

Canada's Controlled Goods Program (CGP)

Executive Summary

Objective:

The objective of this paper is to identify those sections of the Schedule to the Defence Production Act (DPA) that are no longer relevant to the Controlled Goods Program (CGP) and therefore should be removed from the Schedule of "controlled goods".

Background:

CADSI supports the interests of its members by helping to create an environment that allows sustainment and growth of its individual companies so that they remain competitive at home and abroad. In our view the current and proposed direction of the CGP is unnecessarily constraining and unduly harming the day-to-day activities of our members. We are particularly concerned with the CGP Schedule: We believe that it is out-of-date and includes goods and technology that are no longer relevant to the CGP or to its original Mandate.

Canada's Controlled Goods Program (CGP), administered by the Department of Public Works and Government Services Canada (PWGSC), was introduced in 2001 to address U.S. Government concerns that U.S. Munitions List (USML) goods and technology under the International Traffic in Arms Regulations (ITAR) were not adequately protected from unauthorised access in, and export from, Canada. The Mandate of the CGP was to ensure that persons in Canada 'examining, possessing or transferring' "controlled goods" as listed in the Schedule to the DPA were authorised to do so through a basic registration program. In 2001 the Canadian Schedule of "controlled goods" was equivalent to USML goods and technology.¹

The Schedule of "controlled goods" has remained static over the past 12 years although many goods and technologies are no longer included in the USML. In addition, the U.S. is proposing to remove many more items from the USML.

It is our view, therefore, since the CGP Mandate was designed to address USML goods and technologies only, any removal of goods and technology from the USML should coincidentally affect the Schedule. By way of illustration, if the U.S. moved to add certain goods and technology to the USML the US Government would, under the 2000 Canada/U.S. Arrangement, quite rightly expect Canada to amend its Schedule to include new items. Therefore, any removal of goods and technology from the USML should be met with equivalent changes to the Schedule.

There are two Annexes included in this Summary: **Annex A** identifies goods and technology that are currently not included in the USML but remain listed on Canada's Schedule of "controlled goods". **Annex B** includes goods and technology that are proposed for removal from the USML as well as goods and technology proposed for retention on the USML.

Below are examples of goods and technologies that are no longer on the USML but remain on the Schedule²:

1. Black-out lighting on vehicles (2-6) which make the entire vehicle CGP-controlled
2. Chem-Bio Protective clothing (2-7)
3. ALL forgings and castings (2-16). USML includes only certain forgings and castings.
4. ALL missile test/production equipment (6-1.B. & 6-2.B.)
5. MANY turbojet and turbofan engines (6-3.A.)

¹ "controlled goods" are listed in the 'Schedule' to the Defence Production Act and cover most of ECL Group 2, all of ECL Group 6 and all of ECL Item 5504.

² The numbers identified in each of the items (e.g., 2-7) refer to ECL Item numbers.

6. Production equipment, e.g., spin forming/flow forming machines (6-3.B.). Many Canadian companies, regardless of which industry sector, use these machines in day-to-day operations. Composite structures and laminates (6-6.A.)
7. Equipment for production of fibres, prepregs or preforms like filament winding, tape laying and weaving machines (6-6.B.). Many Canadian companies covering a broad range of sectors use these machines in the normal course of manufacturing.
8. Materials for missile components (6-6.C.) – DFAIT tends to categorise all such materials as applicable to missiles unless there was categorical proof that the application was not missiles
9. A wide-range of civil aircraft articles such as linear accelerometers (6-9.A.3.), gyros of any type (6-9.A.5), integrated navigation systems (6-9.A.7.) and magnetic heading sensors (6-9.A.8.)
10. Test and production equipment for 6-9.A. items (6-9.B.)
11. Wind tunnels (6-15.B.2) and environmental chambers (6-15.B.4.)
12. Global Navigation Satellite Systems (5504)

Below are examples of goods and technologies that are proposed for removal from the USML but remain on the USML and therefore the Schedule for the time being:

1. Explosives and other energetic materials (USML Category V) that have broad commercial applications.
2. Many general parts and components for surface vessels of war and other special naval equipment (USML Category VI) unless specifically identified in the USML.
3. Submersible and semi-submersible vessels (USML Category XX) unless they meet certain criteria.
4. Gas turbine engines and associated equipment for land, air and sea (USML Category XIX) including turboshaft or turboprop engines and their parts and components unless specifically identified in the USML.
5. Ground vehicles (USML Category VII), unless the vehicle or its parts and components are specifically identified in Category VII.
6. Aircraft and related articles (USML Category VIII), unless the specific article or part/component is listed in Category VIII.
7. A wide range of fire control, range finder, optical and guidance and control equipment (Category XII).
8. A broad range of auxiliary and miscellaneous equipment (Category XIII) like certain cameras and specialised processing equipment, photo-interpretation, stereoscopic plotting, and photogrammetry equipment for military purposes.
9. A broad range of personal protective equipment (e.g., anti-gravity suits, pressure suits, and atmosphere diving suits) and shelters, including a broad range of parts and components.

CADSI members 'examining, possessing or transferring' any of the above goods and technologies in Canada are required to be CGP-registered. However, if the same companies were located in the U.S. and were manufacturers or exporters of **Annex A** goods or technologies they would not need to register under the ITAR because **Annex A** goods and technology are NOT ITAR/USML-controlled. An equivalent amendment to the Schedule of "controlled goods" would remove a broad range of Canadian companies from the CGP thereby placing them on an equivalent competitive basis as their foreign competitors, both in the U.S. and globally!

Likewise, if the proposed changes as outlined in **Annex B** come to fruition, a broad range of U.S. companies would no longer be required to be ITAR-registered. If Canadian companies manufacturing or exporting **Annex B** goods that will be released from ITAR control were situated in the U.S. they would not need to register under the ITAR because **Annex B** goods and technology would NOT be ITAR/USML-controlled. Equivalent changes to the Schedule of "controlled goods" would remove a broad range of Canadian companies from the CGP thereby placing them on an equivalent competitive basis as their foreign competitors, both in the U.S. and globally!

It is our view that if the mandate and rationale for the establishment of the CGP still applied then Canadian industry should be treated no more restrictive than similar or equivalent companies in the U.S. While the direct impact on Canadian industry is difficult to quantify, clearly the Schedule includes goods and technology that are no longer relevant to U.S. ITAR interests and in our view are no longer relevant as goods and technology that necessitate CGP

scrutiny. At the moment U.S. companies competing with Canadian companies in Annex A goods and technology are not subject to restrictions equivalent to those in effect under the CGP. Furthermore, other foreign competitors are not subject to equivalent CGP-type controls. CGP controls are not only costly to implement and maintain thereby affecting Canadian profit margins but make Canadian Annex A goods and technology less competitive to those of other foreign competitors. If goods and technology listed in Annex B are removed from the USML Canadian industry, and CADSI members in particular, will fall further behind U.S. and other foreign competitors.

Should the significant changes contemplated under current U.S. proposals come to fruition there would be ample justification for amending the Schedule to reflect the bilateral (U.S.) and multilateral (Wassenaar) arrangements. It is important to note that under current U.S. EAR provisions exports of CCL goods and technology to Canada are licence-free. It is expected that this same provision will continue to apply once current USML goods and technology are transferred to the CCL.

The Canadian government continues to actively seek export markets beyond those of the U.S. This is partly as a result of the current U.S. economic crisis and partly as a result of our desire to diversify our international market base. CADSI members need to compete on an equal and unconstrained basis as its foreign competitors. It is our view that the current CGP is a constraint unparalleled in other competitor countries.

Conclusion:

Since the CGP was instituted to meet a U.S. concern it only seems reasonable that it keep pace with those concerns. In this regard, and consistent with the Canada/U.S. Agreement that mandated the CGP in 2000, CADSI has identified three positive impacts for Canadian industry if the CGP kept pace with U.S. ITAR changes.

First, the removal of goods and technology from the 'Schedule' that are no longer listed on the USML would result in an immediate benefit to Canadian industry by de-registering a broad range of companies that examine, possess or transfer the current list of "controlled goods".

Second, should the U.S. proposal to remove a significant number of parts and components from the USML come to fruition, the number of U.S. manufacturers currently required to be registered under the ITAR will decrease, perhaps substantially. We believe that Canadian companies should benefit similarly: That is, through an amended 'Schedule' of goods and technology the number of CGP-registered companies would decrease proportionately thereby allowing Canadian companies to compete on a more level playing field with foreign companies.

Third, these changes will result in an immediate reduction in administrative and operational costs to Canadian industry thereby reducing their costs of doing business.

Recommendations:

On the basis of the above, we have three proposed recommendations:

1. Recommendation 1: Short Term (ANNEX A):

It is recommended that PWGSC make immediate changes to the 'Schedule' based on the attached Annex A. Annex A identifies those goods and technology that are not part of the USML and therefore not relevant to ITAR.

2. Recommendation 2: Mid-Term (ANNEX B):

It is recommended that once the changes to the USML occur that PWGSC make changes to the Schedule based on Annex B. Annex B identifies those goods and technology that the U.S. Government is proposing be removed from the USML because they consider them no longer relevant to the ITAR or USML.

