

**WORKING PARTY ON
DUAL USE GOODS**

DS 25/2009
26 March 2009

**REVISION OF ANNEX I TO COUNCIL REGULATION (EC) No. 1334/2000
FOLLOWING UPDATES TO THE REGIME LISTS**

CHANGE NOTE 7 - PART 3 WORKING PAPERS

ANNEX I

Comments and suggestions have been gratefully received from Member States in response to the proposed update of Annex I, as identified in DS22/2009 and the X17.2 series of working papers.

In response to these comments and in consultation with the various Member States it was decided that a number of editorial amendments are required. These amendments have been implemented in the X17.3 series working papers which are circulated with this document. The changes can be highlighted by comparing the X17.3 series papers with the previously circulated X17.2 series.

You will also find that the proposal of DS24/2009 to clarify NSG nuclear fission reactors has been implemented in Working Paper CAT0_X17.doc

Finally, please find below a revised summary of changes listing all amendments.

If there are any omissions, errors or other questions about this update please e-mail comments to Rosemary Chabanski in the Council Secretariat, copying Gary Barter at the following address:

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EDITORIAL PRACTICES

The English version of the amending regulation and working documents used in the UK and on the BERR website use the decimal point. The OJ uses a comma to separate the whole number from decimals, and whole numbers are presented in series of three, each series being separated by a thin space.

Comparison of old and new text should be carried out to check the full details of the changes which are summarised for reference as follows:

Definitions		
"Bias" (accelerometer)	WA	Definition amended.
"Digital transfer rate"	Edit	Category reference added.
"Explosives"	WA	New definition.
"Fusible"	WA	New definition.
"Multi-data-stream processing"	WA	Definition deleted.
"Noise level"	WA	Definition deleted.
"Nuclear reactor"	DS24/9	Definition of nuclear reactor amended.
"Personal area network"	WA	New definition.
"Personalized smart card"	WA	Definition amended.
"Riot control agent"	WA07	New definition.
"Space-qualified"	Edit	Minor editorial amendment to reflect that use in CAT 3 and 6.

Category 0		
0A001.a.	DS24/9	Sub-entry amended for fission nuclear reactors.
0A001.b.	DS24/9	Sub-entry amended.

Category 1		
Title	WA	Title changed to Special Materials and Related Equipment
1A001.c., 1. & 2.	WA	Sub-entry for components made from fluorinated compounds amended to include 2 new sub-paragraphs.
1A002 <i>Note 3</i>	WA	Note 3 added to decontrol certain composite structures.
1A003 & N.B.	WA	Sub-entry for aromatic polyimides amended; New Nota Bene added
1A004 <i>Note b</i>	WA	Note amended.
1A004.c.	Edit	Regime reference added.
1A004.d., <i>Tech Note & Notes 1 & 2</i>	WA	New sub-entry for electronic equipment for detecting or identifying explosive residues; Technical Note added; Decontrol Notes 1 and 2 added.
1A007.b.2. <i>Tech Note 2</i>	Edit	Minor amendment to Tech Note..
1A008 & <i>Tech Note</i>	WA	New entry for charges and devices, includes 4 sub-entries for shape charges, linear cutting charges, detonating cord and cutters; Technical Note added.
1B001.f.2.	WA	Sub-entry amended.
1B003.c.	WA	Sub-entry amended.
1B101	MTCR	Sub-entry amended to include fibre placement machines; Regime reference amended.
1C008.a. <i>Note & N.B.</i>	WA	Note 2 deleted; Original Note 1 becomes Note; New Nota Bene added.
1C010.b. <i>Tech Note</i>	WA	Technical Note amended.

1C111.a.2.d.	Edit	Minor editorial amendment.
1C111.a.4.a., b., d. & h.	MTCR	CAS numbers added sub-entries for hydrazine derivatives
1C111c.6.b.	MTCR	CAS numbers added to sub-entry for ferrocene additive.
1C111c.6.c. & f.	MTCR	CAS numbers deleted to sub-entries for ferrocene additive.
1C111c.7.	MTCR	New sub-entry for a triazole plasticiser.
1D003	WA	Entry amended to include software related to new entry 1A004.b.; Regime reference added.
1E001	WA	Entry amended to include technology related to new entries 1A006.b. and 1A007
1E002.g.	WA	Sub-entry amended to include libraries related to new entry 1A004.b.

Category 2		
2B116.b. <i>Tech Note</i>	MTCR	Tech Note added to Vibration test system entry
2B120.b. & <i>Note 2</i>	MTCR	Sub-paragraph for motion simulators amended; Note 2 added; Original Note renumber 1.
2B121.b.	MTCR	Sub-paragraph amended.
2B122 & <i>Note</i>	MTCR	Entry for centrifuges amended; New Note added.
2B350.e.	Edit	Minor editorial correction.
2B350.g.i., 1., 2. & 3.	AG	New sub-paragraphs for valves with ceramic construction, includes 3 sub-paragraphs.
2B351	Edit	Entry for toxic gas monitoring equipment amended to remove possible overlap of controls.
2B352.d.1, b., b.1. & b.2.	AG	Sub-entry for certain flow filtration equipment amended, includes 2 new sub-paragraphs.
2D351	AG	New control for toxic gas monitoring equipment software.

Category 3		
3A <i>Note 2 NB</i>	WA	Nota Bene to Note 2 deleted.
3A001.a.7. & <i>Tech Notes 1 & 2</i>	WA	FPGA sub-entry amended; new Tech Note added; original Tech Note renumbered 1.
3A001.a.10.a. & b.	WA	Parameters in sub-paragraphs amended for custom integrated circuits.
3A001.b.1.a.4.c.	Edit	Minor editorial amendment.
3A001.b.8.b.	WA	Sub-paragraph amended.
3A001.b.10. a., b. & <i>Tech Note</i>	WA	New sub-entry for oscillators and oscillator assemblies, including 2 sub-paragraphs and Tech Note.
3A001.c.	WA	New de-control Note added for acoustic wave devices control.
3A001.c.1. & b.1., c.3 & <i>Tech Note</i>	WA	Sub-entry and sub-paragraphs for surface acoustic wave devices amended; New Tech Note added.
3A001.c.2.	WA	Sub-entry for bulk acoustic wave devices amended.
3A001.e.4.	Edit	Minor editorial amendment
3A001.f.	WA	Sub-entry for rotary position encoders amended.
3A001.h., 1., 2., 3., <i>Notes 1, 2 & 3 & Tech Note</i>	WA	New sub-entry for Solid state power switches including 3 sub-paragraphs, 3 new Notes and a Tech Note.
3A002.a.3.b.	Edit	Minor editorial amendment.
3A002.d.3.a, 4., 4.a., 4.b., & <i>Tech Note</i>	WA	Sub-paragraphs for frequency synthesised signal generators amended; New Tech Note added.
3A002.g.	Edit	Minor editorial amendment; Regime reference moved to sub-

		paragraph 1.
3B001.a.1. <i>Note</i>	WA	New Note added.
3C002.e.	Edit	Minor editorial amendment.

Category 4		
4D001.b.1.	WA	Sub-paragraph parameter amended.
4D003	WA	Sub-entries deleted and original sub-entry c. renumber 4D003.
4E001.b.1.	WA	Sub-paragraph parameter amended.

