is a more appropriate control parameter for gyros.

c. Adding in alphabetical order the term "Circular Error Probable" ("CEP"), because this term is found in both 7A003 and 7A008, as set forth below;

d. Adding after "compound rotary table" the new term "III/V compounds", as set forth below; and

e. Removing the term "Drift rate" (gyro), because this term is replaced by the new "bias" (gyro) definition, see rationale above.

Although the Export Administration Act expired on August 20, 2001, the President, through Executive Order 13222 of August 17, 2001, 3 CFR, 2001 Comp., p. 783 (2002), as extended by the Notice of July 23, 2008, 73 FR 43603 (July 25, 2008), has continued the Export Administration Regulations in effect under the International Emergency Economic Powers Act.

#### Saving Clause

Shipments of items removed from license exception eligibility or eligibility for export or reexport without a license as a result of this regulatory action that were on dock for loading, on lighter, laden aboard an exporting or reexporting carrier, or en route aboard a carrier to a port of export or reexport, on October 14, 2008, pursuant to actual orders for export or reexport to a foreign destination, may proceed to that destination under the previous license exception eligibility or without a license

so long as they have been exported from the United States or reexported before December 15, 2008. Any such items not actually exported or reexported before midnight, on December 15, 2008, require a license in accordance with this regulation.

#### Rulemaking Requirements

1. This final rule has been determined to be not significant for purposes of Executive Order 12866.

2. Notwithstanding any other provision of law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*) (PRA), unless that collection of information displays a currently valid Office of Management and Budget (OMB) Control Number. This rule involves two collections of information subject to the PRA. One of the collections has been approved by OMB under control number 0694 0088, "Multi Purpose Application," and carries a burden hour estimate of 58 minutes for a manual or electronic submission. The other of the collections has been approved by OMB under control number 0694 0106, "Reporting and Recordkeeping Requirements under the Wassenaar Arrangement," and carries a burden hour estimate of 21 minutes for a manual or electronic submission. Send comments regarding these burden estimates or any other aspect of these collections of information, including suggestions for reducing the burden, to Jasmeet Sehra, OMB Desk Officer, by e-mail at [jsehra@omb.eop.gov](mailto:jsehra@omb.eop.gov) or by fax to (202) 395-7285; and to the Office of Administration, Bureau of Industry and Security, Department of Commerce, 14th and Pennsylvania Avenue, NW., Room 6622, Washington, DC 20230.

3. This rule does not contain policies with Federalism implications as that term is defined under Executive Order 13132.

4. This rule is exempt for the provisions of the Administrative Procedure Act (5 U.S.C. 553) requiring notice of proposed rulemaking and opportunity for public comment pursuant to 5 U.S.C. 553(a)(1) because this regulation involves a military and foreign affairs function of the United States. No other law requires that a notice of proposed rulemaking and an opportunity for public comment be given for this final rule. Accordingly, the analytical requirements of the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) are not applicable, so no regulatory flexibility analysis is required

and none has been prepared. Therefore, this regulation is issued in final form. Although there is no formal comment period, public comments on this regulation are welcome on a continuing basis. Comments should be submitted to the Regulatory Policy Division, Bureau of Industry and Security, Department of Commerce, 14th & Pennsylvania Ave., NW., Room 2705, Washington, DC 20230.

#### List of Subjects

15 CFR Part 740

Administrative practice and procedure, Exports, Reporting and recordkeeping requirements.

15 CFR Part 772

Exports.

15 CFR Part 774

Exports, Reporting and recordkeeping requirements.

■ Accordingly, Parts 740, 772 and 774 of the Export Administration Regulations (15 CFR Parts 730-774) are amended as follows:

#### PART 740—[AMENDED]

■ 1. The authority citations for Part 740 continue to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 22 U.S.C. 7201 *et seq.*; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228; E.O. 13222, 66 FR 44025, 3 CFR, 2001 Comp., p. 783; Notice of July 23, 2008, 73 FR 43603 (July 25, 2008).

■ 2. Supplement No. 1 to § 740.11 is amended by revising paragraph (a)(1)(i) to read as follows:

**§ 740.11 Governments, international organization, and international inspections under the chemical weapons convention (GOV).**

\* \* \* \* \*

#### Supplement No. 1 to § 740.11— Additional Restrictions on use of License Exception GOV

(a) \* \* \*

(1) \* \* \*

(i) "Composite" structures or laminates controlled by 1A002.a, consisting of an organic "matrix" and materials controlled by 1C010.c or 1C010.d; and

\* \* \* \* \*

#### PART 772—[AMENDED]

■ 3. The authority citations for Part 772 continue to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; E.O. 13222, 66 FR 44025, 3 CFR, 2001 Comp., p. 783; Notice of July 23, 2008, 73 FR 43603 (July 25, 2008).

- 4. Section 772.1 is amended by:
  - a. Revising the definition of the term “Bias (accelerometer)”, as set forth below;
  - b. Adding in alphabetical order the term “Bias (gyro)”, as set forth below;
  - c. Adding in alphabetical order the term “Circular Error Probable” (“CEP”), as set forth below;
  - d. Adding after “compound rotary table” the new term “III/V compounds”, as set forth below; and
  - e. Removing the term “Drift rate (gyro)”.

**§ 772.1 Definitions of Terms as Used in the Export Administration Regulations (EAR).**

\* \* \* \* \*

“Bias”. (accelerometer) (Cat 7) The average over a specified time of accelerometer output measured at specified operating conditions that has no correlation with input acceleration or rotation. “Bias” is expressed in [m/s<sup>2</sup>, g]. (IEEE Std 528–2001) (Micro g equals 1 × 10<sup>-6</sup> g).

“Bias”. (gyro) (Cat 7) The average over a specified time of gyro output measured at specified operating conditions that has no correlation with input rotation or acceleration. “Bias” is typically expressed in degrees per hour (deg/hr). (IEEE Std 528–2001).

\* \* \* \* \*

“Circular Error Probable” (“CEP”). (Cat 7) In a circular normal distribution, the radius of the circle containing 50 percent of the individual measurements being made, or the radius of the circle within which there is a 50 percent probability of being located.

\* \* \* \* \*

“III/V compounds”. (Cat 3 and 6) Polycrystalline or binary or complex monocrystalline products consisting of elements of groups IIIA and VA of Mendeleev’s periodic classification table (e.g., gallium arsenide, gallium-aluminum arsenide, indium phosphide).

**PART 774—[AMENDED]**

- 5. The authority citations for Part 774 continue to read as follows:
 

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 10 U.S.C. 7420; 10 U.S.C. 7430(e); 22 U.S.C. 287c, 22 U.S.C. 3201 *et seq.*; 22 U.S.C. 6004; 30 U.S.C. 185(s), 185(u); 42 U.S.C. 2139a; 42 U.S.C. 6212; 43 U.S.C. 1354; 46 U.S.C. app. 466c; 50 U.S.C. app. 5; 22 U.S.C. 7201 *et seq.*; 22 U.S.C. 7210; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228; E.O. 13222, 66 FR 44025, 3 CFR, 2001 Comp., p. 783; Notice of July 23, 2008, 73 FR 43603 (July 25, 2008).

- Supplement No. 1 to Part 774—[Amended]**
- 6. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 1 Materials, Chemicals, Microorganisms, and Toxins, Export Control Classification Number (ECCN) 1A004 is amended by revising the Related Definitions and Items paragraphs in the List of Items Controlled section, to read as follows:

**1A004 Protective and detection equipment and components not specially designed for military use as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

*Unit:* \* \* \*

*Related Controls:* \* \* \*

*Related Definitions:* (1) “adapted for use in war” means: Any modification or selection (such as altering purity, shelf life, virulence, dissemination characteristics, or resistance to UV radiation) designed to increase the effectiveness in producing casualties in humans or animals, degrading equipment or damaging crops or the environment. (2) “Riot control agents” are substances which, under the expected conditions of use for riot control purposes, produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure. (Tear gases are a subset of “riot control agents”.)

*Items:*

- a. Gas masks, filter canisters and decontamination equipment therefor, designed or modified for defense against any of the following, and specially designed components therefor:

1. Biological agents “adapted for use in war”;
2. Radioactive materials “adapted for use in war”;
3. Chemical warfare (CW) agents; *or*
4. “Riot control agents”, as follows:
  - a. Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (CAS 5798–79–8);
  - b. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenediamalonitrile) (CS) (CAS 2698–41–1);
  - c. 2-Chloro-1-phenylethanone, Phenylacetyl chloride (-chloroacetophenone) (CN) (CAS 532–27–4);
  - d. Dibenz-(b,f)-1,4-oxazepine, (CR) (CAS 257–07–8);
  - e. 10-Chloro-5,10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (CAS 578–94–9);
  - f. N-Nonanoylmorpholine, (MPA) (CAS 5299–64–9);
- b. Protective suits, gloves and shoes, specially designed or modified for defense against any of the following:
  1. Biological agents “adapted for use in war”;
  2. Radioactive materials “adapted for use in war”; *or*
  3. Chemical warfare (CW) agents;
  - c. Nuclear, biological and chemical (NBC) detection systems, specially designed or

modified for detection or identification of any of the following, and specially designed components therefor:

1. Biological agents “adapted for use in war”;
  2. Radioactive materials “adapted for use in war”; *or*
  3. Chemical warfare (CW) agents.
- Note:** 1A004 does not control:
- a. Personal radiation monitoring dosimeters;
  - b. Equipment limited by design or function to protect against hazards specific to civil industries, such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or to the food industry.

**Technical Notes**

1. ECCN 1A004 includes equipment and components that have been identified, successfully tested to national standards or otherwise proven effective, for the detection of or defense against radioactive materials “adapted for use in war”, biological agents “adapted for use in war”, chemical warfare agents, “simulants” or “riot control agents”, even if such equipment or components are used in civil industries such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or the food industry.
2. “Simulant”: A substance or material that is used in place of toxic agent (chemical or biological) in training, research, testing or evaluation.

- 7. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 1 Materials, Chemicals, Microorganisms, and Toxins, Export Control Classification Number (ECCN) 1A006 is added after 1A005, to read as follows:

**1A006 Equipment, specially designed or modified for the disposal of improvised explosive devices, as follows (see List of Items Controlled), and specially designed components and accessories therefor.**

**License Requirements**

*Reason for Control:* NS, AT

Control(s)	Country chart
NS applies to entire entry .....	NS Column 2.
AT applies to entire entry .....	AT Column 1.

**License Requirement Note:** 1A006 does not apply to equipment when accompanying its operator.

**License Exceptions**

- LVS: N/A
- GBS: N/A
- CIV: N/A

**List of Items Controlled**

*Unit:* \$ value

*Related Controls:* Equipment specially designed for military use for the disposal of improvised explosive devices is subject to the export licensing jurisdiction of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121, Category IV).

*Related Definitions:* ‘Disruptors’—Devices specially designed for the purpose of

preventing the operation of an explosive device by projecting a liquid, solid or frangible projectile.

**Items:**

- a. Remotely operated vehicles;
- b. 'Disruptors'.

■ 8. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 1 Materials, Chemicals, Microorganisms, and Toxins, Export Control Classification Number (ECCN) 1A007 is added after 1A006, to read as follows:

**1A007 Equipment and devices, specially designed to initiate charges and devices containing energetic materials, by electrical means, as follows (see List of Items Controlled).**

**License Requirements**

Reason for Control: NS, NP, AT

Control(s)	Country chart
NS applies to entire entry ..... NP applies to 1A007.b, as well as 1A007.a when the detonator firing set meets or exceeds the parameters of 3A229.	NS Column 2. NP Column 1.
AT applies to entire entry .....	AT Column 1.

**License Requirement Note:** 1A007 does not apply to equipment when accompanying its operator.

**License Exceptions**

- LVS: N/A
- GBS: N/A
- CIV: N/A

**List of Items Controlled**

*Unit:* \$ value

**Related Controls:** High explosives and related equipment specially designed for military use is subject to the export licensing jurisdiction of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121). This entry does not control detonators using only primary explosives, such as lead azide. See also 3A229. See 1E001 for "development" and "production" technology controls, and 1E201 for "use" technology controls.

**Related Definitions:** N/A

**Items:**

- a. Explosive detonator firing sets designed to drive explosive detonators specified by 1A007.b;
- b. Electrically driven explosive detonators

as follows:

- b.1. Exploding bridge (EB);
- b.2. Exploding bridge wire (EBW);
- b.3. Slapper;
- b.4. Exploding foil initiators (EFI).