3. Longer-Term/Ongoing Solution:

That PWGSC establish policies, procedures and the Schedule that ensure that the CGP remain evergreen.

ANNEX A

Recommendation 1: Short Term:

That PWGSC make immediate changes to the Schedule based on the information contained in this Annex. This Annex identifies those goods and technology that are not part of the USML and therefore not relevant to ITAR.

This Annex identifies CGP goods and technologies that are no longer listed on the US Munitions List (USML) but remain on the CGP Schedule ³. The goods and technologies listed on Canada's Schedule to the Defence Production Act (DPA) are known as "controlled goods" ⁴.

Specific Items Listed on the Schedule but NOT on the USML

2-1: The only controlled goods under 2-1 ⁵ are prohibited firearms. Most articles in this entry are not prohibited firearms

2-3: The only controlled ammunition under 2-3 is that which is for prohibited firearms controlled under 2-1.

2-8.e.3. BDNPA (bis (2,2-dinitropropyl)acetal) (CAS 5108-69-0);

2-8.e.4. BDNPF (bis (2,2-dinitropropyl)formal) (CAS 5917-61-3);

2-8.e.6. Energetic monomers, plasticizers or polymers, specially formulated for military use and containing any of the following:

- a. Nitro groups;
- b. Azido groups;
- c. Nitrate groups;
- d. Nitroazide groups; **or**
- e. Difluoroamino groups;
- e. Other adducted polymer ferrocene derivatives;

2-8.f.18. Propyleneimine (2-methyl-aziridine) (CAS 75-55-8);

2-9.a.2.c. Having all of the following:

- 1. 'Chemical, Biological, Radiological and Nuclear (CBRN) protection'; **and**
- 2. 'Pre-wet or wash down system' designed for decontamination purposes; **or**

Technical Notes:

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.

³ It is important to note that some items on the 'Schedule', in particular, some items in ECL Group 6, were never listed in the USML.

⁴ Since the Schedule is very technical and precise any attempt to summarise it could result in the elimination of specific meanings associated with the individual items contained in the 'Schedule'. However, it is possible to summarise classes of goods and technology that are included in the 'Schedule', but not in the USML.

⁵ The numbers identified in each item above are ECL Item numbers/sub-item numbers, (e.g., 2-1)

2-9.d. Anti-submarine nets and anti-torpedo nets, specially designed for military use;
 2-9.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;

2-9.g. Silent bearings having any of the following, components therefor and equipment containing those bearings, specially designed for military use:

1. Gas or magnetic suspension;
2. Active signature controls; **or**
3. Vibration suppression controls.

2-6 Note 2: d. Black-out lighting.

2-10.e. Airborne equipment, including airborne refuelling equipment, specially designed for use with the "aircraft" specified by 2-10.a. or 2-10.b. or the aeroengines specified by 2-10.d., and specially designed components therefor;

2-10.f. Pressure refuellers, pressure refuelling equipment, equipment specially designed to facilitate operations in confined areas and ground equipment, developed specially for "aircraft" specified by 2-10.a. or 2-10.b., or for aero-engines specified by 2-10.d.;

2-10.h. Parachutes, paragliders and related equipment, as follows, and specially designed components therefor:

1. Parachutes not specified elsewhere in the Munitions List;
2. Paragliders;
3. Equipment specially designed for high altitude parachutists (e.g., suits, special helmets, breathing systems, navigation equipment);

2-10.i. Automatic piloting systems for parachuted loads; equipment specially designed or modified for military use for controlled opening jumps at any height, including oxygen equipment.

2-5.d. Field test or alignment equipment, specially designed for items specified by 2-5.a., 2-5.b. or 2-5.c.

2-7.d. "Riot control agents", active constituent chemicals and combinations thereof, including:

6. N-Nonanoylmorpholine, (MPA) (CAS 5299-64-9);

2-7.f.1. includes:

- a. Air conditioning units specially designed or modified for nuclear, biological or chemical filtration;
- b. Protective clothing.

N.B.:

For civil gas masks, protective and decontamination equipment, see also 1-1.A.4. on the Dual-Use List.

2-7.i.1. "Biocatalysts" specially designed for the decontamination or degradation of CW agents specified by 2-7.b. resulting from directed laboratory selection or genetic manipulation of biological systems;

2-7.i.2. Biological systems as follows: "expression vectors", viruses or cultures of cells, containing the genetic information specific to the production of "biocatalysts" specified by 2-7.i.1.

2-16. Forgings, castings and other unfinished products, the use of which in a specified product is identifiable by material composition, geometry or function, and which are specially designed for any products specified by 2-1.to 2-4., 2-6., 2-9., 2-10., 2-12. or 2-19

2-9.b.4. 'Air Independent Propulsion' (AIP) systems specially designed for submarines;

2-20. Cryogenic and “superconductive” equipment, as follows, and specially designed components and accessories therefor:

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);

Note:

2-20.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.

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.

Note:

2-20.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.

6-1.B. Test and Production Equipment

6-1.B.1. “Production facilities” specially designed for the systems specified in 6-1.A.

6-1.D. Software

6-1.D.1. “Software” specially designed or modified for the “use” of “production facilities” specified in 6-1.B.

6-1.D.2. “Software” which coordinates the function of more than one subsystem, specially designed or modified for “use” in systems specified in 6-1.A.

6-1.E. Technology

6-1.E.1. “Technology”, in accordance with the General Technology Note, for the “development”, “production” or “use” of equipment or “software” specified in 6-1.A., 6-1.B., or 6-1.D.

6-2.B. Test and Production Equipment

6-2.B.1. Production facilities” specially designed for the subsystems specified in 6-2.A.

6-2.B.2. “Production equipment” specially designed for the subsystems specified in 6-2.A.

6-2.D. Software

6-2.D.1. “Software” specially designed or modified for the “use” of “production facilities” specified in 6-2.B.1.

6-2.D.2. “Software” specially designed or modified for the “use” of rocket motors or engines specified in 6-2.A.1.c.

6-2.D.3. “Software”, specially designed or modified for the “use” of ‘guidance sets’ specified in 6-2.A.1.d.

Note:

6-2.D.3. includes “software”, specially designed or modified to enhance the performance of ‘guidance sets’ to achieve or exceed the accuracy specified in 6-2.A.1.d.

6-2.D.4. “Software” specially designed or modified for the “use” of subsystems or equipment specified in 6-2.A.1.b.3.

6-2.D.5. "Software" specially designed or modified for the "use" of systems in 6-2.A.1.e.

6-2.D.6. "Software" specially designed or modified for the "use" of systems in 6-2.A.1.f.

Notes to 6-2.D:

Subject to end-use statements appropriate for the excepted end-use, "software" controlled by 6-2.D.2. to 6-2.D.6. may be treated as Category II as follows:

1. Under 6-2.D.2. if specially designed or modified for liquid propellant apogee engines, designed or modified for satellite applications as specified in the Note to 6-2.A.1.c.;
2. Under 6-2.D.3. if designed for missiles with a "range" of under 300 km or manned aircraft;
3. Under 6-2.D.4. if specially designed or modified for re-entry vehicles designed for non-weapon payloads;
4. Under 6-2.D.5. if designed for rocket systems that do not exceed the "range" "payload" capability of systems specified in 6-1.A.;
5. Under 6-2.D.6. if designed for systems other than those specified in 6-1.A.

6-2.E. Technology

6-2.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-2.A., 6-2.B. or 6-2.D.

6-3.A.1. Turbojet (not qualified) and turbofan engines, as follows:

- a. Engines having both of the following characteristics:

6-3.A.1.a. 10 g rms is a different number than the USML entry

6-3.A.7. Radial ball bearings 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:

- a. An inner ring bore diameter between 12 and 50 mm;
- b. An outer ring outside diameter between 25 and 100 mm; **and**
- c. A width between 10 and 20 mm.

6-3.A.8. Liquid propellant tanks specially designed for the propellants controlled in Item 6-4.C. or other liquid propellants used in the systems specified in 6-1.A.1.

6-3.A.9. 'Turboprop engine systems' specially designed for the systems in 6-1.A.2. or 6-19.A.2., and specially designed components therefor, having a maximum power greater than 10 kW (achieved uninstalled at sea level standard conditions), excluding civil certified engines.

Technical Note for 6-3.A.9.:

For the purposes of Item 6-3.A.9., a 'turboprop engine system' incorporates all of the following:

- a. Turboshift engine; and
- b. Power transmission system to transfer the power to a propeller.

6-3.B. Test and Production Equipment

6-3.B.1. "Production facilities" specially designed for equipment or materials specified in 6-3.A.1., 6-3.A.2., 6-3.A.3., 6-3.A.4., 6-3.A.5., 6-3.A.6., 6-3.A.8., 6-3.A.9. or 6-3.C.