Category 5 Part 1		
5A001.f., f.1., f.2. & f.3.	WA	Sub-entry for jamming equipment amended; sub-paragraphs 1. and 2. amended; new sub-paragraph 3. added.
5A001.h. & N.B.	WA	New sub-entry for electronic equipment to activate or prevent radio controlled improvised explosive devices, including N.B.
5B001.a.	Edit	Regime reference added.
5B001.b.2.b.	WA	Sub-paragraph amended for telecoms equipment employing lasers.
5D001.a.	WA	Entry amended.
5E001	Edit	Regime reference added.
5E001.a.	WA	Entry amended.
5E001.c.2.d.	WA	Sub-paragraph amended.
5E001.c.2. N.B.	WA	Nota Bene added.
5E001.c.6.	WA	New control on technology for certain mobile equipment
5E001.d., 1., 2., 3., 4., 5. & 6.	WA	New control on technology for certain telecoms microwave monolithic integrated circuits, includes 6 new sub-paragraphs.
5E001.e., 1. & 2.	WA	New control on technology for certain telecoms devices containing superconducting materials, includes 2 new sub-paragraphs.
Category 5 Part 2		
5A002.a.7.	WA	New sub-entry for security systems exceeding EAL-6.
5A002.a. <i>Note h</i>	WA	New decontrol for certain equipment for servicing portable or mobile radiotelephones.
5A002.a. <i>Note i</i>	WA	New decontrol for certain wireless equipment with range of 30m or less.
5B002.a.	WA	Sub-entry amended for information security development and production equipment; 2 original sub-paragraphs removed.
5B002.b.	WA	Sub-entry amended for information security measuring equipment.
5D002.a.	WA	Sub-entry for cryptographic software amended.
5D002.c.1.	WA	Sub-entry for cryptographic software amended.
5E002	WA	Sub-entry for technology for cryptography related items amended.

Category 6		
6A001.c.	WA	New sub-entry for certain diver deterrent acoustic systems.

6A002.a.1.	WA	New Note added.
6A002.a.1.d.	WA	New sub-entry for space qualified FPAs that were previously specified by 6A002.e.
6A002.a.2.a.3.a. & c.	WA	Sub-paragraph for image intensifier photocathodes amended; Note to c. deleted.
6A002.a.2.b.3.	WA	Sub-paragraph for image intensifier photocathodes amended; Note to 3. deleted.
6A002.b. <i>Note</i>	WA	Note added to sub-entry for imaging sensors for remote sensing applications.
6A002.e.	WA	Sub-entry moved to 6A002.a.1.d., now not used.
6A003.b.3.	Edit	Regime reference added.
6A003.b.4.d.	WA	Sub-entry deleted.
6A003.b.5.	Edit	Minor editorial amendment.
6A004.c.1. & 4.	WA	Sub-paragraphs for space qualified optical system components amended.
6A004.d.1. & 2.	WA	Sub-paragraphs for optical control equipment amended.
6A005.b.6.b.	WA	Sub-paragraph for laser control amended.
6A006.a.1., a. & b.	WA	Sub-entry and sub-paragraphs amended for magnetometers.
6A006.a.2.	WA	Sub-entry amended for magnetometers; regime reference amended.
6A006.a.3.	WA	Sub-entry amended for magnetometers.
6A006.a.4.	WA	Sub-entry amended for magnetometers.
6A006.a.5	WA	Sub-entry amended for magnetometers.
6A006.b.	WA	Sub-entry amended for underwater electric field sensors.
6A006.c.2. & 3.	WA	Sub-paragraphs amended for magnetic gradiometers.
6A006 <i>Tech Note</i>	WA	New technical Note added.
6A008.j. <i>Notes 1, 2 & 3</i>	WA	New Notes 1, 2 and 3 added; original Note deleted.
6A008.j.3.	WA	New sub-entry for LIDAR equipment for airborne surveys
6A108.b.2.a.	MTCR	Parameter in sub-entry for tracking systems amended
6D003.b., c., d., e., f., g. & h.	WA/Edit	New sub-entry c. for software to allow increase of frame rate in certain electronic cameras; Original sub-entry b. re-numbered f.; Original sub-entry c. re-numbered g.; Original sub-entry d. re-numbered h.; Sub-entries b., d. and e. not used.

Category 7		
7A001.a.3.	Edit	Regime reference amended.
7A003.c. & c.1.	WA/Edit	Sub-entry for inertial equipment amended.
7A003 <i>Tech Note 2</i>	Edit	Minor editorial amendment to Tech Note 2
7A101, <i>Note & Tech Notes</i>	MTCR	Original sub-entry b. deleted, now specified under 7A001.a.3.; Original sub-entry a. now 7A101; Note and Tech Note amended.

Category 8		
8A001.b.3.a., b. & <i>Tech Note 2</i>	WA	Original sub-paragraphs a. and d. deleted for manned submersibles; Original sub-paragraphs b. and c. re-numbered a. and b.; Tech Note 2 amended.
8A001.f., 1. & 2.	WA	Sub-entry for underwater electronic imaging systems amended; 2 new sub-paragraphs included.

Category 9		
9A012.b.2.	WA	Sub-entry for UAV systems amended; Regime reference added.
9A108, a., b. & c.	MTCR07	Entry amended for solid rocket system to take into account MTCR change of 2007 to M3A3 of Technical Annex
9A110	MTCR	Entry amended for certain composite structures.
9E101.a. & b.	Edit	Editorial amendment to control certain UAV technology; Original entry divided into new sub-entries a. and b.
9E102	Edit	Editorial amendment to control certain UAV technology.

Annex IV		
No change		

For ease of reference the result of the electronic document comparison between the working papers (X15.2 series) and text of the current legislation (X15.1 series) for Categories has been reduced to the following:

Definitions

"Bias" (accelerometer) (7) means 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 g or in metres per second squared (g or m/s²). (IEEE Std 528-2001) (Micro g equals 1x10⁻⁶ g).

"Digital transfer rate" (5) means the total bit rate of the information that is directly transferred on any type of medium.

N.B.: See also "total digital transfer rate".

"Explosives" (1) means solid, liquid or gaseous substances or mixtures of substances which, in their application as primary, booster, or main charges in warheads, demolition and other applications, are required to detonate.

"Fusible" (1) means capable of being cross-linked or polymerized further (cured) by the use of heat, radiation, catalysts, etc., or that can be melted without pyrolysis (charring).

"Nuclear reactor" (0) means a complete reactor capable of operation so as to maintain a controlled self-sustaining fission chain reaction. A "nuclear reactor" includes all the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain, come into direct contact with or control the primary coolant of the reactor core.

"Personal area network" (5) means a data communication system having all of the following characteristics:

- a. Allows an arbitrary number of independent or interconnected 'data devices' to communicate directly with each other; and
- b. Is confined to the communication between devices within the immediate vicinity of an individual person or device controller (e.g., single room, office, or automobile).

Technical Note:

'Data device' means equipment capable of transmitting or receiving sequences of digital information.

"Personalized smart card" (5) means a smart card or an electronically readable personal document (e.g., e-passport), containing a microcircuit which has been programmed for a specific application and cannot be reprogrammed for any other application by the user.

"Riot control agent" (1) means 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.

Technical Note:

Tear gases are a subset of "riot control agents".

"Space-qualified" (3 6) refers to products designed, manufactured and tested to meet the special electrical, mechanical or environmental requirements for use in the launch and deployment of satellites or high altitude flight systems operating at altitudes of 100 km or higher.

Category 0

CATEGORY 0 - NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT

0A Systems, Equipment and Components

- 0A001 "Nuclear reactors" and specially designed or prepared equipment and components
[IV] therefor, as follows:
- [T1.1*] a. "Nuclear reactors";
- [T1.2] b. Metal vessels, or major shop-fabricated parts therefor, including the reactor vessel head for a reactor pressure vessel, specially designed or prepared to contain the core of a "nuclear reactor";

Category 1

CATEGORY 1 – SPECIAL MATERIALS AND RELATED EQUIPMENT

1A Systems, Equipment and Components

- 1A001 Components made from fluorinated compounds, as follows:
- c. Seals, gaskets, valve seats, bladders or diaphragms, having all of the following:
1. Made from fluoroelastomers containing at least one vinyl ether group as a constitutional unit; and
 2. Specially designed for "aircraft", aerospace or 'missile' use.
- 1A002 "Composite" structures or laminates, having any of the following:
Note 3: *1A002.b.1. does not control finished or semi-finished items containing a maximum of two dimensions of interwoven filaments and specially designed for applications as follows:*
- a. *Metal heat-treatment furnaces for tempering metals;*
 - b. *Silicon boule production equipment.*
- 1A003 Manufactures of non-"fusible" aromatic polyimides in film, sheet, tape or ribbon form having any of the following :
- a. A thickness exceeding 0.254 mm; or
 - b. Coated or laminated with carbon, graphite, metals or magnetic substances.
- Note: *1A003 does not control manufactures when coated or laminated with copper and designed for the production of electronic printed circuit boards.*
- N.B.: *For "fusible" aromatic polyimides in any form, see 1C008.a.3.*

1A004 Protective and detection equipment and components, other than those specified in
[W] military goods controls, as follows:

N.B.: SEE ALSO 2B351 AND 2B352.

