

Schedule of Strategic Items

MILITARY ITEMS LIST

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Category Code	Items Description	Note	Relevant Authority
MILITARY ITEMS LIST		<p><u>Note 1:</u> Terms in “quotations” are defined terms. Refer to 'Definitions of Terms used in this List' annexed to this List.</p> <p><u>Note 2:</u> In some instances chemicals are listed by name and CAS number. The list applies to chemicals of the same structural formula (including hydrates) regardless of name or CAS number. CAS numbers are shown to assist in identifying a particular chemical or mixture, irrespective of nomenclature. CAS numbers cannot be used as unique identifiers because some forms of the listed chemical have different CAS numbers and mixtures containing a listed chemical may also have different CAS numbers.</p>	
ML1	<p>Smooth-bore weapons with a calibre of less than 20 mm, other arms and automatic weapons with a calibre of 12.7 mm (calibre 0.50 inches) or less and accessories, as follows, and specially designed components therefor:</p> <ol style="list-style-type: none"> a. Rifles, carbines, revolvers, pistols, machine pistols and machine guns; b. Smooth-bore weapons, as follows: <ol style="list-style-type: none"> 1. Smooth-bore weapons specially designed for military use; 2. Other smooth-bore weapons as follows: <ol style="list-style-type: none"> a. Fully automatic type weapons; b. Semi-automatic or pump-action type weapons; 	<p><u>Note:</u> ML1.a. does not apply to the following:</p> <ol style="list-style-type: none"> a. Muskets, rifles and carbines manufactured earlier than 1938; b. Reproductions of muskets, rifles and carbines the originals of which were manufactured earlier than 1890; c. Revolvers, pistols and machine guns manufactured earlier than 1890, and their reproductions; <p><u>Note 1:</u> ML1 does not apply to smooth-bore</p>	Controller

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	<p>c. Weapons using caseless ammunition;</p> <p>d. Silencers, special gun-mountings, clips, weapons sights and flash suppressors for arms specified by ML1.a, ML1.b. or ML1.c.</p>	<p><i>weapons used for hunting or sporting purposes. These weapons must not be specially designed for military use or of the fully automatic firing type.</i></p> <p><u>Note 2:</u> <i>ML1 does not apply to firearms specially designed for dummy ammunition and which are incapable of firing any ammunition specified by ML3.</i></p> <p><u>Note 3:</u> <i>ML1 does not apply to weapons using non-centre fire cased ammunition and which are not of the fully automatic firing type.</i></p> <p><u>Note 4:</u> <i>ML1.d. does not apply to optical weapon sights without electronic image processing, with a magnification of 4 times or less, provided they are not specially designed or modified for military use.</i></p>	
ML2	<p>Smooth-bore weapons with a calibre of 20 mm or more, other weapons or armament with a calibre greater than 12.7 mm (calibre 0.50 inches), projectors and accessories, as follows, and specially designed components therefor:</p> <p>a. Guns, howitzers, cannon, mortars, anti-tank weapons, projectile launchers, military flame throwers, rifles, recoilless rifles, smooth-bore weapons and signature reduction devices therefor;</p>	<p><u>Note 1:</u> <i>ML2.a. includes injectors, metering devices, storage tanks and other specially designed components for use with liquid propelling charges for any of the equipment specified by ML2.a.</i></p> <p><u>Note 2:</u> <i>ML2.a. does not apply to weapons as follows:</i></p> <p>a. <i>Muskets, rifles and carbines, manufactured earlier than 1938;</i></p>	Controller

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	<ul style="list-style-type: none"> b. Smoke, gas and pyrotechnic projectors or generators, specially designed or modified for military use; c. Weapons sights and weapon sight mounts, having all of the following: <ul style="list-style-type: none"> 1. Specially designed for military use; and 2. Specially designed for weapons specified in ML2.a. d. Mountings specially designed for the weapons specified in ML2.a 	<ul style="list-style-type: none"> b. <i>Reproductions of muskets, rifles and carbines, the originals of which were manufactured earlier than 1890.</i> c. <i>Guns, howitzers, cannons and mortars, manufactured earlier than 1890.</i> <p><u>Note 3:</u> <i>ML2.a. does not apply to hand-held projectile launchers specially designed to launch tethered projectiles having no high explosive charge or communications link, to a range of less than or equal to 500 m.</i></p> <p><u>Note:</u><i>ML2.b. does not apply to signal pistols.</i></p>	
ML3	<p>Ammunition and fuse setting devices, as follows, and specially designed components therefor:</p> <ul style="list-style-type: none"> a. Ammunition for weapons specified by ML1, ML2 or ML12; b. Fuse setting devices specially designed for ammunition specified by ML3.a. 	<p><u>Note 1:</u> <i>Specially designed components specified by ML3 include:</i></p> <ul style="list-style-type: none"> a. <i>Metal or plastic fabrications such as primer anvils, bullet cups, cartridge links, rotating bands and munitions metal parts;</i> 	Controller

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		<p><i>b. Safing and arming devices, fuses, sensors and initiation devices;</i></p> <p><i>c. Power supplies with high one-time operational output;</i></p> <p><i>d. Combustible cases for charges;</i></p> <p><i>e. Submunitions including bomblets, minelets and terminally guided projectiles.</i></p> <p><i>Note 2: ML3.a. does not apply to ammunition crimped without a projectile (blank star) and dummy ammunition with a pierced powder chamber.</i></p> <p><i>Note 3 :ML3.a. does not apply to cartridges specially designed for any of the following purposes:</i></p> <p><i>a. Signalling;</i></p> <p><i>b. Bird scaring; or</i></p> <p><i>c. Lighting of gas flares at oil wells.</i></p>	
ML4	<p>Bombs, torpedoes, rockets, missiles, other explosive devices and charges and related equipment and accessories, as follows, and specially designed components therefor:</p> <p>a. Bombs, torpedoes, grenades, smoke canisters, rockets, mines, missiles, depth charges, demolition-charges,</p>	<p><i>N.B.1: For guidance and navigation equipment, see ML11.</i></p> <p><i>N.B.2: For Aircraft Missile Protection Systems (AMPS), see ML4.c.</i></p> <p><i>Note: ML4.a. includes:</i></p>	Controller

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	<p>demolition-devices, demolition-kits, “pyrotechnic” devices, cartridges and simulators (i.e. equipment simulating the characteristics of any of these items), specially designed for military use;</p> <p>b. Equipment having all of the following:</p> <ol style="list-style-type: none"> 1. Specially designed for military use; and 2. Specially designed for 'activities' relating to any of the following: <ol style="list-style-type: none"> a. Items specified by ML4.a.; or b. Improvised Explosive Devices (IEDs). <p>c. Aircraft Missile Protection Systems (AMPS).</p>	<p>a. Smoke grenades, fire bombs, incendiary bombs and explosive devices;</p> <p>b. Missile rocket nozzles and re-entry vehicle nosetips.</p> <p><u>Technical Note:</u></p> <p><i>For the purpose of ML4.b.2. 'activities' applies to handling, launching, laying, controlling, discharging, detonating, activating, powering with one-time operational output, decoying, jamming, sweeping, detecting, disrupting or disposing.</i></p> <p><u>Note 1:</u> ML4.b. includes:</p> <ol style="list-style-type: none"> a. Mobile gas liquefying equipment capable of producing 1000 kg or more per day of gas in liquid form; b. Buoyant electric conducting cable suitable for sweeping magnetic mines. <p><u>Note 2:</u> ML4.b. does not apply to hand-held devices, limited by design solely to the detection of metal objects and incapable of distinguishing between mines and other metal objects.</p> <p><u>Note:</u> ML4.c. does not apply to AMPS having all of the following:</p>	

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		<p><i>a. Any of the following missile warning sensors:</i></p> <ol style="list-style-type: none"> <i>1. Passive sensors having peak response between 100-400 nm; or</i> <i>2. Active pulsed Doppler missile warning sensors;</i> <p><i>b. Countermeasures dispensing systems;</i></p> <p><i>c. Flares, which exhibit both a visible signature and an infrared signature, for decoying surface-to- air missiles; and</i></p> <p><i>d. Installed on "civil aircraft" and having all of the following:</i></p> <ol style="list-style-type: none"> <i>1. The AMPS is only operable in a specific "civil aircraft" in which the specific AMPS is installed and for which any of the following has been issued:</i> <ol style="list-style-type: none"> <i>a. A civil Type Certificate; or</i> <i>b. An equivalent document recognised by the International Civil Aviation Organisation (ICAO);</i> <i>2. The AMPS employs protection to prevent unauthorised access to "software"; and</i> 	

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		3. <i>The AMPS incorporates an active mechanism that forces the system not to function when it is removed from the "civil aircraft" in which it was installed.</i>	
ML5	<p>Fire control, and related alerting and warning equipment, and related systems, test and alignment and countermeasure equipment, as follows, specially designed for military use, and specially designed components and accessories therefor:</p> <ul style="list-style-type: none"> a. Weapon sights, bombing computers, gun laying equipment and weapon control systems; b. Target acquisition, designation, range-finding, surveillance or tracking systems; detection, data fusion, recognition or identification equipment; and sensor integration equipment; c. Countermeasure equipment for items specified by ML5.a. or ML5.b.; d. Field test or alignment equipment, specially designed for items specified by ML5.a., ML5.b. or ML5.c. 	<p><i>Note: For the purposes of ML5.c., countermeasure equipment includes detection equipment.</i></p>	Controller
ML6	<p>Ground vehicles and components, as follows:</p> <ul style="list-style-type: none"> a. Ground vehicles and components therefor, specially designed or modified for military use; b. Other ground vehicles and components, as follows: 	<p><i>N.B.: For guidance and navigation equipment, see ML11.</i></p> <p><i>Technical Note</i></p> <p><i>For the purposes of ML6.a. the term ground vehicles includes trailers.</i></p> <p><i>N.B.: See also ML13.a</i></p>	Controller

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	<ol style="list-style-type: none"> 1. All-wheel drive vehicles capable of off-road use which have been manufactured or fitted with materials or components to provide ballistic protection to level III (NIJ 0108.01, September 1985, or comparable national standard) or better; 2. Components having all of the following: <ol style="list-style-type: none"> a. Specially designed for vehicles specified in ML6.b.1.; and b. Providing ballistic protection to level III (NIJ 0108.01, September 1985, or comparable national standard) or better. 	<p><u>Note 1:</u> ML6.a. includes:</p> <ol style="list-style-type: none"> a. Tanks and other military armed vehicles and military vehicles fitted with mountings for arms or equipment for mine laying or the launching of munitions specified by ML4; b. Armoured vehicles; c. Amphibious and deep water fording vehicles; d. Recovery vehicles and vehicles for towing or transporting ammunition or weapon systems and associated load handling equipment. <p><u>Note 2:</u> Modification of a ground vehicle for military use specified by ML6.a. entails a structural, electrical or mechanical change involving one or more components that are specially designed for military use. Such components include:</p> <ol style="list-style-type: none"> a. Pneumatic tyre casings of a kind specially designed to be bullet-proof; b. Armoured protection of vital parts, (e.g. fuel tanks or vehicle cabs); c. Special reinforcements or mountings for weapons; 	

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		<p><i>d. Black-out lighting.</i></p> <p><i>Note 3: ML6 does not apply to civil automobiles, or trucks designed or modified for transporting money or valuables, having armoured or ballistic protection.</i></p> <p><i>Note 4: ML6. does not apply to vehicles that meet all of the following;</i></p> <p><i>a. Were manufactured before 1946;</i></p> <p><i>b. Do not have items specified by the Military Item List in this Schedule and manufactured after 1945, except for reproductions of original components or accessories for the vehicle; and</i></p> <p><i>c. Do not incorporate weapons specified in ML1., ML2. or ML4. unless they are inoperable and incapable of discharging a projectile.</i></p>	
ML7	<p>Chemical or biological toxic agents, "riot control agents", radioactive materials, related equipment, components and materials, as follows:</p> <p>a. Biological agents or radioactive materials, "adapted for use in war" to produce casualties in humans or animals, degrade equipment or damage crops or the environment;</p> <p>b. Chemical warfare (CW) agents, including:</p> <p>1. CW nerve agents:</p>		Controller

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	<p>a. O-Alkyl (equal to or less than C₁₀ , including cycloalkyl) alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) -phosphonofluoridates, such as:</p> <p>Sarin (GB):O-Isopropyl methylphosphonofluoridate (CAS 107-44-8); and</p> <p>Soman (GD):O-Pinacolyl methylphosphonofluoridate (CAS 96-64-0);</p> <p>b. O-Alkyl (equal to or less than C₁₀ , including cycloalkyl) N,N-dialkyl (Methyl, Ethyl, n- Propyl or Isopropyl) phosphoramidocyanidates, such as:</p> <p>Tabun (GA):O-Ethyl N,N-dimethylphosphoramidocyanidate (CAS 77-81-6);</p> <p>c. O-Alkyl (H or equal to or less than C₁₀ , including cycloalkyl) S-2-dialkyl (Methyl, Ethyl, n- Propyl or Isopropyl)-aminoethyl alkyl (Methyl, Ethyl, n- Propyl or Isopropyl) phosphonothiolates and corresponding alkylated and protonated salts, such as:</p> <p>VX: O-Ethyl S-2-diisopropylaminoethyl methyl phosphonothiolate (CAS 50782-69-9);</p> <p>2. CW vesicant agents:</p> <p>a. Sulphur mustards, such as:</p> <p>1. 2-Chloroethylchloromethylsulphide (CAS 2625-76-5);</p>		

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	<p>2. Bis(2-chloroethyl) sulphide (CAS 505-60-2);</p> <p>3. Bis(2-chloroethylthio) methane (CAS 63869-13-6);</p> <p>4. 1,2-bis (2-chloroethylthio) ethane (CAS 3563-36-8);</p> <p>5. 1,3-bis (2-chloroethylthio) -n-propane (CAS 63905-10-2);</p> <p>6. 1,4-bis (2-chloroethylthio) -n-butane (CAS 142868-93-7);</p> <p>7. 1,5-bis (2-chloroethylthio) -n-pentane (CAS 142868-94-8);</p> <p>8. Bis (2-chloroethylthiomethyl) ether (CAS 63918-90-1);</p> <p>9. Bis (2-chloroethylthioethyl) ether (CAS 63918-89-8);</p> <p>b. Lewisites, such as:</p> <p>1. 2-chlorovinyl dichloroarsine (CAS 541-25-3);</p> <p>2. Tris (2-chlorovinyl) arsine (CAS 40334-70-1);</p> <p>3. Bis (2-chlorovinyl) chloroarsine (CAS 40334-69-8);</p> <p>c. Nitrogen mustards, such as:</p>		

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	<ol style="list-style-type: none"> 1. HN1: bis (2-chloroethyl) ethylamine (CAS 538-07-8); 2. HN2: bis (2-chloroethyl) methylamine (CAS 51-75-2); 3. HN3: tris (2-chloroethyl) amine (CAS 555-77-1); 3. CW incapacitating agents, such as: <ol style="list-style-type: none"> a. 3-Quinuclidinyl benzilate (BZ) (CAS 6581-06-2); 4. CW defoliants, such as: <ol style="list-style-type: none"> a. Butyl 2-chloro-4-fluorophenoxyacetate (LNF); b. 2,4,5-trichlorophenoxyacetic acid (CAS 93-76-5) mixed with 2,4-dichlorophenoxyacetic acid (CAS 94-75-7) (Agent Orange (CAS 39277-47-9)); c. CW binary precursors and key precursors, as follows: <ol style="list-style-type: none"> 1. Alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) Phosphonyl Difluorides, such as: DF: Methyl Phosphonyldifluoride (CAS 676-99-3); 2. O-Alkyl (H or equal to or less than C₁₀, including cycloalkyl) O-2-dialkyl (Methyl, Ethyl, n- Propyl or Isopropyl) aminoethyl alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphonites and corresponding alkylated and protonated salts, such as: 		

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	<p>QL: O-Ethyl-2-di-isopropylaminoethyl methylphosphonite (CAS 57856-11-8);</p> <p>3. Chlorosarin: O-Isopropyl methylphosphonochloridate (CAS 1445-76-7);</p> <p>4. Chlorosoman: O-Pinacolyl methylphosphonochloridate (CAS 7040-57-5);</p> <p>d. "Riot control agents", active constituent chemicals and combinations thereof, including:</p> <p>1. α-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (CAS 5798-79-8);</p> <p>2. [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile (CS) (CAS 2698-41-1);</p> <p>3. 2-Chloro-1-phenylethanone, Phenylacetyl chloride (ω-chloroacetophenone) (CN) (CAS 532-27- 4);</p> <p>4. Dibenz-(b,f)-1,4-oxazephine, (CR) (CAS 257-07-8);</p> <p>5. 10-Chloro-5,10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (CAS 578- 94-9);</p> <p>6. N-Nonanoylmorpholine, (MPA) (CAS 5299-64-9);</p> <p>e. Equipment specially designed or modified for military use, designed or modified for the dissemination of any of the following, and specially designed components therefor:</p>	<p><i>Note 1: ML7.d. does not apply to "riot control agents" individually packaged for personal self-defence purposes.</i></p> <p><i>Note 2: ML7.d. does not apply to active constituent chemicals, and combinations thereof, identified and packaged for food production or medical purposes.</i></p>	

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	<ol style="list-style-type: none"> 1. Materials or agents specified by ML7.a., ML7.b. or ML7.d.; or 2. CW agents made up of precursors specified by ML7.c. <p>f. Protective and decontamination equipment, specially designed or modified for military use, components and chemical mixtures, as follows:</p> <ol style="list-style-type: none"> 1. Equipment designed or modified for defence against materials specified by ML7.a., ML7.b. or ML7.d., and specially designed components therefor; 2. Equipment designed or modified for decontamination of objects contaminated with materials specified by ML7.a. or ML7.b. and specially designed components therefor; 3. Chemical mixtures specially developed or formulated for the decontamination of objects contaminated with materials specified by ML7.a. or ML7.b.; <p>g. Equipment specially designed or modified for military use designed or modified for the detection or identification of materials specified by ML7.a., ML7.b. or ML7.d., and specially designed components therefor;</p> <p>h. "Biopolymers" specially designed or processed for the detection or identification of CW agents specified by ML7.b., and the cultures of specific cells used to produce them;</p> <p>i. "Biocatalysts" for the decontamination or degradation of CW agents, and biological systems therefor, as follows:</p>	<p><u>Note:</u> ML7.f.1. includes:</p> <ol style="list-style-type: none"> a. Air conditioning units specially designed or modified for nuclear, biological or chemical filtration; b. Protective clothing. <p><u>N.B.:</u> For civil gas masks, protective and decontamination equipment, see also entry 1A004 on the Dual-Use Items List in this Schedule.</p>	

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	<ol style="list-style-type: none"> 1. "Biocatalysts" specially designed for the decontamination or degradation of CW agents specified by ML7.b. resulting from directed laboratory selection or genetic manipulation of biological systems; 2. Biological systems containing the genetic information specific to the production of "biocatalysts" specified by ML7.i.1., as follows: <ol style="list-style-type: none"> a. "Expression vectors"; b. Viruses; c. Cultures of cells. 	<p><i>Note:</i> ML7.g. does not apply to personal radiation monitoring dosimeters.</p> <p><i>N.B.:</i> See also entry 1A004 on the Dual-Use Items List in this Schedule.</p> <p><i>Note 1:</i> ML7.b. and ML7.d. do not apply to the following:</p> <ol style="list-style-type: none"> a. Cyanogen chloride (CAS 506-77-4). See 1C450.a.5. on the Dual-Use Items List in this Schedule; b. Hydrocyanic acid (CAS 74-90-8); c. Chlorine (CAS 7782-50-5); d. Carbonyl chloride (phosgene) (CAS 75-44-5). See 1C450.a.4. on the Dual-Use Items List in this Schedule; e. Diphosgene (trichloromethyl-chloroformate) (CAS 503-38-8); f. Not used since 2004; 	

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		<p>g. Xylyl bromide, ortho: (CAS 89-92-9), meta: (CAS 620-13-3), para: (CAS 104-81-4);</p> <p>h. Benzyl bromide (CAS 100-39-0);</p> <p>i. Benzyl iodide (CAS 620-05-3);</p> <p>j. Bromo acetone (CAS 598-31-2);</p> <p>k. Cyanogen bromide (CAS 506-68-3);</p> <p>l. Bromo methylethylketone (CAS 816-40-0);</p> <p>m. Chloro acetone (CAS 78-95-5);</p> <p>n. Ethyl iodoacetate (CAS 623-48-3);</p> <p>o. Iodo acetone (CAS 3019-04-3);</p> <p>p. Chloropicrin (CAS 76-06-2). See 1C450.a.7. on the Dual-Use Items List in this Schedule.</p> <p><u>Note 2:</u> The cultures of cells and biological systems specified by ML7.h. and ML7.i.2. are exclusive and these sub-items do not apply to cells or biological systems for civil purposes, such as agricultural, pharmaceutical, medical, veterinary, environmental, waste management, or in the food industry.</p>	

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ML8	<p>“Energetic materials”, and related substances, as follows:</p> <p>a. “Explosives”, as follows, and mixtures thereof:</p> <ol style="list-style-type: none"> 1. ADNBF (aminodinitrobenzofuroxan or 7-amino-4,6-dinitrobenzofurazane-1-oxide) (CAS 97096-78-1); 2. BNCP (cis-bis (5-nitrotetrazolato) tetra amine-cobalt (III) perchlorate) (CAS 117412-28-9); 3. CL-14 (diamino dinitrobenzofuroxan or 5,7-diamino-4,6-dinitrobenzofurazane-1-oxide) (CAS 117907-74-1); 4. CL-20 (HNIW or Hexanitrohexaazaisowurtzitane) (CAS 135285-90-4); chlathrates of CL-20 (see also ML8.g.3. and g.4. for its “precursors”); 	<p><i><u>N.B.1.:</u> See also 1C011 on the Dual-Use Items List in this Schedule.</i></p> <p><i><u>N.B.2.:</u> For charges and devices, see ML4 and 1A008 on the Dual-Use Items List in this Schedule.</i></p> <p><i><u>Technical Notes</u></i></p> <ol style="list-style-type: none"> 1. <i>For the purposes of ML8, mixture refers to a composition of two or more substances with at least one substance being listed in the ML8 sub-items.</i> 2. <i>Any substance listed in the ML8 sub-items is subject to this list, even when utilised in an application other than that indicated. (e.g. TAGN is predominantly used as an explosive but can also be used either as a fuel or an oxidizer.)</i> 	Controller

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	<p>5. CP (2-(5-cyanotetrazolato) penta amine-cobalt (III) perchlorate) (CAS 70247-32-4);</p> <p>6. DADE (1,1-diamino-2,2-dinitroethylene, FOX7) (CAS 145250-81-3);</p> <p>7. DATB (diaminotrinitrobenzene) (CAS 1630-08-6);</p> <p>8. DDFP (1,4-dinitrodifurazanopiperazine);</p> <p>9. DDPO (2,6-diamino-3,5-dinitropyrazine-1-oxide, PZO) (CAS 194486-77-6);</p> <p>10. DIPAM (3,3'-diamino-2,2',4,4',6,6'-hexanitrobiphenyl or dipicramide) (CAS 17215-44-0);</p> <p>11. DNGU (DINGU or dinitroglycoluril) (CAS 55510-04-8);</p> <p>12. Furazans, as follows:</p> <p style="padding-left: 40px;">a. DAAOF (diaminoazoxyfurazan);</p> <p style="padding-left: 40px;">b. DAAzF (diaminoazofurazan) (CAS 78644-90-3);</p> <p>13. HMX and derivatives (see also ML8.g.5. for its "precursors"), as follows:</p> <p style="padding-left: 40px;">a. HMX (Cyclotetramethylenetetranitramine, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazine, 1,3,5,7-tetranitro-1,3,5,7-tetraza-cyclooctane, octogen or octogene) (CAS 2691-41-0);</p> <p style="padding-left: 40px;">b. difluoroaminated analogs of HMX;</p>		

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	<p>c. K-55 (2,4,6,8-tetranitro-2,4,6,8-tetraazabicyclo [3,3,0]-octanone-3, tetranitrosemiglycouril or keto-bicyclic HMX) (CAS 130256-72-3);</p> <p>14. HNAD (hexanitroadamantane) (CAS 143850-71-9);</p> <p>15. HNS (hexanitrostilbene) (CAS 20062-22-0);</p> <p>16. Imidazoles as follows:</p> <p>a. BNNII (Octahydro-2,5-bis(nitroimino)imidazo [4,5-d]imidazole);</p> <p>b. DNI (2,4-dinitroimidazole) (CAS 5213-49-0);</p> <p>c. FDIA (1-fluoro-2,4-dinitroimidazole);</p> <p>d. NTDNIA (N-(2-nitrotriazolo)-2,4-dinitroimidazole);</p> <p>e. PTIA (1-picryl-2,4,5-trinitroimidazole);</p> <p>17. NTNMH (1-(2-nitrotriazolo)-2-dinitromethylene hydrazine);</p> <p>18. NTO (ONTA or 3-nitro-1,2,4-triazol-5-one) (CAS 932-64-9);</p> <p>19. Polynitrocubanes with more than four nitro groups;</p> <p>20. PYX (2,6-Bis(picrylamino)-3,5-dinitropyridine) (CAS 38082-89-2);</p> <p>21. RDX and derivatives, as follows:</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>a. RDX (cyclotrimethylenetrinitramine, cyclonite, T4, hexahydro-1,3,5-trinitro-1,3,5-triazine, 1,3,5-trinitro-1,3,5-triaza-cyclohexane, hexogen or hexogene) (CAS 121-82-4);</p> <p>b. Keto-RDX (K-6 or 2,4,6-trinitro-2,4,6-triazacyclohexanone) (CAS 115029-35-1);</p> <p>22. TAGN (triaminoguanidinenitrate) (CAS 4000-16-2);</p> <p>23. TATB (triaminotrinitrobenzene) (CAS 3058-38-6) (see also ML8.g.7 for its “precursors”);</p> <p>24. TEDDZ (3,3,7,7-tetrakis(difluoroamine) octahydro-1,5-dinitro-1,5-diazocine);</p> <p>25. Tetrazoles, as follows:</p> <p>a. NTAT (nitrotriazol aminotetrazole);</p> <p>b. NTNT (1-N-(2-nitrotriazolo)-4-nitrotetrazole);</p> <p>26. Tetryl (trinitrophenylmethylnitramine) (CAS 479-45-8);</p> <p>27. TNAD (1,4,5,8-tetranitro-1,4,5,8-tetraazadecalin) (CAS 135877-16-6) (see also ML8.g.6. for its “precursors”);</p> <p>28. TNAZ (1,3,3-trinitroazetidine) (CAS 97645-24-4) (see also ML8.g.2. for its “precursors”);</p> <p>29. TNGU (SORGUYL or tetranitroglycoluril) (CAS 55510-03-7);</p> <p>30. TNP (1,4,5,8-tetranitro-pyridazino[4,5-d]pyridazine)</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>(CAS 229176-04-9);</p> <p>31. Triazines, as follows:</p> <p>a. DNAM (2-oxy-4,6-dinitroamino-s-triazine) (CAS 19899-80-0);</p> <p>b. NNHT (2-nitroimino-5-nitro-hexahydro-1,3,5-triazine) (CAS 130400-13-4);</p> <p>32. Triazoles, as follows:</p> <p>a. 5-azido-2-nitrotriazole;</p> <p>b. ADHTDN (4-amino-3,5-dihydrazino-1,2,4-triazole dinitramide) (CAS 1614-08-0);</p> <p>c. ADNT (1-amino-3,5-dinitro-1,2,4-triazole);</p> <p>d. BDNTA ([bis-dinitrotriazole]amine);</p> <p>e. DBT (3,3'-dinitro-5,5-bi-1,2,4-triazole) (CAS 30003-46-4);</p> <p>f. DNBT (dinitrobistriazole) (CAS 70890-46-9);</p> <p>g. Not used since 2010;</p> <p>h. NTDNT (1-N-(2-nitrotriazolo) 3,5-dinitrotriazole);</p> <p>i. PDNT (1-picryl-3,5-dinitrotriazole);</p> <p>j. TACOT (tetranitrobenzotriazolobenzotriazole) (CAS 25243-36-1);</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>33. Explosives not listed elsewhere in ML8.a. and having any of the following:</p> <ul style="list-style-type: none"> a. Detonation velocity exceeding 8.700 m/s, at maximum density, or b. Detonation pressure exceeding 34 GPa (340 kbar); <p>34. Organic explosives not listed elsewhere in ML8.a. and having all the following:</p> <ul style="list-style-type: none"> a. Yielding detonation pressures of 25 GPa (250 kbar) or more and b. Remaining stable at temperatures of 523 K (250 °C) or higher for periods of five minutes or longer; <p>b. "Propellants" as follows:</p> <ul style="list-style-type: none"> 1. Any United Nations (UN) Class 1.1 solid "propellant" with a theoretical specific impulse (under standard conditions) of more than 250 seconds for non-metallised, or more than 270 seconds for aluminised compositions; 2. Any UN Class 1.3 solid "propellant" with a theoretical specific impulse (under standard conditions) of more than 230 seconds for non-halogenised, 250 seconds for non-metallised compositions and 266 seconds for metallised compositions; 3. "Propellants" having a force constant of more than 		

Category Code	Items Description	Note	Relevant Authority
	<p>1200 kJ/kg;</p> <ol style="list-style-type: none"> 4. "Propellants" that can sustain a steady-state linear burning rate of more than 38 mm/s under standard conditions (as measured in the form of an inhibited single strand) of 6.89 MPa (68.9 bar) pressure and 294 K (21 °C); 5. Elastomer Modified Cast Double Base (EMCDB) "propellants" with extensibility at maximum stress of more than 5 % at 233 K (– 40 °C); 6. Any "propellant" containing substances specified by ML8.a. 7. "Propellants", not specified elsewhere in the Military Item List in this Schedule, specially designed for military use; <p>c. "Pyrotechnics", fuels and related substances, as follows, and mixtures thereof:</p> <ol style="list-style-type: none"> 1. Aircraft fuels specially formulated for military purposes; 2. Alane (aluminum hydride) (CAS 7784-21-6); 3. Carboranes; decaborane (CAS 17702-41-9); pentaboranes (CAS 19624-22-7 and 18433-84- 6) and their derivatives; 4. Hydrazine and derivatives, as follows (see also ML8.d.8. and d.9. for oxidising hydrazine derivatives): <ol style="list-style-type: none"> a. Hydrazine (CAS 302-01-2) in concentrations of 70 		

Category Code	Items Description	Note	Relevant Authority
	<p>% or more;</p> <ul style="list-style-type: none"> b. Monomethyl hydrazine (CAS 60-34-4); c. Symmetrical dimethyl hydrazine (CAS 540-73-8); d. Unsymmetrical dimethyl hydrazine (CAS 57-14-7); <p>5. Metal fuels in particle form whether spherical, atomised, spheroidal, flaked or ground, manufactured from material consisting of 99 % or more of any of the following:</p> <ul style="list-style-type: none"> a. Metals as follows and mixtures thereof: <ul style="list-style-type: none"> 1. Beryllium (CAS 7440-41-7) in particle sizes of less than 60 µm; 2. Iron powder (CAS 7439-89-6) with particle size of 3 µm or less produced by reduction of iron oxide with hydrogen; b. Mixtures containing any of the following: <ul style="list-style-type: none"> 1. Zirconium (CAS 7440-67-7), magnesium (CAS 7439-95-4) or alloys of these in particle sizes of less than 60 µm; or 2. Boron (CAS 7440-42-8) or boron carbide (CAS 12069-32-8) fuels of 85 % purity or higher and particle sizes of less than 60 µm; <p>6. Military materials, containing thickeners for hydrocarbon fuels, specially formulated for use in</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>flame throwers or incendiary munitions, such as metal stearates or palmates (e.g. octal (CAS 637-12-7)) and M1, M2, and M3 thickeners;</p> <p>7. Perchlorates, chlorates and chromates, composited with powdered metal or other high energy fuel components;</p> <p>8. Spherical aluminium powder (CAS 7429-90-5) with a particle size of 60 µm or less, manufactured from material with an aluminium content of 99 % or more;</p> <p>9. Titanium subhydride (TiH_n) of stoichiometry equivalent to n = 0.65 to 1.68.</p>	<p><i>Note 1: Aircraft fuels specified by ML8.c.1. are finished products, not their constituents.</i></p> <p><i>Note 2 ML8.c.4.a. does not apply to hydrazine mixtures specially formulated for corrosion control.</i></p> <p><i>Note 3: ML8.c.5. applies to explosives and fuels, whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium, or beryllium.</i></p> <p><i>Note 4: ML8.c.5.b.2. does not apply to boron and boron carbide enriched with boron-10 (20 % or more of total boron-10 content).</i></p> <p><i>Note 5: ML8.c.5.b. only applies to metal fuels in particle form when they are mixed with other substances to form a mixture formulated for military purposes such as liquid propellant slurries, solid propellants, or pyrotechnic mixtures.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>d. Oxidizers as follows, and mixtures thereof:</p> <ol style="list-style-type: none"> 1. ADN (ammonium dinitramide or SR 12) (CAS 140456-78-6); 2. AP (ammonium perchlorate) (CAS 7790-98-9); 3. Compounds composed of fluorine and any of the following: <ol style="list-style-type: none"> a. Other halogens; b. Oxygen; or <p>c. Nitrogen;</p> <ol style="list-style-type: none"> 4. DNAD (1,3-dinitro-1,3-diazetidine) (CAS 78246-06-7); 5. HAN (hydroxylammonium nitrate) (CAS 13465-08-2); 6. HAP (hydroxylammonium perchlorate) (CAS 15588-62-2); 7. HNF (hydrazinium nitroformate) (CAS 20773-28-8); 8. Hydrazine nitrate (CAS 37836-27-4); 9. Hydrazine perchlorate (CAS 27978-54-7); 10. Liquid oxidisers comprised of or containing inhibited red fuming nitric acid (IRFNA) (CAS 8007-58-7); 	<p><i>Note 1: ML8.d.3 does not apply to chlorine trifluoride (CAS 7790-91-2).</i></p> <p><i>Note 2: ML8.d.3 does not apply to nitrogen trifluoride (CAS 7783-54-2) in its gaseous state.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>e. Binders, plasticisers, monomers and polymers, as follows:</p> <ol style="list-style-type: none"> 1. AMMO (azidomethylmethyloxetane and its polymers) (CAS 90683-29-7) (see also ML8.g.1. for its "precursors"); 2. BAMO (bisazidomethylmethyloxetane and its polymers) (CAS 17607-20-4) (see also ML8.g.1. for its "precursors"); 3. BDNPA (bis (2,2-dinitropropyl)acetal) (CAS 5108-69-0); 4. BDNPF (bis (2,2-dinitropropyl)formal) (CAS 5917-61-3); 5. BTTN (butanetrioltrinitrate) (CAS 6659-60-5) (see also ML8.g.8. for its "precursors"); 6. Energetic monomers, plasticizers or polymers, specially formulated for military use and containing any of the following; <ol style="list-style-type: none"> a. Nitro groups; b. Azido groups; c. Nitrate groups; d. Nitrataza groups; or e. Difluoroamino groups; 7. FAMAO (3-difluoroaminomethyl-3-azidomethyl 	<p><i>Note: ML8.d.10 does not apply to non-inhibited fuming nitric acid.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>oxetane) and its polymers;</p> <p>8. FEFO (bis-(2-fluoro-2,2-dinitroethyl) formal) (CAS 17003-79-1);</p> <p>9. FPF-1 (poly-2,2,3,3,4,4-hexafluoropentane-1,5-diol formal) (CAS 376-90-9);</p> <p>10. FPF-3 (poly-2,4,4,5,5,6,6-heptafluoro-2-trifluoromethyl-3-oxaheptane-1,7-diol formal);</p> <p>11. GAP (glycidylazide polymer) (CAS 143178-24-9) and its derivatives;</p> <p>12. HTPB (hydroxyl terminated polybutadiene) with a hydroxyl functionality equal to or greater than 2.2 and less than or equal to 2.4, a hydroxyl value of less than 0.77 meq/g, and a viscosity at 30 °C of less than 47 poise (CAS 69102-90-5);</p> <p>13. Alcohol functionalised poly(epichlorohydrin) with a molecular weight less than 10000, as follows:</p> <p>a. Poly(epichlorohydrindiol);</p> <p>b. Poly(epichlorohydrintriol)</p> <p>14. NENAs (nitroethylnitramine compounds) (CAS 17096-47-8, 85068-73-1, 82486-83-7, 82486-82-6 and 85954-06-9);</p> <p>15. PGN (poly-GLYN, polyglycidlnitrate or poly(nitratomethyl oxirane) (CAS 27814-48-8);</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>16. Poly-NIMMO (poly nitratomethylmethyloxetane) or poly-NMMO (poly[3-Nitratomethyl-3- methyloxetane]) (CAS 84051-81-0);</p> <p>17. Polynitroorthocarbonates;</p> <p>18. TVOPA (1,2,3-tris[1,2-bis(difluoroamino)ethoxy] propane or tris vinox propane adduct) (CAS 53159-39-0).</p> <p>f. "Additives" as follows:</p> <ol style="list-style-type: none"> 1. Basic copper salicylate (CAS 62320-94-9); 2. BHEGA (bis-(2-hydroxyethyl) glycolamide) (CAS 17409-41-5); 3. BNO (butadienenitrileoxide); 4. Ferrocene derivatives as follows: <ol style="list-style-type: none"> a. Butacene (CAS 125856-62-4); b. Catocene (2,2-bis-ethylferrocenyl propane) (CAS 37206-42-1); c. Ferrocene carboxylic acids including: Ferrocene carboxylic acid (CAS 1271-42-7), 1,1'-Ferrocenedicarboxylic acid (CAS 1293-87-4); d. n-butyl-ferrocene (CAS 31904-29-7); 		

Category Code	Items Description	Note	Relevant Authority
	<p>e. Other adducted polymer ferrocene derivatives;</p> <p>5. Lead beta-resorcylate (CAS 20936-32-7);</p> <p>6. Lead citrate (CAS 14450-60-3);</p> <p>7. Lead-copper chelates of beta-resorcylate or salicylates (CAS 68411-07-4);</p> <p>8. Lead maleate (CAS 19136-34-6);</p> <p>9. Lead salicylate (CAS 15748-73-9);</p> <p>10. Lead stannate (CAS 12036-31-6);</p> <p>11. MAPO (tris-1-(2-methyl)aziridiny] phosphine oxide) (CAS 57-39-6); BOBBA 8 (bis(2-methyl aziridiny] 2-(2-hydroxypropanoxy) propylamino phosphine oxide); and other MAPO derivatives;</p> <p>12. Methyl BAPO (bis(2-methyl aziridiny] methylamino phosphine oxide) (CAS 85068-72-0);</p> <p>13. N-methyl-p-nitroaniline (CAS 100-15-2);</p> <p>14. 3-Nitraza-1,5-pentane diisocyanate (CAS 7406-61-9);</p> <p>15. Organo-metallic coupling agents as follows:</p> <p>a. Neopentyl[diallyl]oxy, tri[dioctyl]phosphato-titanate (CAS 103850-22-2); also known as titanium IV, 2,2[bis 2-propenolato-methyl, butanolato, tris (dioctyl) phosphato] (CAS 110438-25-0); or LICA 12 (CAS 103850-22-2);</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>b. Titanium IV, [(2-propenolato-1) methyl, n-propanolatomethyl] butanolato-1, tris[dioctyl] pyrophosphate or KR3538;</p> <p>c. Titanium IV, [(2-propenolato-1)methyl, n-propanolatomethyl] butanolato-1, tris(dioctyl)phosphate;</p> <p>16. Polycyanodifluoroaminoethyleneoxide;</p> <p>17. Polyfunctional aziridine amides with isophthalic, trimesic (BITA or butylene imine trimesamide), isocyanuric or trimethyladipic backbone structures and 2-methyl or 2-ethyl substitutions on the aziridine ring;</p> <p>18. Propyleneimine (2-methylaziridine) (CAS 75-55-8);</p> <p>19. Superfine iron oxide (Fe_2O_3) (CAS 1317-60-8) with a specific surface area more than 250 m²/g and an average particle size of 3.0 nm or less;</p> <p>20. TEPAN (tetraethylenepentaamineacrylonitrile) (CAS 68412-45-3); cyanoethylated polyamines and their salts;</p> <p>21. TEPANOL (tetraethylenepentaamineacrylonitrileglycidol) (CAS 68412-46-4); cyanoethylated polyamines adducted with glycidol and their salts;</p> <p>22. TPB (triphenyl bismuth) (CAS 603-33-8).</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>g. "Precursors", as follows:</p> <ol style="list-style-type: none"> 1. BCMO (bischloromethyloxetane) (CAS 142173-26-0) (see also ML8.e.1. and e.2.); 2. Dinitroazetidine-t-butyl salt (CAS 125735-38-8) (see also ML8.a.28.); 3. HBIW (hexabenzylhexaazaisowurtzitane) (CAS 124782-15-6) (see also ML8.a.4.); 4. TAIW (tetraacetyldibenzylhexaazaisowurtzitane) (see also ML8.a.4.) (CAS 182763-60-6); 5. TAT (1,3,5,7 tetraacetyl-1,3,5,7,-tetraaza cyclo-octane) (CAS 41378-98-7) (see also ML8.a.13.); 6. 1,4,5,8-tetraazadecalin (CAS 5409-42-7) (see also ML8.a.27.); 7. 1,3,5-trichlorobenzene (CAS 108-70-3) (see also ML8.a.23.); 8. 1,2,4-trihydroxybutane (1,2,4-butanetriol) (CAS 3068-00-6) (see also ML8.e.5.). 	<p><i><u>N.B.:</u> In ML8.g. the references are to specified "Energetic Materials" manufactured from these substances.</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><u>Note 5:</u> Not used since 2009</p> <p><u>Note 6:</u> ML8 does not apply to the following substances unless they are compounded or mixed with the “energetic material” specified by ML8.a. or powdered metals specified by ML8.c.:</p> <ul style="list-style-type: none"> a. Ammonium picrate (CAS 131-74-8); b. Black powder; c. Hexanitrodiphenylamine (CAS 131-73-7); d. Difluoroamine(CAS 10405-27-3); e. Nitrostarch (CAS9056-38-6); f. Potassium nitrate (CAS 7757-79-1); g. Tetranitronaphthalene; h. Trinitroanisol; i. Trinitronaphthalene; j. Trinitroxylene; k. N-pyrrolidinone; 1-methyl-2-pyrrolidinone (CAS 872-50-4); l. Dioctylmaleate (CAS 142-16-5); 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>m. Ethylhexylacrylate (CAS 103-11-7);</i></p> <p><i>n. Triethylaluminium (TEA) (CAS 97-93-8), trimethylaluminium (TMA) (CAS 75-24-1), and other pyrophoric metal alkyls and aryls of lithium, sodium, magnesium, zinc or boron;</i></p> <p><i>o. Nitrocellulose (CAS 9004-70-0);</i></p> <p><i>p. Nitroglycerin (or glyceroltrinitrate, trinitroglycerine) (NG) (CAS 55-63-0);</i></p> <p><i>q. 2,4,6-trinitrotoluene (TNT) (CAS 118-96-7);</i></p> <p><i>r. Ethylenediaminedinitrate (EDDN) (CAS 20829-66-7);</i></p> <p><i>s. Pentaerythritoltetranitrate (PETN) (CAS 78-11-5);</i></p> <p><i>t. Lead azide (CAS 13424-46-9), normal lead styphnate (CAS 15245-44-0) and basic lead styphnate (CAS 12403-82-6), and primary explosives or priming compositions containing azides or azide complexes;</i></p> <p><i>u. Triethyleneglycoldinitrate (TEGDN) (CAS 111-22-8);</i></p> <p><i>v. 2,4,6-trinitroresorcinol (styphnic acid) (CAS 82-71-3);</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p>w. Diethyldiphenylurea (CAS 85-98-3); dimethyldiphenylurea(CAS 611-92-7); methylethyldiphenyl urea [Centralites];</p> <p>x. N,N-diphenylurea (unsymmetrical diphenylurea) (CAS 603-54-3);</p> <p>y. Methyl-N,N-diphenylurea (methyl unsymmetrical diphenylurea)(CAS 13114-72-2);</p> <p>z. Ethyl-N,N-diphenylurea (ethyl unsymmetrical diphenylurea) (CAS 64544-71-4);</p> <p>aa.2-Nitrodiphenylamine (2-NDPA)(CAS 119-75-5);</p> <p>bb.4-Nitrodiphenylamine (4-NDPA)(CAS 836-30-6);</p> <p>cc.2,2-dinitropropanol (CAS 918-52-5);</p> <p>dd.Nitroguanidine (CAS 556-88-7) (see 1C011.d. on the Dual-Use Items List in this Schedule).</p> <p><u>Note 7:</u> ML8. does not apply to ammonium perchlorate (ML8.d.2.) and NTO (ML8.a.18.), specially shaped and formulated for civil-use gas generation devices and meeting all of the following:</p> <p>a. Compounded or mixed, with non-active</p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>thermoset binders or plasticizers;</i></p> <p><i>b. Having a maximum of 80 % ammonium perchlorate (ML8.d.2.) in mass of active material;</i></p> <p><i>c. Having less than or equal to 4 g of NTO (ML8.a.18.); and</i></p> <p><i>d. Having an individual mass of less than 250 g.</i></p>	
ML9	<p>Vessels of war (surface or underwater), special naval equipment, accessories, components and other surface vessels, as follows:</p> <p>a. Vessels and components, as follows:</p> <ol style="list-style-type: none"> 1. Vessels (surface or underwater) specially designed or modified for military use, regardless of current state of repair or operating condition, and whether or not they contain weapon delivery systems or armour, and hulls or parts of hulls for such vessels, and components therefor specially designed for military use; 2. Surface vessels, other than those specified in ML9.a.1., having any of the following, fixed or integrated into the vessel: <ol style="list-style-type: none"> a. Automatic weapons having a calibre of 12.7 mm or greater specified in ML1., or weapons specified in ML2., ML4., ML12. or ML19., or 'mountings' or hard points for such weapons; 	<p><u>N.B.:</u> For guidance and navigation equipment, see ML11.</p> <p><u>Technical Note</u></p> <p><i>'Mountings' refers to weapon mounts or structural strengthening for the purpose of installing weapons.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Fire control systems specified in ML5.;</p> <p>c. Having all of the following:</p> <ol style="list-style-type: none"> 1. 'Chemical, Biological, Radiological and Nuclear (CBRN) protection'; and 2. 'Pre-wet or wash down system' designed for decontamination purposes; or <p>d. Active weapon countermeasure systems specified in ML4.b., ML5.c. or ML11.a. and having any of the following:</p> <ol style="list-style-type: none"> 1. 'CBRN protection'; 2. Hull and superstructure, specially designed to reduce the radar cross section; 3. Thermal signature reduction devices, (e.g., an exhaust gas cooling system), excluding those specially designed to increase overall power plant efficiency or to reduce the environmental impact; or 4. A degaussing system designed to reduce the magnetic signature of the whole vessel; 	<p><u>Technical Notes</u></p> <ol style="list-style-type: none"> 1. 'CBRN protection' is a self contained interior space containing features such as over-pressurization, isolation of ventilation systems, limited ventilation openings with CBRN filters and limited personnel access points incorporating air-locks. 2. 'Pre-wet or wash down system' is a seawater spray system capable of simultaneously wetting the exterior superstructure and decks of a vessel. 	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Engines and propulsion systems, as follows, specially designed for military use and components therefor specially designed for military use:</p> <ol style="list-style-type: none"> 1. Diesel engines specially designed for submarines and having all of the following: <ol style="list-style-type: none"> a. Power output of 1.12 MW (1500 hp) or more; and b. Rotary speed of 700 rpm or more; 2. Electric motors specially designed for submarines and having all of the following: <ol style="list-style-type: none"> a. Power output of more than 0.75 MW (1000 hp); b. Quick reversing; c. Liquid cooled; and d. Totally enclosed; 3. Non-magnetic diesel engines having all of the following: <ol style="list-style-type: none"> a. Power output of 37.3 kW (50 hp) or more; and b. Non-magnetic content in excess of 75 % of total mass; 4. 'Air Independent Propulsion' (AIP) systems specially designed for submarines; 	<p><u>Technical Note</u></p> <p>'Air Independent Propulsion' (AIP) allows a submerged submarine to operate its propulsion</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>c. Underwater detection devices, specially designed for military use, controls therefor and components therefor specially designed for military use;</p> <p>d. Anti-submarine nets and anti-torpedo nets, specially designed for military use;</p> <p>e. Not used since 2003;</p> <p>f. Hull penetrators and connectors, specially designed for military use, that enable interaction with equipment external to a vessel, and components therefor specially designed for military use;</p> <p>g. Silent bearings having any of the following, components therefor and equipment containing those bearings, specially designed for military use:</p> <ol style="list-style-type: none"> 1. Gas or magnetic suspension; 2. Active signature controls; or 	<p><i>system, without access to atmospheric oxygen, for a longer time than the batteries would have otherwise allowed. For the purposes of ML9.b.4., AIP does not include nuclear power.</i></p> <p><i><u>Note:</u> ML9.f. includes connectors for vessels which are of the single-conductor, multi-conductor, coaxial or waveguide type, and hull penetrators for vessels, both of which are capable of remaining impervious to leakage from without and of retaining required characteristics at marine depths exceeding 100 m; and fibre-optic connectors and optical hull penetrators, specially designed for “laser” beam transmission, regardless of depth. ML9.f. does not apply to ordinary propulsive shaft and hydrodynamic control-rod hull penetrators.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	3. Vibration suppression controls.		
ML10	<p>“Aircraft”, “lighter-than-air vehicles”, Unmanned Aerial Vehicles (“UAVs”), aero-engines and “aircraft” equipment, related equipment, and components, as follows, specially designed or modified for military use:</p> <ul style="list-style-type: none"> a. Manned “aircraft” and “lighter-than-air vehicles”, and specially designed components therefor; b. Not used since 2011; c. Unmanned aircraft and related equipment, as follows, and specially designed components therefor: <ul style="list-style-type: none"> 1. “UAVs”, Remotely Piloted Air Vehicles (RPVs), autonomous programmable vehicles and unmanned “lighter-than-air vehicles”; 2. Launchers, recovery equipment and ground support equipment; 3. Equipment designed for command or control; d. Propulsion aero-engines and specially designed components therefor; e. Airborne equipment, including airborne refuelling equipment, specially designed for use with the “aircraft” specified by ML10.a. or the aero-engines specified by ML10.d., and specially designed components therefor; f. Pressure refuellers, pressure refuelling equipment, 	<i>N.B.: For guidance and navigation equipment, see ML11.</i>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>equipment specially designed to facilitate operations in confined areas and ground equipment, developed specially for “aircraft” specified by ML10.a. or for aero-engines specified by ML10.d.;</p> <p>g. Military crash helmets and protective masks, and specially designed components therefor, pressurised breathing equipment and partial pressure suits for use in “aircraft”, anti-g suits, liquid oxygen converters used for “aircraft” or missiles, and catapults and cartridge actuated devices, for emergency escape of personnel from “aircraft”;</p> <p>h. Parachutes, paragliders and related equipment,as follows, and specially designed components therefor:</p> <ol style="list-style-type: none"> 1. Parachutes not specified elsewhere in the Military Item List in this Schedule; 2. Paragliders 3. Equipment specially designed for high altitude parachutists (e.g. suits, special helmets, breathing systems, navigation equipment); <p>i. Controlled opening equipment or automatic piloting systems, designed for parachuted loads.</p>	<p><i>Note 1: ML10.a. does not apply to “aircraft” and “lighter-than-air vehicles” or variants of those “aircraft” specially designed for military use, and which are all of the following:</i></p> <ol style="list-style-type: none"> a. <i>Not a combat aircraft;</i> b. <i>Not configured for military use and not fitted with equipment or attachments</i> 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>pecially designed or modified for military use; and</i></p> <p><i>c. Certified for civil use by the civil aviation authority.</i></p> <p><u>Note 2:</u> <i>ML 10.d. does not apply to:</i></p> <p><i>a. Aero-engines designed or modified for military use which have been certified by civil aviation authorities for use in "civil aircraft", or specially designed components therefor;</i></p> <p><i>b. Reciprocating engines or specially designed components therefor, except those specially designed for "UAVs".</i></p> <p><u>Note 3:</u> <i>For the purposes of ML 10.a. and ML 10.d., specially designed components and related equipment for non-military "aircraft" or aero-engines modified for military use applies only to those military components and to military related equipment required for the modification to military use.</i></p> <p><u>Note 4:</u> <i>For the purposes of ML 10.a., military use includes: combat, military reconnaissance, assault, military training, logistics support, and transporting and airdropping troops or military equipment.</i></p> <p><u>Note 5:</u> <i>ML 10.a. does not apply to "aircraft" that meet all of the following:</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p>a. Were first manufactured before 1946;</p> <p>b. Do not incorporate items specified by the Military Item List in this Schedule, unless the items are required to meet safety or airworthiness standards; and</p> <p>c. Do not incorporate weapons specified by the Military Item List in this Schedule, unless inoperable and incapable of being returned to operation.</p>	
ML11	<p>Electronic equipment, not specified elsewhere on the Military Item List in this Schedule, as follows, and specially designed components therefor:</p> <p>a. Electronic equipment specially designed for military use;</p>	<p><u>Note:</u> ML 11.a. includes:</p> <p>a. Electronic countermeasure and electronic counter-countermeasure equipment (i.e. equipment designed to introduce extraneous or erroneous signals into radar or radio communication receivers or otherwise hinder the reception, operation or effectiveness of adversary electronic receivers including their countermeasure equipment), including jamming and counter-jamming equipment;</p> <p>b. Frequency agile tubes;</p> <p>c. Electronic systems or equipment, designed either for surveillance and monitoring of the</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Global Navigation Satellite Systems (GNSS) jamming equipment.</p>	<p><i>electro- magnetic spectrum for military intelligence or security purposes or for counteracting such surveillance and monitoring;</i></p> <p><i>d. Underwater countermeasures, including acoustic and magnetic jamming and decoy, equipment designed to introduce extraneous or erroneous signals into sonar receivers;</i></p> <p><i>e. Data processing security equipment, data security equipment and transmission and signalling line security equipment, using ciphering processes;</i></p> <p><i>f. Identification, authentication and keyloader equipment and key management, manufacturing and distribution equipment;</i></p> <p><i>g. Guidance and navigation equipment;</i></p> <p><i>h. Digital troposcatter-radio communications transmission equipment;</i></p> <p><i>i. Digital demodulators specially designed for signals intelligence;</i></p> <p><i>j. “Automated command and control systems”.</i></p> <p><i>N.B.: For “software” associated with military “Software” Defined Radio (SDR), see ML21.</i></p>	

Category Code	Items Description	Note	Relevant Authority
ML12	<p>High velocity kinetic energy weapon systems and related equipment, as follows, and specially designed components therefor:</p> <ul style="list-style-type: none"> a. Kinetic energy weapon systems specially designed for destruction or effecting mission-abort of a target; b. Specially designed test and evaluation facilities and test models, including diagnostic instrumentation and targets, for dynamic testing of kinetic energy projectiles and systems. 	<p><u>N.B.</u>: For weapon systems using sub-calibre ammunition or employing solely chemical propulsion, and ammunition therefor, see ML1 to ML4.</p> <p><u>Note 1</u>: ML12 includes the following when specially designed for kinetic energy weapon systems:</p> <ul style="list-style-type: none"> a. Launch propulsion systems capable of accelerating masses larger than 0.1 g to velocities in excess of 1.6 km/s, in single or rapid fire modes; b. Prime power generation, electric armour, energy storage, thermal management, conditioning, switching or fuel-handling equipment; and electrical interfaces between power supply, gun and other turret electric drive functions; c. Target acquisition, tracking, fire control or damage assessment systems; d. Homing seeker, guidance or divert propulsion (lateral acceleration) systems for projectiles. <p><u>Note 2</u>: ML12 applies to weapon systems using any of the following methods of propulsion:</p> <ul style="list-style-type: none"> a. Electromagnetic; 	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><i>b. Electrothermal;</i></p> <p><i>c. Plasma;</i></p> <p><i>d. Light gas; or</i></p> <p><i>e. Chemical (when used in combination with any of the above).</i></p>	
ML13	<p>Armoured or protective equipment, constructions and components, as follows:</p> <p>a. Armoured plate, having any of the following:</p> <ol style="list-style-type: none"> 1. Manufactured to comply with a military standard or specification; or 2. Suitable for military use; <p>b. Constructions of metallic or non-metallic materials, or combinations thereof, specially designed to provide ballistic protection for military systems, and specially designed components therefor;</p> <p>c. Helmets manufactured according to military standards or specifications, or comparable national standards, and specially designed components therefor, (i.e. helmet shell, liner and comfort pads);</p> <p>d. Body armour or protective garments, and components therefor, as follows:</p> <ol style="list-style-type: none"> 1. Soft body armour or protective garments, manufactured to military standards or specifications, or to their 	<p><u>N.B.:</u> For body armour plate, see ML13.d.2.</p> <p><u>Note:</u> For the purposes of ML13.d.1., military standards or specifications include, at a minimum, specifications for fragmentation protection.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>equivalents, and specially designed components therefor;</p> <p>2. Hard body armour plates providing ballistic protection equal to or greater than level III (NIJ 0101.06, July 2008) or national equivalents.</p>	<p><i><u>Note 1:</u> ML13.b. includes materials specially designed to form explosive reactive armour or to construct military shelters.</i></p> <p><i><u>Note 2:</u> ML13.c. does not apply to conventional steel helmets, neither modified or designed to accept, nor equipped with any type of accessory device.</i></p> <p><i><u>Note 3:</u> ML13.c. and d. do not apply to helmets, body armour or protective garments, when accompanying their user for the user's own personal protection.</i></p> <p><i><u>Note 4:</u> The only helmets specially designed for bomb disposal personnel that are specified by ML13. are those specially designed for military use.</i></p> <p><i><u>N.B. 1:</u> See also entry 1A005 on the Dual-Use Items List in this Schedule.</i></p> <p><i><u>N.B. 2:</u> For "fibrous or filamentary materials" used in the manufacture of body armour and helmets, see entry 1C010 on the Dual-Use Items List in this Schedule.</i></p>	

Category Code	Items Description	Note	Relevant Authority
ML14	'Specialised equipment for military training' or for simulating military scenarios, simulators specially designed for training in the use of any firearm or weapon specified by ML1 or ML2, and specially designed components and accessories therefor.	<p><u>Technical Note</u></p> <p><i>The term 'specialised equipment for military training' includes military types of attack trainers, operational flight trainers, radar target trainers, radar target generators, gunnery training devices, anti-submarine warfare trainers, flight simulators (including human-rated centrifuges for pilot/astronaut training), radar trainers, instrument flight trainers, navigation trainers, missile launch trainers, target equipment, drone "aircraft", armament trainers, pilotless "aircraft" trainers, mobile training units and training equipment for ground military operations.</i></p> <p><u>Note 1:</u> ML14 includes image generating and interactive environment systems for simulators, when specially designed or modified for military use.</p> <p><u>Note 2:</u> ML14 does not apply to equipment specially designed for training in the use of hunting or sporting weapons.</p>	Controller
ML15	<p>Imaging or countermeasure equipment, as follows, specially designed for military use, and specially designed components and accessories therefor:</p> <ul style="list-style-type: none"> a. Recorders and image processing equipment; b. Cameras, photographic equipment and film processing equipment; c. Image intensifier equipment; 		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>d. Infrared or thermal imaging equipment;</p> <p>e. Imaging radar sensor equipment;</p> <p>f. Countermeasure or counter-countermeasure equipment, for the equipment specified by ML15.a. to ML15.e.</p>	<p><u>Note:</u> ML15.f. includes equipment designed to degrade the operation or effectiveness of military imaging systems or to minimize such degrading effects.</p> <p><u>Note 1:</u> In ML15, the term specially designed components includes the following when specially designed for military use:</p> <ul style="list-style-type: none"> a. Infrared image converter tubes; b. Image intensifier tubes (other than first generation); c. Microchannel plates; d. Low-light-level television camera tubes; e. Detector arrays (including electronic interconnection or read out systems); f. Pyroelectric television camera tubes; g. Cooling systems for imaging systems; h. Electrically triggered shutters of 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>the photochromic or electro-optical type having a shutter speed of less than 100 µs, except in the case of shutters which are an essential part of a high-speed camera;</i></p> <p><i>i. Fibre optic image inverters;</i></p> <p><i>j. Compound semiconductor photocathodes</i></p> <p><u>Note 2:</u> <i>ML15 does not apply to "first generation image intensifier tubes" or equipment specially designed to incorporate "first generation image intensifier tube".</i></p> <p><u>N.B.:</u> <i>For the classification of weapons sights incorporating "first generation image intensifier tubes" see ML1., ML2. and ML5.a.</i></p> <p><u>N.B.:</u> <i>See also 6A002.a.2. and 6A002.b. on the Dual-Use Items List in this Schedule.</i></p>	
ML16	Forgings, castings and other unfinished products, specially designed for items specified by ML1 to ML4, ML6, ML9, ML10, ML12 or ML19.	<u>Note:</u> <i>ML16. applies to unfinished products when they are identifiable by material composition, geometry or function.</i>	Controller
ML17	<p>Miscellaneous equipment, materials and 'libraries', as follows, and specially designed components therefor:</p> <p>a. Self-contained diving and underwater swimming apparatus, as follows:</p>	<p><u>Technical Notes</u></p> <p>1. <i>For the purpose of ML17, the term 'library' (parametric technical database) means a collection of technical information of a military nature, reference to which may enhance the</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Closed or semi-closed circuit (rebreathing) apparatus specially designed for military use (i.e. specially designed to be non magnetic); 2. Specially designed components for use in the conversion of open-circuit apparatus to military use; 3. Articles designed exclusively for military use with self-contained diving and underwater swimming apparatus; <p>b. Construction equipment specially designed for military use;</p> <p>c. Fittings, coatings and treatments, for signature suppression, specially designed for military use;</p> <p>d. Field engineer equipment specially designed for use in a combat zone;</p> <p>e. "Robots", "robot" controllers and "robot" "end-effectors", having any of the following characteristics:</p> <ol style="list-style-type: none"> 1. Specially designed for military use; 2. Incorporating means of protecting hydraulic lines against externally induced punctures caused by ballistic fragments (e.g. incorporating self-sealing lines) and designed to use hydraulic fluids with flash points higher than 839 K (566 °C); or 3. Specially designed or rated for operating in an electro magnetic pulse (EMP) environment; 	<p><i>performance of military equipment or systems.</i></p> <p>2. <i>For the purpose of ML17, 'modified' means any structural, electrical, mechanical, or other change that provides a non-military item with military capabilities equivalent to an item which is specially designed for military use.</i></p> <p><u>Technical Note</u></p> <p><i>Electro-magnetic pulse does not refer to unintentional interference caused by electromagnetic radiation from nearby equipment</i></p>	

Category Code	Items Description	Note	Relevant Authority
	f. 'Libraries' (parametric technical databases) specially designed for military use with equipment specified by the Military Item List in this Schedule;	(e.g. machinery, appliances or electronics) or lightning.	
	g. Nuclear power generating equipment or propulsion equipment, including "nuclear reactors", specially designed for military use and components therefor specially designed or 'modified' for military use;		Department of Atomic Energy Licensing Board (AELB), MOSTI
	h. Equipment and material, coated or treated for signature suppression, specially designed for military use, other than those specified elsewhere in the Military Item List in this Schedule;		Controller
	i. Simulators specially designed for military "nuclear reactors";		Department of Atomic Energy Licensing Board (AELB), MOSTI
	j. Mobile repair shops specially designed or 'modified' to service military equipment;		Controller
	k. Field generators specially designed or 'modified' for military use;		
	l. Containers specially designed or 'modified' for military use;		
	m. Ferries, other than those specified elsewhere in the Military Item List in this Schedule, bridges and pontoons, specially designed for military use;		

Category Code	Items Description	Note	Relevant Authority
	<p>n. Test models specially designed for the “development” of items specified by ML4, ML6, ML9 or ML10;</p> <p>o. Laser protection equipment (e.g. eye and sensor protection) specially designed for military use.</p> <p>p. “Fuel cells” other than those specified elsewhere in the Military Item List in this Schedule, specially designed or 'modified' for military use.</p>		
ML18	<p>Production equipment and components, as follows:</p> <p>a. Specially designed or modified 'production' equipment for the 'production' of products specified by the Military Item List in this Schedule, and specially designed components therefor;</p> <p>b. Specially designed environmental test facilities and specially designed equipment therefor, for the certification, qualification or testing of products specified by the Military Item List in this Schedule.</p>	<p><u>Technical Note</u></p> <p><i>For the purposes of ML18, the term 'production' includes design, examination, manufacture, testing and checking.</i></p> <p><u>Note:</u> ML18.a. and ML18.b. include the following equipment:</p> <p>a. Continuous nitrators;</p> <p>b. Centrifugal testing apparatus or equipment having any of the following:</p> <ol style="list-style-type: none"> 1. Driven by a motor or motors having a total rated horsepower of more than 298 kW (400 hp); 2. Capable of carrying a payload of 113 kg or more; or 3. Capable of exerting a centrifugal acceleration of 8 g or more on a payload of 91 kg or more; 	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><i>c. Dehydration presses;</i></p> <p><i>d. Screw extruders specially designed or modified for military explosive extrusion;</i></p> <p><i>e. Cutting machines for the sizing of extruded propellants;</i></p> <p><i>f. Sweetie barrels (tumblers) 1.85 m or more in diameter and having over 227 kg product capacity;</i></p> <p><i>g. Continuous mixers for solid propellants;</i></p> <p><i>h. Fluid energy mills for grinding or milling the ingredients of military explosives;</i></p> <p><i>i. Equipment to achieve both sphericity and uniform particle size in metal powder listed in ML8.c.8.;</i></p> <p><i>j. Convection current converters for the conversion of materials listed in ML8.c.3.</i></p>	
ML19	<p>Directed Energy Weapon (DEW) systems, related or countermeasure equipment and test models, as follows, and specially designed components therefor:</p> <p>a. "Laser" systems specially designed for destruction or effecting mission-abort of a target</p> <p>b. Particle beam systems capable of destruction or effecting mission-abort of a target;</p>	<p><u>Note 1:</u> DEW systems specified by ML19 include systems whose capability is derived from the controlled application of:</p> <p>a. "Lasers" of sufficient power to effect destruction similar to the manner of conventional ammunition;</p> <p>b. Particle accelerators which project a</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>c. High power Radio-Frequency (RF) systems capable of destruction or effecting mission-abort of a target;</p> <p>d. Equipment specially designed for the detection or identification of, or defence against, systems specified by ML19.a. to ML19.c.;</p> <p>e. Physical test models for the systems, equipment and components, specified by ML19.</p> <p>f. "Laser" systems specially designed to cause permanent blindness to unenhanced vision, i.e. to the naked eye or to the eye with corrective eyesight devices.</p>	<p><i>charged or neutral particle beam with destructive power;</i></p> <p><i>c. High pulsed power or high average power radio frequency beam transmitters, which produce fields sufficiently intense to disable electronic circuitry at a distant target.</i></p> <p><i>Note 2: ML19 includes the following when specially designed for DEW systems:</i></p> <p><i>a. Prime power generation, energy storage, switching, power conditioning or fuel-handling equipment;</i></p> <p><i>b. Target acquisition or tracking systems;</i></p> <p><i>c. Systems capable of assessing target damage, destruction or mission-abort;</i></p> <p><i>d. Beam-handling, propagation or pointing equipment;</i></p> <p><i>e. Equipment with rapid beam slew capability for rapid multiple target operations;</i></p> <p><i>f. Adaptive optics and phase conjugators;</i></p> <p><i>g. Current injectors for negative hydrogen ion beams;</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>h. "Space-qualified" accelerator components;</i></p> <p><i>i. Negative ion beam funnelling equipment;</i></p> <p><i>j. Equipment for controlling and slewing a high energy ion beam;</i></p> <p><i>k. "Space qualified" foils for neutralising negative hydrogen isotope beams.</i></p>	
ML20	<p>Cryogenic and "superconductive" equipment, as follows, and specially designed components and accessories therefor:</p> <p>a. Equipment specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications, capable of operating while in motion and of producing or maintaining temperatures below 103 K (– 170 °C);</p> <p>b. "Superconductive" electrical equipment (rotating machinery and transformers) specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications, and capable of operating while in motion.</p>	<p><u>Note:</u> <i>ML20.a. includes mobile systems incorporating or employing accessories or components manufactured from non-metallic or non-electrical conductive materials, such as plastics or epoxy- impregnated materials.</i></p> <p><u>Note:</u> <i>ML20.b. does not apply to direct current hybrid homopolar generators that have single-pole normal metal armatures which rotate in a magnetic field produced by superconducting windings, provided those windings are the only superconducting components in the generator.</i></p>	Controller
ML21	<p>"Software", as follows:</p> <p>a. "Software" specially designed or modified for the "development", "production" or "use" of equipment, materials or "software", specified by the Military Item List in this Schedule;</p>		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Specific “software”, other than that specified by ML21.a., as follows:</p> <ol style="list-style-type: none"> 1. “Software” specially designed for military use and specially designed for modelling, simulating or evaluating military weapon systems; 2. “Software” specially designed for military use and specially designed for modelling or simulating military operational scenarios; 3. “Software” for determining the effects of conventional, nuclear, chemical or biological weapons; 4. “Software” specially designed for military use and specially designed for Command, Communications, Control and Intelligence (C³I) or Command, Communications, Control, Computer and Intelligence (C⁴I) applications; <p>c. “Software”, not specified by ML21.a., or b., specially designed or modified to enable equipment not specified by the Military Item List in this Schedule to perform the military functions of equipment specified by the Military Item List in this Schedule.</p>		
ML22	<p>“Technology” as follows:</p> <ol style="list-style-type: none"> a. “Technology”, other than specified in ML22.b., which is “required” for the “development”, “production” or “use” of items specified in the Military Item List in this Schedule;. b. “Technology” as follows: 	<p><u>Note 1:</u> “Technology” “required” for the “development”, “production” or “use” of items specified by the Military Item List in this Schedule remains under control even when applicable to any item not specified by the Military Item List in this Schedule.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. "Technology" "required" for the design of, the assembly of components into, and the operation, maintenance and repair of, complete production installations for items specified in the Common Military List of The European Union, even if the components of such production installations are not specified; 2. "Technology" "required" for the "development" and "production" of small arms even if used to produce reproductions of antique small arms; 3. "Technology" "required" for the "development", "production" or "use" of toxicological agents, related equipment or components specified by ML7.a. to ML7.g.; 4. "Technology" "required" for the "development", "production" or "use" of "biopolymers" or cultures of specific cells, specified by ML7.h.; 5. "Technology" "required" exclusively for the incorporation of "biocatalysts", specified by ML7.i.1., into military carrier substances or military material. 	<p><u>Note 2: ML22 does not apply to:</u></p> <ol style="list-style-type: none"> a. "Technology" that is the minimum necessary for the installation, operation, maintenance (checking) and repair, of those items which are not controlled or whose export has been authorised; b. "Technology" that is "in the public domain", "basic scientific research" or the minimum necessary information for patent applications; c. "Technology" for magnetic induction for continuous propulsion of civil transport devices. 	