6-3.B.2. "Production equipment" specially designed for equipment or materials specified in 6-3.A.1., 6-3.A.2., 6-3.A.3., 6-3.A.4., 6-3.A.5., 6-3.A.6. 6-3.A.8., 6-3.A.9. or 6-3.C.

6-3.B.3. Flow-forming machines, and specially designed components therefor, which:

a. According to the manufacturers technical specification can be equipped with numerical control units or a computer control, even when not equipped with such units at delivery; **and**

b. Have more than two axes which can be co-ordinated simultaneously for contouring control.

Note to 6-3.B.:

This item does not include machines that are not usable in the "production" of propulsion components and equipment (e.g. motor cases) for systems specified in 6-1.A.

Technical Note to 6-3.B.:

Machines combining the function of spin-forming and flow-forming are, for the purpose of this item, regarded as flow-forming machines.

Technical Note to 6-3.C.:

In 6-3.C.2. 'insulation' intended to be applied to the components of a rocket motor, i.e. the case, nozzle inlets, case closures, 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 specified in 6-3.A.3.

6-3.D. Software

6-3.D.1. "Software" specially designed or modified for the "use" of "production facilities" and flow forming machines specified in 6-3.B.1. or 6-3.B.3.

6-3.D.2. "Software" specially designed or modified for the "use" of equipment specified in 6-3.A.1., 6-3.A.2., 6-3.A.4., 6-3.A.5., 6-3.A.6. or 6-3.A.9.

6-3.D.3. "Software" specially designed or modified for the "development" of equipment specified in 6-3.A.2., 6-3.A.3. or 6-3.A.4.

6-3.E. Technology

6-3.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment, materials or "software" specified in 6-3.A.1., 6-3.A.2., 6-3.A.3., 6-3.A.4., 6-3.A.5., 6-3.A.6., 6-3.A.9., 6-3.B., 6-3.C. or 6-3.D.

6-4.B. Test and Production Equipment

6-4.B.1. "Production equipment", and specially designed components therefor, for the "production", handling or acceptance testing of liquid propellants or propellant constituents specified in 6-4.C.

6-4.B.2. "Production equipment", other than that described in 6-4.B.3., and specially designed components therefor, for the production, handling, mixing, curing, casting, pressing, machining, extruding or acceptance testing of solid propellants or propellant constituents specified in 6-4.C.

6-4.B.3. Equipment as follows and specially designed components therefor:

6-4.B.3.a. Batch mixers with provision for mixing under vacuum in the range of zero to 13.326 kPa and with temperature control capability of the mixing chamber and having all of the following:

1. A total volumetric capacity of 110 litres or more; **and**
2. At least one mixing/kneading shaft mounted off centre;

6-4.B.3.b. Continuous mixers with provision for mixing under vacuum in the range of zero to 13.326 kPa and with a temperature control capability of the mixing chamber having any of the following:

1. Two or more mixing/kneading shafts; **or**
2. A single rotating shaft which oscillates and having kneading teeth/pins on the shaft as well as inside the casing of the mixing hamber;

6-4.B.3.c. Fluid energy mills usable for grinding or milling substances specified in 6-4.C.;

6-4.B.3.d. Metal powder "production equipment" usable for the "production", in a controlled environment, of spherical or atomised materials specified in 6-4.C.2.c., 6-4.C.2.d. or 6-4.C.2.e.

Note to 6-4.B.3.d.:

6-4.B.3.d. includes:

- a. Plasma generators (high frequency arc-jet) usable for obtaining sputtered or spherical metallic powders with organization of the process in an argon-water environment;
- b. Electrobust equipment usable for obtaining sputtered or spherical metallic powders with organization of the process in an argon-water environment;
- c. Equipment usable for the "production" of spherical aluminium powders by powdering a melt in an inert medium (e.g. nitrogen).

Notes to 6-4.B.:

1. The only batch mixers, continuous mixers, usable for solid propellants or propellants constituents specified in 6-4.C., and fluid energy mills specified in 6-4.B., are those specified in 6-4.B.3.
2. Forms of metal powder "production equipment" not specified in 6-4.B.3.d. are to be evaluated in accordance with 6-4.B.2.

6-4.C.2.b.

1. Monomethyl-hydrazine (MMH) (CAS 60-34-4);
3. Hydrazine mononitrate;
4. Trimethylhydrazine (CAS 1741-01-1);
5. Tetramethylhydrazine (CAS 6415-12-9);
6. N,N diallylhydrazine;
7. Allylhydrazine (CAS 7422-78-8);
8. Ethylene dihydrazine;
9. Monomethylhydrazine dinitrate;
10. Unsymmetrical dimethylhydrazine nitrate;
11. Hydrazinium azide (CAS 14546-44-2);
12. Dimethylhydrazinium azide;
13. Hydrazinium dinitrate;
14. Diimido oxalic acid dihydrazine (CAS 3457-37-2);
15. 2-hydroxyethylhydrazine nitrate (HEHN);
16. Hydrazinium perchlorate (CAS 27978-54-7);
17. Hydrazinium diperchlorate (CAS 13812-39-0);

18. Methylhydrazine nitrate (MHN);
19. Diethylhydrazine nitrate (DEHN);
20. 3,6-dihydrazino tetrazine nitrate (DHTN);

6-4.C.2.c. Spherical size in Canadian controls is different from those of the U.S.: (200 x 10⁻⁶ m (200 lm))

6-4.C.2.f. High energy density materials, usable in the systems specified in 6-1.A. or 6-19.A., as follows:

1. Mixed fuels that incorporate both solid and liquid fuels, such as boron slurry, having a mass- based energy density of 40 x 10⁶ J/kg or greater;
2. Other high energy density fuels and fuel additives (e.g., cubane, ionic solutions, JP-10) having a volume-based energy density of 37.5 x 10⁹ J/m³ or greater, measured at 20° C and one atmosphere (101.325 kPa) pressure.

6-4.C.4.1. Dinitrogen trioxide (CAS 10544-73-7);

6-4.C.4.a.3. Dinitrogen pentoxide (CAS 10102-03-1);

6-4.C.4.a.4. Mixed Oxides of Nitrogen (MON);

6-4.C.4.a.6. Compounds composed of fluorine and one or more of other halogens, oxygen or nitrogen;

6-4.C.4.b. Oxidiser substances usable in solid propellant rocket motors as follows:

1. Ammonium perchlorate (AP) (CAS 7790-98-9);
2. Ammonium dinitramide (ADN) (CAS 140456-78-6);
3. Nitro-amines (cyclotetramethylene - tetranitramine (HMX) (CAS 2691-41-0); cyclotrimethylene - trinitramine (RDX) (CAS 121-82-4));
4. Hydrazinium nitroformate (HNF)(CAS 20773-28-8).

6-4.C.5. Polymeric substances, as follows:

- a. Carboxy - terminated polybutadiene (including carboxyl - terminated polybutadiene) (CTPB);
- b. Hydroxy - terminated polybutadiene (including hydroxyl - terminated polybutadiene) (HTPB);
- c. Glycidyl azide polymer (GAP);
- d. Polybutadiene - Acrylic Acid (PBAA);
- e. Polybutadiene - Acrylic Acid - Acrylonitrile (PBAN);
- f. Polytetrahydrofuran polyethylene glycol (TPEG).

6-4.C.6.c.1. Carboranes, decaboranes, pentaboranes and derivatives thereof;

6-4.C.6.c.2.: Other propellant additives and agents as follows; Burning rate modifiers as follows: :

- m. Ferrocene Carboxylic acids;
- n. Butacene (CAS 125856-62-4);
- o. Other ferrocene derivatives usable as rocket propellant burning rate modifiers;

6-4.C.6.d.: Esters and plasticisers as follows:

1. Triethylene glycol dinitrate (TEGDN) (CAS 111-22-8);
2. Trimethylolethane trinitrate (TMETN) (CAS 3032-55-1);
4. Diethylene glycol dinitrate (DEGDN) (CAS 693-21-0);
5. 4,5 diazidomethyl-2-methyl-1,2,3-triazole (iso- DAMTR);
6. Nitroethylnitramine (NENA) based plasticisers, as follows:
 - a. Methyl-NENA (CAS 17096-47-8);
 - b. Ethyl-NENA (CAS 85068-73-1);
 - c. Butyl-NENA (CAS 82486-82-6);
7. Dinitropropyl based plasticisers, as follows:
 - a. Bis (2,2-dinitropropyl) acetal (BDNPA) (CAS 5108-69-0);
 - b. Bis (2,2-dinitropropyl) formal (BDNPF) (CAS 5917-61-3);

6-4.C.6.e. Stabilisers as follows:

1. 2-Nitrodiphenylamine (CAS 119-75-5);

6-6. PRODUCTION OF STRUCTURAL COMPOSITES, PYROLYTIC DEPOSITION AND DENSIFICATION, AND STRUCTURAL MATERIALS

6-6.A. Equipment, Assemblies and Components

6-6.A.1. Composite structures, laminates, and manufactures thereof, specially designed for use in the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. and the subsystems specified in 6-2.A. or 6-20.A.