- a. Gas masks, filter canisters and decontamination equipment therefor, designed or modified for defence 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", including:

[A*] 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.

- d. Electronic equipment designed for automatically detecting or identifying the presence of "explosives" residues and utilising 'trace detection' techniques (e.g., surface acoustic wave, ion mobility spectrometry, differential mobility spectrometry, mass spectrometry).

Technical Note:

'Trace detection' is defined as the capability to detect less than 1 ppm vapour, or 1 mg solid or liquid.

Note 1: 1A004.d. does not control equipment specially designed for laboratory use.

Note 2: 1A004.d. does not control non-contact walk-through security portals.

1A004

Note: 1A004 does not control:

- a. Personal radiation monitoring dosimeters;
- b. Equipment limited by design or function to protect against hazards specific to residential safety and civil industries, such as mining, quarrying, agriculture, pharmaceuticals, medical, veterinary, environmental, waste management, or to the food industry.

1A007 Equipment and devices, specially designed to initiate charges and devices containing
[W] energetic materials, by electrical means, as follows:

[IV*] **N.B.: SEE ALSO MILITARY GOODS CONTROLS, 3A229 AND 3A232.**

[N6A2*] a. Explosive detonator firing sets designed to drive explosive detonators specified in 1A007.b.;

[N6A1*] b. Electrically driven explosive detonators as follows:

1. Exploding bridge (EB);
2. Exploding bridge wire (EBW);
3. Slapper;
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 utilise a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporises 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.*

1A008
[W]

Charges, devices and components, as follows:

- a. 'Shaped charges' having all of the following:
 1. Net Explosive Quantity (NEQ) greater than 90 g; and
 2. Outer casing diameter equal to or greater than 75 mm;
- b. Linear shaped cutting charges having all of the following, and specially designed components therefor:
 1. An explosive load greater than 40 g/m; and
 2. A width of 10 mm or more;
- c. Detonating cord with explosive core load greater than 64 g/m;
- d. Cutters, other than those specified in 1A008.b., and severing tools, having a Net Explosive Quantity (NEQ) greater than 3.5 kg.

Technical Note:

'Shaped charges' are explosive charges shaped to focus the effects of the explosive charge.

1B001

- f. Non-destructive inspection equipment specially designed for "composite" materials, as follows:
 1. X-ray tomography systems for three dimensional defect inspection;
 2. Numerically controlled ultrasonic testing machines of which the motions for positioning transmitters or receivers are simultaneously coordinated and programmed in four or more axes to follow the three dimensional contours of the component under inspection.

1B003
[W]

Tools, dies, moulds or fixtures, for "superplastic forming" or "diffusion bonding" titanium, aluminium or their alloys, specially designed for the manufacture of any of the following:

- a. Airframe or aerospace structures;
- b. "Aircraft" or aerospace engines; or
- c. Specially designed components for structures specified in 1B003.a. or for engines specified in 1B003b.

- 1B101
[M6B1a]
[N3B4*]
- a. Filament winding machines or fibre placement machines, of which the motions for positioning, wrapping and winding fibres can be coordinated and programmed in three or more axes, designed to fabricate composite structures or laminates from fibrous or filamentary materials, and coordinating and programming controls;
- 1C008
[W]
- Non-fluorinated polymeric substances as follows:
- a. 1. Bismaleimides;
2. Aromatic polyamide-imides;
3. Aromatic polyimides;
4. Aromatic polyetherimides having a glass transition temperature (T_g) exceeding 513 K (240°C);
- Note: 1C008.a. controls substances in liquid or solid "fusible" form, including resin, powder, pellet, film, sheet, tape or ribbon.
- N.B. For non-"fusible" aromatic polyimides in film, sheet, tape or ribbon form, see 1A003.
- 1C010
- Technical Note:
Properties for materials described in 1C010.b. should be determined using SACMA recommended methods SRM 12 to 17, ISO 10618 (2004) 10.2.1 Method A or national equivalent tow tests and based on lot average.
- 1C111
[M4C2d]
- Propellants and constituent chemicals for propellants, other than those specified in 1C011, as follows:
- a. Propulsive substances:
2. Metal fuels, other than that specified in the Military Goods Controls, in particle sizes of less than 60 μm , whether spherical, atomized, spheroidal, flaked or ground, consisting 97% by weight or more of any of the following:
- a. Zirconium;
b. Beryllium;
c. Magnesium; or
d. Alloys of the metals specified in a. to c. above;
- [M4C2b]
4. Hydrazine derivatives as follows:
- N.B.:** **SEE ALSO MILITARY GOODS CONTROLS.**
- a. Trimethylhydrazine (CAS 1741-01-1);
b. Tetramethylhydrazine (CAS 6415-12-9);
c. N,N diallylhydrazine;
d. Allylhydrazine (CAS 7422-78-8);
e. Ethylene dihydrazine;
f. Monomethylhydrazine dinitrate;
g. Unsymmetrical dimethylhydrazine nitrate;
h. Hydrazinium azide (CAS 14546-44-2);
i. Dimethylhydrazinium azide;
j. Hydrazinium dinitrate;
k. Diimido oxalic acid dihydrazine;
l. 2-hydroxyethylhydrazine nitrate (HEHN);
m. See Military Goods Controls for Hydrazinium perchlorate;
n. Hydrazinium diperchlorate;

- o. Methylhydrazine nitrate (MHN);
- p. Diethylhydrazine nitrate (DEHN);
- q. 3,6-dihydrazino tetrazine nitrate (1,4-dihydrazine nitrate) (DHTN);

1C111

c. Other propellant additives and agents:

[M4C6c1]
[M4C6d1]
[M4C6e1]
[M4C6d2]
[M4C6d4]
[M4C6c2]

1. **SEE MILITARY GOODS CONTROLS FOR Carboranes, decaboranes, pentaboranes and derivatives thereof;**
2. Triethylene glycol dinitrate (TEGDN) (CAS 111-22-8);
3. 2-Nitrodiphenylamine (CAS 119-75-5);
4. Trimethylolethane trinitrate (TMETN) (CAS 3032-55-1);
5. Diethylene glycol dinitrate (DEGDN) (CAS 693-21-0);
6. Ferrocene derivatives as follows:
 - a. **See Military Goods Controls for catocene;**
 - b. Ethyl ferrocene (CAS 1273-89-8);
 - c. Propyl ferrocene;
 - d. **See Military Goods Controls for n-butyl ferrocene;**
 - e. Pentyl ferrocene (CAS 1274-00-6);
 - f. Dicyclopentyl ferrocene;
 - g. Dicyclohexyl ferrocene;
 - h. Diethyl ferrocene;
 - i. Dipropyl ferrocene;
 - j. Dibutyl ferrocene (CAS 1274-08-4);
 - k. Dihexyl ferrocene (CAS 93894-59-8);
 - l. Acetyl ferrocenes;
 - m. **See Military Goods Controls for ferrocene Carboxylic acids;**
 - n. **See Military Goods Controls for butacene;**
 - o. Other ferrocene derivatives usable as rocket propellant burning rate modifiers, other than those specified in the Military Goods Controls.
7. 4,5 diazidomethyl-2-methyl-1,2,3-triazole (iso- DAMTR) , other than that specified in the Military Goods Controls.