DEFINITIONS OF TERMS USED IN THIS LIST

The following are definitions of the terms used in this List, in alphabetical order.

Note 1: Definitions apply throughout the List. The references are purely advisory and have no effect on the universal application of defined terms throughout the List.

Note 2: Words and terms contained in this List of Definitions only take the defined meaning where this is indicated by their being enclosed in "double quotations marks". Definitions of terms between 'single quotation marks' are given in a Technical note to the relevant item. Elsewhere, words and terms take their commonly accepted (dictionary) meanings.

ML7 "Adapted for use in war"

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.

ML8 "Additives"

Substances used in explosive formulations to improve their properties.

ML8, ML10 and ML14 "Aircraft"

A fixed wing, swivel wing, rotary wing (helicopter), tilt rotor or tilt-wing airborne vehicle.

ML11 "Automated Command and Control Systems"

Electronic systems, through which information essential to the effective operation of the grouping, major formation, tactical formation, unit, ship, subunit or weapons under command is entered, processed and transmitted. This is achieved by the use of computer and other specialised hardware designed to support the functions of a military command and control organisation. The main functions of an automated command and control system are: the efficient automated collection, accumulation, storage and processing of information; the display of the situation and the circumstances affecting the preparation and conduct of combat operations; operational and tactical calculations for the allocation of resources among force groupings or elements of the operational order of battle or battle deployment according to the mission or stage of the operation; the preparation of data for appreciation of the situation and decision-making at any point during operation or battle; computer simulation of operations.

ML22 "Basic scientific research"

Experimental or theoretical work undertaken principally to acquire new knowledge of the fundamental principles of phenomena or observable facts, not primarily directed towards a specific practical aim or objective.

ML7, 22

“Biocatalysts”

Enzymes for specific chemical or biochemical reactions or other biological compounds which bind to and accelerate the degradation of CW agents.

Technical Note

“Enzymes” means “biocatalysts” for specific chemical or biochemical reactions.

ML7, 22

“Biopolymers”

Biological macromolecules as follows:

- a. Enzymes for specific chemical or biochemical reactions;
- b. Antibodies, monoclonal, polyclonal or anti-idiotypic;
- c. Specially designed or specially processed receptors;

Technical Notes

1. *‘Anti-idiotypic antibodies’ means antibodies which bind to the specific antigen binding sites of other antibodies;*
2. *‘Monoclonal antibodies’ means proteins which bind to one antigenic site and are produced by a single clone of cells;*
3. *‘Polyclonal antibodies’ means a mixture of proteins which bind to the specific antigen and are produced by more than one clone of cells;*
4. *‘Receptors’ means biological macromolecular structures capable of binding ligands, the binding of which affects physiological functions.*

ML4, 10

“Civil aircraft”

Those “aircraft” listed by designation in published airworthiness certification lists by the civil aviation authorities to fly commercial civil internal and external routes or for legitimate civil, private or business use.

ML21, 22

“Development”

Is related to all stages prior to serial production, such as: design, design research, design analyses, design concepts, assembly and testing of prototypes, pilot production schemes, design data, process of transforming design data into a product, configuration design, integration design, layouts.

ML17

“End-effectors”

Grippers, active tooling units and any other tooling that is attached to the baseplate on the end of a “robot” manipulator arm.

Technical Note

'Active tooling units' are devices for applying motive power, process energy or sensing to a work piece.

ML 8 "Energetic materials"

Substances or mixtures that react chemically to release energy required for their intended application. "Explosives", "pyrotechnics" and "propellants" are subclasses of energetic materials.

ML8, 18 "Explosives"

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.

ML7 "Expression Vectors"

Carriers (e.g. plasmid or virus) used to introduce genetic material into host cells.

ML 17 "Fuel cell"

An electrochemical device that converts chemical energy directly into Direct Current (DC) electricity by consuming fuel from an external source.

ML13 "Fibrous or filamentary materials"

Include:

- a. Continuous monofilaments;
- b. Continuous yarns and rovings;
- c. Tapes, fabrics, random mats and braids;
- d. Chopped fibres, staple fibres and coherent fibre blankets;
- e. Whiskers, either monocrystalline or polycrystalline, of any length;
- f. Aromatic polyamide pulp.

ML15 "First generation image intensifier tubes"

Electrostatically focused tubes, employing input and output fibre optic or glass face plates, multi-alkali photocathodes (S-20 or S-25), but not microchannel plate amplifiers.

ML22 "In the public domain"

This means "technology" or "software" which has been made available without

restrictions upon its further dissemination.

Note: Copyright restrictions do not remove “technology” or “software” from being “in the public domain”.

ML9, 19	<p>“Laser”</p> <p>An assembly of components which produce both spatially and temporally coherent light that is amplified by stimulated emission of radiation.</p>
ML10	<p>“Lighter-than-air vehicles”</p> <p>Balloons and airships that rely on hot air or on lighter-than-air gases such as helium or hydrogen for their lift.</p>
ML17	<p>“Nuclear reactor”</p> <p>Includes 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 or come into direct contact with or control the primary coolant of the reactor core.</p>
ML8	<p>“Precursors”</p> <p>Speciality chemicals used in the manufacture of explosives.</p>
ML18, 21, 22	<p>“Production”</p> <p>Means all production stages, such as: product engineering, manufacture, integration, assembly (mounting), inspection, testing, quality assurance.</p>
ML8	<p>“Propellants”</p> <p>Substances or mixtures that react chemically to produce large volumes of hot gases at controlled rates to perform mechanical work.</p>
ML4, 8	<p>“Pyrotechnic(s)”</p> <p>Mixtures of solid or liquid fuels and oxidizers which, when ignited, undergo an energetic chemical reaction at a controlled rate intended to produce specific time delays, or quantities of heat, noise, smoke, visible light or infrared radiation. Pyrophorics are a subclass of pyrotechnics, which contain no oxidizers but ignite spontaneously on contact with air.</p>
ML22	<p>“Required”</p> <p>As applied to “technology”, refers to only that portion of “technology” which is peculiarly responsible for achieving or exceeding the controlled performance levels, characteristics or functions. Such “required” “technology” may be shared by different products.</p>

ML7

“Riot control agents”

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”).

ML17

“Robot”

A manipulation mechanism, which may be of the continuous path or of the point-to-point variety, may use sensors, and has all the following characteristics:

- a. Is multifunctional;
- b. Is capable of positioning or orienting material, parts, tools or special devices through variable movements in three-dimensional space;
- c. Incorporates three or more closed or open loop servo-devices which may include stepping motors; and
- d. Has “user-accessible programmability” by means of the teach/playback method or by means of an electronic computer which may be a programmable logic controller, i.e. without mechanical intervention.

Note: The above definition does not include the following devices:

1. Manipulation mechanisms which are only manually/tele-operator controllable;
2. Fixed sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The programme is mechanically limited by fixed stops, such as pins or cams. The sequence of motions and the selection of paths or angles are not variable or changeable by mechanical, electronic or electrical means;
3. Mechanically controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The programme is mechanically limited by fixed, but adjustable, stops, such as pins or cams. The sequence of motions and the selection of paths or angles are variable within the fixed programme pattern. Variations or modifications of the programme pattern (e.g. changes of pins or exchanges of cams) in one or more motion axes are accomplished only through mechanical operations;
4. Non-servo-controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The programme is variable but the sequence proceeds only by the binary signal from mechanically fixed electrical binary devices or adjustable stops;
5. Stacker cranes defined as Cartesian coordinate manipulator systems

manufactured as an integral part of a vertical array of storage bins and designed to access the contents of those bins for storage or retrieval.

ML21

“Software”

A collection of one or more “programmes” or “microprogrammes” fixed in any tangible medium of expression.

ML19

“Space-qualified”

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.

ML 20

“Superconductive”

Refers to materials, (i.e. metals, alloys or compounds) which can lose all electrical resistance (i.e. which can attain infinite electrical conductivity and carry very large electrical currents without Joule heating).

“Critical temperature” (sometimes referred to as the transition temperature) of a specific “superconductive” material is the temperature at which the material loses all resistance to the flow of direct electrical current.

Technical Note

The “superconductive” state of a material is individually characterised by a “critical temperature”, a critical magnetic field, which is a function of temperature, and a critical current density which is, however, a function of both magnetic field and temperature.

ML22

“Technology”

Specific information necessary for the “development”, “production” or “use” of a product. The information takes the form of 'technical data' or 'technical assistance'.

Technical Notes

1. *‘Technical data’ may take forms such as blueprints, plans, diagrams, models, formulae, tables, engineering designs and specifications, manuals and instructions written or recorded on other media or devices such as disk, tape, read-only memories.*
2. *‘Technical assistance’ may take forms such as instruction, skills, training, working knowledge, consulting services. ‘Technical assistance’ may involve transfer of ‘technical data’.*

ML 10

“Unmanned aerial vehicle” (“UAV”)

Any “aircraft” capable of initiating flight and sustaining controlled flight and navigation without any human presence on board.

ML21, 22

“Use”

Operation, installation (including on-site installation), maintenance (checking), repair, overhaul and refurbishing.

ANNEX I

List Referred to in Article 3 of this Order

LIST OF DUAL-USE ITEMS

This list implements internationally agreed dual-use controls including the Wassenaar Arrangement, the Missile Technology Control Regime (MTCR), the Nuclear Suppliers' Group (NSG), the Australia Group (AG) and the Chemical Weapons Convention (CWC).

CONTENTS

Notes

Acronyms and abbreviations

Definitions

Category 0	Nuclear materials, facilities and equipment
Category 1	Special materials and related equipment
Category 2	Materials processing
Category 3	Electronics
Category 4	Computers
Category 5	Telecommunications and "information security"
Category 6	Sensors and lasers
Category 7	Navigation and avionics
Category 8	Marine
Category 9	Aerospace and propulsion

GENERAL NOTES TO ANNEX I

1. For control of goods which are designed or modified for military use, see the relevant list(s) of controls on military goods maintained by individual Member States. References in this Annex that state "SEE ALSO MILITARY GOODS CONTROLS" refer to the same list.
2. The object of the controls contained in this Annex should not be defeated by the export of any non-controlled goods (including plant) containing one or more controlled components when the controlled component or components are the principal element of the goods and can feasibly be removed or used for other purposes.

***NB:** In judging whether the controlled component or components are to be considered the principal element, it is necessary to weigh the factors of quantity, value and technological know-how involved and other special circumstances which might establish the controlled component or components as the principal element of the goods being procured.*

3. Goods specified in this Annex include both new and used goods.

4. In some instances chemicals are listed by name and CAS number. The list applies to chemicals of the same structural formula (including hydrates) regardless of name or CAS number. CAS numbers are shown to assist in identifying a particular chemical or mixture, irrespective of nomenclature. CAS numbers cannot be used as unique identifiers because some forms of the listed chemical have different CAS numbers, and mixtures containing a listed chemical may also have different CAS numbers.

NUCLEAR TECHNOLOGY NOTE (NTN)

(To be read in conjunction with Section E of Category 0.)

The “technology” directly associated with any goods controlled in Category 0 is controlled according to the provisions of Category 0.

“Technology” for the “development”, “production” or “use” of goods under control remains under control even when applicable to non-controlled goods.

The approval of goods for export also authorises the export to the same end-user of the minimum “technology” required for the installation, operation, maintenance and repair of the goods.

Controls on “technology” transfer do not apply to information “in the public domain” or to “basic scientific research”.

GENERAL TECHNOLOGY NOTE (GTN)

(To be read in conjunction with Section E of Categories 1 to 9.)

The export of “technology” which is “required” for the “development”, “production” or “use” of goods controlled in Categories 1 to 9, is controlled according to the provisions of Categories 1 to 9.

“Technology” “required” for the “development”, “production” or “use” of goods under control remains under control even when applicable to non-controlled goods.

Controls do not apply to that “technology” which is the minimum necessary for the installation, operation, maintenance (checking) and repair of those goods which are not controlled or whose export has been authorised.

***NB:** This does not release such “technology” specified in 1E002.e., 1E002.f., 8E002.a. and 8E002.b.*

Controls on “technology” transfer do not apply to information “in the public domain”, to “basic scientific research” or to the minimum necessary information for patent applications.

GENERAL SOFTWARE NOTE (GSN)

(This note overrides any control within Section D of Categories 0 to 9.)

Categories 0 to 9 of this list do not control “software” which is either:

- a. Generally available to the public by being:
 1. Sold from stock at retail selling points, without restriction, by means of:
 - a. Over-the-counter transactions;
 - b. Mail order transactions;
 - c. Electronic transactions; or
 - d. Telephone order transactions; and
 2. Designed for installation by the user without further substantial support by the supplier; or

***NB:** Entry a. of the General Software Note does not release “software” specified in Category 5 — Part 2 (“Information Security”).*

- b. “In the public domain”.

ACRONYMS AND ABBREVIATIONS USED IN THIS ANNEX

An acronym or abbreviation, when used as a defined term, will be found in “Definitions of Terms used in this Annex”.

Acronym or abbreviation	Meaning
ABEC	Annular Bearing Engineers Committee
AGMA	American Gear Manufacturers’ Association
AHRS	attitude and heading reference systems
AISI	American Iron and Steel Institute
ALU	arithmetic logic unit
ANSI	American National Standards Institute
ASTM	the American Society for Testing and Materials
ATC	air traffic control
AVLIS	atomic vapour laser isotope separation
CAD	computer-aided-design
CAS	Chemical Abstracts Service
CCITT	International Telegraph and Telephone Consultative Committee
CDU	control and display unit
CEP	circular error probable
CNTD	controlled nucleation thermal deposition
CRISLA	chemical reaction by isotope selective laser activation
CVD	chemical vapour deposition
CW	chemical warfare

CW (for lasers)	continuous wave
DME	distance measuring equipment
DS	directionally solidified
EB-PVD	electron beam physical vapour deposition
EBU	European Broadcasting Union
ECM	electro-chemical machining
ECR	electron cyclotron resonance
EDM	electrical discharge machines
EEPROMS	electrically erasable programmable read only memory
EIA	Electronic Industries Association
EMC	electromagnetic compatibility
ETSI	European Telecommunications Standards Institute
FFT	Fast Fourier Transform
GLONASS	global navigation satellite system
GPS	global positioning system
HBT	hetero-bipolar transistors
HDDR	high density digital recording
HEMT	high electron mobility transistors
ICAO	International Civil Aviation Organisation
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronic Engineers
IFOV	instantaneous-field-of-view
ILS	instrument landing system
IRIG	inter-range instrumentation group
ISA	international standard atmosphere
ISAR	inverse synthetic aperture radar
ISO	International Organisation for Standardisation
ITU	International Telecommunication Union
JIS	Japanese Industrial Standard
JT	Joule-Thomson
LIDAR	light detection and ranging
LRU	line replaceable unit
MAC	message authentication code
Mach	ratio of speed of an object to speed of sound (after Ernst Mach)
MLIS	molecular laser isotopic separation
MLS	microwave landing systems
MOCVD	metal organic chemical vapour deposition
MRI	magnetic resonance imaging
MTBF	mean-time-between-failures
Mtops	million theoretical operations per second
MTTF	mean-time-to-failure
NBC	Nuclear, Biological and Chemical
NDT	non-destructive test
PAR	precision approach radar
PIN	personal identification number
ppm	parts per million
PSD	power spectral density
QAM	quadrature-amplitude-modulation
RF	radio frequency

SACMA	Suppliers of Advanced Composite Materials Association
SAR	synthetic aperture radar
SC	single crystal
SLAR	sidelooking airborne radar
SMPTE	Society of Motion Picture and Television Engineers
SRA	shop replaceable assembly
SRAM	static random access memory
SRM	SACMA Recommended Methods
SSB	single sideband
SSR	secondary surveillance radar
TCSEC	trusted computer system evaluation criteria
TIR	total indicated reading
UV	ultraviolet
UTS	ultimate tensile strength
VOR	very high frequency omni-directional range
YAG	yttrium/aluminum garnet

DEFINITIONS OF TERMS USED IN THIS ANNEX

Definitions of terms between ‘single quotation marks’ are given in a Technical Note to the relevant item.

Definitions of terms between “double quotation marks” are as follows:

***NB:** Category references are given in brackets after the defined term.*

“Accuracy” (2 6), usually measured in terms of inaccuracy, means the maximum deviation, positive or negative, of an indicated value from an accepted standard or true value.

“Active flight control systems” (7) are systems that function to prevent undesirable “aircraft” and missile motions or structural loads by autonomously processing outputs from multiple sensors and then providing necessary preventive commands to effect automatic control.

“Active pixel” (6 8) is a minimum (single) element of the solid state array which has a photoelectric transfer function when exposed to light (electromagnetic) radiation.

“Adapted for use in war” (1) 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.

“Adjusted Peak Performance” (4) is an adjusted peak rate at which “digital computers” perform 64-bit or larger floating point additions and multiplications, and is expressed in Weighted TeraFLOPS (WT) with units of 10^{12} adjusted floating point operations per second.

***NB:** See Category 4, Technical Note.*

“Aircraft” (1 7 9) means a fixed wing, swivel wing, rotary wing (helicopter), tilt rotor or tilt-wing airborne vehicle.

***NB:** See also “civil aircraft”.*

“All compensations available” (2) means after all feasible measures available to the manufacturer to minimise all systematic positioning errors for the particular machine-tool model or measuring errors for the particular coordinate measuring machine are considered.

“Allocated by the ITU” (3 5) means the allocation of frequency bands according to the current edition of the ITU Radio Regulations for primary, permitted and secondary services.

NB: *Additional and alternative allocations are not included.*

“Angle random walk” (7) means the angular error build up with time that is due to white noise in angular rate. (IEEE STD 528-2001)

“Angular position deviation” (2) means the maximum difference between angular position and the actual, very accurately measured angular position after the workpiece mount of the table has been turned out of its initial position (ref. VDI/VDE 2617, Draft: ‘Rotary tables on coordinate measuring machines’).

“APP” (4) is equivalent to “Adjusted Peak Performance”.

“Asymmetric algorithm” (5) means a cryptographic algorithm using different, mathematically-related keys for encryption and decryption.

NB: *A common use of “asymmetric algorithms” is key management.*

“Automatic target tracking” (6) means a processing technique that automatically determines and provides as output an extrapolated value of the most probable position of the target in real time.

“Average output power” (6) means the total “laser” output energy in joules divided by the “laser duration” in seconds.

“Basic gate propagation delay time” (3) means the propagation delay time value corresponding to the basic gate used in a “monolithic integrated circuit”. For a ‘family’ of “monolithic integrated circuits”, this may be specified either as the propagation delay time per typical gate within the given ‘family’ or as the typical propagation delay time per gate within the given ‘family’.

NB 1: *“Basic gate propagation delay time” is not to be confused with the input/output delay time of a complex “monolithic integrated circuit”.*

NB 2: *‘Family’ consists of all integrated circuits to which all of the following are applied as their manufacturing methodology and specifications except their respective functions:*

- a. The common hardware and software architecture;*
- b. The common design and process technology; and*
- c. The common basic characteristics.*

“Basic scientific research” (GTN NTN) means experimental or theoretical work undertaken principally to acquire new knowledge of the fundamental principles of phenomena or observable facts, not primarily directed towards a specific practical aim or objective.

“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 1×10^{-6} g)

“Bias” (gyro) (7) means 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)

“Camming” (2) means axial displacement in one revolution of the main spindle measured in a plane perpendicular to the spindle faceplate, at a point next to the circumference of the spindle faceplate (Reference: ISO 230/1 1986, paragraph 5.63).

“Carbon fibre preforms” (1) means an ordered arrangement of uncoated or coated fibres intended to constitute a framework of a part before the “matrix” is introduced to form a “composite”.

“CEP” (circle of equal probability) (7) is a measure of accuracy; the radius of the circle centred at the target, at a specific range, in which 50 % of the payloads impact.

“Chemical laser” (6) means a “laser” in which the excited species is produced by the output energy from a chemical reaction.

“Chemical mixture” (1) means a solid, liquid or gaseous product made up of two or more components which do not react together under the conditions under which the mixture is stored.

“Circulation-controlled anti-torque or circulation controlled direction control systems” (7) are systems that use air blown over aerodynamic surfaces to increase or control the forces generated by the surfaces.

“Civil aircraft” (1 3 4 7) means those “aircraft” listed by designation in published airworthiness certification lists by the civil aviation authorities to fly commercial civil internal and external routes or for legitimate civil, private or business use.

NB: See also “aircraft”.

“Commingled” (1) means filament to filament blending of thermoplastic fibres and reinforcement fibres in order to produce a fibre reinforcement “matrix” mix in total fibre form.

“Comminution” (1) means a process to reduce a material to particles by crushing or grinding.

“Common channel signalling” (5) is a signalling method in which a single channel between exchanges conveys, by means of labelled messages, signalling information relating to a multiplicity of circuits or calls and other information such as that used for network management.

“Communications channel controller” (4) means the physical interface which controls the flow of synchronous or asynchronous digital information. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access.

“Compensation systems” (6) consist of the primary scalar sensor, one or more reference sensors (e.g. vector magnetometers) together with software that permit reduction of rigid body rotation noise of the platform.

“Composite” (1 2 6 8 9) means a “matrix” and an additional phase or additional phases consisting of particles, whiskers, fibres or any combination thereof, present for a specific purpose or purposes.

“Compound rotary table” (2) means a table allowing the workpiece to rotate and tilt about two non-parallel axes, which can be coordinated simultaneously for “contouring control”.

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

“Contouring control” (2) means two or more “numerically controlled” motions operating in accordance with instructions that specify the next required position and the required feed rates to that position. These feed rates are varied in relation to each other so that a desired contour is generated (ref. ISO/DIS 2806-1980).

“Critical temperature” (1 3 5) (sometimes referred to as the transition temperature) of a specific “superconductive” material means the temperature at which the material loses all resistance to the flow of direct electrical current.

“Cryptographic activation” (5) means any technique that activates or enables cryptographic capability, via a secure mechanism that is implemented by the manufacturer of the item and is uniquely bound to the item or customer for which the cryptographic capability is being activated or enabled (e.g. a serial number-based licence key or an authentication instrument such as a digitally signed certificate).

Technical Note

“Cryptographic activation” techniques and mechanisms may be implemented as hardware, “software” or “technology”.

“Cryptography” (5) means the discipline which embodies principles, means and methods for the transformation of data in order to hide its information content, prevent its undetected modification or prevent its unauthorised use. “Cryptography” is limited to the transformation of information using one or more ‘secret parameters’ (e.g. crypto variables) or associated key management.

NB: ‘Secret parameter’: a constant or key kept from the knowledge of others or shared only within a group.

“CW laser” (6) means a “laser” that produces a nominally constant output energy for greater than 0.25 seconds.

“Data-Based Referenced Navigation” (“DBRN”) (7) Systems means systems which use various sources of previously measured geo-mapping data integrated to provide accurate navigation information under dynamic conditions. Data sources include bathymetric maps, stellar maps, gravity maps, magnetic maps or 3-D digital terrain maps.

“Deformable mirrors” (6) (also known as adaptive optic mirrors) means mirrors having:

- a. A single continuous optical reflecting surface which is dynamically deformed by the application of individual torques or forces to compensate for distortions in the optical waveform incident upon the mirror; or
- b. Multiple optical reflecting elements that can be individually and dynamically repositioned by the application of torques or forces to compensate for distortions in the optical waveform incident upon the mirror.

“Depleted uranium” (0) means uranium depleted in the isotope 235 below that occurring in nature.

“Development” (GTN NTN All) is related to all phases prior to serial production, such as: design, design research, design analyses, design concepts, assembly and testing of prototypes, pilot production schemes, design data, process of transforming design data into a product, configuration design, integration design, layouts.

“Diffusion bonding” (1 2 9) means a solid state molecular joining of at least two separate metals into a single piece with a joint strength equivalent to that of the weakest material.

“Digital computer” (4 5) means equipment which can, in the form of one or more discrete variables, perform all of the following:

- a. Accept data;
- b. Store data or instructions in fixed or alterable (writable) storage devices;
- c. Process data by means of a stored sequence of instructions which is modifiable; and
- d. Provide output of data.

NB: Modifications of a stored sequence of instructions include replacement of fixed storage devices, but not a physical change in wiring or interconnections.

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

NB: See also “total digital transfer rate”.

“Direct-acting hydraulic pressing” (2) means a deformation process which uses a fluid-filled flexible bladder in direct contact with the workpiece.

“Drift rate” (gyro) (7) means the component of gyro output that is functionally independent of input rotation. It is expressed as an angular rate. (IEEE STD 528-2001)

“Dynamic signal analysers” (3) means “signal analysers” which use digital sampling and transformation techniques to form a Fourier spectrum display of the given waveform including amplitude and phase information.

NB: See also “signal analysers”.

“Effective gramme” (0 1) of “special fissile material” means:

- a. For plutonium isotopes and uranium-233, the isotope weight in grammes;
- b. For uranium enriched 1 per cent or greater in the isotope uranium-235, the element weight in grammes multiplied by the square of its enrichment expressed as a decimal weight fraction;
- c. For uranium enriched below 1 per cent in the isotope uranium-235, the element weight in grammes multiplied by 0,0001.

“Electronic assembly” (2 3 4 5) means a number of electronic components (i.e. ‘circuit elements’, ‘discrete components’, integrated circuits, etc.) connected together to perform (a) specific function(s), replaceable as an entity and normally capable of being disassembled.

NB 1: *‘Circuit element’: a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.*

NB 2: *‘Discrete component’: a separately packaged ‘circuit element’ with its own external connections.*

“Electronically steerable phased array antenna” (5 6) means an antenna which forms a beam by means of phase coupling, i.e. the beam direction is controlled by the complex excitation coefficients of the radiating elements and the direction of that beam can be varied in azimuth or in elevation, or both, by application, both in transmission and reception, of an electrical signal.

“Energetic materials” (1) means substances or mixtures that react chemically to release energy required for their intended application. “Explosives”, “pyrotechnics” and “propellants” are subclasses of energetic materials.

“End-effectors” (2) means grippers, ‘active tooling units’ and any other tooling that is attached to the baseplate on the end of a “robot” manipulator arm.

NB: *‘Active tooling unit’ means a device for applying motive power, process energy or sensing to the workpiece.*

“Equivalent Density” (6) means the mass of an optic per unit optical area projected onto the optical surface.

“Expert systems” (7) mean systems providing results by application of rules to data which are stored independently of the “programme” and capable of any of the following:

- a. Modifying automatically the “source code” introduced by the user;
- b. Providing knowledge linked to a class of problems in quasi-natural language; or
- c. Acquiring the knowledge required for their development (symbolic training).

“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.

“FADEC Systems” (7 9) means Full Authority Digital Engine Control Systems — A digital electronic control system for a gas turbine engine that is able to autonomously control the engine throughout its whole operating range from demanded engine start until demanded engine shut-down, in both normal and fault conditions.

“Fault tolerance” (4) is the capability of a computer system, after any malfunction of any of its hardware or “software” components, to continue to operate without human intervention, at a given level of service that provides: continuity of operation, data integrity and recovery of service within a given time.

“Fibrous or filamentary materials” (0 1 8) include:

- a. Continuous “monofilaments”;
- b. Continuous “yarns” and “rovings”;

- c. "Tapes", fabrics, random mats and braids;
- d. Chopped fibres, staple fibres and coherent fibre blankets;
- e. Whiskers, either monocrystalline or polycrystalline, of any length;
- f. Aromatic polyamide pulp.

"Film type integrated circuit" (3) means an array of 'circuit elements' and metallic interconnections formed by deposition of a thick or thin film on an insulating "substrate".

NB: 'Circuit element' is a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.

"Fixed" (5) means that the coding or compression algorithm cannot accept externally supplied parameters (e.g. cryptographic or key variables) and cannot be modified by the user.

"Flight control optical sensor array" (7) is a network of distributed optical sensors, using "laser" beams, to provide real- time flight control data for on-board processing.

"Flight path optimisation" (7) is a procedure that minimises deviations from a four-dimensional (space and time) desired trajectory based on maximising performance or effectiveness for mission tasks.

"Focal plane array" (6 8) means a linear or two-dimensional planar layer, or combination of planar layers, of individual detector elements, with or without readout electronics, which work in the focal plane.

NB: This is not intended to include a stack of single detector elements or any two, three or four element detectors provided time delay and integration is not performed within the element.

"Fractional bandwidth" (3 5) means the "instantaneous bandwidth" divided by the centre frequency, expressed as a percentage.

"Frequency hopping" (5) means a form of "spread spectrum" in which the transmission frequency of a single communication channel is made to change by a random or pseudo-random sequence of discrete steps.

"Frequency switching time" (3 5) means the time (i.e. delay) taken by a signal when switched from an initial specified output frequency, to arrive at or within $\pm 0,05$ % of a final specified output frequency. Items having a specified frequency range of less than $\pm 0,05$ % around their centre frequency are defined to be incapable of frequency switching.

"Frequency synthesiser" (3) means any kind of frequency source, regardless of the actual technique used, providing a multiplicity of simultaneous or alternative output frequencies, from one or more outputs, controlled by, derived from or disciplined by a lesser number of standard (or master) frequencies.

"Fuel cell" (8) is an electrochemical device that converts chemical energy directly into Direct Current (DC) electricity by consuming fuel from an external source.

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

“Gas Atomisation” (1) means a process to reduce a molten stream of metal alloy to droplets of 500 micrometre diameter or less by a high pressure gas stream.

“Geographically dispersed” (6) is where each location is distant from any other more than 1500 m in any direction. Mobile sensors are always considered “geographically dispersed”.

“Guidance set” (7) means systems that integrate the process of measuring and computing a vehicles position and velocity (i.e. navigation) with that of computing and sending commands to the vehicles flight control systems to correct the trajectory.

“Hot isostatic densification” (2) means the process of pressurising a casting at temperatures exceeding 375 K (102 °C) in a closed cavity through various media (gas, liquid, solid particles, etc.) to create equal force in all directions to reduce or eliminate internal voids in the casting.

“Hybrid integrated circuit” (3) means any combination of integrated circuit(s), or integrated circuit with ‘circuit elements’ or ‘discrete components’ connected together to perform (a) specific function(s), and having all of the following characteristics:

- a. Containing at least one unencapsulated device;
- b. Connected together using typical IC production methods;
- c. Replaceable as an entity; and
- d. Not normally capable of being disassembled.

NB 1: ‘Circuit element’: a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.

NB 2: ‘Discrete component’: a separately packaged ‘circuit element’ with its own external connections.

“Image enhancement” (4) means the processing of externally derived information-bearing images by algorithms such as time compression, filtering, extraction, selection, correlation, convolution or transformations between domains (e.g. fast Fourier transform or Walsh transform). This does not include algorithms using only linear or rotational transformation of a single image, such as translation, feature extraction, registration or false coloration.

“Immunotoxin” (1) is a conjugate of one cell specific monoclonal antibody and a “toxin” or “sub-unit of toxin”, that selectively affects diseased cells.

“In the public domain” (GTN NTN GSN), as it applies herein, means “technology” or “software” which has been made available without restrictions upon its further dissemination (copyright restrictions do not remove “technology” or “software” from being “in the public domain”).

“Information security” (4 5) is all the means and functions ensuring the accessibility, confidentiality or integrity of information or communications, excluding the means and functions intended to safeguard against malfunctions. This includes “cryptography”, “cryptographic activation”, ‘cryptanalysis’, protection against compromising emanations and computer security.

NB: ‘Cryptanalysis’: analysis of a cryptographic system or its inputs and outputs to derive confidential variables or sensitive data, including clear text.

“Instantaneous bandwidth” (3 5 7) means the bandwidth over which output power remains constant within 3 dB without adjustment of other operating parameters.

“Instrumented range” (6) means the specified unambiguous display range of a radar.

“Insulation” (9) is applied to the components of a rocket motor, i.e. the case, nozzle, inlets, case closures, and includes cured or semi-cured compounded rubber sheet stock containing an insulating or refractory material. It may also be incorporated as stress relief boots or flaps.

“Interior lining” (9) is suited for the bond interface between the solid propellant and the case or insulating liner. Usually a liquid polymer based dispersion of refractory or insulating materials, e.g. carbon filled hydroxyl terminated polybutadiene (HTPB) or other polymer with added curing agents sprayed or screeded over a case interior.

“Intrinsic Magnetic Gradiometer” (6) is a single magnetic field gradient sensing element and associated electronics the output of which is a measure of magnetic field gradient.

NB: See also “magnetic gradiometer”.

“Isolated live cultures” (1) includes live cultures in dormant form and in dried preparations.

“Isostatic presses” (2) mean equipment capable of pressurising a closed cavity through various media (gas, liquid, solid particles, etc.) to create equal pressure in all directions within the cavity upon a workpiece or material.

“Laser” (0 2 3 5 6 7 8 9) is an assembly of components which produce both spatially and temporally coherent light that is amplified by stimulated emission of radiation.

NB: See also:

“Chemical laser”;

“Super High Power Laser”;

“Transfer laser”.

“Laser duration” (def) means the time over which a “laser” emits “laser” radiation, which for “pulsed lasers” corresponds to the time over which a single pulse or series of consecutive pulses is emitted.

“Lighter-than-air vehicles” (9) means balloons and airships that rely on hot air or other lighter-than-air gases such as helium or hydrogen for their lift.

“Linearity” (2) (usually measured in terms of non-linearity) means the maximum deviation of the actual characteristic (average of upscale and downscale readings), positive or negative, from a straight line so positioned as to equalise and minimise the maximum deviations.

“Local area network” (4 5) is a data communication system having all of the following characteristics:

- a. Allows an arbitrary number of independent ‘data devices’ to communicate directly with each other; and

- b. Is confined to a geographical area of moderate size (e.g. office building, plant, campus, warehouse).

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

"Magnetic Gradiometers" (6) are instruments designed to detect the spatial variation of magnetic fields from sources external to the instrument. They consist of multiple "magnetometers" and associated electronics the output of which is a measure of magnetic field gradient.

NB: See also "intrinsic magnetic gradiometer".

"Magnetometers" (6) are instruments designed to detect magnetic fields from sources external to the instrument. They consist of a single magnetic field sensing element and associated electronics the output of which is a measure of the magnetic field.

"Main storage" (4) means the primary storage for data or instructions for rapid access by a central processing unit. It consists of the internal storage of a "digital computer" and any hierarchical extension thereto, such as cache storage or non-sequentially accessed extended storage.

"Materials resistant to corrosion by UF_6 " (0) may be copper, stainless steel, aluminium, aluminium oxide, aluminium alloys, nickel or alloy containing 60 weight percent or more nickel and UF_6 -resistant fluorinated hydrocarbon polymers, as appropriate for the type of separation process.

"Matrix" (1 2 8 9) means a substantially continuous phase that fills the space between particles, whiskers or fibres.

"Measurement uncertainty" (2) is the characteristic parameter which specifies in what range around the output value the correct value of the measurable variable lies with a confidence level of 95 %. It includes the uncorrected systematic deviations, the uncorrected backlash and the random deviations (ref. ISO 10360-2, or VDI/VDE 2617).

"Mechanical Alloying" (1) means an alloying process resulting from the bonding, fracturing and rebonding of elemental and master alloy powders by mechanical impact. Non-metallic particles may be incorporated in the alloy by addition of the appropriate powders.

"Melt Extraction" (1) means a process to 'solidify rapidly' and extract a ribbon-like alloy product by the insertion of a short segment of a rotating chilled block into a bath of a molten metal alloy.

NB: 'Solidify rapidly': solidification of molten material at cooling rates exceeding 1000 K/s.

"Melt Spinning" (1) means a process to 'solidify rapidly' a molten metal stream impinging upon a rotating chilled block, forming a flake, ribbon or rod-like product.

NB: 'Solidify rapidly': solidification of molten material at cooling rates exceeding 1000 K/s.

"Microcomputer microcircuit" (3) means a "monolithic integrated circuit" or "multichip integrated circuit" containing an arithmetic logic unit (ALU) capable of executing general purpose instructions from an internal storage, on data contained in the internal storage.

NB: The internal storage may be augmented by an external storage.

“Microprocessor microcircuit” (3) means a “monolithic integrated circuit” or “multichip integrated circuit” containing an arithmetic logic unit (ALU) capable of executing a series of general purpose instructions from an external storage.

NB 1: The “microprocessor microcircuit” normally does not contain integral user-accessible storage, although storage present on-the-chip may be used in performing its logic function.

NB 2: This includes chip sets which are designed to operate together to provide the function of a “microprocessor microcircuit”.

“Microorganisms” (1 2) means bacteria, viruses, mycoplasmas, rickettsiae, chlamydiae or fungi, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures.

“Missiles” (1 3 6 7 9) means complete rocket systems and unmanned aerial vehicle systems, capable of delivering at least 500 kg payload to a range of at least 300 km.

“Monofilament” (1) or filament is the smallest increment of fibre, usually several micrometres in diameter.

“Monolithic integrated circuit” (3) means a combination of passive or active ‘circuit elements’ or both which:

- a. Are formed by means of diffusion processes, implantation processes or deposition processes in or on a single semiconducting piece of material, a so-called ‘chip’;
- b. Can be considered as indivisibly associated; and
- c. Perform the function(s) of a circuit.

NB: ‘Circuit element’ is a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.

“Monospectral imaging sensors” (6) are capable of acquisition of imaging data from one discrete spectral band.

“Multichip integrated circuit” (3) means two or more “monolithic integrated circuits” bonded to a common “substrate”.

“Multispectral imaging sensors” (6) are capable of simultaneous or serial acquisition of imaging data from two or more discrete spectral bands. Sensors having more than twenty discrete spectral bands are sometimes referred to as hyperspectral imaging sensors.

“Natural uranium” (0) means uranium containing the mixtures of isotopes occurring in nature.

“Network access controller” (4) means a physical interface to a distributed switching network. It uses a common medium which operates throughout at the same “digital transfer rate” using arbitration (e.g. token or carrier sense) for transmission. Independently from any other, it selects data packets or data groups (e.g. IEEE 802) addressed to it. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access.

“Neural computer” (4) means a computational device designed or modified to mimic the behaviour of a neuron or a collection of neurons, i.e. a computational device which is distinguished by its hardware capability to

modulate the weights and numbers of the interconnections of a multiplicity of computational components based on previous data.

“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.

“Numerical control” (2) means the automatic control of a process performed by a device that makes use of numeric data usually introduced as the operation is in progress (ref. ISO 2382).

“Object code” (9) means an equipment executable form of a convenient expression of one or more processes (“source code” (source language)) which has been compiled by programming system.

“Optical amplification” (5), in optical communications, means an amplification technique that introduces a gain of optical signals that have been generated by a separate optical source, without conversion to electrical signals, i.e. using semiconductor optical amplifiers, optical fibre luminescent amplifiers.

“Optical computer” (4) means a computer designed or modified to use light to represent data and whose computational logic elements are based on directly coupled optical devices.

“Optical integrated circuit” (3) means a “monolithic integrated circuit” or a “hybrid integrated circuit”, containing one or more parts designed to function as a photosensor or photoemitter or to perform (an) optical or (an) electro-optical function(s).

“Optical switching” (5) means the routing of or switching of signals in optical form without conversion to electrical signals.

“Overall current density” (3) means the total number of ampere-turns in the coil (i.e. the sum of the number of turns multiplied by the maximum current carried by each turn) divided by the total cross-section of the coil (comprising the superconducting filaments, the metallic matrix in which the superconducting filaments are embedded, the encapsulating material, any cooling channels, etc.).

“Participating State” (7 9) is a State participating in the Wassenaar Arrangement.

“Peak power” (6), means the highest level of power attained in the “laser duration”.

“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.

“Power management” (7) means changing the transmitted power of the altimeter signal so that received power at the “aircraft” altitude is always at the minimum necessary to determine the altitude.

“Pressure transducers” (2) are devices that convert pressure measurements into an electrical signal.

“Previously separated” (0 1) means the application of any process intended to increase the concentration of the controlled isotope.

“Primary flight control” (7) means an “aircraft” stability or manoeuvring control using force/moment generators, i.e. aerodynamic control surfaces or propulsive thrust vectoring.

“Principal element” (4), as it applies in Category 4, is a “principal element” when its replacement value is more than 35 % of the total value of the system of which it is an element. Element value is the price paid for the element by the manufacturer of the system, or by the system integrator. Total value is the normal international selling price to unrelated parties at the point of manufacture or consolidation of shipment.

“Production” (GTN NTN All) means all production phases, such as: construction, production engineering, manufacture, integration, assembly (mounting), inspection, testing, quality assurance.

“Production equipment” (1 7 9) means tooling, templates, jigs, mandrels, moulds, dies, fixtures, alignment mechanisms, test equipment, other machinery and components therefor, limited to those specially designed or modified for “development” or for one or more phases of “production”.

“Production facilities” (7 9) means “production equipment” and specially designed software therefor integrated into installations for “development” or for one or more phases of “production”.

“Programme” (2 6) means a sequence of instructions to carry out a process in, or convertible into, a form executable by an electronic computer.

“Pulse compression” (6) means the coding and processing of a radar signal pulse of long time duration to one of short time duration, while maintaining the benefits of high pulse energy.

“Pulse duration” (6) is the duration of a “laser” pulse measured at Full Width Half Intensity (FWHI) levels.

“Pulsed laser” (6) means a “laser” having a “pulse duration” that is less than or equal to 0,25 seconds.

“Quantum cryptography” (5) means a family of techniques for the establishment of 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).

“Radar frequency agility” (6) means any technique which changes, in a pseudo-random sequence, the carrier frequency of a pulsed radar transmitter between pulses or between groups of pulses by an amount equal to or larger than the pulse bandwidth.

“Radar spread spectrum” (6) means any modulation technique for spreading energy originating from a signal with a relatively narrow frequency band, over a much wider band of frequencies, by using random or pseudo-random coding.

“Radiant sensitivity” (6) is Radiant sensitivity (mA/W) = $0,807 \times (\text{wavelength in nm}) \times \text{Quantum Efficiency (QE)}$.

Technical Note:

QE is usually expressed as a percentage; however, for the purposes of this formula QE is expressed as a decimal number less than one, e.g. 78 % is 0,78.

“Real-time bandwidth” (3) for “dynamic signal analysers” is the widest frequency range which the analyser can output to display or mass storage without causing any discontinuity in the analysis of the input data. For analysers with more than one channel, the channel configuration yielding the widest “real-time bandwidth” shall be used to make the calculation.

“Real-time processing” (2 6 7) means the processing of data by a computer system providing a required level of service, as a function of available resources, within a guaranteed response time, regardless of the load of the system, when stimulated by an external event.

“Repeatability” (7) means the closeness of agreement among repeated measurements of the same variable under the same operating conditions when changes in conditions or non-operating periods occur between measurements (Reference: IEEE STD 528-2001 (one sigma standard deviation)).

“Required” (GTN 1-9), as applied to “technology”, refers to only that portion of “technology” which is peculiarly responsible for achieving or extending the controlled performance levels, characteristics or functions. Such “required” “technology” may be shared by different goods.

“Resolution” (2) means the least increment of a measuring device; on digital instruments, the least significant bit (ref. ANSI B-89.1.12).

“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”.

“Robot” (2 8) means a manipulation mechanism, which may be of the continuous path or of the point-to-point variety, may use sensors, and has all the following characteristics:

- a. Is multifunctional;
- b. Is capable of positioning or orienting material, parts, tools or special devices through variable movements in three dimensional space;
- c. Incorporates three or more closed or open loop servo-devices which may include stepping motors; and
- d. Has “user accessible programmability” by means of teach/playback method or by means of an electronic computer which may be a programmable logic controller, i.e. without mechanical intervention.

NB: *The above definition does not include the following devices:*

1. *Manipulation mechanisms which are only manually/ teleoperator controllable;*

2. *Fixed sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The programme is mechanically limited by fixed stops, such as pins or cams. The sequence of motions and the selection of paths or angles are not variable or changeable by mechanical, electronic or electrical means;*
3. *Mechanically controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions.*

The programme is mechanically limited by fixed, but adjustable stops, such as pins or cams. The sequence of motions and the selection of paths or angles are variable within the fixed programme pattern. Variations or modifications of the programme pattern (e.g. changes of pins or exchanges of cams) in one or more motion axes are accomplished only through mechanical operations;

4. *Non-servo-controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The programme is variable but the sequence proceeds only by the binary signal from mechanically fixed electrical binary devices or adjustable stops;*
5. *Stacker cranes defined as Cartesian coordinate manipulator systems manufactured as an integral part of a vertical array of storage bins and designed to access the contents of those bins for storage or retrieval.*

“Rotary atomisation” (1) means a process to reduce a stream or pool of molten metal to droplets to a diameter of 500 micrometer or less by centrifugal force.

“Roving” (1) is a bundle (typically 12-120) of approximately parallel ‘strands’.

NB: ‘Strand’ is a bundle of “monofilaments” (typically over 200) arranged approximately parallel.

“Run-out” (2) (out-of-true running) means radial displacement in one revolution of the main spindle measured in a plane perpendicular to the spindle axis at a point on the external or internal revolving surface to be tested (Reference: ISO 230/1 1986, paragraph 5.61).

“Scale factor” (gyro or accelerometer) (7) means the ratio of change in output to a change in the input intended to be measured. Scale factor is generally evaluated as the slope of the straight line that can be fitted by the method of least squares to input-output data obtained by varying the input cyclically over the input range.

“Settling time” (3) means the time required for the output to come within one-half bit of the final value when switching between any two levels of the converter.

“SHPL” is equivalent to “super high power laser”.

“Signal analysers” (3) means apparatus capable of measuring and displaying basic properties of the single-frequency components of multi-frequency signals.

“Signal processing” (3 4 5 6) means the processing of externally derived information-bearing signals by algorithms such as time compression, filtering, extraction, selection, correlation, convolution or transformations between domains (e.g. fast Fourier transform or Walsh transform).

“Software” (GSN All) means a collection of one or more “programmes” or ‘microprogrammes’ fixed in any tangible medium of expression.

NB: *'Microprogramme' means a sequence of elementary instructions, maintained in a special storage, the execution of which is initiated by the introduction of its reference instruction into an instruction register.*

"Source code" (or source language) (6 7 9) is a convenient expression of one or more processes which may be turned by a programming system into equipment executable form ("object code" (or object language)).

"Spacecraft" (7 9) means active and passive satellites and space probes.

"Space-qualified" (3 6 8) 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.

"Special fissile material" (0) means plutonium-239, uranium-233, "uranium enriched in the isotopes 235 or 233", and any material containing the foregoing.

"Specific modulus" (0 1 9) is Young's modulus in pascals, equivalent to N/m^2 divided by specific weight in N/m^3 , measured at a temperature of $(296 \pm 2) \text{ K}$ ($(23 \pm 2) ^\circ\text{C}$) and a relative humidity of $(50 \pm 5) \%$.

"Specific tensile strength" (0 1 9) is ultimate tensile strength in pascals, equivalent to N/m^2 divided by specific weight in N/m^3 , measured at a temperature of $(296 \pm 2) \text{ K}$ ($(23 \pm 2) ^\circ\text{C}$) and a relative humidity of $(50 \pm 5) \%$.

"Splat Quenching" (1) means a process to 'solidify rapidly' a molten metal stream impinging upon a chilled block, forming a flake-like product.

NB: *'Solidify rapidly' solidification of molten material at cooling rates exceeding 1000 K/s.*

"Spread spectrum" (5) means the technique whereby energy in a relatively narrow-band communication channel is spread over a much wider energy spectrum.

"Spread spectrum" radar (6) — see "Radar spread spectrum"

"Stability" (7) means the standard deviation (1 sigma) of the variation of a particular parameter from its calibrated value measured under stable temperature conditions. This can be expressed as a function of time.

"States (not) Party to the Chemical Weapon Convention" (1) are those states for which the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons has (not) entered into force.

"Substrate" (3) means a sheet of base material with or without an interconnection pattern and on which or within which 'discrete components' or integrated circuits or both can be located.

NB 1: *'Discrete component': a separately packaged 'circuit element' with its own external connections.*

NB 2: *'Circuit element': a single active or passive functional part of an electronic circuit, such as one diode, one transistor, one resistor, one capacitor, etc.*

"Substrate blanks" (6) means monolithic compounds with dimensions suitable for the production of optical elements such as mirrors or optical windows.

"Sub-unit of toxin" (1) is a structurally and functionally discrete component of a whole "toxin".

“Superalloys” (2 9) means nickel-, cobalt- or iron-base alloys having strengths superior to any alloys in the AISI 300 series at temperatures over 922 K (649 °C) under severe environmental and operating conditions.

“Superconductive” (1 3 5 6 8) means materials, i.e. metals, alloys or compounds, which can lose all electrical resistance, i.e. which can attain infinite electrical conductivity and carry very large electrical currents without Joule heating.

NB: The “superconductive” state of a material is individually characterised by a “critical temperature”, a critical magnetic field, which is a function of temperature, and a critical current density which is, however, a function of both magnetic field and temperature.

“Super High Power Laser” (“SHPL”) (6) means a “laser” capable of delivering (the total or any portion of) the output energy exceeding 1 kJ within 50 ms or having an average or CW power exceeding 20 kW.

“Superplastic forming” (1 2) means a deformation process using heat for metals that are normally characterised by low values of elongation (less than 20 %) at the breaking point as determined at room temperature by conventional tensile strength testing, in order to achieve elongations during processing which are at least 2 times those values.

“Symmetric algorithm” (5) means a cryptographic algorithm using an identical key for both encryption and decryption.

NB: A common use of “symmetric algorithms” is confidentiality of data.

“System tracks” (6) means processed, correlated (fusion of radar target data to flight plan position) and updated aircraft flight position report available to the Air Traffic Control centre controllers.

“Systolic array computer” (4) means a computer where the flow and modification of the data is dynamically controllable at the logic gate level by the user.

“Tape” (1) is a material constructed of interlaced or unidirectional “monofilaments”, ‘strands’, “rovings”, “tows”, or “yarns”, etc., usually preimpregnated with resin.

NB: ‘Strand’ is a bundle of “monofilaments” (typically over 200) arranged approximately parallel.

“Technology” (GTN NTN All) means specific information necessary for the “development”, “production” or “use” of goods. This information takes the form of ‘technical data’ or ‘technical assistance’.

NB 1: ‘Technical assistance’ may take forms such as instructions, skills, training, working knowledge and consulting services and may involve the transfer of ‘technical data’.

NB 2: ‘Technical data’ may take forms such as blueprints, plans, diagrams, models, formulae, tables, engineering designs and specifications, manuals and instructions written or recorded on other media or devices such as disk, tape, read-only memories.

“Tilting spindle” (2) means a tool-holding spindle which alters, during the machining process, the angular position of its centre line with respect to any other axis.

“Time constant” (6) is the time taken from the application of a light stimulus for the current increment to reach a value of $1-1/e$ times the final value (i.e. 63 % of the final value).

“Tip shroud” (9) means a stationary ring component (solid or segmented) attached to the inner surface of the engine turbine casing or a feature at the outer tip of the turbine blade, which primarily provides a gas seal between the stationary and rotating components.

“Total control of flight” (7) means an automated control of “aircraft” state variables and flight path to meet mission objectives responding to real-time changes in data regarding objectives, hazards or other “aircraft”.

“Total digital transfer rate” (5) means the number of bits, including line coding, overhead and so forth per unit time passing between corresponding equipment in a digital transmission system.

NB: See also “digital transfer rate”.

“Tow” (1) is a bundle of “monofilaments”, usually approximately parallel.

“Toxins” (1 2) means toxins in the form of deliberately isolated preparations or mixtures, no matter how produced, other than toxins present as contaminants of other materials such as pathological specimens, crops, foodstuffs or seed stocks of “microorganisms”.

“Transfer laser” (6) means a “laser” in which the lasing species is excited through the transfer of energy by collision of a non-lasing atom or molecule with a lasing atom or molecule species.

“Tunable” (6) means the ability of a “laser” to produce a continuous output at all wavelengths over a range of several “laser” transitions. A line selectable “laser” produces discrete wavelengths within one “laser” transition and is not considered “tunable”.

“Unmanned Aerial Vehicle” (“UAV”) (9) means any aircraft capable of initiating flight and sustaining controlled flight and navigation without any human presence on board.

“Uranium enriched in the isotopes 235 or 233” (0) means uranium containing the isotopes 235 or 233, or both, in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is more than the ratio of the isotope 235 to the isotope 238 occurring in nature (isotopic ratio 0,71 per cent).

“Use” (GTN NTN All) means operation, installation (including on-site installation), maintenance (checking), repair, overhaul and refurbishing.

“User accessible programmability” (6) means the facility allowing a user to insert, modify or replace “programmes” by means other than:

- a. A physical change in wiring or interconnections; or
- b. The setting of function controls including entry of parameters.

“Vaccine” (1) is a medicinal product in a pharmaceutical formulation licensed by, or having marketing or clinical trial authorisation from, the regulatory authorities of either the country of manufacture or of use, which is intended to stimulate a protective immunological response in humans or animals in order to prevent disease in those to whom or to which it is administered.

“Vacuum Atomisation” (1) means a process to reduce a molten stream of metal to droplets of a diameter of 500 micrometre or less by the rapid evolution of a dissolved gas upon exposure to a vacuum.

“Variable geometry airfoils” (7) means the use of trailing edge flaps or tabs, or leading edge slats or pivoted nose droop, the position of which can be controlled in flight.

“Yarn” (1) is a bundle of twisted ‘strands’.

NB: ‘Strand’ is a bundle of “monofilaments” (typically over 200) arranged approximately parallel.