6-6.A.2. Resaturated pyrolysed (i.e. carbon-carbon) components having all of the following:

- a. Designed for rocket systems; **and**
- b. Usable in the systems specified in 6-1.A. or 6-19.A.1.

6-6.B. Test and Production Equipment

6-6.B.1. Equipment for the "production" of structural composites, fibres, prepregs or preforms, usable in the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. as follows, and specially designed components, and accessories therefor:

- a. Filament winding machines or fibre placement machines, of which the motions for positioning, wrapping and winding fibres can be co-ordinated and programmed in three or more axes, designed to fabricate composite structures or laminates from fibrous or filamentary materials, and co-ordinating and programming controls;
- b. Tape-laying machines of which the motions for positioning and laying tape and sheets can be co-ordinated and programmed in two or more axes, designed for the manufacture of composite airframes and missile structures;
- c. Multi-directional, multi-dimensional weaving machines or interlacing machines, including adapters and modification kits for weaving, interlacing or braiding fibres to manufacture composite structures;

Note:

6-6.B.1.c. does not control textile machinery not modified for the end-uses stated.

d. Equipment designed or modified for the production of fibrous or filamentary materials as follows:

1. Equipment for converting polymeric fibres (such as polyacrylonitrile, rayon, or polycarbosilane) including special provision to strain the fibre during heating;
2. Equipment for the vapour deposition of elements or compounds on heated filament substrates;
3. Equipment for the wet-spinning of refractory ceramics (such as aluminium oxide);

e. Equipment designed or modified for special fibre surface treatment or for producing prepregs and preforms, including rollers, tension stretchers, coating equipment, cutting equipment and clicker dies.

Note:

Examples of components and accessories for the machines specified in 6-6.B.1. are moulds, mandrels, dies, fixtures and tooling for the preform pressing, curing, casting, sintering or bonding of composite structures, laminates and manufactures thereof.

6-6.B.2. Nozzles specially designed for the processes referred to in 6-6.E.3.

6-6.B.3. Isostatic presses having all of the following characteristics:

- a. Maximum working pressure equal to or greater than 69 MPa;
- b. Designed to achieve and maintain a controlled thermal environment of 600° C or greater; **and**
- c. Possessing a chamber cavity with an inside diameter of 254 mm or greater.

6-6.B.4. Chemical vapour deposition furnaces designed or modified for the densification of carbon-carbon composites.

6-6.B.5. Equipment and process controls, other than those specified in 6-6.B.3. or 6-6.B.4., designed or modified for densification and pyrolysis of structural composite rocket nozzles and re-entry vehicle nose tips. 6-6.C. Materials

6-6.C.7. Materials for the fabrication of missile components in the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2, as follows:

- a. Tungsten and alloys in particulate form with a tungsten content of 97% by weight or more and a particle size of 50 x10⁻⁶ m (50 lm) or less;
- b. Molybdenum and alloys in particulate form with a molybdenum content of 97% by weight or more and a particle size of 50 x10⁻⁶ m (50 lm) or less;
- c. Tungsten materials in the solid form having all of the following:
 1. Any of the following material compositions:
 - a. Tungsten and alloys containing 97% by weight or more of tungsten;
 - b. Copper infiltrated tungsten containing 80% by weight or more of tungsten; **or**
 - c. Silver infiltrated tungsten containing 80% by weight or more of tungsten; **and**
 2. Able to be machined to any of the following products:

- a. Cylinders having a diameter of 120 mm or greater and a length of 50 mm or greater;
- b. Tubes having an inner diameter of 65 mm or greater and a wall thickness of 25 mm or greater and a length of 50 mm or greater; **or**
- c. Blocks having a size of 120 mm x 120 mm x 50 mm or greater.

6-6.C.8. Maraging steels having an ultimate tensile strength equal to or greater than 1.5 GPa, measured at 20° C, in the form of sheet, plate or tubing with a wall or plate thickness equal to or less than 5.0 mm usable in systems specified in 6-1.A. or 6-19.A.1.

Technical Note:

Maraging steels are iron alloys generally characterised by high nickel, very low carbon content and use substitutional elements or precipitates to produce strengthening and age-hardening of the alloy.

6-6.C.9. Titanium-stabilized duplex stainless steel (Ti-DSS) usable in the systems specified in 6-1.A. or 6-19.A.1. and having all of the following:

a. Having all of the following characteristics:

- 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% is austenite by volume (according to ASTM E-1181-87 or national equivalents); **and**

b. Any of the following forms:

- 1. Ingots or bars having a size of 100 mm or more in each dimension;
- 2. Sheets having a width of 600 mm or more and a thickness of 3 mm or less; **or**
- 3. Tubes having an outer diameter of 600 mm or more and a wall thickness of 3 mm or less.

6-6.D. Software

6-6.D.1. "Software" specially designed or modified for the "use" of equipment specified in 6-6.B.1.

2. "Software" specially designed or modified for the equipment specified in 6-6.B.3., 6-6.B.4. or 6-6.B.5.

6-6.E. Technology

6-6.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment, materials or "software" specified in 6-6.A., 6-6.B., 6-6.C. or 6-6.D.

6-6.E.2. "Technical data" (including processing conditions) and procedures for the regulation of temperature, pressures or atmosphere in autoclaves or hydroclaves when used for the production of composites or partially processed composites, usable for equipment or materials specified in 6-6.A. or 6-6.C. and parameters.

6-6.E.3. "Technology" for producing pyrolytically derived materials formed on a mould, mandrel or other substrate from precursor gases which decompose in the 1,300° C to 2,900° C temperature range at pressures of 130 Pa (1 mm Hg) to 20 kPa (150 mm Hg) including "technology" for the composition of precursor gases, flow-rates, and process control schedules

6-9.A.3. Linear accelerometers, designed for use in inertial navigation systems or in guidance systems of all types, usable in the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2., having all of the following characteristics, and specially designed components therefor:

- a. 'Scale factor' 'repeatability' less (better) than 1250 ppm; **and**
- b. 'Bias' 'repeatability' less (better) than 1250 micro g.

6-9.A.5. Accelerometers or gyros of any type, designed for use in inertial navigation systems or in guidance systems of all types, specified to function at acceleration levels greater than 100 g, and specially designed components therefor.

6-9.A.7. 'Integrated navigation systems', designed or modified for the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. and capable of providing a navigational accuracy of 200 m CEP or less.

6-9.A.8. Three axis magnetic heading sensors having all of the following characteristics, and specially designed components therefor:

- a. Internal tilt compensation in pitch (+/-90 degrees) and roll (+/-180 degrees) axes;
- b. Capable of providing azimuthal accuracy better (less) than 0.5 degrees rms at latitudes of +/-80 degrees, referenced to local magnetic field; **and**
- c. Designed or modified to be integrated with flight control and navigation systems.

Test and Production Equipment

6-9.B.1. "Production equipment", and other test, calibration and alignment equipment, other than that described in 6-9.B.2., designed or modified to be used with equipment specified in 6-9.A.

Note for 6-9.B.:

Equipment specified in 6-9.B.1. includes the following:

a. For laser gyro equipment, the following equipment used to characterise mirrors, having the threshold accuracy shown or better:

- 1. Scatterometer (10 ppm);
- 2. Reflectometer (50 ppm);
- 3. Profilometer (5 Angstroms);

b. For other inertial equipment:

- 1. Inertial Measurement Unit (IMU) Module Tester;
- 2. IMU Platform Tester;
- 3. IMU Stable Element Handling Fixture;
- 4. IMU Platform Balance Fixture;
- 5. Gyro Tuning Test Station;
- 6. Gyro Dynamic Balance Station;
- 7. Gyro Run-In/Motor Test Station;
- 8. Gyro Evacuation and Filling Station;
- 9. Centrifuge Fixture for Gyro Bearings;
- 10. Accelerometer Axis Align Station;
- 11. Accelerometer Test Station.

6-9.B.2. Equipment as follows:

6-9.B.2. a. Balancing machines having all the following characteristics:

1. Not capable of balancing rotors/assemblies having a mass greater than 3 kg;
2. Capable of balancing rotors/assemblies at speeds greater than 12,500 rpm;
3. Capable of correcting unbalance in two planes or more; **and**
4. Capable of balancing to a residual specific unbalance of 0.2 g mm per kg of rotor mass;

6-9.B.2. b. Indicator heads (sometimes known as balancing instrumentation) designed or modified for use with machines specified in 6-9.B.2.a.;

6-9.B.2. c. Motion simulators/rate tables (equipment capable of simulating motion) having all of the following characteristics:

1. Two axes or more;
2. Designed or modified to incorporate sliprings or integrated non-contact devices capable of transferring electrical power, signal information, or both; **and**
3. Having any of the following characteristics:
 - a. For any single axis having all of the following:
 1. Capable of rates of 400 degrees/s or more, or 30 degrees/s or less; **and**
 2. A rate resolution equal to or less than 6 degrees/s and an accuracy equal to or less than 0.6 degrees/s;
 - b. Having a worst-case rate stability equal to or better (less) than plus or minus 0.05% averaged over 10 degrees or more; **or**
 - c. A positioning "accuracy" equal to or less (better) than 5 arc second;
 - d. Positioning tables (equipment capable of precise rotary positioning in any axes) having the following characteristics:
 1. Two axes or more; **and**
 2. A positioning "accuracy" equal to or less (better) than 5 arc second;
 - e. Centrifuges capable of imparting accelerations above 100 g and designed or modified to incorporate sliprings or integrated non-contact devices capable of transferring electrical power, signal information, or both.