[M4C6d5]

1D003 "Software" specially designed or modified to enable equipment to perform the functions
[W] of equipment specified in 1A004.c. or 1A004.d.
[A*]

1E Technology

1E001 "Technology" according to the General Technology Note for the "development"
[WS*&VS*] or "production" of equipment or materials specified in 1A001.b., 1A001.c., 1A002
[M*] to 1A005, 1A006.b., 1A007, 1B or 1C.

1E002

- g. 'Libraries (parametric technical databases)' specially designed or modified to enable equipment to perform the functions of equipment specified in 1A004.c. or 1A004.d.
Technical Note:
For the purpose of 1E002.g., 'library (parametric technical database)' means a collection of technical information, reference to which may enhance the performance of relevant equipment or systems.

Category 2

- 2B116 Vibration test systems, equipment and components therefor, as follows:
- b. Digital controllers, combined with specially designed vibration test software, with a 'real-time control bandwidth' greater than 5 kHz designed for use with vibration test systems specified in 2B116.a.;
Technical Note:
In 2B116.b., 'real-time control bandwidth' means the maximum rate at which a controller can execute complete cycles of sampling, processing data and transmitting control signals.
- 2B120 Motion simulators or rate tables having all of the following characteristics:
[M9B2c]
- a. Two axes or more;
 - b. Designed or modified to incorporate slip rings or integrated non-contact devices capable of transferring electrical power, signal information, or both; and
- Note 1: 2B120 does not control rotary tables designed or modified for machine tools or for medical equipment. For controls on machine tool rotary tables see 2B008.
Note 2: Motion simulators or rate tables specified in 2B120 remain controlled whether or not slip rings or integrated non-contact devices are fitted at time of export.
- 2B121 Positioning tables (equipment capable of precise rotary positioning in any axes), other than those specified in 2B120, having all the following characteristics:
[M9B2d]
- a. Two axes or more; and
 - b. A positioning "accuracy" equal to or less (better) than 5 arc second.
- Note: 2B121 does not control rotary tables designed or modified for machine tools or for medical equipment. For controls on machine tool rotary tables see 2B008.
- 2B122 Centrifuges capable of imparting accelerations above 100 g and designed or modified to incorporate slip rings or integrated non-contact devices capable of transferring electrical power, signal information, or both.
[M9B2e]
- Note: Centrifuges specified in 2B122 remain controlled whether or not slip rings or integrated non-contact devices are fitted at time of export.
- 2B350
- e. Distillation or absorption columns of internal diameter greater than 0.1 m; and liquid distributors, vapour distributors or liquid collectors designed for such distillation or absorption columns, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:
 1. Alloys with more than 25% nickel and 20% chromium by weight;
 2. Fluoropolymers;
 3. Glass (including vitrified or enamelled coatings or glass lining);
 4. Graphite or 'carbon graphite';

5. Nickel or alloys with more than 40% nickel by weight;
 6. Tantalum or tantalum alloys;
 7. Titanium or titanium alloys;
 8. Zirconium or zirconium alloys; or
 7. Niobium (columbium) or niobium alloys;
- g. Valves with nominal sizes greater than 10 mm and casings (valve bodies) or preformed casing liners designed for such valves, in which all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:
1. Alloys with more than 25% nickel and 20% chromium by weight;
 2. Fluoropolymers;
 3. Glass (including vitrified or enamelled coatings or glass lining);
 4. Nickel or alloys with more than 40% nickel by weight;
 5. Tantalum or tantalum alloys;
 6. Titanium or titanium alloys;
 7. Zirconium or zirconium alloys; or
 8. Niobium (columbium) or niobium alloys;
 9. Ceramic materials as follows:
 - a. Silicon carbide with purity of 80% or more by weight;
 - b. Aluminium oxide (alumina) with purity of 99.9% or more by weight;
 - c. Zirconium oxide (zirconia);

2B351 Toxic gas monitoring systems, other than those specified in 1A004, as follows; and
[A] dedicated detectors therefor:

- a. Designed for continuous operation and usable for the detection of chemical warfare agents or chemicals specified in 1C350, at concentrations of less than 0.3 mg/m³; or
- b. Designed for the detection of cholinesterase-inhibiting activity.

2B352

- d. Cross (tangential) flow filtration equipment and components as follows:
1. Cross (tangential) flow filtration equipment capable of separation of pathogenic micro-organisms, viruses, toxins or cell cultures, without the propagation of aerosols, having all of the following characteristics:
 - a. A total filtration area equal to or greater than 1 m²; and
 - b. Having any of the following characteristics:
 1. Capable of being sterilised or disinfected in-situ; or
 2. Using disposable or single-use filtration components;

Technical Note:
In 2B352.d.1.b. sterilised denotes the elimination of all viable microbes from the equipment through the use of either physical (e.g. steam) or chemical agents. Disinfected denotes the destruction of potential microbial infectivity in the equipment through the use of chemical agents with a germicidal effect. Disinfection and sterilisation are distinct from sanitisation, the latter referring to cleaning procedures designed to lower the microbial content of equipment without necessarily achieving elimination of all microbial infectivity or viability.
 2. Cross (tangential) flow filtration components (e.g. modules, elements, cassettes, cartridges, units or plates) with filtration area equal to or greater than 0.2 m² for each component and designed for use in cross (tangential) flow filtration equipment specified in 2B352.d.;

Note: 2B352.d. does not control reverse osmosis equipment, as specified by the manufacturer.

2D351 [A] "Software", other than that specified in 1D003, specially designed for "use" of equipment specified in 2B351.

Category 3

3A Systems, Equipment and Components

Note 2: The control status of integrated circuits described in 3A001.a.3. to 3A001.a.9. or 3A001.a.12. which are unalterably programmed or designed for a specific function for another equipment is determined by the control status of the other equipment.

N.B.: When the manufacturer or applicant cannot determine the control status of the other equipment, the control status of the integrated circuits is determined in 3A001.a.3. to 3A001.a.9. and 3A001.a.12.

- 3A001 a.
7. 'Field programmable logic devices' having any of the following:
 - a. A maximum number of digital input/outputs greater than 200; or
 - b. A system gate count of greater than 230,000;

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)
- Field Programmable Interconnects (FPICs)

Technical Notes:

1. 'Field programmable logic devices' are also known as field programmable gate or field programmable logic arrays.
 2. Maximum number of digital input/outputs in 3A001.a.7.a. is also referred to as the maximum user input/outputs or maximum available input/outputs, whether the integrated circuit is packaged or bare die.
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. More than 1,500 terminals;
 - b. A typical "basic gate propagation delay time" of less than 0.02 ns; or
 - c. An operating frequency exceeding 3 GHz;

- 3A001 b. Microwave or millimetre wave components, as follows:

1. Electronic vacuum tubes and cathodes, as follows:
 - a. Travelling wave tubes, pulsed or continuous wave, as follows:
 1. Tubes operating at frequencies exceeding 31.8 GHz;
 2. Tubes having a cathode heater element with a turn on time to rated RF power of less than 3 seconds;
 3. Coupled cavity tubes, or derivatives thereof, with a "fractional bandwidth" of more than 7% or a peak power exceeding 2.5 kW;
 4. Helix tubes, or derivatives thereof, having any of the following:
 - 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. An "instantaneous bandwidth" of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1; or
 - c. Being "space-qualified";
 8. Microwave power amplifiers containing tubes specified in 3A001.b.1. and having all of the following:
 - a. Operating frequencies above 3 GHz;
 - b. An average output power density to mass ratio exceeding 80 W/kg; and
 - c. A volume of less than 400 cm³;

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.
 10. Oscillators or oscillator assemblies, designed to operate with all of the following:
 - a. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(126+20\log_{10}F-20\log_{10}f)$ for $10\text{ Hz} < F < 10\text{ kHz}$; and
 - b. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(114+20\log_{10}F-20\log_{10}f)$ for $10\text{ kHz} \leq F < 500\text{ kHz}$;

Technical Note:
In 3A001.b.10., F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.