**Technical Notes**

1. The word *initiator* or *igniter* is sometimes used in place of the word *detonator*.

2. For the purpose of 1A007.b the detonators of concern all utilize a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporizes when a fast, high-current electrical pulse is passed through it. In non-slapper types, the exploding conductor starts a chemical

*detonation in a contacting high explosive material such as PETN (pentaerythritoltetranitrate). In slapper detonators, the explosive vaporization of the electrical conductor drives a flyer or slapper across a gap, and the impact of the slapper on an explosive starts a chemical detonation.*

*The slapper in some designs is driven by magnetic force. The term exploding foil detonator may refer to either an EB or a slapper-type detonator. Also, the word initiator is sometimes used in place of the word detonator.*

■ 9. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 1 Materials, Chemicals, Microorganisms, and Toxins, Export Control Classification Number (ECCN) 1E001 is amended by revising the Heading and the NS Column 1 and the NP paragraph of the License Requirements section, to read as follows:

**1E001 "Technology" according to the General Technology Note for the "development" or "production" of items controlled by 1A001.b, 1A001.c, 1A002, 1A003, 1A004, 1A005, 1A006, 1A007, 1A101, 1B (except 1B999), or 1C (except 1C355, 1C980 to 1C984, 1C988, 1C990, 1C991, 1C992, 1C995 to 1C999).**

**License Requirements**

\* \* \* \* \*

Control(s)	Country chart
NS applies to "technology" for items controlled by 1A001.b and .c, 1A002, 1A003, 1A005, 1A006, 1A007, 1B001 to 1B003, 1B018, 1C001 to 1C011, or 1C018.	NS Column 1.
* * * * *	
NP applies to "technology" for items controlled by 1A002, 1A007, 1B001, 1B101, 1B201, 1B225 to 1B233, 1C002, 1C010, 1C116, 1C202, 1C210, 1C216, 1C225 to 1C240 for NP reasons.	NP Column 1.
* * * * *	

■ 10. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 1 Materials, Chemicals, Microorganisms, and Toxins, Export Control Classification Number (ECCN) 1E201 is amended by revising the Heading and the NP paragraph of the License Requirements section, to read as follows:

**1E201 "Technology" according to the General Technology Note for the "use" of items controlled by 1A002, 1A007, 1A202, 1A225 to 1A227, 1B201, 1B225 to 1B232, 1B233.b, 1C002.a.2.c or .d, 1C010.a, 1C010.b, 1C010.e.1, 1C202, 1C210, 1C216, 1C225 to 1C240 or 1D201.**

**License Requirements**

\* \* \* \* \*

Control(s)	Country Chart
NP applies to entire entry, for items controlled for NP reasons.	NP Column 1.

\* \* \* \* \*

■ 11. Supplement No. 1 to Part 774 (the Commerce Control List), Category 2 Materials Processing, Group B Test, Inspection and Production Equipment, technical notes for 2B001 to 2B009 are amended by revising Notes 5 and 6 to read as follows:

**B. Test, Inspection and Production Equipment**

**Technical Notes for 2B001 to 2B009:**

\* \* \* \* \*

5. The positioning accuracy of "numerically controlled" machine tools is to be determined and presented in accordance with ISO 230/2 (1988).

6. 'Stated positioning accuracy' levels derived from measurements made according to ISO 230/2 (1988) may be used for each specific machine model as an alternative to individual machine tests. 'Stated positioning accuracy' means the accuracy value provided to BIS as representative of the accuracy of a specific machine model.

Determination of 'Stated Positioning Accuracy'

- a. Select five machines of a model to be evaluated;
- b. Measure the linear axis accuracies according to ISO 230/2 (1988);
- c. Determine the A-values for each axis of each machine. The method of calculating the A-value is described in the ISO standard;
- d. Determine the mean value of the A-value of each axis. This mean value A becomes the stated value of each axis for the model (Ax Ay \* \* \*);
- e. Since the Category 2 list refers to each linear axis there will be as many stated values as there are linear axes;
- f. If any axis of a machine model not controlled by 2B001.a. to 2B001.c. has a stated accuracy A of 6 microns for grinding machines and 8 microns for milling and turning machines or better, the builder should be required to reaffirm the accuracy level once every eighteen months.

\* \* \* \* \*

■ 12. Supplement No. 1 to Part 774 (the Commerce Control List), Category 2 Materials Processing, Export Control Classification Number (ECCN) 2B001 is amended by revising the Heading, and the Related Controls and Items

\* \* \* \* \*

paragraph in the List of Items Controlled section to read as follows:

**2B001 Machine tools and any combination thereof, for removing (or cutting) metals, ceramics or "composites", which, according to the manufacturer's technical specifications, can be equipped with electronic devices for "numerical control"; and specially designed components as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

Unit: \* \* \*

*Related Controls:* (1) See ECCN 2B002 for optical finishing machines. (2) See ECCNs 2D001 and 2D002 for software for items controlled under this entry. (3) See ECCNs 2E001 ("development"), 2E002 ("production"), and 2E201 ("use") for technology for items controlled under this entry. (4) Also see ECCNs 2B201, 2B290, and 2B991.

*Related Definitions:* \* \* \*

*Items:*

**Note 1:** 2B001 does not control special purpose machine tools limited to the manufacture of gears. For such machines, see 2B003.

**Note 2:** 2B001 does not control special purpose machine tools limited to the manufacture of any of the following:

- a. Crank shafts or cam shafts;
- b. Tools or cutters;
- c. Extruder worms; or
- d. Engraved or faceted jewellery parts.

**Note 3:** A machine tool having at least two of the three turning, milling or grinding capabilities (e.g., a turning machine with milling capability), must be evaluated against each applicable entry 2B001.a., b. or c.

- a. Machine tools for turning having all of the following:
  - a.1. Positioning accuracy with "all compensations available" of less (better) than 6 µm along any linear axis; and
  - a.2. Two or more axes which can be coordinated simultaneously for "contouring control";

**Note:** 2B001.a does not control turning machines specially designed for producing contact lenses, having all of the following:

- a. Machine controller limited to using ophthalmic based software for part programming data input; and
- b. No vacuum chucking.
- b. Machine tools for milling having any of the following:
  - b.1. Having all of the following:
    - b.1.a. Positioning accuracy with "all compensations available" of less (better) than 6 µm along any linear axis; and
    - b.1.b. Three linear axes plus one rotary axis which can be coordinated simultaneously for "contouring control";
  - b.2. Five or more axes which can be coordinated simultaneously for "contouring control";
  - b.3. A positioning accuracy for jig boring machines, with "all compensations available", of less (better) than 4 µm along any linear axis; or
  - b.4. Fly cutting machines having all of the following:

- b.4.a. Spindle "run-out" and "camming" less (better) than 0.0004 mm TIR; and
- b.4.b. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over 300 mm of travel.
- c. Machine tools for grinding having any of the following:
  - c.1. Having all of the following:
    - c.1.a. Positioning accuracy with "all compensations available" of less (better) than 4 µm along any linear axis; and
    - c.1.b. Three or more axes which can be coordinated simultaneously for "contouring control"; or
  - c.2. Five or more axes which can be coordinated simultaneously for "contouring control";

**Notes:** 2B001.c does not control grinding machines, as follows:

- a. Cylindrical external, internal, and external-internal grinding machines, having all of the following:
  - 1. Limited to cylindrical grinding; and
  - 2. Limited to a maximum workpiece capacity of 150 mm outside diameter or length.
- b. Machines designed specifically as jig grinders that do not have a z-axis or a w-axis, with a positioning accuracy with "all compensations available" less (better) than 4 µm.
- c. Surface grinders.

- d. Electrical discharge machines (EDM) of the non-wire type which have two or more rotary axes which can be coordinated simultaneously for "contouring control";
- e. Machine tools for removing metals, ceramics or "composites", having all of the following:
  - e.1. Removing material by means of any of the following:
    - e.1.a. Water or other liquid jets, including those employing abrasive additives;
    - e.1.b. Electron beam; or
    - e.1.c. "Laser" beam; and
  - e.2. Having two or more rotary axes and all of the following:
    - e.2.a. Can be coordinated simultaneously for "contouring control"; and
    - e.2.b. A positioning accuracy of less (better) than 0.003°;
  - f. Deep-hole-drilling machines and turning machines modified for deep-hole-drilling, having a maximum depth-of-bore capability exceeding 5 m and specially designed components therefor.

■ 13. Supplement No. 1 to Part 774 (the Commerce Control List), Category 2 Materials Processing, Export Control Classification Number (ECCN) 2B002 is amended by revising the Heading, and the Related Definitions and Items paragraphs in the List of Items Controlled section to read as follows:

**2B002 Numerically controlled optical finishing machine tools equipped for selective material removal to produce non-spherical optical surfaces having all of the following characteristics (See List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Related Definitions:* For the purposes of 2B002, 'MRF' is a material removal process using an abrasive magnetic fluid whose viscosity is controlled by a magnetic field. 'ERF' is a removal process using an abrasive fluid whose viscosity is controlled by an electric field. 'Energetic particle beam finishing' uses Reactive Atom Plasmas (RAP) or ion-beams to selectively remove material. 'Inflatable membrane tool finishing' is a process that uses a pressurized membrane that deforms to contact the workpiece over a small area. 'Fluid jet finishing' makes use of a fluid stream for material removal.

*Items:*

- a. Finishing the form to less (better) than 1.0 µm;
- b. Finishing to a roughness less (better) than 100 nm rms;
- c. Four or more axes which can be coordinated simultaneously for "contouring control"; and
- d. Using any of the following processes:
  - d.1. 'Magnetorheological finishing (MRF)';
  - d.2. 'Electrorheological finishing (ERF)';
  - d.3. 'Energetic particle beam finishing';
  - d.4. 'Inflatable membrane tool finishing'; or
  - d.5. 'Fluid jet finishing'.

■ 14. Supplement No. 1 to Part 774 (the Commerce Control List), Category 2 Materials Processing, Export Control Classification Number (ECCN) 2B006 is amended by revising the NP paragraph in the License Requirements section and the Items paragraph of the List of Items Controlled section to read as follows:

**2B006 Dimensional inspection or measuring systems, equipment, and "electronic assemblies", as follows (see List of Items Controlled).**

**License Requirements**

\* \* \* \* \*

Control(s)	Country Chart
* * * *	* *
NP applies to 2B006.a and .b, except 2B006.b.1.d.	NP Column 1.

**Note:** NP applies to measuring systems in 2B006.b.1.c that maintain, for at least 12 hours, over a temperature range of ±1 K around a standard temperature and at a standard pressure, all of the following: a "resolution" over their full scale of 0.1 µm or less (better); and a "measurement uncertainty" equal to or less (better) than (0.2 + L/2,000) µm (L is the measured length in mm).

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Items:*  
a. Computer controlled or "numerically controlled" co-ordinate measuring machines (CMM), having a three dimensional length (volumetric) maximum permissible error of indication (MPEE) at any point within the operating range of the machine (i.e., within the length of axes) equal to or less (better)

than  $(1.7 + L/1,000)$   $\mu\text{m}$  (L is the measured length in mm) tested according to ISO 10360-2 (2001);

b. Linear and angular displacement measuring instruments, as follows:  
 b.1. 'Linear displacement' measuring instruments having any of the following:

**Technical Note:** For the purpose of 2B006.b.1 'linear displacement' means the change of distance between the measuring probe and the measured object.

b.1.a. Non-contact type measuring systems with a "resolution" equal to or less (better) than 0.2  $\mu\text{m}$  within a measuring range up to 0.2 mm;

b.1.b. Linear voltage differential transformer systems having all of the following:

b.1.b.1. "Linearity" equal to or less (better) than 0.1% within a measuring range up to 5 mm; and

b.1.b.2. Drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature  $\pm 1$  K;

b.1.c. Measuring systems having all of the following:

b.1.c.1. Containing a "laser"; and  
 b.1.c.2. Maintaining, for at least 12 hours, at a temperature of  $20 \pm 1$  °C, all of the following:

b.1.c.2.a. A "resolution" over their full scale of 0.1  $\mu\text{m}$  or less (better); and  
 b.1.c.2.b. Capable of achieving a "measurement uncertainty", when compensated for the refractive index of air, equal to or less (better) than  $(0.2 + L/2,000)$   $\mu\text{m}$  (L is the measured length in mm); or  
 b.1.d. "Electronic assemblies" specially designed to provide feedback capability in systems controlled by 2B006.b.1.c.;

**Note:** 2B006.b.1 does not control measuring interferometer systems, with an automatic control system that is designed to use no feedback techniques, containing a "laser" to measure slide movement errors of machine-tools, dimensional inspection machines or similar equipment.

b.2. Angular displacement measuring instruments having an "angular position deviation" equal to or less (better) than 0.00025°;

**Note:** 2B006.b.2 does not control optical instruments, such as autocollimators, using collimated light (e.g., laser light) to detect angular displacement of a mirror.

c. Equipment for measuring surface irregularities, by measuring optical scatter as a function of angle, with a sensitivity of 0.5 nm or less (better).