CATEGORY 0

NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT

CATEGORY 0

NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT

DUAL-USE ITEMS LIST

Category Code	Items Description	Note	Relevant Authority
Category 0: NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT			
0A	Systems, Equipment and Components		
0A001	<p>“Nuclear reactors” and specially designed or prepared equipment and components therefor, as follows:</p> <ul style="list-style-type: none">a. “Nuclear reactors”;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”;c. Manipulative equipment specially designed or prepared for inserting or removing fuel in a “nuclear reactor”;d. Control rods specially designed or prepared for the control of the fission process in a “nuclear reactor”, support or suspension structures therefor, rod drive mechanisms and rod guide tubes;e. Pressure tubes specially designed or prepared to contain fuel elements and the primary coolant in a “nuclear reactor” at an operating pressure in excess of 5.1 MPa;		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>f. Zirconium metal and alloys in the form of tubes or assemblies of tubes in which the ratio of hafnium to zirconium is less than 1:500 parts by weight, specially designed or prepared for use in a “nuclear reactor”;</p> <p>g. Coolant pumps specially designed or prepared for circulating the primary coolant of “nuclear reactors”;</p> <p>h. ‘Nuclear reactor internals’ specially designed or prepared for use in a “nuclear reactor”, including support columns for the core, fuel channels, thermal shields, baffles, core grid plates, and diffuser plates;</p> <p>i. Heat exchangers (steam generators) specially designed or prepared for use in the primary coolant circuit of a “nuclear reactor”;</p> <p>j. Neutron detection and measuring instruments specially designed or prepared for determining neutron flux levels within the core of a “nuclear reactor”.</p>	<p><i>Note: In 0A001.h. ‘nuclear reactor internals’ means any major structure within a reactor vessel which has one or more functions such as supporting the core, maintaining fuel alignment, directing primary coolant flow, providing radiation shields for the reactor vessel, and guiding in-core instrumentation.</i></p>	
0B	Test, Inspection and Production Equipment		
0B001	<p>Plant for the separation of isotopes of “natural uranium”, “depleted uranium” and “special fissile materials”, and specially designed or prepared equipment and components therefor, as follows:</p> <p>a. Plant specially designed for separating isotopes of “natural uranium”, “depleted uranium”, and “special fissile materials”, as follows:</p> <p>1. Gas centrifuge separation plant;</p>		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 2. Gaseous diffusion separation plant; 3. Aerodynamic separation plant; 4. Chemical exchange separation plant; 5. Ion-exchange separation plant; 6. Atomic vapour "laser" isotope separation (AVLIS) plant; 7. Molecular "laser" isotope separation (MLIS) plant; 8. Plasma separation plant; 9. Electromagnetic separation plant; b. Gas centrifuges and assemblies and components, specially designed or prepared for gas centrifuge separation process, as follows: <ol style="list-style-type: none"> 1. Gas centrifuges; 2. Complete rotor assemblies; 3. Rotor tube cylinders with a wall thickness of 12 mm or less, a diameter of between 75 mm and 400 mm, made from 'high strength-to-density ratio materials'; 4. Rings or bellows with a wall thickness of 3 mm or less and a diameter of between 75 mm and 400 mm and designed to give local support to a rotor tube or to join a number together, made from 'high strength-to-density ratio materials'; 	<p><i>Note: In 0B001.b. 'high strength-to-density ratio material' means any of the following:</i></p> <ol style="list-style-type: none"> a. Maraging steel capable of an ultimate tensile strength of 2 050 MPa or more; b. Aluminium alloys capable of an ultimate tensile strength of 460 MPa or more; or c. "Fibrous or filamentary materials" with a "specific modulus" of more than 3.18×10^6 m and a "specific tensile strength" greater than 76.2×10^3 m; 	

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 5. Baffles of between 75 mm and 400 mm diameter for mounting inside a rotor tube, made from 'high strength-to-density ratio materials'. 6. Top or bottom caps of between 75 mm and 400 mm diameter to fit the ends of a rotor tube, made from 'high strength-to-density ratio materials'; 7. Magnetic suspension bearings consisting of an annular magnet suspended within a housing made of or protected by "materials resistant to corrosion by UF₆" containing a damping medium and having the magnet coupling with a pole piece or second magnet fitted to the top cap of the rotor; 8. Specially prepared bearings comprising a pivot-cup assembly mounted on a damper; 9. Molecular pumps comprised of cylinders having internally machined or extruded helical grooves and internally machined bores; 10. Ring-shaped motor stators for multiphase AC hysteresis (or reluctance) motors for synchronous operation within a vacuum in the frequency range of 600 to 2 000 Hz and a power range of 50 to 1 000 Volt-Amps; 11. Centrifuge housing/recipients to contain the rotor tube assembly of a gas centrifuge, consisting of a rigid cylinder of wall thickness up to 30 mm with precision machined ends and made of or protected by "materials resistant to corrosion by UF₆"; 		

Category Code	Items Description	Note	Relevant Authority
	<p>12. Scoops consisting of tubes of up to 12 mm internal diameter for the extraction of UF₆ gas from within a centrifuge rotor tube by a Pitot tube action, made of or protected by "materials resistant to corrosion by U₆";</p> <p>13. Frequency changers (converters or inverters) specially designed or prepared to supply motor stators for gas centrifuge enrichment, having all of the following characteristics, and specially designed components therefor:</p> <p>a. Multiphase output of 600 to 2 000 Hz;</p> <p>b. Frequency control better than 0.1%;</p> <p>c. Harmonic distortion of less than 2 %; and</p> <p>d. An efficiency greater than 80 %;</p> <p>14. Bellows valves made of or protected by "materials resistant to corrosion by UF₆", with a diameter of 10 mm to 160 mm;</p> <p>c. Equipment and components, specially designed or prepared for gaseous diffusion separation process, as follows:</p> <p>1. Gaseous diffusion barriers made of porous metallic, polymer or ceramic "materials resistant to corrosion by UF₆" with a pore size of 10 to 100 nm, a thickness of 5 mm or less, and, for tubular forms, a diameter of 25 mm or less;</p> <p>2. Gaseous diffuser housings made of or protected by "materials resistant to corrosion by UF₆";</p>		

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 3. Compressors (positive displacement, centrifugal and axial flow types) or gas blowers with a suction volume capacity of 1 m³/min or more of UF₆, and discharge pressure up to 666.7kPa, made of or protected by "materials resistant to corrosion by UF₆"; 4. Rotary shaft seals for compressors or blowers specified in 0B001.c.3. and designed for a buffer gas in-leakage rate of less than 1 000 cm³/min.; 5. Heat exchangers made of aluminium, copper, nickel, or alloys containing more than 60 per cent nickel, or combinations of these metals as clad tubes, designed to operate at sub-atmospheric pressure with a leak rate that limits the pressure rise to less than 10 Pa per hour under a pressure differential of 100 kPa; 6. Bellow valves made of or protected by "materials resistant to corrosion by UF₆", with a diameter of 40 mm to 1 500 mm; d. Equipment and components, specially designed or prepared for aerodynamic separation process, as follows: <ul style="list-style-type: none"> 1. Separation nozzles consisting of slit-shaped, curved channels having a radius of curvature less than 1 mm, resistant to corrosion by UF₆, and having a knife-edge contained within the nozzle which separates the gas flowing through the nozzle into two streams; 2. Tangential inlet flow-driven cylindrical or conical tubes, (vortex tubes), made of or protected by "materials resistant to corrosion by UF₆" with a diameter of 		

Category Code	Items Description	Note	Relevant Authority
	<p>between 0.5 cm and 4 cm and a length to diameter ratio of 20:1 or less and with one or more tangential inlets;</p> <ol style="list-style-type: none"> 3. Compressors (positive displacement, centrifugal and axial flow types) or gas blowers with a suction volume capacity of 2 m³/min or more, made of or protected by “materials resistant to corrosion by UF₆”, and rotary shaft seals therefor; 4. Heat exchangers made of or protected by “materials resistant to corrosion by UF₆”; 5. Aerodynamic separation element housings, made of or protected by “materials resistant to corrosion by UF₆” to contain vortex tubes or separation nozzles; 6. Bellows valves made of or protected by “materials resistant to corrosion by UF₆”, with a diameter of 40 to 1 500 mm; 7. Process systems for separating UF₆ from carrier gas (hydrogen or helium) to 1 ppm UF₆ content or less, including: <ol style="list-style-type: none"> a. Cryogenic heat exchangers and cryoseparators capable of temperatures of 153K (– 120 °C) or less; b. Cryogenic refrigeration units capable of temperatures of 153 K (– 120 °C) or less; c. Separation nozzle or vortex tube units for the separation of UF₆ from carrier gas; d. UF₆ cold traps capable of temperatures of 253 K (– 		

Category Code	Items Description	Note	Relevant Authority
	<p>120 °C) or less;</p> <p>e. Equipment and components, specially designed or prepared for chemical exchange separation process, as follows:</p> <ol style="list-style-type: none"> 1. Fast-exchange liquid-liquid pulse columns with stage residence time of 30 seconds or less and resistant to concentrated hydrochloric acid (e.g. made of or protected by suitable plastic materials such as fluorocarbon polymers or glass); 2. Fast-exchange liquid-liquid centrifugal contactors with stage residence time of 30 seconds or less and resistant to concentrated hydrochloric acid (e.g. made of or protected by suitable plastic materials such as fluorocarbon polymers or glass); 3. Electrochemical reduction cells resistant to concentrated hydrochloric acid solutions, for reduction of uranium from one valence state to another; 4. Electrochemical reduction cells feed equipment to take U^{+4} from the organic stream and, for those parts in contact with the process stream, made of or protected by suitable materials (e.g. glass, fluorocarbon polymers, polyphenyl sulphate, polyether sulfone and resin-impregnated graphite); 5. Feed preparation systems for producing high purity uranium chloride solution consisting of dissolution, solvent extraction and/or ion exchange equipment for purification and electrolytic cells for reducing the uranium U^{+6} or U^{+4} to U^{+3}; 		

Category Code	Items Description	Note	Relevant Authority
	<p>6. Uranium oxidation systems for oxidation of U^{+3} to U^{+4} ;</p> <p>f. Equipment and components, specially designed or prepared for ion-exchange separation process, as follows:</p> <ol style="list-style-type: none"> 1. Fast reacting ion-exchange resins, pellicular or porous macro-reticulated resins in which the active chemical exchange groups are limited to a coating on the surface of an inactive porous support structure, and other composite structures in any suitable form, including particles or fibres, with diameters of 0.2 mm or less, resistant to concentrated hydrochloric acid and designed to have an exchange rate half-time of less than 10 seconds and capable of operating at temperatures in the range of 373 K (100 °C) to 473 K (200 °C); 2. Ion exchange columns (cylindrical) with a diameter greater than 1 000 mm, made of or protected by materials resistant to concentrated hydrochloric acid (e.g. titanium or fluorocarbon plastics) and capable of operating at temperatures in the range of 373 K (100 °C) to 473 K (200 °C) and pressures above 0.7MPa; 3. Ion exchange reflux systems (chemical or electrochemical oxidation or reduction systems) for regeneration of the chemical reducing or oxidising agents used in ion exchange enrichment cascades; <p>g. Equipment and components, specially designed or prepared for atomic vapour "laser" isotope separation process (AVLIS), as follows:</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>made from “materials resistant to corrosion by UF₆”;</p> <ol style="list-style-type: none"> 2. Uranium pentafluoride (UF₅) product collectors consisting of filter, impact, or cyclone-type collectors or combinations thereof, and made of “materials resistant to corrosion by UF₅/UF₆”; 3. Compressors made of or protected by “materials resistant to corrosion by UF₆”, and rotary shaft seals therefor; 4. Equipment for fluorinating UF₅ (solid) to UF₆ (gas); 5. Process systems for separating UF₆ from carrier gas (e.g. nitrogen or argon) including: <ol style="list-style-type: none"> a. Cryogenic heat exchangers and cryoseparators capable of temperatures of 153 K (– 120 °C) or less; b. Cryogenic refrigeration units capable of temperatures of 153 K (– 120 °C) or less; c. UF₆ cold traps capable of temperatures of 253 K (– 20 °C) or less; 6. “Lasers” or “laser” systems for the separation of uranium isotopes with a spectrum frequency stabiliser for operation over extended periods of time; i. Equipment and components, specially designed or prepared for plasma separation process, as follows: <ol style="list-style-type: none"> 1. Microwave power sources and antennae for producing 	<p>NB: SEE ALSO 6A005 AND 6A205.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>or accelerating ions, with an output frequency greater than 30 GHz and mean power output greater than 50 kW;</p> <ol style="list-style-type: none"> 2. Radio frequency ion excitation coils for frequencies of more than 100 kHz and capable of handling more than 40 kW mean power; 3. Uranium plasma generation systems; 4. Liquid metal handling systems for molten uranium or uranium alloys, consisting of crucibles, made of or protected by suitable corrosion and heat resistant materials (e.g. tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof), and cooling equipment for the crucibles; 5. Product and tails collectors made of or protected by materials resistant to the heat and corrosion of uranium vapour such as yttria-coated graphite or tantalum; 6. Separator module housings (cylindrical) for containing the uranium plasma source, radio-frequency drive coil and the product and tails collectors and made of a suitable non-magnetic material (e.g. stainless steel); j. Equipment and components, specially designed or prepared for electromagnetic separation process, as follows: <ol style="list-style-type: none"> 1. Ion sources, single or multiple, consisting of a vapour source, ioniser, and beam accelerator made of suitable non-magnetic materials (e.g. graphite, stainless steel, or copper) and capable of providing a total ion beam current of 50 mA or greater; 	<p>NB: SEE ALSO 2A225.</p>	

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 2. Ion collector plates for collection of enriched or depleted uranium ion beams, consisting of two or more slits and pockets and made of suitable non-magnetic materials (e.g. graphite or stainless steel); 3. Vacuum housings for uranium electromagnetic separators made of non-magnetic materials (e.g. stainless steel) and designed to operate at pressures of 0.1Pa or lower; 4. Magnet pole pieces with a diameter greater than 2 m; 5. High voltage power supplies for ion sources, having all of the following characteristics: <ol style="list-style-type: none"> a. Capable of continuous operation; b. Output voltage of 20 000 V or greater; c. Output current of 1 A or greater; and d. Voltage regulation of better than 0.01% over a period of 8 hours; 6. Magnet power supplies (high power, direct current) having all of the following characteristics: <ol style="list-style-type: none"> a. Capable of continuous operation with a current output of 500 A or greater at a voltage of 100 V or greater; and b. Current or voltage regulation better than 0.01% 	<p>NB: SEE ALSO 3A227.</p> <p>NB: SEE ALSO 3A226.</p>	

Category Code	Items Description	Note	Relevant Authority
	over a period of 8 hours.		
0B002	<p>Specially designed or prepared auxiliary systems, equipment and components, as follows, for isotope separation plant specified in 0B001, made of or protected by "materials resistant to corrosion by UF₆":</p> <ol style="list-style-type: none"> Feed autoclaves, ovens or systems used for passing UF₆ to the enrichment process; Desublimers or cold traps, used to remove UF₆ from the enrichment process for subsequent transfer upon heating; Product and tails stations for transferring UF₆ into containers; Liquefaction or solidification stations used to remove UF₆ from the enrichment process by compressing, cooling and converting UF₆ to a liquid or solid form; Piping systems and header systems specially designed for handling UF₆ within gaseous diffusion, centrifuge or aerodynamic cascades; <ol style="list-style-type: none"> Vacuum manifolds or vacuum headers having a suction capacity of 5 m³ /minute or more; or Vacuum pumps specially designed for use in UF₆ bearing atmospheres; UF₆ mass spectrometers/ion sources specially designed or prepared for taking on-line samples of feed, product or tails from UF₆ gas streams and having all of the following characteristics: 		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Unit resolution for mass of more than 320 amu; 2. Ion sources constructed of or lined with nichrome or monel, or nickel plated; 3. Electron bombardment ionisation sources; and 4. Collector system suitable for isotopic analysis. 		
0B003	<p>Plant for the conversion of uranium and equipment specially designed or prepared therefor, as follows:</p> <ol style="list-style-type: none"> a. Systems for the conversion of uranium ore concentrates to UO_3 ; b. Systems for the conversion of UO_3 to UF_6 ; c. Systems for the conversion of UO_3 to UO_2 ; d. Systems for the conversion of UO_2 to UF_4 ; e. Systems for the conversion of UF_4 to UF_6 ; f. Systems for the conversion of UF_4 to uranium metal; g. Systems for the conversion of UF_6 to UO_2 ; h. Systems for the conversion of UF_6 to UF_4 ; i. Systems for the conversion of UO_2 to UCl_4 . 		Atomic Energy Licensing Board (AELB), MOSTI
0B004	Plant for the production or concentration of heavy water, deuterium and deuterium compounds and specially designed or prepared equipment and components therefor, as follows:		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>a. Plant for the production of heavy water, deuterium or deuterium compounds, as follows:</p> <ol style="list-style-type: none"> 1. Water-hydrogen sulphide exchange plants; 2. Ammonia-hydrogen exchange plants; <p>b. Equipment and components, as follows:</p> <ol style="list-style-type: none"> 1. Water-hydrogen sulphide exchange towers fabricated from fine carbon steel (e.g. ASTM A516) with diameters of 6 m to 9 m, capable of operating at pressures greater than or equal to 2 MPa and with a corrosion allowance of 6mm or greater; 2. Single stage, low head (i.e. 0.2MPa) centrifugal blowers or compressors for hydrogen sulphide gas circulation (i.e. gas containing more than 70% H₂S) with a throughput capacity greater than or equal to 56 m³ /second when operating at pressures greater than or equal to 1.8 MPa suction and having seals designed for wet H₂S service; 3. Ammonia-hydrogen exchange towers greater than or equal to 35 m in height with diameters of 1.5 m to 2.5 m capable of operating at pressures greater than 15 MPa; 4. Tower internals, including stage contactors, and stage pumps, including those which are submersible, for heavy water production utilising the ammonia-hydrogen exchange process; 5. Ammonia crackers with operating pressures greater than or equal to 3MPa for heavy water production utilising the 		

Category Code	Items Description	Note	Relevant Authority
	<p>ammonia-hydrogen exchange process;</p> <p>6. Infrared absorption analysers capable of on-line hydrogen/deuterium ratio analysis where deuterium concentrations are equal to or greater than 90%;</p> <p>7. Catalytic burners for the conversion of enriched deuterium gas into heavy water utilising the ammonia-hydrogen exchange process;</p> <p>8. Complete heavy water upgrade systems, or columns therefor, for the upgrade of heavy water to reactor-grade deuterium concentration.</p>		
OB005	Plant specially designed for the fabrication of "nuclear reactor" fuel elements and specially designed or prepared equipment therefor.	<p><u>Note:</u> A plant for the fabrication of "nuclear reactor" fuel elements includes equipment which:</p> <p>a. Normally comes into direct contact with or directly processes or controls the production flow of nuclear materials;</p> <p>b. Seals the nuclear materials within the cladding;</p> <p>c. Checks the integrity of the cladding or the seal; or</p> <p>d. Checks the finish treatment of the sealed fuel.</p>	Atomic Energy Licensing Board (AELB), MOSTI
OB006	Plant for the reprocessing of irradiated "nuclear reactor" fuel elements, and specially designed or prepared equipment and	<u>Note:</u> OB006 includes:	Atomic Energy Licensing Board

Category Code	Items Description	Note	Relevant Authority
	components therefor.	<p>a. <i>Plant for the reprocessing of irradiated “nuclear reactor” fuel elements including equipment and components which normally come into direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams;</i></p> <p>b. <i>Fuel element chopping or shredding machines, i.e. remotely operated equipment to cut, chop, shred or shear irradiated “nuclear reactor” fuel assemblies, bundles or rods;</i></p> <p>c. <i>Dissolvers, critically safe tanks (e.g. small diameter, annular or slab tanks) specially designed or prepared for the dissolution of irradiated “nuclear reactor” fuel, which are capable of withstanding hot, highly corrosive liquids, and which can be remotely loaded and maintained;</i></p> <p>d. <i>Counter-current solvent extractors and ion-exchange processing equipment specially designed or prepared for use in a plant for the reprocessing of irradiated “natural uranium”, “depleted uranium” or “special fissile materials”;</i></p> <p>e. <i>Holding or storage vessels specially designed to be critically safe and</i></p>	(AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<p><i>resistant to the corrosive effects of nitric acid;</i></p> <p><i><u>Note:</u> Holding or storage vessels may have the following features:</i></p> <ol style="list-style-type: none"> <i>1. Walls or internal structures with a boron equivalent (calculated for all constituent elements as defined in the Note to 0C004) of at least two per cent;</i> <i>2. A maximum diameter of 175 mm for cylindrical vessels; or</i> <i>3. A maximum width of 75 mm for either a slab or annular vessel.</i> <p><i>f. Process control instrumentation specially designed or prepared for monitoring or controlling the reprocessing of irradiated "natural uranium", "depleted uranium" or "special fissile materials".</i></p>	
0B007	<p>Plant for the conversion of plutonium and equipment specially designed or prepared therefor, as follows:</p> <ol style="list-style-type: none"> a. Systems for the conversion of plutonium nitrate to oxide; b. Systems for plutonium metal production. 		Atomic Energy Licensing Board (AELB), MOSTI
0C	Materials		

Category Code	Items Description	Note	Relevant Authority
0C001	"Natural uranium" or "depleted uranium" or thorium in the form of metal, alloy, chemical compound or concentrate and any other material containing one or more of the foregoing;	<p><u>Note:</u> 0C001 does not control the following:</p> <ul style="list-style-type: none"> a. Four grammes or less of "natural uranium" or "depleted uranium" when contained in a sensing component in instruments; b. "Depleted uranium" specially fabricated for the following civil non-nuclear applications: <ul style="list-style-type: none"> 1. Shielding; 2. Packaging; 3. Ballasts having a mass not greater than 100kg; 4. Counter-weights having a mass not greater than 100kg; c. Alloys containing less than 5% thorium; d. Ceramic products containing thorium, which have been manufactured for non-nuclear use. 	Atomic Energy Licensing Board (AELB), MOSTI
0C002	"Special fissile materials"	<p><u>Note:</u> 0C002 does not control four "effective grammes" or less when contained in a sensing component in instruments.</p>	Atomic Energy Licensing Board (AELB), MOSTI
0C003	Deuterium, heavy water (deuterium oxide) and other compounds of deuterium, and mixtures and solutions containing deuterium, in		Atomic Energy Licensing Board

Category Code	Items Description	Note	Relevant Authority
	which the isotopic ratio of deuterium to hydrogen exceeds 1:5 000.		(AELB), MOSTI
0C004	Graphite, nuclear grade, having a purity level of less than 5 parts per million 'boron equivalent' and with a density greater than 1.5 g/cm ³ .	<p>NB: SEE ALSO 1C107</p> <p><u>Note 1:</u> 0C004 does not control the following:</p> <ul style="list-style-type: none"> a. Manufactures of graphite having a mass less than 1 kg, other than those specially designed or prepared for use in a nuclear reactor; b. Graphite powder. <p><u>Note 2:</u> In 0C004, 'boron equivalent' (BE) is defined as the sum of BE_Z for impurities (excluding BE_{carbon} since carbon is not considered an impurity) including boron, where:</p> <p>BE_Z (ppm) = CF × concentration of element Z in ppm;</p> <p>where CF is the conversion factor</p> $= \frac{\sigma_Z \times A_B}{\sigma_B \times A_Z}$ <p>and σ_B and σ_Z are the thermal neutron capture cross sections (in barns) for naturally occurring boron and element Z respectively; and A_B and A_Z are the atomic masses of naturally occurring boron and element Z respectively.</p>	Atomic Energy Licensing Board (AELB), MOSTI
0C005	Specially prepared compounds or powders for the manufacture of gaseous diffusion barriers, resistant to corrosion by UF ₆ (e.g.		Atomic Energy Licensing Board

Category Code	Items Description	Note	Relevant Authority
	nickel or alloy containing 60 weight per cent or more nickel, aluminium oxide and fully fluorinated hydrocarbon polymers), having a purity of 99.9 weight per cent or more and a mean particle size of less than 10 micrometres measured by American Society for Testing and Materials (ASTM) B330 standard and a high degree of particle size uniformity.		(AELB), MOSTI
0D	Software		
0D001	"Software" specially designed or modified for the "development", "production" or "use" of goods specified in this Category.		Atomic Energy Licensing Board (AELB), MOSTI
0E	Technology		
0E001	"Technology" according to the Nuclear Technology Note for the "development", "production" or "use" of goods specified in this Category.		Atomic Energy Licensing Board (AELB), MOSTI

CATEGORY 1

SPECIAL MATERIALS AND RELATED EQUIPMENT

Category Code	Items Description	Note	Relevant Authority
Category 1: SPECIAL MATERIALS AND RELATED EQUIPMENT			
1A	Systems, Equipment and Components		
1A001	<p>Components made from fluorinated compounds, as follows:</p> <ol style="list-style-type: none"> Seals, gaskets, sealants or fuel bladders, specially designed for “aircraft” or aerospace use, made from more than 50% by weight of any of the materials specified in 1C009.b. or 1C009.c.; Piezoelectric polymers and copolymers, made from vinylidene fluoride (CAS 75-38-7) materials, specified in 1C009.a., having all of the following: <ol style="list-style-type: none"> In sheet or film form; and With a thickness exceeding 200µm; Seals, gaskets, valve seats, bladders or diaphragms, having all of the following: <ol style="list-style-type: none"> Made from fluoroelastomers containing at least one vinylether group as a constitutional unit; and Specially designed for “aircraft”, aerospace or ‘missile’ use. 	<p><i>Note: In 1A001.c., ‘missile’ means complete rocket systems and unmanned aerial vehicle systems.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
1A002	<p>“Composite” structures or laminates, having any of the following:</p> <ol style="list-style-type: none"> Consisting of an organic “matrix” and materials specified in 1C010.c., 1C010.d. or 1C010.e.; or 	<p>NB: SEE ALSO 1A202, 9A010 AND 9A110</p> <p><i>Note 1: 1A002 does not control composite structures or laminates made from epoxy resin impregnated carbon</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>b. Consisting of a metal or carbon “matrix”, and any of the following:</p> <p>1. Carbon “fibrous or filamentary materials” having all of the following:</p> <p>a. A “specific modulus” exceeding 10.15×10^6 m; and</p> <p>b. A “specific tensile strength” exceeding 17.7×10^4 m; or</p> <p>2. Materials specified in 1C010.c.</p>	<p><i>“fibrous or filamentary materials” for the repair of “civil aircraft” structures or laminates, having all of the following:</i></p> <p>a. <i>An area not exceeding $1m^2$;</i></p> <p>b. <i>A length not exceeding 2.5m; and</i></p> <p>c. <i>A width exceeding 15mm.</i></p> <p><u>Note 2:</u> <i>1A002 does not control semi-finished items, specially designed for purely civilian applications as follows:</i></p> <p>a. <i>Sporting goods;</i></p> <p>b. <i>Automotive industry;</i></p> <p>c. <i>Machine tool industry;</i></p> <p>d. <i>Medical applications.</i></p> <p><u>Note 3:</u> <i>1A002.b.1. does not control semi-finished items containing a maximum of two dimensions of interwoven filaments and specially designed for applications as follows:</i></p> <p>a. <i>Metal heat-treatment furnaces for tempering metals;</i></p> <p>b. <i>Silicon boule production equipment.</i></p> <p><u>Note 4:</u> <i>1A002 does not control finished items</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<i>specially designed for a specific application.</i>	
1A003	<p>Manufactures of non-“fusible” aromatic polyimides in film, sheet, tape or ribbon form having any of the following:</p> <ol style="list-style-type: none"> A thickness exceeding 0.254 mm; or Coated or laminated with carbon, graphite, metals or magnetic substances. 	<p><u>Note:</u> 1A003 does not control manufactures when coated or laminated with copper and designed for the production of electronic printed circuit boards.</p> <p><u>NB:</u> For “fusible” aromatic polyimides in any form, see 1C008.a.3.</p>	Atomic Energy Licensing Board (AELB), MOSTI
1A004	<p>Protective and detection equipment and components, other than those specified in Military Items List, as follows:</p> <ol style="list-style-type: none"> Gas masks, filter canisters and decontamination equipment therefor, designed or modified for defence against any of the following, and specially designed components therefor: <ol style="list-style-type: none"> Biological agents “adapted for use in war”; Radioactive materials “adapted for use in war”; Chemical warfare (CW) agents; or “Riot control agents”, including: <ol style="list-style-type: none"> α-Bromobenzeneacetonitrile, (Bromobenzyl cyanide) (CA) (CAS 5798-79-8); [(2-chlorophenyl) methylene] propanedinitrile, (o-Chlorobenzylidenemalononitrile) (CS) (CAS 2698-41-1); 2-Chloro-1-phenylethanone, Phenylacetyl chloride (ω- 	<p>NB: SEE ALSO 2B351 AND 2B352.</p> <p><u>Note:</u> 1A004 does not control:</p> <ol style="list-style-type: none"> Personal radiation monitoring dosimeters; Equipment limited by design or function to protect against hazards specific to residential safety or civil industries, including <ol style="list-style-type: none"> mining; quarrying; agriculture; pharmaceutical; medical; veterinary; 	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>chloroacetophenone) (CN) (CAS 532-27-4);</p> <p>d. Dibenz-(b,f)-1,4-oxazepine (CR) (CAS 257-07-8);</p> <p>e. 10-Chloro-5,10-dihydrophenarsazine, (Phenarsazine chloride), (Adamsite), (DM) (CAS 578-94-9);</p> <p>f. N-Nonanoylmorpholine, (MPA) (CAS 5299-64-9);</p> <p>b. Protective suits, gloves and shoes, specially designed or modified for defence against any of the following:</p> <ol style="list-style-type: none"> 1. Biological agents “adapted for use in war”; 2. Radioactive materials “adapted for use in war”; or 3. Chemical warfare (CW) agents; <p>c. Detection systems, specially designed or modified for detection or identification of any of the following, and specially designed components therefor:</p> <ol style="list-style-type: none"> 1. Biological agents “adapted for use in war”; 2. Radioactive materials “adapted for use in war”; or 3. Chemical warfare (CW) agents. <p>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).</p>	<p>7. <i>environmental</i>;</p> <p>8. <i>waste management</i>;</p> <p>9. <i>food industry</i>.</p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. 1A004 includes equipment and components that have been identified, successfully tested to national standards or otherwise proven effective, for the detection of or defence 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’ is a substance or material that is used in place of toxic agent (chemical or biological) in training, research, testing or evaluation. <p><u>Technical Note:</u></p> <p>‘Trace detection’ is defined as the capability to</p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>detect less than 1ppm vapour, or 1mg solid or liquid.</i></p> <p><i><u>Note 1:</u> 1A004.d. does not control equipment specially designed for laboratory use.</i></p> <p><i><u>Note 2:</u> 1A004.d. does not control non-contact walk-through security portals.</i></p>	
1A005	Body armour, and specially designed components therefor, other than those manufactured to military standards or specifications or to their equivalents in performance.	<p>NB: SEE ALSO MILITARY ITEMS LIST.</p> <p><i><u>NB:</u> For “fibrous or filamentary materials” used in the manufacture of body armour, see 1C010.</i></p> <p><i><u>Note 1:</u> 1A005 does not control body armour or protective garments, when accompanying their user for the user’s own personal protection.</i></p> <p><i><u>Note 2:</u> 1A005 does not control body armour designed to provide frontal protection only from both fragment and blast from non-military explosive devices.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
1A006	<p>Equipment, specially designed or modified for the disposal of improvised explosive devices, as follows, and specially designed components and accessories therefor:</p> <p>a. Remotely operated vehicles;</p> <p>b. ‘Disruptors’.</p>	<p>NB: SEE ALSO MILITARY ITEMS LIST.</p> <p><i><u>Technical Note:</u></i></p> <p><i>‘Disruptors’ are devices specially designed for the purpose of preventing the operation of an explosive device by projecting a liquid, solid or frangible projectile.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<i>Note: 1A006 does not control equipment when accompanying its operator.</i>	
1A007	<p>Equipment and devices, specially designed to initiate charges and devices containing “energetic materials”, by electrical means, as follows:</p> <p>a. Explosive detonator firing sets designed to drive explosive detonators specified in 1A007.b.;</p> <p>b. Electrically driven explosive detonators as follows:</p> <ol style="list-style-type: none"> 1. Exploding bridge (EB); 2. Exploding bridge wire (EBW); 3. Slapper; 4. Exploding foil initiators (EFI). 	<p>NB: SEE ALSO MILITARY ITEMS LIST, 3A229 AND 3A232.</p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. <i>The word initiator or igniter is sometimes used in place of the word detonator.</i> 2. <i>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 vaporisation 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.</i> 	Atomic Energy Licensing Board (AELB), MOSTI
1A008	<p>Charges, devices and components, as follows:</p> <p>a. ‘Shaped charges’ having all of the following:</p>	<p><u>Technical Note:</u></p> <p><i>‘Shaped charges’ are explosive charges shaped to focus the effects of the explosive</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Net Explosive Quantity (NEQ) greater than 90g; and 2. Outer casing diameter equal to or greater than 75mm; <ol style="list-style-type: none"> b. Linear shaped cutting charges having all of the following, and specially designed components therefor: <ol style="list-style-type: none"> 1. An explosive load greater than 40g/m; and 2. A width of 10mm 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. 	<i>blast.</i>	
1A102	Resaturated pyrolised carbon-carbon components designed for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.		Atomic Energy Licensing Board (AELB), MOSTI
1A202	<p>Composite structures, other than those specified in 1A002, in the form of tubes and having both of the following characteristics:</p> <ol style="list-style-type: none"> a. An inside diameter of between 75mm and 400mm; and b. Made with any of the “fibrous or filamentary materials” specified in 1C010.a. or b. or 1C210.a. or with carbon prepreg materials specified in 1C210.c. 	NB: SEE ALSO 9A010 AND 9A110.	Atomic Energy Licensing Board (AELB), MOSTI
1A225	Platinised catalysts specially designed or prepared for promoting the hydrogen isotope exchange reaction between hydrogen and water for the recovery of tritium from heavy water or for the		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	production of heavy water.		
1A226	<p>Specialised packings which may be used in separating heavy water from ordinary water, having both of the following characteristics:</p> <p>a. Made of phosphor bronze mesh chemically treated to improve wettability; and</p> <p>b. Designed to be used in vacuum distillation towers.</p>		Atomic Energy Licensing Board (AELB), MOSTI
1A227	<p>High-density (lead glass or other) radiation shielding windows, having all of the following characteristics, and specially designed frames therefor:</p> <p>a. A 'cold area' greater than 0.09 m^2 ;</p> <p>b. A density greater than 3g/cm^3 ; and</p> <p>c. A thickness of 100mm or greater.</p>	<p><u>Technical Note:</u></p> <p><i>In 1A227 the term 'cold area' means the viewing area of the window exposed to the lowest level of radiation in the design application.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
1B	Test, Inspection and Production Equipment		
1B001	<p>Equipment for the production or inspection of "composite" structures or laminates specified in 1A002 or "fibrous or filamentary materials" specified in 1C010, as follows, and specially designed components and accessories therefor:</p> <p>a. Filament winding machines, of which the motions for positioning, wrapping and winding fibres are coordinated and programmed in three or more 'primary servo positioning' axes, specially designed for the manufacture of "composite" structures or laminates, from "fibrous or filamentary materials";</p>	<p>NB: SEE ALSO 1B101 AND 1B201.</p> <p><u>Technical Note:</u></p> <p><i>For the purpose of 1B001, 'primary servo positioning' axes control, under computer program direction, the position of the end effector (i.e. head) in space relative to the work piece at the correct orientation and direction to achieve the desired process.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>b. Tape-laying machines, of which the motions for positioning and laying tape or sheets are coordinated and programmed in five or more 'primary servo positioning' axes, specially designed for the manufacture of "composite" airframe or 'missile' structures;</p> <p>c. Multidirectional, multidimensional weaving machines or interlacing machines, including adapters and modification kits, specially designed or modified for weaving, interlacing or braiding fibres, for "composite" structures;</p> <p>d. Equipment specially designed or adapted for the production of reinforcement fibres, as follows:</p> <ol style="list-style-type: none"> 1. Equipment for converting polymeric fibres (such as polyacrylonitrile, rayon, pitch or polycarbosilane) into carbon fibres or silicon carbide fibres, including special equipment to strain the fibre during heating; 2. Equipment for the chemical vapour deposition of elements or compounds, on heated filamentary substrates, to manufacture silicon carbide fibres; 3. Equipment for the wet-spinning of refractory ceramics (such as aluminium oxide); 4. Equipment for converting aluminium containing precursor fibres into alumina fibres by heat treatment; <p>e. Equipment for producing prepregs specified in 1C010.e. by the hot melt method;</p> <p>f. Non-destructive inspection equipment specially designed for "composite" materials, as follows:</p>	<p><u>Note:</u> In 1B001.b., 'missile' means complete rocket systems and unmanned aerial vehicle systems.</p> <p><u>Technical Note:</u></p> <p>For the purposes of 1B001.c., the technique of interlacing includes knitting.</p>	

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 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; g. Tow-placement machines, of which the motions for positioning and laying tows or sheets are coordinated and programmed in two or more 'primary servo positioning' axes, specially designed for the manufacture of "composite" airframe or 'missile' structures. 		
1B002	Equipment for producing metal alloys, metal alloy powder or alloyed materials, specially designed to avoid contamination and specially designed for use in one of the processes specified in 1C002.c.2.	NB: SEE ALSO 1B102.	Atomic Energy Licensing Board (AELB), MOSTI
1B003	<p>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:</p> <ol style="list-style-type: none"> 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 1B003.b. 		Atomic Energy Licensing Board (AELB), MOSTI
1B101	Equipment, other than that specified in 1B001, for the "production" of structural composites as follows; and specially	NB: SEE ALSO 1B201.	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>designed components and accessories therefor:</p> <ol style="list-style-type: none"> 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; Tape-laying machines of which the motions for positioning and laying tape and sheets can be coordinated and programmed in two or more axes, designed for the manufacture of composite airframe and “missile” structures; Equipment designed or modified for the “production” of “fibrous or filamentary materials” as follows: <ol style="list-style-type: none"> Equipment for converting polymeric fibres (such as polyacrylonitrile, rayon or polycarbosilane) including special provision to strain the fibre during heating; Equipment for the vapour deposition of elements or compounds on heated filament substrates; Equipment for the wet-spinning of refractory ceramics (such as aluminium oxide); Equipment designed or modified for special fibre surface treatment or for producing prepregs and preforms specified in entry 9C110. 	<p><u>Note:</u> Components and accessories specified in 1B101 include moulds, mandrels, dies, fixtures and tooling for the preform pressing, curing, casting, sintering or bonding of composite structures, laminates and manufactures thereof.</p> <p><u>Note:</u> 1B101.d. includes rollers, tension stretchers, coating equipment, cutting equipment and clicker dies.</p>	
1B102	Metal powder “production equipment”, other than that specified in	<u>NB:</u> SEE ALSO 1B115.b.	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>1B002, and components as follows:</p> <p>a. Metal powder “production equipment” usable for the “production”, in a controlled environment, of spherical or atomised materials specified in 1C011.a., 1C011.b., 1C111.a.1., 1C111.a.2. or in the Military Items List.</p> <p>b. Specially designed components for “production equipment” specified in 1B002 or 1B102.a.</p>	<p><u>Note:</u> 1B102 includes:</p> <p>a. Plasma generators (high frequency arc-jet) usable for obtaining sputtered or spherical metallic powders with organisation of the process in an argon-water environment;</p> <p>b. Electrobust equipment usable for obtaining sputtered or spherical metallic powders with organisation of the process in an argon-water environment;</p> <p>c. Equipment usable for the “production” of spherical aluminium powders by powdering a melt in an inert medium (e.g. nitrogen).</p>	
1B115	<p>Equipment, other than that specified in 1B002 or 1B102, for the production of propellant and propellant constituents, as follows, and specially designed components therefor:</p> <p>a. “Production equipment” for the “production”, handling or acceptance testing of liquid propellants or propellant constituents specified in 1C011.a., 1C011.b., 1C111 or in the Military Items List;</p> <p>b. “Production equipment” for the “production”, handling, mixing, curing, casting, pressing, machining, extruding or acceptance testing of solid propellants or propellant constituents specified</p>	<p><u>Note 1:</u> For equipment specially designed for the production of military goods, see the Military Items List.</p> <p><u>Note 2:</u> 1B115 does not control equipment for the “production”, handling and acceptance testing of boron carbide.</p> <p><u>Note:</u> 1B115.b. does not control batch mixers, continuous mixers or fluid energy mills. For the control of batch</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	in 1C011.a., 1C011.b., 1C111 or in the Military Items List.	<i>mixers, continuous mixers and fluid energy mills see 1B117, 1B118 and 1B119.</i>	
1B116	Specially designed nozzles for producing pyrolitically derived materials formed on a mould, mandrel or other substrate from precursor gases which decompose in the 1573K (1300°C) to 3173K (2900°C) temperature range at pressures of 130Pa to 20kPa.		Controller
1B117	Batch mixers with provision for mixing under vacuum in the range of zero to 13.326kPa and with temperature control capability of the mixing chamber and having all of the following, and specially designed components therefor: a. A total volumetric capacity of 110litres or more; and b. At least one mixing/kneading shaft mounted off centre.		Controller
1B118	Continuous mixers with provision for mixing under vacuum in the range of zero to 13.326kPa and with a temperature control capability of the mixing chamber having any of the following, and specially designed components therefor: a. Two or more mixing/kneading shafts; or b. A single rotating shaft which oscillates and having kneading teeth/pins on the shaft as well as inside the casing of the mixing chamber.		Controller
1B119	Fluid energy mills usable for grinding or milling substances specified in 1C011.a., 1C011.b., 1C111 or in the Military Items List, and specially designed components therefor.		Controller

Category Code	Items Description	Note	Relevant Authority
1B201	<p>Filament winding machines, other than those specified in 1B001 or 1B101, and related equipment, as follows:</p> <ol style="list-style-type: none"> Filament winding machines having all of the following characteristics: <ol style="list-style-type: none"> Having motions for positioning, wrapping, and winding fibres coordinated and programmed in two or more axes; Specially designed to fabricate composite structures or laminates from “fibrous or filamentary materials”; and Capable of winding cylindrical rotors of diameter between 75mm and 400mm and lengths of 600mm or greater; Coordinating and programming controls for the filament winding machines specified in 1B201.a.; Precision mandrels for the filament winding machines specified in 1B201.a. 		Atomic Energy Licensing Board (AELB), MOSTI
1B225	Electrolytic cells for fluorine production with an output capacity greater than 250g of fluorine per hour.		Atomic Energy Licensing Board (AELB), MOSTI
1B226	Electromagnetic isotope separators designed for, or equipped with, single or multiple ion sources capable of providing a total ion beam current of 50mA or greater.	<p><u>Note:</u> 1B226 includes separators:</p> <ol style="list-style-type: none"> Capable of enriching stable isotopes; With the ion sources and collectors both in the magnetic field and those configurations in which they are external to the 	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<i>field.</i>	
1B227	Ammonia synthesis converters or ammonia synthesis units, in which the synthesis gas (nitrogen and hydrogen) is withdrawn from an ammonia/hydrogen high-pressure exchange column and the synthesised ammonia is returned to said column.		Atomic Energy Licensing Board (AELB), MOSTI
1B228	<p>Hydrogen-cryogenic distillation columns having all of the following characteristics:</p> <ol style="list-style-type: none"> Designed for operation with internal temperatures of 35K (–238°C) or less; Designed for operation at an internal pressure of 0.5 to 5MPa; Constructed of either: <ol style="list-style-type: none"> Stainless steel of the 300 series with low sulphur content and with an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; or Equivalent materials which are both cryogenic and H₂ -compatible; and With internal diameters of 1m or greater and effective lengths of 5m or greater. 		Atomic Energy Licensing Board (AELB), MOSTI
1B229	<p>Water-hydrogen sulphide exchange tray columns and 'internal contactors', as follows:</p> <ol style="list-style-type: none"> Water-hydrogen sulphide exchange tray columns, having all of the following characteristics: <ol style="list-style-type: none"> Can operate at pressures of 2MPa or greater; 	<p><u>NB:</u> For columns which are specially designed or prepared for the production of heavy water see 0B004.</p> <p><u>Technical Note:</u></p> <p>'Internal contactors' of the columns are</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 2. Constructed of carbon steel having an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; and 3. With a diameter of 1.8 m or greater; b. 'Internal contactors' for the water-hydrogen sulphide exchange tray columns specified in 1B229.a. 	<p><i>segmented trays which have an effective assembled diameter of 1.8m or greater, are designed to facilitate countercurrent contacting and are constructed of stainless steels with a carbon content of 0.03 % or less These may be sieve trays, valve trays, bubble cap trays, or turbogrid trays.</i></p>	
1B230	<p>Pumps capable of circulating solutions of concentrated or dilute potassium amide catalyst in liquid ammonia (KNH_2/NH_3), having all of the following characteristics:</p> <ul style="list-style-type: none"> a. Airtight (i.e. hermetically sealed); b. A capacity greater than 8.5 m³/h; and c. Either of the following characteristics: <ul style="list-style-type: none"> 1. For concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 to 60MPa; or 2. For dilute potassium amide solutions (less than 1%), an operating pressure of 20 to 60MPa. 		Atomic Energy Licensing Board (AELB), MOSTI
1B231	<p>Tritium facilities or plants, and equipment therefor, as follows:</p> <ul style="list-style-type: none"> a. Facilities or plants for the production, recovery, extraction, concentration, or handling of tritium; b. Equipment for tritium facilities or plants, as follows: <ul style="list-style-type: none"> 1. Hydrogen or helium refrigeration units capable of cooling 		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>to 23K (– 250°C) or less, with heat removal capacity greater than 150W;</p> <p>2. Hydrogen isotope storage or purification systems using metal hydrides as the storage or purification medium.</p>		
1B232	<p>Turboexpanders or turboexpander-compressor sets having both of the following characteristics:</p> <p>a. Designed for operation with an outlet temperature of 35K (– 238°C) or less; and</p> <p>b. Designed for a throughput of hydrogen gas of 1000kg/h or greater.</p>		Atomic Energy Licensing Board (AELB), MOSTI
1B233	<p>Lithium isotope separation facilities or plants, and equipment therefor, as follows:</p> <p>a. Facilities or plants for the separation of lithium isotopes;</p> <p>b. Equipment for the separation of lithium isotopes, as follows:</p> <ol style="list-style-type: none"> 1. Packed liquid-liquid exchange columns specially designed for lithium amalgams; 2. Mercury or lithium amalgam pumps; 3. Lithium amalgam electrolysis cells; 4. Evaporators for concentrated lithium hydroxide solution. 		Atomic Energy Licensing Board (AELB), MOSTI
1C	Material	<u>Technical Note:</u>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>Metals and alloys:</i></p> <p><i>Unless provision to the contrary is made, the words 'metals' and 'alloys' in 1C001 to 1C012 cover crude and semi- fabricated forms, as follows:</i></p> <p><i>Crude forms:</i></p> <p><i>Anodes, balls, bars (including notched bars and wire bars), billets, blocks, blooms, bricks, cakes, cathodes, crystals, cubes, dice, grains, granules, ingots, lumps, pellets, pigs, powder, rondelles, shot, slabs, slugs, sponge, sticks;</i></p> <p><i>Semi-fabricated forms (whether or not coated, plated, drilled or punched):</i></p> <p><i>a. Wrought or worked materials fabricated by rolling, drawing, extruding, forging, impact extruding, pressing, graining, atomising, and grinding, i.e.: angles, channels, circles, discs, dust, flakes, foils and leaf, forging, plate, powder, pressings and stampings, ribbons, rings, rods (including bare welding rods, wire rods, and rolled wire), sections, shapes, sheets, strip, pipe and tubes (including tube rounds, squares, and hollows), drawn or extruded wire;</i></p> <p><i>b. Cast material produced by casting in sand, die, metal, plaster or other types of moulds, including high pressure castings, sintered</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>forms, and forms made by powder metallurgy.</i></p> <p><i>The object of the control should not be defeated by the export of non-listed forms alleged to be finished products but representing in reality crude forms or semi-fabricated forms</i></p>	
1C001	<p>Materials specially designed for use as absorbers of electromagnetic waves, or intrinsically conductive polymers, as follows:</p> <ol style="list-style-type: none"> Materials for absorbing frequencies exceeding 2×10^8 Hz but less than 3×10^{12} Hz; Materials for absorbing frequencies exceeding 1.5×10^{14} Hz but less than 3.7×10^{14} Hz and not transparent to visible light; Intrinsically conductive polymeric materials with a 'bulk electrical conductivity' exceeding 10000S/m (Siemens per metre) or a 'sheet (surface) resistivity' of less than 100ohms/square, based on any of the following polymers: <ol style="list-style-type: none"> Polyaniline; Polypyrrole; Polythiophene; Poly phenylene-vinylene; or Poly thienylene-vinylene. 	<p>NB: SEE ALSO 1C101.</p> <p><u>Note 1:</u> 1C001.a. does not control:</p> <ol style="list-style-type: none"> Hair type absorbers, constructed of natural or synthetic fibres, with non-magnetic loading to provide absorption; Absorbers having no magnetic loss and whose incident surface is non-planar in shape, including pyramids, cones, wedges and convoluted surfaces; Planar absorbers, having all of the following: <ol style="list-style-type: none"> Made from any of the following: <ol style="list-style-type: none"> Plastic foam materials (flexible or non-flexible) 	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<p>with carbon-loading, or organic materials, including binders, providing more than 5% echo compared with metal over a bandwidth exceeding $\pm 15\%$ of the centre frequency of the incident energy, and not capable of withstanding temperatures exceeding 450K (177°C); or</p> <p>b. Ceramic materials providing more than 20% echo compared with metal over a bandwidth exceeding $\pm 15\%$ of the centre frequency of the incident energy, and not capable of withstanding temperatures exceeding 800K (527°C);</p> <p><u>Technical Note:</u></p> <p>Absorption test samples for 1C001.a. Note: 1.c.1. should be a square at least 5 wavelengths of the centre frequency on a side and positioned in the far field of the radiating element.</p> <p>2. Tensile strength less than $7 \times 10^6 \text{ N/m}^2$; and</p>	

Category Code	Items Description	Note	Relevant Authority
		<p>3. Compressive strength less than $14 \times 10^6 \text{ N/m}^2$;</p> <p>d. Planar absorbers made of sintered ferrite, having all of the following:</p> <p>1. A specific gravity exceeding 4.4; and</p> <p>2. A maximum operating temperature of 548K (275°C).</p> <p><u>Note 2:</u> Nothing in Note 1 to 1C001.a. releases magnetic materials to provide absorption when contained in paint.</p> <p><u>Technical Note:</u></p> <p>'Bulk electrical conductivity' and 'sheet (surface) resistivity' should be determined using ASTM D-257 or national equivalents.</p>	
1C002	<p>Metal alloys, metal alloy powder and alloyed materials, as follows:</p> <p>a. Aluminides, as follows:</p> <p>1. Nickel aluminides containing a minimum of 15% by weight aluminium, a maximum of 38% by weight aluminium and at least one additional alloying element;</p> <p>2. Titanium aluminides containing 10% by weight or more aluminium and at least one additional alloying element;</p>	<p>NB: SEE ALSO 1C202.</p> <p><u>Note:</u> 1C002 does not control metal alloys, metal alloy powder and alloyed materials for coating substrates.</p> <p><u>Technical Notes:</u></p> <p>1. The metal alloys in 1C002 are those containing a higher percentage by weight of the stated metal than of any other</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>b. Metal alloys, as follows, made from the powder or particulate material specified in 1C002.c.:</p> <ol style="list-style-type: none"> 1. Nickel alloys having any of the following: <ol style="list-style-type: none"> a. A 'stress-rupture life' of 10000 hours or longer at 923K (650°C) at a stress of 676MPa; or b. A 'low cycle fatigue life' of 10000 cycles or more at 823K (550°C) at a maximum stress of 1095 MPa; 2. Niobium alloys having any of the following: <ol style="list-style-type: none"> a. A 'stress-rupture life' of 10000 hours or longer at 1073K (800°C) at a stress of 400MPa; or b. A 'low cycle fatigue life' of 10000 cycles or more at 973K (700°C) at a maximum stress of 700MPa; 3. Titanium alloys having any of the following: <ol style="list-style-type: none"> a. A 'stress-rupture life' of 10000 hours or longer at 723K (450 °C) at a stress of 200MPa; or b. A 'low cycle fatigue life' of 10000 cycles or more at 723K (450°C) at a maximum stress of 400MPa; 4. Aluminium alloys having any of the following: <ol style="list-style-type: none"> a. A tensile strength of 240MPa or more at 473K (200°C); or b. A tensile strength of 415MPa or more at 298K (25°C); 	<p><i>element.</i></p> <ol style="list-style-type: none"> 2. <i>'Stress-rupture life' should be measured in accordance with ASTM standard E-139 or national equivalents.</i> 3. <i>'Low cycle fatigue life' should be measured in accordance with ASTM Standard E-606 'Recommended Practice for Constant-Amplitude Low-Cycle Fatigue Testing' or national equivalents. Testing should be axial with an average stress ratio equal to 1 and a stress-concentration factor (Kt) equal to 1. The average stress is defined as maximum stress minus minimum stress divided by maximum stress.</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>5. Magnesium alloys having all of the following:</p> <ul style="list-style-type: none"> a. A tensile strength of 345MPa or more; and b. A corrosion rate of less than 1mm/year in 3% sodium chloride aqueous solution measured in accordance with ASTM standard G-31 or national equivalents; <p>c. Metal alloy powder or particulate material, having all of the following:</p> <ul style="list-style-type: none"> 1. Made from any of the following composition systems: <ul style="list-style-type: none"> a. Nickel alloys (Ni-Al-X, Ni-X-Al) qualified for turbine engine parts or components, i.e. with less than 3 non-metallic particles (introduced during the manufacturing process) larger than 100µm in 10⁹ alloy particles; b. Niobium alloys (Nb-Al-X or Nb-X-Al, Nb-Si-X or Nb-X-Si, Nb-Ti-X or Nb-X-Ti); c. Titanium alloys (Ti-Al-X or Ti-X-Al); d. Aluminium alloys (Al-Mg-X or Al-X-Mg, Al-Zn-X or Al-X-Zn, Al-Fe-X or Al-X-Fe); or e. Magnesium alloys (Mg-Al-X or Mg-X-Al); 2. Made in a controlled environment by any of the following processes: <ul style="list-style-type: none"> a. "Vacuum atomisation"; 	<p><u>Technical Note:</u></p> <p><i>X in the following equals one or more alloying elements.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. "Gas atomisation"; c. "Rotary atomisation"; d. "Splat quenching"; e. "Melt spinning" and "comminution"; f. "Melt extraction" and "comminution"; or g. "Mechanical alloying"; and <p>3. Capable of forming materials specified in 1C002.a. or 1C002.b.</p> <p>d. Alloyed materials having all of the following:</p> <ul style="list-style-type: none"> 1. Made from any of the composition systems specified in 1C002.c.1.; 2. In the form of uncomminuted flakes, ribbons or thin rods; and 3. Produced in a controlled environment by any of the following: <ul style="list-style-type: none"> a. "Splat quenching"; b. "Melt spinning"; or c. "Melt extraction". 		
1C003	Magnetic metals, of all types and of whatever form, having any of	<u>Technical Note:</u>	Atomic Energy

Category Code	Items Description	Note	Relevant Authority
	<p>the following:</p> <ol style="list-style-type: none"> Initial relative permeability of 120000 or more and a thickness of 0.05mm or less; Magnetostrictive alloys having any of the following: <ol style="list-style-type: none"> A saturation magnetostriction of more than 5×10^{-4}; or A magnetomechanical coupling factor (k) of more than 0.8; or Amorphous or 'nanocrystalline' alloy strips, having all of the following: <ol style="list-style-type: none"> A composition having a minimum of 75% by weight of iron, cobalt or nickel; A saturation magnetic induction (B_s) of 1.6T or more; and Any of the following: <ol style="list-style-type: none"> A strip thickness of 0.02mm or less; or An electrical resistivity of 2×10^{-4} ohm cm or more. 	<p><i>Measurement of initial relative permeability must be performed on fully annealed materials.</i></p> <p><u>Technical Note:</u></p> <p><i>'Nanocrystalline' materials in 1C003.c. are those materials having a crystal grain size of 50nm or less, as determined by X-ray diffraction.</i></p>	Licensing Board (AELB), MOSTI
1C004	<p>Uranium titanium alloys or tungsten alloys with a "matrix" based on iron, nickel or copper, having all of the following:</p> <ol style="list-style-type: none"> A density exceeding 17.5g/cm^3 ; An elastic limit exceeding 880MPa; 		Atomic Energy Licensing Board (AELB), MOSTI

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	<p>c. An ultimate tensile strength exceeding 1270MPa; and</p> <p>d. An elongation exceeding 8%.</p>		
1C005	<p>“Superconductive” “composite” conductors in lengths exceeding 100m or with a mass exceeding 100g, as follows:</p> <p>a. “Superconductive” “composite” conductors containing one or more niobium-titanium ‘filaments’, having both of the following:</p> <ol style="list-style-type: none"> 1. Embedded in a “matrix” other than a copper or copper-based mixed “matrix”; and 2. Having a cross-section area less than $0.28 \times 10^{-4} \text{mm}^2$ (6µm in diameter for circular ‘filaments’); <p>b. “Superconductive” “composite” conductors consisting of one or more “superconductive” ‘filaments’ other than niobium-titanium, having all of the following:</p> <ol style="list-style-type: none"> 1. A “critical temperature” at zero magnetic induction exceeding 9.85K (– 263.31°C); and 2. Remaining in the “superconductive” state at a temperature of 4.2K(–268.96°C) when exposed to a magnetic field oriented in any direction perpendicular to the longitudinal axis of conductor and corresponding to a magnetic induction of 12T with critical current density exceeding 1750A/mm² on overall cross-section of the conductor; <p>c. “Superconductive” “composite” conductors consisting of one or more “superconductive” ‘filaments’ which remain</p>	<p><u>Technical Note:</u></p> <p><i>For the purpose of 1C005 ‘filaments’ may be in wire, cylinder, film, tape or ribbon form.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	"superconductive" above 115K (–158.16°C).		
1C006	<p>Fluids and lubricating materials, as follows:</p> <p>a. Hydraulic fluids containing, as their principal ingredients, any of the following:</p> <p>1. Synthetic 'silahydrocarbon oils' having all of the following:</p> <p>a. A 'flash point' exceeding 477K (204°C);</p> <p>b. A 'pour point' at 239K (–34°C) or less;</p> <p>c. A 'viscosity index' of 75 or more; and</p> <p>d. A 'thermal stability' at 616K (343°C); or</p> <p>2. 'Chlorofluorocarbons' having all of the following:</p> <p>a. No 'flash point';</p> <p>b. An 'autogenous ignition temperature' exceeding 977K (704°C);</p> <p>c. A 'pour point' at 219K (–54°C) or less;</p> <p>d. A 'viscosity index' of 80 or more; and</p> <p>e. A boiling point at 473K (200°C) or higher;</p> <p>b. Lubricating materials containing, as their principal ingredients, any of the following:</p> <p>1. Phenylene or alkylphenylene ethers or thio-ethers, or</p>	<p><u>Technical Note:</u></p> <p>For the purpose of 1C006.a.1., 'silahydrocarbon oils' contain exclusively silicon, hydrogen and carbon.</p> <p><u>Technical Note:</u></p> <p>For the purpose of 1C006.a.2., 'chlorofluorocarbons' contain exclusively carbon, fluorine and chlorine.</p> <p><u>Technical Note:</u></p> <p>For the purpose of 1C006:</p> <p>1. 'Flash point' is determined using the Cleveland Open Cup Method described in ASTM D-92 or national equivalents;</p> <p>2. 'Pour point' is determined using the</p>	Atomic Energy Licensing Board (AELB), MOSTI

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	<p>their mixtures, containing more than two ether or thio-ether functions or mixtures thereof; or</p> <p>2. Fluorinated silicone fluids with a kinematic viscosity of less than 5 000mm²/s (5000 centistokes) measured at 298K (25°C);</p> <p>c. Damping or flotation fluids having all of the following:</p> <p>1. Purity exceeding 99.8%;</p> <p>2. Containing less than 25 particles of 200µm or larger in size per 100ml; and</p> <p>3. Made from at least 85% of any of the following:</p> <p>a. Dibromotetrafluoroethane (CAS 25497-30-7, 124-73-2, 27336-23-8);</p> <p>b. Polychlorotrifluoroethylene (oily and waxy modifications only); or</p> <p>c. Polybromotrifluoroethylene;</p> <p>d. Fluorocarbon electronic cooling fluids having all of the following:</p> <p>1. Containing 85% by weight or more of any of the following, or mixtures thereof:</p> <p>a. Monomeric forms of perfluoropolyalkylether-triazines or perfluoroaliphatic-ethers;</p> <p>b. Perfluoroalkylamines;</p>	<p><i>method described in ASTM D-97 or national equivalents;</i></p> <p>3. <i>'Viscosity index' is determined using the method described in ASTM D-2270 or national equivalents;</i></p> <p>4. <i>'Thermal stability' is determined by the following test procedure or national equivalents:</i></p> <p><i>Twenty ml of the fluid under test is placed in a 46ml type 317 stainless steel chamber containing one each of 12.5 mm (nominal) diameter balls of M-10 tool steel, 52100 steel and naval bronze (60% Cu, 39% Zn, 0.75% Sn);</i></p> <p><i>The chamber is purged with nitrogen, sealed at atmospheric pressure and the temperature raised to and maintained at 644±6K (371±6°C) for six hours;</i></p> <p><i>The specimen will be considered thermally stable if, on completion of the above procedure, all of the following conditions are met:</i></p> <p>a. <i>The loss in weight of each ball is less than 10mg/mm² of ball surface;</i></p> <p>b. <i>The change in original viscosity as determined at 311K (38°C) is less than 25%; and</i></p>	

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	<ul style="list-style-type: none"> c. Perfluorocycloalkanes; or d. Perfluoroalkanes; <ul style="list-style-type: none"> 2. Density at 298K (25°C) of 1.5g/ml or more; 3. In a liquid state at 273K (0°C); and 4. Containing 60% or more by weight of fluorine. 	<p>c. <i>The total acid or base number is less than 0.40</i></p> <p>5. <i>'Autogenous ignition' temperature is determined using the method described in ASTM E-659 or national equivalents.</i></p>	
1C007	<p>Ceramic base materials, non-"composite" ceramic materials, ceramic-"matrix" "composite" materials and precursor materials, as follows:</p> <ul style="list-style-type: none"> a. Base materials of single or complex borides of titanium, having total metallic impurities, excluding intentional additions, of less than 5000ppm, an average particle size equal to or less than 5µm and no more than 10% of the particles larger than 10µm; b. Non-"composite" ceramic materials in crude or semi-fabricated form, composed of borides of titanium with a density of 98% or more of the theoretical density; c. Ceramic-ceramic "composite" materials with a glass or oxide-"matrix" and reinforced with fibres having all of the following: <ul style="list-style-type: none"> 1. Made from any of the following materials: <ul style="list-style-type: none"> a. Si-N; b. Si-C; 	<p>NB: SEE ALSO 1C107.</p> <p><u>Note:</u> 1C007.b. does not control abrasives.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>c. Si-Al-O-N; or</p> <p>d. Si-O-N; and</p> <p>2. Having a “specific tensile strength” exceeding $12.7 \times 10^3 \text{m}$;</p> <p>d. Ceramic-ceramic “composite” materials, with or without a continuous metallic phase, incorporating particles, whiskers or fibres, where carbides or nitrides of silicon, zirconium or boron form the “matrix”;</p> <p>e. Precursor materials (i.e. special purpose polymeric or metallo-organic materials) for producing any phase or phases of the materials specified in 1C007.c., as follows:</p> <p>1. Polydiorganosilanes (for producing silicon carbide);</p> <p>2. Polysilazanes (for producing silicon nitride);</p> <p>3. Polycarbosilazanes (for producing ceramics with silicon, carbon and nitrogen components);</p> <p>f. Ceramic-ceramic “composite” materials with an oxide or glass “matrix” reinforced with continuous fibres from any of the following systems:</p> <p>1. Al_2O_3 (CAS 1344-28-1); or</p> <p>2. Si-C-N.</p>	<p><u>Note:</u> 1C007.f. does not control “composites” containing fibres from these systems with a fibre tensile strength of less than 700MPa at 1273K (1000°C) or fibre tensile creep resistance of more than 1% creep strain at 100MPa load and 1273K (1000°C) for 100 hours.</p>	
1C008	<p>Non-fluorinated polymeric substances as follows:</p> <p>a. Imides, as follows:</p>	<p><u>Note:</u> 1C008.a. controls substances in liquid</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Bismaleimides; 2. Aromatic polyamide-imides (PAI) having a 'glass transition temperature (T_g)' exceeding 563K (290°C); 3. Aromatic polyimides; 4. Aromatic polyetherimides having a glass transition temperature (T_g) exceeding 513K (240°C); <p>b. Thermoplastic liquid crystal copolymers having a heat distortion temperature exceeding 523K (250°C) measured according to ISO 75-2 (2004), method A or national equivalents, with a load of 1.80N/mm² and composed of:</p> <ol style="list-style-type: none"> 1. Any of the following compounds: <ol style="list-style-type: none"> a. Phenylene, biphenylene or naphthalene; or b. Methyl, tertiary-butyl or phenyl substituted phenylene, biphenylene or naphthalene; and 2. Any of the following acids: <ol style="list-style-type: none"> a. Terephthalic acid (CAS 100-21-0); b. 6-hydroxy-2 naphthoic acid (CAS 16712-64-4); or c. 4-hydroxybenzoic acid (CAS 99-96-7); c. Not used; d. Polyarylene ketones; 	<p>or solid "fusible" form, including resin, powder, pellet, film, sheet, tape or ribbon.</p> <p><u>NB:</u> For non-"fusible" aromatic polyimides in film, sheet, tape or ribbon form, see 1A003.</p> <p><u>Technical Note:</u></p> <p>The 'glass transition temperature (T_g)' for 1C008 materials is determined using the method described in ISO 11357- 2 (1999) or national equivalents. In addition, for 1C008.a.2. materials, 'glass transition temperature (T_g)' is determined on a PAI test specimen having initially been cured at a minimum temperature of 310°C for a minimum of 15 minutes.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>e. Polyarylene sulphides, where the arylene group is biphenylene, triphenylene or combinations thereof;</p> <p>f. Polybiphenylenethersulphone having a 'glass transition temperature (T_g)' exceeding 513K (240°C).</p>		
1C009	<p>Unprocessed fluorinated compounds as follows:</p> <p>a. Copolymers of vinylidene fluoride having 75% or more beta crystalline structure without stretching;</p> <p>b. Fluorinated polyimides containing 10% by weight or more of combined fluorine;</p> <p>c. Fluorinated phosphazene elastomers containing 30% by weight or more of combined fluorine.</p>		Atomic Energy Licensing Board (AELB), MOSTI
1C010	<p>"Fibrous or filamentary materials", as follows:</p> <p>a. Organic "fibrous or filamentary materials", having both of the following:</p> <ol style="list-style-type: none"> "Specific modulus" exceeding 12.7×10^6m; and "Specific tensile strength" exceeding 23.5×10^4m; <p>b. Carbon "fibrous or filamentary materials", having both of the following:</p> <ol style="list-style-type: none"> "Specific modulus" exceeding 14.65×10^6m; and "Specific tensile strength" exceeding 26.82×10^4m; 	<p>NB: SEE ALSO 1C210 AND 9C110.</p> <p><u>Note:</u> 1C010.a. does not control polyethylene.</p> <p><u>Note:</u> 1C010.b. does not control:</p> <p>a. "Fibrous or filamentary materials", for the repair of "civil aircraft" structures or laminates, having all</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>c. Inorganic “fibrous or filamentary materials”, having both of the following:</p> <ol style="list-style-type: none"> 1. “Specific modulus” exceeding $2.54 \times 10^6 \text{m}$; and 2. Melting, softening, decomposition or sublimation point exceeding 1922K (1649°C) in an inert environment; <p>d. “Fibrous or filamentary materials”, having any of the following:</p> <ol style="list-style-type: none"> 1. Composed of any of the following: <ol style="list-style-type: none"> a. Polyetherimides specified in 1C008.a.; or b. Materials specified in 1C008.b. to 1C008.f.; or 2. Composed of materials specified in 1C010.d.1.a. or 1C010.d.1.b. and “commingled” with other fibres 	<p><i>of the following:</i></p> <ol style="list-style-type: none"> 1. An area not exceeding 1m^2 ; 2. A length not exceeding 2.5m; and 3. A width exceeding 15mm. <p><i>b. Mechanically chopped, milled or cut carbon “fibrous or filamentary materials” 25.0mm or less in length.</i></p> <p><u>Technical Note:</u></p> <p><i>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.</i></p> <p><u>Note:</u> 1C010.c. does not control:</p> <ol style="list-style-type: none"> a. Discontinuous, multiphase, polycrystalline alumina fibres in chopped fibre or random mat form, containing 3% by weight or more silica, with a “specific modulus” of less than $10 \times 10^6 \text{m}$; b. Molybdenum and molybdenum alloy fibres; 	

Category Code	Items Description	Note	Relevant Authority
	<p>specified in 1C010.a., 1C010.b. or 1C010.c.;</p> <p>e. Fully or partially resin-impregnated or pitch-impregnated “fibrous or filamentary materials” (prepregs), metal or carbon-coated “fibrous or filamentary materials” (preforms) or “carbon fibre preforms”, having all of the following:</p> <p>1. Having any of the following:</p> <p>a. Inorganic “fibrous or filamentary materials” specified in 1C010.c.; or</p> <p>b. Organic or carbon “fibrous or filamentary materials”, having all of the following:</p> <p>1. “Specific modulus” exceeding $10.15 \times 10^6 \text{m}$; and</p> <p>2. “Specific tensile strength” exceeding $17.7 \times 10^4 \text{m}$; and</p> <p>2. Having any of the following:</p> <p>a. Resin or pitch specified in 1C008 or 1C009.b.;</p> <p>b. ‘Dynamic Mechanical Analysis glass transition temperature (DMA T_g)’ equal to or exceeding 453K (180°C) and having a phenolic resin; or</p> <p>c. ‘Dynamic Mechanical Analysis glass transition temperature (DMA T_g)’ equal to or exceeding 505K (232°C) and having a resin or pitch, not specified in 1C008 or 1C009.b., and not being a phenolic resin;</p>	<p>c. <i>Boron fibres;</i></p> <p>d. <i>Discontinuous ceramic fibres with a melting, softening, decomposition or sublimation point lower than 2 043K (1 770°C) in an inert environment.</i></p> <p><u>Note 1:</u> <i>Metal or carbon-coated “fibrous or filamentary materials” (preforms) or “carbon fibre preforms”, not impregnated with resin or pitch, are specified by “fibrous or filamentary materials” in 1C010.a., 1C010.b. or 1C010.c.</i></p> <p><u>Note 2:</u> <i>1C010.e. does not control:</i></p> <p>a. <i>Epoxy resin “matrix” impregnated carbon “fibrous or filamentary materials” (prepregs) for the repair of “civil aircraft” structures or laminates, having all the following;</i></p> <p>1. <i>An area not exceeding 1m^2 ;</i></p> <p>2. <i>A length not exceeding 2.5m; and</i></p> <p>3. <i>A width exceeding 15mm.</i></p> <p>b. <i>Fully or partially resin-impregnated or pitch-impregnated mechanically chopped, milled or cut carbon</i></p>	