Notes to 6-9.B:

1. The only balancing machines, indicator heads, motion simulators, rate tables, positioning tables and centrifuges specified in Item 6-9. are those specified in 6-9.B.2.
2. 6-9.B.2.a. does not control balancing machines designed or modified for dental or other medical equipment.
3. 6-9.B.2.c. and 6-9.B.2.d. do not control rotary tables designed or modified for machine tools or for medical equipment.

4. Rate tables not controlled by 6-9.B.2.c. and providing the characteristics of a positioning table are to be evaluated according to 6-9.B.2.d.

5. Equipment that has the characteristics specified in 6-9.B.2.d. which also meets the characteristics of 6-9.B.2.c. will be treated as equipment specified in 6-9.B.2.c.

6. Item 6-9.B.2.c. applies whether or not slirings or integrated non-contact devices are fitted at the time of export. 7. Item 6-9.B.2.e. applies whether or not slirings or integrated non-contact devices are fitted at the time of export.

6-9.D. Software

6-9.D.1. "Software" specially designed or modified for the "use" of equipment specified in 6-9.A. or 6-9.B.

6-9.D.2. Integration "software" for the equipment specified in 6-9.A.1.

6-9.D.3. Integration "software" specially designed for the equipment specified in 6-9.A.6.

6-9.D.4. Integration "software", designed or modified for the 'integrated navigation systems' specified in 6-9.A.7.

Note:

A common form of integration "software" employs Kalman filtering.

6-9.E. Technology

6-9.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-9.A., 6-9.B. or 6-9.D.

Note:

Governments may permit the export of equipment or "software" specified in 6-9.A. or 6-9.D. as part of a manned aircraft, satellite, land vehicle, marine/submarine vessel or geophysical survey equipment or in quantities appropriate for replacement parts for such applications.

6-10.A.3. Flight control servo valves designed or modified for the systems in 6-10.A.1. or 6-10.A.2., and designed or modified to operate in a vibration environment greater than 10 g rms between 20 Hz and 2 kHz.

Note:

Governments may permit the export of systems, equipment or valves specified in 6-10.A. as part of a manned aircraft or satellite or in quantities appropriate for replacement parts for manned aircraft.

6-10.B. Test and Production Equipment

6-10.B.1. Test, calibration, and alignment equipment specially designed for equipment specified in 6-10.A.

6-10.D. Software

6-10.D.1. "Software" specially designed or modified for the "use" of equipment specified in 6-10.A. or 6-10.B.

Note:

Governments may permit the export of "software" specified in 6-10.D.1. as part of a manned aircraft or satellite or in quantities appropriate for replacement parts for manned aircraft.

6-10.D.3. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-10.A., 6-10.B. or 6-10.D.

6-11.A.3. Receiving equipment for Global Navigation Satellite Systems (GNSS); e.g., GPS, GLONASS or Galileo), having any of the following characteristics, and specially designed components therefor:

- a. Designed or modified for use in systems specified in 6-1.A.; **or**
- b. Designed or modified for airborne applications and having any of the following:
 - 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 secure 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.

Notes to 6-11.A.3.b.2 & 3:

6-11.A.3.b.2. and 6-11.A.3.b.3. do not control equipment designed for commercial, civil or 'Safety of Life' (e.g. data integrity, flight safety) GNSS services.

6-11.A.4. Electronic assemblies and components, designed or modified for use in the systems specified in 6-1.A. or 6-19.A. and specially designed for military use and operation at temperatures in excess of 125° C.

6-11.D. Software

6-11.D.1. "Software" specially designed or modified for the "use" of equipment specified in 6-11.A.1., 6-11.A.2. or 6-11.A.4.

6-11.D.2. "Software" specially designed for the "use" of equipment specified in 6-11.A.3.

6-11.E. Technology

6-11.E.1. Design "technology" for protection of avionics and electrical subsystems against Electromagnetic Pulse (EMP) and Electromagnetic Interference (EMI) hazards from external sources, as follows:

- a. Design "technology" for shielding systems;
- b. Design "technology" for the configuration of hardened electrical circuits and subsystems;
- c. Design "technology" for determination of hardening criteria for the above.

6-11.E.2. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-11.A. or 6-11.D.

6-12.A.3. Gravity meters (gravimeters), gravity gradiometers, and specially designed components therefor, designed or modified for airborne or marine use, and having a static or operational accuracy of 7×10^{-6} m/s² (0.7 milligal) or better, with a time to steady-state registration of two minutes or less, usable for systems specified in 6-1.A.

6-12.A.6. Thermal batteries designed or modified for the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2.

Note:

Item 6-12.A.6. does not control thermal batteries specially designed for rocket systems or unmanned aerial vehicles that are not capable of a "range" equal to or greater than 300 km.

Technical Note to 6-12:

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.

6-12.D. Software

6-12.D.1. "Software" specially designed or modified for the "use" of equipment specified in 6-12.A.1.

6-12.D.3. "Software" specially designed or modified for the "use" of equipment specified in 6-12.A.4. or 6-12.A.5., usable for systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2.

6-12.E. Technology

6-12.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-12.A. or 6-12.D.

6-13.E. Technology

6-13.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment specified in 6-13.A.

6-14.E. Technology

6-14.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment specified in 6-14.A.

6-15. TEST FACILITIES AND EQUIPMENT

6-15.B. Test and Production Equipment

6-15.B.1. Vibration test equipment, usable for the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. or the subsystems specified in 6-2.A. or 6-20.A., and components therefor, as follows:

- 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 10 g rms between 20 Hz and 2 kHz while imparting forces equal to or greater than 50 kN, measured 'bare table';
- b. Digital controllers, combined with specially designed vibration test "software", with a 'real-time control bandwidth' greater than 5 kHz and designed for use with vibration test systems specified in 6-15.B.1.a.;

Technical Note:

'Real-time control bandwidth' is defined as the maximum rate at which a controller can execute complete cycles of sampling, processing data and transmitting control signals. c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force equal to or greater than 50 kN, measured 'bare table', and usable in vibration test systems specified in 6-15.B.1.a.;

- d. Test piece support structures and electronic units designed to combine multiple shaker units into a complete shaker system capable of providing an effective combined force equal to or greater than 50 kN, measured 'bare table', and usable in vibration test systems specified in 6-15.B.1.a.

Technical Note:

Vibration test systems incorporating a digital controller are those systems, the functions of which are, partly or entirely, automatically controlled by stored and digitally coded electrical signals.

6-15.B.2. Wind-tunnels for speeds of Mach 0.9 or more, usable for the systems specified in 6-1.A. or 6-19.A. or the subsystems specified in 6-2.A. or 6-20.A.

6-15.B.3. Test benches/stands, usable for the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. or the subsystems specified in 6-2.A. or 6-20.A., which have the capacity to handle solid or liquid propellant rockets, motors or engines having a thrust greater than 68 kN, or which are capable of simultaneously measuring the three axial thrust components.

6-15.B.4. Environmental chambers as follows, usable for the systems specified in 6-1.A. or 6-19.A. or the subsystems specified in 6-2.A. or 6-20.A.:

a. Environmental chambers capable of simulating all of the following flight conditions:

1. Having any of the following:

a. Altitude equal to or greater than 15 km; **or**

b. Temperature range from below -50°C to above $+125^{\circ}\text{C}$; **and**

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;

Technical Notes:

1. Item 6-15.B.4.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).

2. In Item 6-15.B.4.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 this Item.

b. Environmental chambers capable of simulating all of the following flight conditions:

1. Acoustic environments at an overall sound pressure level of 140 dB or greater (referenced to $2 \times 10^{-5} \text{ N/m}^2$) or with a total rated acoustic power output of 4 kW or greater; **and**

2. Any of the following:

a. Altitude equal to or greater than 15 km; **or**

b. Temperature range from below -50°C to above $+125^{\circ}\text{C}$. 5. Accelerators capable of delivering electromagnetic radiation produced by bremsstrahlung from accelerated electrons of 2 MeV or greater, and equipment containing those accelerators, usable for the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. or the subsystems specified in 6-2.A. or 6-20.A.

Note:

6-15.B.5. does not control equipment specially designed for medical purposes.

Technical Note:

In Item 6-15.B. 'bare table' means a flat table, or surface, with no fixture or fittings.

6-15.D. Software

6-15.D.1. "Software" specially designed or modified for the "use" of equipment specified in 6-15.B. usable for testing systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. or subsystems specified in 6-2.A. or 6-20.A.

6-15.E. Technology

6-15.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-15.B. or 6-15.D.

Note:

This control only applies when the equipment is supplied with "software" specified in 6-16.D.1.