**Note:** Machine tools, which can be used as measuring machines, are controlled if they meet or exceed the criteria specified for the machine tool function or the measuring machine function.

■ 15. Supplement No. 1 to Part 774 (the Commerce Control List), Category 2 Materials Processing, Export Control Classification Number (ECCN) 2B007 is amended by revising the NP paragraph in the License Requirements section and the Items paragraph of the List of Items Controlled section to read as follows:

**2B007 "Robots" having any of the following characteristics described in the List of Items Controlled and specially designed controllers and "end-effectors" therefor.**

**License Requirements**

\* \* \* \* \*

Control(s)	Country Chart
NP applies to equipment that meets or exceeds the criteria in ECCNs 2B207.	NP Column 1.
* * * * *	

**List of Items Controlled**

\* \* \* \* \*

*Items:*

a. Capable in real time of full three-dimensional image processing or full three-dimensional 'scene analysis' to generate or modify "programs" or to generate or modify numerical program data;

**Technical Note:** The 'scene analysis' limitation does not include approximation of the third dimension by viewing at a given angle, or limited grey scale interpretation for the perception of depth or texture for the approved tasks (2½ D).

b. Specially designed to comply with national safety standards applicable to potentially explosive munitions environments;

**Note:** 2B007.b does not apply to "robots" specially designed for paint-spraying booths.

c. Specially designed or rated as radiation hardened to withstand a total radiation dose greater than  $5 \times 10^3$  Gy (silicon) without operational degradation; or

**Technical Note:** The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.

d. Specially designed to operate at altitudes exceeding 30,000m.

■ 16. Supplement No. 1 to Part 774 (the Commerce Control List), Category 2 Materials Processing, Export Control Classification Number (ECCN) 2B008 is amended by revising the Items paragraph in the List of Items Controlled section to read as follows:

**2B008 Assemblies or units, specially designed for machine tools, or dimensional inspection or measuring systems and equipment, as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Items:*

a. Linear position feedback units (e.g., inductive type devices, graduated scales, infrared systems or "laser" systems) having an overall "accuracy" less (better) than  $(800 + (600 \times L \times 10^{-3}))$  nm (L equals the effective length in mm);

*N.B.:* For "laser" systems see also 2B006.b.1.c and d.

b. Rotary position feedback units (e.g., inductive type devices, graduated scales, infrared systems or "laser" systems) having an "accuracy" less (better) than 0.00025°;

*N.B.:* For "laser" systems see also 2B006.b.2.

c. "Compound rotary tables" and "tilting spindles", capable of upgrading, according to the manufacturer's specifications, machine tools to or above the levels controlled by 2B001 to 2B009.

■ 17. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3A001 is amended by:

- a. Revising the Heading;
- b. Revising the GBS paragraph of the License Exceptions section;
- c. Revising the Related Controls paragraph of the List of Items Controlled section;
- d. Removing the second sentence of the "Related Definitions" paragraph of the List of Items Controlled section; and
- e. Revising the Items paragraph in the List of Items Controlled section, to read as follows:

**3A001 Electronic components and specially designed components therefor, as follows (see List of Items Controlled).**

\* \* \* \* \*

**License Exceptions**

LVS: \* \* \*

GBS: Yes for 3A001.a.1.b, a.2 to a.12 (except .a.5.a when controlled for MT), b.2, b.8 (except for TWTAs exceeding 18 GHz), b.9., and .g.

CIV: \* \* \*

**List of Items Controlled**

\* \* \* \* \*

Unit: Number.\* \* \*

*Related Controls:* (1) The following commodities are under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121) when "space qualified" and operating at frequencies higher than 31.8 GHz: helix tubes (traveling wave tubes (TWT)) defined in 3A001.b.1.a.4.c; microwave solid state amplifiers defined in 3A001.b.4.b traveling wave tube amplifiers (TWTA) defined in 3A001.b.8; and derivatives thereof; (2) The following commodities are also under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): (a) "Space qualified" solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays and/or solar panels, with a minimum average efficiency of 31% or greater measured at an operating temperature of 301 K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m<sup>2</sup>), and associated solar concentrators, power conditioners and/or controllers, bearing and power transfer assemblies, and deployment

hardware/systems; (b) Radiation-hardened microelectronic circuits controlled by Category XV (d) of the United States Munitions List (USML); and (c) All specifically designed or modified systems or subsystems, components, parts, accessories, attachments, and associated equipment controlled by Category XV (e) of the USML. See also 3A101, 3A201, and 3A991.

\* \* \* \* \*

**Items:**

a. General purpose integrated circuits, as follows:

**Note 1:** *The control status of wafers (finished or unfinished), in which the function has been determined, is to be evaluated against the parameters of 3A001.a.*

**Note 2:** *Integrated circuits include the following types:*

“Monolithic integrated circuits”;  
“Hybrid integrated circuits”;  
“Multichip integrated circuits”;  
“Film type integrated circuits”, including silicon-on-sapphire integrated circuits;  
“Optical integrated circuits”.

a.1. Integrated circuits designed or rated as radiation hardened to withstand any of the following:

- a.1.a. A total dose of  $5 \times 10^3$  Gy (Si), or higher;
- a.1.b. A dose rate upset of  $5 \times 10^6$  Gy (Si)/s, or higher; or
- a.1.c. A fluence (integrated flux) of neutrons (1 MeV equivalent) of  $5 \times 10^{13}$  n/cm<sup>2</sup> or higher on silicon, or its equivalent for other materials;

**Note:** *3A001.a.1.c does not apply to Metal Insulator Semiconductors (MIS).*

a.2. “Microprocessor microcircuits”, “microcomputer microcircuits”, microcontroller microcircuits, storage integrated circuits manufactured from a compound semiconductor, analog-to-digital converters, digital-to-analog converters, electro-optical or “optical integrated circuits” designed for “signal processing”, field programmable logic devices, custom integrated circuits for which either the function is unknown or the control status of the equipment in which the integrated circuit will be used is unknown, Fast Fourier Transform (FFT) processors, electrical erasable programmable read-only memories (EEPROMs), flash memories or static random-access memories (SRAMs), having any of the following:

- a.2.a. Rated for operation at an ambient temperature above 398 K (125 °C);
- a.2.b. Rated for operation at an ambient temperature below 218 K (–55 °C); or
- a.2.c. Rated for operation over the entire ambient temperature range from 218 K (–55 °C) to 398 K (125 °C);

**Note:** *3A001.a.2 does not apply to integrated circuits for civil automobile or railway train applications.*

a.3. “Microprocessor microcircuits”, “microcomputer microcircuits” and microcontroller microcircuits, manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz;

**Note:** *3A001.a.3 includes digital signal processors, digital array processors and digital coprocessors.*

a.4. Storage integrated circuits manufactured from a compound semiconductor;

a.5. Analog-to-digital and digital-to-analog converter integrated circuits, as follows:

- a.5.a. Analog-to-digital converters having any of the following:
  - a.5.a.1. A resolution of 8 bit or more, but less than 10 bit, with an output rate greater than 500 million words per second;
  - a.5.a.2. A resolution of 10 bit or more, but less than 12 bit, with an output rate greater than 200 million words per second;
  - a.5.a.3. A resolution of 12 bit with an output rate greater than 105 million words per second;
  - a.5.a.4. A resolution of more than 12 bit but equal to or less than 14 bit with an output rate greater than 10 million words per second; or
  - a.5.a.5. A resolution of more than 14 bit with an output rate greater than 2.5 million words per second;
- a.5.b. Digital-to-analog converters with a resolution of 12 bit or more and a “settling time” of less than 10 ns;

**Technical Notes:** 1. *A resolution of n bit corresponds to a quantization of 2<sup>n</sup> levels.*  
2. *The number of bits in the output word is equal to the resolution of the analog-to-digital converter.*  
3. *The output rate is the maximum output rate of the converter, regardless of architecture or oversampling. Vendors may also refer to the output rate as sampling rate, conversion rate or throughput rate. It is often specified in megahertz (MHz) or mega samples per second (MSPS).*

4. *For the purpose of measuring output rate, one output word per second is equivalent to one Hertz or one sample per second.*

a.6. Electro-optical and “optical integrated circuits”, designed for “signal processing” and having all of the following:

- a.6.a. One or more than one internal “laser” diode;
- a.6.b. One or more than one internal light detecting element; and
- a.6.c. Optical waveguides;
- a.7. “Field programmable logic devices” having any of the following:
  - a.7.a. An equivalent usable gate count of more than 30,000 (2 input gates);
  - a.7.b. A typical “basic gate propagation delay time” of less than 0.1 ns; or
  - a.7.c. A toggle frequency exceeding 133 MHz;

**Note:** *3A001.a.7 includes:*

- Simple Programmable Logic Devices (SPLDs),
- Complex Programmable Logic Devices (CPLDs),
- Field Programmable Gate Arrays (FPGAs),
- Field Programmable Logic Arrays (FPLAs), and
- Field Programmable Interconnects (FPICs).

**Technical Note:** *Field programmable logic devices’ are also known as field programmable gate or field programmable logic arrays.*

a.8. [Reserved]

a.9. Neural network integrated circuits;  
a.10. Custom integrated circuits for which the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

- a.10.a. More than 1,000 terminals;
- a.10.b. A typical “basic gate propagation delay time” of less than 0.1 ns; or
- a.10.c. An operating frequency exceeding 3 GHz;
- a.11. Digital integrated circuits, other than those described in 3A001.a.3 to 3A001.a.10 and 3A001.a.12, based upon any compound semiconductor and having any of the following:
  - a.11.a. An equivalent gate count of more than 3,000 (2 input gates); or
  - a.11.b. A toggle frequency exceeding 1.2 GHz;
- a.12. Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than  $(N \log_2 N)/20,480$  ms, where N is the number of points;

**Technical Note:** *When N is equal to 1,024 points, the formula in 3A001.a.12 gives an execution time of 500 μs.*

b. Microwave or millimeter wave components, as follows:

b.1. Electronic vacuum tubes and cathodes, as follows:

**Note 1:** *3A001.b.1 does not control tubes designed or rated for operation in any frequency band and having all of the following:*

- a. Does not exceed 31.8 GHz; and
- b. Is “allocated by the ITU” for radio-communications services, but not for radio-determination.

**Note 2:** *3A001.b.1 does not control non-“space-qualified” tubes having all the following:*

- (a) *An average output power equal to or less than 50 W; and*
- (b) *Designed or rated for operation in any frequency band and having all of the following:*
  - (1) *Exceeds 31.8 GHz but does not exceed 43.5 GHz; and*
  - (2) *Is “allocated by the ITU” for radio-communications services, but not for radio-determination.*

b.1.a. Traveling wave tubes, pulsed or continuous wave, as follows:

b.1.a.1. Tubes operating at frequencies exceeding 31.8 GHz;

b.1.a.2. Tubes having a cathode heater element with a turn on time to rated RF power of less than 3 seconds;

b.1.a.3. Coupled cavity tubes, or derivatives thereof, with a “fractional bandwidth” of more than 7% or a peak power exceeding 2.5 kW;

b.1.a.4. Helix tubes, or derivatives thereof, having any of the following:

b.1.a.4.a. An “instantaneous bandwidth” of more than one octave, and average power (expressed in kW) times frequency (expressed in GHz) of more than 0.5;

b.1.a.4.b. An “instantaneous bandwidth” of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1; or

b.1.a.4.c. Being "space qualified";  
b.1.b. Crossed-field amplifier tubes with a gain of more than 17 dB;

b.1.c. Impregnated cathodes designed for electronic tubes producing a continuous emission current density at rated operating conditions exceeding 5 A/cm<sup>2</sup>;

b.2. Microwave "Monolithic Integrated Circuits" (MMIC) power amplifiers having any of the following:

b.2.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and with an average output power greater than 4W (36 dBm) with a "fractional bandwidth" greater than 15%;

b.2.b. Rated for operation at frequencies exceeding 6 GHz up to and including 16 GHz and with an average output power greater than 1W (30 dBm) with a "fractional bandwidth" greater than 10%;

b.2.c. Rated for operation at frequencies exceeding 16 GHz up to and including 31.8 GHz and with an average output power greater than 0.8W (29 dBm) with a "fractional bandwidth" greater than 10%;

b.2.d. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz;

b.2.e. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 0.25W (24 dBm) with a "fractional bandwidth" greater than 10%; or

b.2.f. Rated for operation at frequencies exceeding 43.5 GHz.