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		<p><i>"fibrous or filamentary materials" 25.0mm or less in length when using a resin or pitch other than those specified by 1C008 or 1C009.b.</i></p> <p><u>Technical Note:</u></p> <p><i>The 'Dynamic Mechanical Analysis glass transition temperature (DMA T_g)' for materials specified by 1C010.e. is determined using the method described in ASTM D 7028-07, or equivalent national standard, on a dry test specimen. In the case of thermoset materials, degree of cure of a dry test specimen shall be a minimum of 90% as defined by ASTM E 2160-04 or equivalent national standard.</i></p>	
1C011	<p>Metals and compounds, as follows:</p> <p>a. Metals in particle sizes of less than 60µm whether spherical, atomised, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of zirconium, magnesium and alloys thereof;</p> <p>b. Boron or boron alloys, with a particle size of 60µm or less, as follows:</p> <ol style="list-style-type: none"> 1. Boron with a purity of 85% by weight or more; 2. Boron alloys with a boron content of 85% by weight or more; <p>c. Guanidine nitrate (CAS 506-93-4);</p>	<p>NB: SEE ALSO MILITARY ITEMS LIST AND 1C111.</p> <p><u>Technical Note:</u></p> <p><i>The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.</i></p> <p><u>Note:</u> <i>The metals or alloys specified in 1C011.a. are controlled whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium or beryllium.</i></p> <p><u>Note:</u> <i>The metals or alloys specified in</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	d. Nitroguanidine (NQ) (CAS 556-88-7).	<p>1C011.b. are controlled whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium or beryllium.</p> <p><u>NB:</u> See also Military Items List for metal powders mixed with other substances to form a mixture formulated for military purposes.</p>	
1C012	<p>Materials as follows:</p> <p>a. Plutonium in any form with a plutonium isotopic assay of plutonium-238 of more than 50% by weight;</p> <p>b. "Previously separated" neptunium-237 in any form.</p>	<p><u>Technical Note:</u></p> <p>These materials are typically used for nuclear heat sources.</p> <p><u>Note:</u> 1C012.a. does not control:</p> <p>a. Shipments with a plutonium content of 1g or less;</p> <p>b. Shipments of 3 "effective grammes" or less when contained in a sensing component in instruments.</p> <p><u>Note:</u> 1C012.b. does not control shipments with a neptunium-237 content of 1g or less.</p>	Atomic Energy Licensing Board (AELB), MOSTI
1C101	Materials and devices for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures, other than those specified in 1C001, usable in 'missiles', "missile" subsystems or unmanned aerial vehicles specified in 9A012.	<p><u>Note 1:</u> 1C101 includes:</p> <p>a. Structural materials and coatings specially designed for reduced radar reflectivity;</p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><i>b. Coatings, including paints, specially designed for reduced or tailored reflectivity or emissivity in the microwave, infrared or ultraviolet regions of the electromagnetic spectrum.</i></p> <p><i><u>Note 2:</u> 1C101 does not include coatings when specially used for the thermal control of satellites.</i></p> <p><i><u>Technical Note:</u></i></p> <p><i>In 1C101 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300km.</i></p>	
1C102	Resaturated pyrolised carbon-carbon materials designed for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.		Controller
1C107	<p>Graphite and ceramic materials, other than those specified in 1C007, as follows:</p> <p>a. Fine grain graphites with a bulk density of 1.72g/cm³ or greater, measured at 288K (15°C), and having a grain size of 100µm or less, usable for rocket nozzles and re-entry vehicle nose tips, which can be machined to any of the following products:</p> <p>1. Cylinders having a diameter of 120mm or greater and a length of 50mm or greater;</p>	<p><i><u>NB:</u> See also 0C004</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>2. Tubes having an inner diameter of 65mm or greater and a wall thickness of 25mm or greater and a length of 50mm or greater; or</p> <p>3. Blocks having a size of 120mm x 120mm x 50mm or greater;</p> <p>b. Pyrolytic or fibrous reinforced graphites, usable for rocket nozzles and reentry vehicle nose tips usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;</p> <p>c. Ceramic composite materials (dielectric constant less than 6 at any frequency from 100MHz to 100GHz) for use in radomes usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;</p> <p>d. Bulk machinable silicon-carbide reinforced unfired ceramic, usable for nose tips usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;</p> <p>e. Reinforced silicon-carbide ceramic composites, usable for nose tips, reentry vehicles and nozzle flaps usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.</p>	<p><u>NB:</u> See also 0C004</p>	
1C111	<p>Propellants and constituent chemicals for propellants, other than those specified in 1C011, as follows:</p> <p>a. Propulsive substances:</p> <p>1. Spherical aluminium powder, other than that specified in the Military Items List, with particles of uniform diameter of less than 200µm and an aluminium content of 97% by</p>	<p><u>Note:</u> For propellants and constituent chemicals for propellants not specified in 1C111, see the Military Items List.</p> <p><u>Technical Note:</u></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>weight or more, if at least 10% of the total weight is made up of particles of less than 63µm, according to ISO 2591:1988 or national equivalents;</p> <p>2. Metal fuels, other than that specified in the Military Items List, in particle sizes of less than 60µm, whether spherical, atomised, spheroidal, flaked or ground, consisting 97% by weight or more of any of the following:</p> <p>a. Zirconium;</p> <p>b. Beryllium;</p> <p>c. Magnesium; or</p> <p>d. Alloys of the metals specified in a. to c. above;</p> <p>3. Oxidiser substances usable in liquid propellant rocket engines as follows:</p> <p>a. Dinitrogen trioxide (CAS 10544-73-7);</p> <p>b. Nitrogen dioxide (CAS 10102-44-0)/dinitrogen tetroxide (CAS 10544-72-6);</p> <p>c. Dinitrogen pentoxide (CAS 10102-03-1);</p> <p>d. Mixed Oxides of Nitrogen (MON);</p> <p>e. SEE MILITARY ITEMS LIST FOR Inhibited Red Fuming Nitric Acid (IRFNA);</p> <p>f. SEE MILITARY ITEMS LIST AND 1C238 FOR Compounds composed of fluorine and one or</p>	<p><i>A particle size of 63µm (ISO R-565) corresponds to 250mesh (Tyler) or 230mesh (ASTM standard E-11).</i></p> <p><u>Technical Note:</u></p> <p><i>The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.</i></p> <p><u>Technical Note:</u></p> <p><i>Mixed Oxides of Nitrogen (MON) are solutions</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>more of other halogens, oxygen or nitrogen;</p> <p>4. Hydrazine derivatives as follows:</p> <ul style="list-style-type: none"> 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 (CAS 3457-37-2); l. 2-hydroxyethylhydrazine nitrate (HEHN); m. See Military Items List for Hydrazinium perchlorate; n. Hydrazinium diperchlorate (CAS 13812-39-0); 	<p><i>of Nitric Oxide (NO) in Dinitrogen Tetroxide/Nitrogen Dioxide (N₂O₄/NO₂) that can be used in missile systems. There are a range of compositions that can be denoted as MON_i or MON_{ij}, where i and j are integers representing the percentage of Nitric Oxide in the mixture (e.g. MON3 contains 3% Nitric Oxide, MON25 25% Nitric Oxide. An upper limit is MON40, 40% by weight).</i></p> <p>NB: SEE ALSO ITEMS LIST.</p>	

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	<ul style="list-style-type: none"> o. Methylhydrazine nitrate (MHN); p. Diethylhydrazine nitrate (DEHN); q. 3,6-dihydrazino tetrazine nitrate (1,4-dihydrazine nitrate) (DHTN); <p>5. High energy density materials, other than that specified in the Military Items List, usable in 'missiles' or unmanned aerial vehicles specified in 9A012;</p> <ul style="list-style-type: none"> a. Mixed fuel that incorporate both solid and liquid fuels, such as boron slurry, having a mass-based energy density of 40×10^6 J/kg or greater; b. Other high energy density fuels and fuel additives (e.g. cubane, ionic solutions, JP-10) having a volume-based energy density of 37.5×10^9 J/m³ or greater, measured at 20°C and one atmosphere (101.325 kPa) pressure; <p>b. Polymeric substances:</p> <ul style="list-style-type: none"> 1. Carboxy-terminated polybutadiene (including carboxyl-terminated polybutadiene) (CTPB); 2. Hydroxy-terminated polybutadiene (including hydroxyl-terminated polybutadiene) (HTPB), other than that specified in the Military Items List; 3. Polybutadiene-acrylic acid (PBAA); 	<p><u>Technical Note:</u></p> <p><i>In 1C111.a.5. 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300km.</i></p> <p><u>Note:</u> 1C111.a.5.b. does not control fossil refined fuels and biofuels produced from vegetables, including fuels for engines certified for use in civil aviation, unless specially formulated for 'missiles' or unmanned aerial vehicles specified in 9A012.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>4. Polybutadiene-acrylic acid-acrylonitrile (PBAN);</p> <p>5. Polytetrahydrofuran polyethylene glycol (TPEG);</p> <p>c. Other propellant additives and agents:</p> <p>1. SEE MILITARY ITEMS LIST FOR Carboranes, decaboranes, pentaboranes and derivatives thereof;</p> <p>2. Triethylene glycol dinitrate (TEGDN) (CAS 111-22-8);</p> <p>3. 2-Nitrodiphenylamine (CAS 119-75-5);</p> <p>4. Trimethylolethane trinitrate (TMETN) (CAS 3032-55-1);</p> <p>5. Diethylene glycol dinitrate (DEGDN) (CAS 693-21-0);</p> <p>6. Ferrocene derivatives as follows:</p> <p>a. See Military Items List for catocene;</p> <p>b. Ethyl ferrocene (CAS 1273-89-8);</p> <p>c. Propyl ferrocene;</p> <p>d. See Military Items List for n-butyl ferrocene;</p> <p>e. Pentyl ferrocene (CAS 1274-00-6);</p> <p>f. Dicyclopentyl ferrocene;</p> <p>g. Dicyclohexyl ferrocene;</p> <p>h. Diethyl ferrocene (CAS 1273-97-8);</p>	<p><u>Technical Note:</u></p> <p><i>Polytetrahydrofuran polyethylene glycol (TPEG) is a block co-polymer of poly 1,4-Butanediol and polyethylene glycol (PEG).</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> i. Dipropyl ferrocene; j. Dibutyl ferrocene (CAS 1274-08-4); k. Dihexyl ferrocene (CAS 93894-59-8); l. Acetyl ferrocene (CAS 1271-55-2) / 1,1'-diacetyl ferrocene (CAS 1273-94-5); m. See Military Items List for ferrocene Carboxylic acids; n. See Military Items List for butacene; o. Other ferrocene derivatives usable as rocket propellant burning rate modifiers, other than those specified in the Military Items List. <p>7. 4,5 diazidomethyl-2-methyl-1,2,3-triazole (iso- DAMTR), other than that specified in the Military Items List.</p>	<p><i>Note: 1C111.c.6.o. does not control ferrocene derivatives that contain a six carbon aromatic functional group attached to the ferrocene molecule.</i></p>	
1C116	Maraging steels having an ultimate tensile strength of 1500 MPa or greater, measured at 293K (20°C), in the form of sheet, plate or tubing with a wall or plate thickness equal to or less than 5 mm.	<p>NB: SEE ALSO 1C216.</p> <p><u>Technical Note:</u></p> <p><i>Maraging steels are iron alloys generally characterised by high nickel, very low carbon content and the use of substitutional elements</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<i>or precipitates to produce strengthening and age-hardening of the alloy.</i>	
1C117	<p>Materials for the fabrication of 'missiles' components as follows:</p> <ol style="list-style-type: none"> Tungsten and alloys in particulate form with a tungsten content of 97% by weight or more and a particle size of $50 \times 10^{-6} \text{m}$ (50μm) or less; Molybdenum and alloys in particulate form with a molybdenum content of 97% by weight or more and a particle size of $50 \times 10^{-6} \text{m}$ (50μm) or less; Tungsten materials in solid form having all of the following: <ol style="list-style-type: none"> Any of the following material compositions: <ol style="list-style-type: none"> Tungsten and alloys containing 97% by weight or more of tungsten; Copper infiltrated tungsten containing 80% by weight or more of tungsten; or Silver infiltrated tungsten containing 80% by weight or more of tungsten; and Able to be machined to any of the following products: <ol style="list-style-type: none"> Cylinders having a diameter of 120mm or greater and a length of 50mm or greater; Tubes having an inner diameter of 65mm or greater and a wall thickness of 25mm or greater and a length of 50mm or greater; or 	<p><u>Technical Note:</u></p> <p><i>In 1C117 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300km.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	c. Blocks having a size of 120mm by 120mm by 50mm or greater.		
1C118	<p>Titanium-stabilised duplex stainless steel (Ti-DSS) having all of the following:</p> <p>a. Having all of the following characteristics:</p> <ol style="list-style-type: none"> 1. Containing 17.0-23.0 weight percent chromium and 4.5-7.0 weight percent nickel; 2. Having a titanium content of greater than 0.10 weight percent; and 3. A ferritic-austenitic microstructure (also referred to as a two-phase microstructure) of which at least 10 percent is austenite by volume (according to ASTM E-1181-87 or national equivalents); and <p>b. Having any of the following forms:</p> <ol style="list-style-type: none"> 1. Ingots or bars having a size of 100mm or more in each dimension; 2. Sheets having a width of 600mm or more and a thickness of 3mm or less; or 3. Tubes having an outer diameter of 600mm or more and a wall thickness of 3mm or less. 		Controller
1C202	Alloys, other than those specified in 1C002.b.3. or.b.4., as	<u>Technical Note:</u>	Atomic Energy

Category Code	Items Description	Note	Relevant Authority
	<p>follows:</p> <p>a. Aluminium alloys having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. 'Capable of' an ultimate tensile strength of 460MPa or more at 293K (20°C); and 2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75mm; <p>b. Titanium alloys having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. 'Capable of' an ultimate tensile strength of 900MPa or more at 293K (20°C); and 2. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75mm. 	<p><i>The phrase alloys 'capable of' encompasses alloys before or after heat treatment.</i></p>	Licensing Board (AELB), MOSTI
1C210	<p>'Fibrous or filamentary materials' or prepregs, other than those specified in 1C010.a., b. or e., as follows:</p> <p>a. Carbon or aramid 'fibrous or filamentary materials' having either of the following characteristics:</p> <ol style="list-style-type: none"> 1. A "specific modulus" of 12.7×10^6 m or greater; or 2. A "specific tensile strength" of 235×10^3 m or greater; <p>b. Glass 'fibrous or filamentary materials' having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. A "specific modulus" of 3.18×10^6 m or greater; and 2. A "specific tensile strength" of 76.2×10^3 m or greater; 	<p><u>Note:</u> In 1C210, 'fibrous or filamentary materials' is restricted to continuous "monofilaments", "yarns", "rovings", "tows" or "tapes".</p> <p><u>Note:</u> 1C210.a. does not control aramid 'fibrous or filamentary materials' having 0.25 percent or more by weight of an ester based fibre surface modifier;</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	c. Thermoset resin impregnated continuous “yarns”, “rovings”, “tows” or “tapes” with a width of 15mm or less (prepregs), made from carbon or glass ‘fibrous or filamentary materials’ specified in 1C210.a. or b.	<p><u>Technical Note:</u></p> <p><i>The resin forms the matrix of the composite.</i></p>	
1C216	Maraging steel, other than that specified in 1C116, ‘capable of’ an ultimate tensile strength of 2050MPa or more, at 293K (20°C).	<p><u>Note:</u> 1C216 does not control forms in which all linear dimensions are 75 mm or less.</p> <p><u>Technical Note:</u></p> <p><i>The phrase maraging steel ‘capable of’ encompasses maraging steel before or after heat treatment.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
1C225	Boron enriched in the boron-10 (^{10}B) isotope to greater than its natural isotopic abundance, as follows: elemental boron, compounds, mixtures containing boron, manufactures thereof, waste or scrap of any of the foregoing.	<p><u>Note:</u> In 1C225 mixtures containing boron include boron loaded materials.</p> <p><u>Technical Note:</u></p> <p><i>The natural isotopic abundance of boron-10 is approximately 18.5weight per cent (20 atom per cent).</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
1C226	<p>Tungsten, tungsten carbide, and alloys containing more than 90% tungsten by weight, other than that specified by 1C117, having both of the following characteristics:</p> <p>a. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100mm and 300mm; and</p>	<p><u>Note:</u> 1C226 does not control manufactures specially designed as weights or gamma-ray collimators.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	b. A mass greater than 20kg.		
1C227	Calcium having both of the following characteristics: a. Containing less than 1000 parts per million by weight of metallic impurities other than magnesium; and b. Containing less than 10 parts per million by weight of boron.		Atomic Energy Licensing Board (AELB), MOSTI
1C228	Magnesium having both of the following characteristics: a. Containing less than 200 parts per million by weight of metallic impurities other than calcium; and b. Containing less than 10 parts per million by weight of boron.		Atomic Energy Licensing Board (AELB), MOSTI
1C229	Bismuth having both of the following characteristics: a. A purity of 99.99 % or greater by weight; and b. Containing less than 10 parts per million by weight of silver.		Pharmaceutical Services Division, MOH
1C230	Beryllium metal, alloys containing more than 50% beryllium by weight, beryllium compounds, manufactures thereof, and waste or scrap of any of the foregoing, other than that specified in the Military Items List.	NB: SEE ALSO MILITARY ITEMS LIST. <u>Note:</u> 1C230 does not control the following: a. Metal windows for X-ray machines, or for bore-hole logging devices; b. Oxide shapes in fabricated or semi-fabricated forms specially designed for electronic component	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<p>parts or as substrates for electronic circuits;</p> <p>c. Beryl (silicate of beryllium and aluminium) in the form of emeralds or aquamarines.</p>	
1C231	Hafnium metal, alloys containing more than 60% hafnium by weight, hafnium compounds containing more than 60% hafnium by weight, manufactures thereof, and waste or scrap of any of the foregoing.		Atomic Energy Licensing Board (AELB), MOSTI
1C232	Helium-3 (^3He), mixtures containing helium-3, and products or devices containing any of the foregoing.	<u>Note:</u> 1C232 does not control a product or device containing less than 1g of helium-3.	Atomic Energy Licensing Board (AELB), MOSTI
1C233	Lithium enriched in the lithium-6 (^6Li) isotope to greater than its natural isotopic abundance, and products or devices containing enriched lithium, as follows: elemental lithium, alloys, compounds, mixtures containing lithium, manufactures thereof, waste or scrap of any of the foregoing.	<p><u>Note:</u> 1C233 does not control thermoluminescent dosimeters.</p> <p><u>Technical Note:</u></p> <p>The natural isotopic abundance of lithium-6 is approximately 6.5 weight per cent (7.5atom per cent).</p>	Atomic Energy Licensing Board (AELB), MOSTI
1C234	Zirconium with a hafnium content of less than 1 part hafnium to 500 parts zirconium by weight, as follows: metal, alloys containing more than 50% zirconium by weight, compounds, manufactures thereof, waste or scrap of any of the foregoing.	<u>Note:</u> 1C234 does not control zirconium in the form of foil having a thickness of 0.10 mm or less.	Atomic Energy Licensing Board (AELB), MOSTI
1C235	Tritium, tritium compounds, mixtures containing tritium in which the ratio of tritium to hydrogen atoms exceeds 1 part in 1000, and products or devices containing any of the foregoing.	<u>Note:</u> 1C235 does not control a product or device containing less than $1.48 \times 10^3 \text{GBq}$ (40Ci) of tritium.	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
1C236	Alpha-emitting radionuclides having an alpha half-life of 10 days or greater but less than 200 years, in the following forms: <ul style="list-style-type: none"> a. Elemental; b. Compounds having a total alpha activity of 37GBq/kg (1Ci/kg) or greater; c. Mixtures having a total alpha activity of 37GBq/kg (1Ci/kg) or greater; d. Products or devices containing any of the foregoing. 	<u>Note:</u> 1C236 does not control a product or device containing less than 3.7GBq (100millicuries) of alpha activity.	Atomic Energy Licensing Board (AELB), MOSTI
1C237	Radium-226 (²²⁶ Ra), radium-226 alloys, radium-226 compounds, mixtures containing radium-226, manufactures thereof, and products or devices containing any of the foregoing.	<u>Note:</u> 1C237 does not control the following: <ul style="list-style-type: none"> a. Medical applicators; b. A product or device containing less than 0.37GBq (10millicuries) of radium-226. 	Atomic Energy Licensing Board (AELB), MOSTI
1C238	Chlorine trifluoride (ClF ₃).		Atomic Energy Licensing Board (AELB), MOSTI
1C239	High explosives, other than those specified in the Military Items List, or substances or mixtures containing more than 2% by weight thereof, with a crystal density greater than 1.8g/cm ³ and having a detonation velocity greater than 8000m/s.		Atomic Energy Licensing Board (AELB), MOSTI
1C240	Nickel powder and porous nickel metal, other than those specified in 0C005, as follows: <ul style="list-style-type: none"> a. Nickel powder having both of the following characteristics: 	<u>Note:</u> 1C240 does not control the following: <ul style="list-style-type: none"> a. Filamentary nickel powders; 	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. A nickel purity content of 99.0% or greater by weight; and 2. A mean particle size of less than 10 micrometres measured by American Society for Testing and Materials (ASTM) B330 standard; <p>b. Porous nickel metal produced from materials specified in 1C240.a.</p>	<p><i>b. Single porous nickel sheets with an area of 1000cm² per sheet or less.</i></p> <p><u>Technical Note:</u></p> <p><i>1C240.b. refers to porous metal formed by compacting and sintering the materials in 1C240.a. to form a metal material with fine pores interconnected throughout the structure.</i></p>	
1C350	<p>Chemicals, which may be used as precursors for toxic chemical agents, as follows, and “chemical mixtures” containing one or more thereof:</p> <ol style="list-style-type: none"> 1. Thiodiglycol (111-48-8); 2. Phosphorus oxychloride (10025-87-3); 3. Dimethyl methylphosphonate (756-79-6); 4. SEE MILITARY ITEMS LIST FOR Methyl phosphonyl difluoride (676-99-3); 5. Methyl phosphonyl dichloride (676-97-1); 6. Dimethyl phosphite (DMP) (868-85-9); 7. Phosphorus trichloride (7719-12-2); 	<p>NB: SEE ALSO MILITARY ITEMS LIST AND 1C450.</p> <p><u>Note 1:</u> <i>For exports to “States not Party to the Chemical Weapons Convention”, 1C350 does not control “chemical mixtures” containing one or more of the chemicals specified in entries 1C350.1, .3, .5, .11, .12, .13, .17, .18, .21, .22, .26, .27, .28, .31, .32, .33, .34, .35, .36, .54, .55, .56, .57 and .63 in which no individually specified chemical constitutes more than 10 % by the weight of the mixture.</i></p> <p><u>Note 2:</u> <i>For exports to “States Party to the Chemical Weapons Convention”, 1C350 does not control “chemical mixtures” containing one or more of</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	8. Trimethyl phosphite (TMP) (121-45-9);	<p><i>the chemicals specified in entries 1C350.1, .3, .5, .11, .12, .13, .17, .18, .21, .22, .26, .27, .28, .31, .32, .33, .34, .35, .36, .54, .55, .56, .57 and .63 in which no individually specified chemical constitutes more than 30 % by the weight of the mixture.</i></p>	
	9. Thionyl chloride (7719-09-7);		Pharmaceutical Services Division, MOH
	10. 3-Hydroxy-1-methylpiperidine (3554-74-3);		Controller
	11. N,N-Diisopropyl-(beta)-aminoethyl chloride (96-79-7);	<p><u>Note 3:</u> 1C350 does not control “chemical mixtures” containing one or more of the chemicals specified in entries 1C350.2, .6, .7, .8, .9, .10, .14, .15, .16, .19, .20, .24, .25, .30, .37, .38, .39, .40, .41, .42, .43, .44, .45, .46, .47, .48, .49, .50, .51, .52, .53, .58, .59, .60, .61 and .62 in which no individually specified chemical constitutes more than 30 % by the weight of the mixture.</p>	
	12. N,N-Diisopropyl-(beta)-aminoethane thiol (5842-07-9);		
	13. 3-Quinuclidinol (1619-34-7);	<p><u>Note 4:</u> 1C350 does not control products identified as consumer goods packaged for retail sale for personal use or packaged for individual use.</p>	
	14. Potassium fluoride (7789-23-3);		
	15. 2-Chloroethanol (107-07-3);		
	16. Dimethylamine (124-40-3);		
	17. Diethyl ethylphosphonate (78-38-6);		
	18. Diethyl-N,N-dimethylphosphoramidate (2404-03-7);		
	19. Diethyl phosphite (762-04-9);		
	20. Dimethylamine hydrochloride (506-59-2);		
	21. Ethyl phosphinyl dichloride (1498-40-4);		
	22. Ethyl phosphonyl dichloride (1066-50-8);		
	23. SEE MILITARY ITEMS LIST FOR Ethyl phosphonyl difluoride (753-98-0);		

Category Code	Items Description	Note	Relevant Authority
	24. Hydrogen fluoride (7664-39-3);		Pharmaceutical Services Division, MOH
	25. Methyl benzoate (76-89-1); 26. Methyl phosphinyl dichloride (676-83-5); 27. N,N-Diisopropyl-(beta)-amino ethanol (96-80-0); 28. Pinacolyl alcohol (464-07-3); 29. SEE MILITARY ITEMS LIST FOR O-Ethyl-2-diisopropylaminoethyl methyl phosphonite (QL) (57856-11-8); 30. Triethyl phosphite (122-52-1);		Controller
	31. Arsenic trichloride (7784-34-1);		Pharmaceutical Services Division, MOH
	32. Benzoic acid (76-93-7); 33. Diethyl methylphosphonite (15715-41-0); 34. Dimethyl ethylphosphonate (6163-75-3); 35. Ethyl phosphinyl difluoride (430-78-4); 36. Methyl phosphinyl difluoride (753-59-3);		Controller

Category Code	Items Description	Note	Relevant Authority
	37. 3-Quinuclidone (3731-38-2);		
	38. Phosphorus pentachloride (10026-13-8);		
	39. Pinacolone (75-97-8);		Pharmaceutical Services Division, MOH
	40. Potassium cyanide (151-50-8);		
	41. Potassium bifluoride (7789-29-9);		Controller
	42. Ammonium hydrogen fluoride or ammonium bifluoride (1341-49-7);		
	43. Sodium fluoride (7681-49-4);		Pharmaceutical Services Division, MOH
	44. Sodium bifluoride (1333-83-1);		Controller
	45. Sodium cyanide (143-33-9);		Pharmaceutical Services Division, MOH
	46. Triethanolamine (102-71-6);		Controller
	47. Phosphorus pentasulphide (1314-80-3);		
	48. Di-isopropylamine (108-18-9);		
	49. Diethylaminoethanol (100-37-8);		

Category Code	Items Description	Note	Relevant Authority
	50. Sodium sulphide (1313-82-2);		
	51. Sulphur monochloride (10025-67-9);		
	52. Sulphur dichloride (10545-99-0);		
	53. Triethanolamine hydrochloride (637-39-8);		
	54. N,N-Diisopropyl-(Beta)-aminoethyl chloride hydrochloride (4261-68-1);		
	55. Methylphosphonic acid (993-13-5);		
	56. Diethyl methylphosphonate (683-08-9);		
	57. N,N-Dimethylaminophosphoryl dichloride (677-43-0);		
	58. Triisopropyl phosphite (116-17-6);		
	59. Ethyldiethanolamine (139-87-7);		
	60. O,O-Diethyl phosphorothioate (2465-65-8);		
	61. O,O-Diethyl phosphorodithioate (298-06-6);		
	62. Sodium hexafluorosilicate (16893-85-9);		Pharmaceutical Services Division, MOH
	63. Methylphosphonothioic dichloride (676-98-2).		Controller
1C351	Human pathogens, zoonoses and "toxins", as follows: a. Viruses, whether natural, enhanced or modified, either in the	<i>Note: 1C351 does not control "vaccines" or "immunotoxins".</i>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <ol style="list-style-type: none"> 1. Andes virus; 2. Chapare virus; 3. Chikungunya virus; 4. Choclo virus; 5. Congo-Crimean haemorrhagic fever virus; 6. Dengue fever virus; 7. Dobrava-Belgrade virus; 8. Eastern equine encephalitis virus; 9. Ebola virus; 10. Guanarito virus; 11. Hantaan virus; 12. Hendra virus (Equine morbillivirus); 13. Japanese encephalitis virus; 14. Junin virus; 15. Kyasanur Forest virus; 		

Category Code	Items Description	Note	Relevant Authority
	<p>16. Laguna Negra virus;</p> <p>17. Lassa fever virus;</p> <p>18. Louping ill virus;</p> <p>19. Lujo virus;</p> <p>20. Lymphocytic choriomeningitis virus;</p> <p>21. Machupo virus;</p> <p>22. Marburg virus;</p> <p>23. Monkey pox virus;</p> <p>24. Murray Valley encephalitis virus;</p> <p>25. Nipah virus;</p> <p>26. Omsk haemorrhagic fever virus;</p> <p>27. Oropouche virus;</p> <p>28. Powassan virus;</p> <p>29. Rift Valley fever virus;</p> <p>30. Rocio virus;</p> <p>31. Sabia virus;</p> <p>32. Seoul virus;</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>33. Sin nombre virus;</p> <p>34. St Louis encephalitis virus;</p> <p>35. Tick-borne encephalitis virus (Russian Spring-Summer encephalitis virus);</p> <p>36. Variola virus;</p> <p>37. Venezuelan equine encephalitis virus;</p> <p>38. Western equine encephalitis virus;</p> <p>39. Yellow fever virus;</p> <p>b. Rickettsiae, whether natural, enhanced or modified, either in the form of "isolated live cultures" or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <p>1. Coxiella burnetii;</p> <p>2. Bartonella quintana (Rochalimaea quintana, Rickettsia quintana);</p> <p>3. Rickettsia prowasecki;</p> <p>4. Rickettsia rickettsii;</p> <p>c. Bacteria, whether natural, enhanced or modified, either in the form of "isolated live cultures" or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p>		

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Bacillus anthracis; 2. Brucella abortus; 3. Brucella melitensis; 4. Brucella suis; 5. Chlamydia psittaci; 6. Clostridium botulinum; 7. Francisella tularensis; 8. Burkholderia mallei (Pseudomonas mallei); 9. Burkholderia pseudomallei (Pseudomonas pseudomallei); 10. Salmonella typhi; 11. Shigella dysenteriae; 12. Vibrio cholerae; 13. Yersinia pestis; 14. Clostridium perfringens epsilon toxin producing types; 15. Enterohaemorrhagic Escherichia coli, serotype O157 and other verotoxin producing serotypes; <p>d. "Toxins", as follows, and "sub-unit of toxins" thereof:</p>		

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Botulinum toxins; 2. Clostridium perfringens toxins; 3. Conotoxin; 4. Ricin; 5. Saxitoxin; 6. Shiga toxin; 7. Staphylococcus aureus toxins; 8. Tetrodotoxin; 9. Verotoxin and shiga-like ribosome inactivating proteins; 10. Microcystin (Cyanginosin); 11. Aflatoxins; 12. Abrin; 13. Cholera toxin; 14. Diacetoxyscirpenol toxin; 15. T-2 toxin; 16. HT-2 toxin; 17. Modeccin; 	<p><i>Note: 1C351.d. does not control botulinum toxins or conotoxins in product form meeting all of the following criteria:</i></p> <ol style="list-style-type: none"> <i>1. Are pharmaceutical formulations designed for human administration in the treatment of medical conditions;</i> <i>2. Are pre-packaged for distribution as medical products;</i> <i>3. Are authorised by a state authority to be marketed as medical products.</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>18. Volkensin;</p> <p>19. Viscum album Lectin 1 (Viscumin);</p> <p>e. Fungi, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <p>1. Coccidioides immitis;</p> <p>2. Coccidioides posadasii.</p>		
1C352	<p>Animal pathogens, as follows:</p> <p>a. Viruses, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <p>1. African swine fever virus;</p> <p>2. Avian influenza virus, which are:</p> <p>a. Uncharacterised; or</p> <p>b. Defined in Annex I(2) to Council Directive 2005/94/EC of 20 December 2005 on Community measures for the control of avian influenza (OJ L 10, 14.1.2006, p. 16) as having high pathogenicity, as follows:</p> <p>1. Type A viruses with an IVPI (intravenous pathogenicity index) in 6 week old chickens of</p>	<u>Note:</u> 1C352 does not control “vaccines”.	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>greater than 1.2; or</p> <ol style="list-style-type: none"> 2. Type A viruses of the subtypes H5 or H7 with genome sequences codified for multiple basic amino acids at the cleavage site of the haemagglutinin molecule similar to that observed for other HPAI viruses, indicating that the haemagglutinin molecule can be cleaved by a host ubiquitous protease; 3. Bluetongue virus; 4. Foot and mouth disease virus; 5. Goat pox virus; 6. Porcine herpes virus (Aujeszky's disease); 7. Swine fever virus (Hog cholera virus); 8. Lyssa virus; 9. Newcastle disease virus; 10. Peste des petits ruminants virus; 11. Porcine enterovirus type 9 (swine vesicular disease virus); 12. Rinderpest virus; 13. Sheep pox virus; 14. Teschen disease virus; 		

Category Code	Items Description	Note	Relevant Authority
	<p>15. Vesicular stomatitis virus;</p> <p>16. Lumpy skin disease virus;</p> <p>17. African horse sickness virus.</p> <p>b. Mycoplasmas, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <p>1. Mycoplasma mycoides subspecies mycoides SC (small colony);</p> <p>2. Mycoplasma capricolum subspecies capripneumoniae.</p>		
1C353	<p>Genetic elements and genetically modified organisms, as follows:</p> <p>a. Genetically modified organisms or genetic elements that contain nucleic acid sequences associated with pathogenicity of organisms specified in 1C351.a., 1C351.b., 1C351.c, 1C351.e., 1C352 or 1C354;</p> <p>b. Genetically modified organisms or genetic elements that contain nucleic acid sequences coding for any of the “toxins” specified in 1C351.d. or “sub-units of toxins” thereof.</p>	<p><u>Technical Notes:</u></p> <p>1. Genetic elements include, inter alia, chromosomes, genomes, plasmids, transposons and vectors whether genetically modified or unmodified.</p> <p>2. Nucleic acid sequences associated with the pathogenicity of any of the micro-organisms specified in 1C351.a., 1C351.b., 1C351.c., 1C351.e., 1C352 or 1C354 means any sequence specific to the specified micro-organism that:</p> <p>a. In itself or through its transcribed or translated products represents a significant hazard to human, animal or</p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><i>plant health; or</i></p> <p><i>b. Is known to enhance the ability of a specified micro-organism, or any other organism into which it may be inserted or otherwise integrated, to cause serious harm to humans, animals or plant health.</i></p> <p><u>Note:</u> 1C353 does not apply to nucleic acid sequences associated with the pathogenicity of enterohaemorrhagic <i>Escherichia coli</i>, serotype O157 and other verotoxin producing strains, other than those coding for the verotoxin, or for its sub-units.</p>	
1C354	<p>Plant pathogens, as follows:</p> <p>a. Viruses, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material including living material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <ol style="list-style-type: none"> Potato Andean latent tymovirus; Potato spindle tuber viroid; <p>b. Bacteria, whether natural, enhanced or modified, either in the form of “isolated live cultures” or as material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <ol style="list-style-type: none"> Xanthomonas albilineans; 		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>2. <i>Xanthomonas campestris</i> pv. <i>citri</i> including strains referred to as <i>Xanthomonas campestris</i> pv. <i>citri</i> types A,B,C,D,E or otherwise classified as <i>Xanthomonas citri</i>, <i>Xanthomonas campestris</i> pv. <i>aurantifolia</i> or <i>Xanthomonas campestris</i> pv. <i>citrumelo</i>;</p> <p>3. <i>Xanthomonas oryzae</i> pv. <i>Oryzae</i> (<i>Pseudomonas campestris</i> pv. <i>Oryzae</i>);</p> <p>4. <i>Clavibacter michiganensis</i> subsp. <i>Sepedonicus</i> (<i>Corynebacterium michiganensis</i> subsp. <i>Sepedonicum</i> or <i>Corynebacterium Sepedonicum</i>);</p> <p>5. <i>Ralstonia solanacearum</i> Races 2 and 3 (<i>Pseudomonas solanacearum</i> Races 2 and 3 or <i>Burkholderia solanacearum</i> Races 2 and 3);</p> <p>c. Fungi, whether natural, enhanced or modified, either in the form of "isolated live cultures" or as material which has been deliberately inoculated or contaminated with such cultures, as follows:</p> <p>1. <i>Colletotrichum coffeanum</i> var. <i>virulans</i> (<i>Colletotrichum kahawae</i>);</p> <p>2. <i>Cochliobolus miyabeanus</i> (<i>Helminthosporium oryzae</i>);</p> <p>3. <i>Microcyclus ulei</i> (syn. <i>Dothidella ulei</i>);</p> <p>4. <i>Puccinia graminis</i> (syn. <i>Puccinia graminis</i> f. sp. <i>tritici</i>);</p> <p>5. <i>Puccinia striiformis</i> (syn. <i>Puccinia glumarum</i>);</p> <p>6. <i>Magnaporthe grisea</i> (<i>pyricularia grisea/pyricularia</i></p>		

Category Code	Items Description	Note	Relevant Authority
	oryzae).		
1C450	<p>Toxic chemicals and toxic chemical precursors, as follows, and “chemical mixtures” containing one or more thereof:</p> <p>a. Toxic chemicals, as follows:</p> <ol style="list-style-type: none"> 1. Amiton: O,O-Diethyl S-[2-(diethylamino)ethyl] phosphorothiolate (78-53-5) and corresponding alkylated or protonated salts; 2. PFIB: 1,1,3,3,3-Pentafluoro-2-(trifluoromethyl)-1-propene (382-21-8); 3. SEE MILITARY ITEMS LIST FOR BZ: 3-Quinuclidinyl benzilate (6581-06-2); 4. Phosgene: Carbonyl dichloride (75-44-5); 5. Cyanogen chloride (506-77-4); 	<p>NB: SEE ALSO ENTRY 1C350, 1C351.d. AND MILITARY ITEMS LIST.</p> <p><i>Note 1: For exports to “States not Party to the Chemical Weapons Convention”, 1C450 does not control “chemical mixtures” containing one or more of the chemicals specified in entries 1C450.a.1. and .a.2. in which no individually specified chemical constitutes more than 1 % by the weight of the mixture.</i></p> <p><i>Note 2: For exports to “States Party to the Chemical Weapons Convention”, 1C450 does not control “chemical mixtures” containing one or more of the chemicals specified in entries 1C450.a.1. and .a.2. in which no individually specified chemical constitutes more than 30 % by the weight of the mixture.</i></p>	Controller
	6. Hydrogen cyanide (74-90-8);	<i>Note 3: 1C450 does not control “chemical mixtures” containing one or more of the chemicals specified in entries 1C450.a.4., .a.5., .a.6. and .a.7. in which no individually specified chemical constitutes more than 30 % by the weight of the mixture.</i>	Pharmaceutical Services Division, MOH
	7. Chloropicrin: Trichloronitromethane (76-06-2);	<i>Note 4: 1C450 does not control products identified as consumer goods packaged for retail sale for personal use or packaged for individual use.</i>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Toxic chemical precursors, as follows:</p> <ol style="list-style-type: none"> 1. Chemicals, other than those specified in the Military Items List or in 1C350, containing a phosphorus atom to which is bonded one methyl, ethyl or propyl (normal or iso) group but not further carbon atoms; 2. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] phosphoramidic dihalides, other than N,N-Dimethylaminophosphoryl dichloride; 3. Dialkyl [methyl, ethyl or propyl (normal or iso)] N,N-dialkyl [methyl, ethyl or propyl (normal or iso)]-phosphoramidates, other than Diethyl-N,N-dimethylphosphoramidate which is specified in 1C350; 4. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] aminoethyl-2-chlorides and corresponding protonated salts, other than N,N-Diisopropyl-(beta)-aminoethyl chloride or N,N-Diisopropyl-(beta)- aminoethyl chloride hydrochloride which are specified in 1C350; 5. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] aminoethane-2-ols and corresponding protonated salts, other than N,N-Diisopropyl-(beta)-aminoethanol (96-80-0) and N,N-Diethylaminoethanol (100-37-8) which are specified in 1C350; 6. N,N-Dialkyl [methyl, ethyl or propyl (normal or iso)] aminoethane-2-thiols and corresponding protonated 	<p><u>Note:</u> 1C450.b.1 does not control Fonofos: O-Ethyl S-phenyl ethylphosphonothiolothionate (944-22-9);</p> <p><u>NB:</u> See 1C350.57. for N,N-Dimethylaminophosphoryl dichloride.</p> <p><u>Note:</u> 1C450.b.5. does not control the following:</p> <ol style="list-style-type: none"> a. N,N-Dimethylaminoethanol (108-01-0) and corresponding protonated salts; b. Protonated salts of N,N-Diethylaminoethanol (100-37-8); <p><u>Note 1:</u> For exports to "States not Party to the Chemical Weapons Convention", 1C450 does not control "chemical mixtures" containing one or more of the chemicals specified in entries</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>salts, other than N,N-Diisopropyl-(beta)-aminoethane thiol which is specified in 1C350;</p> <p>7. See 1C350 for ethyldiethanolamine (139-87-7);</p> <p>8. Methyldiethanolamine (105-59-9).</p>	<p>1C450.b.1., .b.2., .b.3., .b.4., .b.5. and .b.6. in which no individually specified chemical constitutes more than 10 % by the weight of the mixture.</p> <p><u>Note 2:</u> For exports to “States Party to the Chemical Weapons Convention”, 1C450 does not control “chemical mixtures” containing one or more of the chemicals specified in entries 1C450.b.1., .b.2., .b.3., .b.4., .b.5. and .b.6. in which no individually specified chemical constitutes more than 30% by the weight of the mixture.</p> <p><u>Note 3:</u> 1C450 does not control “chemical mixtures” containing one or more of the chemicals specified in entry 1C450.b.8. in which no individually specified chemical constitutes more than 30% by the weight of the mixture.</p> <p><u>Note 4:</u> 1C450 does not control products identified as consumer goods packaged for retail sale for personal use or packaged for individual use.</p>	
1D	Software		
1D001	“Software” specially designed or modified for the “development”, “production” or “use” of equipment specified in 1B001 to 1B003.		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
1D002	"Software" for the "development" of organic "matrix", metal "matrix" or carbon "matrix" laminates or "composites".		Atomic Energy Licensing Board (AELB), MOSTI
1D003	"Software" specially designed or modified to enable equipment to perform the functions of equipment specified in 1A004.c. or 1A004.d.		Atomic Energy Licensing Board (AELB), MOSTI
1D101	"Software" specially designed or modified for the "use" of goods specified in 1B101 1B102, 1B115, 1B117, 1B118 or 1B119.		Atomic Energy Licensing Board (AELB), MOSTI
1D103	"Software" specially designed for analysis of reduced observables such as radar reflectivity, ultraviolet/ infrared signatures and acoustic signatures.		Atomic Energy Licensing Board (AELB), MOSTI
1D201	"Software" specially designed for the "use" of goods specified in 1B201.		Atomic Energy Licensing Board (AELB), MOSTI
1E	Technology		
1E001	"Technology" according to the General Technology Note for the "development" or "production" of equipment or materials specified in 1A001.b., 1A001.c., 1A002 to 1A005, 1A006.b., 1A007, 1B or 1C.		Atomic Energy Licensing Board (AELB), MOSTI
1E002	Other "technology" as follows: a. "Technology" for the "development" or "production" of polybenzothiazoles or polybenzoxazoles; b. "Technology" for the "development" or "production" of fluoroelastomer compounds containing at least one vinyl ether		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>monomer;</p> <p>c. "Technology" for the design or "production" of the following base materials or non-"composite" ceramic materials:</p> <p>1. Base materials having all of the following:</p> <p>a. Any of the following compositions:</p> <ol style="list-style-type: none"> 1. Single or complex oxides of zirconium and complex oxides of silicon or aluminium; 2. Single nitrides of boron (cubic crystalline forms); 3. Single or complex carbides of silicon or boron; or 4. Single or complex nitrides of silicon; <p>b. Either of the following total metallic impurities (excluding intentional additions):</p> <ol style="list-style-type: none"> 1. Less than 1000ppm for single oxides or carbides; or 2. Less than 5000ppm for complex compounds or single nitrides; and <p>c. Being any of the following:</p> <ol style="list-style-type: none"> 1. Zirconia (CAS 1314-23-4) with an average particle size equal to or less than 1µm and no more than 10% of the particles larger than 5µm; 2. Other base materials with an average particle 		

Category Code	Items Description	Note	Relevant Authority
	<p>size equal to or less than 5µm and no more than 10% of the particles larger than 10µm; or</p> <p>3. Having all of the following:</p> <p>a. Platelets with a length to thickness ratio exceeding 5;</p> <p>b. Whiskers with a length to diameter ratio exceeding 10 for diameters less than 2µm; and</p> <p>c. Continuous or chopped fibres less than 10µm in diameter;</p> <p>2. Non-“composite” ceramic materials composed of the materials specified in 1E002.c.1;</p> <p>d. “Technology” for the “production” of aromatic polyamide fibres;</p> <p>e. “Technology” for the installation, maintenance or repair of materials specified in 1C001;</p> <p>f. “Technology” for the repair of “composite” structures, laminates or materials specified in 1A002, 1C007.c. or 1C007.d.;</p> <p>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.</p>	<p><i>Note: 1E002.c.2. does not control “technology” for the design or production of abrasives.</i></p> <p><i>Note: 1E002.f. does not control “technology” for the repair of “civil aircraft” structures using carbon “fibrous or filamentary materials” and</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>epoxy resins, contained in aircraft manufacturers' manuals.</i></p> <p><u>Technical Note:</u></p> <p><i>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.</i></p>	
1E101	"Technology" according to the General Technology Note for the "use" of goods specified in 1A102, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C101, 1C107, 1C111 to 1C118, 1D101 or 1D103.		Controller
1E102	"Technology" according to the General Technology Note for the "development" of "software" specified in 1D001, 1D101 or 1D103.		Controller
1E103	"Technology" for the regulation of temperature, pressure or atmosphere in autoclaves or hydroclaves, when used for the "production" of "composites" or partially processed "composites".		Controller
1E104	"Technology" relating to the "production" of pyrolytically derived materials formed on a mould, mandrel or other substrate from precursor gases which decompose in the 1573K (1300°C) to 3173K (2900°C) temperature range at pressures of 130Pa to 20kPa.	<u>Note:</u> 1E104 includes "technology" for the composition of precursor gases, flow-rates and process control schedules and parameters.	Controller
1E201	"Technology" according to the General Technology Note for the "use" of goods specified in 1A002, 1A007, 1A202, 1A225 to 1A227, 1B201, 1B225 to 1B233, 1C002.b.3. or .b.4., 1C010.b., 1C202, 1C210, 1C216, 1C225 to 1C240 or 1D201.		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
1E202	"Technology" according to the General Technology Note for the "development" or "production" of goods specified in 1A007, 1A202 or 1A225 to 1A227.		Atomic Energy Licensing Board (AELB), MOSTI
1E203	"Technology" according to the General Technology Note for the "development" of "software" specified in 1D201.		Atomic Energy Licensing Board (AELB), MOSTI

CATEGORY 2

MATERIALS PROCESSING

Category Code	Items Description	Note	Relevant Authority
Category 2 : MATERIALS PROCESSING			
2A	Systems, Equipment and Components	<i><u>NB:</u> For quiet running bearings, see the Military Items List.</i>	
2A001	<p>Anti-friction bearings and bearing systems, as follows, and components therefor:</p> <ol style="list-style-type: none"> Ball bearings and solid roller bearings, having all tolerances specified by the manufacturer in accordance with ISO 492 Tolerance Class 4 (or national equivalents), or better, and having both rings and rolling elements (ISO 5593), made from monel or beryllium; Not used; Active magnetic bearing systems using any of the following: <ol style="list-style-type: none"> Materials with flux densities of 2.0 T or greater and yield strengths greater than 414MPa; All-electromagnetic 3D homopolar bias designs for actuators; or High temperature (450K (177°C) and above) position sensors. 	<p>NB: SEE ALSO 2A101.</p> <p><i><u>Note:</u> 2A001 does not control balls with tolerances specified by the manufacturer in accordance with ISO 3290 as grade 5 or worse.</i></p> <p><i><u>Note:</u> 2A001.a. does not control tapered roller bearings.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
2A101	Radial ball bearings, other than those specified in 2A001, having all tolerances specified in accordance with ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC-9 or other national equivalents), or better and having all the following characteristics:		Atomic Energy Licensing Board (AELB), MOSTI

	<ul style="list-style-type: none"> a. An inner ring bore diameter between 12mm and 50mm; b. An outer ring bore diameter between 25mm and 100mm; and c. A width between 10mm and 20mm. 		
2A225	<p>Crucibles made of materials resistant to liquid actinide metals, as follows:</p> <ul style="list-style-type: none"> a. Crucibles having both of the following characteristics: <ul style="list-style-type: none"> 1. A volume of between 150cm³ and 8000cm³; and 2. Made of or coated with any of the following materials, having a purity of 98% or greater by weight: <ul style="list-style-type: none"> a. Calcium fluoride (CaF₂); b. Calcium zirconate (metazirconate) (CaZrO₃); c. Cerium sulphide (Ce₂S₃); d. Erbium oxide (erbia) (Er₂O₃); e. Hafnium oxide (hafnia) (HfO₂); f. Magnesium oxide (MgO); g. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W); h. Yttrium oxide (yttria) (Y₂O₃); or i. Zirconium oxide (zirconia) (ZrO₂); b. Crucibles having both of the following characteristics: 		Atomic Energy Licensing Board (AELB), MOSTI

	<ol style="list-style-type: none"> 1. A volume of between 50cm³ and 2000cm³ ; and 2. Made of or lined with tantalum, having a purity of 99.9% or greater by weight; c. Crucibles having all of the following characteristics: <ol style="list-style-type: none"> 1. A volume of between 50cm³ and 2000cm³ ; 2. Made of or lined with tantalum, having a purity of 98% or greater by weight; and 3. Coated with tantalum carbide, nitride, boride, or any combination thereof. 		
2A226	<p>Valves having all of the following characteristics:</p> <ol style="list-style-type: none"> a. A 'nominal size' of 5mm or greater; b. Having a bellows seal; and c. Wholly made of or lined with aluminium, aluminium alloy, nickel, or nickel alloy containing more than 60% nickel by weight. 	<p><u>Technical Note:</u></p> <p><i>For valves with different inlet and outlet diameters, the 'nominal size' in 2A226 refers to the smallest diameter.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
2B	Test, Inspection and Production Equipment	<p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. <i>Secondary parallel contouring axes, (e.g. the w-axis on horizontal boring mills or a secondary rotary axis the centre line of which is parallel to the primary rotary axis) are not counted in the total number of contouring axes. Rotary axes need not rotate over 360 °. A rotary axis can be driven by a linear device (e.g. a screw or a</i> 	

		<p><i>rack-and- pinion).</i></p> <ol style="list-style-type: none"> 2. <i>For the purposes of 2B, the number of axes which can be co-ordinated simultaneously for “contouring control” is the number of axes along or around which, during processing of the workpiece, simultaneous and interrelated motions are performed between the workpiece and a tool. This does not include any additional axes along or around which other relative movement within the machine are performed such as:</i> <ol style="list-style-type: none"> a. <i>Wheel-dressing systems in grinding machines;</i> b. <i>Parallel rotary axes designed for mounting of separate workpieces;</i> c. <i>Co-linear rotary axes designed for manipulating the same workpiece by holding it in a chuck from different ends.</i> 3. <i>Axis nomenclature shall be in accordance with International Standard ISO 841, ‘Numerical Control Machines — Axis and Motion Nomenclature’.</i> 4. <i>For the purposes of 2B001 to 2B009 a “tilting spindle” is counted as a rotary axis.</i> 5. <i>‘Stated positioning accuracy’ derived from measurements made according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents may be used for each machine tool model</i> 	
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		<p>as an alternative to individual machine tests. 'Stated positioning accuracy' means the accuracy value provided to the competent authorities in which the exporter is established as representative of the accuracy of a specific machine model.</p> <p>(¹) Manufacturers calculating positioning accuracy in accordance with ISO 230/2 (1997) should consult the competent authorities in which they are established.</p> <p><i>Determination of 'Stated Positioning Accuracy'</i></p> <ol style="list-style-type: none"> Select five machines of a model to be evaluated; Measure the linear axis accuracies according to ISO 230/2 (1988) (¹); Determine the A-values for each axis of each machine. The method of calculating the A-value is described in the ISO standard; Determine the mean value of the A-value of each axis. This mean value \bar{A} becomes the stated value of each axis for the model ($\bar{A}_x \bar{A}_y \dots$); Since the Category 2 list refers to each linear axis there will be as many stated values as there are linear axes; If any axis of a machine model not controlled by 2B001.a. to 2B001.c. or 	
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2B001	<p>Machine tools and any combination thereof, for removing (or cutting) metals, ceramics or “composites”, which, according to the manufacturer’s technical specification, can be equipped with electronic devices for “numerical control”, and specially designed components as follows:</p>	<p>NB: SEE ALSO 2B201.</p> <p><u>Note 1:</u> <i>2B001 does not control special purpose machine tools limited to the manufacture of gears. For such machines see 2B003.</i></p> <p><u>Note 2:</u> <i>2B001 does not control special purpose machine tools limited to the manufacture of any of the following:</i></p> <ul style="list-style-type: none"> <i>a. Crankshafts or camshafts;</i> <i>b. Tools or cutters;</i> <i>c. Extruder worms; or</i> <i>d. Engraved or faceted jewellery parts.</i> <p><u>Note 3:</u> <i>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.</i></p> <p><u>NB:</u> <i>For optical finishing machines, see 2B002.</i></p>	<p>Atomic Energy Licensing Board (AELB), MOSTI</p>

	<p>a. Machine tools for turning having all of the following:</p> <ol style="list-style-type: none"> 1. Positioning accuracy with “all compensations available” equal to or less (better) than 6 µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents along any linear axis; and 2. Two or more axes which can be coordinated simultaneously for “contouring control”; <p>b. Machine tools for milling having any of the following:</p> <ol style="list-style-type: none"> 1. Having all of the following: <ol style="list-style-type: none"> a. Positioning accuracy with “all compensations available” equal to or less (better) than 6µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents along any linear axis; and b. Three linear axes plus one rotary axis which can be coordinated simultaneously for “contouring control”; 2. Five or more axes which can be coordinated simultaneously for “contouring control”; 3. A positioning accuracy for jig boring machines, with “all compensations available”, equal to or less (better) than 4µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents along any linear axis; or 4. Fly cutting machines having all of the following: <ol style="list-style-type: none"> a. Spindle “run-out” and “camming” less (better) than 0.0004mm TIR; and b. Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR over 	<p><u>Note:</u> 2B001.a. does not control turning machines specially designed for producing contact lenses, having both of the following:</p> <ol style="list-style-type: none"> a. Machine controller limited to using ophthalmic based software for part programming data input; and b. No vacuum chucking. 	
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	<p>300mm of travel;</p> <p>c. Machine tools for grinding having any of the following:</p> <ol style="list-style-type: none"> 1. Having all of the following: <ol style="list-style-type: none"> a. Positioning accuracy with “all compensations available” equal to or less (better) than 4µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents along any linear axis; and b. Three or more axes which can be coordinated simultaneously for “contouring control”; or 2. Five or more axes which can be coordinated simultaneously for “contouring control”; <p>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”;</p> <p>e. Machine tools for removing metals, ceramics or “composites”, having all of the following:</p> <ol style="list-style-type: none"> 1. Removing material by means of any of the following: <ol style="list-style-type: none"> a. Water or other liquid jets, including those employing abrasive additives; b. Electron beam; or c. “Laser” beam; and 	<p><u>Note:</u> 2B001.c. does not control grinding machine as follows:</p> <ol style="list-style-type: none"> a. Cylindrical external, internal, and external-internal grinding machines, having all of the following: <ol style="list-style-type: none"> 1. Limited to cylindrical grinding; and 2. Limited to a maximum workpiece capacity of 150mm 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 4µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents. c. Surface grinders. <p>⁽¹⁾ Manufacturers calculating positioning accuracy according to ISO 230/2 (1997) should consult the competent authorities in which they are established.</p>	
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	<p>2. At least two rotary axes having all of the following:</p> <p>a. Can be coordinated simultaneously for “contouring control”; and</p> <p>b. A positioning accuracy of less (better) than 0.003°;</p> <p>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.</p>		
2B002	<p>Numerically controlled optical finishing machine tools equipped for selective material removal to produce non-spherical optical surfaces having all of the following characteristics:</p> <p>a. Finishing the form to less (better) than 1.0µm;</p> <p>b. Finishing to a roughness less (better) than 100nm rms;</p> <p>c. Four or more axes which can be coordinated simultaneously for “contouring control”; and</p> <p>d. Using any of the following processes:</p> <p>1. Magnetorheological finishing (‘MRF’);</p> <p>2. Electrorheological finishing (‘ERF’);</p> <p>3. ‘Energetic particle beam finishing’;</p> <p>4. ‘Inflatable membrane tool finishing’; or</p>	<p><u>Technical Notes:</u></p> <p><i>For the purposes of 2B002:</i></p> <p>1. ‘MRF’ is a material removal process using an abrasive magnetic fluid whose viscosity is controlled by a magnetic field.</p> <p>2. ‘ERF’ is a removal process using an abrasive fluid whose viscosity is controlled by an electric field.</p> <p>3. ‘Energetic particle beam finishing’ uses Reactive Atom Plasmas (RAP) or ion-beams to selectively remove material.</p> <p>4. ‘Inflatable membrane tool finishing’ is a process that uses a pressurised membrane that deforms to contact the workpiece over a small area.</p>	Atomic Energy Licensing Board (AELB), MOSTI

	5. 'Fluid jet finishing'.	5. 'Fluid jet finishing' makes use of a fluid stream for material removal.	
2B003	"Numerically controlled" or manual machine tools, and specially designed components, controls and accessories therefor, specially designed for the shaving, finishing, grinding or honing of hardened (Rc = 40 or more) spur, helical and double-helical gears with a pitch diameter exceeding 1250mm and a face width of 15% of pitch diameter or larger finished to a quality of AGMA 14 or better (equivalent to ISO 1328 class 3).		Atomic Energy Licensing Board (AELB), MOSTI
2B004	Hot "isostatic presses" having all of the following, and specially designed components and accessories therefor: <ul style="list-style-type: none"> a. A controlled thermal environment within the closed cavity and a chamber cavity with an inside diameter of 406mm or more; and b. Having any of the following: <ul style="list-style-type: none"> 1. A maximum working pressure exceeding 207MPa; 2. A controlled thermal environment exceeding 1773 K (1500°C); or 3. A facility for hydrocarbon impregnation and removal of resultant gaseous degradation products. 	NB: SEE ALSO 2B104 AND 2B204. <u>Technical Note:</u> <i>The inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.</i> <u>NB:</u> For specially designed dies, moulds and tooling see 1B003, 9B009 and the Military Items List.	Atomic Energy Licensing Board (AELB), MOSTI
2B005	Equipment specially designed for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, as follows, for non-electronic substrates, by processes shown in the Table and associated Notes following 2E003.f., and specially designed automated handling, positioning, manipulation and control components therefor:		Atomic Energy Licensing Board (AELB), MOSTI

	<p>a. Chemical vapour deposition (CVD) production equipment having both of the following:</p> <ol style="list-style-type: none"> 1. A process modified for one of the following: <ol style="list-style-type: none"> a. Pulsating CVD; b. Controlled nucleation thermal deposition (CNTD); or c. Plasma enhanced or plasma assisted CVD; and 2. Having either of the following: <ol style="list-style-type: none"> a. Incorporating high vacuum (equal to or less than 0.01 Pa) rotating seals; or b. Incorporating <i>in situ</i> coating thickness control; <p>b. Ion implantation production equipment having beam currents of 5mA or more;</p> <p>c. Electron beam physical vapour deposition (EB-PVD) production equipment incorporating power systems rated for over 80kW and having either of the following:</p> <ol style="list-style-type: none"> 1. A liquid pool level "laser" control system which regulates precisely the ingots feed rate; or 2. A computer controlled rate monitor operating on the principle of photo-luminescence of the ionised atoms in the evaporant stream to control the deposition rate of a coating containing two or more elements; <p>d. Plasma spraying production equipment having either of the following:</p>	<p>NB: SEE ALSO 2B105.</p> <p><u>Note:</u> 2B005 does not control chemical vapour deposition, cathodic arc, sputter deposition, ion plating or ion implantation equipment, specially designed for cutting or machining tools.</p>	
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	<ol style="list-style-type: none"> 1. Operating at reduced pressure controlled atmosphere (equal to or less than 10kPa measured above and within 300mm of the gun nozzle exit) in a vacuum chamber capable of evacuation down to 0.01Pa prior to the spraying process; or 2. Incorporating <i>in situ</i> coating thickness control; <ol style="list-style-type: none"> e. Sputter deposition production equipment capable of current densities of 0.1mA/mm² or higher at a deposition rate of 15µm/h or more; f. Cathodic arc deposition production equipment incorporating a grid of electromagnets for steering control of the arc spot on the cathode; g. Ion plating production equipment capable of the <i>in situ</i> measurement of either of the following: <ol style="list-style-type: none"> 1. Coating thickness on the substrate and rate control; or 2. Optical characteristics. 		
2B006	<p>Dimensional inspection or measuring systems, equipment and “electronic assemblies”, as follows:</p> <ol style="list-style-type: none"> a. Computer controlled or “numerically controlled” Coordinate Measuring Machines (CMM), having a three dimensional (volumetric) maximum permissible error of length measurement (E_0 , MPE) at any point within the operating range of the machine (i.e. within the length of axes) equal to or less (better) than $(1.7+L/1000)\mu\text{m}$ (L is the measured length in mm), according to ISO 10360-2 (2009); b. Linear and angular displacement measuring instruments, as follows: 	<p><u>Technical Note:</u></p> <p><i>The E_0, MPE of the most accurate configuration of the CMM specified by the manufacturer (e.g. best of the following: probe, stylus length, motion parameters, environment) and with “all compensations available” shall be compared to the $1.7+L/1000\mu\text{m}$ threshold.</i></p> <p>NB: SEE ALSO 2B206.</p>	Atomic Energy Licensing Board (AELB), MOSTI

	<ol style="list-style-type: none"> 1. 'Linear displacement' measuring instruments having any of the following: <ol style="list-style-type: none"> a. Non-contact type measuring systems with a "resolution" equal to or less (better) than 0.2µm within a measuring range up to 0.2mm; b. Linear voltage differential transformer systems having both of the following: <ol style="list-style-type: none"> 1. "Linearity" equal to or less (better) than 0.1% within a measuring range up to 5mm; and 2. Drift equal to or less (better) than 0.1% per day at a standard ambient test room temperature $\pm 1K$; c. Measuring systems having all of the following: <ol style="list-style-type: none"> 1. Containing a "laser"; and 2. Maintaining, for at least 12 hours, at a temperature of $20 \pm 1^{\circ}C$, all of the following: <ol style="list-style-type: none"> a. A "resolution" over their full scale of 0.1 µm or less (better); and b. Capable of achieving a "measurement uncertainty", when compensated for the refractive index of air, equal to or less (better) than $(0.2 + L/2\ 000) \mu m$ (L is the measured length in mm); or d. "Electronic assemblies" specially designed to provide feedback capability in systems specified in 	<p><u>Technical Note:</u></p> <p><i>For the purpose of 2B006.b.1. 'linear displacement' means the change of distance between the measuring probe and the measured object.</i></p> <p><u>Note:</u> 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.</p> <p><u>Note:</u> 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.</p> <p><u>Note:</u> 2B006 includes machine tools, other than those specified by 2B001 that can be used as measuring machines if they meet or exceed the criteria specified for the measuring machine function.</p>	
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	<p>2B006.b.1.c.;</p> <p>2. Angular displacement measuring instruments having an “angular position deviation” equal to or less (better) than 0.00025°;</p> <p>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).</p>		
2B007	<p>“Robots” having any of the following characteristics and specially designed controllers and “end-effectors” therefor:</p> <p>a. Capable in real time of full three-dimensional image processing or full three-dimensional ‘scene analysis’ to generate or modify “programmes” or to generate or modify numerical programme data;</p> <p>b. Specially designed to comply with national safety standards applicable to potentially explosive munitions environments;</p> <p>c. Specially designed or rated as radiation-hardened to withstand a total radiation dose greater than 5×10³Gy (silicon) without operational degradation; or</p> <p>d. Specially designed to operate at altitudes exceeding 30000m.</p>	<p>NB: SEE ALSO 2B207.</p> <p><u>Technical Note:</u></p> <p><i>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 (2 1/2 D).</i></p> <p><u>Note:</u> 2B007.b. does not control “robots” specially designed for paint-spraying booths.</p> <p><u>Technical Note:</u></p> <p><i>The term Gy(silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionising radiation.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
2B008	<p>Assemblies or units, specially designed for machine tools, or dimensional inspection or measuring systems and equipment, as follows:</p> <p>a. Linear position feedback units (e.g. inductive type devices,</p>	<p><u>NB:</u> For “laser” systems see also Note to</p>	Atomic Energy Licensing Board (AELB), MOSTI