3A001

- c. Acoustic wave devices as follows and specially designed components therefor:
 1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices, having any of the following:
 - a. A carrier frequency exceeding 6 GHz;
 - b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz and having any of the following:
 1. A 'frequency side-lobe rejection' exceeding 65 dB;
 2. A product of the maximum delay time and the bandwidth (time in μs and bandwidth in MHz) of more than 100;
 3. A bandwidth greater than 250 MHz; or
 4. A dispersive delay of more than 10 μs ; or
 - c. A carrier frequency of 1 GHz or less and having any of the following:
 1. A product of the maximum delay time and the bandwidth (time in μs and bandwidth in MHz) of more than 100;
 2. A dispersive delay of more than 10 μs ; or
 3. A 'frequency side-lobe rejection' exceeding 65 dB and a bandwidth greater than 100 MHz;

Technical Note:

'Frequency side-lobe rejection' is the maximum rejection value specified in data sheet.

2. Bulk (volume) acoustic wave devices which permit the direct processing of signals at frequencies exceeding 6 GHz;
3. Acoustic-optic "signal processing" devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves which permit the direct processing of signals or images, including spectral analysis, correlation or convolution;

Note: 3A001.c. does not control acoustic wave devices that are limited to a single band pass, low pass, high pass or notch filtering, or resonating function.

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 metre (W/m²);

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 an accuracy equal to or less (better) than ± 1.0 second of arc;

- h. Solid-state power semiconductor switches, diodes, or 'modules', having all of the following:

1. Rated for a maximum operating junction temperature greater than 488 K (215°C);
2. Repetitive peak off-state voltage (blocking voltage) exceeding 300 V; and
3. Continuous current greater than 1 A.

Note 1: Repetitive peak off-state voltage in 3A001.h. includes drain to source voltage, collector to emitter voltage, repetitive peak reverse voltage and peak repetitive off-state blocking voltage.

Note 2: 3A001.h. includes:

- Junction Field Effect Transistors (JFETs)
- Vertical Junction Field Effect Transistors (VJFETs)
- Metal Oxide Semiconductor Field effect Transistors (MOSFETs)
- Double Diffused Metal Oxide Semiconductor Field Effect Transistor (DMOSFET)
- Insulated Gate Bipolar Transistor (IGBT)
- High Electron Mobility Transistors (HEMTs)
- Bipolar Junction Transistors (BJTs)
- Thyristors and Silicon Controlled Rectifiers (SCRs)
- Gate Turn-Off Thyristors (GTOs)
- Emitter Turn-Off Thyristors (ETOs)
- PiN Diodes
- Schottky Diodes

Note 2: 3A001.h. does not control switches, diodes, or 'modules' incorporated into equipment designed for civil automobile, civil railway or "civil aircraft" applications.

Technical Note:

For the purposes of 3A001.h., 'modules' contain one or more solid-state power semiconductor switches or diodes.

3A002 General purpose electronic equipment and accessories therefor, as follows:

[W]

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

3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques and having any of the following:
 - a. A maximum digital interface transfer rate exceeding 175 Mbit/s; or
 - b. Being "space-qualified";

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

3A002

- d. Frequency synthesised 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:
 1. A maximum synthesised frequency exceeding 31.8 GHz but not exceeding 43.5 GHz and rated to generate a 'pulse duration' of less than 100 ns;
 2. A maximum synthesised frequency exceeding 43.5 GHz;
 3. A "frequency switching time" from one selected frequency to another as specified by any of the following:
 - a. Less than 312 ps;
 - b. Less than 100 μ s for any frequency change exceeding 1.6 GHz within the synthesised frequency range exceeding 3.2 GHz but not exceeding 10.6 GHz;
 - c. Less than 250 μ s for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 10.6 GHz but not exceeding 31.8 GHz;
 - d. Less than 500 μ s for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz; or
 - e. Less than 1 ms within the synthesised frequency range exceeding 43.5 GHz; or
 4. A maximum synthesised frequency exceeding 3.2 GHz and having all of the following:
 - a. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(126 + 20\log_{10} F - 20\log_{10} f)$ for $10 \text{ Hz} < F < 10 \text{ kHz}$; and
 - b. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(114 + 20\log_{10} F - 20\log_{10} f)$ for $10 \text{ kHz} \leq F < 500 \text{ kHz}$;

Technical Note:

In 3A002.d.4., F is the offset from the operating frequency in Hz and f is the operating frequency in MHz;

Note 1.: For the purpose of 3A002.d., frequency synthesised signal generators include 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.

3A002

[WS]

- g. Atomic frequency standards being any of the following:
1. "Space-qualified";
 2. Non-rubidium and having a long-term stability less (better) than 1×10^{-11} /month; or
 1. Non-"space-qualified" and having all of the following:
 - a. Being a rubidium standard;
 - b. Long-term stability less (better) than 1×10^{-11} /month; and
 - c. Total power consumption of less than 1 W.

3B001

[W]

Equipment for the manufacturing of semiconductor devices or materials, as follows and specially designed components and accessories therefor:

- a. Equipment designed for epitaxial growth as follows:
1. Equipment capable of producing a layer of any material other than silicon with a thickness uniform to less than $\pm 2.5\%$ across a distance of 75 mm or more;
Note: 3B001.a.1. includes Atomic Layer Epitaxy (ALE) equipment.

3C002

[W]

Resist materials as follows and "substrates" coated with the following resists:

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

Category 4

4D001

[W]

[WS*]

"Software" as follows:

- a. "Software" specially designed or modified for the "development", "production" or "use" of equipment or "software" specified in 4A001 to 4A004, or 4D.
- b. "Software", other than that specified in 4D001.a., specially designed or modified for the "development" or "production" of equipment as follows:
1. "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 0.1 Weighted TeraFLOPS (WT);
 2. "Electronic assemblies" specially designed or modified for enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit in 4D001.b.1.;

[WS*]

4D003

[W]

"Software" having characteristics or performing functions exceeding the limits in Category 5, Part 2 ("Information Security");

Note: 4D003 does not control "software" when accompanying its user for the user's personal use.

4E001

- b. "Technology", other than that specified in 4E001.a., specially designed or modified for the "development" or "production" of equipment as follows:
- [WS*] 1. "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 0.1 Weighted TeraFLOPS (WT);

Category 5

5A001

- f. Jamming equipment specially designed or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunications services and perform any of the following, and specially designed components therefor:
1. Simulate the functions of Radio Access Network (RAN) equipment;
 2. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM); or
 3. Exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM);
- h. Electronic equipment designed or modified to prematurely activate or prevent the initiation of Radio Controlled Improvised Explosive Devices (RCIED).

N.B.: SEE ALSO MILITARY GOODS CONTROLS.

5B001

[W]

Telecommunications test, inspection and production equipment, components and accessories, as follows:

- b. Equipment and specially designed components or accessories therefor, specially designed for the "development" of any of the following telecommunication transmission or switching equipment:
2. Equipment employing a "laser" and having any of the following:
 - a. A transmission wavelength exceeding 1750 nm;
 - b. Performing "optical amplification" using praseodymium-doped fluoride fibre amplifiers (PDFFA);
 - c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques); or
 - d. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz;

Note: 5B001.b.2.d. does not control equipment specially designed for the "development" of commercial TV systems.