**Note 1:** 3A001.b.2 does not control broadcast satellite equipment designed or to operate in the frequency range of 40.5 to 42.5 GHz.

**Note 2:** The control status of the MMIC whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.2.a through 3A001.b.2.f, is determined by the lowest average output power control threshold.

**Note 3:** Notes 1 and 2 following the Category 3 heading for A. Systems, Equipment, and Components mean that 3A001.b.2. does not control MMICs if they are specially designed for other applications, e.g., telecommunications, radar, automobiles.

b.3. Discrete microwave transistors having any of the following:

b.3.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and having an average output power greater than 60W (47.8 dBm);

b.3.b. Rated for operation at frequencies exceeding 6 GHz up to and including 31.8 GHz and having an average output power greater than 20W (43 dBm);

b.3.c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz and having an average output power greater than 0.5W (27 dBm);

b.3.d. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and having an average output power greater than 1W (30 dBm); or

b.3.e. Rated for operation at frequencies exceeding 43.5 GHz;

**Note:** The control status of a transistor whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.3.a through

3A001.b.3.e, is determined by the lowest average output power control threshold.

b.4. Microwave solid state amplifiers and microwave assemblies/modules containing microwave solid state amplifiers, having any of the following:

b.4.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and with an average output power greater than 60W (47.8 dBm) with a "fractional bandwidth" greater than 15%;

b.4.b. Rated for operation at frequencies exceeding 6 GHz up to and including 31.8 GHz and with an average output power greater than 15W (42 dBm) with a "fractional bandwidth" greater than 10%;

b.4.c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz;

b.4.d. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 1W (30 dBm) with a "fractional bandwidth" greater than 10%;

b.4.e. Rated for operation at frequencies exceeding 43.5 GHz; or

b.4.f. Rated for operation at frequencies above 3.2 GHz and all of the following:

b.4.f.1. An average output power (in watts), P, greater than 150 divided by the maximum operating frequency (in GHz) squared [ $P > 150 W^*GHz^2/f_{GHz}^2$ ];

b.4.f.2. A "fractional bandwidth" of 5% or greater; and

b.4.f.3. Any two sides perpendicular to one another with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [ $d \leq 15 \text{ cm}^*GHz/f_{GHz}$ ];

**Technical Note:** 3.2 GHz should be used as the lowest operating frequency ( $f_{GHz}$ ) in the formula 3A001.b.4.f.3., for amplifiers that have a rated operation range extending downward to 3.2 GHz and below [ $d \leq 15 \text{ cm}^*GHz/3.2 f_{GHz}$ ].

**N.B.:** MMIC power amplifiers should be evaluated against the criteria in 3A001.b.2.

**Note 1:** 3A001.b.4. does not control broadcast satellite equipment designed or rated to operate in the frequency range of 40.5 to 42.5 GHz.

**Note 2:** The control status of an item whose rated operating frequency includes frequencies listed in more than one frequency range, as defined by 3A001.b.4.a through 3A001.b.4.e, is determined by the lowest average output power control threshold.

b.5. Electronically or magnetically tunable band-pass or band-stop filters, having more than 5 tunable resonators capable of tuning across a 1.5:1 frequency band ( $f_{max}/f_{min}$ ) in less than 10  $\mu$ s and having any of the following:

b.5.a. A band-pass bandwidth of more than 0.5% of center frequency; or

b.5.b. A band-stop bandwidth of less than 0.5% of center frequency;

b.6. [Reserved]

b.7. Converters and harmonic mixers, designed to extend the frequency range of equipment described in 3A002.c, 3A002.d, 3A002.e or 3A002.f beyond the limits stated therein;

b.8. Microwave power amplifiers containing tubes controlled by 3A001.b.1 and having all of the following:

b.8.a. Operating frequencies above 3 GHz;

b.8.b. An average output power density exceeding 80 W/kg; and

b.8.c. A volume of less than 400 cm<sup>3</sup>;

**Note:** 3A001.b.8 does not control equipment designed or rated for operation in any frequency band which is "allocated by the ITU" for radio-communications services, but not for radio-determination.

b.9. Microwave power modules (MPM), consisting of, at least, a traveling wave tube, a microwave "monolithic integrated circuit" and an integrated electronic power conditioner and having all of the following:

b.9.a. A "turn-on time" from off to fully operational in less than 10 seconds;

b.9.b. A volume less than the maximum rated power in Watts multiplied by 10 cm<sup>3</sup>/W; and

b.9.c. An "instantaneous bandwidth" greater than 1 octave ( $f_{max} > 2f_{min}$ ) and having any of the following:

b.9.c.1. For frequencies equal to or less than 18 GHz, an RF output power greater than 100 W; or

b.9.c.2. A frequency greater than 18 GHz;

**Technical Notes:**

1. To calculate the volume in 3A001.b.9.b., the following example is provided: for a maximum rated power of 20 W, the volume would be:  $20 W \times 10 \text{ cm}^3/W = 200 \text{ cm}^3$ .

2. The 'turn-on time' in 3A001.b.9.a. refers to the time from fully-off to fully operational, i.e., it includes the warm-up time of the MPM.

c. Acoustic wave devices as follows and specially designed components therefor:

c.1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (i.e., "signal processing" devices employing elastic waves in materials), having any of the following:

c.1.a. A carrier frequency exceeding 6 GHz;

c.1.b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz and having any of the following:

c.1.b.1. A frequency side-lobe rejection exceeding 55 dB;

c.1.b.2. A product of the maximum delay time and the bandwidth (time in  $\mu$ s and bandwidth in MHz) of more than 100;

c.1.b.3. A bandwidth greater than 250 MHz; or

c.1.b.4. A dispersive delay of more than 10  $\mu$ s; or

c.1.c. A carrier frequency of 1 GHz or less and having any of the following:

c.1.c.1. A product of the maximum delay time and the bandwidth (time in  $\mu$ s and bandwidth in MHz) of more than 100;

c.1.c.2. A dispersive delay of more than 10  $\mu$ s; or

c.1.c.3. A frequency side-lobe rejection exceeding 55 dB and a bandwidth greater than 100 MHz;

c.2. Bulk (volume) acoustic wave devices (i.e., "signal processing" devices employing elastic waves) that permit the direct processing of signals at frequencies exceeding 2.5 GHz;

c.3. Acoustic-optic "signal processing" devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves that permit the direct processing of signals or images, including spectral analysis, correlation or convolution;



d. Electronic devices and circuits containing components, manufactured from "superconductive" materials, specially designed for operation at temperatures below the "critical temperature" of at least one of the "superconductive" constituents and having any of the following:

d.1. Current switching for digital circuits using "superconductive" gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than  $10^{-14}$  J; or

d.2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000;

e. High energy devices as follows:

e.1. 'Cells' and photovoltaic arrays as follows:

e.1.a. 'Primary cells' having an 'energy density' exceeding 550 Wh/kg at 293 K (20 °C);

e.1.b. Secondary cells having an 'energy density' exceeding 250 Wh/kg at 293 K (20 °C);

**Technical Notes:**

1. For the purpose of 3A001.e.1., 'energy density' (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours (Ah) divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in Ohms and the mass in kilograms.

2. For the purpose of 3A001.e.1., a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, an electrolyte, and is a source of electrical energy. It is the basic building block of a battery.

3. For the purpose of 3A001.e.1.a., a 'primary cell' is a 'cell' that is not designed to be charged by any other source.

4. For the purpose of 3A001.e.1.b., a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.

**Note:** 3A001.e. does not control batteries, including single-cell batteries.

e.2. High energy storage capacitors as follows:

e.2.a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) and having all of the following:

e.2.a.1. A voltage rating equal to or more than 5 kV;

e.2.a.2. An energy density equal to or more than 250 J/kg; and

e.2.a.3. A total energy equal to or more than 25 kJ;

e.2.b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) and having all of the following:

e.2.b.1. A voltage rating equal to or more than 5 kV;

e.2.b.2. An energy density equal to or more than 50 J/kg;

e.2.b.3. A total energy equal to or more than 100 J; and

e.2.b.4. A charge/discharge cycle life equal to or more than 10,000;

e.3. "Superconductive" electromagnets and solenoids, specially designed to be fully charged or discharged in less than one second and having all of the following:

**Note:** 3A001.e.3 does not control "superconductive" electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.

e.3.a. Energy delivered during the discharge exceeding 10 kJ in the first second;

e.3.b. Inner diameter of the current carrying windings of more than 250 mm; and

e.3.c. Rated for a magnetic induction of more than 8 T or "overall current density" in the winding of more than 300 A/mm<sup>2</sup>;

e.4. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are "space qualified," having a minimum average efficiency exceeding 20% at an operating temperature of 301 K (28 °C) under simulated 'AM0' illumination with an irradiance of 1,367 Watts per square meter (W/m<sup>2</sup>).

**Technical Note:** 'AM0', or 'Air Mass Zero', refers to the spectral irradiance of sun light in the earth's outer atmosphere when the distance between the earth and sun is one astronomical unit (AU).

f. Rotary input type shaft absolute position encoders having any of the following:

f.1. A resolution of better than 1 part in 265,000 (18 bit resolution) of full scale; or

f.2. An accuracy better than  $\pm 2.5$  seconds of arc;

g. Solid-state pulsed power switching thyristor devices and 'thyristor modules', using either electrically, optically, or electron radiation controlled switch methods and having any of the following:

g.1. A maximum turn-on current rate of rise (di/dt) greater than 30,000 A/ $\mu$ s and off-state voltage greater than 1,100 V; or

g.2. A maximum turn-on current rate of rise (di/dt) greater than 2,000 A/ $\mu$ s and having all of the following:

g.2.a. An off-state peak voltage equal to or greater than 3,000 V; and

g.2.b. A peak (surge) current equal to or greater than 3,000 A.

**Note 1:** 3A001.g. includes:

—Silicon Controlled Rectifiers (SCRs)

—Electrical Triggering Thyristors (ETTs)

—Light Triggering Thyristors (LTTs)

—Integrated Gate Commutated Thyristors (IGCTs)

—Gate Turn-off Thyristors (GTOs)

—MOS Controlled Thyristors (MCTs)

—Solidtrons

**Note 2:** 3A001.g. does not control thyristor devices and 'thyristor modules' incorporated into equipment designed for civil railway or "civil aircraft" applications.

■ 18. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3A002 is amended by revising the Heading, and the Related Controls and Items paragraphs in the List of Items Controlled section, to read as follows:

**3A002 General purpose electronic equipment and accessories therefor, as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

Unit: \* \* \*

**Related Controls:** "Space qualified" atomic frequency standards defined in 3A002.g.1 are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121.1, Category XV). See also 3A292 and 3A992.