	<p>graduated scales, infrared systems or “laser” systems) having an overall “accuracy” less (better) than $(800+(600 \times L \times 10^{-3}))\text{nm}$ (L equals the effective length in mm);</p> <p>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 °;</p> <p>c. “Compound rotary tables” and “tilting spindles”, capable of upgrading, according to the manufacturer’s specifications, machine tools to or above the levels specified in 2B.</p>	<p>2B006.b.1.c. and d.</p> <p><u>NB:</u> For “laser” systems see also Note to 2B006.b.2.</p>	
2B009	<p>Spin-forming machines and flow-forming machines, which, according to the manufacturer’s technical specification, can be equipped with “numerical control” units or a computer control and having both of the following:</p> <p>a. Two or more controlled axes of which at least two can be coordinated simultaneously for “contouring control”; and</p> <p>b. A roller force more than 60kN.</p>	<p>NB: SEE ALSO 2B109 AND 2B209.</p> <p><u>Technical Note:</u></p> <p><i>For the purpose of 2B009, machines combining the function of spin-forming and flow-forming are regarded as flow-forming machines.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
2B104	<p>“Isostatic presses”, other than those specified in 2B004, having all of the following:</p> <p>a. Maximum working pressure of 69MPa or greater;</p> <p>b. Designed to achieve and maintain a controlled thermal environment of 873K (600°C) or greater; and</p> <p>c. Possessing a chamber cavity with an inside diameter of 254mm or greater.</p>	NB: SEE ALSO 2B204.	Controller
2B105	Chemical vapour deposition (CVD) furnaces, other than those specified in 2B005.a., designed or modified for the densification		Controller

	of carbon-carbon composites.		
2B109	<p>Flow-forming machines, other than those specified in 2B009, and specially designed components as follows:</p> <p>a. Flow-forming machines having both of the following:</p> <ol style="list-style-type: none"> 1. According to the manufacturer's technical specification, can be equipped with "numerical control" units or a computer control, even when not equipped with such units; and 2. With more than two axes which can be coordinated simultaneously for "contouring control". <p>b. Specially designed components for flow-forming machines specified in 2B009 or 2B109.a.</p>	<p>NB: SEE ALSO 2B209.</p> <p><u>Note:</u> 2B109 does not control machines that are not usable in the production of propulsion components and equipment (e.g. motor cases) for systems specified in 9A005, 9A007.a. or 9A105.a.</p> <p><u>Technical Note:</u></p> <p>Machines combining the function of spin-forming and flow-forming are for the purpose of 2B109 regarded as flow-forming machines.</p>	Controller
2B116	<p>Vibration test systems, equipment and components therefor, as follows:</p> <p>a. Vibration test systems employing feedback or closed loop techniques and incorporating a digital controller, capable of vibrating a system at an acceleration equal to or greater than 10g rms between 20Hz and 2kHz while imparting forces equal to or greater than 50kN, measured 'bare table';</p> <p>b. Digital controllers, combined with specially designed vibration test software, with a 'real-time control bandwidth' greater than 5kHz designed for use with vibration test systems specified in 2B116.a.;</p> <p>c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force equal to or greater than 50kN, measured 'bare table', and usable in vibration test systems specified in 2B116.a.;</p>	<p><u>Technical Note:</u></p> <p>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.</p> <p><u>Technical Note:</u></p>	Controller

	d. Test piece support structures and electronic units designed to combine multiple shaker units in a system capable of providing an effective combined force equal to or greater than 50kN, measured 'bare table', and usable in vibration systems specified in 2B116.a.	<i>In 2B116, 'bare table' means a flat table, or surface, with no fixture or fittings.</i>	
2B117	Equipment and process controls, other than those specified in 2B004, 2B005.a., 2B104 or 2B105, designed or modified for densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips.		Controller
2B119	<p>Balancing machines and related equipment, as follows:</p> <p>a. Balancing machines having all the following characteristics:</p> <ol style="list-style-type: none"> 1. Not capable of balancing rotors/assemblies having a mass greater than 3kg; 2. Capable of balancing rotors/assemblies at speeds greater than 12500 rpm; 3. Capable of correcting unbalance in two planes or more; and 4. Capable of balancing to a residual specific unbalance of 0.2g mm per kg of rotor mass; <p>b. Indicator heads designed or modified for use with machines specified in 2B119.a.</p>	<p>NB: SEE ALSO 2B219.</p> <p><u>Note:</u> 2B119.a. does not control balancing machines designed or modified for dental or other medical equipment.</p> <p><u>Technical Note:</u></p> <p>Indicator heads are sometimes known as balancing instrumentation.</p>	Controller
2B120	<p>Motion simulators or rate tables having all of the following characteristics:</p> <p>a. Two axes or more;</p> <p>b. Designed or modified to incorporate slip rings or integrated non-contact devices capable of transferring electrical power,</p>	<p><u>Note 1:</u> 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.</p> <p><u>Note 2:</u> Motion simulators or rate tables</p>	Controller

	<p>signal information, or both; and</p> <p>c. Having any of the following characteristics:</p> <ol style="list-style-type: none"> 1. For any single axis having all of the following: <ol style="list-style-type: none"> a. Capable of rates of 400 degrees/s or more, or 30 degrees/s or less; and b. A rate resolution equal to or less than 6 degrees/s and an accuracy equal to or less than 0.6 degrees/s; 2. Having a worst-case rate stability equal to or better (less) than plus or minus 0.05% averaged over 10 degrees or more; or 3. A positioning "accuracy" equal to or less (better) than 5 arc second. 	<p><i>specified in 2B120 remain controlled whether or not slip rings or integrated non-contact devices are fitted at time of export.</i></p>	
2B121	<p>Positioning tables (equipment capable of precise rotary positioning in any axes), other than those specified in 2B120, having all the following characteristics:</p> <ol style="list-style-type: none"> a. Two axes or more; and b. A positioning "accuracy" equal to or less (better) than 5 arc second. 	<p><u>Note:</u> <i>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.</i></p>	Controller
2B122	<p>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.</p>	<p><u>Note:</u> <i>Centrifuges specified in 2B122 remain controlled whether or not slip rings or integrated non-contact devices are fitted at time of export.</i></p>	Controller
2B201	<p>Machine tools and any combination thereof, other than those specified in 2B001, as follows, for removing or cutting metals, ceramics or "composites", which, according to the manufacturer's technical specification, can be equipped with electronic devices</p>		Atomic Energy Licensing Board (AELB), MOSTI

	<p>for simultaneous “contouring control” in two or more axes:</p> <p>a. Machine tools for milling, having any of the following characteristics:</p> <ol style="list-style-type: none"> 1. Positioning accuracies with “all compensations available” equal to or less (better) than 6 µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents along any linear axis; or 2. Two or more contouring rotary axes; <p>b. Machine tools for grinding, having any of the following characteristics:</p> <ol style="list-style-type: none"> 1. Positioning accuracies with “all compensations available” equal to or less (better) than 4 µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents along any linear axis; or 2. Two or more contouring rotary axes. 	<p><u>Note:</u> 2B201.a. does not control milling machines having the following characteristics:</p> <ol style="list-style-type: none"> a. X-axis travel greater than 2m; and b. Overall positioning accuracy on the x-axis more (worse) than 30µm. <p><u>Note:</u> 2B201.b. does not control the following grinding machines:</p> <ol style="list-style-type: none"> a. Cylindrical external, internal, and external-internal grinding machines having both of the following characteristics: <ol style="list-style-type: none"> 1. Limited to a maximum workpiece capacity of 150mm outside diameter or length; and 2. Axes limited to x, z and c; b. Jig grinders that do not have a z-axis or a w-axis with an overall positioning accuracy less (better) than 4µm according to ISO 230/2 (1988) ⁽¹⁾ or national equivalents. <p><u>Note 1:</u> 2B201 does not control special purpose machine tools limited to the manufacture of any of the following parts:</p>	
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		<p>a. Gears;</p> <p>b. Crankshafts or camshafts;</p> <p>c. Tools or cutters;</p> <p>d. Extruder worms.</p> <p><u>Note 2:</u> 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. or 2B201.a. or b.</p> <p>(¹) Manufacturers calculating positioning accuracy in accordance with ISO 230/2 (1997) should consult the competent authorities of the in which they are established.</p>	
2B204	<p>“Isostatic presses”, other than those specified in 2B004 or 2B104, and related equipment, as follows:</p> <p>a. “Isostatic presses” having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. Capable of achieving a maximum working pressure of 69MPa or greater; and 2. A chamber cavity with an inside diameter in excess of 152mm; <p>b. Dies, moulds and controls, specially designed for “isostatic presses” specified in 2B204.a.</p>	<p><u>Technical Note:</u></p> <p><i>In 2B204 the inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

2B206	<p>Dimensional inspection machines, instruments or systems, other than those specified in 2B006, as follows:</p> <ol style="list-style-type: none"> a. Computer controlled or numerically controlled coordinate measuring machines (CMM) having both of the following characteristics: <ol style="list-style-type: none"> 1. Two or more axes; and 2. A maximum permissible error of length measurement (E_0, MPE) along any axis (one dimensional), identified as E_{0x}, E_{0y}, or E_{0z}, equal to or less (better) than $(1.25 + L/1000) \mu\text{m}$ (where L is the measured length in millimetres) at any point within the operating range of the machine (i.e. within the length of the axis), tested according to ISO 10360-2(2009); b. Systems for simultaneous linear-angular inspection of hemishells, having both of the following characteristics: <ol style="list-style-type: none"> 1. "Measurement uncertainty" along any linear axis equal to or less (better) than $3.5 \mu\text{m}$ per 5 mm; and 2. "Angular position deviation" equal to or less than 0.02°. 	<p><u>Note 1:</u> Machine tools that 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.</p> <p><u>Note 2:</u> A machine specified in 2B206 is controlled if it exceeds the control threshold anywhere within its operating range.</p> <p><u>Technical Notes:</u></p> <p>All parameters of measurement values in 2B206 represent plus/minus i.e. not total band.</p>	Atomic Energy Licensing Board (AELB), MOSTI
2B207	<p>"Robots", "end-effectors" and control units, other than those specified in 2B007, as follows:</p> <ol style="list-style-type: none"> a. "Robots" or "end-effectors" specially designed to comply with national safety standards applicable to handling high explosives (for example, meeting electrical code ratings for high explosives); b. Control units specially designed for any of the "robots" or "end-effectors" specified in 2B207.a. 		Atomic Energy Licensing Board (AELB), MOSTI

2B209	<p>Flow forming machines, spin forming machines capable of flow forming functions, other than those specified in 2B009 or 2B109, and mandrels, as follows:</p> <ul style="list-style-type: none"> a. Machines having both of the following characteristics: <ul style="list-style-type: none"> 1. Three or more rollers (active or guiding); and 2. Which, according to the manufacturer's technical specification, can be equipped with "numerical control" units or a computer control; b. Rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 mm and 400 mm. 	<p><u>Note:</u> 2B209.a. includes machines which have only a single roller designed to deform metal plus two auxiliary rollers which support the mandrel, but do not participate directly in the deformation process.</p>	Atomic Energy Licensing Board (AELB), MOSTI
2B219	<p>Centrifugal multiplane balancing machines, fixed or portable, horizontal or vertical, as follows:</p> <ul style="list-style-type: none"> a. Centrifugal balancing machines designed for balancing flexible rotors having a length of 600mm or more and having all of the following characteristics: <ul style="list-style-type: none"> 1. Swing or journal diameter greater than 75mm; 2. Mass capability of from 0.9 to 23 kg; and 3. Capable of balancing speed of revolution greater than 5000 r.p.m.; b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics: <ul style="list-style-type: none"> 1. Journal diameter greater than 75 mm; 2. Mass capability of from 0.9 to 23 kg; 		Atomic Energy Licensing Board (AELB), MOSTI

	<p>3. Capable of balancing to a residual imbalance equal to or less than 0.01kgxmm/kg per plane; and</p> <p>4. Belt drive type.</p>		
2B225	<p>Remote manipulators that can be used to provide remote actions in radiochemical separation operations or hot cells, having either of the following characteristics:</p> <p>a. A capability of penetrating 0.6 m or more of hot cell wall (through-the-wall operation); or</p> <p>b. A capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-the-wall operation).</p>	<p><u>Technical Note:</u></p> <p><i>Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of 'master/slave' type or operated by joystick or keypad.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
2B226	<p>Controlled atmosphere (vacuum or inert gas) induction furnaces, and power supplies therefor, as follows:</p> <p>a. Furnaces having all of the following characteristics:</p> <ol style="list-style-type: none"> 1. Capable of operation above 1123K (850°C); 2. Induction coils 600mm or less in diameter; and 3. Designed for power inputs of 5kW or more; <p>b. Power supplies, with a specified power output of 5kW or more, specially designed for furnaces specified in 2B226.a.</p>	<p>NB: SEE ALSO 3B.</p> <p><u>Note:</u> 2B226.a. does not control furnaces designed for the processing of semiconductor wafers.</p>	Atomic Energy Licensing Board (AELB), MOSTI
2B227	<p>Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment as follows:</p> <p>a. Arc remelt and casting furnaces having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. Consumable electrode capacities between 1000cm³ and 20000cm³; and 		Atomic Energy Licensing Board (AELB), MOSTI

	<p>2. Capable of operating with melting temperatures above 1973K (1700°C);</p> <p>b. Electron beam melting furnaces and plasma atomisation and melting furnaces, having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. A power of 50kW or greater; and 2. Capable of operating with melting temperatures above 1473K (1200°C). <p>c. Computer control and monitoring systems specially configured for any of the furnaces specified in 2B227.a. or b.</p>		
2B228	<p>Rotor fabrication or assembly equipment, rotor straightening equipment, bellows-forming mandrels and dies, as follows:</p> <p>a. Rotor assembly equipment for assembly of gas centrifuge rotor tube sections, baffles, and end caps;</p> <p>b. Rotor straightening equipment for alignment of gas centrifuge rotor tube sections to a common axis;</p> <p>c. Bellows-forming mandrels and dies for producing single-convolution bellows.</p>	<p><i>Note: 2B228.a. includes precision mandrels, clamps, and shrink fit machines.</i></p> <p><u>Technical Note:</u></p> <p><i>In 2B228.b. such equipment normally consists of precision measuring probes linked to a computer that subsequently controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.</i></p> <p><u>Technical Note:</u></p> <p><i>In 2B228.c. the bellows have all of the following characteristics:</i></p> <ol style="list-style-type: none"> 1. Inside diameter between 75 mm and 400 mm; 	Atomic Energy Licensing Board (AELB), MOSTI

		<p>2. Length equal to or greater than 12.7 mm;</p> <p>3. Single convolution depth greater than 2 mm; and</p> <p>4. Made of high-strength aluminium alloys, maraging steel or high strength "fibrous or filamentary materials".</p>	
2B230	<p>"Pressure transducers" capable of measuring absolute pressures at any point in the range 0 to 13kPa and having both of the following characteristics:</p> <p>a. Pressure sensing elements made of or protected by aluminium, aluminium alloy, nickel or nickel alloy with more than 60% nickel by weight; and</p> <p>b. Having either of the following characteristics:</p> <p>1. A full scale of less than 13kPa and an 'accuracy' of better than $\pm 1\%$ of full-scale; or</p> <p>2. A full scale of 13kPa or greater and an 'accuracy' of better than ± 130 Pa.</p>	<p><u>Technical Note:</u></p> <p><i>For the purposes of 2B230, 'accuracy' includes non-linearity, hysteresis and repeatability at ambient temperature.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
2B231	<p>Vacuum pumps having all of the following characteristics:</p> <p>a. Input throat size equal to or greater than 380mm;</p> <p>b. Pumping speed equal to or greater than 15m³/s; and</p> <p>c. Capable of producing an ultimate vacuum better than 13mPa.</p>	<p><u>Technical Notes:</u></p> <p>1. The pumping speed is determined at the measurement point with nitrogen gas or air.</p> <p>2. The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.</p>	Atomic Energy Licensing Board (AELB), MOSTI
2B232	Multistage light gas guns or other high-velocity gun systems (coil, electromagnetic, and electrothermal types, and other advanced		Atomic Energy Licensing Board

	systems) capable of accelerating projectiles to 2km/s or greater.		(AELB), MOSTI
2B350	<p>Chemical manufacturing facilities, equipment and components, as follows:</p> <p>a. Reaction vessels or reactors, with or without agitators, with total internal (geometric) volume greater than 0.1m³ (100 litres) and less than 20m³ (20000 litres), where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight); 3. Glass (including vitrified or enamelled coating 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'; <p>b. Agitators for use in reaction vessels or reactors specified in 2B350.a.; and impellers, blades or shafts designed for such agitators, where all surfaces of the agitator that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:</p>	<p><u>Technical Note:</u></p> <p><i>The 'nominal size' is defined as the smaller of the inlet and outlet diameters.</i></p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. 'Carbon graphite' is a composition consisting of amorphous carbon and graphite, in which the graphite content is eight percent or more by weight. 2. For the listed materials in the above entries, the term 'alloy' when not accompanied by a specific elemental concentration is understood as identifying those alloys where the identified metal is present in a higher percentage by weight than any other element. 	Controller

	<ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight); 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'; <p>c. Storage tanks, containers or receivers with a total internal (geometric) volume greater than 0.1m³ (100 litres) where all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight); 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'; 		
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	<p>6. Titanium or titanium 'alloys';</p> <p>7. Zirconium or zirconium 'alloys'; or</p> <p>8. Niobium (columbium) or niobium 'alloys';</p> <p>d. Heat exchangers or condensers with a heat transfer surface area greater than 0.15m² , and less than 20m² ; and tubes, plates, coils or blocks (cores) designed for such heat exchangers or condensers, where all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:</p> <p>1. 'Alloys' with more than 25% nickel and 20% chromium by weight;</p> <p>2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight);</p> <p>3. Glass (including vitrified or enamelled coatings or glass lining);</p> <p>4. Graphite or 'carbon graphite';</p> <p>5. Nickel or 'alloys' with more than 40% nickel by weight;</p> <p>6. Tantalum or tantalum 'alloys';</p> <p>7. Titanium or titanium 'alloys';</p> <p>8. Zirconium or zirconium 'alloys';</p> <p>9. Silicon carbide;</p> <p>10. Titanium carbide; or</p>		
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	<p>11. Niobium (columbium) or niobium 'alloys';</p> <p>e. Distillation or absorption columns of internal diameter greater than 0.1m; 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:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight); 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 9. Niobium (columbium) or niobium 'alloys'; <p>f. Remotely operated filling equipment in which all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; or 		
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	<p>2. Nickel or 'alloys' with more than 40% nickel by weight;</p> <p>g. Valves with 'nominal sizes' greater than 10mm 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:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight); 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'; 8. Niobium (columbium) or niobium 'alloys'; or 9. Ceramic materials as follows: <ol style="list-style-type: none"> 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); <p>h. Multi-walled piping incorporating a leak detection port, in</p>		
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	<p>which all surfaces that come in direct contact with the chemical(s) being processed or contained are made from any of the following materials:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Fluoropolymers (polymeric or elastomeric materials with more than 35 % fluorine by weight); 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 9. Niobium (columbium) or niobium 'alloys'; <p>i. Multiple-seal and seal-less pumps, with manufacturer's specified maximum flow-rate greater than 0.6m³/hour, or vacuum pumps with manufacturer's specified maximum flow-rate greater than 5m³/hour (under standard temperature (273K (0°C)) and pressure (101.3kPa) conditions); and casings (pump bodies), preformed casing liners, impellers, rotors or jet pump nozzles designed for such pumps, in which all surfaces that come in direct contact with the chemical(s) being processed are made from any of the following materials:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by 		
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	<p>weight;</p> <ol style="list-style-type: none"> 2. Ceramics; 3. Ferrosilicon (high silicon iron alloys); 4. Fluoropolymers (polymeric or elastomeric materials with more than 35% fluorine by weight); 5. Glass (including vitrified or enamelled coatings or glass lining); 6. Graphite or 'carbon graphite'; 7. Nickel or 'alloys' with more than 40% nickel by weight; 8. Tantalum or tantalum 'alloys'; 9. Titanium or titanium 'alloys'; 10. Zirconium or zirconium 'alloys'; or 11. Niobium (columbium) or niobium 'alloys'; <p>j. Incinerators designed to destroy chemicals specified in entry 1C350, having specially designed waste supply systems, special handling facilities and an average combustion chamber temperature greater than 1273K (1000°C), in which all surfaces in the waste supply system that come into direct contact with the waste products are made from or lined with any of the following materials:</p> <ol style="list-style-type: none"> 1. 'Alloys' with more than 25% nickel and 20% chromium by weight; 2. Ceramics; or 		
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	3. Nickel or 'alloys' with more than 40% nickel by weight.		
2B351	<p>Toxic gas monitoring systems and their dedicated detecting components, other than those specified in 1A004, as follows; and detectors; sensor devices; and replaceable sensor cartridges therefor:</p> <p>a. Designed for continuous operation and usable for the detection of chemical warfare agents or chemicals specified in 1C350, at concentrations of less than 0.3mg/m³ ; or</p> <p>b. Designed for the detection of cholinesterase-inhibiting activity.</p>		Controller
2B352	<p>Equipment capable of use in handling biological materials, as follows:</p> <p>a. Complete biological containment facilities at P3, P4 containment level;</p> <p>b. Fermenters capable of cultivation of pathogenic "microorganisms", viruses or capable of toxin production, without the propagation of aerosols, and having a total capacity of 20 litres or more;</p> <p>c. Centrifugal separators, capable of continuous separation without the propagation of aerosols, having all the following characteristics:</p> <ol style="list-style-type: none"> 1. Flow-rate exceeding 100litres per hour; 2. Components of polished stainless steel or titanium; 3. One or more sealing joints within the steam containment area; and 4. Capable of <i>in situ</i> steam sterilisation in a closed state; 	<p><u>Technical Note:</u></p> <p><i>P3 or P4 (BL3, BL4, L3, L4) containment levels are as specified in the WHO Laboratory Biosafety manual (3rd edition Geneva 2004).</i></p> <p><u>Technical Note:</u></p> <p><i>Fermenters include bioreactors, chemostats and continuous-flow systems.</i></p> <p><u>Technical Note:</u></p> <p><i>Centrifugal separators include decanters.</i></p>	Controller

	<p>d. Cross (tangential) flow filtration equipment and components as follows:</p> <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> a. A total filtration area equal to or greater than 1m² ; and b. Having either of the following characteristics: <ol style="list-style-type: none"> 1. Capable of being sterilised or disinfected <i>in situ</i>; or 2. Using disposable or single-use filtration components; 2. Cross (tangential) flow filtration components (e.g. modules, elements, cassettes, cartridges, units or plates) with filtration area equal to or greater than 0.2m² for each component and designed for use in cross (tangential) flow filtration equipment specified in 2B352.d.; <p>e. Steam sterilisable freeze drying equipment with a condenser capacity exceeding 10kg of ice in 24hours and less than 1000kg of ice in 24 hours;</p>	<p><u>Technical Note:</u></p> <p><i>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.</i></p> <p><u>Note:</u> 2B352.d. does not control reverse osmosis equipment, as specified by the manufacturer.</p>	
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	<p>f. Protective and containment equipment, as follows:</p> <ol style="list-style-type: none"> 1. Protective full or half suits, or hoods dependent upon a tethered external air supply and operating under positive pressure; 2. Class III biological safety cabinets or isolators with similar performance standards; <p>g. Chambers designed for aerosol challenge testing with “microorganisms”, viruses or “toxins” and having a capacity of 1 m³ or greater.</p>	<p><u>Note:</u> 2B352.f.1. does not control suits designed to be worn with self-contained breathing apparatus.</p> <p><u>Note:</u> In 2B352.f.2., isolators include flexible isolators, dry boxes, anaerobic chambers, glove boxes and laminar flow hoods (closed with vertical flow).</p>	
2C	<p>Materials</p> <p>None.</p>		
2D	<p>Software</p>		
2D001	“Software”, other than that specified in 2D002, specially designed or modified for the “development”, “production” or “use” of equipment specified in 2A001 or 2B001 to 2B009.		Atomic Energy Licensing Board (AELB), MOSTI
2D002	“Software” for electronic devices, even when residing in an electronic device or system, enabling such devices or systems to function as a “numerical control” unit, capable of co-ordinating simultaneously more than four axes for “contouring control”.	<p><u>Note 1:</u> 2D002 does not control “software” specially designed or modified for the operation of machine tools not specified in Category 2.</p> <p><u>Note 2:</u> 2D002 does not control “software” for items specified in 2B002. See 2D001 for “software” for items specified in 2B002.</p>	Atomic Energy Licensing Board (AELB), MOSTI
2D101	“Software” specially designed or modified for the “use” of equipment specified in 2B104, 2B105, 2B109, 2B116, 2B117 or	NB: SEE ALSO 9D004.	Atomic Energy Licensing Board

	2B119 to 2B122.		(AELB), MOSTI
2D201	"Software" specially designed for the "use" of equipment specified in 2B204, 2B206, 2B207, 2B209, 2B219 or 2B227.		Atomic Energy Licensing Board (AELB), MOSTI
2D202	"Software" specially designed or modified for the "development", "production" or "use" of equipment specified in 2B201.		Atomic Energy Licensing Board (AELB), MOSTI
2D351	"Software", other than that specified in 1D003, specially designed for "use" of equipment specified in 2B351.		Controller
2E	Technology		
2E001	"Technology" according to the General Technology Note for the "development" of equipment or "software" specified in 2A, 2B or 2D.		Atomic Energy Licensing Board (AELB), MOSTI
2E002	"Technology" according to the General Technology Note for the "production" of equipment specified in 2A or 2B.		Atomic Energy Licensing Board (AELB), MOSTI
2E003	<p>Other "technology", as follows:</p> <p>a. "Technology" for the "development" of interactive graphics as an integrated part in "numerical control" units for preparation or modification of part programmes;</p> <p>b. "Technology" for metal-working manufacturing processes, as follows:</p> <p>1. "Technology" for the design of tools, dies or fixtures specially designed for any of the following processes:</p> <p>a. "Superplastic forming";</p>	<p><u>Note:</u> The table and Technical Note appear after entry 2E301.</p> <p><u>NB:</u> This table should be read to specify the technology of a particular Coating Process only when the Resultant Coating in column 3 is in a paragraph directly across from the relevant Substrate under column 2. For example, Chemical Vapour Deposition (CVD) coating process technical data are included for the application of silicides to carbon-carbon, ceramic and metal "matrix" "composites" substrates,</p>	Atomic Energy Licensing Board (AELB), MOSTI

	<ul style="list-style-type: none"> b. "Diffusion bonding"; or c. "Direct-acting hydraulic pressing"; <p>2. Technical data consisting of process methods or parameters as listed below used to control:</p> <ul style="list-style-type: none"> a. "Superplastic forming" of aluminium alloys, titanium alloys or "superalloys": <ul style="list-style-type: none"> 1. Surface preparation; 2. Strain rate; 3. Temperature; 4. Pressure; b. "Diffusion bonding" of "superalloys" or titanium alloys: <ul style="list-style-type: none"> 1. Surface preparation; 2. Temperature; 3. Pressure; c. "Direct-acting hydraulic pressing" of aluminium alloys or titanium alloys: <ul style="list-style-type: none"> 1. Pressure; 2. Cycle time; d. "Hot isostatic densification" of titanium alloys, aluminium alloys or "superalloys": 	<p><i>but are not included for the application of silicides to 'cemented tungsten carbide' (16), 'silicon carbide' (18) substrates. In the second case, the resultant coating is not listed in the paragraph under column 3 directly across from the paragraph under column 2 listing 'cemented tungsten carbide' (16), 'silicon carbide' (18).</i></p>	
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	<p>1. Temperature;</p> <p>2. Pressure;</p> <p>3. Cycle time;</p> <p>c. "Technology" for the "development" or "production" of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;</p> <p>d. "Technology" for the "development" of generators of machine tool instructions (e.g. part programmes) from design data residing inside "numerical control" units;</p> <p>e. "Technology" for the "development" of integration "software" for incorporation of expert systems for advanced decision support of shop floor operations into "numerical control" units;</p> <p>f. "Technology" for the application of inorganic overlay coatings or inorganic surface modification coatings (specified in column 3 of the following table) to non-electronic substrates (specified in column 2 of the following table), by processes specified in column 1 of the following table and defined in the Technical Note.</p>		
2E101	"Technology" according to the General Technology Note for the "use" of equipment or "software" specified in 2B004, 2B009, 2B104, 2B109, 2B116, 2B119 to 2B122 or 2D101.		Controller
2E201	"Technology" according to the General Technology Note for the "use" of equipment or "software" specified in 2A225, 2A226, 2B001, 2B006, 2B007.b., 2B007.c., 2B008, 2B009, 2B201, 2B204, 2B206, 2B207, 2B209, 2B225 to 2B232, 2D201 or 2D202.		Atomic Energy Licensing Board (AELB), MOSTI

2E301	"Technology" according to the General Technology Note for the "use" of goods specified in 2B350 to 2B352.		Controller
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Table

Deposition techniques

1. Coating Process (1) (*)		2. Substrate	3. Resultant Coating
A.	Chemical Vapour Deposition (CVD)	"Superalloys"	Aluminides for internal passages
		Ceramics (19) and Low-expansion glasses (14)	Silicides Carbides Dielectric layers (15) Diamond Diamond-like carbon (17)
		Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Aluminides Alloyed aluminides (2) Boron nitride
		Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
		Molybdenum and Molybdenum alloys	Dielectric layers (15)

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
	Beryllium and Beryllium alloys	Dielectric layers (15) Diamond Diamond-like carbon (17)
	Sensor window materials (9)	Dielectric layers (15) Diamond Diamond-like carbon (17)
B. Thermal-Evaporation Physical Vapour Deposition (TE-PVD)		
B.1. Physical Vapour Deposition (PVD): Electron-Beam (EB- PVD)	<p>"Superalloys"</p> <p>Ceramics (19) and Low-expansion glasses (14)</p> <p>Corrosion resistant steel (7)</p> <p>Carbon-carbon, Ceramic and Metal "matrix" "composites"</p>	<p>Alloyed silicides</p> <p>Alloyed aluminides (2)</p> <p>MCrAlX (5)</p> <p>Modified zirconia (12)</p> <p>Silicides</p> <p>Aluminides</p> <p>Mixtures thereof (4)</p> <p>Dielectric layers (15)</p> <p>MCrAlX (5)</p> <p>Modified zirconia (12)</p> <p>Mixtures thereof (4)</p> <p>Silicides</p> <p>Carbides</p> <p>Refractory metals</p>

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
	<p>Cemented tungsten carbide (16), Silicon carbide (18)</p> <p>Molybdenum and Molybdenum alloys</p> <p>Beryllium and Beryllium alloys</p> <p>Sensor window materials (9)</p> <p>Titanium alloys (13)</p>	<p>Mixtures thereof (4)</p> <p>Dielectric layers (15)</p> <p>Boron nitride</p> <p>Carbides</p> <p>Tungsten</p> <p>Mixtures thereof (4)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p> <p>Borides</p> <p>Beryllium</p> <p>Dielectric layers (15)</p> <p>Borides</p> <p>Nitrides</p>
B.2. Ion assisted resistive heating Physical Vapour Deposition (PVD) (Ion Plating)	<p>Ceramics (19) and Low-expansion glasses (14)</p> <p>Carbon-carbon, Ceramic and Metal "matrix" "composites"</p> <p>Cemented tungsten carbide (16), Silicon carbide</p> <p>Molybdenum and Molybdenum alloys</p> <p>Beryllium and Beryllium alloys</p>	<p>Dielectric layers (15)</p> <p>Diamond-like carbon (17)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p> <p>Dielectric layers (15)</p>

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
B.3. Physical Vapour Deposition (PVD): "Laser" Vaporisation	Ceramics (19) and Low-expansion glasses (14) Carbon-carbon, Ceramic and Metal "matrix" "composites" Cemented tungsten carbide (16), Silicon carbide Molybdenum and Molybdenum alloys Beryllium and Beryllium alloys Sensor window materials (9)	Silicides Dielectric layers (15) Diamond-like carbon (17) Dielectric layers (15) Dielectric layers (15) Dielectric layers (15) Dielectric layers (15) Dielectric layers (15) Diamond-like carbon
B.4. Physical Vapour Deposition (PVD): Cathodic Arc Discharge	"Superalloys" Polymers (11) and Organic "matrix" "composites"	Alloyed silicides Alloyed aluminides (2) MCrAlX (5) Borides Carbides Nitrides Diamond-like carbon (17)
C. Pack cementation (see A above for out-of-pack cementation) (10)	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof (4)

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
	Titanium alloys (13)	Silicides Aluminides Alloyed aluminides (2)
	Refractory metals and alloys (8)	Silicides Oxides
D. Plasma spraying	<p>“Superalloys”</p> <p>Aluminium alloys (6)</p> <p>Refractory metals and alloys (8)</p> <p>Corrosion resistant steel (7)</p>	<p>MCrAlX (5)</p> <p>Modified zirconia (12)</p> <p>Mixtures thereof (4)</p> <p>Abradable Nickel-Graphite</p> <p>Abradable materials containing Ni-Cr- Al</p> <p>Abradable Al-Si-Polyester</p> <p>Alloyed aluminides (2)</p> <p>MCrAlX (5)</p> <p>Modified zirconia (12)</p> <p>Silicides</p> <p>Mixtures thereof (4)</p> <p>Aluminides</p> <p>Silicides</p> <p>Carbides</p> <p>MCrAlX (5)</p> <p>Modified zirconia (12)</p> <p>Mixtures thereof (4)</p>

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
	Titanium alloys (13)	Carbides Aluminides Silicides Alloyed aluminides (2) Abradable Nickel-Graphite Abradable materials containing Ni-Cr- Al Abradable Al-Si-Polyester
E. Slurry Deposition	Refractory metals and alloys (8) Carbon-carbon, Ceramic and Metal “matrix” “composites”	Fused silicides Fused aluminides except for resistance heating elements Silicides Carbides Mixtures thereof (4)
F. Sputter Deposition	“Superalloys” Ceramics and Low-expansion glasses (14)	Alloyed silicides Alloyed aluminides (2) Noble metal modified aluminides (3) MCrAlX (5) Modified zirconia (12) Platinum Mixtures thereof (4) Silicides Platinum Mixtures thereof (4)

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
		Dielectric layers (15)
		Diamond-like carbon (17)
	Titanium alloys (13)	Borides
		Nitrides
		Oxides
		Silicides
		Aluminides
		Alloyed aluminides (2)
		Carbides
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides
		Carbides
		Refractory metals
		Mixtures thereof (4)
		Dielectric layers (15)
		Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides
		Tungsten
		Mixtures thereof (4)
		Dielectric layers (15)
		Boron nitride
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Borides

1. Coating Process (1) (*)	2. Substrate	3. Resultant Coating
	Sensor window materials (9)	Dielectric layers (15) Beryllium Dielectric layers (15) Diamond-like carbon (17)
	Refractory metals and alloys (8)	Aluminides Silicides Oxides Carbides
G. Ion Implantation	High temperature bearing steels	Additions of Chromium Tantalum or Niobium (Columbium)
	Titanium alloys (13)	Borides Nitrides
	Beryllium and Beryllium alloys	Borides
	Cemented tungsten carbide (16)	Carbides Nitrides
(*) The numbers in parenthesis refer to the notes following this table.		

Table — Deposition Techniques — Notes

1. The term 'coating process' includes coating repair and refurbishing as well as original coating.
2. The term 'alloyed aluminide coating' includes single or multiple-step coatings in which an element or elements are deposited prior to or during application of the aluminide coating, even if these elements are deposited by another coating process. It does not, however, include the multiple use of single-step pack cementation processes to achieve alloyed aluminides.
3. The term 'noble metal modified aluminide' coating includes multiple-step coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating.

4. The term 'mixtures thereof' includes infiltrated material, graded compositions, co-deposits and multilayer deposits and are obtained by one or more of the coating processes specified in the Table.
5. 'MCrAlX' refers to a coating alloy where M equals cobalt, iron, nickel or combinations thereof and X equals hafnium, yttrium, silicon, tantalum in any amount or other intentional additions over 0.01% by weight in various proportions and combinations, except:
 - a. CoCrAlY coatings which contain less than 22% by weight of chromium, less than 7% by weight of aluminium and less than 2% by weight of yttrium;
 - b. CoCrAlY coatings which contain 22 to 24% by weight of chromium, 10 to 12% by weight of aluminium and 0.5 to 0.7% by weight of yttrium; or
 - c. NiCrAlY coatings which contain 21 to 23% by weight of chromium, 10 to 12% by weight of aluminium and 0.9 to 1.1% by weight of yttrium.
6. The term 'aluminium alloys' refers to alloys having an ultimate tensile strength of 190 MPa or more measured at 293 K (20°C).
7. The term 'corrosion resistant steel' refers to AISI (American Iron and Steel Institute) 300 series or equivalent national standard steels.
8. 'Refractory metals and alloys' include the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.
9. 'Sensor window materials', as follows: alumina, silicon, germanium, zinc sulphide, zinc selenide, gallium arsenide, diamond, gallium phosphide, sapphire and the following metal halides: sensor window materials of more than 40 mm diameter for zirconium fluoride and hafnium fluoride.
10. "Technology" for single-step pack cementation of solid airfoils is not controlled by Category 2.
11. 'Polymers', as follows: polyimide, polyester, polysulphide, polycarbonates and polyurethanes.
12. 'Modified zirconia' refers to additions of other metal oxides (e.g. calcia, magnesia, yttria, hafnia, rare earth oxides) to zirconia in order to stabilise certain crystallographic phases and phase compositions. Thermal barrier coatings made of zirconia, modified with calcia or magnesia by mixing or fusion, are not controlled.
13. 'Titanium alloys' refers only to aerospace alloys having an ultimate tensile strength of 900 MPa or more measured at 293 K (20 °C).
14. 'Low-expansion glasses' refers to glasses which have a coefficient of thermal expansion of $1 \times 10^{-7} \text{ K}^{-1}$ or less measured at 293 K (20 °C).
15. Dielectric layers' are coatings constructed of multi-layers of insulator materials in which the interference properties of a design composed of materials of various refractive indices are used to reflect, transmit or absorb various wavelength bands. Dielectric layers refers to more than four dielectric layers or dielectric/metal "composite" layers.
16. 'Cemented tungsten carbide' does not include cutting and forming tool materials consisting of tungsten carbide/ (cobalt, nickel), titanium carbide/(cobalt, nickel), chromium carbide/nickel-chromium and chromium carbide/nickel.

17. "Technology" specially designed to deposit diamond-like carbon on any of the following is not controlled:

magnetic disk drives and heads, equipment for the manufacture of disposables, valves for faucets, acoustic diaphragms for speakers, engine parts for automobiles, cutting tools, punching-pressing dies, office automation equipment, microphones or medical devices or moulds, for casting or moulding of plastics, manufactured from alloys containing less than 5% beryllium.

18. 'Silicon carbide' does not include cutting and forming tool materials.

19. Ceramic substrates, as used in this entry, does not include ceramic materials containing 5% by weight, or greater, clay or cement content, either as separate constituents or in combination.

Table — Deposition Techniques — Technical Note

Processes specified in Column 1 of the Table are defined as follows:

- a. Chemical Vapour Deposition (CVD) is an overlay coating or surface modification coating process wherein a metal, alloy, "composite", dielectric or ceramic is deposited upon a heated substrate. Gaseous reactants are decomposed or combined in the vicinity of a substrate resulting in the deposition of the desired elemental, alloy or compound material on the substrate. Energy for this decomposition or chemical reaction process may be provided by the heat of the substrate, a glow discharge plasma, or "laser" irradiation.

NB 1: CVD includes the following processes: directed gas flow out-of-pack deposition, pulsating CVD, controlled nucleation thermal deposition (CNTD), plasma enhanced or plasma assisted CVD processes.

NB 2: Pack denotes a substrate immersed in a powder mixture

NB 3: The gaseous reactants used in the out-of-pack process are produced using the same basic reactions and parameters as the pack cementation process, except that the substrate to be coated is not in contact with the powder mixture.

- b. Thermal Evaporation-Physical Vapour Deposition (TE-PVD) is an overlay coating process conducted in a vacuum with a pressure less than 0,1 Pa wherein a source of thermal energy is used to vaporise the coating material. This process results in the condensation, or deposition, of the evaporated species onto appropriately positioned substrates.

The addition of gases to the vacuum chamber during the coating process to synthesise compound coatings is an ordinary modification of the process.

The use of ion or electron beams, or plasma, to activate or assist the coating's deposition is also a common modification in this technique. The use of monitors to provide in-process measurement of optical characteristics and thickness of coatings can be a feature of these processes.

Specific TE-PVD processes are as follows:

1. Electron Beam PVD uses an electron beam to heat and evaporate the material which forms the coating;
2. Ion Assisted Resistive Heating PVD employs electrically resistive heating sources in combination with impinging ion beam(s) to produce a controlled and uniform flux of evaporated coating species;
3. "Laser" Vaporisation uses either pulsed or continuous wave "laser" beams to vaporise the material which forms the coating;
4. Cathodic Arc Deposition employs a consumable cathode of the material which forms the coating and has an arc discharge established on the surface by a momentary contact of a ground trigger. Controlled motion of arcing erodes the cathode surface creating a highly ionised plasma. The anode can be either a cone attached to the periphery of the cathode, through an insulator, or the chamber. Substrate biasing is used for non-line-of-sight deposition.

NB: This definition does not include random cathodic arc deposition with non-biased substrates.

5. Ion Plating is a special modification of a general TE-PVD process in which a plasma or an ion source is used to ionise the species to be deposited, and a negative bias is applied to the substrate in order to facilitate the extraction of the species from the plasma. The introduction of reactive species, evaporation of solids within the process chamber, and the use of monitors to provide in-process measurement of optical characteristics and thicknesses of coatings are ordinary modifications of the process.
- c. Pack Cementation is a surface modification coating or overlay coating process wherein a substrate is immersed in a powder mixture (a pack), that consists of:
1. The metallic powders that are to be deposited (usually aluminium, chromium, silicon or combinations thereof);
 2. An activator (normally a halide salt); and
 3. An inert powder, most frequently alumina.

The substrate and powder mixture is contained within a retort which is heated to between 1030K (757°C) and 1375K (1102°C) for sufficient time to deposit the coating.

- d. Plasma Spraying is an overlay coating process wherein a gun (spray torch) which produces and controls a plasma accepts powder or wire coating materials, melts them and propels them towards a substrate, whereon an integrally bonded coating is formed. Plasma spraying constitutes either low pressure plasma spraying or high velocity plasma spraying.

NB 1: Low pressure means less than ambient atmospheric pressure.

NB 2: High velocity refers to nozzle-exit gas velocity exceeding 750m/s calculated at 293K (20°C) at 0.1MPa.

- e. Slurry Deposition is a surface modification coating or overlay coating process wherein a metallic or ceramic powder with an organic binder is suspended in a liquid and is applied to a substrate by either spraying, dipping or painting, subsequent air or oven drying, and heat treatment to obtain the desired coating.

- f. Sputter Deposition is an overlay coating process based on a momentum transfer phenomenon, wherein positive ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on an appropriately positioned substrate.

NB 1: The Table refers only to triode, magnetron or reactive sputter deposition which is used to increase adhesion of the coating and rate of deposition and to radio frequency (RF) augmented sputter deposition used to permit vaporisation of non-metallic coating materials.

NB 2: Low-energy ion beams (less than 5keV) can be used to activate the deposition.

- g. Ion Implantation is a surface modification coating process in which the element to be alloyed is ionised, accelerated through a potential gradient and implanted into the surface region of the substrate. This includes processes in which ion implantation is performed simultaneously with electron beam physical vapour deposition or sputter deposition.

CATEGORY 3

ELECTRONICS

Category Code	Items Description	Note	Relevant Authority
Category 3: ELECTRONICS			
3A	Systems, Equipment and Components	<p><u>Note 1:</u> The control status of equipment and components described in 3A001 or 3A002, other than those described in 3A001.a.3. to 3A001.a.10. or 3A001.a.12., which are specially designed for or which have the same functional characteristics as other equipment is determined by the control status of the other equipment.</p> <p><u>Note 2:</u> 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.</p> <p><u>NB:</u> 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.</p>	
3A001	<p>Electronic components and specially designed components therefor, as follows:</p> <p>a. General purpose integrated circuits, as follows:</p>	<p><u>Note 1:</u> 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.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><u>Note 2:</u> Integrated circuits include the following types:</p> <ul style="list-style-type: none"> — “Monolithic integrated circuits”; — “Hybrid integrated circuits”; — “Multichip integrated circuits”; — “Film type integrated circuits”, including silicon-on-sapphire integrated circuits; — “Optical integrated circuits”. 	
	<p>1. Integrated circuits designed or rated as radiation hardened to withstand any of the following:</p> <ul style="list-style-type: none"> a. A total dose of 5×10^3 Gy (silicon) or higher; b. A dose rate upset of 5×10^6 Gy (silicon)/s or higher; or c. A fluence (integrated flux) of neutrons (1 MeV equivalent) of 5×10^{13} n/cm² or higher on silicon, or its equivalent for other materials; 	<p><u>Note:</u> 3A001.a.1.c. does not apply to Metal Insulator Semiconductors (MIS).</p>	Atomic Energy Licensing Board (AELB), MOSTI
	<p>2. “Microprocessor microcircuits”, “microcomputer microcircuits”, microcontroller microcircuits, storage integrated circuits manufactured from a compound semiconductor, analogue-to-digital converters, digital-to-analogue 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</p>	<p><u>Note:</u> 3A001.a.2. does not apply to integrated circuits for civil automobiles or railway train applications.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>memories (EEPROMs), flash memories or static random-access memories (SRAMs), having any of the following:</p> <ol style="list-style-type: none"> Rated for operation at an ambient temperature above 398 K (125 °C); Rated for operation at an ambient temperature below 218 K (– 55 °C); or Rated for operation over the entire ambient temperature range from 218 K (– 55 °C) to 398 K (125 °C); <p>3. “Microprocessor microcircuits”, “microcomputer microcircuits” and microcontroller microcircuits, manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz;</p> <p>4. Not used;</p> <p>5. Analogue-to-Digital Converter (ADC) and Digital-to-Analogue Converter (DAC) integrated circuits, as follows:</p> <ol style="list-style-type: none"> ADCs having any of the following: <ol style="list-style-type: none"> A resolution of 8 bit or more, but less than 10 bit, with an output rate greater than 500 million words per second; A resolution of 10 bit or more, but less than 12 bit, with an output rate greater than 300 million words per second; A resolution of 12 bit with an output rate greater than 200 million words per second; 	<p><u>Note:</u> 3A001.a.3. includes digital signal processors, digital array processors and digital coprocessors.</p> <p>NB: SEE ALSO 3A101</p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> A resolution of n bit corresponds to a quantisation of 2^n levels. The number of bits in the output word is equal to the resolution of the ADC. The output rate is the maximum output rate 	

Category Code	Items Description	Note	Relevant Authority
	<p>4. A resolution of more than 12 bit, but equal to or less than 14 bit, with an output rate greater than 125 million words per second; or</p> <p>5. A resolution of more than 14 bit with an output rate greater than 20 million words per second;</p>	<p><i>of the converter, regardless of the architecture or oversampling.</i></p> <p>4. <i>For 'multiple channel ADCs', the outputs are not aggregated and the output rate is the maximum output rate of any single channel.</i></p> <p>5. <i>For 'interleaved ADCs' or for 'multiple channel ADCs' that are specified to have an interleaved mode of operation, the outputs are aggregated and the output rate is the maximum combined total output rate of all of the outputs.</i></p> <p>6. <i>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).</i></p> <p>7. <i>For the purpose of measuring output rate, one output word per second is equivalent to one Hertz or one sample per second.</i></p> <p>8. <i>'Multiple channel ADCs' are defined as devices which integrate more than one ADC, designed so that each ADC has a separate analogue input.</i></p> <p>9. <i>'Interleaved ADCs' are defined as devices which have multiple ADC units that sample the same analogue input at different times such that when the outputs are</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Digital-to-Analogue Converters (DAC) having any of the following:</p> <ol style="list-style-type: none"> 1. A resolution of 10 bit or more with an 'adjusted update rate' of 3500 MSPS or greater; or 2. A resolution of 12 bit or more with an 'adjusted update rate' of equal to or greater than 1250 MSPS and having any of the following: <ol style="list-style-type: none"> a. A settling time less than 9 ns to 0.024 % of full scale from a full scale step; or b. A 'Spurious Free Dynamic Range' (SFDR) greater than 68 dBc (carrier) when synthesising a full scale analogue signal of 100 MHz or the highest full scale analogue signal frequency specified below 100 MHz. 	<p><i>aggregated, the analogue input has been effectively sampled and converted at a higher sampling rate.</i></p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. 'Spurious Free Dynamic Range' (SFDR) is defined as the ratio of the RMS value of the carrier frequency (maximum signal component) at the input of the DAC to the RMS value of the next largest noise or harmonic distortion component at its output. 2. SFDR is determined directly from the specification table or from the characterisation plots of SFDR versus frequency. 3. A signal is defined to be full scale when its amplitude is greater than – 3 dBfs (full scale). 4. 'Adjusted update rate' for DACs: <ol style="list-style-type: none"> a. For conventional (non-interpolating) DACs, the 'adjusted update rate' is the rate at which the digital signal is converted to an analogue signal and the output analogue values are changed by the DAC. For DACs where the interpolation mode may be bypassed (interpolation factor of one), the DAC should be considered as a 	

Category Code	Items Description	Note	Relevant Authority
	<p>6. Electro-optical and “optical integrated circuits”, designed for “signal processing” and having all of the following:</p> <ul style="list-style-type: none"> a. One or more than one internal “laser” diode; b. One or more than one internal light detecting element; and c. Optical waveguides; <p>7. ‘Field programmable logic devices’ having either of the following:</p> <ul style="list-style-type: none"> a. A maximum number of digital input/outputs 	<p><i>conventional (non-interpolating) DAC.</i></p> <p><i>b. For interpolating DACs (oversampling DACs), the ‘adjusted update rate’ is defined as the DAC update rate divided by the smallest interpolating factor. For interpolating DACs, the ‘adjusted update rate’ may be referred to by different terms including:</i></p> <ul style="list-style-type: none"> <i>— input data rate</i> <i>— input word rate</i> <i>— input sample rate</i> <i>— maximum total input bus rate</i> <i>— maximum DAC clock rate for DAC clock input.</i> <p><u>Note:</u> 3A001.a.7. includes:</p> <ul style="list-style-type: none"> <i>— Simple Programmable Logic</i> 	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. A typical “basic gate propagation delay time” of less than 0.02ns; or c. An operating frequency exceeding 3 GHz; <p>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 either of the following:</p> <ul style="list-style-type: none"> a. An equivalent gate count of more than 3000 (2 input gates); or b. A toggle frequency exceeding 1.2 GHz; <p>12. Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than $(N \log_2 N) / 20480$ ms, where N is the number of points;</p> <p>b. Microwave or millimetre wave components, as follows:</p> <p>1. Electronic vacuum tubes and cathodes, as follows:</p>	<p><i>Technical Note:</i></p> <p><i>When N is equal to 1 024 points, the formula in 3A001.a.12. gives an execution time of 500 μs.</i></p> <p><i>Note 1: 3A001.b.1. does not control tubes designed or rated for operation in any frequency band and having both of the following:</i></p> <ul style="list-style-type: none"> <i>a. Does not exceed 3.8 GHz; and</i> <i>b. Is “allocated by the ITU” for radio-communications services, but not for radio-determination.</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>a. Travelling wave tubes, pulsed or continuous wave, as follows:</p> <ol style="list-style-type: none"> 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: 	<p><u>Note 2:</u> 3A001.b.1. does not control non-"space-qualified" tubes having all of the following:</p> <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 1. Exceeds 3,8 GHz but does not exceed 43,5 GHz; and 2. Is "allocated by the ITU" for radio-communications services, but not for radio-determination. 	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 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”; b. Crossed-field amplifier tubes with a gain of more than 17 dB; c. Impregnated cathodes designed for electronic tubes producing a continuous emission current density at rated operating conditions exceeding 5 A/cm² ; 2. Microwave “Monolithic Integrated Circuits” (MMIC) power amplifiers having any of the following: <ul style="list-style-type: none"> a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and with an average output power greater than 4 W (36 dBm) with a “fractional bandwidth” greater than 15 %; b. Rated for operation at frequencies exceeding 6.8 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 %; c. Rated for operation at frequencies exceeding 16 		

Category Code	Items Description	Note	Relevant Authority
	<p>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 %;</p> <p>d. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5GHz and with an average output power greater than 0,1 nW;</p> <p>e. Rated for operation at frequencies exceeding 37.5 GHz up to and including 43.5GHz and with an average output power greater than 0.25 W (24 dBm) with a “fractional bandwidth” greater than 10 %; or</p> <p>f. Rated for operation at frequencies exceeding 43.5 GHz and with an average output power greater than 0.1 nW;</p> <p>3. Discrete microwave transistors having any of the following:</p>	<p><i>Note 1: Not used.</i></p> <p><i>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. to 3A001.b.2.f., is determined by the lowest average output power control threshold.</i></p> <p><i>Note 3: Notes 1 and 2 in 3A mean that 3A001.b.2. does not control MMICs if they are specially designed for other applications, e.g. telecommunications, radar, automobiles.</i></p> <p><i>Note: The control status of a transistor whose rated operating frequency</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and having an average output power greater than 60 W (47.8 dBm);</p> <p>b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz and having an average output power greater than 20 W (43 dBm);</p> <p>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 0.5 W (27 dBm);</p> <p>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 1 W (30 dBm); or</p> <p>e. Rated for operation at frequencies exceeding 43.5 GHz and having an average output power greater than 0.1 nW;</p> <p>4. Microwave solid state amplifiers and microwave assemblies/modules containing microwave solid state amplifiers, having any of the following:</p> <p>a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and with an average output power greater than 60 W (47.8 dBm) with a “fractional bandwidth” greater than 15 %;</p> <p>b. Rated for operation at frequencies exceeding 6.8 GHz up to and including 31.8 GHz and with an average output power greater than 15 W (42 dBm)</p>	<p><i>includes frequencies listed in more than one frequency range, as defined by 3A001.b.3.a. to 3A001.b.3.e., is determined by the lowest average output power control threshold.</i></p> <p><u>Technical Note:</u></p> <p><i>3,2 GHz should be used as the lowest operating frequency (f_{GHz}) in the formula in 3A001.b.4.f.3., for amplifiers that have a rated operating range extending downward to 3,2 GHz and below [$d \leq 15 \text{ cm} \cdot \text{GHz} / 3,2 \text{ GHz}$].</i></p> <p><u>NB:</u> <i>MMIC power amplifiers should be</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>with a “fractional bandwidth” greater than 10 %;</p> <p>c. Rated for operation at frequencies exceeding 31.8 GHz up to and including 37.5 GHz and with an average output power greater than 0.1 nW;</p> <p>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 1 W (30 dBm) with a “fractional bandwidth” greater than 10 %;</p> <p>e. Rated for operation at frequencies exceeding 43.5 GHz and with an average output power greater than 0.1 nW; or</p> <p>f. Rated for operation at frequencies above 3.2GHz and having all of the following:</p> <ol style="list-style-type: none"> 1. An average output power (in watts), P, greater than 150 divided by the maximum operating frequency (in GHz) squared [$P > 150 \text{ W} \cdot \text{GHz}^2 / f_{\text{GHz}}^2$]; 2. A “fractional bandwidth” of 5 % or greater; and 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 [$d \leq 15 \text{ cm} \cdot \text{GHz} / f_{\text{GHz}}$]; <p>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 ($f_{\text{max}} / f_{\text{min}}$) in less than 10 μs and having either of the</p>	<p><i>evaluated against the criteria in 3A001.b.2.</i></p> <p><u>Note 1:</u> <i>Not used.</i></p> <p><u>Note 2:</u> <i>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. to 3A001.b.4.e., is determined by the lowest average output power control threshold.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>following:</p> <ul style="list-style-type: none"> a. A band-pass bandwidth of more than 0.5 % of centre frequency; or b. A band-stop bandwidth of less than 0.5 % of centre frequency; <p>6. Not used;</p> <p>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;</p> <p>8. Microwave power amplifiers containing tubes specified in 3A001.b.1. and having all of the following:</p> <ul style="list-style-type: none"> a. Operating frequencies above 3 GHz; b. An average output power to mass ratio exceeding 80 W/kg; and c. A volume of less than 400 cm³ ; <p>9. Microwave power modules (MPM) consisting of, at least, a travelling wave tube, a microwave “monolithic integrated circuit” and an integrated electronic power conditioner and having all of the following:</p> <ul style="list-style-type: none"> a. A ‘turn-on time’ from off to fully operational in less than 10 seconds; b. A volume less than the maximum rated power in 	<p><i>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.</i></p> <p><u>Technical Notes:</u></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>Watts multiplied by $10 \text{ cm}^3/\text{W}$; and</p> <p>c. An “instantaneous bandwidth” greater than 1 octave ($f_{\text{max.}} > 2 f_{\text{min.}}$) and having either of the following:</p> <ol style="list-style-type: none"> 1. For frequencies equal to or less than 18 GHz, and RF output power greater than 100 W; or 2. A frequency greater than 18 GHz; <p>10. Oscillators or oscillator assemblies, designed to operate with all of the following:</p> <ol style="list-style-type: none"> 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 $10 \text{ kHz} \leq F < 500 \text{ kHz}$; <p>11. “Frequency synthesiser” “electronic assemblies” having a “frequency switching time” as specified by any of the following:</p> <ol style="list-style-type: none"> a. Less than 312 ps; b. Less than 100 μs 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 μs for any frequency change exceeding 550 MHz within the synthesised frequency 	<ol style="list-style-type: none"> 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: $20 \text{ W} \times 10 \text{ cm}^3/\text{W} = 200 \text{ cm}^3$. 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. <p><u>Technical Note:</u></p> <p>In 3A001.b.10., F is the offset from the operating frequency in Hz and f is the operating frequency in MHz.</p> <p><u>NB:</u> For general purpose “signal analysers”, signal generators, network analysers and microwave test receivers, see 3A002.c., 3A002.d., 3A002.e. and 3A002.f., respectively.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>range exceeding 10.6 GHz but not exceeding 31.8 GHz;</p> <p>d. Less than 500 μs for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz; or</p> <p>e. Less than 1 ms within the synthesised frequency range exceeding 43.5 GHz.</p> <p>c. Acoustic wave devices as follows and specially designed components therefor:</p> <p>1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices, having any of the following:</p> <p>a. A carrier frequency exceeding 6 GHz;</p> <p>b. A carrier frequency exceeding 1 GHz, but not exceeding 6 GHz and having any of the following:</p> <p>1. A 'frequency side-lobe rejection' exceeding 65 dB;</p> <p>2. A product of the maximum delay time and the bandwidth (time in μs and bandwidth in MHz) of more than 100;</p> <p>3. A bandwidth greater than 250 MHz; or</p> <p>4. A dispersive delay of more than 10 μs; or</p> <p>c. A carrier frequency of 1 GHz or less and having any</p>	<p><u>Note:</u> 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.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>of the following:</p> <ol style="list-style-type: none"> 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; <ol style="list-style-type: none"> 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; <p>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 either of the following:</p> <ol style="list-style-type: none"> 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 	<p><u>Technical Note:</u></p> <p>'Frequency side-lobe rejection' is the maximum rejection value specified in data sheet.</p>	

Category Code	Items Description	Note	Relevant Authority
	2. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10000;		
	<p>e. High energy devices as follows:</p> <p>1. 'Cells' as follows:</p> <p>a. 'Primary cells' having an 'energy density' exceeding 550 Wh/kg at 20 °C;</p> <p>b. 'Secondary cells' having an 'energy density' exceeding 250 Wh/kg at 20 °C;</p>	<p><u>Technical Notes:</u></p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<p><u>Note:</u> 3A001.e.1. does not control batteries, including single-cell batteries.</p> <p>NB: SEE ALSO 3A201.a.</p>	
	<p>2. High energy storage capacitors as follows:</p> <p>a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) and having all of the following:</p> <ol style="list-style-type: none"> 1. A voltage rating equal to or more than 5 kV; 2. An energy density equal to or more than 250 J/kg; and 3. A total energy equal to or more than 25 kJ; <p>b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) and having all of the following:</p> <ol style="list-style-type: none"> 1. A voltage rating equal to or more than 5 kV; 2. An energy density equal to or more than 50 J/kg; 3. A total energy equal to or more than 100 J; and 4. A charge/discharge cycle life equal to or more than 10000; 	<p>NB: SEE ALSO 3A201.b.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>3. “Superconductive” electromagnets and solenoids, specially designed to be fully charged or discharged in less than one second and having all of the following:</p> <p>a. Energy delivered during the discharge exceeding 10 kJ in the first second;</p> <p>b. Inner diameter of the current carrying windings of more than 250 mm; and</p> <p>c. Rated for a magnetic induction of more than 8 T or “overall current density” in the winding of more than 300 A/mm²;</p> <p>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 1367 watts per square metre (W/m²);</p> <p>f. Rotary input type absolute position encoders having an accuracy equal to or less (better) than ± 1.0 second of arc;</p> <p>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:</p> <p>1. A maximum turn-on current rate of rise (di/dt) greater than 30000 A/μs and off-state voltage greater than 1100 V; or</p>	<p><u>Note:</u> 3A001.e.3. does not control “superconductive” electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.</p> <p><u>Technical Note:</u></p> <p>‘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).</p> <p><u>Note 1:</u> 3A001.g. includes:</p> <ul style="list-style-type: none"> - Silicon Controlled Rectifiers (SCRs) - Electrical Triggering Thyristors (ETTs) - Light Triggering Thyristors (LTTs) - Integrated Gate Commutated Thyristors (IGCTs) 	

Category Code	Items Description	Note	Relevant Authority
	<p>2. A maximum turn-on current rate of rise (di/dt) greater than 2000 A/μs and having both of the following:</p> <p>a. An off-state peak voltage equal to or greater than 3000 V; and</p> <p>b. A peak (surge) current equal to or greater than 3000 A.</p> <p>h. Solid-state power semiconductor switches, diodes or 'modules', having all of the following:</p> <p>1. Rated for a maximum operating junction temperature greater than 488 K (215 °C);</p> <p>2. Repetitive peak off-state voltage (blocking voltage) exceeding 300 V; and</p> <p>3. Continuous current greater than 1 A.</p>	<ul style="list-style-type: none"> - Gate Turn-off Thyristors (GTOs) - MOS Controlled Thyristors (MCTs) - Solidtrons <p><u>Note 2:</u> 3A001.g. does not control thyristor devices and 'thyristor modules' incorporated into equipment designed for civil railway or "civil aircraft" applications.</p> <p><u>Technical Note:</u></p> <p>For the purposes of 3A001.g., a 'thyristor module' contains one or more thyristor devices.</p> <p><u>Note 1:</u> 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.</p> <p><u>Note 2:</u> 3A001.h. includes:</p> <ul style="list-style-type: none"> - 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) 	