5D001

[W]

"Software" as follows:

- [WS*&VS*] a. "Software" specially designed or modified for the "development", "production" or "use" of equipment, functions or features, specified in 5A001;

5E001 "Technology" as follows:

[W]

[WS*&VS*] a. "Technology" according to the General Technology Note for the "development", "production" or "use" (excluding operation) of equipment, functions or features specified in 5A001 or "software" specified in 5D001.a.;

c. "Technology" according to the General Technology Note for the "development" or "production" of any of the following:

2. Equipment employing a "laser" and having any of the following:

- a. A transmission wavelength exceeding 1,750 nm;
- b. Performing "optical amplification" using Praseodymium-Doped Fluoride Fibre Amplifiers (PDFFA);
- c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques);
- d. Employing wavelength division multiplexing techniques of optical carriers at less than 100 GHz spacing; or
- e. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz;

Note: 5E001.c.2.e. does not control "technology" for the "development" or "production" of commercial TV systems.

N.B.: For "technology" for the "development" or "production" of non-telecommunications equipment employing a laser, see 6E.

5. Equipment employing "common channel signalling" operating in non-associated mode of operation; or

6. Mobile equipment having all of the following:

- a. Operating at an optical wavelength greater than or equal to 200 nm and less than or equal to 400 nm; and
- b. Operating as a "local area network";

d. "Technology" according to the General Technology Note for the "development" or "production" of Microwave Monolithic Integrated Circuit (MMIC) power amplifiers specially designed for telecommunications and having any of the following:

1. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6 GHz and with an average output power greater than 4 W (36 dBm) with a "fractional bandwidth" greater than 15%;
2. Rated for operation at frequencies exceeding 6 GHz up to and including 16 GHz and with an average output power greater than 1 W (30 dBm) with a "fractional bandwidth" greater than 10%;
3. Rated for operation at frequencies exceeding 16 GHz up to and including 31.8 GHz and with an average output power greater than 0.8 W (29 dBm) with a "fractional bandwidth" greater than 10%;
4. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz;
5. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5 GHz and with an average output power greater than 0.25 W (24 dBm) with a "fractional bandwidth" greater than 10%; or
6. Rated for operation at frequencies exceeding 43.5 GHz;

- e. "Technology" according to the General Technology Note for the "development" or "production" of electronic devices and circuits, specially designed for telecommunications and 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:
 - 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
 - 2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000.

Part 2 - "INFORMATION SECURITY"

- 5A002 a. 7. Non-cryptographic information and communications technology (ICT) security systems and devices evaluated to an assurance level exceeding class EAL-6 (evaluation assurance level) of the Common Criteria (CC) or equivalent;
- Note: *5A002 does not control any of the following:*
- h. *Equipment specially designed for the servicing of portable or mobile radiotelephones and similar client wireless devices that meet all the provisions of the Cryptography Note (Note 3 in Category 5, Part 2), where the servicing equipment meets all of the following:*
 - 1. *The cryptographic functionality of the servicing equipment cannot easily be changed by the user of the equipment;*
 - 2. *The servicing equipment is designed for installation without further substantial support by the supplier; and*
 - 3. *The servicing equipment cannot change the cryptographic functionality of the device being serviced;*
 - i. *Wireless "personal area network" equipment that implement only published or commercial cryptographic standards and where the cryptographic capability is limited to a nominal operating range not exceeding 30 metres according to the manufacturer's specifications.*

- 5B002 "Information security" test, inspection and "production" equipment, as follows:
[W]
- a. Equipment specially designed for the "development" or "production" of equipment specified in 5A002 or 5B002.b.;

- [W]
- b. Measuring equipment specially designed to evaluate and validate the "information security" functions of the equipment specified in 5A002 or "software" specified in 5D002.a. or 5D002.c.

5D002 "Software" as follows:

- [W]
- a. "Software" specially designed or modified for the "development", "production" or "use" of equipment specified in 5A002 or "software" specified in 5D002.c.;

- [W]
- c. Specific "software", as follows:

- [IV*]
1. "Software" having the characteristics, or performing or simulating the functions of the equipment, specified in 5A002;
 2. "Software" to certify "software" specified in 5D002.c.1.

5E2 Technology

5E002 "Technology" according to the General Technology Note for the "development",
[W] "production" or "use" of equipment specified in 5A002, 5B002 or "software" specified in
5D002.a. or 5D002.c.

[IV*]

Category 6

6A001

- 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:
 1. Correlation-velocity sonar log equipment having any of the following characteristics:
 - a. Designed to operate at distances between the carrier and the sea bed exceeding 500 m; or
 - b. Having speed accuracy better than 1% of speed;
 2. Doppler-velocity sonar log equipment having speed accuracy better than 1% of speed;

Note 1: 6A001.b. does not control 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 control equipment specially designed for installation on surface vessels.

- c. Diver deterrent acoustic systems specially designed or modified to disrupt divers and having a sound pressure level equal to or exceeding 190 dB (reference 1 μ Pa at 1 m) at frequencies of 200 Hz and below.

Note 1: 6A001.c. does not control diver deterrent systems based on underwater explosive devices, air guns or combustible sources.

Note 2: 6A001.c. includes diver deterrent acoustic systems that use spark gap sources, also known as plasma sound sources.

6A002 Optical sensors or equipment and components therefor, as follows:

[W]

N.B.: SEE ALSO 6A102.

[M18A2*]

[M11A2*]

a. Optical detectors as follows:

1. "Space-qualified" solid-state detectors as follows:

Note: For the purpose of 6A002.a.1., solid-state detectors include "focal plane arrays".

[WS]

d. "Space-qualified" "focal plane arrays" having more than 2,048 elements per array and having a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm.

2. Image intensifier tubes and specially designed components therefor, as follows:

Note: 6A002.a.2. does not control non-imaging photomultiplier tubes having an electron sensing device in the vacuum space limited solely to any of the following:

- a. A single metal anode; or
- b. Metal anodes with a centre to centre spacing greater than 500 μm .

Technical Note:

'Charge multiplication' is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionization gain process. 'Charge multiplication' sensors may take the form of an image intensifier tube, solid state detector or "focal plane array".

[WS*]

a. Image intensifier tubes having all of the following:

1. A peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;
2. Electron image amplification using any of the following:
 - a. A microchannel plate with a hole pitch (centre-to-centre spacing) of 12 μm or less; or
 - b. An electron sensing device with a non-binned pixel pitch of 500 μm or less, specially designed or modified to achieve 'charge multiplication' other than by a microchannel plate; and
3. Any of the following photocathodes:
 - a. Multialkali photocathodes (e.g., S-20 and S-25) having a luminous sensitivity exceeding 350 $\mu\text{A}/\text{lm}$;
 - b. GaAs or GaInAs photocathodes; or
 - c. Other "III-V compound" semiconductor photocathodes having a maximum radiant sensitivity exceeding 10 mA/W;

[WS]

b. Image intensifier tubes having all of the following:

1. A peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,800 nm;
2. Electron image amplification using any of the following:
 - a. A microchannel plate with a hole pitch (centre-to-centre spacing) of 12 μm or less; or
 - b. An electron sensing device with a non-binned pixel pitch of 500 μm or less, specially designed or modified to achieve 'charge multiplication' other than by a microchannel plate; and
3. "III-V compound" semiconductor (e.g., GaAs or GaInAs) photocathodes and transferred electron photocathodes, having a maximum radiant sensitivity exceeding 15 mA/W;

6A002
[WS]

- b. "Monospectral imaging sensors" and "multispectral imaging sensors", designed for remote sensing applications and having any of the following:
 - 1. An Instantaneous-Field-Of-View (IFOV) of less than 200 μ rad (microradians); or
 - 2. Specified for operation in the wavelength range exceeding 400 nm but not exceeding 30,000 nm and having all the following:
 - a. Providing output imaging data in digital format; and
 - b. Having any of the following characteristics:
 - 1. "Space-qualified"; or
 - 2. Designed for airborne operation, using other than silicon detectors, and having an IFOV of less than 2.5 mrad (milliradians);
- Note:* 6A002.b.1. does not control "monospectral imaging sensors" with a peak response in the wavelength range exceeding 300 nm but not exceeding 900 nm and only incorporating any of the following non-"space-qualified" detectors or non-"space-qualified" "focal plane arrays":
- 1. Charge Coupled Devices (CCD) not designed or modified to achieve 'charge multiplication'; or
 - 2. Complementary Metal Oxide Semiconductor (CMOS) devices not designed or modified to achieve 'charge multiplication'.
- e. Not used.