**Related Definitions:** \* \* \*

**Items:**

a. Recording equipment as follows and specially designed test tape therefor:

a.1. Analog instrumentation magnetic tape recorders, including those permitting the recording of digital signals (e.g., using a high density digital recording (HDDR) module), having any of the following:

a.1.a. A bandwidth exceeding 4 MHz per electronic channel or track;

a.1.b. A bandwidth exceeding 2 MHz per electronic channel or track and having more than 42 tracks; or

a.1.c. A time displacement (base) error, measured in accordance with applicable IRIG or EIA documents, of less than  $\pm 0.1$   $\mu$ s;

**Note:** Analog magnetic tape recorders specially designed for civilian video purposes are not considered to be instrumentation tape recorders.

a.2. Digital video magnetic tape recorders having a maximum digital interface transfer rate exceeding 360 Mbit/s;

**Note:** 3A002.a.2 does not control digital video magnetic tape recorders specially designed for television recording using a signal format, which may include a compressed signal format, standardized or recommended by the ITU, the IEC, the SMPTE, the EBU, the ETSI, or the IEEE for civil television applications.

a.3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques and having any of the following:

a.3.a. A maximum digital interface transfer rate exceeding 175 Mbit/s; or

a.3.b. Being "space qualified";

**Note:** 3A002.a.3 does not control analog magnetic tape recorders equipped with HDDR conversion electronics and configured to record only digital data.

a.4. Equipment having a maximum digital interface transfer rate exceeding 175 Mbit/s and designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders;

a.5. Waveform digitizers and transient recorders, having all of the following:

*N.B.:* See also 3A292.

a.5.a. Digitizing rates equal to or more than 200 million samples per second and a resolution of 10 bits or more; and

a.5.b. A 'continuous throughput' of 2 Gbit/s or more;

**Technical Notes:**

1. For those instruments with a parallel bus architecture, the 'continuous throughput' rate is the highest word rate multiplied by the number of bits in a word.

2. 'Continuous throughput' is the fastest data rate the instrument can output to mass storage without the loss of any information while sustaining the sampling rate and analog-to-digital conversion.

a.6. Digital instrumentation data recorders, using magnetic disk storage technique and having all of the following:

a.6.a. Digitizing rate equal to or more than 100 million samples per second and a resolution of 8 bits or more; and

a.6.b. A 'continuous throughput' of 1 Gbit/s or more;

b. "Frequency synthesizer" "electronic assemblies" having a "frequency switching time" from one selected frequency to another of less than 1 ms;

**Note:** The control status of "signal analyzers", signal generators, network analyzers, and microwave test receivers as stand-alone instruments is determined by 3A002.c., 3A002.d., 3A002.e., and 3A002.f., respectively.

c. Radio-frequency "signal analyzers" as follows:

c.1. "Signal analyzers" capable of analyzing any frequencies exceeding 31.8 GHz but not exceeding 37.5 GHz and having a 3 dB resolution bandwidth (RBW) exceeding 10 MHz;

c.2. "Signal analyzers" capable of analyzing frequencies exceeding 43.5 GHz;

c.3. "Dynamic signal analyzers" having a "real-time bandwidth" exceeding 500 kHz;

**Note:** 3A002.c.3 does not control those "dynamic signal analyzers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

d. Frequency synthesized signal generators producing output frequencies, the accuracy and short term and long term stability of which are controlled, derived from or disciplined by the internal master reference oscillator, and having any of the following:

d.1. A maximum synthesized frequency exceeding 31.8 GHz, but not exceeding 43.5 GHz and rated to generate a 'pulse duration' of less than 100 ns;

d.2. A maximum synthesized frequency exceeding 43.5 GHz;

d.3. A "frequency switching time" from one selected frequency to another as specified by any of the following:

d.3.a. Less than 10 ns;

d.3.b. Less than 100  $\mu$ s for any frequency change exceeding 1.6 GHz within the synthesized frequency range exceeding 3.2 GHz but not exceeding 10.6 GHz;

d.3.c. Less than 250  $\mu$ s for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 10.6 GHz but not exceeding 31.8 GHz;

d.3.d. Less than 500  $\mu$ s for any frequency change exceeding 550 MHz within the synthesized frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz; or

d.3.e. Less than 1 ms within the synthesized frequency range exceeding 43.5 GHz; or

d.4. A single sideband (SSB) phase noise better than  $-(126 + 20 \log_{10} F) - 20 \log_{10} f$  in dBc/Hz, where F is the off-set from the operating frequency in Hz and f is the operating frequency in MHz;

**Note 1:** For the purpose of 3A002.d., frequency synthesized signal generators includes arbitrary waveform and function generators.

**Note 2:** 3A002.d. does not control equipment in which the output frequency is

either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction followed by a multiplication of the result.

**Technical Notes:**

1. Arbitrary waveform and function generators are normally specified by sample rate (e.g., GSample/s), which is converted to the RF domain by the Nyquist factor of two. Thus, a 1 GSample/s arbitrary waveform has a direct output capability of 500 MHz. Or, when oversampling is used, the maximum direct output capability is proportionately lower.

2. For the purposes of 3A002.d.1., 'pulse duration' is defined as the time interval between the leading edge of the pulse achieving 90% of the peak and the trailing edge of the pulse achieving 10% of the peak.

**Note:** 3A002.d does not control equipment in which the output frequency is either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction followed by a multiplication of the result.

e. Network analyzers with a maximum operating frequency exceeding 43.5 GHz;

f. Microwave test receivers having all of the following:

f.1. A maximum operating frequency exceeding 43.5 GHz; and

f.2. Being capable of measuring amplitude and phase simultaneously;

g. Atomic frequency standards being any of the following:

g.1. "Space qualified";

g.2. Non-rubidium and having a long-term stability less (better) than  $1 \times 10^{-11}$ /month; or

g.3. Non-"space qualified" and having all of the following:

g.3.a. Being a rubidium standard;

g.3.b. Long-term stability less (better) than  $1 \times 10^{-11}$ /month; and

g.3.c. Total power consumption of less than 1 Watt.

■ 19. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3A229 is amended by revising the Related Controls paragraph, to read as follows:

**3A229 Firing sets and equivalent high-current pulse generators (for detonators controlled by 3A232), as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

**Related Controls:** (1) See ECCNs 3E001 and 1E001 ("development" and "production") and 3E201 and 1E201 ("use") for technology for items controlled under this entry. (2) High explosives and related equipment for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

\* \* \* \* \*

■ 20. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3

Electronics, Export Control Classification Number (ECCN) 3A232 is amended by revising the Related Controls and Items paragraphs in the List of Items Controlled section, to read as follows:

**3A232 Detonators and multipoint initiation systems, as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

**Related Controls:** (1) See 1A007 for electrically driven explosive detonators. (2) See ECCNs 3E001 ("development" and "production") and 3E201 ("use") for technology for items controlled under this entry. (3) High explosives and related equipment for military use are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121).

\* \* \* \* \*

**Items:**

a. [Reserved]

b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over an area greater than 5,000 mm<sup>2</sup> from a single firing signal with an initiation timing spread over the surface of less than 2.5  $\mu$ s.

**Technical Note:** The word initiator is sometimes used in place of the word detonator.

■ 21. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3A991 amended by adding a new paragraph (o) to the Items paragraph in the List of Items Controlled section, to read as follows:

**3A991 Electronic devices and components not controlled by 3A001.**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

**Items:**

\* \* \* \* \*

o. Solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays, which are "space qualified" and not controlled by 3A001.e.4.

■ 22. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3B001 is amended by revising the Heading and the Items paragraph in the List of Items Controlled section, to read as follows:

**3B001 Equipment for the manufacturing of semiconductor devices or materials, as follows (see List of Items Controlled) and specially designed components and accessories therefor.**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Items:*

a. Equipment designed for epitaxial growth as follows:

a.1. Equipment capable of producing a layer of any material other than silicon with a thickness uniform to less than ±2.5% across a distance of 75 mm or more;

a.2. Metal Organic Chemical Vapor Deposition (MOCVD) reactors specially designed for compound semiconductor crystal growth by the chemical reaction between materials controlled by 3C003 or 3C004;

a.3. Molecular beam epitaxial growth equipment using gas or solid sources;

b. Equipment designed for ion implantation and having any of the following:

b.1. A beam energy (accelerating voltage) exceeding 1MeV;

b.2. Being specially designed and optimized to operate at a beam energy (accelerating voltage) of less than 2 keV;

b.3. Direct write capability; or

b.4. A beam energy of 65 keV or more and a beam current of 45 mA or more for high oxygen implant into a heated semiconductor material "substrate";

c. Anisotropic plasma dry etching equipment as follows:

c.1. Equipment with cassette-to-cassette operation and load-locks, and having any of the following:

c.1.a. Designed or optimized to produce critical dimensions of 180 nm or less with ±5% 3 sigma precision; or

c.1.b. Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1 μm in diameter;

c.2. Equipment specially designed for equipment controlled by 3B001.e. and having any of the following:

c.2.a. Designed or optimized to produce critical dimensions of 180 nm or less with ±5% 3 sigma precision; or

c.2.b. Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1 μm in diameter;

d. Plasma enhanced Chemical Vapor Deposition (CVD) equipment as follows:

d.1. Equipment with cassette-to-cassette operation and load-locks, and designed according to the manufacturer's specifications or optimized for use in the production of semiconductor devices with critical dimensions of 180 nm or less;

d.2. Equipment specially designed for equipment controlled by 3B001.e. and designed according to the manufacturer's

specifications or optimized for use in the production of semiconductor devices with critical dimensions of 180 nm or less;

e. Automatic loading multi-chamber central wafer handling systems having all of the following:

e.1. Interfaces for wafer input and output, to which more than two pieces of semiconductor processing equipment are to be connected; and

e.2. Designed to form an integrated system in a vacuum environment for sequential multiple wafer processing;

**Note:** 3B001.e. does not control automatic robotic wafer handling systems not designed to operate in a vacuum environment.

f. Lithography equipment as follows:

f.1. Align and expose step and repeat (direct step on wafer) or step and scan (scanner) equipment for wafer processing using photo-optical or X-ray methods and having any of the following:

f.1.a. A light source wavelength shorter than 245 nm; or

f.1.b. Capable of producing a pattern with a 'minimum resolvable feature size' of 180 nm or less;

**Technical Note:** The 'minimum resolvable feature size' is calculated by the following formula:

$$MRF = \frac{(an\ exposure\ light\ source\ wavelength\ in\ nm) \times (K\ factor)}{numerical\ aperture}$$

Where the K factor = 0.45

MRF = 'minimum resolvable feature size'.

f.2. Imprint lithography equipment capable of production features of 180 nm or less;

**Note:** 3B001.f.2 includes:

—Micro contact printing tools

—Hot embossing tools

—Nano-imprint lithography tools

—Step and flash imprint lithography (S-FIL) tools.

f.3. Equipment specially designed for mask making or semiconductor device processing using direct writing methods and having all of the following:

f.3.a. Using deflected focused electron beam, ion beam or "laser" beam; and

f.3.b. Having any of the following:

f.3.b.1. A spot size smaller than 0.2 μm;

f.3.b.2. Being capable of producing a pattern with a feature size of less than 1 μm; or

f.3.b.3. An overlay accuracy of better than ±0.20 μm (3 sigma);

g. Masks and reticles, designed for integrated circuits controlled by 3A001;

h. Multi-layer masks with a phase shift layer;

**Note:** 3B001.h. does not control multi-layer masks with a phase shift layer designed for the fabrication of memory devices not controlled by 3A001.

i. Imprint lithography templates designed for integrated circuits by 3A001.

■ 23. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control

Classification Number (ECCN) 3C002 is amended by:

■ a. Revising the Heading;

■ b. Revising the GBS and CIV paragraphs in the License Exception section; and

■ c. Replacing the semicolon with a period at the end of paragraph d; and

■ d. Adding paragraph e to the Items paragraph in the List of Items Controlled section, to read as follows:

**3C002 Resist materials as follows (see List of Items Controlled) and "substrates" coated with the following resists.**

\* \* \* \* \*

**License Exceptions**

\* \* \* \* \*

GBS: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .e.

CIV: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .e.

**List of Items Controlled**

\* \* \* \* \*

*Items:*

\* \* \* \* \*

e. All resists designed or optimized for use with imprint lithography equipment specified by 3B001.f.2. that use either a thermal or photo-curable process.

■ 24. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3C005 is amended by revising the Heading, to read as follows:

**3C005 Silicon carbide (SiC), gallium nitride (GaN), aluminum nitride (AlN) or aluminum gallium nitride (AlGaIn) "substrates", or ingots, boules, or other preforms of those materials, having resistivities greater than 10,000 ohm-cm at 20 °C.**

\* \* \* \* \*

■ 25. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3C006 is added after ECCN 3C005, to read as follows:

**3C006 "Substrates" specified in 3C005 with at least one epitaxial layer of silicon carbide, gallium nitride, aluminum nitride or aluminum gallium nitride.**

**License Requirements**

*Reason for Control:* NS, AT

Control(s)	Country Chart
NS applies to entire entry .....	NS Column 2.
AT applies to entire entry .....	AT Column 1.