Category Code	Items Description	Note	Relevant Authority
		<ul style="list-style-type: none"> - 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 <p><u>Note 3:</u> 3A001.h. does not control switches, diodes or 'modules' incorporated into equipment designed for civil automobile, civil railway or "civil aircraft" applications.</p> <p><u>Technical Note:</u></p> <p>For the purposes of 3A001.h., 'modules' contain one or more solid-state power semiconductor switches or diodes.</p>	
3A002	<p>General purpose electronic equipment and accessories therefor, as follows:</p> <p>a. Recording equipment as follows and specially designed test tape therefor:</p> <p>1. Analogue instrumentation magnetic tape recorders, including those permitting the recording of digital signals</p>	<p><u>Note:</u> Analogue magnetic tape recorders specially designed for civilian video purposes are not considered to be instrumentation tape recorders.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>(e.g. using a high density digital recording (HDDR) module), having any of the following:</p> <ul style="list-style-type: none"> a. A bandwidth exceeding 4 MHz per electronic channel or track; b. A bandwidth exceeding 2 MHz per electronic channel or track and having more than 42 tracks; or c. A time displacement (base) error, measured in accordance with applicable IRIG or EIA documents, of less than $\pm 0.1 \mu\text{s}$; <p>2. Digital video magnetic tape recorders having a maximum digital interface transfer rate exceeding 360 Mbit/s;</p> <p>3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques and having either of the following:</p> <ul style="list-style-type: none"> a. A maximum digital interface transfer rate exceeding 175 Mbit/s; or b. Being "space-qualified"; <p>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;</p>	<p><u>Note:</u> 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, standardised or recommended by the ITU, the IEC, the SMPTE, the EBU, the ETSI or the IEEE for civil television applications.</p> <p><u>Note:</u> 3A002.a.3. does not control analogue magnetic tape recorders equipped with HDDR conversion electronics and configured to record only digital data.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>5. Waveform digitisers and transient recorders, having both of the following:</p> <ul style="list-style-type: none"> a. Digitising rate equal to or more than 200 million samples per second and a resolution of 10 bit or more; and b. A 'continuous throughput' of 2 Gbit/s or more; <p>6. Digital instrumentation data recorders using magnetic disk storage technique and having both of the following:</p> <ul style="list-style-type: none"> a. Digitising rate equal to or more than 100 million samples per second and a resolution of 8 bit or more; and b. A 'continuous throughput' of 1 Gbit/s or more; <p>b. Not used;</p> <p>c. Radio-frequency "signal analysers" as follows:</p> <ul style="list-style-type: none"> 1. "Signal analysers" having a 3 dB resolution bandwidth (RBW) exceeding 10 MHz anywhere within the frequency 	<p><u>Technical Notes:</u></p> <p>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.</p> <p>2. 'Continuous throughput' is the fastest data rate the instrument can output to mass storage without the loss of any information whilst sustaining the sampling rate and analogue-to-digital conversion.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>range exceeding 31.8 GHz but not exceeding 37.5 GHz;</p> <ol style="list-style-type: none"> 2. "Signal analysers" having Displayed Average Noise Level (DANL) less (better) than - 150 dBm/Hz anywhere within the frequency range exceeding 43.5 GHz but not exceeding 70 GHz; 3. "Signal analysers" having a frequency exceeding 70 GHz; 4. "Dynamic signal analysers" having a "real-time bandwidth" exceeding 40 MHz; <p>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:</p> <ol style="list-style-type: none"> 1. Specified to generate a 'pulse duration' of less than 100 ns anywhere within the synthesised frequency range exceeding 31.8 GHz but not exceeding 70 GHz; 2. An output power exceeding 100 mW (20 dBm) anywhere within the synthesised frequency range exceeding 43.5 GHz but not exceeding 70 GHz; 3. A "frequency switching time" as specified by any of the following: <ol style="list-style-type: none"> a. Less than 312 ps; 	<p><u>Note:</u> 3A002.c.4. does not control those "dynamic signal analysers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).</p> <p><u>Note 1.:</u> For the purpose of 3A002.d., frequency synthesised signal generators include arbitrary waveform and function generators.</p> <p><u>Note 2.:</u> 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.</p> <p><u>Technical Notes:</u></p> <p>1. Arbitrary waveform and function generators</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Less than 100 μs for any frequency change exceeding 1.6 GHz within the synthesised frequency range exceeding 3.2 GHz but not exceeding 10.6 GHz;</p> <p>c. Less than 250 μs for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 10.6 GHz but not exceeding 31.8 GHz;</p> <p>d. Less than 500 μs for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 31.8 GHz but not exceeding 43.5 GHz;</p> <p>e. Less than 1 ms for any frequency change exceeding 550 MHz within the synthesised frequency range exceeding 43.5 GHz but not exceeding 56 GHz; or</p> <p>f. Less than 1 ms for any frequency change exceeding 2.2 GHz within the synthesised frequency range exceeding 56 GHz but not exceeding 70 GHz;</p> <p>4. At synthesised frequencies exceeding 3.2 GHz but not exceeding 70 GHz, and having both of the following:</p> <p>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</p> <p>b. A single sideband (SSB) phase noise, in dBc/Hz, better than $-(114 + 20\log_{10} F - 20\log_{10} f)$ for $10 \text{ kHz} \leq F < 500 \text{ kHz}$; or</p>	<p><i>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.</i></p> <p>2. <i>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.</i></p> <p><u>Technical Note:</u></p> <p><i>In 3A002.d.4., F is the offset from the operating frequency in Hz and f is the operating frequency in MHz;</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>5. A maximum synthesised frequency exceeding 70 GHz;</p> <p>e. Network analysers having either of the following:</p> <ol style="list-style-type: none"> 1. Maximum operating frequency exceeding 43.5 GHz and output power exceeding 31.62 mW (15 dBm); or 2. Maximum operating frequency exceeding 70 GHz; <p>f. Microwave test receivers having both of the following:</p> <ol style="list-style-type: none"> 1. A maximum operating frequency exceeding 43.5 GHz; and 2. Being capable of measuring amplitude and phase simultaneously; 		
	<p>g. Atomic frequency standards being any of the following:</p> <ol style="list-style-type: none"> 1. "Space-qualified"; 2. Non-rubidium and having a long-term stability less (better) than 1×10^{-11} /month; or 3. Non-"space-qualified" and having all of the following: <ol style="list-style-type: none"> 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. 		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
3A003	Spray cooling thermal management systems employing closed loop fluid handling and reconditioning equipment in a sealed enclosure where a dielectric fluid is sprayed onto electronic components using specially designed spray nozzles that are designed to maintain electronic components within their operating temperature range, and specially designed components therefor.		Atomic Energy Licensing Board (AELB), MOSTI
3A101	Electronic equipment, devices and components, other than those specified in 3A001, as follows: <ul style="list-style-type: none"> a. Analogue-to-digital converters, usable in "missiles", designed to meet military specifications for ruggedised equipment; b. Accelerators capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2 MeV or greater, and systems containing those accelerators. 	<p><i>Note: 3A101.b. above does not specify equipment specially designed for medical purposes.</i></p>	Controller
3A102	'Thermal batteries' designed or modified for 'missiles'.	<p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. In 3A102 'thermal batteries' are single use batteries that contain a solid non-conducting inorganic salt as the electrolyte. These batteries incorporate a pyrolytic material that, when ignited, melts the electrolyte and activates the battery. 2. In 3A102 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km. 	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>c. Flash X-ray generators or pulsed electron accelerators having either of the following sets of characteristics:</p> <ol style="list-style-type: none"> 1. a. An accelerator peak electron energy of 500 keV or greater but less than 25 MeV; and <li style="padding-left: 40px;">b. With a 'figure of merit' (K) of 0.25 or greater; or 2. a. An accelerator peak electron energy of 25 MeV or greater; and <li style="padding-left: 40px;">b. A 'peak power' greater than 50 MW. 	<p><u>Note:</u> 3A201.c. does not control accelerators that are component parts of devices designed for purposes other than electron beam or X-ray radiation (electron microscopy, for example) nor those designed for medical purposes:</p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. The 'figure of merit' K is defined as: $K = 1.7 \times 10^{-3} \times V^{2.65} \times Q$ <p>V is the peak electron energy in million electron volts.</p> <p>If the accelerator beam pulse duration is less than or equal to 1 μs, then Q is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than 1 μs, then Q is the maximum accelerated charge in 1 μs.</p> <p>Q equals the integral of i with respect to t, over the lesser of 1 μs or the time duration of the beam pulse ($Q = \int i dt$), where i is beam current in amperes and t is time in seconds.</p> 2. 'Peak power' = (peak potential in volts) × (peak beam current in amperes). 3. In machines based on microwave accelerating cavities, the time duration of 	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<p><i>the beam pulse is the lesser of 1 μs or the duration of the bunched beam packet resulting from one microwave modulator pulse.</i></p> <p><i>4. In machines based on microwave accelerating cavities, the peak beam current is the average current in the time duration of a bunched beam packet.</i></p>	
3A225	<p>Frequency changers or generators, other than those specified in 0B001.b.13., having all of the following characteristics:</p> <ol style="list-style-type: none"> Multiphase output capable of providing a power of 40 W or greater; Capable of operating in the frequency range between 600 and 2000 Hz; Total harmonic distortion better (less) than 10 %; and Frequency control better (less) than 0.1 %. 	<p><u>Technical Note:</u></p> <p><i>Frequency changers in 3A225 are also known as converters or inverters.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
3A226	<p>High-power direct current power supplies, other than those specified in 0B001.j.6., having both of the following characteristics:</p> <ol style="list-style-type: none"> Capable of continuously producing, over a time period of 8 hours, 100 V or greater with current output of 500 A or greater; and Current or voltage stability better than 0.1% over a time period of 8 hours. 		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
3A227	<p>High-voltage direct current power supplies, other than those specified in 0B001.j.5., having both of the following characteristics:</p> <ol style="list-style-type: none"> Capable of continuously producing, over a time period of 8 hours, 20 kV or greater with current output of 1 A or greater; and Current or voltage stability better than 0.1 % over a time period of 8 hours. 		Atomic Energy Licensing Board (AELB), MOSTI
3A228	<p>Switching devices, as follows:</p> <ol style="list-style-type: none"> Cold-cathode tubes, whether gas filled or not, operating similarly to a spark gap, having all of the following characteristics: <ol style="list-style-type: none"> Containing three or more electrodes; Anode peak voltage rating of 2.5 kV or more; Anode peak current rating of 100 A or more; and Anode delay time of 10 μs or less; Triggered spark-gaps having both of the following characteristics: <ol style="list-style-type: none"> An anode delay time of 15 μs or less; and Rated for a peak current of 500 A or more; Modules or assemblies with a fast switching function, other than those specified in 3A001.g. or 3A001.h., having all of the 	<p><u>Note:</u> 3A228 includes gas krytron tubes and vacuum sprytron tubes.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>following characteristics:</p> <ol style="list-style-type: none"> 1. Anode peak voltage rating greater than 2 kV; 2. Anode peak current rating of 500 A or more; and 3. Turn-on time of 1 μs or less. 		
3A229	<p>High-current pulse generators as follows:</p> <ol style="list-style-type: none"> a. Not used; b. Modular electrical pulse generators (pulsers) having all of the following characteristics: <ol style="list-style-type: none"> 1. Designed for portable, mobile, or ruggedised-use; 2. Enclosed in a dust-tight enclosure; 3. Capable of delivering their energy in less than 15 μs; 4. Having an output greater than 100 A; 5. Having a 'rise time' of less than 10 μs into loads of less than 40 ohms; 6. No dimension greater than 254 mm; 	<p>NB: SEE ALSO MILITARY ITEMS LIST.</p> <p><u>NB:</u> See 1A007.a. for explosive detonator firing sets.</p> <p><u>Note:</u> 3A229.b. includes xenon flash-lamp drivers.</p> <p><u>Technical Note:</u></p> <p>In 3A229.b.5. 'rise time' is defined as the time interval from 10 % to 90 % current amplitude when driving a resistive load.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>7. Weight less than 25 kg; and</p> <p>8. Specified for use over an extended temperature range 223 K (– 50 °C) to 373 K (100 °C) or specified as suitable for aerospace applications.</p>		
3A230	<p>High-speed pulse generators having both of the following characteristics:</p> <p>a. Output voltage greater than 6 V into a resistive load of less than 55 ohms; and</p> <p>b. 'Pulse transition time' less than 500 ps.</p>	<p><u>Technical Note:</u></p> <p><i>In 3A230, 'pulse transition time' is defined as the time interval between 10 % and 90 % voltage amplitude.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI
3A231	<p>Neutron generator systems, including tubes, having both of the following characteristics:</p> <p>a. Designed for operation without an external vacuum system; and</p> <p>b. Utilising electrostatic acceleration to induce a tritium-deuterium nuclear reaction.</p>		Atomic Energy Licensing Board (AELB), MOSTI
3A232	<p>Multipoint initiation systems, other than those specified in 1A007, as follows:</p> <p>a. Not used;</p> <p>b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over greater than 5000 mm² from a single firing signal with an initiation timing spread over the surface of less than 2.5 µs.</p>	<p>NB: SEE ALSO MILITARY ITEMS LIST.</p> <p><u>NB:</u> See 1A007.b. for detonators.</p> <p><u>Note:</u> 3A232 does not control detonators using only primary explosives, such as lead azide.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
3A233	<p>Mass spectrometers, other than those specified in 0B002.g., capable of measuring ions of 230 atomic mass units or greater and having a resolution of better than 2 parts in 230, as follows, and ion sources therefor:</p> <ol style="list-style-type: none"> Inductively coupled plasma mass spectrometers (ICP/MS); Glow discharge mass spectrometers (GDMS); Thermal ionisation mass spectrometers (TIMS); Electron bombardment mass spectrometers which have a source chamber constructed from, lined with or plated with materials resistant to UF₆; Molecular beam mass spectrometers having either of the following characteristics: <ol style="list-style-type: none"> A source chamber constructed from, lined with or plated with stainless steel or molybdenum and equipped with a cold trap capable of cooling to 193 K (– 80 °C) or less; or A source chamber constructed from, lined with or plated with materials resistant to UF₆; Mass spectrometers equipped with a microfluorination ion source designed for actinides or actinide fluorides. 		Atomic Energy Licensing Board (AELB), MOSTI
3B	Test, Inspection and Production Equipment		
3B001	Equipment for the manufacturing of semiconductor devices or materials, as follows and specially designed components and		Atomic Energy Licensing Board

Category Code	Items Description	Note	Relevant Authority
	<p>accessories therefor:</p> <p>a. Equipment designed for epitaxial growth as follows:</p> <ol style="list-style-type: none"> 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; 2. Metal Organic Chemical Vapour Deposition (MOCVD) reactors specially designed for compound semiconductor crystal growth by the chemical reaction between materials specified in 3C003 or 3C004; 3. Molecular beam epitaxial growth equipment using gas or solid sources; <p>b. Equipment designed for ion implantation and having any of the following:</p> <ol style="list-style-type: none"> 1. A beam energy (accelerating voltage) exceeding 1MeV; 2. Being specially designed and optimised to operate at a beam energy (accelerating voltage) of less than 2 keV; 3. Direct write capability; or 4. A beam energy of 65 keV or more and a beam current of 45 mA or more for high energy oxygen implant into a heated semiconductor material "substrate"; <p>c. Anisotropic plasma dry etching equipment having both of the following:</p> <ol style="list-style-type: none"> 1. Designed or optimised to produce critical dimensions of 	<p><u>Note:</u> 3B001.a.1. includes Atomic Layer Epitaxy (ALE) equipment.</p>	(AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>65 nm or less; and</p> <p>2. Within-wafer non-uniformity equal to or less than 10 % 3σ measured with an edge exclusion of 2 mm or less;</p> <p>d. Plasma enhanced Chemical Vapour Deposition (CVD) equipment as follows:</p> <p>1. Equipment with cassette-to-cassette operation and load-locks, and designed according to the manufacturer's specifications or optimised for use in the production of semiconductor devices with critical dimensions of 65 nm or less;</p> <p>2. Equipment specially designed for equipment specified in 3B001.e. and designed according to the manufacturer's specifications or optimised for use in the production of semiconductor devices with critical dimensions of 65 nm or less;</p> <p>e. Automatic loading multi-chamber central wafer handling systems having both of the following:</p> <p>1. Interfaces for wafer input and output, to which more than two functionally different 'semiconductor process tools' specified in 3B001.a., 3B001.b., 3B001.c. or 3B001.d. are designed to be connected; and</p> <p>2. Designed to form an integrated system in a vacuum environment for 'sequential multiple wafer processing';</p>	<p><i>Note: 3B001.e. does not control automatic robotic wafer handling systems specially designed for parallel wafer processing.</i></p> <p><i>Technical Notes:</i></p> <p>1. For the purpose of 3B001.e.,</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>f. Lithography equipment as follows:</p> <ol style="list-style-type: none"> 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 either of the following: <ol style="list-style-type: none"> a. A light source wavelength shorter than 245 nm; or b. Capable of producing a pattern with a 'Minimum Resolvable Feature size' (MRF) of 95 nm or less; 2. Imprint lithography equipment capable of producing features of 95 nm or less; 3. Equipment specially designed for mask making or semiconductor device processing using direct writing methods, having all of the following: <ol style="list-style-type: none"> a. Using deflected focussed electron beam, ion beam or "laser" beam; and 	<p><i>'semiconductor process tools' refers to modular tools that provide physical processes for semiconductor production that are functionally different, such as deposition, etch, implant or thermal processing.</i></p> <p>2. <i>For the purpose of 3B001.e., 'sequential multiple wafer processing' means the capability to process each wafer in different 'semiconductor process tools', such as by transferring each wafer from one tool to a second tool and on to a third tool with the automatic loading multi-chamber central wafer handling systems.</i></p> <p><u>Technical Note:</u></p> <p><i>The 'Minimum Resolvable Feature size' (MRF) is calculated by the following formula:</i></p> $MRF = \frac{(\text{an exposure light source wavelength in nm}) \times (K\text{factor})}{\text{numerical aperture}}$ <p><i>where the K factor = 0.35</i></p> <p><u>Note:</u> 3B001.f.2. includes:</p> <ul style="list-style-type: none"> — Micro contact printing tools — Hot embossing tools 	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Having any of the following:</p> <ol style="list-style-type: none"> 1. A spot size smaller than 0.2 μm; 2. Being capable of producing a pattern with a feature size of less than 1 μm; or 3. An overlay accuracy of better than $\pm 0.20 \mu\text{m}$ (3 sigma); <p>g. Masks and reticles, designed for integrated circuits specified in 3A001;</p> <p>h. Multi-layer masks with a phase shift layer;</p> <p>i. Imprint lithography templates designed for integrated circuits specified in 3A001.</p>	<p>— Nano-imprint lithography tools</p> <p>— Step and flash imprint lithography (S-FIL) tools</p> <p><u>Note:</u> 3B001.h. does not control multi-layer masks with a phase shift layer designed for the fabrication of memory devices not controlled by 3A001.</p>	
3B002	<p>Test equipment specially designed for testing finished or unfinished semiconductor devices as follows and specially designed components and accessories therefor:</p> <p>a. For testing S-parameters of transistor devices at frequencies exceeding 31.8 GHz;</p>		Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	b. Not used; c. For testing microwave integrated circuits specified in 3A001.b.2.		
3C	Materials		
3C001	Hetero-epitaxial materials consisting of a “substrate” having stacked epitaxially grown multiple layers of any of the following: a. Silicon (Si); b. Germanium (Ge); c. Silicon carbide (SiC); or d. “III/V compounds” of gallium or indium.		Atomic Energy Licensing Board (AELB), MOSTI
3C002	Resist materials as follows and “substrates” coated with the following resists: a. Positive resists designed for semiconductor lithography specially adjusted (optimised) for use at wavelengths below 245 nm; b. All resists designed for use with electron beams or ion beams, with a sensitivity of 0.01µcoulomb/mm ² or better; c. All resists designed for use with X-rays, with a sensitivity of 2.5 mJ/mm ² or better; d. All resists optimised for surface imaging technologies, including ‘silylated’ resists;	<u>Technical Note:</u>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	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.	<i>'Silylation' techniques are defined as processes incorporating oxidation of the resist surface to enhance performance for both wet and dry developing.</i>	
3C003	Organo-inorganic compounds as follows: a. Organo-metallic compounds of aluminium, gallium or indium, having a purity (metal basis) better than 99.999 %; b. Organo-arsenic, organo-antimony and organo-phosphorus compounds, having a purity (inorganic element basis) better than 99.999 %.	<u>Note:</u> 3C003 only controls compounds whose metallic, partly metallic or non-metallic element is directly linked to carbon in the organic part of the molecule.	Atomic Energy Licensing Board (AELB), MOSTI
3C004	Hydrides of phosphorus, arsenic or antimony, having a purity better than 99.999 %, even diluted in inert gases or hydrogen.	<u>Note:</u> 3C004 does not control hydrides containing 20 % molar or more of inert gases or hydrogen.	Atomic Energy Licensing Board (AELB), MOSTI
3C005	Silicon carbide (SiC), gallium nitride (GaN), aluminium nitride (AlN) or aluminium gallium nitride (AlGaN) "substrates", or ingots, boules, or other preforms of those materials, having resistivities greater than 10000 ohm-cm at 20 °C.		Atomic Energy Licensing Board (AELB), MOSTI
3C006	"Substrates" specified in 3C005 with at least one epitaxial layer of silicon carbide, gallium nitride, aluminium nitride or aluminium gallium nitride.		Atomic Energy Licensing Board (AELB), MOSTI
3D	Software		
3D001	"Software" specially designed for the "development" or		Atomic Energy

Category Code	Items Description	Note	Relevant Authority
	"production" of equipment specified in 3A001.b. to 3A002.g. or 3B.		Licensing Board (AELB), MOSTI
3D002	"Software" specially designed for the "use" of equipment specified in 3B001.a. to f. or 3B002.		Atomic Energy Licensing Board (AELB), MOSTI
3D003	'Physics-based' simulation "software" specially designed for the "development" of lithographic, etching or deposition processes for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor materials.	<p><u>Technical Note:</u></p> <p><i>'Physics-based' in 3D003 means using computations to determine a sequence of physical cause and effect events based on physical properties (e.g. temperature, pressure, diffusion constants and semiconductor materials properties).</i></p> <p><u>Note:</u> Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as "technology".</p>	Atomic Energy Licensing Board (AELB), MOSTI
3D004	"Software" specially designed for the "development" of the equipment specified in 3A003.		Atomic Energy Licensing Board (AELB), MOSTI
3D101	"Software" specially designed or modified for the "use" of equipment specified in 3A101.b.		Atomic Energy Licensing Board (AELB), MOSTI
3E	Technology		
3E001	"Technology" according to the General Technology Note for the "development" or "production" of equipment or materials specified in 3A, 3B or 3C;	<u>Note 1:</u> 3E001 does not control "technology" for the "production" of equipment or components controlled by 3A003.	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
		<p><u>Note 2:</u> 3E001 does not control “technology” for the “development” or “production” of integrated circuits specified in 3A001.a.3. to 3A001.a.12., having all of the following:</p> <p>a. Using “technology” at or above 0.130 μm; and</p> <p>b. Incorporating multi-layer structures with three or fewer metal layers.</p>	
3E002	<p>“Technology” according to the General Technology Note, other than that specified in 3E001, for the “development” or “production” of a “microprocessor microcircuit”, “microcomputer microcircuit” or microcontroller microcircuit core, having an arithmetic logic unit with an access width of 32 bits or more and any of the following features or characteristics:</p> <p>a. A ‘vector processor unit’ designed to perform more than two calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers) simultaneously;</p> <p>b. Designed to perform more than two 64-bit or larger floating-</p>	<p><u>Note 1:</u> 3E002 does not control “technology” for the “development” or “production” of micro-processor cores, having all of the following:</p> <p>a. Using “technology” at or above 0.130 μm; and</p> <p>b. Incorporating multi-layer structures with five or fewer metal layers.</p> <p><u>Note 2:</u> 3E002 includes “technology” for digital signal processors and digital array processors.</p> <p><u>Technical Note:</u></p> <p>A ‘vector processor unit’ is a processor element with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 32-bit or larger numbers)</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>point operation results per cycle; or</p> <p>c. Designed to perform more than four 16-bit fixed-point multiply-accumulate results per cycle (e.g. digital manipulation of analogue information that has been previously converted into digital form, also known as digital “signal processing”).</p>	<p><i>simultaneously, having at least one vector arithmetic logic unit.</i></p> <p><u>Note:</u> 3E002.c. does not control “technology” for multimedia extensions.</p>	
3E003	<p>Other “technology” for the “development” or “production” of the following:</p> <p>a. Vacuum microelectronic devices;</p> <p>b. Hetero-structure semiconductor devices such as high electron mobility transistors (HEMT), hetero- bipolar transistors (HBT), quantum well and super lattice devices;</p> <p>c. “Superconductive” electronic devices;</p> <p>d. Substrates of films of diamond for electronic components.</p> <p>e. Substrates of silicon-on-insulator (SOI) for integrated circuits in which the insulator is silicon dioxide;</p> <p>f. Substrates of silicon carbide for electronic components;</p> <p>g. Electronic vacuum tubes operating at frequencies of 31.8 GHz or higher.</p>	<p><u>Note:</u> 3E003.b. does not control “technology” for high electron mobility transistors (HEMT) operating at frequencies lower than 31.8 GHz and hetero-junction bipolar transistors (HBT) operating at frequencies lower than 31.8 GHz.</p>	Atomic Energy Licensing Board (AELB), MOSTI
3E101	<p>“Technology” according to the General Technology Note for the “use” of equipment or “software” specified in 3A001.a.1. or 2., 3A101, 3A102 or 3D101.</p>		Controller
3E102	<p>“Technology” according to the General Technology Note for the</p>		Controller

Category Code	Items Description	Note	Relevant Authority
	"development" of "software" specified in 3D101.		
3E201	"Technology" according to the General Technology Note for the "use" of equipment specified in 3A001.e.2., 3A001.e.3., 3A001.g., 3A201, 3A225 to 3A233.		Controller

CATEGORY 4

COMPUTERS

Category Code	Items Description	Note	Relevant Authority
Category 4: COMPUTERS		<p><u>Note 1:</u> Computers, related equipment and “software” performing telecommunications or “local area network” functions must also be evaluated against the performance characteristics of Category 5, Part 1 (Telecommunications).</p> <p><u>Note 2:</u> Control units which directly interconnect the buses or channels of central processing units, “main storage” or disk controllers are not regarded as telecommunications equipment described in Category 5, Part 1 (Telecommunications).</p> <p><u>NB:</u> For the control status of “software” specially designed for packet switching, see 5D001.</p> <p><u>Note 3:</u> Computers, related equipment and “software” performing cryptographic, cryptanalytic, certifiable multi-level security or certifiable user isolation functions, or which limit electromagnetic compatibility (EMC), must also be evaluated against the performance characteristics in Category 5, Part 2 (“Information Security”).</p>	
4A	Systems, Equipment and Components		
4A001	<p>Electronic computers and related equipment, having any of the following and “electronic assemblies” and specially designed components therefor:</p> <p>a. Specially designed to have any of the following:</p> <ol style="list-style-type: none"> Rated for operation at an ambient temperature below 228 K (– 45 °C) or above 358 K (85 °C); or Radiation hardened to exceed any of the following 	<p><u>NB:</u> SEE ALSO 4A101.</p> <p><u>Note:</u> 4A001.a.1. does not control computers specially designed for civil automobile, railway train or “civil aircraft” applications.</p> <p><u>Note:</u> 4A001.a.2. does not control computers</p>	Department of Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>specifications:</p> <p>a. Total Dose 5×10^3 Gy (silicon);</p> <p>b. Dose Rate Upset 5×10^6 Gy (silicon)/s; or</p> <p>c. Single Event Upset 1×10^{-8} Error/bit/day;</p> <p>b. Not used.</p>	<p><i>specially designed for "civil aircraft" applications.</i></p>	
4A003	<p>"Digital computers", "electronic assemblies", and related equipment therefor, as follows and specially designed components therefor:</p>	<p><u>Note 1:</u> 4A003 includes the following:</p> <ul style="list-style-type: none"> - 'Vector processors'; - Array processors; - Digital signal processors; - Logic processors; - Equipment designed for "image enhancement"; - Equipment designed for "signal processing". <p><u>Note 2:</u> The control status of the "digital computers" and related equipment described in 4A003 is determined by the control status of other equipment or systems provided:</p> <p>a. The "digital computers" or related</p>	<p>Malaysian Communications and Multimedia Commission</p>

Category Code	Items Description	Note	Relevant Authority
	a. Designed or modified for “fault tolerance”;	<p>equipment are essential for the operation of the other equipment or systems;</p> <p>b. The “digital computers” or related equipment are not a “principal element” of the other equipment or systems; and</p> <p><u>NB 1:</u> The control status of “signal processing” or “image enhancement” equipment specially designed for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the “principal element” criterion.</p> <p><u>NB 2:</u> For the control status of “digital computers” or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications).</p> <p>c. The “technology” for the “digital computers” and related equipment is determined by 4E.</p> <p><u>Note:</u> For the purposes of 4A003.a., “digital computers” and related equipment are not considered to be designed or modified for “fault tolerance” if they utilise any of the following:</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>b. "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 1.5 Weighted TeraFLOPS (WT);</p> <p>c. "Electronic assemblies" specially designed or modified for enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit specified in</p>	<p>1. <i>Error detection or correction algorithms in "main storage";</i></p> <p>2. <i>The interconnection of two "digital computers" so that, if the active central processing unit fails, an idling but mirroring central processing unit can continue the system's functioning;</i></p> <p>3. <i>The interconnection of two central processing units by data channels or by using shared storage to permit one central processing unit to perform other work until the second central processing unit fails, at which time the first central processing unit takes over in order to continue the system's functioning; or</i></p> <p>4. <i>The synchronisation of two central processing units by "software" so that one central processing unit recognises when the other central processing unit fails and recovers tasks from the failing unit.</i></p> <p><u>Note 1:</u> 4A003.c. controls only "electronic assemblies" and programmable interconnections not exceeding the</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>4A003.b.;</p> <p>d. Not used;</p> <p>e. Equipment performing analogue-to-digital conversions exceeding the limits specified in 3A001.a.5.;</p> <p>f. Not used;</p> <p>g. Equipment specially designed for aggregating the performance of “digital computers” by providing external interconnections which allows communications at unidirectional data rates exceeding 2.0 Gbyte/s per link.</p>	<p><i>limit specified in 4A003.b. when shipped as unintegrated “electronic assemblies”. It does not control “electronic assemblies” inherently limited by nature of their design for use as related equipment specified in 4A003.e.</i></p> <p><u>Note 2:</u> 4A003.c. does not control “electronic assemblies” specially designed for a product or family of products whose maximum configuration does not exceed the limit specified in 4A003.b.</p> <p><u>Note:</u> 4A003.g. does not control internal interconnection equipment (e.g. backplanes, buses), passive interconnection equipment, “network access controllers” or “communications channel controllers”.</p>	
4A004	<p>Computers as follows and specially designed related equipment, “electronic assemblies” and components therefor:</p> <p>a. “Systolic array computers”;</p> <p>b. “Neural computers”;</p>		Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	c. "Optical computers".		
4A101	Analogue computers, "digital computers" or digital differential analysers, other than those specified in 4A001.a.1., which are ruggedised and designed or modified for use in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.		Malaysian Communications and Multimedia Commission
4A102	"Hybrid computers" specially designed for modelling, simulation or design integration of space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.	<i>Note: This control only applies when the equipment is supplied with "software" specified in 7D103 or 9D103.</i>	Malaysian Communications and Multimedia Commission
4B	Test, Inspection and Production Equipment None.		
4C	Materials None.		
4D	Software	<i>Note: The control status of "software" for the "development", "production", or "use" of equipment described in other Categories is dealt with in the appropriate Category.</i>	
4D001	<p>"Software" as follows:</p> <p>a. "Software" specially designed or modified for the "development", "production" or "use" of equipment or "software" specified in 4A001 to 4A004, or 4D.</p> <p>b. "Software", other than that specified in 4D001.a., specially</p>		Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	<p>designed or modified for the “development” or “production” of equipment as follows:</p> <ol style="list-style-type: none"> 1. “Digital computers” having an “Adjusted Peak Performance” (“APP”) exceeding 0.25 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.; 		
4D002	“Software” specially designed or modified to support “technology” specified in 4E.		Malaysian Communications and Multimedia Commission
4D003	Not used.		
4E	Technology		
4E001	<ol style="list-style-type: none"> a. “Technology” according to the General Technology Note, for the “development” “production” or “use” of equipment or “software” specified in 4A or 4D. b. “Technology”, other than that specified in 4E001.a., specially designed or modified for the “development” or “production” of equipment as follows: <ol style="list-style-type: none"> 1. “Digital computers” having an “Adjusted Peak Performance” (“APP”) exceeding 0.25Weighted TeraFLOPS (WT); 2. “Electronic assemblies” specially designed or modified for enhancing performance by aggregation of processors so 		Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	that the “APP” of the aggregation exceeds the limit in 4E001.b.1.		

TECHNICAL NOTE ON “ADJUSTED PEAK PERFORMANCE” (“APP”)

“APP” is an adjusted peak rate at which “digital computers” perform 64-bit or larger floating point additions and multiplications.

“APP” is expressed in Weighted TeraFLOPS (WT), in units of 10^{12} adjusted floating point operations per second.

Abbreviations used in this Technical Note

n number of processors in the “digital computer”

i processor number ($i = 1, \dots, n$)

t_i processor cycle time ($t_i = 1/F_i$)

F_i processor frequency

R_i peak floating point calculating rate

W_i architecture adjustment factor

Outline of “APP” calculation method

1. For each processor i , determine the peak number of 64-bit or larger floating point operations, FPO_i , performed per cycle for each processor in the “digital computer”.

Note: In determining FPO , include only 64-bit or larger floating point additions and/or multiplications. All floating point operations must be expressed in operations per processor cycle; operations requiring multiple cycles may be expressed in fractional results per cycle. For processors not capable of performing calculations on floating point operands of 64-bit or more, the effective calculating rate R is zero.

2. Calculate the floating point rate R for each processor $R_i = FPO_i / t_i$.
3. Calculate “APP” as “APP” = $W_1 \times R_1 + W_2 \times R_2 + \dots + W_n \times R_n$.
4. For ‘vector processors’, $W_i = 0.9$. For non-‘vector processors’, $W_i = 0.3$

Note 1: For processors that perform compound operations in a cycle, such as addition and multiplication, each operation is counted.

Note 2: For a pipelined processor the effective calculating rate R is the faster of the pipelined rate, once the pipeline is full, or the non-pipelined rate.

Note 3: The calculating rate R of each contributing processor is to be calculated at its maximum value theoretically possible before the “APP” of the combination is derived. Simultaneous operations are assumed to exist when the computer manufacturer claims concurrent, parallel, or simultaneous operation or execution in a manual or brochure for the computer.

Note 4: Do not include processors that are limited to input/output and peripheral functions (e.g. disk drive, communication and video display) when calculating “APP”.

Note 5: “APP” values are not to be calculated for processor combinations (inter)connected by “Local Area Networks”, Wide Area Networks, I/O shared connections/devices, I/O controllers and any communication interconnection implemented by “software”.

Note 6: “APP” values must be calculated for:

1. Processor combinations containing processors specially designed to enhance performance by aggregation, operating simultaneously and sharing memory; or
2. Multiple memory/processor combinations operating simultaneously utilising specially designed hardware.

Note 7: A ‘vector processor’ is defined as a processor with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 64-bit or larger numbers) simultaneously, having at least 2 vector functional units and at least 8 vector registers of at least 64 elements each.

CATEGORY 5

TELECOMMUNICATIONS AND “INFORMATION SECURITY”

Category Code	Items Description	Note	Relevant Authority
Category 5: TELECOMMUNICATIONS AND “INFORMATION SECURITY”			
CATEGORY 5, PART 1 : TELECOMMUNICATIONS		<p><u>Note 1:</u> The control status of components, “lasers”, test and “production” equipment and “software” therefor which are specially designed for telecommunications equipment or systems is determined in Category 5, Part 1.</p> <p><u>NB 1:</u> For “lasers” specially designed for telecommunications equipment or systems, see 6A005.</p> <p><u>NB 2:</u> See also Category 5, Part 2 for equipment, components, and “software” performing or incorporating “information security” functions.</p> <p><u>Note 2:</u> “Digital computers”, related equipment or “software”, when essential for the operation and support of telecommunications equipment described in this Category, are regarded as specially designed components, provided they are the standard models customarily supplied by the manufacturer. This includes operation, administration, maintenance, engineering or billing computer systems.</p>	
5A1	Systems, Equipment and Components		
5A001	Telecommunications systems, equipment, components and accessories as follows: a. Any type of telecommunications equipment having any of the following characteristics, functions or features: 1. Specially designed to withstand transitory electronic effects or electromagnetic pulse		Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	<p>effects, both arising from a nuclear explosion;</p> <ol style="list-style-type: none"> 2. Specially hardened to withstand gamma, neutron or ion radiation; or 3. Specially designed to operate outside the temperature range from 218 K (– 55 °C) to 397 K (124 °C); <p>b. Telecommunication systems and equipment, and specially designed components and accessories therefor, having any of the following characteristics, functions or features:</p> <ol style="list-style-type: none"> 1. Being underwater untethered communications systems having any of the following: <ol style="list-style-type: none"> a. An acoustic carrier frequency outside the range from 20 kHz to 60 kHz; b. Using an electromagnetic carrier frequency below 30 kHz; c. Using electronic beam steering techniques; or 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”; 2. Being radio equipment operating in the 1.5 MHz 	<p><i><u>Note:</u> 5A001.a.3. applies only to electronic equipment.</i></p> <p><i><u>Note:</u> 5A001.a.2. and 5A001.a.3. do not control equipment designed or modified for use on board satellites.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>to 87.5 MHz band and having all of the following:</p> <ul style="list-style-type: none"> a. Automatically predicting and selecting frequencies and “total digital transfer rates” per channel to optimise the transmission; and 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; <p>3. Being radio equipment employing “spread spectrum” techniques, including “frequency hopping” techniques, other than those specified in 5A001.b.4. and having any of the following:</p> <ul style="list-style-type: none"> a. User programmable spreading codes; or b. A total transmitted bandwidth which is 100 or more times the bandwidth of any one information channel and in excess of 50 kHz; <p>4. Being radio equipment employing ultra-wideband modulation techniques, having user</p>	<p><i>Note: 5A001.b.3.b. does not control radio equipment specially designed for use with civil cellular radio- communications systems.</i></p> <p><i>Note: 5A001.b.3 does not control equipment designed to operate at an output power of 1 W or less.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>programmable channelising codes, scrambling codes or network identification codes and having any of the following:</p> <ul style="list-style-type: none"> a. A bandwidth exceeding 500 MHz; or b. A “fractional bandwidth” of 20 % or more; <p>5. Being digitally controlled radio receivers having all of the following:</p> <ul style="list-style-type: none"> a. More than 1000 channels; b. A “frequency switching time” of less than 1 ms; c. Automatic searching or scanning of a part of the electromagnetic spectrum; and d. Identification of the received signals or the type of transmitter; or <p>6. Employing functions of digital “signal processing” to provide ‘voice coding’ output at rates of less than 2400 bit/s.</p>	<p><i><u>Note:</u> 5A001.b.5. does not control radio equipment specially designed for use with civil cellular radio- communications systems.</i></p> <p><i><u>Technical Notes:</u></i></p> <ol style="list-style-type: none"> 1. <i>For variable rate ‘voice coding’, 5A001.b.6. applies to the ‘voice coding’ output of continuous speech.</i> 2. <i>For the purposes of 5A001.b.6., ‘voice coding’ is defined as the technique to take samples of human voice and then convert these samples into a digital signal, taking into account specific</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>c. Optical fibres of more than 500 m in length and specified by the manufacturer as being capable of withstanding a 'proof test' tensile stress of 2×10^9 N/m² or more;</p> <p>d. "Electronically steerable phased array antennae" operating above 31.8 GHz;</p> <p>e. Radio direction finding equipment operating at frequencies above 30 MHz and having both of the following, and specially designed components therefor:</p> <ol style="list-style-type: none"> 1. "Instantaneous bandwidth" of 10 MHz or more; and 2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms; <p>f. Jamming equipment specially designed or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile</p>	<p><i>characteristics of human speech.</i></p> <p><u>NB:</u> For underwater umbilical cables, see 8A002.a.3.</p> <p><u>Technical Note:</u></p> <p><i>'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 fibre at a running rate of 2 to 5 m/s while passing between capstans approximately 50 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.</i></p> <p><u>Note:</u> 5A001.d. does not control "electronically steerable phased array antennae" for landing systems with instruments meeting ICAO standards covering Microwave Landing Systems (MLS).</p> <p><u>NB:</u> For GNSS jamming equipment see Military Goods</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>telecommunications services and perform any of the following, and specially designed components therefor:</p> <ol style="list-style-type: none"> 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); <p>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;</p> <p>h. Radio Frequency (RF) transmitting equipment designed or modified for prematurely activating or preventing the initiation of Improvised Explosive Devices (IEDs).</p>	<p><i>Controls.</i></p> <p><u>Technical Note:</u></p> <p><i>Non-radar transmitters may include commercial radio, television or cellular telecommunications base stations.</i></p> <p><u>Note:</u> 5A001.g. does not control any of the following:</p> <ol style="list-style-type: none"> a. Radio-astronomical equipment; or b. Systems or equipment, that require any radio transmission from the target. <p>NB: SEE ALSO 5A001.f. AND MILITARY GOODS CONTROLS.</p>	
5A101	Telemetry and telecontrol equipment, including ground	<u>Technical Note:</u>	Malaysian

Category Code	Items Description	Note	Relevant Authority
	equipment, designed or modified for 'missiles'.	<p><i>In 5A101 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p> <p><u>Note:</u> 5A101 does not control:</p> <ul style="list-style-type: none"> a. <i>Equipment designed or modified for manned aircraft or satellites;</i> b. <i>Ground based equipment designed or modified for terrestrial or marine applications;</i> c. <i>Equipment designed for commercial, civil or 'Safety of Life' (e.g. data integrity, flight safety) GNSS services;</i> 	Communications and Multimedia Commission
5B1	Test, Inspection and Production Equipment		
5B001	<p>Telecommunications test, inspection and production equipment, components and accessories, as follows:</p> <ul style="list-style-type: none"> a. Equipment and specially designed components or accessories therefor, specially designed for the "development", "production" or "use" of equipment, functions or features, specified in 5A001; b. Equipment and specially designed components or accessories therefor, specially designed for the "development" of any of the following telecommunication transmission or switching equipment: 	<p><u>Note:</u> 5B001.a. does not control optical fibre characterisation equipment.</p>	Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Not used; 2. Equipment employing a “laser” and having any of the following: <ol style="list-style-type: none"> 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 2.5GHz; 3. Not used; 4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 256; or 5. Equipment employing “common channel signalling” operating in non-associated mode of operation. 	<p><u>Note:</u> 5B001.b.2.d. does not control equipment specially designed for the “development” of commercial TV systems.</p>	
5C1	Materials		

Category Code	Items Description	Note	Relevant Authority
	None		
5D1	Software		
5D001	<p>“Software” as follows:</p> <ol style="list-style-type: none"> a. “Software” specially designed or modified for the “development”, “production” or “use” of equipment, functions or features, specified in 5A001; b. “Software” specially designed or modified to support “technology” specified in 5E001; c. Specific “software” specially designed or modified to provide characteristics, functions or features of equipment, specified in 5A001 or 5B001; d. “Software” specially designed or modified for the “development” of any of the following telecommunication transmission or switching equipment: <ol style="list-style-type: none"> 1. Not used; 2. Equipment employing a “laser” and having either of the following: <ol style="list-style-type: none"> a. A transmission wavelength exceeding 1750 nm; or b. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz; or 3. Not used; 	<p><u>Note:</u> 5D001.d.2.b. does not control “software” specially designed or modified for the “development” of commercial TV systems.</p>	Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 256.		
5D101	"Software" specially designed or modified for the "use" of equipment specified in 5A101.		Malaysian Communications and Multimedia Commission
5E1	Technology		
5E001	<p>"Technology" as follows:</p> <p>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.;</p> <p>b. Specific "technology" as follows:</p> <ol style="list-style-type: none"> "Required" "technology" for the "development" or "production" of telecommunications equipment specially designed to be used on board satellites; "Technology" for the "development" or "use" of "laser" communication techniques with the capability of automatically acquiring and tracking signals and maintaining communications through exoatmosphere or sub-surface (water) media; 		Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	<p>3. "Technology" for the "development" of digital cellular radio base station receiving equipment whose reception capabilities that allow multi-band, multi-channel, multi-mode, multi-coding algorithm or multi-protocol operation can be modified by changes in "software";</p> <p>4. "Technology" for the "development" of "spread spectrum" techniques, including "frequency hopping" techniques;</p> <p>c. "Technology" according to the General Technology Note for the "development" or "production" of any of the following:</p> <p>1. Equipment employing digital techniques designed to operate at a "total digital transfer rate" exceeding 50 Gbit/s;</p> <p>2. Equipment employing a "laser" and having any of the following:</p> <p>a. A transmission wavelength exceeding 1750 nm;</p> <p>b. Performing "optical amplification" using Praseodymium-Doped Fluoride Fibre Amplifiers (PDFFA);</p> <p>c. Employing coherent optical transmission or coherent optical detection techniques (also</p>	<p><u>Note:</u> 5E001.b.4. does not control "technology" for the "development" of civil cellular radio-communications systems.</p> <p><u>Technical Note:</u></p> <p>For telecommunication switching equipment the "total digital transfer rate" is the unidirectional speed of a single interface, measured at the highest speed port or line.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>called optical heterodyne or homodyne techniques);</p> <p>d. Employing wavelength division multiplexing techniques of optical carriers at less than 100 GHz spacing; or</p> <p>e. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz;</p> <p>3. Equipment employing "optical switching" and having a switching time less than 1 ms;</p> <p>4. Radio equipment having any of the following:</p> <p>a. Quadrature-Amplitude-Modulation (QAM) techniques above level 256;</p> <p>b. Operating at input or output frequencies exceeding 31.8 GHz; or</p> <p>c. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal;</p> <p>5. Equipment employing "common channel signalling"</p>	<p><u>Note:</u> 5E001.c.2.e. does not control "technology" for the "development" or "production" of commercial TV systems.</p> <p><u>NB:</u> For "technology" for the "development" or "production" of non-telecommunications equipment employing a laser, see 6E.</p> <p><u>Note:</u> 5E001.c.4.b. does not control "technology" for the "development" or "production" of equipment designed or modified for operation in any frequency band which is "allocated by the ITU" for radio- communications services, but not for radio-determination.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>operating in non-associated mode of operation; or</p> <p>6. Mobile equipment having all of the following:</p> <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 1. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8GHz 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 6.8 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 %; 		

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 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; <p>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 either of the following:</p> <ol style="list-style-type: none"> 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. 		
5E101	“Technology” according to the General Technology Note for the “development”, “production” or “use” of equipment		Malaysian Communications

Category Code	Items Description	Note	Relevant Authority
	specified in 5A101.		and Multimedia Commission
CATEGORY 5, PART 2 : “INFORMATION SECURITY”		<p><u>Note 1:</u> The control status of “information security” equipment, “software”, systems, application specific “electronic assemblies”, modules, integrated circuits, components or functions is determined in Category 5, Part 2 even if they are components or “electronic assemblies” of other equipment.</p> <p><u>Note 2:</u> Category 5 — Part 2 does not control products when accompanying their user for the user’s personal use.</p> <p><u>Note 3:</u> <u>Cryptography Note</u></p> <p>5A002 and 5D002 do not control goods that meet all of the following:</p> <p>a. Generally available to the public by being sold, without restriction, from stock at retail selling points by means of any of the following:</p> <ol style="list-style-type: none"> 1. Over-the-counter transactions; 2. Mail order transactions; 3. Electronic transactions; or 4. Telephone call transactions; <p>b. The cryptographic functionality cannot easily be changed by the user;</p> <p>c. Designed for installation by the user without further substantial support by the supplier; and</p> <p>d. When necessary, details of the goods are accessible and will be</p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>provided, upon request, to the competent authorities in which the exporter is established in order to ascertain compliance with conditions described in paragraphs a. to c. above.</i></p> <p><u>Note 4:</u> <i>Category 5 — Part 2 does not control items incorporating or using “cryptography” and meeting all of the following:</i></p> <p><i>a. The primary function or set of functions is not any of the following:</i></p> <ol style="list-style-type: none"> <i>1. “Information security”;</i> <i>2. A computer, including operating systems, parts and components therefor;</i> <i>3. Sending, receiving or storing information (except in support of entertainment, mass commercial broadcasts, digital rights management or medical records management); or</i> <i>4. Networking (includes operation, administration, management and provisioning);</i> <p><i>b. The cryptographic functionality is limited to supporting their primary function or set of functions; and</i></p> <p><i>c. When necessary, details of the items are accessible and will be provided, upon request, to the appropriate authority in the exporter’s country in order to ascertain compliance with conditions described in paragraphs a. and b. above.</i></p> <p><u>Technical Note:</u></p> <p><i>In Category 5 — Part 2, parity bits are not included in the key length.</i></p>	

Category Code	Items Description	Note	Relevant Authority
5A2	Systems, Equipment and Components		
5A002	<p>“Information security” systems, equipment and components therefor, as follows:</p> <p>a. Systems, equipment, application specific “electronic assemblies”, modules and integrated circuits for “information security”, as follows, and components therefor specially designed for “information security”:</p> <p>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:</p> <p>a. A “symmetric algorithm” employing a key length in excess of 56 bits; or</p> <p>b. An “asymmetric algorithm” where the security of the algorithm is based on any of</p>	<p><u>NB:</u> For the control of Global Navigation Satellite Systems (GNSS) receiving equipment containing or employing decryption, see 7A005.</p> <p><u>Technical Notes:</u></p> <p>1. Authentication and digital signature functions include their associated key management function.</p> <p>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 unauthorised access.</p> <p>3. “Cryptography” does not include “fixed” data compression or coding techniques.</p> <p><u>Note:</u> 5A002.a.1. includes equipment designed or modified to use “cryptography” employing analogue principles when implemented with digital techniques.</p>	Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	<p>the following:</p> <ol style="list-style-type: none"> 1. Factorisation of integers in excess of 512 bits (e.g. RSA); 2. Computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (e.g. Diffie-Hellman over $\mathbb{Z}/p\mathbb{Z}$); or 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); 2. Designed or modified to perform cryptanalytic functions; 3. Not used; 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; 5. Designed or modified to use cryptographic techniques to generate the spreading code for "spread spectrum" systems, other than those specified in 5A002.a.6., including the hopping code for "frequency hopping" systems; 6. Designed or modified to use cryptographic techniques to generate channelising codes, 		

Category Code	Items Description	Note	Relevant Authority
	<p>scrambling codes or network identification codes, for systems using ultra-wideband modulation techniques and having either of the following:</p> <ul style="list-style-type: none"> a. A bandwidth exceeding 500 MHz; or b. A “fractional bandwidth” of 20 % or more; <p>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;</p> <p>8. Communications cable systems designed or modified using mechanical, electrical or electronic means to detect surreptitious intrusion;</p> <p>9. Designed or modified to use “quantum cryptography”.</p> <p>b. Systems, equipment, application specific “electronic assemblies”, modules and integrated circuits, designed or modified to enable an item to achieve or exceed the controlled performance levels for functionality specified by 5A002.a. that would not otherwise be enabled.</p>	<p><u>Technical Note:</u></p> <p>“Quantum cryptography” is also known as Quantum Key Distribution (QKD).</p> <p><u>Note:</u> 5A002 does not control any of the following:</p> <ul style="list-style-type: none"> a. Smart cards and smart card ‘readers/writers’ as follows: <ul style="list-style-type: none"> 1. A smart card or an electronically readable personal document (e.g. token coin, e-passport) that meets either of 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>the following:</i></p> <ul style="list-style-type: none"> a. <i>The cryptographic capability is restricted for use in equipment or systems excluded from 5A002 by Note 4 in Category 5 — Part 2 or entries b. to i. of this Note, and cannot be reprogrammed for any other use; or</i> b. <i>Having all of the following:</i> <ul style="list-style-type: none"> 1. <i>It is specially designed and limited to allow protection of 'personal data' stored within;</i> 2. <i>Has been, or can only be, personalised for public or commercial transactions or individual identification; and</i> 3. <i>Where the cryptographic capability is not user-accessible;</i> <p><u><i>Technical Note:</i></u></p> <p><i>'Personal data' includes any data specific to a particular person or entity, such as the amount of money stored and data necessary for authentication.</i></p> <ul style="list-style-type: none"> 2. <i>'Readers/writers' specially designed or modified, and limited, for items specified by a.1. of this Note.</i> 	

Category Code	Items Description	Note	Relevant Authority
		<p><u>Technical Note:</u></p> <p><i>'Readers/writers' include equipment that communicates with smart cards or electronically readable documents through a network.</i></p> <ul style="list-style-type: none"> a. <i>Not used;</i> b. <i>Not used;</i> c. <i>Cryptographic equipment specially designed and limited for banking use or 'money transactions';</i> <p><u>Technical Note:</u></p> <p><i>'Money transactions' in 5A002 Note d. includes the collection and settlement of fares or credit functions.</i></p> <ul style="list-style-type: none"> a. <i>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));</i> b. <i>Cordless telephone equipment not capable of end-to-end encryption where the maximum effective range of unboosted cordless</i> 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>operation (i.e. a single, unrelayed hop between terminal and home base station) is less than 400 metres according to the manufacturer's specifications;</i></p> <p><i>c. 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 non- published) and also meet the provisions of paragraphs b. to d. of the Cryptography Note (Note 3 in Category 5 — Part 2), that have been customised for a specific civil industry application with features that do not affect the cryptographic functionality of these original non-customised devices;</i></p> <p><i>d. Not used;</i></p> <p><i>e. 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; or</i></p> <p><i>f. Equipment, having no functionality specified by 5A002.a.2., 5A002.a.4., 5A002.a.7., or 5A002.a.8., where all cryptographic capability specified by 5A002.a. meets any of the following:</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p>1. <i>It cannot be used; or</i></p> <p>2. <i>It can only be made useable by means of “cryptographic activation”.</i></p> <p><u>NB:</u> <i>See 5A002.a. for equipment that has undergone “cryptographic activation”.</i></p>	
5B2	Test, Inspection and Production Equipment		
5B002	<p>“Information security” test, inspection and “production” equipment, as follows:</p> <p>a. Equipment specially designed for the “development” or “production” of equipment specified in 5A002 or 5B002.b.;</p> <p>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.</p>		Malaysian Communications and Multimedia Commission
5C2	<p>Materials</p> <p>None.</p>		
5D2	Software		
5D002	<p>“Software” as follows:</p> <p>a. “Software” specially designed or modified for the “development”, “production” or “use” of equipment specified in 5A002 or “software” specified in 5D002.c.;</p>	<p><u>Note:</u> <i>5D002 does not control “software” as follows:</i></p> <p>a. <i>“Software” required for the “use” of equipment excluded from control by the Note to 5A002;</i></p> <p>b. <i>“Software” providing any of the functions of</i></p>	Malaysian Communications and Multimedia Commission

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. "Software" specially designed or modified to support "technology" specified in 5E002; c. Specific "software", as follows: <ul style="list-style-type: none"> 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. d. "Software" designed or modified to enable an item to achieve or exceed the controlled performance levels for functionality specified by 5A002.a. that would not otherwise be enabled. 	<i>equipment excluded from control by the Note to 5A002.</i>	
5E2	Technology		
5E002	<p>"Technology" as follows:</p> <ul style="list-style-type: none"> a. "Technology" according to the General Technology Note for the "development", "production" or "use" of equipment specified in 5A002, 5B002 or "software" specified in 5D002.a. or 5D002.c. b. "Technology" to enable an item to achieve or exceed the controlled performance levels for functionality specified by 5A002.a. that would not otherwise be enabled. 		Malaysian Communications and Multimedia Commission

CATEGORY 6

SENSORS AND LASERS

Category Code	Items Description	Note	Relevant Authority
Category 6: SENSORS AND LASERS			
6A	Systems, Equipment and Components		
6A001	<p>Acoustic systems, equipment and components, as follows:</p> <p>a. Marine acoustic systems, equipment and specially designed components therefor, as follows:</p> <p>1. Active (transmitting or transmitting-and-receiving) systems, equipment and specially designed components therefor, as follows:</p> <p>a. Acoustic seabed survey equipment as follows:</p> <p>1. Surface vessel survey equipment designed for seabed topographic mapping and having all of the following:</p> <p>a. Designed to take measurements at an angle exceeding 20° from the vertical;</p> <p>b. Designed to measure seabed topography at seabed depths exceeding 600 m;</p>	<p><i>Note: 6A001.a.1. does not control equipment as follows:</i></p> <p>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;</p> <p>b. Acoustic beacons, as follows:</p> <p>1. Acoustic emergency beacons;</p> <p>2. Pingers specially designed for relocating or returning to an underwater position.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> c. 'Sounding resolution' less than 2; and d. 'Enhancement' of the depth accuracy through compensation for all the following: <ul style="list-style-type: none"> 1. Motion of the acoustic sensor; 2. In-water propagation from sensor to the seabed and back; and 3. Sound speed at the sensor; 2. Underwater survey equipment designed for seabed topographic mapping and having all of the following: <ul style="list-style-type: none"> a. Designed or modified to operate at depths exceeding 300 m; and b. 'Sounding rate' greater than 3800; 3. Side Scan Sonar (SSS) or Synthetic Aperture Sonar (SAS), designed for seabed imaging and having all of the following: <ul style="list-style-type: none"> a. Designed or modified to operate at depths exceeding 500 m; and b. An 'area coverage rate' of greater than 570 m²/s while operating with both an 'along track resolution' and 'across track resolution' of less than 15 cm. 	<p><u>Technical Notes</u></p> <ul style="list-style-type: none"> 1. 'Sounding resolution' is the swath width (degrees) divided by the maximum number of soundings per swath. 2. 'Enhancement' includes the ability to compensate by external means. <p><u>Technical Note</u></p> <p>'Sounding rate' is the product of the maximum speed (m/s) at which the sensor can operate and the maximum number of soundings per swath.</p> <p><u>Technical Notes</u></p> <ul style="list-style-type: none"> 1. 'Area coverage rate' (m²/s) is twice the product of the maximum sonar range (m) and the maximum speed (m/s) at which the sensor can operate. 	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Object detection or location systems, having any of the following:</p> <ol style="list-style-type: none"> 1. A transmitting frequency below 10 kHz; 2. Sound pressure level exceeding 224 dB (reference 1 µPa at 1 m) for equipment with an operating frequency in the band from 10 kHz to 24 kHz inclusive; 3. Sound pressure level exceeding 235 dB (reference 1 µPa at 1 m) for equipment with an operating frequency in the band between 24 kHz and 30 kHz; 4. Forming beams of less than 1° on any axis and having an operating frequency of less than 100 kHz; 5. Designed to operate with an unambiguous display range exceeding 5 120 m; or 6. Designed to withstand pressure during normal operation at depths exceeding 1 000 m and having transducers with any of the following: <ol style="list-style-type: none"> a. Dynamic compensation for pressure; or b. Incorporating other than lead zirconatetitanate as the transduction element; <p>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:</p>	<ol style="list-style-type: none"> 2. 'Along track resolution' (cm), for SSS only, is the product of azimuth (horizontal) beamwidth (degrees) and maximum sonar range (m) and 0,873. 3. 'Across track resolution' (cm) is 75 divided by the signal bandwidth (kHz). <p><i>Note 1: The control status of acoustic projectors, including transducers, specially designed for other equipment is determined by the control status of the</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. An instantaneous radiated 'acoustic power density' exceeding 0.01 mW/mm²/Hz for devices operating at frequencies below 10 kHz; 2. A continuously radiated 'acoustic power density' exceeding 0.001 mW/mm²/Hz for devices operating at frequencies below 10 kHz; or 3. Side-lobe suppression exceeding 22 dB; d. Acoustic systems and equipment, designed to determine the position of surface vessels or underwater vehicles and having all the following, and specially designed components therefor: <ol style="list-style-type: none"> 1. Detection range exceeding 1 000 m; and 2. Positioning accuracy of less than 10 m rms (root mean square) when measured at a range of 1000 m; e. Active individual sonars, specially designed or modified to detect, locate and automatically classify swimmers or divers, having all of the following: <ol style="list-style-type: none"> 1. Detection range exceeding 530 m; 2. Positioning accuracy of less than 15 m rms (root mean square) when measured at a range of 530 m; and 3. Transmitted pulse signal bandwidth exceeding 3 	<p>other equipment.</p> <p><u>Note 2:</u> 6A001.a.1.c. does not control electronic sources which direct the sound vertically only, or mechanical (e.g. air gun or vapour-shock gun) or chemical (e.g. explosive) sources.</p> <p><u>Technical Note:</u></p> <p>'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.</p> <p><u>Note:</u> 6A001.a.1.d. includes:</p> <ol style="list-style-type: none"> 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. <p><u>N.B.:</u> For diver detection systems specially designed or modified for military use, see the Military Items List.</p> <p><u>Note:</u> For 6A001.a.1.e., where multiple detection ranges are specified for various environments, the greatest detection range is used.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>kHz;</p> <p>2. Passive systems, equipment and specially designed components therefor, as follows:</p> <p>a. Hydrophones having any of the following:</p> <ol style="list-style-type: none"> 1. Incorporating continuous flexible sensing elements; 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; 3. Having any of the following sensing elements: <ol style="list-style-type: none"> a. Optical fibres; b. 'Piezoelectric polymer films' other than polyvinylidene-fluoride (PVDF) and its co-polymers {P(VDF-TrFE) and P(VDF-TFE)}; or c. 'Flexible piezoelectric composites'; 4. A 'hydrophone sensitivity' better than – 180 dB at any depth with no acceleration compensation; 5. Designed to operate at depths exceeding 35 m with acceleration compensation; or 6. Designed for operation at depths exceeding 1000 m; 	<p><i>Note: The control status of hydrophones specially designed for other equipment is determined by the control status of the other equipment.</i></p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. 'Piezoelectric polymer film' sensing elements consist of polarised 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 fibres 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) 	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Towed acoustic hydrophone arrays having any of the following:</p> <ol style="list-style-type: none"> 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; 2. Designed or 'able to be modified' to operate at depths exceeding 35 m; 3. Heading sensors specified in 6A001.a.2.d.; 4. Longitudinally reinforced array hoses; 5. An assembled array of less than 40 mm in diameter; or 6. Not used; 7. Hydrophone characteristics specified in 6A001.a.2.a.; <p>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;</p> <p>d. Heading sensors having all of the following:</p>	<p>would yield an output voltage of 10^{-8} V in such a field, while one of – 180 dB sensitivity would yield only 10^{-9} V output. Thus, – 160 dB is better than – 180 dB.</p> <p><u>Technical Note:</u></p> <p>'Able to be modified' in 6A001.a.2.b.1. and 2. 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.</p>	

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. An accuracy of better than $\pm 0.5^\circ$; and 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; e. Bottom or bay cable systems, having any of the following: <ol style="list-style-type: none"> 1. Incorporating hydrophones specified in 6A001.a.2.a.; or 2. Incorporating multiplexed hydrophone group signal modules having all of the following characteristics: <ol style="list-style-type: none"> 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 b. Capable of being operationally interchanged with towed acoustic hydrophone array modules; 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: <ol style="list-style-type: none"> 1. Correlation-velocity sonar log equipment having any of the following characteristics: 	<p><i>Note:</i> 6A001.a.2. also controls receiving equipment, whether or not related in normal application to separate active equipment, and specially designed components therefor.</p> <p><u>Note 1:</u> 6A001.b. does not control depth sounders limited to any of the following:</p> <p>a. Measuring the depth of</p>	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 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. c. Not used. 	<p><i>water;</i></p> <ul style="list-style-type: none"> <i>b. Measuring the distance of submerged or buried objects; or</i> <i>c. Fish finding.</i> <p><u>Note 2:</u> 6A001.b. does not control equipment specially designed for installation on surface vessels.</p>	
6A002	<p>Optical sensors or equipment and components therefor, as follows:</p> <ul style="list-style-type: none"> a. Optical detectors as follows: <ul style="list-style-type: none"> 1. "Space-qualified" solid-state detectors as follows: <ul style="list-style-type: none"> a. "Space-qualified" solid-state detectors having all of the following: <ul style="list-style-type: none"> 1. A peak response in the wavelength range exceeding 10 nm but not exceeding 300 nm; and 2. A response of less than 0.1 % relative to the peak response at a wavelength exceeding 400 nm; b. "Space-qualified" solid-state detectors having all of the following: <ul style="list-style-type: none"> 1. A peak response in the wavelength range exceeding 900 nm but not exceeding 1200 nm; and 2. A response "time constant" of 95 ns or less; c. "Space-qualified" solid-state detectors having a peak response in the wavelength range exceeding 1200 nm but not exceeding 30000 nm; d. "Space-qualified" "focal plane arrays" having more than 2048 elements per array and having a peak response in 	<p>NB: SEE ALSO 6A102.</p> <p><u>Note:</u> For the purpose of 6A002.a.1., solid-state detectors include "focal plane arrays".</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>the wavelength range exceeding 300 nm but not exceeding 900 nm.</p> <p>2. Image intensifier tubes and specially designed components therefor, as follows:</p> <p>a. Image intensifier tubes having all of the following:</p> <p>1. A peak response in the wavelength range exceeding 400 nm but not exceeding 1050 nm;</p> <p>2. Electron image amplification using any of the following:</p> <p>a. A microchannel plate with a hole pitch (centre-to-centre spacing) of 12 µm or less; or</p> <p>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</p> <p>3. Any of the following photocathodes:</p> <p>a. Multialkali photocathodes (e.g. S-20 and S-25) having a luminous sensitivity exceeding 350 µA/lm;</p> <p>b. GaAs or GaInAs photocathodes; or</p> <p>c. Other "III/V compound" semiconductor photocathodes having a maximum "radiant sensitivity" exceeding 10 mA/W;</p> <p>b. Image intensifier tubes having all of the following:</p>	<p><u>Note:</u> 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:</p> <p>a. A single metal anode; or</p> <p>b. Metal anodes with a centre to centre spacing greater than 500 µm.</p> <p><u>Technical Note:</u></p> <p>'Charge multiplication' is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionisation gain process. 'Charge multiplication' sensors may take the form of an image intensifier tube, solid state detector or "focal plane array".</p>	

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. A peak response in the wavelength range exceeding 1050 nm but not exceeding 1800 nm; 2. Electron image amplification using any of the following: <ol style="list-style-type: none"> 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; <p>c. Specially designed components as follows:</p> <ol style="list-style-type: none"> 1. Microchannel plates having a hole pitch (centre-to-centre spacing) of 12 µm or less; 2. 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; 3. "III/V compound" semiconductor (e.g. GaAs or GaInAs) photocathodes and transferred electron photocathodes; 	<p><i>Note: 6A002.a.2.c.3. does not control compound semiconductor photocathodes designed to achieve a maximum "radiant sensitivity" of any of the following:</i></p> <ol style="list-style-type: none"> a. 10 mA/W or less at the peak response in the wavelength range exceeding 400 nm but not exceeding 1 050 nm; or b. 15 mA/W or less at the peak response in the wavelength range exceeding 1 050 nm but not exceeding 1800 nm. <p><i>NB: 'Microbolometer' non-"space-qualified" "focal plane arrays" are only</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>3. Non-“space-qualified” “focal plane arrays” as follows:</p>	<p><i>specified in 6A002.a.3.f.</i></p> <p><u>Technical Note:</u></p> <p><i>Linear or two-dimensional multi-element detector arrays are referred to as “focal plane arrays”;</i></p> <p><u>Note 1:</u> 6A002.a.3. <i>includes photoconductive arrays and photovoltaic arrays.</i></p> <p><u>Note 2:</u> 6A002.a.3. <i>does not control:</i></p> <ul style="list-style-type: none"> a. <i>Multi-element (not to exceed 16 elements) encapsulated photoconductive cells using either lead sulphide or lead selenide;</i> b. <i>Pyroelectric detectors using any of the following:</i> <ul style="list-style-type: none"> 1. <i>Triglycinesulphate and variants;</i> 2. <i>Lead-lanthanum-zirconium titanate and variants;</i> 3. <i>Lithium tantalate;</i> 4. <i>Polyvinylidene fluoride and variants; or</i> 5. <i>Strontium barium niobate and variants.</i> c. <i>“Focal plane arrays” specially designed or modified to achieve ‘charge multiplication’ and limited by</i> 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>design to have a maximum “radiant sensitivity” of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:</i></p> <ol style="list-style-type: none"> <i>1. Incorporating a response limiting mechanism designed not to be removed or modified; and</i> <i>2. Any of the following:</i> <ol style="list-style-type: none"> <i>a. The response limiting mechanism is integral to or combined with the detector element; or</i> <i>b. The “focal plane array” is only operable with the response limiting mechanism in place.</i> <p><u><i>Technical Note:</i></u></p> <p><i>A response limiting mechanism integral to the detector element is designed not to be removed or modified without rendering the detector inoperable.</i></p> <p><u><i>Technical Note:</i></u></p> <p><i>‘Charge multiplication’ is a form of electronic image amplification and is defined as the generation of charge carriers as a result of an impact ionisation gain process. ‘Charge multiplication’ sensors may take the form of an image</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>a. Non-"space-qualified" "focal plane arrays" having all of the following:</p> <ol style="list-style-type: none"> Individual elements with a peak response within the wavelength range exceeding 900 nm but not exceeding 1 050 nm; and Any of the following: <ol style="list-style-type: none"> A response "time constant" of less than 0.5ns; or Specially designed or modified to achieve 'charge multiplication' and having a maximum "radiant sensitivity" exceeding 10 mA/W; <p>b. Non-"space-qualified" "focal plane arrays" having all of the following:</p> <ol style="list-style-type: none"> Individual elements with a peak response in the wavelength range exceeding 1050 nm but not exceeding 1200 nm; and Any of the following: <ol style="list-style-type: none"> A response "time constant" of 95 ns or less; or Specially designed or modified to achieve 'charge multiplication' and having a maximum "radiant sensitivity" exceeding 10 mA/W; <p>c. Non-"space-qualified" non-linear (2-dimensional) "focal plane arrays" having individual elements with a peak response in the wavelength range exceeding 1200 nm but not exceeding 30000 nm;</p> <p>d. Non-"space-qualified" linear (1-dimensional) "focal plane arrays" having all of the following:</p> <ol style="list-style-type: none"> Individual elements with a peak response in the wavelength range exceeding 1200 nm but not exceeding 3000 nm; and 	<p><i>intensifier tube, solid state detector or "focal plane array".</i></p> <p><u>NB:</u> Silicon and other material based 'microbolometer' non-"space-qualified" "focal plane arrays" are only specified in 6A002.a.3.f.</p> <p><u>Note:</u> 6A002.a.3.d. does not control "focal plane arrays" (not to exceed 32 elements) having detector elements limited solely to germanium material.</p> <p><u>Technical Note:</u></p> <p><i>For the purposes of 6A002.a.3.d., 'cross-scan direction' is defined as the axis parallel to the linear array of detector elements and the 'scan direction' is defined as the axis perpendicular to the linear array of detector elements.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>2. Any of the following:</p> <p>a. A ratio of 'scan direction' dimension of the detector element to the 'cross-scan direction' dimension of the detector element of less than 3.8; or</p> <p>b. Signal Processing In The Element (SPRITE);</p> <p>e. Non-"space-qualified" linear (1-dimensional) "focal plane arrays" having individual elements with a peak response in the wavelength range exceeding 3000 nm but not exceeding 30000 nm;</p> <p>f. Non-"space-qualified" non-linear (2-dimensional) infrared "focal plane arrays" based on 'microbolometer' material having individual elements with an unfiltered response in the wavelength range equal to or exceeding 8 000 nm but not exceeding 14 000 nm;</p> <p>g. Non-"space-qualified" "focal plane arrays" having all of the following:</p> <p>1. Individual detector elements with a peak response in the wavelength range exceeding 400 nm but not exceeding 900 nm;</p> <p>2. Specially designed or modified to achieve 'charge multiplication' and having a maximum "radiant sensitivity" exceeding 10 mA/W for wavelengths exceeding 760 nm; and</p> <p>3. Greater than 32 elements.</p> <p>b. "Monospectral imaging sensors" and "multispectral imaging sensors", designed for remote sensing applications and having either of the following:</p> <p>1. An Instantaneous Field of View (IFOV) of less than 200 μrad (microradians); or</p>	<p><u>Technical Note:</u></p> <p><i>For the purposes of 6A002.a.3.f., 'microbolometer' is defined as a thermal imaging detector that, as a result of a temperature change in the detector caused by the absorption of infrared radiation, is used to generate any usable signal.</i></p> <p><u>Note:</u> 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":</p> <p>1. Charge Coupled Devices (CCD) not designed or modified</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>2. Specified for operation in the wavelength range exceeding 400 nm but not exceeding 30000 nm and having all the following:</p> <ul style="list-style-type: none"> a. Providing output imaging data in digital format; and b. Having any of the following characteristics: <ul style="list-style-type: none"> 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); c. 'Direct view' imaging equipment incorporating any of the following: <ul style="list-style-type: none"> 1. Image intensifier tubes specified in 6A002.a.2.a. or 6A002.a.2.b.; 2. "Focal plane arrays" specified in 6A002.a.3.; or 3. Solid state detectors specified in 6A002.a.1.; 	<p>to achieve 'charge multiplication'; or</p> <p>2. Complementary Metal Oxide Semiconductor (CMOS) devices not designed or modified to achieve 'charge multiplication'.</p> <p><u>Technical Note:</u> 'Direct view' refers to imaging equipment that presents a visual image to a human observer without converting the image into an electronic signal for television display, and that cannot record or store the image photographically, electronically or by any other means.</p> <p><u>Note:</u> 6A002.c. does not control equipment as follows, when incorporating other than GaAs or GaInAs photocathodes:</p> <ul style="list-style-type: none"> a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems; b. Medical equipment; c. Industrial equipment used for inspection, sorting or analysis of the properties of materials; d. Flame detectors for industrial furnaces; e. Equipment specially designed for laboratory use. 	