6-16.D. Software

6-16.D.1. "Software" specially designed for modelling, simulation, or design integration of the systems specified in 6-1.A. or the subsystems specified in 6-2.A. or 6-20.A.

6-16.E. Technology

6-16.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-16.A. or 6-16.D.

6-17.B. Test and Production Equipment

6-17.B.1. Systems, specially designed for radar cross section measurement, usable for the systems specified in 6-1.A., 6-19.A.1. or 6-19.A.2. or the subsystems specified in 6-2.A.

6-17.D. Software

6-17.D.1. "Software" specially designed for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures (i.e. stealth technology), for applications usable for the systems specified in 6-1.A. or 6-19.A. or the subsystems specified in 6-2.A.

Note:

6-17.D.1. includes "software" specially designed for analysis of signature reduction.

6-17.E. Technology

6-17.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment, materials or "software" specified in 6-17.A., 6-17.B., 6-17.C. or 6-17.D.

Note:

6-17.E.1. includes databases specially designed for analysis of signature reduction.

6-18.E. Technology

6-18.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment specified in 6-18.A.

6-19. OTHER COMPLETE DELIVERY SYSTEMS

6-19.A. Equipment, Assemblies and Components

6-19.A.1. Complete rocket systems (including ballistic missile systems, space launch vehicles, and sounding rockets), not specified in 6-1.A.1., capable of a "range" equal to or greater than 300 km.

6-19.A.2. Complete unmanned aerial vehicle systems (including cruise missile systems, target drones and reconnaissance drones), not specified in 6-1.A.2., capable of a "range" equal to or greater than 300 km.

6-19.A.3. Complete unmanned aerial vehicle systems, not specified in 6-1.A.2. or 6-19.A.2., having all of the following:

a. Having any of the following:

1. An autonomous flight control and navigation capability; **or**
2. Capability of controlled flight out of the direct vision range involving a human operator; **and**

b. Having any of the following:

1. Incorporating an aerosol dispensing system/mechanism with a capacity greater than 20 litres; **or**
2. Designed or modified to incorporate an aerosol dispensing system/mechanism with a capacity greater than 20 litres.

Note:

Item 6-19.A.3. does not control model aircraft, specially designed for recreational or competition purposes.

Technical Notes:

1. An aerosol consists of particulate or liquids other than fuel components, by-products or additives, as part of the "payload" to be dispersed in the atmosphere. Examples of aerosols include pesticides for crop dusting and dry chemicals for cloud seeding.
2. An aerosol dispensing system/mechanism contains all those devices (mechanical, electrical, hydraulic, etc.), which are necessary for storage and dispersion of an aerosol into the atmosphere. This includes the possibility of aerosol injection into the combustion exhaust vapour and into the propeller slip stream.

6-19.D. Software

6-19.D.1. "Software" which coordinates the function of more than one subsystem, specially designed or modified for "use" in the systems specified in 6-19.A.1. or 6-19.A.2.

6-19.E. Technology

6-19.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment specified in 6-19.A.1. or 6-19.A.2.

6-20. OTHER COMPLETE SUBSYSTEMS

6-20.A. Equipment, Assemblies and Components

6-20.A.1. Complete subsystems as follows:

- a. Individual rocket stages, not specified in 6-2.A.1., usable in systems specified in 6-19.A.;
- b. Solid propellant rocket motors or liquid propellant rocket engines, not specified in 6-2.A.1., usable in systems specified in 6-19.A., having a total impulse capacity equal to or greater than 8.41×10^5 Ns, but less than 1.1×10^6 Ns.

6-20.B. Test and Production Equipment

6-20.B.1. "Production facilities" specially designed for the subsystems specified in 6-20.A.

6-20.B.2. "Production equipment" specially designed for the subsystems specified in 6-20.A.

6-20.D. Software

6-20.D.1. "Software" specially designed or modified for the systems specified in 6-20.B.1.

6-20.D.2. "Software", not specified in 6-2.D.2., specially designed or modified for the "use" of rocket motors or engines specified in 6-20.A.1.b.

6-20.E. Technology

6-20.E.1. "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or "software" specified in 6-20.A., 6-20.B. or 6-20. D.

2-17. b. Construction equipment specially designed for military use;

2-17.c. Fittings, coatings and treatments, for signature suppression, specially designed for military use;

2-17.d. Field engineer equipment specially designed for use in a combat zone;

2-17.e. "Robots", "robot" controllers and "robot" "end-effectors", having any of the following characteristics:

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;

2-17.f. 'Libraries' (parametric technical databases) specially designed for military use with equipment specified by the Munitions List;

2-17. 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;

2-17.k. Field generators specially designed or 'modified' for military use;

2-17.l. Containers specially designed or 'modified' for military use;

2-17.n. Test models specially designed for the "development" of items specified by 2-4., 2-6., 2-9. or 2-10.;

2-17.p. "Fuel cells", other than those specified elsewhere in the Munitions List, specially designed or 'modified' for military use.

5504.2.a.i./1-7.A.5. Global Navigation Satellite Systems (GNSS) receiving equipment having any of the following and specially designed components therefor:

5504.2.a.ii./1-9.A.5. Liquid rocket propulsion systems containing any of the systems or components, specified by 1-9.A.6.

5504.2.a.ii./1-9.A.6. Systems and components, specially designed for liquid rocket propulsion systems, as follows:

5504.2.a.ii./1-9.A.6.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;

5504.2.a.ii./1-9.A.6.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";

5504.2.a.ii./1-9.A.6.c. Slush hydrogen storage or transfer systems;

5504.2.a.ii./1-9.A.6.d. High pressure (exceeding 17.5 MPa) turbo pumps, pump components or their associated gas generator or expander cycle turbine drive systems;

5504.2.a.ii./1-9.A.6.e. High-pressure (exceeding 10.6 MPa) thrust chambers and nozzles therefor;

5504.2.a.ii./1-9.A.6.f. Propellant storage systems using the principle of capillary containment or positive expulsion (i.e., with flexible bladders);

5504.2.a.ii./1-9.A.6.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;

5504.2.a.ii./1-9.A.6.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.

5504.2.a.ii./1-9.A.7.a. Total impulse capacity exceeding 1.1 MNs;

5504.2.a.ii./1-9.A.7.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;

5504.2.a.ii./1-9.A.7.c. Stage mass fractions exceeding 88% and propellant solid loadings exceeding 86%;

5504.2.a.ii./1-9.A.7.d. Components specified by 1-9.A.8.; **or**

5504.2.a.ii./1-9.A.8.b. Filament-wound "composite" motor cases exceeding 0.61 m in diameter or having 'structural efficiency ratios (PVW)' exceeding 25 km;

5504.2.d. . payloads specially designed or modified for "spacecraft", and specially designed components therefor not controlled elsewhere by Group 1 of the Guide;

5504.2.f. chemiluminescent compounds specially designed or modified for military use, and specially designed components therefor;

NB: While it appears that most 'Schedule' articles are interpreted in the same way by all countries that subscribe to similar lists, there are instances when other countries, including Canada, will make interpretations that are inconsistent with the general understanding. This paper does not attempt to correct situations that fall into this general category.

ANNEX B

Recommendation 2: Mid-Term:

It is recommended that once the changes to the USML occur that PWGSC make changes to the Schedule based on Annex B. Annex B identifies those goods and technology that the U.S. Government is proposing be removed from the USML because they consider them no longer relevant to the ITAR or the USML.

The U.S. is proposing a major overhaul to its export control system pursuant to President Obama's Export Control Reform Initiative (ECRI). Part of this overhaul calls for the removal of a broad range of goods and technology from the US Munitions List (USML) under the International Traffic in Arms Regulations (ITAR) to the Commerce Control List (CCL) under the Export Administration Regulations (EAR). **Subsection 1** of this Annex generally describes goods and technology that are currently contained in the USML, and therefore are included in the Schedule of "controlled goods", but which are proposed for removal from the USML. **Subsection 2** identifies goods and technology that the U.S. government proposes remain on the USML and which are currently on the Schedule of "controlled goods".

While the ultimate objective of ECRI is to create one U.S. export control system by amalgamating the ITAR and EAR, the initial step is to move certain non-critical items from the current USML to the CCL. The review of the USML and the identification of articles and data to be moved from the USML to the CCL was to be completed by mid-2012 (it may not occur now until after the November election). The U.S. review is aimed at creating a revised USML that specifically describes what is controlled using objective criteria rather than broad, open-ended, subjective, or design intent-based criteria which have historically been difficult for industry and government to apply consistently. The fact that an item is used by the military does not, in and of itself, make that item a military item or even an important or strategic item. Under the proposed changes, only specific types of items would be USML listed. All other items would become subject to the EAR. However, should certain articles and data be removed from the USML they should, practically speaking, be removed from the 'Schedule', as well.