**License Exceptions**

LVS: \$3000  
 GBS: Yes  
 CIV: Yes

**List of Items Controlled**

Unit: \$ value

*Related Controls:* See ECCN 3D001 for related “development” or “production” “software”, ECCN 3E001 for related “development” and “production” “technology”, and ECCN 3B991.b.1.b for related “production” equipment.

*Related Definition:* N/A

*Items:*

The list of items controlled is contained in the ECCN heading.

■ 26. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3D001 is amended by:

(a) Revising the Related Controls paragraph of the List of Items Controlled section; and

(b) Removing the text of the Related Definitions paragraph of the List of Items Controlled section and replacing it with “N/A” to read as follows:

**3D001 “Software” specially designed for the “development” or “production” of equipment controlled by 3A001.b to 3A002.g or 3B (except 3B991 and 3B992).**

**List of Items Controlled**

Unit: \* \* \*

*Related Controls:* “Software” specially designed for the “development” or “production” of the following equipment is under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): (1.) When operating at frequencies higher than 31.8 GHz and “space qualified”: Helix tubes (traveling wave tubes (TWT)) defined in 3A001.b.1.a.4.c; microwave solid state amplifiers defined in 3A001.b.4.b; and traveling wave tube amplifiers (TWTA) defined in 3A001.b.8; (2.) “Space qualified” solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays, and/or solar panels, with a minimum average efficiency of 31% or greater at an operating temperature of 301 °K (28 °C) under simulated ‘AM0’ illumination with an irradiance of 1,367 Watts per square meter (W/m<sup>2</sup>), and associated solar concentrators, power conditioners, and/or controllers, bearing and power transfer assemblies, and deployment hardware/systems. (3.) “Space qualified” atomic frequency standards defined in 3A002.g.2. See also 3D101.

*Related Definitions:* N/A

*Items:* \* \* \*

■ 27. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 3 Electronics, Export Control Classification Number (ECCN) 3E001 is amended by:

■ a. Revising the Heading;

- b. Revising the NS column 1 paragraph of the License Requirements section;
- c. Revising the Related Controls paragraph of the List of Items Controlled section;
- d. Revising the License Exceptions section;
- e. Removing the text of the Related Definitions paragraph of the List of Items and replacing it with “N/A”; and
- f. Revising the technical note in the Items paragraph of the List of Items Controlled section, to read as follows:

**3E001 “Technology” according to the General Technology Note for the “development” or “production” of equipment or materials controlled by 3A (except 3A292, 3A980, 3A981, 3A991 3A992, or 3A999), 3B (except 3B991 or 3B992) or 3C (except 3C992).**

**License Requirements**

\* \* \* \* \*

Control(s)	Country Chart
NS applies to “technology” for items controlled by 3A001, 3A002, 3B001,3B002, or 3C001 to 3C006.	NS Column 1.

\* \* \* \* \*

**License Exceptions**

CIV: N/A

TSR: Yes, except N/A for MT, and “technology” specially designed for the “development” or “production” of: (a) Traveling Wave Tube Amplifiers described in 3A001.b.8, having operating frequencies exceeding 19 Ghz; and (b) solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays and/or solar panels, which are “space qualified,” having a minimum average efficiency exceeding 20% but less than 31% described in 3A001.e.4.

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Related Controls:* (1) See also 3E101 and 3E201. (2) “Technology” according to the General Technology Note for the “development” or “production” of the following commodities is under the export licensing authority of the Department of State, Directorate of Defense Trade Controls (22 CFR part 121): (a) When operating at frequencies higher than 31.8 GHz and “space qualified”: helix tubes (traveling wave tubes (TWT)) defined in 3A001.b.1.a.4.c; microwave solid state amplifiers defined in 3A001.b.4.b; or traveling wave tube amplifiers (TWTA) defined in 3A001.b.8; (b) “Space qualified” solar cells, coverglass-interconnect-cells or covered-interconnect-cells (CIC) assemblies, solar arrays, and/or solar panels, with a minimum average efficiency of 31% or greater at an operating temperature of 301 °K (28 °C) under simulated ‘AM0’ illumination with an

irradiance of 1,367 Watts per square meter (W/m<sup>2</sup>), and associated solar concentrators, power conditioners, and/or controllers, bearing and power transfer assemblies, and deployment hardware/systems. and (c) “Space qualified” atomic frequency standards defined in 3A002.g.2.

*Related Definition:* N/A

*Items:*

\* \* \* \* \*

**Technical Note:** Multi-layer structures in Note 2 of 3E001 do not include devices incorporating a maximum of three metal layers and three polysilicon layers.

28. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 5 Telecommunications and “Information Security”, Part I Telecommunications, Export Control Classification Number (ECCN) 5A001 is amended by revising the Heading and the Items paragraph of the List of Items Controlled section to read as follows:

**5A001 Telecommunications systems, equipment, components and accessories, as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Items:*

a. Any type of telecommunications equipment having any of the following characteristics, functions or features:

- a.1. Specially designed to withstand transitory electronic effects or electromagnetic pulse effects, both arising from a nuclear explosion;
- a.2. Specially hardened to withstand gamma, neutron or ion radiation; or
- a.3. Specially designed to operate outside the temperature range from 218 K (– 55 °C) to 397 K (124 °C);

**Note:** 5A001.a.3 applies only to electronic equipment.

**Note:** 5A001.a.2 and 5A001.a.3 do not apply to equipment designed or modified for use on board satellites.

b. Telecommunication systems and equipment, and specially designed components and accessories therefor, having any of the following characteristics, functions or features:

- b.1 Being underwater untethered communications systems having any of the following:
  - b.1.a. An acoustic carrier frequency outside the range from 20 kHz to 60 kHz;
  - b.1.b. Using an electromagnetic carrier frequency below 30 kHz; or
  - b.1.c. Using electronic beam steering techniques; or
  - b.1.d. Using “lasers” or light-emitting diodes (LEDs) with an output wavelength greater than 400 nm and less than 700 nm, in a “local area network”;
- b.2. Being radio equipment operating in the 1.5 MHz to 87.5 MHz band and having all of the following:
  - b.2.a. Automatically predicting and selecting frequencies and “total digital transfer rates” per channel to optimize the transmission; and

b.2.b. Incorporating a linear power amplifier configuration having a capability to support multiple signals simultaneously at an output power of 1 kW or more in the frequency range of 1.5 MHz or more but less than 30 MHz, or 250 W or more in the frequency range of 30 MHz or more but not exceeding 87.5 MHz, over an "instantaneous bandwidth" of one octave or more and with an output harmonic and distortion content of better than -80 dB;

b.3. Being radio equipment employing "spread spectrum" techniques, including "frequency hopping" techniques, not controlled in 5A001.b.4 and having any of the following:

b.3.a. User programmable spreading codes; or

b.3.b. A total transmitted bandwidth which is 100 or more times the bandwidth of any one information channel and in excess of 50 kHz;

**Note:** 5A001.b.3.b does not control radio equipment specially designed for use with civil cellular radio-communications systems.

**Note:** 5A001.b.3 does not control equipment operating at an output power of 1 W or less.

b.4. Being radio equipment employing ultra-wideband modulation techniques, having user programmable channelizing codes, scrambling codes, or network identification codes and having any of the following:

b.4.a. A bandwidth exceeding 500 MHz; or

b.4.b. A "fractional bandwidth" of 20% or more;

b.5. Being digitally controlled radio receivers having all of the following:

b.5.a. More than 1,000 channels;

b.5.b. A "frequency switching time" of less than 1 ms;

b.5.c. Automatic searching or scanning of a part of the electromagnetic spectrum; and

b.5.d. Identification of the received signals or the type of transmitter; or

**Note:** 5A001.b.5 does not control radio equipment specially designed for use with civil cellular radio-communications systems.

b.6. Employing functions of digital "signal processing" to provide "voice coding" output at rates of less than 2,400 bit/s.

**Technical Notes:** 1. For variable rate 'voice coding', 5A001.b.6 applies to the 'voice coding' output of continuous speech.  
2. For the purpose of 5A001.b.6, 'voice coding' is defined as the technique to take samples of human voice and then convert these samples of human voice and then convert these samples into a digital signal taking into account specific characteristics of human speech.

c. Optical fiber communication cables, optical fibers and accessories, as follows:

c.1. Optical fibers of more than 500 m in length specified by the manufacturer as being capable of withstanding a 'proof test' tensile stress of  $2 \times 10^9$  N/m<sup>2</sup> or more;

**Technical Note:** 'Proof Test': on-line or off-line production screen testing that dynamically applies a prescribed tensile stress over a 0.5 to 3 m length of fiber at a running rate of 2 to 5 m/s while passing between capstans approximately 150 mm in

diameter. The ambient temperature is a nominal 293 K (20 °C) and relative humidity 40%. Equivalent national standards may be used for executing the proof test.

c.2. Optical fiber cables and accessories, designed for underwater use;

**Note:** 5A001.c.2 does not control standard civil telecommunication cables and accessories.

N.B. 1: For underwater umbilical cables, and connectors thereof, see 8A002.a.3.

N.B. 2: For fiber-optic hull penetrators or connectors, see 8A002.c.

d. "Electronically steerable phased array antennae" operating above 31.8 GHz;

**Note:** 5A001.d does not control "electronically steerable phased array antennae" for landing systems with instruments meeting ICAO standards covering Microwave Landing Systems (MLS).

e. Radio direction finding equipment operating at frequencies above 30 MHz and having all of the following, and specially designed components therefor:

e.1. "Instantaneous bandwidth" of 10 MHz or more; and

e.2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms;

f. Jamming equipment specially designed or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and having any of the following characteristics, and specially designed components therefor:

f.1. Simulating the functions of Radio Access Network (RAN) equipment; or

f.2. Detecting and exploiting specific characteristics of the mobile telecommunications protocol employed (e.g., GSM);

N.B.: For GNSS jamming equipment see the Munitions List.

g. Passive Coherent Location (PCL) systems or equipment, specially designed for detecting and tracking moving objects by measuring reflections of ambient radio frequency emissions, supplied by non-radar transmitters.

**Technical Note:** Non-radar transmitters may include commercial radio, television or cellular telecommunication base stations.

**Note:** 5A001.g. does not control:

a. Radio-astronomical equipment; or

b. Systems or equipment, that require any radio transmission from the target.

■ 29. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 5 Telecommunications and "Information Security", Part 2 Information Security, Export Control Classification Number (ECCN) 5A002 is amended by revising the Heading and the Items paragraph of the List of Items Controlled section, to read as follows:

**5A002 "Information security" systems, equipment and components therefor, as follows (see List of Items Controlled).**

\* \* \* \* \*

#### List of Items Controlled

\* \* \* \* \*

Items:

**Note:** 5A002 does not control any of the following. However, these items are instead controlled under 5A992:

(a) "Personalized smart cards" having any of the following:

(1) Where the cryptographic capability is restricted for use in equipment or systems excluded from control paragraphs (b) through (g) of this Note; or

(2) For general public-use applications where the cryptographic capability is not user-accessible and it is specially designed and limited to allow protection of personal data stored within;

N.B.: If a "personalized smart card" has multiple functions, the control status of each function is assessed individually.

(b) Receiving equipment for radio broadcast, pay television or similar restricted audience broadcast of the consumer type, without digital encryption except that exclusively used for sending the billing or program-related information back to the broadcast providers;

(c) Equipment where the cryptographic capability is not user-accessible and which is specially designed and limited to allow any of the following:

(1) Execution of copy-protected "software";

(2) Access to any of the following:

(a) Copy-protected contents stored on read-only media; or

(b) Information stored in encrypted form on media (e.g., in connection with the protection of intellectual property rights) where the media is offered for sale in identical sets to the public;

(3) Copying control of copyright protected audio/video data; or

(4) Encryption and/or decryption for protection of libraries, design attributes, or associated data for the design of semiconductor devices or integrated circuits;

(d) Cryptographic equipment specially designed and limited for banking use or 'money transactions';

**Technical Note:** The term 'money transactions' includes the collection and settlement of fares or credit functions.  
(e) Portable or mobile radiotelephones for civil use (e.g., for use with commercial civil cellular radio communication systems) that are not capable of transmitting encrypted data directly to another radiotelephone or equipment (other than Radio Access Network (RAN) equipment), nor of passing encrypted data through RAN equipment (e.g., Radio Network Controller (RNC) or Base Station Controller (BSC));

(f) Cordless telephone equipment not capable of end-to-end encryption where the maximum effective range of unboosted cordless operation (e.g., a single, unrelayed hop between terminal and home base station) is less than 400 meters according to the manufacturer's specifications; or

(g) Portable or mobile radiotelephones and similar client wireless devices for civil use, that implement only published or commercial cryptographic standards (except for anti-piracy functions, which may be unpublished) and also meet the provisions of paragraphs b. to d. of the Cryptography Note

(Note 3 in Category 5—Part 2), that have been customized for a specific civil industry application with features that do not affect the cryptographic functionality of these original non-customized devices.