Category Code	Items Description	Note	Relevant Authority
	<p>d. Special support components for optical sensors, as follows:</p> <ol style="list-style-type: none"> 1. "Space-qualified" cryocoolers; 2. Non-"space-qualified" cryocoolers having a cooling source temperature below 218 K (– 55°C), as follows: <ol style="list-style-type: none"> a. Closed cycle type with a specified Mean-Time-To-Failure (MTTF) or Mean-Time-Between-Failures (MTBF), exceeding 2500 hours; b. Joule-Thomson (JT) self-regulating minicoolers having bore (outside) diameters of less than 8 mm; 3. Optical sensing fibres specially fabricated either compositionally or structurally, or modified by coating, to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive; <p>e. Not used.</p>	<p><i>Note: 6A002.d.3. does not control encapsulated optical sensing fibres specially designed for bore hole sensing applications.</i></p>	
6A003	<p>Cameras, systems or equipment, and components therefor, as follows:</p> <ol style="list-style-type: none"> a. Instrumentation cameras and specially designed components therefor, as follows: 	<p>NB: SEE ALSO 6A203.</p> <p><i>NB: For television and film-based photographic still cameras specially designed or modified for underwater use, see 8A002.d.1. and 8A002.e.</i></p> <p><i>Note: Instrumentation cameras, specified in 6A003.a.3. to 6A003.a.5., with modular structures should be evaluated by</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. High-speed cinema recording cameras using any film format from 8 mm to 16 mm inclusive, in which the film is continuously advanced throughout the recording period, and that are capable of recording at framing rates exceeding 13 150 frames/s; 2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1 000 000 frames/s for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights; 3. Mechanical or electronic streak cameras, having writing speeds exceeding 10 mm/μs; 4. Electronic framing cameras having a speed exceeding 1 000 000 frames/s; 5. Electronic cameras having all of the following: <ol style="list-style-type: none"> a. An electronic shutter speed (gating capability) of less than 1 μs per full frame; and b. A read out time allowing a framing rate of more than 125 full frames per second; 6. Plug-ins having all of the following characteristics: <ol style="list-style-type: none"> a. Specially designed for instrumentation cameras which have modular structures and which are specified in 6A003.a.; and b. Enabling these cameras to meet the characteristics specified in 6A003.a.3., 6A003.a.4., or 6A003.a.5., according to the manufacturer's specifications; 	<p><i>their maximum capability, using plug-ins available according to the camera manufacturer's specifications.</i></p> <p><u>Note:</u> 6A003.a.1. does not control cinema recording cameras designed for civil purposes.</p> <p><u>Note:</u> 6A003.b. does not control television or video cameras, specially</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Imaging cameras as follows:</p> <p>1. Video cameras incorporating solid state sensors, having a peak response in the wavelength range exceeding 10 nm, but not exceeding 30 000 nm and having all of the following:</p> <p>a. Having any of the following:</p> <ol style="list-style-type: none"> 1. More than 4×10^6 "active pixels" per solid state array for monochrome (black and white) cameras; 2. More than 4×10^6 "active pixels" per solid state array for colour cameras incorporating three solid state arrays; or 3. More than 12×10^6 "active pixels" for solid state array colour cameras incorporating one solid state array; and <p>b. Having any of the following:</p> <ol style="list-style-type: none"> 1. Optical mirrors specified in 6A004.a.; 2. Optical control equipment specified in 6A004.d.; or 3. The capability for annotating internally generated 'camera tracking data'; <p>2. Scanning cameras and scanning camera systems, having all of the following:</p> <p>a. A peak response in the wavelength range exceeding 10 nm, but not exceeding 30 000 nm;</p> <p>b. Linear detector arrays with more than 8 192 elements per array; and</p> <p>c. Mechanical scanning in one direction;</p>	<p><i>designed for television broadcasting.</i></p> <p><u>Technical Note:</u></p> <ol style="list-style-type: none"> 1. <i>For the purpose of this entry, digital video cameras should be evaluated by the maximum number of "active pixels" used for capturing moving images.</i> 2. <i>For the purpose of this entry, 'camera tracking data' is the information necessary to define camera line of sight orientation with respect to the earth. This includes: 1) the horizontal angle of the camera line of sight makes with respect to the earth's magnetic field direction; and 2) the vertical angle between the camera line of sight and the earth's horizon.</i> <p><u>Note:</u> 6A003.b.2. does not control scanning cameras and scanning camera systems, specially designed for any of the following:</p> <ol style="list-style-type: none"> a. <i>Industrial or civilian photocopiers;</i> b. <i>Image scanners specially designed for civil, stationary, close proximity scanning applications (e.g. reproduction of images or print contained in documents, artwork or</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>3. Imaging cameras incorporating image intensifier tubes specified in 6A002.a.2.a. or 6A002.a.2.b.;</p> <p>4. Imaging cameras incorporating “focal plane arrays” having any of the following:</p> <p>a. Incorporating “focal plane arrays” specified in 6A002.a.3.a. to 6A002.a.3.e.;</p> <p>b. Incorporating “focal plane arrays” specified in 6A002.a.3.f.; or</p> <p>c. Incorporating “focal plane arrays” specified in 6A002.a.3.g.;</p>	<p><i>photographs); or</i></p> <p><i>c. Medical equipment.</i></p> <p><i>Note 1 :Imaging cameras specified in 6A003.b.4. include “focal plane arrays” combined with sufficient “signal processing” electronics, beyond the read out integrated circuit, to enable as a minimum the output of an analogue or digital signal once power is supplied.</i></p> <p><i>Note 2: 6A003.b.4.a. does not control imaging cameras incorporating linear “focal plane arrays” with 12 elements or fewer, not employing time-delay-and-integration within the element and designed for any of the following:</i></p> <p><i>a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;</i></p> <p><i>b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;</i></p> <p><i>c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;</i></p> <p><i>d. Equipment specially designed for laboratory use; or</i></p> <p><i>e. Medical equipment.</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>Note 3: 6A003.b.4.b. does not control imaging cameras having any of the following:</i></p> <ul style="list-style-type: none"> <i>a. A maximum frame rate equal to or less than 9 Hz;</i> <i>b. Having all of the following:</i> <ul style="list-style-type: none"> <i>1. Having a minimum horizontal or vertical 'Instantaneous Field of View (IFOV)' of at least 10 mrad/pixel (milliradians/pixel);</i> <i>2. Incorporating a fixed focal-length lens that is not designed to be removed;</i> <i>3. Not incorporating a 'direct view' display, and</i> <i>4. Having any of the following:</i> <ul style="list-style-type: none"> <i>a. No facility to obtain a viewable image of the detected field-of-view; or</i> <i>b. The camera is designed for a single kind of application and designed not to be user modified; or</i> <i>c. The camera is specially designed for installation into a</i> 	

Category Code	Items Description	Note	Relevant Authority
		<p><i>civilian passenger land vehicle of less than 3 tonnes (gross vehicle weight) and having all of the following:</i></p> <ol style="list-style-type: none"> 1. <i>Is only operable when installed in any of the following:</i> <ol style="list-style-type: none"> a. <i>The civilian passenger land vehicle for which it was intended; or</i> b. <i>A specially designed, authorised maintenance test facility; and</i> 2. <i>Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended.</i> <p><u>Technical Notes:</u></p> <p>1. 'Instantaneous Field of View (IFOV)' specified in 6A003.b.4. Note 3.b. is the lesser figure of the 'Horizontal IFOV' or the</p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>'Vertical IFOV'.</i></p> <p><i>'Horizontal IFOV' = horizontal Field of View (FOV)/number) of horizontal detector elements</i></p> <p><i>'Vertical IFOV' = vertical Field of View (FOV/number) of vertical detector elements.</i></p> <p><i>2. 'Direct view' in 6A003.b.4. Note 3.b. refers to an imaging camera operating in the infrared spectrum that presents a visual image to a human observer using a near-to-eye micro display incorporating any light-security mechanism.</i></p> <p><i><u>Note 4:</u> 6A003.b.4.c. does not control imaging cameras having any of the following:</i></p> <p style="padding-left: 40px;"><i>a. Having all of the following:</i></p> <p style="padding-left: 80px;"><i>1. Where the camera is specially designed for installation as an integrated component into indoor and wall-plug-operated systems or equipment, limited by design for a single kind of application, as follows:</i></p> <p style="padding-left: 120px;"><i>a. Industrial process monitoring, quality control, or analysis of the properties of materials;</i></p> <p style="padding-left: 120px;"><i>b. Laboratory equipment specially designed for</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>scientific research;</i></p> <p><i>c. Medical equipment;</i></p> <p><i>d. Financial fraud detection equipment; and</i></p> <p><i>2. Is only operable when installed in any of the following;</i></p> <p><i>a. The system(s) or equipment for which it was intended; or</i></p> <p><i>b. A specially designed, authorised maintenance facility; and</i></p> <p><i>3. Incorporates an active mechanism that forces the camera not to function when it is removed from the system(s) or equipment for which it was intended;</i></p> <p><i>b. Where the camera is specially designed for installation into a civilian passenger land vehicle of less than three tonnes (gross vehicle weight), or passenger and vehicle ferries having a length overall (LOA) 65 m or greater, and having all of the following;</i></p> <p><i>1. Is only operable when installed in any of the</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><i>following:</i></p> <ul style="list-style-type: none"> a. <i>The civilian passenger land vehicle or passenger and vehicle ferry for which it was intended; or</i> b. <i>A specially designed, authorised maintenance test facility; and</i> <p>2. <i>Incorporates an active mechanism that forces the camera not to function when it is removed from the vehicle for which it was intended;</i></p> <p>c. <i>Limited by design to have a maximum "radiant sensitivity" of 10 mA/W or less for wavelengths exceeding 760 nm, having all of the following:</i></p> <ul style="list-style-type: none"> 1. <i>Incorporating a response limiting mechanism designed not to be removed or modified;</i> 2. <i>Incorporates an active mechanism that forces the camera not to function when the response limiting mechanism is removed; and</i> 3. <i>Not specially designed or modified for underwater</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>5. Imaging cameras incorporating solid-state detectors specified in 6A002.a.1.</p>	<p>use; or</p> <p>d. Having all of the following:</p> <ol style="list-style-type: none"> 1. Not incorporating a 'direct view' or electronic image display; 2. Has no facility to output a viewable image of the detected field of view; 3. The "focal plane array" is only operable when installed in the camera for which it was intended; and 4. The "focal plane array" incorporates an active mechanism that forces it to be permanently inoperable when removed from the camera for which it was intended. 	
6A004	<p>Optical equipment and components, as follows:</p> <p>a. Optical mirrors (reflectors) as follows:</p> <ol style="list-style-type: none"> 1. "Deformable mirrors" having either continuous or multi-element surfaces, and specially designed components therefor, capable of dynamically repositioning portions of the surface of the mirror at rates exceeding 100 Hz; 	<p><u>NB:</u> For optical mirrors specially designed for lithography equipment, see 3B001.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 2. Lightweight monolithic mirrors having an average “equivalent density” of less than 30 kg/m² and a total mass exceeding 10 kg; 3. Lightweight “composite” or foam mirror structures having an average “equivalent density” of less than 30 kg/m² and a total mass exceeding 2 kg; 4. Beam steering mirrors more than 100 mm in diameter or length of major axis, which maintain a flatness of $\lambda/2$ or better (λ is equal to 633 nm) having a control bandwidth exceeding 100 Hz; <p>b. Optical components made from zinc selenide (ZnSe) or zinc sulphide (ZnS) with transmission in the wavelength range exceeding 3000 nm but not exceeding 25000 nm and having any of the following:</p> <ol style="list-style-type: none"> 1. Exceeding 100 cm³ in volume; or 2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth); <p>c. “Space-qualified” components for optical systems, as follows:</p> <ol style="list-style-type: none"> 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; 		

Category Code	Items Description	Note	Relevant Authority
	<p>d. Optical control equipment as follows:</p> <ol style="list-style-type: none"> 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 μrad (microradians) or less; 3. Gimbals having all of the following: <ol style="list-style-type: none"> a. A maximum slew exceeding 5°; b. A bandwidth of 100 Hz or more; c. Angular pointing errors of 200 μrad (microradians) or less; and d. Having any of the following: <ol style="list-style-type: none"> 1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 2 rad (radians)/s² ; or 2. Exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 0.5 rad (radians)/s² ; 4. Specially designed to maintain the alignment of phased array or phased segment mirror systems consisting of mirrors with a segment diameter or major axis length of 1 m or more; <p>e. ‘Aspheric optical elements’ having all of the following:</p> <ol style="list-style-type: none"> 1. Largest dimension of the optical-aperture greater than 400 mm; 2. Surface roughness less than 1 nm (rms) for sampling lengths equal to or greater than 1 mm; and 	<p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. An ‘aspheric optical element’ is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of 	

Category Code	Items Description	Note	Relevant Authority
	<p>3. Coefficient of linear thermal expansion's absolute magnitude less than 3×10^{-6} /K at 25°C.</p>	<p><i>an ideal sphere.</i></p> <p>2. <i>Manufacturers are not required to measure the surface roughness listed in 6A004.e.2. unless the optical element was designed or manufactured with the intent to meet, or exceed, the control parameter.</i></p> <p><u>Note:</u> 6A004.e. does not control 'aspheric optical elements' having any of the following:</p> <ul style="list-style-type: none"> a. <i>Largest optical-aperture dimension less than 1 m and focal length to aperture ratio equal to or greater than 4.5:1</i> b. <i>Largest optical-aperture dimension equal to or greater than 1 m and focal length to aperture ratio equal to or greater than 7:1;</i> c. <i>Designed as Fresnel, flyeye, stripe, prism or diffractive optical elements;</i> d. <i>Fabricated from borosilicate glass having a coefficient of linear thermal expansion greater than 2.5×10^{-6} /K at 25°C; or</i> e. <i>An x-ray optical element having inner mirror capabilities (e.g. tube-type mirrors).</i> <p><u>NB:</u> For 'aspheric optical elements' specially designed for lithography equipment, see 3B001.</p>	

Category Code	Items Description	Note	Relevant Authority
6A005	<p>"Lasers", other than those specified in 0B001.g.5. or 0B001.h.6., components and optical equipment, as follows:</p>	<p>NB: SEE ALSO 6A205.</p> <p><i>Note 1: Pulsed "lasers" include those that run in a continuous wave (CW) mode with pulses superimposed.</i></p> <p><i>Note 2: Excimer, semiconductor, chemical, CO, CO₂, and non-repetitive pulsed Nd:glass "lasers" are only specified in 6A005.d.</i></p> <p><i>Note 3: 6A005 includes fibre "lasers".</i></p> <p><i>Note 4: The control status of "lasers" incorporating frequency conversion (i.e. wavelength change) by means other than one "laser" pumping another "laser" is determined by applying the control parameters for both the output of the source "laser" and the frequency-converted optical output.</i></p> <p><i>Note 5: 6A005 does not control "lasers" as follows:</i></p> <ul style="list-style-type: none"> <i>a. Ruby with output energy below 20 J;</i> <i>b. Nitrogen;</i> <i>c. Krypton.</i> <p><u>Technical Note:</u></p> <p><i>In 6A005 'Wall-plug efficiency' is defined as the ratio of "laser" output power (or "average output power") to total electrical input power required to operate the "laser", including the power supply/conditioning and thermal conditioning/heat exchanger.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>a. Non-“tunable” continuous wave “(CW) lasers” having any of the following:</p> <ol style="list-style-type: none"> 1. Output wavelength less than 150 nm and output power exceeding 1 W; 2. Output wavelength of 150 nm or more but not exceeding 520 nm and output power exceeding 30 W; 3. Output wavelength exceeding 520 nm but not exceeding 540 nm and any of the following: <ol style="list-style-type: none"> a. Single transverse mode output and output power exceeding 50 W; or b. Multiple transverse mode output and output power exceeding 150 W; 4. Output wavelength exceeding 540 nm but not exceeding 800 nm and output power exceeding 30 W; 5. Output wavelength exceeding 800 nm but not exceeding 975 nm and any of the following: <ol style="list-style-type: none"> a. Single transverse mode output and output power exceeding 50 W; or b. Multiple transverse mode output and output power exceeding 80 W; 6. Output wavelength exceeding 975 nm but not exceeding 1 150 nm and any of the following: <ol style="list-style-type: none"> a. Single transverse mode output and any of the following: <ol style="list-style-type: none"> 1. ‘Wall-plug efficiency’ exceeding 12% and output power exceeding 100 W; or 2. Output power exceeding 150 W; or b. Multiple transverse mode output and any of the following: 	<p><u>Note:</u> 6A005.a.2. does not control Argon “lasers” having an output power equal to or less than 50 W.</p> <p><u>Note:</u> 6A005.a.6.b. does not control multiple transverse mode, industrial “lasers” with output power exceeding 2 kW</p>	

[illegible]

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 3. Output wavelength exceeding 520 nm but not exceeding 540 nm and any of the following: <ol style="list-style-type: none"> a. Single transverse mode output and any of the following: <ol style="list-style-type: none"> 1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 50 W; or 2. “Average output power” exceeding 50 W; or b. Multiple transverse mode output and any of the following: <ol style="list-style-type: none"> 1. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 150 W; or 2. “Average output power” exceeding 150 W; 4. Output wavelength exceeding 540 nm but not exceeding 800 nm and any of the following: <ol style="list-style-type: none"> a. Output energy exceeding 1.5 J per pulse and “peak power” exceeding 30 W; or b. “Average output power” exceeding 30 W; 5. Output wavelength exceeding 800 nm but not exceeding 975 nm and any of the following: <ol style="list-style-type: none"> a. “Pulse duration” not exceeding 1 μs and any of the following: <ol style="list-style-type: none"> 1. Output energy exceeding 0.5J per pulse and “peak power” exceeding 50 W; 2. Single transverse mode output and “average output power” exceeding 20 W; or 3. Multiple transverse mode output and “average output power” exceeding 50 W; or 		

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. "Pulse duration" exceeding 1 μs and any of the following: <ul style="list-style-type: none"> 1. Output energy exceeding 2 J per pulse and "peak power" exceeding 50 W; 2. Single transverse mode output and "average output power" exceeding 50 W; or 3. Multiple transverse mode output and "average output power" exceeding 80 W; 6. Output wavelength exceeding 975 nm but not exceeding 1 150 nm and any of the following: <ul style="list-style-type: none"> a. "Pulse duration" of less than 1 ns and any of the following: <ul style="list-style-type: none"> 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 μs, and any of the following: <ul style="list-style-type: none"> 1. Single transverse mode output and any of the following: <ul style="list-style-type: none"> 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 		

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> e. Output energy exceeding 2 J per pulse; or 2. Multiple transverse mode output and any of the following: <ul style="list-style-type: none"> a. "Peak power" exceeding 400 MW; b. 'Wall-plug efficiency' exceeding 18% and "average output power" exceeding 500 W; c. "Average output power" exceeding 2 kW; or d. Output energy exceeding 4 J per pulse; or c. "Pulse duration" exceeding 1 μs and any of the following: <ul style="list-style-type: none"> 1. Single transverse mode output and any of the following: <ul style="list-style-type: none"> a. "Peak power" exceeding 500 kW; b. 'Wall-plug efficiency' exceeding 12 % and "average output power" exceeding 100 W; or c. "Average output power" exceeding 150 W; or 2. Multiple transverse mode output and any of the following: <ul style="list-style-type: none"> a. "Peak power" exceeding 1 MW; b. 'Wall-plug efficiency' exceeding 18% and "average output power" exceeding 500 W; or c. "Average output power" exceeding 2 kW; 7. Output wavelength exceeding 1 150 nm but not exceeding 1 555 nm, and any of the following: <ul style="list-style-type: none"> a. "Pulse duration" not exceeding 1 μs and any of the following: 		

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Output energy exceeding 0.5 J per pulse and “peak power” exceeding 50 W; 2. Single transverse mode output and “average output power” exceeding 20 W; or 3. Multiple transverse mode output and “average output power” exceeding 50 W; or <p>b. “Pulse duration” exceeding 1 µs and any of the following:</p> <ol style="list-style-type: none"> 1. Output energy exceeding 2 J per pulse and “peak power” exceeding 50 W; 2. Single transverse mode output and “average output power” exceeding 50 W; or 3. Multiple transverse mode output and “average output power” exceeding 80 W; or <p>8. Output wavelength exceeding 1 555 nm and any of the following:</p> <ol style="list-style-type: none"> a. Output energy exceeding 100 mJ per pulse and “peak power” exceeding 1 W; or b. “Average output power” exceeding 1 W; <p>c. “Tunable” “lasers” having any of the following:</p> <ol style="list-style-type: none"> 1. Output wavelength less than 600 nm and any of the following: <ol style="list-style-type: none"> a. Output energy exceeding 50 mJ per pulse and “peak power” exceeding 1 W; or b. Average or CW output power exceeding 1 W; 	<p><i>Note: 6A005.c. includes titanium-sapphire (Ti: Al₂O₃), thulium-YAG (Tm: YAG), thulium-YSGG (Tm: YSGG), alexandrite (Cr: BeAl₂O₄), colourcentre “lasers”, dye “lasers”, and liquid “lasers”.</i></p> <p><i>Note: 6A005.c.1. does not control dye lasers or other liquid lasers, having a multimode output and a wavelength of 150 nm or more but not exceeding 600 nm and all of the following:</i></p> <ol style="list-style-type: none"> 1. Output energy less than 1.5 J per pulse or a “peak power” less than 20 W; and 2. Average or CW output power 	

Category Code	Items Description	Note	Relevant Authority
	<p>2. Output wavelength of 600 nm or more but not exceeding 1 400 nm, and any of the following:</p> <p>a. Output energy exceeding 1 J per pulse and “peak power” exceeding 20 W; or</p> <p>b. Average or CW output power exceeding 20 W; or</p> <p>3. Output wavelength exceeding 1 400 nm and any of the following:</p> <p>a. Output energy exceeding 50 mJ per pulse and “peak power” exceeding 1 W; or</p> <p>b. Average or CW output power exceeding 1 W;</p> <p>d. Other “lasers”, not specified in 6A005.a., 6A005.b. or 6A005.c. as follows:</p> <p>1. Semiconductor “lasers” as follows:</p> <p>a. Individual single-transverse mode semiconductor “lasers” having any of the following:</p> <p>1. Wavelength equal to or less than 1 510 nm and average or CW output power, exceeding 1,5 W; or</p>	<p><i>less than 20 W.</i></p> <p><i>Note 1: 6A005.d.1. includes semiconductor “lasers” having optical output connectors (e.g. fibre optic pigtails).</i></p> <p><i>Note 2: The control status of semiconductor “lasers” specially designed for other equipment is determined by the control status of the other equipment.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 2. Wavelength greater than 1 510 nm and average or CW output power, exceeding 500 mW; b. Individual, multiple-transverse mode semiconductor "lasers" having any of the following: <ul style="list-style-type: none"> 1. Wavelength of less than 1 400 nm and average or CW output power, exceeding 15 W; 2. Wavelength equal to or greater than 1 400 nm and less than 1 900 nm and average or CW output power, exceeding 2.5W; or 3. Wavelength equal to or greater than 1 900 nm and average or CW output power, exceeding 1 W; c. Individual semiconductor "laser" 'bars', having any of the following: <ul style="list-style-type: none"> 1. Wavelength of less than 1400 nm and average or CW output power, exceeding 100 W; 2. Wavelength equal to or greater than 1 400 nm and less than 1 900 nm and average or CW output power, exceeding 25 W; or 3. Wavelength equal to or greater than 1 900 nm and average or CW output power, exceeding 10 W; d. Semiconductor "laser" 'stacked arrays' (two-dimensional arrays) having any of the following: <ul style="list-style-type: none"> 1. Wavelength less than 1 400 nm and having any of the following: <ul style="list-style-type: none"> a. Average or CW total output power less than 3 kW and having average or CW output 'power density' greater than 500 W/cm² ; b. Average or CW total output power equal to or exceeding 3 kW but less than or equal to 5 kW, 	<p><u>Technical Note:</u></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>and having average or CW output ‘power density’ greater than 350 W/cm²;</p> <ul style="list-style-type: none"> c. Average or CW total output power exceeding 5 kW; d. Peak pulsed ‘power density’ exceeding 2 500 W/cm²; or e. Spatially coherent average or CW total output power, greater than 150 W; <p>2. Wavelength greater than or equal to 1 400 nm but less than 1 900 nm, and having any of the following:</p> <ul style="list-style-type: none"> a. Average or CW total output power less than 250 W and average or CW output ‘power density’ greater than 150 W/cm²; b. Average or CW total output power equal to or exceeding 250 W but less than or equal to 500 W, and having average or CW output ‘power density’ greater than 50 W/cm²; c. Average or CW total output power exceeding 500 W; d. Peak pulsed ‘power density’ exceeding 500 W/cm²; or e. Spatially coherent average or CW total output power, exceeding 15 W; <p>3. Wavelength greater than or equal to 1 900 nm and having any of the following:</p> <ul style="list-style-type: none"> a. Average or CW output ‘power density’ greater than 50 W/cm²; b. Average or CW output power greater than 10 W; or 	<p><i>For the purposes of 6A005.d.1.d., ‘power density’ means the total “laser” output power divided by the emitter surface area of the ‘stacked array’.</i></p> <p><i><u>Note 1:</u> ‘Stacked arrays’, formed by combining semiconductor “laser” ‘stacked arrays’ specified by 6A005.d.1.e., that are</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>c. Spatially coherent average or CW total output power, exceeding 1.5 W; or</p> <p>4. At least one “laser” ‘bar’ specified in 6A005.d.1.c.;</p> <p>e. Semiconductor “laser” ‘stacked arrays’, other than those specified in 6A005.d.1.d., having all of the following:</p> <ol style="list-style-type: none"> 1. Specially designed or modified to be combined with other ‘stacked arrays’ to form a larger ‘stacked array’; and 2. Integrated connections, common for both electronics and cooling; 	<p><i>not designed to be further combined or modified are specified by 6A005.d.1.d.</i></p> <p><u>Note 2:</u> ‘Stacked arrays’, formed by combining semiconductor “laser” ‘stacked arrays’ specified by 6A005.d.1.e., that are designed to be further combined or modified are specified by 6A005.d.1.e.</p> <p><u>Note 3:</u> 6A005.d.1.e. does not apply to modular assemblies of single ‘bars’ designed to be fabricated into end-to-end stacked linear arrays.</p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. Semiconductor “lasers” are commonly called “laser” diodes. 2. A ‘bar’ (also called a semiconductor “laser” ‘bar’, a “laser” diode ‘bar’ or diode ‘bar’) consists of multiple semiconductor “lasers” in a one-dimensional array. 3. A ‘stacked array’ consists of multiple ‘bars’ forming a two-dimensional array of semiconductor “lasers”. 	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 2. Carbon monoxide (CO) “lasers” having any of the following: <ul style="list-style-type: none"> a. Output energy exceeding 2 J per pulse and “peak power” exceeding 5 kW; or b. Average or CW output power exceeding 5 kW; 3. Carbon dioxide (CO₂) “lasers” having any of the following: <ul style="list-style-type: none"> a. CW output power exceeding 15 kW; b. Pulsed output with a “pulse duration” exceeding 10 µs and any of the following: <ul style="list-style-type: none"> 1. “Average output power” exceeding 10 kW; or 2. “Peak power” exceeding 100 kW; or c. Pulsed output with a “pulse duration” equal to or less than 10 µs and any of the following: <ul style="list-style-type: none"> 1. Pulse energy exceeding 5 J per pulse; or 2. “Average output power” exceeding 2.5kW; 4. Excimer “lasers” having any of the following: <ul style="list-style-type: none"> a. Output wavelength not exceeding 150 nm and any of the following: <ul style="list-style-type: none"> 1. Output energy exceeding 50 mJ per pulse; or 2. “Average output power” exceeding 1 W; b. Output wavelength exceeding 150 nm but not exceeding 190 nm and any of the following: <ul style="list-style-type: none"> 1. Output energy exceeding 1.5 J per pulse; or 2. “Average output power” exceeding 120 W; 	<p><i><u>NB:</u> For excimer “lasers” specially designed for lithography equipment, see 3B001.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>c. Output wavelength exceeding 190 nm but not exceeding 360 nm and any of the following:</p> <ol style="list-style-type: none"> 1. Output energy exceeding 10 J per pulse; or 2. "Average output power" exceeding 500 W; or <p>d. Output wavelength exceeding 360 nm and any of the following:</p> <ol style="list-style-type: none"> 1. Output energy exceeding 1.5J per pulse; or 2. "Average output power" exceeding 30 W; <p>5. "Chemical lasers" as follows:</p> <ol style="list-style-type: none"> a. Hydrogen Fluoride (HF) "lasers"; b. Deuterium Fluoride (DF) "lasers"; c. "Transfer lasers" as follows: <ol style="list-style-type: none"> 1. Oxygen Iodine (O₂-I) "lasers"; 2. Deuterium Fluoride-Carbon dioxide (DF-CO₂) "lasers"; <p>6. 'Non-repetitive pulsed' Nd: glass "lasers" having any of the following:</p> <ol style="list-style-type: none"> a. "Pulse duration" not exceeding 1 µs and output energy exceeding 50 J per pulse; or b. "Pulse duration" exceeding 1 µs and output energy exceeding 100 J per pulse; <p>e. Components as follows:</p> <ol style="list-style-type: none"> 1. Mirrors cooled either by 'active cooling' or by heat pipe cooling; 	<p><u>Note:</u> 'Non-repetitive pulsed' refers to "lasers" that produce either a single output pulse or that have a time interval between pulses exceeding one minute.</p> <p><u>Technical Note:</u></p> <p>'Active cooling' is a cooling technique for optical components using flowing fluids within the subsurface (nominally less than 1 mm below the optical surface) of the optical component to remove heat from the optic.</p> <p><u>NB:</u> For shared aperture optical elements, capable of operating in "Super-High Power Laser" ("SHPL") applications, see the Military Items List.</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>2. Optical mirrors or transmissive or partially transmissive optical or electro-optical components, specially designed for use with specified "lasers";</p> <p>f. Optical equipment as follows:</p> <p>1. Dynamic wavefront (phase) measuring equipment capable of mapping at least 50 positions on a beam wavefront and any of the following:</p> <p>a. Frame rates equal to or more than 100 Hz and phase discrimination of at least 5 % of the beam's wavelength; or</p> <p>b. Frame rates equal to or more than 1 000 Hz and phase discrimination of at least 20 % of the beam's wavelength;</p> <p>2. "Laser" diagnostic equipment capable of measuring "SHPL" system angular beam steering errors of equal to or less than 10 μrad;</p> <p>3. Optical equipment and components, specially designed for a phased-array "SHPL" system for coherent beam combination to an accuracy of $\lambda/10$ at the designed wavelength, or 0.1 μm, whichever is the smaller;</p> <p>4. Projection telescopes specially designed for use with "SHPL" systems.</p> <p>g. 'Laser acoustic detection equipment' having all of the following:</p> <p>1. CW laser output power equal to or exceeding 20 mW;</p> <p>2. Laser frequency stability equal to or better (less) than 10 MHz;</p>	<p><u>Technical Note:</u></p> <p>'Laser acoustic detection equipment' is sometimes referred to as a Laser Microphone or Particle Flow Detection Microphone.</p>	

Category Code	Items Description	Note	Relevant Authority
	3. Laser wavelengths equal to or exceeding 1 000 nm but not exceeding 2 000 nm; 4. Optical system resolution better (less) than 1 nm; and 5. Optical Signal to Noise ratio equal to or exceeding 10^3 .		
6A006	<p>“Magnetometers”, “magnetic gradiometers”, “intrinsic magnetic gradiometers”, underwater electric field sensors, “compensation systems”, and specially designed components therefor, as follows:</p> <p>a. “Magnetometers” and subsystems as follows:</p> <ol style="list-style-type: none"> 1. “Magnetometers” using “superconductive” (SQUID) “technology” and having any of the following: <ol style="list-style-type: none"> 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; 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: <ol style="list-style-type: none"> a. 0.05 nT (rms) per square root Hz at frequencies of less than 1 Hz; 	<p><i>Note: 6A006 does not control instruments specially designed for fishery applications or biomagnetic measurements for medical diagnostics.</i></p> <p><u>Technical Note:</u></p> <p><i>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.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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; 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. e. Underwater electromagnetic receivers incorporating magnetic field sensors specified by 6A006.a. or underwater electric field sensors specified by 6A006.b. 		
6A007	<p>Gravity meters (gravimeters) and gravity gradiometers, as follows:</p> <ul style="list-style-type: none"> a. Gravity meters designed or modified for ground use and having a static accuracy of less (better) than 10 µgal; 	<p>NB: SEE ALSO 6A107.</p> <p><i>Note: 6A007.a. does not control ground gravity meters of the quartz element (Worden) type.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Gravity meters designed for mobile platforms and having all of the following:</p> <ol style="list-style-type: none"> 1. A static accuracy of less (better) than 0.7 mgal; and 2. An in-service (operational) accuracy of less (better) than 0.7 mgal having a time-to-steady-state registration of less than 2 minutes under any combination of attendant corrective compensations and motional influences; <p>c. Gravity gradiometers.</p>		
6A008	<p>Radar systems, equipment and assemblies, having any of the following, and specially designed components therefor:</p> <p>a. Operating at frequencies from 40 GHz to 230 GHz and having any of the following:</p> <ol style="list-style-type: none"> 1. An average output power exceeding 100 mW; or 2. Locating accuracy of 1 m or less (better) in range and 0.2 degree or less (better) in azimuth; 	<p>NB: SEE ALSO 6A108.</p> <p><u>Note:</u> 6A008 does not control:</p> <ul style="list-style-type: none"> — Secondary surveillance radar (SSR); — Civil Automotive Radar; — Displays or monitors used for air traffic control (ATC); — Meteorological (weather) radar; — Precision approach radar (PAR) equipment conforming to ICAO standards and employing electronically steerable linear (1-dimensional) arrays or mechanically positioned passive antennae. <p><u>Technical Note:</u></p> <p>The 'centre operating frequency' equals</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. A tunable bandwidth exceeding ± 6.25 % of the 'centre operating frequency';</p> <p>c. Capable of operating simultaneously on more than two carrier frequencies;</p> <p>d. Capable of operating in synthetic aperture (SAR), inverse synthetic aperture (ISAR) radar mode, or sidelooking airborne (SLAR) radar mode;</p> <p>e. Incorporating electronically steerable array antennae;</p> <p>f. Capable of heightfinding non-cooperative targets;</p> <p>g. Specially designed for airborne (balloon or airframe mounted) operation and having Doppler "signal processing" for the detection of moving targets;</p> <p>h. Employing processing of radar signals and using any of the following:</p> <ol style="list-style-type: none"> 1. "Radar spread spectrum" techniques; or 2. "Radar frequency agility" techniques; <p>i. Providing ground-based operation with a maximum "instrumented range" exceeding 185 km;</p>	<p><i>one half of the sum of the highest plus the lowest specified operating frequencies.</i></p> <p><u>Note:</u> 6A008.i. does not control:</p> <ol style="list-style-type: none"> a. Fishing ground surveillance radar; b. Ground radar equipment specially designed for enroute air traffic control and having all the following: <ol style="list-style-type: none"> 1. A maximum "instrumented range" of 500 km or less; 2. Configured so that radar target data can be transmitted only one way 	

Category Code	Items Description	Note	Relevant Authority
	<p>j. Being “laser” radar or Light Detection and Ranging (LIDAR) equipment and having any of the following:</p> <ol style="list-style-type: none"> 1. “Space-qualified”; 2. Employing coherent heterodyne or homodyne detection techniques and having an angular resolution of less (better) than 20 µrad (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; 	<p><i>from the radar site to one or more civil ATC centres;</i></p> <ol style="list-style-type: none"> 3. <i>Contains no provisions for remote control of the radar scan rate from the enroute ATC centre; and</i> 4. <i>Permanently installed;</i> <p><i>c. Weather balloon tracking radars.</i></p> <p><u>Note 1:</u> <i>LIDAR equipment specially designed for surveying is only specified in 6A008.j.3.</i></p> <p><u>Note 2:</u> <i>6A008.j. does not control LIDAR equipment specially designed for meteorological observation.</i></p> <p><u>Note 3:</u> <i>Parameters in the IHO Order 1a Standard 5th Edition February 2008 are summarised as follows:</i></p> <ul style="list-style-type: none"> — <i>Horizontal Accuracy (95 % Confidence Level) = 5 m + 5 % of depth.</i> — <i>Depth Accuracy for Reduced Depths (95 % confidence level) = $\pm\sqrt{(a^2 + (b*d)^2)}$, where:</i> <p><i>a = 0.5 m = constant depth error, i.e. the sum of all constant depth errors</i></p> <p><i>b = 0.015 = factor of depth dependent error</i></p> <p><i>b*d = depth dependent error, i.e. the sum of all depth dependent errors</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>k. Having “signal processing” sub-systems using “pulse compression” and having any of the following:</p> <p>a. A “pulse compression” ratio exceeding 150; or</p> <p>b. A pulse width of less than 200 ns; or</p> <p>l. Having data processing sub-systems and having any of the following:</p> <p>1. “Automatic target tracking” providing, at any antenna rotation, the predicted target position beyond the time of the next antenna beam passage; or</p> <p>2. Not used;</p> <p>3. Not used;</p> <p>4. Configured to provide superposition and correlation, or fusion, of target data within six seconds from two or more “geographically dispersed” radar sensors to improve the aggregate performance beyond that of any single sensor specified by 6A008.f. or 6A008.i.</p>	<p>$d = \text{depth}$</p> <p>— <i>Feature Detection = Cubic features > 2 m in depths up to 40 m; 10% of depth beyond 40 m.</i></p> <p><u>Note:</u> 6A008.l.1. does not control conflict alert capability in ATC systems, or marine or harbour radar.</p> <p>NB: SEE ALSO MILITARY GOODS CONTROL.</p> <p><u>Note:</u> 6A008.l.4. does not control systems, equipment and assemblies used for marine traffic control.</p>	
6A102	Radiation hardened ‘detectors’, other than those specified in 6A002, specially designed or modified for protecting against nuclear effects (e.g. electromagnetic pulse (EMP), X-rays, combined blast and thermal effects) and usable for “missiles”, designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of 5×10^5 rads (silicon).	<p><u>Technical Note:</u></p> <p><i>In 6A102, a ‘detector’ is defined as a mechanical, electrical, optical or chemical device that automatically identifies and records, or registers a stimulus such as an</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<i>environmental change in pressure or temperature, an electrical or electromagnetic signal or radiation from a radioactive material. This includes devices that sense by one time operation or failure.</i>	
6A107	<p>Gravity meters (gravimeters) and components for gravity meters and gravity gradiometers, as follows:</p> <p>a. Gravity meters, other than those specified in 6A007.b, designed or modified for airborne or marine use, and having a static or operational accuracy of 7×10^{-6} m/s² (0.7 mgal) or less (better), and having a time-to-steady-state registration of two minutes or less;</p> <p>b. Specially designed components for gravity meters specified in 6A007.b or 6A107.a. and gravity gradiometers specified in 6A007.c.</p>		Controller
6A108	<p>Radar systems and tracking systems, other than those specified in entry 6A008, as follows:</p> <p>a. Radar and laser radar systems designed or modified for use in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;</p> <p>b. Precision tracking systems, usable for 'missiles', as follows:</p> <p>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;</p>	<p><u>Note:</u> 6A108.a. includes the following:</p> <p>a. Terrain contour mapping equipment;</p> <p>b. Imaging sensor equipment;</p> <p>c. Scene mapping and correlation (both digital and analogue) equipment;</p> <p>d. Doppler navigation radar equipment.</p> <p><u>Technical Note:</u></p> <p>In 6A108.b. 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>2. Range instrumentation radars including associated optical/infrared trackers with all of the following capabilities:</p> <ul style="list-style-type: none"> 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. 		
6A202	<p>Photomultiplier tubes having both of the following characteristics:</p> <ul style="list-style-type: none"> a. Photocathode area of greater than 20 cm²; and b. Anode pulse rise time of less than 1 ns. 		Atomic Energy Licensing Board (AELB), MOSTI
6A203	<p>Cameras and components, other than those specified in 6A003, as follows:</p> <ul style="list-style-type: none"> a. Mechanical rotating mirror cameras, as follows, and specially designed components therefor: <ul style="list-style-type: none"> 1. Framing cameras with recording rates greater than 225 000 frames per second; 2. Streak cameras with writing speeds greater than 0.5 mm per microsecond; b. Electronic streak cameras, electronic framing cameras, tubes and devices, as follows: <ul style="list-style-type: none"> 1. Electronic streak cameras capable of 50 ns or less time resolution; 2. Streak tubes for cameras specified in 6A203.b.1.; 3. Electronic (or electronically shuttered) framing cameras capable of 50 ns or less frame exposure time; 4. Framing tubes and solid-state imaging devices for use with cameras specified in 6A203.b.3., as follows: 	<p><i>Note: In 6A203.a. components of such cameras include their synchronising electronics units and rotor assemblies consisting of turbines, mirrors and bearings.</i></p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> a. Proximity focused image intensifier tubes having the photocathode deposited on a transparent conductive coating to decrease photocathode sheet resistance; b. Gate silicon intensifier target (SIT) videcon tubes, where a fast system allows gating the photoelectrons from the photocathode before they impinge on the SIT plate; c. Kerr or Pockels cell electro-optical shuttering; d. Other framing tubes and solid-state imaging devices having a fast-image gating time of less than 50 ns specially designed for cameras specified in 6A203.b.3.; c. Radiation-hardened TV cameras, or lenses therefor, specially designed or rated as radiation hardened to withstand a total radiation dose greater than $50 \times 10^3 \text{ Gy}$ (silicon) ($5 \times 10^6 \text{ rad}$ (silicon)) without operational degradation. 	<p><u>Technical Note:</u></p> <p><i>The term Gy (silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionising radiation.</i></p>	
6A205	<p>"Lasers", "laser" amplifiers and oscillators, other than those specified in 0B001.g.5., 0B001.h.6. and 6A005; as follows:</p> <ul style="list-style-type: none"> a. Argon ion "lasers" having both of the following characteristics: <ul style="list-style-type: none"> 1. Operating at wavelengths between 400 nm and 515 nm; and 2. An average output power greater than 40 W; b. Tunable pulsed single-mode dye laser oscillators having all of the following characteristics: <ul style="list-style-type: none"> 1. Operating at wavelengths between 300 nm and 800 nm; 2. An average output power greater than 1 W; 3. A repetition rate greater than 1 kHz; and 4. Pulse width less than 100 ns; 	<p><u>NB:</u> For copper vapour lasers, see 6A005.b.</p>	Atomic Energy Licensing Board (AELB), MOSTI

Category Code	Items Description	Note	Relevant Authority
	<p>c. Tunable pulsed dye laser amplifiers and oscillators, having all of the following characteristics:</p> <ol style="list-style-type: none"> 1. Operating at wavelengths between 300 nm and 800 nm; 2. An average output power greater than 30 W; 3. A repetition rate greater than 1 kHz; and 4. Pulse width less than 100 ns; <p>d. Pulsed carbon dioxide “lasers” having all of the following characteristics:</p> <ol style="list-style-type: none"> 1. Operating at wavelengths between 9 000 nm and 11 000 nm; 2. A repetition rate greater than 250 Hz; 3. An average output power greater than 500 W; and 4. Pulse width of less than 200 ns; <p>e. Para-hydrogen Raman shifters designed to operate at 16 micrometre output wavelength and at a repetition rate greater than 250 Hz;</p> <p>f. Neodymium-doped (other than glass) “lasers” with an output wavelength between 1 000 and 1 100 nm having either of the following:</p> <ol style="list-style-type: none"> 1. Pulse-excited and Q-switched with a pulse duration equal to or more than 1 ns, and having either of the following: <ol style="list-style-type: none"> a. A single-transverse mode output with an average output power greater than 40 W; or b. A multiple-transverse mode output having an average power greater than 50 W; or 2. Incorporating frequency doubling to give an output wavelength between 500 and 550 nm with an average output power of more than 40 W. 	<p><i>Note: 6A205.c. does not control single mode oscillators.</i></p>	

Category Code	Items Description	Note	Relevant Authority
6A225	Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 microseconds.	<i>Note: 6A225 includes velocity interferometers such as VISARs (Velocity interferometer systems for any reflector) and DLIs (Doppler laser interferometers).</i>	Atomic Energy Licensing Board (AELB), MOSTI
6A226	Pressure sensors, as follows: a. Manganin gauges for pressures greater than 10 GPa; b. Quartz pressure transducers for pressures greater than 10 GPa.		Atomic Energy Licensing Board (AELB), MOSTI
6B	Test, Inspection and Production Equipment		
6B004	Optical equipment as follows: a. Equipment for measuring absolute reflectance to an accuracy of ± 0.1 % of the reflectance value; b. Equipment other than optical surface scattering measurement equipment, having an unobscured aperture of more than 10 cm, specially designed for the non-contact optical measurement of a non-planar optical surface figure (profile) to an "accuracy" of 2 nm or less (better) against the required profile.	<i>Note: 6B004 does not control microscopes.</i>	Controller
6B007	Equipment to produce, align and calibrate land-based gravity meters with a static accuracy of better than 0.1mgal.		Controller
6B008	Pulse radar cross-section measurement systems having transmit pulse widths of 100 ns or less, and specially designed components therefor.	NB: SEE ALSO 6B108.	Controller
6B108	Systems, other than those specified in 6B008, specially designed for radar cross-section measurement usable for 'missiles' and their subsystems.	<u>Technical Note:</u> <i>In 6B108 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i>	Controller
6C	Materials		

Category Code	Items Description	Note	Relevant Authority
6C002	<p>Optical sensor materials as follows:</p> <ol style="list-style-type: none"> Elemental tellurium (Te) of purity levels of 99.9995 % or more; Single crystals (including epitaxial wafers) of any of the following: <ol style="list-style-type: none"> Cadmium zinc telluride (CdZnTe), with zinc content of less than 6 % by 'mole fraction'; Cadmium telluride (CdTe) of any purity level; or Mercury cadmium telluride (HgCdTe) of any purity level. 	<p><u>Technical Note:</u></p> <p>'Mole fraction' is defined as the ratio of moles of ZnTe to the sum of moles of CdTe and ZnTe present in the crystal.</p>	Controller
6C004	<p>Optical materials as follows:</p> <ol style="list-style-type: none"> Zinc selenide (ZnSe) and zinc sulphide (ZnS) "substrate blanks", produced by the chemical vapour deposition process and having any of the following: <ol style="list-style-type: none"> A volume greater than 100 cm³ ; or A diameter greater than 80 mm and a thickness of 20 mm or more; Boules of any of the following electro-optic materials: <ol style="list-style-type: none"> Potassium titanyl arsenate (KTA) (CAS 59400-80-5); Silver gallium selenide (AgGaSe₂) (CAS 12002-67-4); or Thallium arsenic selenide (Tl₃AsSe₃, also known as TAS) (CAS 16142-89-5); Non-linear optical materials having all of the following: <ol style="list-style-type: none"> Third order susceptibility (chi 3) of 10⁻⁶ m²/V² or more; and A response time of less than 1 ms; 		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>d. "Substrate blanks" of silicon carbide or beryllium beryllium (Be/Be) deposited materials, exceeding 300 mm in diameter or major axis length;</p> <p>e. Glass, including fused silica, phosphate glass, fluorophosphate glass, zirconium fluoride (ZrF_4) (CAS 7783-64-4) and hafnium fluoride (HfF_4) (CAS 13709-52-9) and having all of the following:</p> <ol style="list-style-type: none"> 1. A hydroxyl ion (OH^-) concentration of less than 5 ppm; 2. Integrated metallic purity levels of less than 1 ppm; and 3. High homogeneity (index of refraction variance) less than 5×10^{-6}; <p>f. Synthetically produced diamond material with an absorption of less than 10^{-5} cm^{-1} for wavelengths exceeding 200 nm but not exceeding 14 000 nm.</p>		
6C005	<p>Synthetic crystalline "laser" host material in unfinished form as follows:</p> <ol style="list-style-type: none"> a. Titanium doped sapphire; b. Alexandrite. 		Controller
6D	Software		
6D001	"Software" specially designed for the "development" or "production" of equipment specified in 6A004, 6A005, 6A008 or 6B008.		Controller
6D002	"Software" specially designed for the "use" of equipment specified in 6A002.b., 6A008 or 6B008.		Controller
6D003	<p>Other "software" as follows:</p> <ol style="list-style-type: none"> a. "Software" as follows: <ol style="list-style-type: none"> 1. "Software" specially designed for acoustic beam forming for the "real-time processing" of acoustic data for passive reception using towed hydrophone arrays; 		Controller

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 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; 5. "Software" or "source code", specially designed for all of the following: <ol style="list-style-type: none"> a. "Real-time processing" of acoustic data from sonar systems specified by 6A001.a.1.e.; and b. Automatically detecting, classifying and determining the location of divers or swimmers; 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: <ol style="list-style-type: none"> 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; 3. "Software" specially designed for "real-time processing" of electromagnetic data using underwater electromagnetic receivers specified by 6A006.e.; 	<p><i><u>NB:</u> For diver detection "software" or "source code", specially designed or modified for military use, see the Military Goods Controls.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>4. "Source code" for "real-time processing" of electromagnetic data using underwater electromagnetic receivers specified by 6A006.e;</p> <p>g. "Software" specially designed to correct motional influences of gravity meters or gravity gradiometers;</p> <p>h. "Software" as follows:</p> <ol style="list-style-type: none"> 1. Air Traffic Control (ATC) "software" application "programmes" designed to be hosted on general purpose computers located at Air Traffic Control centres and capable of 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: <ol style="list-style-type: none"> 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. 	<p><u>Technical Note:</u></p> <p><i>'Average side lobe level' in 6D003.h.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.</i></p>	
6D102	"Software" specially designed or modified for the "use" of goods specified in 6A108.		Controller
6D103	"Software" which processes post-flight, recorded data, enabling determination of vehicle position throughout its flight path, specially designed or modified for 'missiles'.	<p><u>Technical Note:</u></p> <p><i>In 6D103 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>	Controller
6E	Technology		
6E001	"Technology" according to the General Technology Note for the		Atomic Energy Licensing

Category Code	Items Description	Note	Relevant Authority
	"development" of equipment, materials or "software" specified in 6A, 6B, 6C or 6D.		Board (AELB), MOSTI
6E002	"Technology" according to the General Technology Note for the "production" of equipment or materials specified in 6A, 6B or 6C.		Atomic Energy Licensing Board (AELB), MOSTI
6E003	Other "technology" as follows: a. "Technology" as follows: 1. Optical surface coating and treatment "technology", "required" to achieve an 'optical thickness' uniformity of 99.5 % or better for optical coatings 500 mm or more in diameter or major axis length and with a total loss (absorption and scatter) of less than 5×10^{-3} ; 2. Optical fabrication "technology" using single point diamond turning techniques to produce surface finish accuracies of better than 10 nm rms on non-planar surfaces exceeding 0.5 m ² ; b. "Technology" "required" for the "development", "production" or "use" of specially designed diagnostic instruments or targets in test facilities for "SHPL" testing or testing or evaluation of materials irradiated by "SHPL" beams.	NB: SEE ALSO 2E003.F. <u>Technical Note:</u> <i>'Optical thickness' is the mathematical product of the index of refraction and the physical thickness of the coating.</i>	Controller
6E101	"Technology" according to the General Technology Note for the "use" of equipment or "software" specified in 6A002, 6A007.b. and c., 6A008, 6A102, 6A107, 6A108, 6B108, 6D102 or 6D103.	<u>Note:</u> 6E101 only specifies "technology" for equipment specified in 6A008 when it is designed for airborne applications and is usable in "missiles".	Controller
6E201	"Technology" according to the General Technology Note for the "use" of equipment specified in 6A003, 6A005.a.2., 6A005.b.2., 6A005.b.3., 6A005.b.4., 6A005.b.6., 6A005.c.2., 6A005.d.3.c., 6A005.d.4.c., 6A202, 6A203, 6A205, 6A225 or 6A226.		Atomic Energy Licensing Board (AELB), MOSTI

CATEGORY 7

NAVIGATION AND AVIONICS

Category Code	Items Description	Note	Relevant Authority
Category 7 : NAVIGATION AND AVIONICS			
7A	Systems, Equipment and Components	<i><u>NB:</u> For automatic pilots for underwater vehicles, see Category 8. For radar, see Category 6.</i>	
7A001	<p>Accelerometers as follows and specially designed components therefor:</p> <p>a. Linear accelerometers having any of the following:</p> <ol style="list-style-type: none"> 1. Specified to function at linear acceleration levels less than or equal to 15 g and having any of the following: <ol style="list-style-type: none"> a. A "bias" "stability" of less (better) than 130 micro g with respect to a fixed calibration value over a period of one year; or b. A "scale factor" "stability" of less (better) than 130 ppm with respect to a fixed calibration value over a period of one year; 2. Specified to function at linear acceleration levels exceeding 15 g but less than or equal to 100 g and having all of the following: <ol style="list-style-type: none"> a. A "bias" "repeatability" of less (better) than 5 000 micro g over a period of one year; and b. A "scale factor" "repeatability" of less (better) than 2 500 ppm over a period of one year; or 3. Designed for use in inertial navigation or guidance systems and specified to function at linear acceleration levels exceeding 100 g; 	<p>NB: SEE ALSO 7A101.</p> <p><i><u>NB:</u> For angular or rotational accelerometers, see 7A001.b.</i></p> <p><i><u>Note:</u> 7A001.a.1. and 7A001.a.2. do not control accelerometers limited to measurement of only vibration or shock.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	b. Angular or rotational accelerometers, specified to function at linear acceleration levels exceeding 100 g.		
7A002	<p>Gyros or angular rate sensors, having any of the following and specially designed components therefor:</p> <p>a. Specified to function at linear acceleration levels less than or equal to 100 g and having any of the following:</p> <ol style="list-style-type: none"> 1. A rate range of less than 500 degrees per second and having any of the following: <ol style="list-style-type: none"> a. A “bias” “stability” of less (better) than 0.5degree per hour, when measured in a 1 g environment over a period of one month, and with respect to a fixed calibration value; or b. An “angle random walk” of less (better) than or equal to 0.0035 degree per square root hour; or 2. A rate range greater than or equal to 500 degrees per second and having any of the following: <ol style="list-style-type: none"> a. A “bias” “stability” of less (better) than 40 degrees per hour, when measured in a 1 g environment over a period of three minutes, and with respect to a fixed calibration value; or 	<p>NB: SEE ALSO 7A102.</p> <p><u>NB:</u> For angular or rotational accelerometers, see 7A001.b.</p> <p><u>Note:</u> 7A002.a.1.b. does not control ‘spinning mass gyros’.</p> <p><u>Technical Note:</u></p> <p>‘Spinning mass gyros’ are gyros which use a continually rotating mass to sense angular motion.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. An “angle random walk” of less (better) than or equal to 0.2 degree per square root hour; or</p> <p>b. Specified to function at linear acceleration levels exceeding 100 g.</p>	<p><u>Note:</u> 7A002.a.2.b. does not control ‘spinning mass gyros’.</p> <p><u>Technical Note:</u></p> <p>‘Spinning mass gyros’ are gyros which use a continually rotating mass to sense angular motion.</p>	
7A003	<p>Inertial systems and specially designed components, as follows:</p> <p>a. Inertial Navigation Systems (INS) (gimballed or strapdown) and inertial equipment, designed for “aircraft”, land vehicle, vessels (surface or underwater) or “spacecraft” for navigation, attitude, guidance or control and having any of the following and specially designed components therefor:</p> <ol style="list-style-type: none"> 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 2. Specified to function at linear acceleration levels exceeding 10 g; <p>b. Hybrid Inertial Navigation Systems embedded with Global Navigation Satellite Systems(s) (GNSS) or with “Data-Based Referenced Navigation” (“DBRN”) System(s) for navigation, attitude, guidance or control, subsequent to normal alignment and having an INS navigation position accuracy, after loss of GNSS or “DBRN” for a period of up to four minutes, of less</p>	<p>NB: SEE ALSO 7A103.</p> <p><u>Note 1:</u> The parameters of 7A003.a. and 7A003.b. are applicable with any of the following environmental conditions:</p> <p>a. Input random vibration with an overall magnitude of 7.7g rms in the first 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 the following:</p> <ol style="list-style-type: none"> 1. A constant Power Spectral Density (PSD) value of 0.04 g²/Hz over a 	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>(better) than 10 metres 'Circular Error Probable' ('CEP');</p> <p>c. Inertial Measurement equipment for heading or True North determination and having any of the following and specially designed components therefor:</p> <ol style="list-style-type: none"> 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; <p>d. Inertial Measurement equipment including Inertial Measurement Units (IMU) and Inertial Reference Systems (IRS), incorporating accelerometers or gyros specified in 7A001 or 7A002.</p>	<p><i>frequency interval of 15 to 1 000 Hz; and</i></p> <p><i>2. The PSD attenuates with frequency from 0.04 g²/Hz to 0.01 g²/Hz over a frequency interval from 1000 to 2000 Hz;</i></p> <p><i>b. An angular rate capability about one or more axes of equal to or more than + 2.62 rad/s (150 deg/s); or</i></p> <p><i>c. According to national standards equivalent to a. or b. above.</i></p> <p><u>Note 2:</u> <i>7A003 does not control inertial navigation systems which are certified for use on "civil aircraft" by civil authorities of a "participating state".</i></p> <p><u>Note 3:</u> <i>7A003.c.1. does not control theodolite systems incorporating inertial equipment specially designed for civil surveying purposes.</i></p>	