One of the most critical and significant changes proposed under ECRI is the general removal of USML controls on **MOST** generic **parts, components, accessories, and attachments** that are in any way specifically designed or modified for a defence article. Rather, these changes are directed at establishing positive and specific lists of types of parts, components, accessories, and attachments that continue to warrant control on the USML. This means that all other parts, components, accessories, and attachments which are currently subject to USML/ITAR controls, and are currently reflected in Canada's Schedule of "controlled goods" will become **subject to the EAR**. As a general comment, Canada has traditionally been a major supplier of parts and components to the defence industry in Canada and abroad and in particular, the U.S. Any changes to the USML, followed by equivalent changes to the Schedule, will be of significant benefit to Canadian industry.

Subsection 1: Proposed USML Changes (General) and Potential Canadian Impact:

If the proposed changes under ECRI come to fruition, many items currently listed in the USML will fall off of the USML and into the CCL. The following summarises the items that are being proposed for removal from the USML and the potential impact on Canadian industry.

1. Explosives and other energetic materials (USML Category V) that have broad commercial application would no longer fall under the USML. As a significant manufacturer of explosive materials for the mining, removing such items from the USML and ultimately the 'Schedule' would reduce the number of Canadian companies subject to the CGP.
2. General parts and components for surface vessels of war and other special naval equipment (USML Category VI) will no longer be subject to the USML unless specifically identified in the USML. Canadian

industry provides a broad range of parts and components for surface vessels given our long history of vessel manufacturing (frigates) and our current shipbuilding projects. Under the USML proposal only specific, critical parts and components will be subject to USML controls and if Canada were to change its 'Schedule' a great number of Canadian companies would no longer be subject to the CGP.

3. Submersible and semi-submersible vessels (USML Category XX) will be controlled only if they meet certain criteria listed in Category XX. Canada has a small but significant submersible industry that would likely no longer be subject to CGP requirements.
4. Gas turbine engines and associated equipment (USML Category XIX) is a new Category designed to cover gas turbine engines for land, air and sea vehicles and vessels. As a significant country involved in the RDP of gas turbine engines any elimination of USML controls and ultimately CGP controls will result in eliminating constraints on a broad range of manufacturers of engines, parts and components and probably reduce the number of CGP registrants. Turboshift or turboprop engines, including their parts and components, will only be controlled under the USML if specifically identified in the USML. All others will be covered under the CCL. These U.S. changes would warrant an equivalent change to the CGP 'Schedule'.
5. Ground vehicles (USML Category VII) are also subject to major changes. Unless the vehicle or its parts and components are specifically identified in Category VII they will be controlled under the CCL. An equivalent change to the 'Schedule' will significantly reduce the number of suppliers of parts and components for the Light Armoured Vehicles (LAV) manufactured by General Dynamics because most of the parts and components currently subject to controls under the 'Schedule' will no longer fall under the CGP. Also, companies like Navistar would no longer be subject to the CGP because most of its military vehicles would not be listed in the USML and therefore would be candidates for removal from the CGP 'Schedule'.
6. Aircraft and related articles (USML Category VIII) are also areas in which Canadian industry excels. Unless the specific article or part/component is listed in Category VIII they will fall under the CCL. Since Canada is a major supplier of aircraft parts and components many companies that are currently subject to the CGP would no longer be required to be CGP registered once the 'Schedule' is amended to reflect the USML changes.
7. A wide range of fire control, range finder, optical and guidance and control equipment, much of which is manufactured by Canadian industry, will see major changes if Category XII of the USML is amended to move many of the Category XII goods and technology to the CCL of the EAR. Canadian industry has traditionally been at the forefront of many of these technologies.
8. A broad range of auxiliary and miscellaneous equipment (Category XIII) is proposed for removal from the USML. Items like certain cameras and specialised processing equipment, photo-interpretation, stereoscopic plotting, and photogrammetry equipment for military purposes, as well as components and parts, are proposed for removal from the USML to the CCL. Canadian industry has traditionally been at the forefront of many of these technologies.
9. A broad range of personal protective equipment and shelters, including a broad range of parts and components currently controlled under the USML, are proposed for transfer to the CCL. For example, body armour which meets or exceeds NIJ Standard-0101.06 Type IV would remain under the USML whereas Type III body armour would be controlled on the CCL. As well, anti-gravity suits, pressure suits, and atmosphere diving suits, as well as permanent and transportable shelters, currently controlled under the USML, would be controlled under the CCL.

Subsection 2: Proposed USML Changes (Specific):**USML Category VI—Surface Vessels of War and Special Naval Equipment**

The revised list of articles under USML Category VI includes the following:

- *(a) Warships and other combatant vessels (see ITAR Part 121.15 for list of vessel types).
- (b) Other vessels not controlled in paragraph (a) of this section (see ITAR Part 121.15).
- (c) Developmental vessels and “specially designed” parts, components, accessories, and attachments therefor, developed under a contract with the U.S. Department of Defence.
- (d) [Reserved]
- *(e) Naval nuclear propulsion plants, their land prototypes, and special facilities for their construction, support, and maintenance (see ITAR Part 123.20).
- (f) Vessel and naval equipment components, parts, accessories, attachments, and associated equipment, as follows:
 - (1) hulls or superstructures “specially designed” for any vessels controlled in paragraph (a) of this section;
 - (2) hulls or superstructures having armour, active protection systems, or developmental armour systems;
 - (3) hulls or superstructures designed to survive 12.5% or greater damage across the length as measured between perpendiculars;
 - (4) propulsion and supporting auxiliary, control, and monitoring systems that store, create, distribute, conserve, transfer, and use energy outside propulsion system boundaries exceeding 30MJ storage, discharge less than 3 seconds and cycle time under 45 seconds, and parts and components “specially designed” therefor;
 - (5) shipborne auxiliary systems for Chemical, Biological, Radiological, and Nuclear (CBRN) compartmentalization, over-pressurization and filtration systems, and parts and components “specially designed” therefor;
 - *(6) control and monitoring systems for autonomous unmanned vessels capable of on-board, autonomous perception and decision-making necessary for the vessel to navigate while avoiding fixed and moving hazards, and obeying rules-of-the-road without human intervention;
 - *(7) any machinery, device, component, or equipment specifically developed, designed, or modified for use in plants or facilities controlled in paragraph (e) of this section (see § 123.20 of this subchapter);
 - (8) components, parts, accessories, attachments, and equipment “specially designed” for integration of articles controlled by Categories II, IV, or XVIII or catapults for launching aircraft or arresting gear for recovering aircraft;
 - (9) shipborne active protection systems (*i.e.*, defensive systems that actively detect and track incoming threats and launch a ballistic, explosive, energy, or electromagnetic countermeasure(s) to neutralize the threat prior to contact with a vessel) and parts and components “specially designed” therefor;
 - (10) minesweeping and mine hunting equipment (including mine countermeasures equipment deployed by aircraft) and parts and components “specially designed” therefor; or
 - *(11) any component, part, accessory, attachment, equipment, or system that:
 - (i) is classified;
 - (ii) contains classified software;
 - (iii) is manufactured using classified production data; or
 - (iv) is being developed using classified information.
- (g) Technical data (as defined in ITAR Part 120.10) and defence services (as defined in 120.9 of this subchapter) directly related to the defence articles enumerated in paragraphs (a) through (f) of this category.

Note to Category VI, paragraph (a):

Vessels “specially designed” for military use but not identified in (a) above, are **subject to the EAR**.

Note to Category VI, paragraph (f):

Parts, components, accessories, and attachments “specially designed” for vessels enumerated in this category but not listed in Category VI(f) are **subject to the EAR**.

Category VII - Ground Vehicles

This proposed rule revises USML Category VII, Ground Vehicles. The proposed revision narrows the types of ground vehicle controlled on the USML to only those that warrant control under the stringent requirements of the Arms Export Control Act. Changes include the removal of most unarmoured and unarmed military vehicles, trucks, trailers, and trains (unless “specially designed” as firing platforms for weapons above .50 caliber), and armoured vehicles (either unarmed or with inoperable weapons) before 1956. This Category includes the following:

*(a) Armoured combat ground vehicles (see ITAR Part 121.4) as follows:

- (1) tanks; or
- (2) infantry fighting vehicles.

*(b) Ground vehicles (not enumerated in paragraph (a) of this category) and trailers that are armed or are “specially designed” to serve as a firing or launch platform (see ITAR Part 121.4).

(c) Ground vehicles and trailers equipped with any mission systems controlled under this subchapter (see § 121.4 of this subchapter).

(d) [Reserved]

*(e) Armoured support ground vehicles (see ITAR Part 121.4).

*(f) [Reserved—for articles formerly controlled under this paragraph see Category XIX and ECCN 0A606.]