**Technical Note:** Parity bits are not included in the key length.

a. Systems, equipment, application specific “electronic assemblies”, modules and integrated circuits for “information security”, as follows and other specially designed components therefor:

*N.B.:* For the control of Global Navigation Satellite Systems (GNSS) receiving equipment containing or employing decryption (i.e., GPS or GLONASS) see 7A005.

a.1. Designed or modified to use “cryptography” employing digital techniques performing any cryptographic function other than authentication or digital signature and having any of the following:

**Technical Notes:**

1. Authentication and digital signature functions include their associated key management function.

2. Authentication includes all aspects of access control where there is no encryption of files or text except as directly related to the protection of passwords, Personal Identification Numbers (PINs) or similar data to prevent unauthorized access.

3. “Cryptography” does not include “fixed” data compression or coding techniques.

**Note:** 5A002.a.1 includes equipment designed or modified to use “cryptography” employing analog principles when implemented with digital techniques.

a.1.a. A “symmetric algorithm” employing a key length in excess of 56-bits; or

a.1.b. An “asymmetric algorithm” where the security of the algorithm is based on any of the following:

a.1.b.1. Factorization of integers in excess of 512 bits (e.g., RSA);

a.1.b.2. Computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (e.g., Diffie-Hellman over  $Z/pZ$ ); or

a.1.b.3. Discrete logarithms in a group other than mentioned in 5A002.a.1.b.2 in excess of 112 bits (e.g., Diffie-Hellman over an elliptic curve);

a.2. Designed or modified to perform cryptanalytic functions;

a.3. [Reserved]

a.4. Specially designed or modified to reduce the compromising emanations of information-bearing signals beyond what is necessary for health, safety or electromagnetic interference standards;

a.5. Designed or modified to use cryptographic techniques to generate the spreading code for “spread spectrum” systems, not controlled in 5A002. a.6., including the hopping code for “frequency hopping” systems;

a.6. Designed or modified to use cryptographic techniques to generate channelizing codes, scrambling codes or network identification codes, for systems using ultra-wideband modulation techniques and having any of the following:

a.6.a. A bandwidth exceeding 500 MHz; or

a.6.b. A “fractional bandwidth” of 20% or more;

a.7. [Reserved]

a.8. Communications cable systems designed or modified using mechanical, electrical or electronic means to detect surreptitious intrusion;

a.9. Designed or modified to use ‘quantum cryptography.’

**Technical Notes:**

1. ‘Quantum cryptography’ A family of techniques for the establishment of a shared key for “cryptography” by measuring the quantum-mechanical properties of a physical system (including those physical properties explicitly governed by quantum optics, quantum field theory, or quantum electrodynamics).

2. ‘Quantum cryptography’ is also known as Quantum Key Distribution (QKD).

■ 30. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 6 Sensors, Export Control Classification Number (ECCN) 6A001 is amended by revising the Heading and the Items paragraph of the List of Items Controlled section, to read as follows:

**6A001 Acoustic systems, equipment and components, as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

**Items:**

a. Marine acoustic systems, equipment and specially designed components therefor, as follows:

a.1. Active (transmitting or transmitting-and-receiving) systems, equipment and specially designed components therefor, as follows:

**Note:** 6A001.a.1 does not control:

a. Depth sounders operating vertically below the apparatus, not including a scanning function exceeding  $\pm 20^\circ$ , and limited to measuring the depth of water, the distance of submerged or buried objects or fish finding;

b. Acoustic beacons, as follows:

1. Acoustic emergency beacons;

2. Pingers specially designed for relocating or returning to an underwater position.

a.1.a. Wide-swath bathymetric survey systems designed for sea bed topographic mapping and having all of the following:

a.1.a.1. Designed to take measurements at an angle exceeding  $20^\circ$  from the vertical;

a.1.a.2. Designed to measure depths exceeding 600 m below the water surface; and

a.1.a.3. Designed to provide any of the following:

a.1.a.3.a. Incorporation of multiple beams any of which is less than  $1.9^\circ$ ; or

a.1.a.3.b. Data accuracies of better than 0.3% of water depth across the swath averaged over the individual measurements within the swath;

a.1.b. Object detection or location systems, having any of the following:

a.1.b.1. A transmitting frequency below 10 kHz;

a.1.b.2. Sound pressure level exceeding 224dB (reference  $1\mu\text{Pa}$  at 1 m) for equipment

with an operating frequency in the band from 10 kHz to 24 kHz inclusive;

a.1.b.3. Sound pressure level exceeding 235 dB (reference  $1\mu\text{Pa}$  at 1 m) for equipment with an operating frequency in the band between 24 kHz and 30 kHz;

a.1.b.4. Forming beams of less than  $1^\circ$  on any axis and having an operating frequency of less than 100 kHz;

a.1.b.5. Designed to operate with an unambiguous display range exceeding 5,120 m; or

a.1.b.6. Designed to withstand pressure during normal operation at depths exceeding 1,000 m and having transducers with any of the following:

a.1.b.6.a. Dynamic compensation for pressure; or

a.1.b.6.b. Incorporating other than lead zirconate titanate as the transduction element;

a.1.c. Acoustic projectors, including transducers, incorporating piezoelectric, magnetostrictive, electrostrictive, electrodynamic or hydraulic elements operating individually or in a designed combination and having any of the following:

**Notes:** 1. The control status of acoustic projectors, including transducers, specially designed for other equipment is determined by the control status of the other equipment.

2. 6A001.a.1.c does not control electronic sources that direct the sound vertically only, or mechanical (e.g., air gun or vapor-shock gun) or chemical (e.g., explosive) sources.

a.1.c.1. An instantaneous radiated ‘acoustic power density’ exceeding  $0.01\text{ mW/mm}^2/\text{Hz}$  for devices operating at frequencies below 10 kHz;

a.1.c.2. A continuously radiated ‘acoustic power density’ exceeding  $0.001\text{ mW/mm}^2/\text{Hz}$  for devices operating at frequencies below 10 kHz; or

**Technical Note:** ‘Acoustic power density’ is obtained by dividing the output acoustic power by the product of the area of the radiating surface and the frequency of operation.

a.1.c.3. Side-lobe suppression exceeding 22 dB;

a.1.d. Acoustic systems, equipment and specially designed components for determining the position of surface vessels or underwater vehicles, designed to operate at a range exceeding 1,000 m with a positioning accuracy of less than 10 m rms (root mean square) when measured at a range of 1,000 m;

**Note:** 6A001.a.1.d includes:

a. Equipment using coherent “signal processing” between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle;

b. Equipment capable of automatically correcting speed-of-sound propagation errors for calculation of a point.

a.2. Passive (receiving, whether or not related in normal application to separate active equipment) systems, equipment and specially designed components therefor, as follows:

a.2.a. Hydrophones having any of the following:

**Note:** The control status of hydrophones specially designed for other equipment is determined by the control status of the other equipment.

- a.2.a.1. Incorporating continuous flexible sensing elements;
- a.2.a.2. Incorporating flexible assemblies of discrete sensing elements with either a diameter or length less than 20 mm and with a separation between elements of less than 20 mm;
- a.2.a.3. Having any of the following sensing elements:
  - a.2.a.3.a. Optical fibers;
  - a.2.a.3.b. 'Piezoelectric polymer films' other than polyvinylidene-fluoride (PVDF) and its co-polymers {P(VDF-TrFE) and P(VDF-TFE)}; or
  - a.2.a.3.c. 'Flexible piezoelectric composites';
  - a.2.a.4. A 'hydrophone sensitivity' better than -180dB at any depth with no acceleration compensation;
  - a.2.a.5. Designed to operate at depths exceeding 35 m with acceleration compensation; or
  - a.2.a.6. Designed for operation at depths exceeding 1,000 m;

**Technical Notes:** 1. 'Piezoelectric polymer film' sensing elements consist of polarized polymer film that is stretched over and attached to a supporting frame or spool (mandrel).

2. 'Flexible piezoelectric composite' sensing elements consist of piezoelectric ceramic particles or fibers combined with an electrically insulating, acoustically transparent rubber, polymer or epoxy compound, where the compound is an integral part of the sensing elements.

3. 'Hydrophone sensitivity' is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field with an rms pressure of 1 µPa. For example, a hydrophone of -160 dB (reference 1 V per µPa) would yield an output voltage of 10<sup>-8</sup> V in such a field, while one of -180 dB sensitivity would yield only 10<sup>-9</sup> V output. Thus, -160 dB is better than -180 dB.

- a.2.b. Towed acoustic hydrophone arrays having any of the following:
    - a.2.b.1. Hydrophone group spacing of less than 12.5 m or 'able to be modified' to have hydrophone group spacing of less than 12.5 m;
    - a.2.b.2. Designed or 'able to be modified' to operate at depths exceeding 35m;
- Technical Note:** 'Able to be modified' in 6A001.a.2.b means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These provisions are: spare wiring exceeding 10% of the number of wires, hydrophone group spacing adjustment blocks or internal depth limiting devices that are adjustable or that control more than one hydrophone group.
- a.2.b.3. Heading sensors controlled by 6A001.a.2.d;
  - a.2.b.4. Longitudinally reinforced array hoses;
  - a.2.b.5. An assembled array of less than 40 mm in diameter;
  - a.2.b.6. [Reserved]; or
  - a.2.b.7. Hydrophone characteristics controlled by 6A001.a.2.a;
  - a.2.c. Processing equipment, specially designed for towed acoustic hydrophone

arrays, having "user accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

- a.2.d. Heading sensors having all of the following:
  - a.2.d.1. An accuracy of better than ±0.5°; and
  - a.2.d.2. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m;
- a.2.e. Bottom or bay cable systems, having any of the following:
  - a.2.e.1. Incorporating hydrophones controlled by 6A001.a.2.a; or
  - a.2.e.2. Incorporating multiplexed hydrophone group signal modules having all of the following characteristics:
    - a.2.e.2.a. Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; and
    - a.2.e.2.b. Capable of being operationally interchanged with towed acoustic hydrophone array modules;

a.2.f. Processing equipment, specially designed for bottom or bay cable systems, having "user accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

b. Correlation-velocity and Doppler-velocity sonar log equipment designed to measure the horizontal speed of the equipment carrier relative to the sea bed, as follows:

- b.1. Correlation-velocity sonar log equipment having any of the following characteristics:
  - b.1.a. Designed to operate at distances between the carrier and the sea bed exceeding 500 m; or
  - b.1.b. Having speed accuracy better than 1% of speed;
- b.2. Doppler-velocity sonar log equipment having speed accuracy better than 1% of speed.

**Note 1:** 6A001.b. does not apply to depth sounders limited to any of the following:

- a. Measuring the depth of water;
- b. Measuring the distance of submerged or buried objects; or
- c. Fish finding.

**Note 2:** 6A001.b. does not apply to equipment specially designed for installation on surface vessels.

- 31. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 6 Sensors, Export Control Classification Number (ECCN) 6A005 is amended by:
  - a. Revising the citation "6A005.b.2, b.3, or b.4" to read "6A005.a.4, b.2, b.3, b.4" in paragraph g of the License Requirements Note;
  - b. Revising the phrase "Dye and Liquid Lasers controlled by 6A005.c.1 and c.2," to read "Dye and Liquid Lasers controlled by 6A005.c.1, c.2 and c.3," in the GBS and CIV paragraphs of the License Exception section; and

■ 32. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 6 Sensors, Export Control Classification Number (ECCN) 6A995, the Note following paragraph e.2.b is amended by revising the citation "6A995.e.1.b" to read "6A995.e.2.b".