Category Code	Items Description	Note	Relevant Authority
		<p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 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. 	
7A004	Gyro-astro compasses and other devices which derive position or orientation by means of automatically tracking celestial bodies or satellites, with an azimuth accuracy of equal to or less (better) than 5 seconds of arc.	NB: SEE ALSO 7A104.	Controller
7A005	<p>Global Navigation Satellite Systems (GNSS) receiving equipment having any of the following and specially designed components therefor:</p> <ol style="list-style-type: none"> a. Employing a decryption algorithm specially designed or modified for government use to access the ranging code for position and time; or b. Employing 'adaptive antenna systems'. 	<p>NB: SEE ALSO 7A105.</p> <p><u>NB:</u> For equipment specially designed for military use, see Military Goods Control.</p> <p><u>Note:</u> 7A005.b. does not control GNSS receiving equipment that only uses components designed to filter, switch, or combine signals from multiple omni-directional antennae that do not implement</p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><i>adaptive antenna techniques.</i></p> <p><u>Technical Note:</u></p> <p><i>For the purpose of 7A005.b. 'adaptive antenna systems' dynamically generate one or more spatial nulls in an antenna array pattern by signal processing in the time domain or frequency domain.</i></p>	
7A006	<p>Airborne altimeters operating at frequencies other than 4.2 to 4.4 GHz inclusive and having any of the following:</p> <p>a. "Power management"; or</p> <p>b. Using phase shift key modulation.</p>	NB: SEE ALSO 7A106.	Controller
7A008	Underwater sonar navigation systems using doppler velocity or correlation velocity logs integrated with aheading source and having a positioning accuracy of equal to or less (better) than 3% of distance travelled 'Circular Error Probable' ('CEP') and specially designed components therefor.	<p><u>Note:</u> 7A008 does not control systems specially designed for installation on surface vessels or systems requiring acoustic beacons or buoys to provide positioning data.</p> <p><u>NB:</u> See 6A001.a.for acoustic systems, and 6A001.b. for correlation-velocity and Doppler-velocity sonar log equipment.See 8A002 for other marine systems.</p>	Controller
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 of the following characteristics, and specially designed components therefor;	<u>Note:</u> 7A101 does not control accelerometers specially designed and developed as MWD (Measurement While	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>a. A "bias" "repeatability" of less (better) than 1250 micro g; and</p> <p>b. A "scale factor" "repeatability" of less (better) than 1250 ppm;</p>	<p><i>Drilling) Sensors for use in downhole well service operations.</i></p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> <i>In 7A101 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km;</i> <i>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.</i> 	
7A102	All types of gyros, other than those specified in 7A002, usable in 'missiles', with a rated "drift rate" 'stability' of less than 0.5° (1 sigma or rms) per hour in a 1 g environment and specially designed components therefor.	<p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> <i>In 7A102 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i> <i>In 7A102 'stability' is defined as a measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition (IEEE STD 528-2001 paragraph 2.247).</i> 	Controller
7A103	Instrumentation, navigation equipment and systems, other than those specified in 7A003, as follows; and specially designed components therefor:	<p><u>Technical Note:</u></p> <p><i>In 7A103 'missile' means complete</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>a. Inertial or other equipment, using accelerometers or gyros as follows, and systems incorporating such equipment:</p> <ol style="list-style-type: none"> 1. Accelerometers specified in 7A001.a.3., 7A001.b. or 7A101 or gyros specified in 7A002 or 7A102; or 2. Accelerometers specified in 7A001.a.1. or 7A001.a.2. and having all of the following: <ol style="list-style-type: none"> a. Designed for use in inertial navigation systems or in guidance systems of all types and usable in 'missiles'; b. A "bias" "repeatability" of less (better) than 1250 micro g; and c. A "scale factor" "repeatability" of less (better) than 1250 ppm; <p>b. Integrated flight instrument systems which include gyrostabilisers or automatic pilots, designed or modified for use in 'missiles';</p> <p>c. 'Integrated navigation systems', designed or modified for 'missiles' and capable of providing a navigational accuracy of 200 m Circle of Equal Probability (CEP) or less;</p>	<p><i>rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p> <p><u>Note:</u> 7A103.a. does not specify equipment containing accelerometers specified in 7A001 where such accelerometers are specially designed and developed as MWD (Measurement While Drilling) sensors for use in down-hole well services operations.</p> <p><u>Technical Note:</u></p> <p><i>An 'integrated navigation system' typically incorporates the following components:</i></p> <ol style="list-style-type: none"> 1. <i>An inertial measurement device (e.g., an attitude and heading reference system, inertial reference unit, or inertial navigation system);</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>d. Three axis magnetic heading sensors, designed or modified to be integrated with flight control and navigation systems, having all the following characteristics, and specially designed components therefor;</p> <ol style="list-style-type: none"> 1. Internal tilt compensation in pitch (± 90 degrees) and roll (± 180 degrees) axes; 2. Capable of providing azimuthal accuracy better (less) than 0.5 degrees rms at latitude of ± 80 degrees, reference to local magnetic field. 	<ol style="list-style-type: none"> 2. <i>One or more external sensors used to update the position and/or velocity, either periodically or continuously throughout the flight (e.g., satellite navigation receiver, radar altimeter, and/or Doppler radar); and</i> 3. <i>Integration hardware and software.</i> <p><u>Note:</u> <i>Flight control and navigation systems in 7A103.d. include gyrostabilizers, automatic pilots and inertial navigation systems.</i></p>	
7A104	Gyro-astro compasses and other devices, other than those specified in 7A004, which derive position or orientation by means of automatically tracking celestial bodies or satellites and specially designed components therefore.		Controller

Category Code	Items Description	Note	Relevant Authority
7A105	<p>Receiving equipment for Global Navigation Satellite Systems (GNSS; e.g. GPS, GLONASS, or Galileo), having any of the following characteristics, and specially designed components therefore:</p> <p>a. Designed or modified for use in space launch vehicles specified in 9A004, unmanned aerial vehicles specified in 9A012 or sounding rockets specified in 9A104; or</p> <p>b. Designed or modified for airborne applications and having any of the following:</p> <ol style="list-style-type: none"> 1. Capable of providing navigation information at speeds in excess of 600 m/s; 2. Employing decryption, designed or modified for military or governmental services, to gain access to GNSS secured signal/data; or 3. Being specially designed to employ anti-jam features (e.g. null steering antenna or electronically steerable antenna) to function in an environment of active or passive countermeasures. 	<p><u>Note:</u> 7A105.b.2. and 7A105.b.3. do not. control equipment designed for commercial, civil or 'Safety of Life' (e.g., data integrity, flight safety) GNSS services.</p>	Controller
7A106	Altimeters, other than those specified in 7A006, of radar or laser radar type, designed or modified for use in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.		Controller
7A115	Passive sensors for determining bearing to specific electromagnetic source (direction finding equipment) or terrain characteristics, designed or modified for use in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.	<p><u>Note:</u> 7A115 includes sensors for the following equipment:</p> <p>a. Terrain contour mapping equipment;</p> <p>b. Imaging sensor equipment (both active and passive);</p>	Controller

Category Code	Items Description	Note	Relevant Authority
		c. <i>Passive interferometer equipment.</i>	
7A116	<p>Flight control systems and servo valves, as follows, designed or modified for use in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.</p> <p>a. Hydraulic, mechanical, electro-optical, or electro-mechanical flight control systems (including fly-by-wire types);</p> <p>b. Attitude control equipment;</p> <p>c. Flight control servo valves designed or modified for the systems specified in 7A116.a. or 7A116.b., and designed or modified to operate in a vibration environment greater than 10 g rms between 20 Hz and 2 kHz.</p>		Controller
7A117	“Guidance sets”, usable in “missiles” capable of achieving system accuracy of 3.33 % or less of the range (e.g., a “CEP” of 10 km or less at a range of 300 km).		Controller
7B	Test, Inspection and Production Equipment		
7B001	Test, calibration or alignment equipment specially designed for equipment specified in 7A.	<p><u>Note:</u> 7B001 does not control test, calibration or alignment equipment for ‘Maintenance Level I’ or ‘Maintenance Level II’.</p> <p><u>Technical Notes:</u></p> <p>1. <u>Maintenance Level I</u></p> <p><i>The failure of an inertial navigation unit is detected on the aircraft by</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
		<p>indications from the Control and Display Unit (CDU) or by the status message from the corresponding subsystem. By following the manufacturer's manual, the cause of the failure may be localised at the level of the malfunctioning Line Replaceable Unit (LRU). The operator then removes the LRU and replaces it with a spare.</p> <p>2. <u>Maintenance Level II</u></p> <p>The defective LRU is sent to the maintenance workshop (the manufacturer's or that of the operator responsible for Level II maintenance). At the maintenance workshop, the malfunctioning LRU is tested by various appropriate means to verify and localise the defective shop replaceable assembly (SRA) module responsible for the failure. This SRA is removed and replaced by an operative spare. The defective SRA (or possibly the complete LRU) is then shipped to the manufacturer. 'Maintenance Level II' does not include the disassembly or repair of controlled accelerometers or gyro sensors.</p>	
7B002	Equipment specially designed to characterise mirrors for ring "laser" gyros, as follows:	N.B.: SEE ALSO 7B102.	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>a. Scatterometers having a measurement accuracy of 10 ppm or less (better);</p> <p>b. Profilometers having a measurement accuracy of 0.5nm (5 angstrom) or less (better).</p>		
7B003	Equipment specially designed for the “production” of equipment specified in 7A.	<p><u>Note:</u> 7B003 includes:</p> <ul style="list-style-type: none"> — Gyro tuning test stations; — Gyro dynamic balance stations; — Gyro run-in/motor test stations; — Gyro evacuation and fill stations; — Centrifuge fixtures for gyro bearings; — Accelerometer axis align stations; — Fibre optic gyro coil winding machines. 	Controller
7B102	Reflectometers specially designed to characterise mirrors, for “laser” gyros, having a measurement accuracy of 50 ppm or less (better).		Controller
7B103	“Production facilities” and “production equipment” as follows:		Controller

Category Code	Items Description	Note	Relevant Authority
	a. "Production facilities" specially designed for equipment specified in 7A117; b. "Production equipment", and other test, calibration and alignment equipment, other than that specified in 7B001 to 7B003, designed or modified to be used with equipment specified in 7A.		
7C	Materials		
	None.		
7D	Software		
7D001	"Software" specially designed or modified for the "development" or "production" of equipment specified in 7A or 7B.		Controller
7D002	"Source code" for the "use" of any inertial navigation equipment, including inertial equipment not included in 7A003 or 7A004, or Attitude and Heading Reference Systems ('AHRS').	<p><u>Note:</u> 7D002 does not control "source code" for the "use" of gimballed 'AHRS'.</p> <p><u>Technical Note:</u></p> <p>'AHRS' generally differ from Inertial Navigation Systems (INS) in that an 'AHRS' provides attitude and heading information and normally does not provide the acceleration, velocity and position information associated with an INS.</p>	Controller
7D003	Other "software", as follows: a. "Software" specially designed or modified to improve the operational performance or reduce the navigational error of systems to the levels specified in 7A003, 7A004 or 7A008;		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. "Source code" for hybrid integrated systems which improves the operational performance or reduces the navigational error of systems to the level specified in 7A003 or 7A008 by continuously combining heading data with any of the following:</p> <ol style="list-style-type: none"> 1. Doppler radar or sonar velocity data; 2. Global Navigation Satellite Systems (GNSS) reference data; or 3. Data from "Data-Based Referenced Navigation" ("DBRN") systems; <p>c. "Source code" for integrated avionics or mission systems which combine sensor data and employ "expert systems";</p> <p>d. "Source code" for the "development" of any of the following:</p> <ol style="list-style-type: none"> 1. Digital flight management systems for "total control of flight"; 2. Integrated propulsion and flight control systems; 3. Fly-by-wire or fly-by-light control systems; 4. Fault-tolerant or self-reconfiguring "active flight control systems"; 5. Airborne automatic direction finding equipment; 6. Air data systems based on surface static data; or 7. Raster-type head-up displays or three dimensional displays; <p>e. Computer-Aided-Design (CAD) "software" specially designed for</p>		

Category Code	Items Description	Note	Relevant Authority
	the “development” of “active flight control systems”, helicopter multi-axis fly-by-wire or fly-by-light controllers or helicopter “circulation controlled anti-torque or circulation-controlled direction control systems”, whose “technology” is specified in 7E004.b., 7E004.c.1. or 7E004.c.2.		
7D101	“Software” specially designed or modified for the “use” of equipment specified in 7A001 to 7A006, 7A101 to 7A106, 7A115, 7A116.a., 7A116.b., 7B001, 7B002, 7B003, 7B102 or 7B103.		Controller
7D102	Integration “software” as follows: a. Integration “software” for the equipment specified in 7A103.b.; b. Integration “software” specially designed for the equipment specified in 7A003 or 7A103.a. c. Integration “software” designed or modified for the equipment specified in 7A103.c.	<u>Note:</u> A common form of integration “software” employs Kalman filtering.	Controller
7D103	“Software” specially designed for modelling or simulation of the “guidance sets” specified in 7A117 or for their design integration with the space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.	<u>Note:</u> “Software” specified in 7D103 remains controlled when combined with specially designed hardware specified in 4A102.	Controller
7E	Technology		
7E001	“Technology” according to the General Technology Note for the “development” of equipment or “software” specified in 7A, 7B or 7D.		Controller
7E002	“Technology” according to the General Technology Note for the “production” of equipment specified in 7A or 7B.		Controller

Category Code	Items Description	Note	Relevant Authority
7E003	<p>“Technology” according to the General Technology Note for the repair, refurbishing or overhaul of equipment specified in 7A001 to 7A004.</p>	<p><u>Note:</u> 7E003 does not control maintenance “technology” directly associated with calibration, removal or replacement of damaged or unserviceable LRUs and SRAs of a “civil aircraft” as described in ‘Maintenance Level I’ or ‘Maintenance Level II’.</p> <p><u>NB:</u> See Technical Notes to 7B001.</p>	Controller
7E004	<p>Other “technology”, as follows:</p> <ol style="list-style-type: none"> a. “Technology” for the “development” or “production” of any of the following: <ol style="list-style-type: none"> 1. Airborne automatic direction finding equipment operating at frequencies exceeding 5 MHz; 2. Air data systems based on surface static data only, i.e. which dispense with conventional air data probes; 3. Three dimensional displays for “aircraft”; 4. Not used; 5. Electric actuators (i.e., electromechanical, electrohydrostatic and integrated actuator package) specially designed for “primary flight control”; 6. “Flight control optical sensor array” specially designed for implementing “active flight control systems”; or 7. “DBRN” systems designed to navigate underwater, using 		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>sonar or gravity databases, that provide a positioning accuracy equal to or less (better) than 0.4 nautical miles;</p> <p>b. "Development" "technology", as follows, for "active flight control systems" (including fly-by-wire or fly-by-light):</p> <ol style="list-style-type: none"> 1. Configuration design for interconnecting multiple microelectronic processing elements (on-board computers) to achieve "real time processing" for control law implementation; 2. Control law compensation for sensor location or dynamic airframe loads, i.e., compensation for sensor vibration environment or for variation of sensor location from the centre of gravity; 3. Electronic management of data redundancy or systems redundancy for fault detection, fault tolerance, fault isolation or reconfiguration; 4. Flight controls which permit inflight reconfiguration of force and moment controls for real time autonomous air vehicle control; 5. Integration of digital flight control, navigation and propulsion control data, into a digital flight management system for "total control of flight"; 	<p><u>Note:</u> 7E004.b.3. does not control "technology" for the design of physical redundancy.</p> <p><u>Note:</u> 7E004.b.5. does not control:</p> <ol style="list-style-type: none"> a. "Development" "technology" for integration of digital flight control, navigation and propulsion control data, into a digital flight management system for "flight path optimisation"; b. "Development" "technology" 	

Category Code	Items Description	Note	Relevant Authority
	<p>6. Full authority digital flight control or multisensor mission management systems, employing “expert systems”;</p> <p>c. Technology for the “development” of helicopter systems, as follows:</p> <ol style="list-style-type: none"> 1. Multi-axis fly-by-wire or fly-by-light controllers, which combine the functions of at least two of the following into one controlling element: <ol style="list-style-type: none"> a. Collective controls; b. Cyclic controls; c. Yaw controls; 2. “Circulation-controlled anti-torque or circulation-controlled directional control systems”; 3. Rotor blades incorporating “variable geometry airfoils”, for use in systems using individual blade control. 	<p><i>for “aircraft” flight instrument systems integrated solely for VOR, DME, ILS or MLS navigation or approaches.</i></p> <p><u>NB:</u> <i>For “technology” for Full Authority Digital Engine Control System (“FADEC System”), see 9E003.h.</i></p>	
7E101	“Technology” according to the General Technology Note for the “use” of equipment specified in 7A001 to 7A006, 7A101 to 7A106, 7A115 to 7A117, 7B001, 7B002, 7B003, 7B102, 7B103, 7D101 to 7D103.		Controller
7E102	“Technology” for protection of avionics and electrical subsystems against electromagnetic pulse (EMP) and electromagnetic interference (EMI) hazards, from external sources, as follows:		Controller

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> a. Design “technology” for shielding systems; b. Design “technology” for the configuration of hardened electrical circuits and subsystems; c. Design “technology” for the determination of hardening criteria of 7E102.a. and 7E102.b. 		
7E104	“Technology” for the integration of the flight control, guidance, and propulsion data into a flight management system for optimisation of rocket system trajectory.		Controller

CATEGORY 8

MARINE

Category Code	Items Description	Note	Relevant Authority
Category 8: MARINE			
8A	Systems, Equipment and Components		
8A001	<p>Submersible vehicles and surface vessels, as follows:</p> <p>a. Manned, tethered submersible vehicles designed to operate at depths exceeding 1 000 m;</p> <p>b. Manned, untethered submersible vehicles having any of the following:</p> <ol style="list-style-type: none"> 1. Designed to 'operate autonomously' and having a lifting capacity of all the following: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> a. Designed to continuously 'operate autonomously' for 10 hours or more; and 	<p><u>Note:</u> For the control status of equipment for submersible vehicles, see:</p> <ul style="list-style-type: none"> — Category 5, Part 2 "Information Security" for encrypted communication equipment; — Category 6 for sensors; — Categories 7 and 8 for navigation equipment; — Category 8A for underwater equipment. <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 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 	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. 'Range' of 25 nautical miles or more;</p> <p>c. Unmanned, tethered submersible vehicles designed to operate at depths exceeding 1 000 m and having any of the following:</p> <ol style="list-style-type: none"> 1. Designed for self-propelled manoeuvre using propulsion motors or thrusters specified in 8A002.a.2.; or 2. Fibre optic data link; <p>d. Unmanned, untethered submersible vehicles having any of the following:</p> <ol style="list-style-type: none"> 1. Designed for deciding a course relative to any geographical reference without real-time human assistance; 2. Acoustic data or command link; or 3. Optical data or command link exceeding 1000 m; <p>e. Ocean salvage systems with a lifting capacity exceeding 5 MN for salvaging objects from depths exceeding 250 m and having any of the following:</p> <ol style="list-style-type: none"> 1. Dynamic positioning systems capable of position keeping within 20 m of a given point provided by the navigation system; or 2. Seafloor navigation and navigation integration systems, for depths exceeding 1 000 m and with positioning accuracies to within 10 m of a predetermined point; <p>f. Surface-effect vehicles (fully skirted variety) having all of the following:</p> <ol style="list-style-type: none"> 1. Maximum design speed, fully loaded, exceeding 30 	<p><i>autonomously'.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>knots in a significant wave height of 1.25 m (Sea State 3) or more;</p> <p>2. Cushion pressure exceeding 3 830 Pa; and</p> <p>3. Light-ship-to-full-load displacement ratio of less than 0.70;</p> <p>g. Surface-effect vehicles (rigid sidewalls) with a maximum design speed, fully loaded, exceeding 40 knots in a significant wave height of 3.25 m (Sea State 5) or more;</p> <p>h. Hydrofoil vessels with active systems for automatically controlling foil systems, with a maximum design speed, fully loaded, of 40 knots or more in a significant wave height of 3.25 m (Sea State 5) or more;</p> <p>i. 'Small waterplane area vessels' having any of the following:</p> <p>1. Full load displacement exceeding 500 tonnes with a maximum design speed, fully loaded, exceeding 35 knots in a significant wave height of 3.25 m (Sea State 5) or more; or</p> <p>2. Full load displacement exceeding 1500 tonnes with a maximum design speed, fully loaded, exceeding 25 knots in a significant wave height of 4 m (Sea State 6) or more.</p>	<p><u>Technical Note:</u></p> <p>A 'small waterplane area vessel' is defined by the following formula: waterplane area at an operational design draught less than $2 \times (\text{displaced volume at the operational design draught})^{2/3}$.</p>	
8A002	<p>Marine systems, equipment and components, as follows:</p> <p>a. Systems, equipment and components, specially designed or modified for submersible vehicles and designed to operate at depths exceeding 1 000 m, as follows:</p> <p>1. Pressure housings or pressure hulls with a maximum inside chamber diameter exceeding 1.5 m;</p>	<p><u>Note:</u> For underwater communications systems, see Category 5, Part 1 — Telecommunications.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>2. Direct current propulsion motors or thrusters;</p> <p>3. Umbilical cables, and connectors therefore, using optical fibre and having synthetic strength members;</p> <p>4. Components manufactured from material specified in 8C001;</p> <p>b. Systems specially designed or modified for the automated control of the motion of submersible vehicles specified in 8A001, using navigation data, having closed loop servo-controls and having any of the following:</p> <p>1. Enabling a vehicle to move within 10 m of a predetermined point in the water column;</p> <p>2. Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; or</p> <p>3. Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed;</p> <p>c. Fibre optic hull penetrators or connectors;</p> <p>d. Underwater vision systems, as follows:</p> <p>1. Television systems and television cameras, as follows:</p> <p>a. Television systems (comprising camera, monitoring and signal transmission equipment) having a 'limiting resolution' when measured in air of more than 800 lines and specially designed or modified for remote operation with a submersible vehicle;</p>	<p><u>Technical Note:</u></p> <p><i>The objective of 8A002.a.4. should not be defeated by the export of 'syntactic foam' specified in 8C001 when an intermediate stage of manufacture has been performed and it is not yet in the final component form.</i></p> <p><u>Technical Note:</u></p> <p><i>'Limiting resolution' is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. Underwater television cameras having a 'limiting resolution' when measured in air of more than 1 100 lines; c. Low light level television cameras specially designed or modified for underwater use and having all of the following: <ul style="list-style-type: none"> 1. Image intensifier tubes specified in 6A002.a.2.a.; and 2. More than 150 000 "active pixels" per solid state area array; 2. Systems specially designed or modified for remote operation with an underwater vehicle, employing techniques to minimize the effects of back scatter and including range-gated illuminators or "laser" systems; e. Photographic still cameras specially designed or modified for underwater use below 150 m, with a film format of 35 mm or larger and having any of the following: <ul style="list-style-type: none"> 1. Annotation of the film with data provided by a source external to the camera; 2. Automatic back focal distance correction; or 3. Automatic compensation control specially designed to permit an underwater camera housing to be usable at depths exceeding 1 000 m; f. Not used; g. Light systems specially designed or modified for underwater use, as follows: <ul style="list-style-type: none"> 1. Stroboscopic light systems capable of a light output 	<p><i>picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>energy of more than 300 J per flash and a flash rate of more than 5 flashes per second;</p> <p>2. Argon arc light systems specially designed for use below 1 000 m;</p> <p>h. "Robots" specially designed for underwater use, controlled by using a dedicated computer and having any of the following:</p> <p>1. Systems that control the "robot" using information from sensors which measure force or torque applied to an external object, distance to an external object, or tactile sense between the "robot" and an external object; or</p> <p>2. The ability to exert a force of 250 N or more or a torque of 250 Nm or more and using titanium based alloys or "composite" "fibrous or filamentary materials" in their structural members;</p> <p>i. Remotely controlled articulated manipulators specially designed or modified for use with submersible vehicles and having any of the following:</p> <p>1. Systems which control the manipulator using information from sensors which measure any of the following:</p> <p>a. Torque or force applied to an external object; or</p> <p>b. Tactile sense between the manipulator and an external object; or</p> <p>2. Controlled by proportional master-slave techniques or by using a dedicated computer and having 5 degrees of 'freedom of movement' or more;</p>	<p><u>Technical Note:</u></p> <p><i>Only functions having proportional control using positional feedback or by using a dedicated computer are counted when determining the number of degrees of 'freedom of movement'.</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>j. Air independent power systems specially designed for underwater use, as follows:</p> <ol style="list-style-type: none"> 1. Brayton or Rankine cycle engine air independent power systems having any of the following: <ol style="list-style-type: none"> a. Chemical scrubber or absorber systems, specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust; b. Systems specially designed to use a monoatomic gas; c. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; or d. Systems having all of the following: <ol style="list-style-type: none"> 1. Specially designed to pressurize the products of reaction or for fuel reformation; 2. Specially designed to store the products of the reaction; and 3. Specially designed to discharge the products of the reaction against a pressure of 100 kPa or more; 2. Diesel cycle engine air independent systems having all of the following: <ol style="list-style-type: none"> a. Chemical scrubber or absorber systems, specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust; 		

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. Systems specially designed to use a monoatomic gas; c. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; and d. Specially designed exhaust systems that do not exhaust continuously the products of combustion; <p>3. "Fuel cell" air independent power systems with an output exceeding 2 kW and having any of the following:</p> <ul style="list-style-type: none"> a. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; or b. Systems having all of the following: <ul style="list-style-type: none"> 1. Specially designed to pressurize the products of reaction or for fuel reformation; 2. Specially designed to store the products of the reaction; and 3. Specially designed to discharge the products of the reaction against a pressure of 100 kPa or more; <p>4. Stirling cycle engine air independent power systems having all of the following:</p> <ul style="list-style-type: none"> a. Devices or enclosures, specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; and 		

Category Code	Items Description	Note	Relevant Authority
	<p>b. Specially designed exhaust systems which discharge the products of combustion against a pressure of 100 kPa or more;</p> <p>k. Skirts, seals and fingers, having any of the following:</p> <ol style="list-style-type: none"> 1. Designed for cushion pressures of 3 830 Pa or more, operating in a significant wave height of 1.25m (Sea State 3) or more and specially designed for surface effect vehicles (fully skirted variety) specified in 8A001.f.; or 2. Designed for cushion pressures of 6 224 Pa or more, operating in a significant wave height of 3.25 m (Sea State 5) or more and specially designed for surface effect vehicles (rigid sidewalls) specified in 8A001.g.; <p>l. Lift fans rated at more than 400 kW and specially designed for surface effect vehicles specified in 8A001.f. or 8A001.g.;</p> <p>m. Fully submerged subcavitating or supercavitating hydrofoils, specially designed for vessels specified in 8A001.h.;</p> <p>n. Active systems specially designed or modified to control automatically the sea-induced motion of vehicles or vessels, specified in 8A001.f., 8A001.g., 8A001.h. or 8A001.i.;</p> <p>o. Propellers, power transmission systems, power generation systems and noise reduction systems, as follows:</p> <ol style="list-style-type: none"> 1. Water-screw propeller or power transmission systems, as follows, specially designed for surface effect vehicles (fully skirted or rigid sidewall variety), hydrofoils or 'small waterplane area vessels' specified in 8A001.f., 8A001.g., 8A001.h. or 8A001.i., as follows: <ol style="list-style-type: none"> a. Supercavitating, super-ventilated, partially-submerged or surface piercing propellers, rated at 		

Category Code	Items Description	Note	Relevant Authority
	<p>more than 7.5 MW;</p> <ul style="list-style-type: none"> b. Contrarotating propeller systems rated at more than 15 MW; c. Systems employing pre-swirl or post-swirl techniques, for smoothing the flow into a propeller; d. Light-weight, high capacity (K factor exceeding 300) reduction gearing; e. Power transmission shaft systems incorporating "composite" material components and capable of transmitting more than 1 MW; <p>2. Water-screw propeller, power generation systems or transmission systems, designed for use on vessels, as follows:</p> <ul style="list-style-type: none"> a. Controllable-pitch propellers and hub assemblies, rated at more than 30 MW; b. Internally liquid-cooled electric propulsion engines with a power output exceeding 2.5 MW; c. "Superconductive" propulsion engines or permanent magnet electric propulsion engines, with a power output exceeding 0.1 MW; d. Power transmission shaft systems incorporating "composite" material components and capable of transmitting more than 2 MW; e. Ventilated or base-ventilated propeller systems, rated at more than 2.5 MW; <p>3. Noise reduction systems designed for use on vessels of 1 000 tonnes displacement or more, as follows:</p>		

Category Code	Items Description	Note	Relevant Authority
	<p>a. Systems that attenuate underwater noise at frequencies below 500 Hz and consist of compound acoustic mounts for the acoustic isolation of diesel engines, diesel generator sets, gas turbines, gas turbine generator sets, propulsion motors or propulsion reduction gears, specially designed for sound or vibration isolation and having an intermediate mass exceeding 30% of the equipment to be mounted;</p> <p>b. 'Active noise reduction or cancellation systems' or magnetic bearings, specially designed for power transmission systems;</p> <p>p. Pumpjet propulsion systems having all of the following:</p> <ol style="list-style-type: none"> 1. Power output exceeding 2.5 MW; and 2. Using divergent nozzle and flow conditioning vane techniques to improve propulsive efficiency or reduce propulsion-generated underwater-radiated noise; <p>q. Underwater swimming and diving equipment as follows:</p> <ol style="list-style-type: none"> 1. Closed circuit rebreathers; 2. Semi-closed circuit rebreathers; <p>r. 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 µPa at 1 m) at frequencies of 200 Hz and below.</p>	<p><u>Technical Note:</u></p> <p><i>'Active noise reduction or cancellation systems' incorporate electronic control systems capable of actively reducing equipment vibration by the generation of anti-noise or anti-vibration signals directly to the source.</i></p> <p><u>Note:</u> 8A002.q. does not control individual rebreathers for personal use when accompanying their users.</p> <p><u>Note 1:</u> 8A002.r. does not control diver deterrent systems based on underwater explosive devices, air guns or combustible sources.</p> <p><u>Note 2:</u> 8A002.r. includes diver</p>	

Category Code	Items Description	Note	Relevant Authority
		<i>deterrent acoustic systems that use spark gap sources, also known as plasma sound sources.</i>	
8B	Test, Inspection and Production Equipment		
8B001	Water tunnels having a background noise of less than 100 dB (reference 1 µPa, 1 Hz), in the frequency range from 0 to 500 Hz and designed for measuring acoustic fields generated by a hydro-flow around propulsion system models.		Controller
8C	Materials		
8C001	<p>‘Syntactic foam’ designed for underwater use and having all of the following:</p> <p>a. Designed for marine depths exceeding 1 000 m; and</p> <p>b. A density less than 561 kg/m³.</p>	<p>NB: SEE ALSO 8A002.A.4.</p> <p><u>Technical Note:</u></p> <p><i>‘Syntactic foam’ consists of hollow spheres of plastic or glass embedded in a resin matrix.</i></p>	Controller
8D	Software		
8D001	“Software” specially designed or modified for the “development”, “production” or “use” of equipment or materials, specified in 8A, 8B or 8C.		Controller
8D002	Specific “software” specially designed or modified for the “development”, “production”, repair, overhaul or refurbishing (re-machining) of propellers specially designed for underwater noise reduction.		Controller
8E	Technology		
8E001	“Technology” according to the General Technology Note for the “development” or “production” of equipment or materials, specified in 8A, 8B or 8C.		Controller
8E002	Other “technology” as follows:		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>a. "Technology" for the "development", "production", repair, overhaul or refurbishing (re-machining) of propellers specially designed for underwater noise reduction;</p> <p>b. "Technology" for the overhaul or refurbishing of equipment specified in 8A001, 8A002.b., 8A002.j., 8A002.o. or 8A002.p.</p>		

CATEGORY 9

AEROSPACE AND PROPULSION

Category Code	Items Description	Note	Relevant Authority
Category 9: AEROSPACE AND PROPULSION			
9A	Systems, Equipment and Components	<i><u>NB:</u> For propulsion systems designed or rated against neutron or transient ionizing radiation, see the Military Goods Controls.</i>	
9A001	<p>Aero gas turbine engines having any of the following:</p> <p>a. Incorporating any of the “technologies” specified in 9E003.a., 9E003.h. or 9E003.i.; or</p> <p>b. Designed to power an aircraft to cruise at Mach 1 or higher, for more than 30 minutes.</p>	<p>NB: SEE ALSO 9A101.</p> <p><i><u>Note:</u> 9A001.a. does not control aero gas turbine engines which meet all of the following:</i></p> <p><i>a. Certified by the civil aviation authority in a “participating State”; and</i></p> <p><i>b. Intended to power non-military manned aircraft for which any of the following has been issued by a “participating State” for the aircraft with this specific engine type:</i></p> <p><i>1. A civil type certificate; or</i></p> <p><i>2. An equivalent document recognised by the International Civil Aviation Organisation (ICAO).</i></p>	Controller
9A002	‘Marine gas turbine engines’ with an ISO standard continuous power rating of 24 245 kW or more and a specific fuel	<i><u>Note:</u> The term ‘marine gas turbine engines’ includes those industrial, or aero-</i>	Controller

Category Code	Items Description	Note	Relevant Authority
	consumption not exceeding 0.219 kg/kWh in the power range from 35 to 100 %, and specially designed assemblies and components therefor.	<i>derivative, gas turbine engines adapted for a ship's electric power generation or propulsion.</i>	
9A003	<p>Specially designed assemblies and components, incorporating any of the “technologies” specified in 9E003.a., 9E003.h. or 9E003i., for any of the following gas turbine engine propulsion systems:</p> <p>a. Specified in 9A001; or</p> <p>b. Whose design or production origins are either non-“participating states” or unknown to the manufacturer.</p>		Controller
9A004	Space launch vehicles and “spacecraft”.	<p>NB: SEE ALSO 9A104.</p> <p><i>Note: 9A004 does not control payloads.</i></p> <p><i>NB: For the control status of products contained in “spacecraft” payloads, see the appropriate Categories.</i></p>	Controller
9A005	Liquid rocket propulsion systems containing any of the systems or components, specified in 9A006.	NB: SEE ALSO 9A105 AND 9A119.	Controller
9A006	<p>Systems and components, specially designed for liquid rocket propulsion systems, as follows:</p> <p>a. Cryogenic refrigerators, flightweight dewars, cryogenic heat pipes or cryogenic systems, specially designed for use in space vehicles and capable of restricting cryogenic fluid losses to less than 30 % per year;</p>	NB: SEE ALSO 9A106, 9A108 AND 9A120.	Controller

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> b. Cryogenic containers or closed-cycle refrigeration systems, capable of providing temperatures of 100 K (– 173 °C) or less for “aircraft” capable of sustained flight at speeds exceeding Mach 3, launch vehicles or “spacecraft”; c. Slush hydrogen storage or transfer systems; d. High pressure (exceeding 17.5MPa) turbo pumps, pump components or their associated gas generator or expander cycle turbine drive systems; e. High-pressure (exceeding 10.6 MPa) thrust chambers and nozzles therefore; f. Propellant storage systems using the principle of capillary containment or positive expulsion (i.e., with flexible bladders); g. Liquid propellant injectors with individual orifices of 0.381 mm or smaller in diameter (an area of $1.14 \times 10^{-3} \text{ cm}^2$ or smaller for non-circular orifices) and specially designed for liquid rocket engines; h. One-piece carbon-carbon thrust chambers or one-piece carbon-carbon exit cones, with densities exceeding 1.4 g/cm^3 and tensile strengths exceeding 48 MPa. 		
9A007	<p>Solid rocket propulsion systems having any of the following:</p> <ul style="list-style-type: none"> a. Total impulse capacity exceeding 1.1 MNs; b. Specific impulse of 2.4 kNs/kg or more, when the nozzle flow is expanded to ambient sea level conditions for an adjusted chamber pressure of 7 MPa; 	NB: SEE ALSO 9A107 AND 9A119.	Controller

Category Code	Items Description	Note	Relevant Authority
	<ul style="list-style-type: none"> c. Stage mass fractions exceeding 88 % and propellant solid loadings exceeding 86 %; d. Components specified in 9A008; or e. Insulation and propellant bonding systems, using direct-bonded motor designs to provide a 'strong mechanical bond' or a barrier to chemical migration between the solid propellant and case insulation material. 	<p><u>Technical Note:</u></p> <p><i>'Strong mechanical bond' means bond strength equal to or more than propellant strength.</i></p>	
9A008	<p>Components specially designed for solid rocket propulsion systems, as follows:</p> <ul style="list-style-type: none"> a. Insulation and propellant bonding systems, using liners to provide a 'strong mechanical bond' or a barrier to chemical migration between the solid propellant and case insulation material; b. Filament-wound "composite" motor cases exceeding 0,61 m in diameter or having 'structural efficiency ratios (PV/W)' exceeding 25 km; c. Nozzles with thrust levels exceeding 45 kN or nozzle throat erosion rates of less than 0.075 mm/s; d. Movable nozzle or secondary fluid injection thrust vector control systems, capable of any of the following: 	<p>NB: SEE ALSO 9A108.</p> <p><u>Technical Note:</u></p> <p><i>'Strong mechanical bond' means bond strength equal to or more than propellant strength.</i></p> <p><u>Technical Note:</u></p> <p><i>'Structural efficiency ratio (PV/W)' is the burst pressure (P) multiplied by the vessel volume (V) divided by the total pressure vessel weight (W).</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<ol style="list-style-type: none"> 1. Omni-axial movement exceeding $\pm 5^\circ$; 2. Angular vector rotations of $20^\circ/\text{s}$ or more; or 3. Angular vector accelerations of $40^\circ/\text{s}^2$ or more. 		
9A009	<p>Hybrid rocket propulsion systems having any of the following:</p> <ol style="list-style-type: none"> a. Total impulse capacity exceeding 1.1 MNs; or b. Thrust levels exceeding 220 kN in vacuum exit conditions. 	NB: SEE ALSO 9A109 AND 9A119.	Controller
9A010	<p>Specially designed components, systems and structures, for launch vehicles, launch vehicle propulsion systems or "spacecraft", as follows:</p> <ol style="list-style-type: none"> a. Components and structures, each exceeding 10 kg and specially designed for launch vehicles manufactured using metal "matrix", "composite", organic "composite", ceramic "matrix" or intermetallic reinforced materials specified in 1C007 or 1C010; b. Components and structures, specially designed for launch vehicle propulsion systems specified in 9A005 to 9A009 manufactured using metal "matrix", "composite", organic "composite", ceramic "matrix" or intermetallic reinforced materials, specified in 1C007 or 1C010; c. Structural components and isolation systems, specially designed to control actively the dynamic response or distortion of "spacecraft" structures; d. Pulsed liquid rocket engines with thrust-to-weight ratios equal to or more than 1 kN/kg and a response time (the 	<p>NB: SEE ALSO 1A002 AND 9A110.</p> <p><i>Note: The weight cut-off is not relevant for nose cones.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	time required to achieve 90% of total rated thrust from start-up) of less than 30 ms.		
9A011	Ramjet, scramjet or combined cycle engines, and specially designed components therefore.	NB: SEE ALSO 9A111 AND 9A118.	Controller
9A012	<p>“Unmanned aerial vehicles” (“UAVs”), associated systems, equipment and components, as follows:</p> <p>a. “UAVs” having any of the following:</p> <ol style="list-style-type: none"> 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); <p>b. Associated systems, equipment and components, as follows:</p> <ol style="list-style-type: none"> 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 		Controller

Category Code	Items Description	Note	Relevant Authority
	type engines, specially designed or modified to propel "UAVs" at altitudes above 50 000 feet (15 240 metres).		
9A101	<p>Turbojet and turbofan engines, other than those specified in 9A001, as follows;</p> <p>a. Engines having both of the following characteristics:</p> <ol style="list-style-type: none"> 1. Maximum thrust value greater than 400 N (achieved uninstalled) excluding civil certified engines with a maximum thrust value greater than 8 890 N (achieved uninstalled), and 2. Specific fuel consumption of 0.15 kg/N/hr or less (at maximum continuous power at sea level static and standard conditions); <p>b. Engines designed or modified for use in "missiles" or unmanned aerial vehicles specified in 9A012.</p>		Controller
9A102	'Turboprop engine systems' specially designed for unmanned aerial vehicles specified in 9A012, and specially designed components therefore, having a 'maximum power' greater than 10 kW.	<p><u>Note:</u> 9A102 does not control civil certified engines.</p> <p><u>Technical Notes:</u></p> <ol style="list-style-type: none"> 1. For the purposes of 9A102 a 'turboprop engine system' incorporates all of the following: <ol style="list-style-type: none"> a. Turboshift engine; and b. Power transmission system to transfer the power to a propeller. 	Controller

Category Code	Items Description	Note	Relevant Authority
		2. For the purposes of 9A102 the 'maximum power' is achieved uninstalled at sea level standard conditions.	
9A104	Sounding rockets, capable of a range of at least 300 km.	NB: SEE ALSO 9A004.	Controller
9A105	Liquid propellant rocket engines, as follows: <ul style="list-style-type: none"> a. Liquid propellant rocket engines usable in "missiles", other than those specified in 9A005, having a total impulse capacity equal to or greater than 1.1 MNs; b. Liquid propellant rocket engines, usable in complete rocket systems or unmanned aerial vehicles, capable of a range of 300 km, other than those specified in 9A005 or 9A105.a., having a total impulse capacity equal to or greater than 0.841 MNs. 	NB: SEE ALSO 9A119.	Controller
9A106	Systems or components, other than those specified in 9A006 as follows, specially designed for liquid rocket propulsion systems: <ul style="list-style-type: none"> a. Ablative liners for thrust or combustion chambers, usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104; b. Rocket nozzles, usable in "missiles", space launch vehicles specified in 9A004 or sounding rockets specified in 9A104; c. Thrust vector control sub-systems, usable in "missiles"; 	<u>Technical Note:</u> <i>Examples of methods of achieving thrust</i>	Controller

Category Code	Items Description	Note	Relevant Authority
	d. Liquid and slurry propellant (including oxidisers) control systems, and specially designed components therefore, usable in “missiles”, designed or modified to operate in vibration environments greater than 10 g rms between 20 Hz and 2 kHz.	<p>vector control specified in 9A106.c. are:</p> <ol style="list-style-type: none"> 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. <p><u>Note:</u> The only servo valves and pumps specified in 9A106.d., are the following:</p> <ol style="list-style-type: none"> a. Servo valves designed for flow-rates equal to or greater than 24 litres per minute, at an absolute pressure equal to or greater than 7 MPa, that have an actuator response time of less than 100 ms; b. Pumps, for liquid propellants, with shaft speeds equal to or greater than 8 000 r.p.m. or with discharge pressures equal to or greater than 7 MPa. 	
9A107	Solid propellant rocket engines, usable in complete rocket systems or unmanned aerial vehicles, capable of a range of 300 km, other than those specified in 9A007, having total impulse capacity equal to or greater than 0.841 MNs.	NB: SEE ALSO 9A119.	Controller
9A108	Components, other than those specified in 9A008, as follows,		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>specifically designed for solid rocket propulsion systems:</p> <ul style="list-style-type: none"> a. Rocket motor cases and “insulation” components therefor, usable in “missiles”, space launch vehicles specified in 9A004 or sounding rockets specified in 9A104; b. Rocket nozzles, usable in “missiles”, space launch vehicles specified in 9A004 or sounding rockets specified in 9A104; c. Thrust vector control sub-systems, usable in “missiles”. 	<p><u>Technical Note:</u></p> <p><i>Examples of methods of achieving thrust vector control specified in 9A108.c. are:</i></p> <ul style="list-style-type: none"> 1. <i>Flexible nozzle;</i> 2. <i>Fluid or secondary gas injection;</i> 3. <i>Movable engine or nozzle;</i> 4. <i>Deflection of exhaust gas stream (jet vanes or probes); or</i> 5. <i>Thrust tabs.</i> 	
9A109	<p>Hybrid rocket motors and specially designed components as follows:</p> <ul style="list-style-type: none"> a. Hybrid rocket motors usable in complete rocket systems or unmanned aerial vehicles, capable of 300 km, other than those specified in 9A009, having a total impulse capacity equal to or greater than 0.841MNs, and specially designed components therefor; 	NB: SEE ALSO 9A009 AND 9A119.	Controller

Category Code	Items Description	Note	Relevant Authority
	b. Specially designed components for hybrid rocket motors specified in 9A009 that are usable in “missiles”.		
9A110	Composite structures, laminates and manufactures thereof, other than those specified in 9A010, specially designed for use in ‘missiles’ or the subsystems specified in 9A005, 9A007, 9A105, 9A106.c., 9A107, 9A108.c., 9A116 or 9A119.	NB: SEE ALSO 1A002. <u>Technical Note:</u> <i>In 9A110 ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i>	Controller
9A111	Pulse jet engines, usable in “missiles” or unmanned aerial vehicles specified in 9A012, and specially designed components therefore.	NB: SEE ALSO 9A011 AND 9A118.	Controller
9A115	Launch support equipment as follows: a. Apparatus and devices for handling, control, activation or launching, designed or modified for space launch vehicles specified in 9A004, unmanned aerial vehicles specified in 9A012 or sounding rockets specified in 9A104; b. Vehicles for transport, handling, control, activation or launching, designed or modified for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.		Controller
9A116	Reentry vehicles, usable in “missiles”, and equipment designed or modified therefore, as follows: a. Reentry vehicles;		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Heat shields and components therefor, fabricated of ceramic or ablative materials;</p> <p>c. Heat sinks and components therefor, fabricated of light-weight, high heat capacity materials;</p> <p>d. Electronic equipment specially designed for reentry vehicles.</p>		
9A117	Staging mechanisms, separation mechanisms, and interstages, usable in "missiles".		Controller
9A118	Devices to regulate combustion usable in engines, which are usable in "missiles" or unmanned aerial vehicles specified in 9A012, 9A011 or 9A111.		Controller
9A119	Individual rocket stages, usable in complete rocket systems or unmanned aerial vehicles, capable of a range of 300 km, other than those specified in 9A005, 9A007, 9A009, 9A105, 9A107 and 9A109.		Controller
9A120	Liquid propellant tanks, other than those specified in 9A006, specially designed for propellants specified in 1C111 or 'other liquid propellants', used in rocket systems capable of delivering at least a 500 kg payload to a range of at least 300 km.	<i><u>Note:</u> In 9A120 'other liquid propellants' includes, but is not limited to, propellants specified in the Military Goods Controls.</i>	Controller
9A350	<p>Spraying or fogging systems, specially designed or modified for fitting to aircraft, "lighter-than-air vehicles" or unmanned aerial vehicles, and specially designed components therefore, as follows:</p> <p>a. Complete spraying or fogging systems capable of delivering, from a liquid suspension, an initial droplet 'VMD'</p>	<p><i><u>Note:</u> 9A350 does not control spraying or fogging systems and components that are demonstrated not to be capable of delivering biological agents in the form of infectious aerosols.</i></p> <p><i><u>Technical Notes:</u></i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>of less than 50 µm at a flow-rate of greater than two litres per minute;</p> <p>b. Spray booms or arrays of aerosol generating units capable of delivering, from a liquid suspension, an initial droplet 'VMD' of less than 50 µm at a flow-rate of greater than two litres per minute;</p> <p>c. Aerosol generating units specially designed for fitting to systems specified in 9A350.a. and b.</p>	<p>1. <i>Droplet size for spray equipment or nozzles specially designed for use on aircraft, "lighter-than-air vehicles" or unmanned aerial vehicles should be measured using either of the following:</i></p> <p><i>a. Doppler laser method;</i></p> <p><i>b. Forward laser diffraction method.</i></p> <p>2. <i>In 9A350 'VMD' means Volume Median Diameter and for water-based systems this equates to Mass Median Diameter (MMD).</i></p> <p><i>Note: Aerosol generating units are devices specially designed or modified for fitting to aircraft such as nozzles, rotary drum atomisers and similar devices.</i></p>	
9B	Test, Inspection and Production Equipment		
9B001	<p>Equipment, tooling and fixtures, specially designed for manufacturing gas turbine blades, vanes or "tip shroud" castings, as follows:</p> <p>a. Directional solidification or single crystal casting equipment;</p> <p>b. Ceramic cores or shells.</p>		Controller
9B002	On-line (real-time) control systems, instrumentation (including sensors) or automated data acquisition and processing		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>equipment, having all of the following:</p> <p>a. Specially designed for the “development” of gas turbine engines, assemblies or components; and</p> <p>b. Incorporating “technology” specified in 9E003.h. or 9E003.i.</p>		
9B003	Equipment specially designed for the “production” or test of gas turbine brush seals designed to operate at tip speeds exceeding 335 m/s and temperatures in excess of 773 K (500°C), and specially designed components or accessories therefore.		Controller
9B004	Tools, dies or fixtures, for the solid state joining of “superalloy”, titanium or intermetallic airfoil-to-disk combinations described in 9E003.a.3. or 9E003.a.6. for gas turbines.		Controller
9B005	<p>On-line (real-time) control systems, instrumentation (including sensors) or automated data acquisition and processing equipment, specially designed for use with any of the following:</p> <p>a. Wind tunnels designed for speeds of Mach 1.2 or more;</p> <p>b. Devices for simulating flow-environments at speeds exceeding Mach 5, including hot-shot tunnels, plasma arc</p>	<p>NB: SEE ALSO 9B105.</p> <p><i>Note: 9B005.a. does not control wind tunnels specially designed for educational purposes and having a ‘test section size’ (measured laterally) of less than 250 mm.</i></p> <p><u>Technical Note:</u></p> <p><i>‘Test section size’ means the diameter of the circle, or the side of the square, or the longest side of the rectangle, at the largest test section location.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	tunnels, shock tubes, shock tunnels, gas tunnels and light gas guns; or c. Wind tunnels or devices, other than two-dimensional sections, capable of simulating Reynolds number flows exceeding 25×10^6 .		
9B006	Acoustic vibration test equipment capable of producing sound pressure levels of 160 dB or more (referenced to 20 μ Pa) with a rated output of 4 kW or more at a test cell temperature exceeding 1273 K (1 000°C), and specially designed quartz heaters therefor.	NB: SEE ALSO 9B106.	Controller
9B007	Equipment specially designed for inspecting the integrity of rocket motors and using Non-Destructive Test (NDT) techniques other than planar x-ray or basic physical or chemical analysis.		Controller
9B008	Direct measurement wall skin friction transducers specially designed to operate at a test flow total (stagnation) temperature exceeding 833 K (560°C).		Controller
9B009	Tooling specially designed for producing turbine engine powder metallurgy rotor components capable of operating at stress levels of 60 % of Ultimate Tensile Strength (UTS) or more and metal temperatures of 873 K (600°C) or more.		Controller
9B010	Equipment specially designed for the production of "UAVs" and associated systems, equipment and components, specified in 9A012.		Controller
9B105	Wind tunnels for speeds of Mach 0,9 or more, usable for 'missiles' and their subsystems.	NB: SEE ALSO 9B005.	Controller

Category Code	Items Description	Note	Relevant Authority
		<p><u>Technical Note:</u></p> <p><i>In 9B105 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>	
9B106	<p>Environmental chambers and anechoic chambers, as follows:</p> <p>a. Environmental chambers capable of simulating all the following flight conditions:</p> <p>1. Having any of the following:</p> <p>a. Altitude equal to or greater than 15 km; or</p> <p>b. Temperature range from below 223 K (– 50°C) to above 398 K (+ 125°C);</p> <p>2. Incorporating, or 'designed or modified' to incorporate, a shaker unit or other vibration test equipment to produce vibration environments equal to or greater than 10 g rms, measured 'bare table', between 20 Hz and 2 kHz imparting forces equal to or greater than 5 kN;</p>	<p><u>Technical Notes:</u></p> <p>1. 9B106.a.2. describes systems that are capable of generating a vibration environment with a single wave (e.g. a sine wave) and systems capable of generating a broad band random vibration (i.e. power spectrum).</p> <p>2. In 9B106.a.2., 'designed or modified' means the environmental chamber provides appropriate interfaces (e.g. sealing devices) to incorporate a shaker unit or other vibration test equipment as specified in 2B116.</p>	Controller

Category Code	Items Description	Note	Relevant Authority
	<p>b. Environmental chambers capable of simulating the following flight conditions:</p> <ol style="list-style-type: none"> 1. Acoustic environments at an overall sound pressure level of 140 dB or greater (referenced to 20 µPa) or with a total rated acoustic power output of 4 kW or greater; and 2. Altitude equal to or greater than 15 km; or 3. Temperature range from below 223 K (– 50°C) to above 398 K (+ 125°C). 	<p>3. <i>In 9B106.a.2. 'bare table' means a flat table, or surface, with no fixture or fittings.</i></p>	
9B115	Specially designed "production equipment" for the systems, sub-systems and components specified in 9A005 to 9A009, 9A011, 9A101, 9A102, 9A105 to 9A109, 9A111, 9A116 to 9A120.		Controller
9B116	Specially designed "production facilities" for the space launch vehicles specified in 9A004, or systems, sub- systems, and components specified in 9A005 to 9A009, 9A011, 9A101, 9A102, 9A104 to 9A109, 9A111, 9A116 to 9A120 or 'missiles'.	<p><u>Technical Note:</u></p> <p><i>In 9B116 'missile' means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>	Controller
9B117	Test benches and test stands for solid or liquid propellant rockets or rocket motors, having either of the following characteristics:		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>a. The capacity to handle more than 68 kN of thrust; or</p> <p>b. Capable of simultaneously measuring the three axial thrust components.</p>		
9C	Materials		
9C108	“Insulation” material in bulk form and “interior lining”, other than those specified in 9A008, for rocket motor cases usable in “missiles” or specially designed for ‘missiles’.	<p><u>Technical Note:</u></p> <p><i>In 9C108 ‘missile’ means complete rocket systems and unmanned aerial vehicle systems capable of a range exceeding 300 km.</i></p>	Controller
9C110	Resin impregnated fibre prepregs and metal coated fibre preforms therefor, for composite structures, laminates and manufactures specified in 9A110, made either with organic matrix or metal matrix utilising fibrous or filamentary reinforcements having a “specific tensile strength” greater than 7.62×10^4 m and a “specific modulus” greater than 3.18×10^6 m.	<p>NB: SEE ALSO 1C010 AND 1C210.</p> <p><u>Note:</u> <i>The only resin impregnated fibre prepregs specified in entry 9C110 are those using resins with a glass transition temperature (T_g), after cure, exceeding 418 K (145°C) as determined by ASTM D4065 or equivalent.</i></p>	Controller
9D	Software		
9D001	“Software” specially designed or modified for the “development” of equipment or “technology”, specified in 9A001 to 9A119, 9B or 9E003.		Controller
9D002	“Software” specially designed or modified for the “production” of equipment specified in 9A001 to 9A119 or 9B.		Controller
9D003	“Software” incorporating “technology” specified in 9E003.h. and used in “FADEC Systems” for propulsion systems specified in 9A or equipment specified in 9B.		Controller

Category Code	Items Description	Note	Relevant Authority
9D004	<p>Other “software” as follows:</p> <ul style="list-style-type: none"> a. 2D or 3D viscous “software”, validated with wind tunnel or flight test data required for detailed engine flow modelling; b. “Software” for testing aero gas turbine engines, assemblies or components, specially designed to collect, reduce and analyse data in real time and capable of feedback control, including the dynamic adjustment of test articles or test conditions, as the test is in progress; c. “Software” specially designed to control directional solidification or single crystal casting; d. “Software” in “source code”, “object code” or machine code, required for the “use” of active compensating systems for rotor blade tip clearance control; e. “Software” specially designed or modified for the “use” of “UAVs” and associated systems, equipment and components, specified in 9A012; f. “Software” specially designed to design the internal cooling passages of aero gas turbine blades, vans and “tip shrouds”; g. “Software” having all of the following: <ul style="list-style-type: none"> 1. Specially designed to predict aero thermal, aeromechanical and combustion conditions in aero gas 	<p><i>Note: 9D004.d. does not control “software” embedded in equipment not specified in Annex I or required for maintenance activities associated with the calibration or repair or updates to the active compensating clearance control system.</i></p>	Controller

Category Code	Items Description	Note	Relevant Authority
	turbine engines; and 2. Theoretical modelling predictions of the aero thermal, aeromechanical and combustion conditions, which have been validated with actual aero gas turbine engine (experimental or production) performance data.		
9D101	"Software" specially designed or modified for the "use" of goods specified in 9B105, 9B106, 9B116 or 9B117.		Controller
9D103	"Software" specially designed for modelling, simulation or design integration of the space launch vehicles specified in 9A004 or sounding rockets specified in 9A104, or the subsystems specified in 9A005, 9A007, 9A105, 9A106.c., 9A107, 9A108.c., 9A116 or 9A119.	<i>Note: "Software" specified in 9D103 remains controlled when combined with specially designed hardware specified in 4A102.</i>	Controller
9D104	"Software" specially designed or modified for the "use" of goods specified in 9A001, 9A005, 9A006.d., 9A006.g., 9A007.a., 9A008.d., 9A009.a., 9A010.d., 9A011, 9A101, 9A102, 9A105, 9A106.c., 9A106.d., 9A107, 9A108.c., 9A109, 9A111, 9A115.a., 9A116.d., 9A117 or 9A118.		Controller
9D105	"Software" which coordinates the function of more than one subsystem, specially designed or modified for "use" in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104.		Controller
9E	Technology	<i>Note: "Development" or "production" "technology" specified in 9E001 to 9E003 for gas turbine engines remains controlled when used as "use" "technology" for repair, rebuild and overhaul. Excluded from control are: technical data, drawings or</i>	

Category Code	Items Description	Note	Relevant Authority
		<i>documentation for maintenance activities directly associated with calibration, removal or replacement of damaged or unserviceable line replaceable units, including replacement of whole engines or engine modules.</i>	
9E001	"Technology" according to the General Technology Note for the "development" of equipment or "software", specified in 9A001.b., 9A004 to 9A012, 9A350, 9B or 9D.		Controller
9E002	"Technology" according to the General Technology Note for the "production" of equipment specified in 9A001.b., 9A004 to 9A011, 9A350 or 9B.	<i><u>NB:</u> For "technology" for the repair of controlled structures, laminates or materials, see 1E002.f.</i>	Controller
9E003	Other "technology" as follows: a. "Technology" "required" for the "development" or "production" of any of the following gas turbine engine components or systems: 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; 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;		Controller

Category Code	Items Description	Note	Relevant Authority
	<p>3. Components manufactured from any of the following:</p> <ul style="list-style-type: none"> a. Organic “composite” materials designed to operate above 588 K (315°C); b. Metal “matrix” “composite”, ceramic “matrix”, intermetallic or intermetallic reinforced materials, specified in 1C007; or c. “Composite” material specified in 1C010 and manufactured with resins specified in 1C008; <p>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;</p> <p>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;</p> <p>6. Airfoil-to-disk blade combinations using solid state joining;</p> <p>7. Gas turbine engine components using “diffusion bonding” “technology” specified in 2E003.b.;</p> <p>8. ‘Damage tolerant’ gas turbine engine rotor components using powder metallurgy materials specified in 1C002.b.; or</p>	<p><u>Technical Note:</u></p> <p><i>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.</i></p> <p><u>Technical Note:</u></p> <p><i>‘Damage tolerant’ components are designed using methodology and</i></p>	

Category Code	Items Description	Note	Relevant Authority
	<p>2. All of the following:</p> <ul style="list-style-type: none"> a. Depths more than five times their diameter; b. Diameters less than 0.4mm; and c. 'Incidence angles' of more than 25°; <p>d. "Technology" "required" for the "development" or "production" of helicopter power transfer systems or tilt rotor or tilt wing "aircraft" power transfer systems;</p> <p>e. "Technology" for the "development" or "production" of reciprocating diesel engine ground vehicle propulsion systems having all of the following:</p> <ul style="list-style-type: none"> 1. 'Box volume' of 1.2 m³ or less; 2. An overall power output of more than 750 kW based on 80/1269/EEC, ISO 2534 or national equivalents; and 3. Power density of more than 700 kW/m³ of 'box volume'; 	<p><u>Technical Note:</u></p> <p><i>'Box volume' in 9E003.e. is the product of three perpendicular dimensions measured in the following way:</i></p> <p><u>Length:</u> <i>The length of the crankshaft from front flange to flywheel face;</i></p> <p><u>Width:</u> <i>The widest of any of the following:</i></p> <ul style="list-style-type: none"> a. <i>The outside dimension from valve cover to valve cover;</i> b. <i>The dimensions of the outside edges of the cylinder heads; or</i> c. <i>The diameter of the flywheel housing;</i> 	

Category Code	Items Description	Note	Relevant Authority
	<p>f. "Technology" "required" for the "production" of specially designed components for high output diesel engines, as follows:</p> <p>1. "Technology" "required" for the "production" of engine systems having all of the following components employing ceramics materials specified in 1C007:</p> <ul style="list-style-type: none"> a. Cylinder liners; b. Pistons; c. Cylinder heads; and d. One or more other components (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors); <p>2. "Technology" "required" for the "production" of turbocharger systems with single-stage compressors and having all of the following:</p> <ul style="list-style-type: none"> a. Operating at pressure ratios of 4:1 or higher; 	<p><u>Height:</u> The largest of any of the following:</p> <ul style="list-style-type: none"> a. The dimension of the crankshaft centre-line to the top plane of the valve cover (or cylinder head) plus twice the stroke; or b. The diameter of the flywheel housing. 	

Category Code	Items Description	Note	Relevant Authority
	<p>b. Mass flow in the range from 30 to 130 kg per minute; and</p> <p>c. Variable flow area capability within the compressor or turbine sections;</p> <p>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:</p> <p>a. Injection amount in excess of 230 mm 3 per injection per cylinder; and</p> <p>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;</p> <p>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;</p> <p>h. "Technology" for gas turbine engine "FADEC systems" as follows:</p> <p>1. "Development" "technology" for deriving the functional</p>	<p><u>Technical Note:</u></p> <p><i>'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.</i></p> <p><u>Note:</u> 9E003.h. does not control technical data related to engine-aircraft integration required by the civil aviation certification authorities to be published for general</p>	

Category Code	Items Description	Note	Relevant Authority
	<p>requirements for the components necessary for the “FADEC system” to regulate engine thrust or shaft power (e.g. feedback sensor time constants and accuracies, fuel valve slew rate);</p> <p>2. “Development” or “production” “technology” for control and diagnostic components unique to the “FADEC system” and used to regulate engine thrust or shaft power;</p> <p>3. “Development” “technology” for the control law algorithms, including “source code”, unique to the “FADEC system” and used to regulate engine thrust or shaft power.</p> <p>i. “Technology” for adjustable flow path systems designed to maintain engine stability for gas generator turbines, fan or power turbines, or propelling nozzles, as follows:</p> <p>1. “Development” “technology” for deriving the functional requirements for the components that maintain engine stability;</p> <p>2. “Development” or “production” “technology” for components unique to the adjustable flow path system and that maintain engine stability;</p> <p>3. “Development” “technology” for the control law algorithms, including “source code”, unique to the adjustable flow path system and that maintain engine stability.</p>	<p><i>airline use (e.g. installation manuals, operating instructions, instructions for continued airworthiness) or interface functions (e.g. input/output processing, airframe thrust or shaft power demand).</i></p> <p><u>Note:</u> 9E003.i. does not control “development” or “production” “technology” for any of the following:</p> <p><i>Inlet guide vanes;</i></p> <p><i>Variable pitch fans or prop-fans;</i></p> <p><i>Variable compressor vanes;</i></p> <p><i>Compressor bleed valves; or</i></p> <p><i>Adjustable flow path geometry for reverse thrust.</i></p>	
9E101	a. “Technology” according to the General Technology Note for the “development” of goods specified in 9A101, 9A102, 9A104 to 9A111 or 9A115 to 9A119.		Controller

Category Code	Items Description	Note	Relevant Authority
	b. "Technology" according to the General Technology Note for the "production" of 'UAV's specified in 9A012 or goods specified in 9A101, 9A102, 9A104 to 9A111 or 9A115 to 9A119.	<u>Technical Note:</u> <i>In 9E101.b. 'UAV' means unmanned aerial vehicle systems capable of a range exceeding 300 km.</i>	
9E102	"Technology" according to the General Technology Note for the "use" of space launch vehicles specified in 9A004, goods specified in 9A005 to 9A011, 'UAV's specified in 9A012 or goods specified in 9A101, 9A102, 9A104 to 9A111, 9A115 to 9A119, 9B105, 9B106, 9B115, 9B116, 9B117, 9D101 or 9D103.	<u>Technical Note:</u> <i>In 9E102 'UAV' means unmanned aerial vehicle systems capable of a range exceeding 300 km.</i>	Controller