6A003

- b. Imaging cameras as follows:

[WS*]
[N5B4*]

- 3. Imaging cameras incorporating image intensifier tubes specified in 6A002.a.2.a. or 6A002.a.2.b.;

[WS*]
[N5B4*]

- 4. 'Imaging cameras' incorporating "focal plane arrays" having any of the following:
 - a. Incorporating "focal plane arrays" specified in 6A002.a.3.a. to 6A002.a.3.e.;
 - b. Incorporating "focal plane arrays" specified in 6A002.a.3.f.; or
 - c. Incorporating "focal plane arrays" specified in 6A002.a.3.g.;

6A003
[WS]

- b
 - 5. Imaging cameras incorporating solid-state detectors specified in 6A002.a.1.

6A004
[W]
[WS]

Optical equipment and components, as follows:

- c. "Space-qualified" components for optical systems, as follows:
 - 1. Components lightweighted to less than 20% "equivalent density" compared with a solid blank of the same aperture and thickness;
 - 2. Raw substrates, processed substrates having surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or having protective films;

3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 m in diameter;
4. Components manufactured from "composite" materials having a coefficient of linear thermal expansion equal to or less than 5×10^{-6} in any coordinate direction;

[WS] d. Optical control equipment as follows:

1. Equipment specially designed to maintain the surface figure or orientation of the "space-qualified" components specified in 6A004.c.1. or 6A004.c.3.;
2. Equipment having steering, tracking, stabilisation or resonator alignment bandwidths equal to or more than 100 Hz and an accuracy of 10 μ rad (microradians) or less;

6A005
[N3A2c*]

- b.
6. Output wavelength exceeding 975 nm but not exceeding 1,150 nm and any of the following:
 - a. "Pulse duration" of less than 1 ns and any of the following:
 1. Output "peak power" exceeding 5 GW per pulse;
 2. "Average output power" exceeding 10 W; or
 3. Output energy exceeding 0.1 J per pulse;
 - b. "Pulse duration" equal to or exceeding 1 ns but not exceeding 1 μ s, and any of the following:
 1. Single transverse mode output and any of the following:
 - a. "Peak power" exceeding 100 MW;
 - b. "Average output power" exceeding 20 W limited by design to a maximum pulse repetition frequency less than or equal to 1 kHz;
 - c. "Wall-plug efficiency" exceeding 12%, "average output power" exceeding 100 W and capable of operating at a pulse repetition frequency greater than 1 kHz;
 - d. "Average output power" exceeding 150 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or
 - e. Output energy exceeding 2 J per pulse; or

6A006
[W] "Magnetometers", "magnetic gradiometers", "intrinsic magnetic gradiometers", underwater electric field sensors, "compensation systems", and specially designed components therefor, as follows:

Note: 6A006 does not control instruments specially designed for fishery applications or biomagnetic measurements for medical diagnostics.

a. "Magnetometers" and subsystems as follows:

- [WS]
1. "Magnetometers" using "superconductive" (SQUID) "technology" and having any of the following:
 - a. SQUID systems designed for stationary operation, without specially designed subsystems designed to reduce in-motion noise, and having a 'sensitivity' equal to or lower (better) than 50 fT (rms) per square root Hz at a frequency of 1 Hz; or
 - b. SQUID systems having an in-motion-magnetometer 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz and specially designed to reduce in-motion noise;

- [WS*]
2. "Magnetometers" using optically pumped or nuclear precession (proton/Overhauser) "technology" having a 'sensitivity' lower (better) than 20 pT (rms) per square root Hz at a frequency of 1 Hz;
 3. "Magnetometers" using fluxgate "technology" having a 'sensitivity' equal to or lower (better) than 10 pT (rms) per square root Hz at a frequency of 1 Hz;
 4. Induction coil "magnetometers" having a 'sensitivity' lower (better) than any of the following:
 - a. 0.05 nT (rms) per square root Hz at frequencies of less than 1 Hz;
 - b. 1×10^{-3} nT (rms) per square root Hz at frequencies of 1 Hz or more but not exceeding 10 Hz; or
 - c. 1×10^{-4} nT (rms) per square root Hz at frequencies exceeding 10 Hz;
 5. Fibre optic "magnetometers" having a 'sensitivity' lower (better) than 1 nT (rms) per square root Hz;
- b. Underwater electric field sensors having a 'sensitivity' lower (better) than 8 nanovolt per metre per square root Hz when measured at 1 Hz;
- c. "Magnetic gradiometers" as follows:

- [WS*]
1. "Magnetic gradiometers" using multiple "magnetometers" specified in 6A006.a.;
 2. Fibre optic "intrinsic magnetic gradiometers" having a magnetic gradient field 'sensitivity' lower (better) than 0.3 nT/m rms per square root Hz;
 3. "Intrinsic magnetic gradiometers", using "technology" other than fibre-optic "technology", having a magnetic gradient field 'sensitivity' lower (better) than 0.015 nT/m rms per square root Hz;

- [WS*]
- d. "Compensation systems" for magnetic or underwater electric field sensors resulting in a performance equal to or better than the specified parameters of 6A006.a., 6A006.b. or 6A006.c.

Technical Note:

For the purposes of 6A006., 'sensitivity' (noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.

6A008 Radar systems, equipment and assemblies, having any of the following, and specially designed components therefor:

[W]

[M11A1*]

[M12A5b*]

N.B.: SEE ALSO 6A108.

- j. Being "laser" radar or Light Detection and Ranging (LIDAR) equipment and having any of the following:
 1. "Space-qualified";
 2. Employing coherent heterodyne or homodyne detection techniques and having an angular resolution of less (better) than 20 μ rad (microradians); or
 3. Designed for carrying out airborne bathymetric littoral surveys to International Hydrographic Organization (IHO) Order 1a Standard (5th Edition February 2008) for Hydrographic Surveys or better, and using one or more lasers with a wavelength exceeding 400 nm but not exceeding 600 nm.

Note 1: LIDAR equipment specially designed for surveying is only specified in 6A008.j.3.

Note 2: 6A008.j. does not control LIDAR equipment specially designed for meteorological observation.

Note 3: Parameters in the IHO Order 1a Standard 5th Edition February 2008 are summarized as follows:

- Horizontal Accuracy (95% Confidence Level) = 5 m + 5% of depth.
- Depth Accuracy for Reduced Depths (95% confidence level) = $\pm\sqrt{(a^2 + (b*d)^2)}$, where:
 - $a = 0.5 \text{ m}$ = constant depth error,
i.e. the sum of all constant depth errors
 - $b = 0.013$ = factor of depth dependent error
 - $b*d$ = depth dependent error,
i.e. the sum of all depth dependent errors
 - d = depth
- Feature Detection = Cubic features > 2 m in depths up to 40 m;
10% of depth beyond 40 m.

6A108 Radar systems and tracking systems, other than those specified in entry 6A008, as follows:

- [M12A5] b. Precision tracking systems, usable for 'missiles', as follows:
1. Tracking systems which use a code translator in conjunction with either surface or airborne references or navigation satellite systems to provide real-time measurements of in-flight position and velocity;
 2. Range instrumentation radars including associated optical/infrared trackers with all of the following capabilities:
 - a. Angular resolution better than 1.5 milliradians;
 - b. Range of 30 km or greater with a range resolution better than 10 m rms;
 - c. Velocity resolution better than 3 m/s.