■ 33. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 7 Navigation and Avionics, Export Control Classification Number (ECCN) 7A002 is amended by removing the term "drift rate" and adding in its place "bias" in 7A002.a and 7A002.c.1 in the Items paragraph of the List of Items Controlled section.

■ 34. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 7 Navigation and Avionics, Export Control Classification Number (ECCN) 7A003 is amended by revising the Items paragraph of the List of Items Controlled section, to read as follows:

**7A003 Inertial Systems and specially designed components therefor.**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

- Items:*
- a. Inertial Navigation Systems (INS) (gimbal or strapdown) and inertial equipment designed for "aircraft", land vehicles, vessels (surface or underwater) or "spacecraft" for navigation, attitude, guidance or control, having any of the following characteristics, and specially designed components therefor:
    - a.1. Navigation error (free inertial) subsequent to normal alignment of 0.8 nautical mile per hour (nm/hr) "Circular Error Probable" ("CEP") or less (better); or
    - a.2. Specified to function at linear acceleration levels exceeding 10 g;
  - b. Hybrid Inertial Navigation Systems embedded with Global Navigation Satellite System(s) (GNSS) or with "Data-Based Referenced Navigation" ("DBRN") System(s) for navigation, attitude, guidance or control, subsequent to normal alignment, having an INS navigation position accuracy, after loss of GNSS or "DBRN" for a period of up to 4 minutes, of less (better) than 10 meters "Circular Error Probable" ("CEP");
  - c. Inertial Measurement equipment for heading or True North determination having any of the following, and specially designed components therefor:
    - c.1. Designed to have heading or True North determination accuracy equal to, or less (better) than 0.07 deg sec (Lat) equivalent to 6 arc minutes RMS at 45 degrees latitude; or
    - c.2. Designed to have a non-operating shock level of 900 g or greater at a duration of 1-msec or greater;
    - d. Inertial measurement equipment including Inertial Measurement Units (IMU) and Inertial Reference Systems (IRS), incorporating accelerometers or gyros controlled by 7A001 or 7A002, and specially designed components therefor.

**Note 1:** The parameters of 7A003.a and 7A003.b are applicable with any of the following environmental conditions:

a. Input random vibration with an overall magnitude of 7.7 g rms in the 0.5 hour and a total test duration of 1.5 hour per axis in each of the 3 perpendicular axes, when the random vibration meets all of the following:

1. A constant Power Spectral Density (PSD) value of 0.04 g<sup>2</sup>/Hz over a frequency interval of 15 to 1,000 Hz; and

2. The PSD attenuates with frequency from 0.04 g<sup>2</sup>/Hz to 0.01 g<sup>2</sup>/Hz over a frequency interval from 1,000 to 2,000 Hz;

b. An angular rate capability about one or more axes of equal to or more than +2.62 rad/s (150 deg/s); or

c. According to national standards equivalent to a. or b. of this note.

**Note 2:** 7A003 does not control inertial navigation systems that are certified for use on "civil aircraft" by civil authorities of a Wassenaar Arrangement Participating State, see Supplement No. 1 to Part 743 for a list of these countries.

**Note 3:** 7A003.c.1 does not control theodolite systems incorporating inertial equipment specially designed for civil surveying purposes.

**Technical Note:** 7A003.b refers to systems in which an INS and other independent navigation aids are built into a single unit (embedded) in order to achieve improved performance.

■ 35. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 7 Navigation and Avionics, Export Control Classification Number (ECCN) 7A008 is amended by revising the Heading and Related Controls paragraph in the List of Items Controlled section, to read as follows:

**7A008 Underwater sonar navigation systems, using Doppler velocity or correlation velocity logs integrated with a heading source and having a positioning accuracy of equal to or less (better) than 3% of distance traveled "Circular Error Probable" ("CEP"), and specially designed components therefore.**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Related Controls:* 7A008 does not control systems specially designed for installation on surface vessels or systems requiring acoustic beacons or buoys to provide positioning data. See 6A001.a for acoustic systems, and 6A001.b for correlation-velocity and Doppler-velocity sonar log equipment. See 8A002 for other marine systems.

\* \* \* \* \*

■ 36. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 9 Aerospace and Propulsion, Export Control Classification Number 9A012 is amended by revising the Heading and the Items paragraph in the List of Items Controlled section, to read as follows:

**9A012 Non-military "unmanned aerial vehicles," ("UAVs"), associated systems, equipment and components, as follows. (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Items:*

- a. "UAVs" having any of the following:
  - a.1. An autonomous flight control and navigation capability (e.g., an autopilot with an Inertial Navigation System); or
  - a.2. Capability of controlled flight out of the direct visual range involving a human operator (e.g., televisual remote control);
- b. Associated systems, equipment and components, as follows:
  - b.1. Equipment specially designed for remotely controlling the "UAVs" controlled by 9A012.a.;
  - b.2. Guidance or control systems, other than those controlled in Category 7, specially designed for integration into "UAVs" controlled by 9A012.a.;
  - b.3. Equipment and components specially designed to convert a manned "aircraft" to a "UAV" controlled by 9A012.a.;
  - b.4. Air breathing reciprocating or rotary internal combustion type engines, specially designed or modified to propel "UAVs" at altitudes above 50,000 feet (15,240 meters).

**Note:** 9A012 does not control model aircraft.

■ 37. In Supplement No. 1 to Part 774 (the Commerce Control List), Category 9 Aerospace and Propulsion, Export Control Classification Number 9E003 is amended by revising the Heading and the Items paragraph in the List of Items Controlled section, to read as follows:

**9E003 Other "technology" as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

\* \* \* \* \*

*Items:*

- a. "Technology" "required" for the "development", "production" of any of the following gas turbine engine components or systems:
  - a.1. Gas turbine blades, vanes or tip shrouds, made from directionally solidified (DS) or single crystal (SC) alloys and having (in the 001 Miller Index Direction) a stress-rupture life exceeding 400 hours at 1,273 K (1,000 °C) at a stress of 200 MPa, based on the average property values;
  - a.2. Multiple domed combustors operating at average burner outlet temperatures exceeding 1,813 K (1,540 °C) or combustors incorporating thermally decoupled combustion liners, non-metallic liners or non-metallic shells;
  - a.3. Components manufactured from any of the following:
    - a.3.a. Organic "composite" materials designed to operate above 588 K (315 °C);
    - a.3.b. Metal "matrix" "composite", ceramic "matrix", intermetallic or intermetallic reinforced materials, controlled by 1C007; or

- a.3.c. "Composite" material controlled by 1C010 and manufactured with resins controlled by 1C008;

- a.4. Uncooled turbine blades, vanes, tip-shrouds or other components, designed to operate at gas path total (stagnation) temperatures of 1,323 K (1,050 °C) or more at sea-level static take-off (ISA) in a 'steady state mode' of engine operation;

- a.5. Cooled turbine blades, vanes or tip-shrouds, other than those described in 9E003.a.1, exposed to gas path total (stagnation) temperatures of 1,643 K (1,370 °C) or more at sea-level static take-off (ISA) in a 'steady state mode' of engine operation;

**Technical Note:** The term 'steady state mode' defines engine operation conditions, where the engine parameters, such as thrust/power, rpm and others, have no appreciable fluctuations, when the ambient air temperature and pressure at the engine inlet are constant.

- a.6. Airfoil-to-disk blade combinations using solid state joining;

- a.7. Gas turbine engine components using "diffusion bonding" "technology" controlled by 2E003.b;

- a.8. Damage tolerant gas turbine engine rotating components using powder metallurgy materials controlled by 1C002.b;

- a.9. Full authority digital electronic engine control (FADEC) for gas turbine and combined cycle engines and their related diagnostic components, sensors and specially designed components;

- a.10. Adjustable flow path geometry and associated control systems for:

- a.10.a. Gas generator turbines;

- a.10.b. Fan or power turbines;

- a.10.c. Propelling nozzles; or

**Note 1:** Adjustable flow path geometry and associated control systems in 9E003.a.10 do not include inlet guide vanes, variable pitch fans, variable stators or bleed valves for compressors.

**Note 2:** 9E003.a.10 does not control "development" or "production" "technology" for adjustable flow path geometry for reverse thrust.

- a.11. Hollow fan blades;

- b. "Technology" "required" for the "development" or "production" of any of the following:

- b.1. Wind tunnel aero-models equipped with non-intrusive sensors capable of transmitting data from the sensors to the data acquisition system; or

- b.2. "Composite" propeller blades or propfans, capable of absorbing more than 2,000 kW at flight speeds exceeding Mach 0.55;

- c. "Technology" "required" for the "development" or "production" of gas turbine engine components using "laser", water jet, Electro-Chemical Machining (ECM) or Electrical Discharge Machines (EDM) hole drilling processes to produce holes having any of the following:

- c.1. All of the following:

- c.1.a. Depths more than four times their diameter;

- c.1.b. Diameters less than 0.76 mm; and

- c.1.c. 'Incidence angles' equal to or less than 25°; or

- c.2. All of the following:



- c.2.a. Depths more than five times their diameter;
- c.2.b. Diameters less than 0.4 mm; and
- c.2.c. 'Incidence angles' of more than 25°;

**Technical Note:** For the purposes of 9E003.c, incidence angle is measured from a plane tangential to the airfoil surface at the point where the hole axis enters the airfoil surface.

d. "Technology" "required" for the "development" or "production" of helicopter power transfer systems or tilt rotor or tilt wing "aircraft" power transfer systems;

e. "Technology" for the "development" or "production" of reciprocating diesel engine ground vehicle propulsion systems having all of the following:

- e.1. 'Box volume' of 1.2 m<sup>3</sup> or less;
- e.2. An overall power output of more than 750 kW based on 80/1269/EEC, ISO 2534 or national equivalents; and
- e.3. Power density of more than 700 kW/m<sup>3</sup> of 'box volume';

**Technical Note:** 'Box volume' is the product of three perpendicular dimensions measured in the following way:

Length: The length of the crankshaft from front flange to flywheel face;

Width: The widest of any of the following:

a. The outside dimension from valve cover to valve cover;

b. The dimensions of the outside edges of the cylinder heads; or

c. The diameter of the flywheel housing;

Height: The largest of any of the following:

a. The dimension of the crankshaft centerline to the top plane of the valve cover (or cylinder head) plus twice the stroke; or

b. The diameter of the flywheel housing.

f. "Technology" "required" for the "production" of specially designed components, for high output diesel engines, as follows:

f.1. "Technology" "required" for the "production" of engine systems having all of the following components employing ceramics materials controlled by 1C007:

f.1.a. Cylinder liners;

f.1.b. Pistons;

f.1.c. Cylinder heads; and

f.1.d. One or more other components (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors);

f.2. "Technology" "required" for the "production" of turbocharger systems with single-stage compressors and having all of the following:

f.2.a. Operating at pressure ratios of 4:1 or higher;

f.2.b. Mass flow in the range from 30 to 130 kg per minute; and

f.2.c. Variable flow area capability within the compressor or turbine sections;

f.3. "Technology" "required" for the "production" of fuel injection systems with a specially designed multifuel (e.g., diesel or jet fuel) capability covering a viscosity range from diesel fuel (2.5 cSt at 310.8 K (37.8 °C)) down to gasoline fuel (0.5 cSt at 310.8 K (37.8 °C)) and having all of the following:

f.3.a. Injection amount in excess of 230 mm<sup>3</sup> per injection per cylinder; and

f.3.b. Electronic control features specially designed for switching governor characteristics automatically depending on fuel property to provide the same torque characteristics by using the appropriate sensors;

g. "Technology" "required" for the "development" or "production" of 'high output diesel engines' for solid, gas phase or liquid film (or combinations thereof) cylinder wall lubrication and permitting operation to temperatures exceeding 723 K (450 °C), measured on the cylinder wall at the top limit of travel of the top ring of the piston;

**Technical Note:** 'High output diesel engines' are diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 r.p.m., provided the rated speed is 2,300 r.p.m. or more.

h. "Technology" not otherwise controlled in 9E003.a.1 through a.10 and currently used in the "development", "production", or overhaul of hot section parts and components of civil derivatives of military engines controlled on the U.S. Munitions List.

Dated: September 26, 2008.

**Christopher R. Wall,**

Assistant Secretary for Export Administration.

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