6D003 Other "software" as follows:

[W]

[WS&VS]

[IV]

- a. "Software" as follows:
1. "Software" specially designed for acoustic beam forming for the "real time processing" of acoustic data for passive reception using towed hydrophone arrays;
 2. "Source code" for the "real time processing" of acoustic data for passive reception using towed hydrophone arrays;
 3. "Software" specially designed for acoustic beam forming for "real time processing" of acoustic data for passive reception using bottom or bay cable systems;
 4. "Source code" for "real time processing" of acoustic data for passive reception using bottom or bay cable systems;
- b. Not used;
- c. "Software" designed or modified for cameras incorporating "focal plane arrays" specified in 6A002.a.3.f. and designed or modified to remove a frame rate restriction and allow the camera to exceed the frame rate specified in 6A003.b.4. Note 3.a.

- d. Not used;
- e. Not used;
- f. "Software" as follows:
 - 1. "Software" specially designed for magnetic and electric field "compensation systems" for magnetic sensors designed to operate on mobile platforms;
 - 2. "Software" specially designed for magnetic and electric field anomaly detection on mobile platforms;
- g. "Software" specially designed to correct motional influences of gravity meters or gravity gradiometers;
- h. "Software" as follows:
 - 1. Air Traffic Control (ATC) "software" application "programmes" hosted on general purpose computers located at Air Traffic Control centres and capable of any of the following:
 - a. Processing and displaying more than 150 simultaneous "system tracks"; or
 - b. Accepting radar target data from more than four primary radars;
 - 2. "Software" for the design or "production" of radomes and having all of the following:
 - a. Specially designed to protect the "electronically steerable phased array antennae" specified in 6A008.e.; and
 - b. Resulting in an antenna pattern having an 'average side lobe level' more than 40 dB below the peak of the main beam level.

Technical Note:
'Average side lobe level' in 6D003.d.2.b. is measured over the entire array excluding the angular extent of the main beam and the first two side lobes on either side of the main beam.

Category 7

7A001 Accelerometers as follows and specially designed components therefor:

[W] **N.B.: SEE ALSO 7A101.**

N.B.: For angular or rotational accelerometers, see 7A001.b.

[M9A3*] a. Linear accelerometers having any of the following:

[M9A5] 3. Designed for use in inertial navigation or guidance systems and specified to function at linear acceleration levels exceeding 100 g;

7A003 Inertial systems and specially designed components, as follows:

[W]

[M2A1d*] **N.B.: SEE ALSO 7A103.**

[M9A6*]

- [M9A8*] c. Inertial Measurement equipment for heading or True North determination and having any of the following and specially designed components therefor:
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
 2. Designed to have a non-operating shock level of 900 g or greater at a duration of 1 msec or greater;

7A003

Technical Notes:

1. 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.
2. 'Circular Error Probable' (CEP) – In a circular normal distribution, the radius of the circle containing 50% of the individual measurements being made, or the radius of the circle within which there is a 50% probability of being located.

7A101

Linear accelerometers, other than those specified in 7A001, designed for use in inertial navigation systems or in guidance systems of all types, usable in 'missiles', having all the following characteristics, and specially designed components therefor:

- a. A "bias" "repeatability" of less (better) than 1250 micro g; and
- b. A "scale factor" "repeatability" of less (better) than 1250 ppm;

Note: 7A101 does not specify accelerometers which are specially designed and developed as MWD (Measurement While Drilling) Sensors for use in downhole well service operations.

Technical Notes:

1. In 7A101 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km;
2. In 7A101 the measurement of "bias" and "scale factor" refers to a one sigma standard deviation with respect to a fixed calibration over a period of one year;

Category 8

8A001 Submersible vehicles and surface vessels, as follows:

[W]

[WVS]

- b. Manned, untethered submersible vehicles having any of the following:
 1. Designed to 'operate autonomously' and having a lifting capacity of all the following:
 - a. 10% or more of their weight in air; and
 - b. 15 kN or more;
 2. Designed to operate at depths exceeding 1,000 m; or
 3. Having all of the following:
 - a. Designed to continuously 'operate autonomously' for 10 hours or more; and
 - b. 'Range' of 25 nautical miles or more;

Technical Notes:

1. *For the purposes of 8A001.b., 'operate autonomously' means fully submerged, without snorkel, all systems working and cruising at minimum speed at which the submersible can safely control its depth dynamically by using its depth planes only, with no need for a support vessel or support base on the surface, sea-bed or shore, and containing a propulsion system for submerged or surface use.*
2. *For the purposes of 8A001.b., 'range' means half the maximum distance a submersible vehicle can 'operate autonomously'.*

8A002

- f. Electronic imaging systems specially designed or modified for underwater use and having any of the following:
 1. Image intensifier tubes specified in 6A002.a.2.a. or 6A002.a.2.b., and using electron image amplification other than by microchannel plate; or
 2. Non-"space-qualified" "focal plane arrays" specified in 6A002.a.3.g.;

Category 9

- 9A012 "Unmanned aerial vehicles" ("UAVs"), associated systems, equipment and components,
 [W] as follows:
 [M1A2*]
 [M19A2*]
 [M19A3*]
- a. "UAVs" having any of the following:
 1. An autonomous flight control and navigation capability (e.g., an autopilot with an Inertial Navigation System); or
 2. Capability of controlled-flight out of the direct vision range involving a human operator (e.g., televisual remote control);
 - b. Associated systems, equipment and components, as follows:
 1. Equipment specially designed for remotely controlling the "UAVs" specified in 9A012.a.;
 2. Systems for navigation, attitude, guidance or control, other than those specified in 7A and specially designed to provide autonomous flight control or navigation capability to "UAVs" specified in 9A012.a.;
 3. Equipment and components, specially designed to convert a manned "aircraft" to a "UAV" specified in 9A012.a.;
 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 metres).
- [M9A6*]
- 9A108 Components, other than those specified in 9A008, as follows, specially designed for solid rocket propulsion systems:
- [M3A3] a. Rocket motor cases and "insulation" components therefor, usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;
 - [M3A3] b. Rocket nozzles, usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;
 - [M2A1e] c. Thrust vector control sub-systems, usable in "missiles".
 [IV*]

Technical Note:

Examples of methods of achieving thrust vector control specified in 9A108.c. are:

1. Flexible nozzle;
2. Fluid or secondary gas injection;
3. Movable engine or nozzle;
4. Deflection of exhaust gas stream (jet vanes or probes); or
5. Thrust tabs.

9A110 Composite structures, laminates and manufactures thereof, other than those specified
[M6A1] in 9A010, specially designed for use in 'missiles' or the subsystems specified in 9A005,
9A007, 9A105, 9A106.c., 9A107, 9A108.c., 9A116 or 9A119.

N.B.: SEE ALSO 1A002.

Technical Note:

In 9A110 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.

- 9E101 a. "Technology" according to the General Technology Note for the "development"
[M*] of goods specified in 9A101, 9A102, 9A104 to 9A111 or 9A115 to 9A119.
[IV*]
[M*] b. "Technology" according to the General Technology Note for the "production"
[IV*] of 'UAV's specified in 9A012 or goods specified in 9A101, 9A102, 9A104 to 9A111 or
9A115 to 9A119.

Technical Note:

In 9E101.b. 'UAV' means unmanned aerial vehicle systems capable of a range exceeding 300 km.

9E102 "Technology" according to the General Technology Note for the "use" of space launch
[M*] vehicles specified in 9A004, goods specified in 9A005 to 9A011, 'UAV's specified in
[IV*] 9A012 or goods specified in 9A101, 9A102, 9A104 to 9A111, 9A115 to 9A119, 9B105,
9B106, 9B115, 9B116, 9B117, 9D101 or 9D103.

Technical Note:

In 9E102 'UAV' means unmanned aerial vehicle systems capable of a range exceeding 300 km.

ANNEX IV

None