(g) Ground vehicle components, parts, accessories, attachments, and associated equipment as follows:

- (1) armoured hulls, armoured turrets, and turret rings;
- (2) active protection systems (*i.e.*, defensive systems that actively detect and track incoming threats and launch a ballistic, explosive, energy, or electromagnetic countermeasure(s) to neutralize the threat prior to contact with a vehicle) and parts and components “specially designed” therefor;
- (3) composite armour parts and components “specially designed” for the vehicles in this category;
- (4) spaced armour components and parts, including slat armour components and parts “specially designed” for the vehicles in this category;
- (5) reactive armour parts and components;
- (6) electromagnetic armour parts and components, including pulsed power parts and components “specially designed” therefor;
- (7) built in test equipment (BITE) to evaluate the condition of weapons or other mission systems for vehicles identified in this Category. This does not include BITE that provides diagnostics solely for a subsystem or component for the basic operation of the vehicle.
- (8) gun mount, stabilization, turret drive, and automatic elevating systems, and parts and components “specially designed” therefor;
- (9) self-launching bridge components rated class 60 or above for deployment by vehicles enumerated in this category;
- (10) suspension components as follows:
 - (i) rotary shock absorbers “specially designed” for vehicles weighing more than 30 tons in this category; or
 - (ii) torsion bars “specially designed” for the vehicles weighing more than 50 tons in this category;
- (11) kits “specially designed” to convert a vehicle enumerated in this category into either an unmanned or a driver-optional vehicle. For a kit to be controlled by this paragraph, it must, at a minimum, include equipment for:
 - (i) remote or autonomous steering;

- (ii) acceleration and braking; and
- (iii) a control system;
- (12) fire control computers, mission computers, vehicle management computers, integrated core processors, stores management systems, armaments control processors, vehicle-weapon interface units and computers;
- (13) test or calibration equipment for the mission systems of the vehicles controlled in this category, except those enumerated elsewhere; or
- * (14) any component, part, accessory, attachment, equipment, or system that:
 - (i) is classified;
 - (ii) contains classified software;
 - (iii) is manufactured using classified production data; or
 - (iv) is being developed using classified information.

Note: Parts, components, accessories, and attachments “specially designed” for vehicles enumerated in this category but not listed in Category VII(g) are subject to the EAR under ECCN 0A606.

(h) Technical data (as defined in ITAR Part 120.10) and defence services (as defined in ITAR Part 120.9) directly related to the defence articles enumerated in paragraphs (a) through (g) of this category (see ITAR Part 125.4 for exemptions).

Ground vehicles identified in ITAR Part 121.4.

(a) In Category VII, “Ground Vehicles” means developmental, production, or inventory ground vehicles, whether manned or unmanned, that:

- (1) are armed or are “specially designed” to be used as a platform to deliver munitions or otherwise destroy or incapacitate targets (e.g., firing lasers, launching rockets, firing missiles, firing mortars, firing artillery rounds, or firing other ammunition greater than .50 caliber);
- (2) are armoured support vehicles capable of off-road or amphibious use “specially designed” to transport or deploy personnel or materiel, or to move with other vehicles over land in close support of combat vehicles or troops (e.g., personnel carriers, resupply vehicles, combat engineer vehicles, recovery vehicles, reconnaissance vehicles, bridge launching vehicles, ambulances, and command and control vehicles); or
- (3) incorporate any “mission systems” controlled under this subchapter.

Note: “Mission systems” are defined as “systems” (see § 121.8(g) of this subchapter) that are defence articles that perform specific military functions, such as by providing military communication, target designation, surveillance, target detection, or sensor capabilities.

Note: “Armoured” ground vehicles, for purposes of paragraph (a) of this section, (i) are ground vehicles that have integrated, fully armoured hulls or cabs, or (ii) are ground vehicles on which add-on armour has been installed to provide ballistic protection to level III (National Institute of Justice Standard 0108.01, September 1985) or better.

Note: “Armoured” vehicles do not include those that are merely capable of being equipped with add-on armour.

Note: (b) Ground Vehicles “specially designed” for military applications that are not identified in (a) of this section are subject to the EAR under ECCN 0A606, including any unarmed ground vehicles, regardless of origin or designation, manufactured prior to 1956 and unmodified since 1955. Modifications made to incorporate safety features required by law, are cosmetic (e.g. different paint, repositioning of bolt holes), or that add parts or components otherwise available prior to 1956 are considered “unmodified” for the purposes of this subparagraph. ECCN 0A606 also includes unarmed vehicles derived from otherwise EAR99 civilian vehicles that have been modified or otherwise fitted with materials to provide ballistic protection, including protection to level III (National Institute of Justice Standard 0108.01, September 1985) or better and that do not have reactive or electromagnetic armour.

Category VIII - Aircraft and Related Articles

The objective is to revise Category VIII of the USML to describe more precisely the military aircraft and related defence articles warranting control on the USML. While many of the aircraft controlled in paragraph (a) of Category VIII are defined based on objective parameters, some are not. For example, **unmanned aerial vehicles** controlled under (a)(6) are simply described as "military." This is to differentiate those unmanned aerial vehicles currently controlled under Category VIII from those currently controlled, and **will remain so controlled, under the EAR (ECCN 9A012)**.

The articles proposed in Category VIII include the following:

(a) Aircraft (see ITAR Part 121.3) as follows:

- * (1) Bombers;
- * (2) Fighters, fighter bombers, and fixed-wing attack aircraft;
- * (3) Jet-powered trainers used to train pilots for fighter, attack, or bomber aircraft;
- * (4) Attack helicopters;
- * (5) Unarmed military unmanned aerial vehicles (UAVs);
- * (6) Armed unmanned aerial vehicles;
- * (7) Military intelligence, surveillance, and reconnaissance aircraft;
- * (8) Electronic warfare, airborne warning and control aircraft;
- (9) Air refueling aircraft and Strategic airlift aircraft;
- (10) Target drones;
- (11) Aircraft equipped with any mission systems controlled under this subchapter; or
- (12) Aircraft capable of being refueled in flight including hover-in-flight refueling (HIFR).

(b) [Reserved]

(c) [Reserved]

(d) Launching and recovery equipment "specially designed" for defence articles described in paragraph (a) of this category.

(e) [Reserved]

(f) Developmental aircraft and "specially designed" parts, components, accessories, and attachments therefor developed under a contract with the U.S. Department of Defence.

(g) [Reserved]

(h) Aircraft components, parts, accessories, attachments, and associated equipment as follows:

- (1) Components, parts, accessories, attachments, and equipment "specially designed" for the following U.S.-origin aircraft: B-1B, B-2, F-15SE, F/A18E/F/G, F-22, F-35 (and variants thereof), F-117, or United States Government technology demonstrators.

Components, parts, accessories, attachments, and equipment of the F-15SE, and F/A-18 E/F/G that are common to earlier models of these aircraft, unless listed below, are subject to the jurisdiction of the EAR;

- (2) Face gear gearboxes, split-torque gearboxes, variable speed gearboxes, synchronization shafts, interconnecting drive shafts, and gearboxes with internal pitch line velocities exceeding 15,000 feet per minute and parts and components "specially designed" therefor;
- (3) Tail boom, stabilator and automatic rotor blade folding systems and parts and components "specially designed" therefor;
- (4) Aircraft wing folding systems and parts and components "specially designed" therefor;
- (5) Tail hooks and arresting gear and parts and components "specially designed" therefor;
- (6) Bomb racks, missile launchers, missile rails, weapon pylons, pylon-to launcher adapters, UAV launching systems, and external stores support systems and parts and components "specially designed" therefor;
- (7) Damage/failure-adaptive flight control systems;
- (8) Threat-adaptive autonomous flight control systems;
- (9) Non-surface-based flight control systems and effectors, e.g., thrust vectoring from gas ports other than main engine thrust vector, "specially designed" for aircraft;
- (10) Radar altimeters with output power management or signal modulation (i.e., frequency hopping, chirping, direct sequence-spectrum spreading) LPI (low probability of intercept) capabilities;
- (11) Air-to-air refueling systems and hover-in-flight refueling (HIFR) systems and parts and components "specially designed" therefor;
- (12) UAV flight control systems and vehicle management systems with swarming capability, i.e., UAVs interact with each other to avoid collisions and stay together, or, if weaponized, coordinate targeting;
- (13) Aircraft lithium-ion batteries that provide 28 VDC or 270 VDC;
- (14) Lift fans, clutches, and roll posts for short take-off, vertical landing (STOVL) aircraft and parts and components "specially designed" for such lift fans and roll posts;
- (15) Helmet Mounted Cueing Systems, Joint Helmet Mounted Cueing Systems (JHMCS), Helmet Mounted Displays, Display and Sight Helmets (DASH), and variants thereof;
- (16) Fire control computers, mission computers, vehicle management computers, integrated core processors, stores management systems, armaments control processors, aircraft-weapon interface units and computers (e.g., AGM-88 HARM Aircraft Launcher Interface Computer (ALIC)) "specially designed" for aircraft;
- (17) Radomes "specially designed" for operation in multiple or nonadjacent radar bands or designed to withstand a combined thermal shock greater than 4.184×10^6 J/m² accompanied by a peak overpressure of greater than 50 kPa;
- (18) Drive systems and flight control systems "specially designed" to function after impact of a 7.62 mm or larger projectile; or
- (19) Any component, part, accessory, attachment, equipment, or system that:
 - (i) is classified;
 - (ii) contains classified software;
 - (iii) is manufactured using classified production data; or
 - (iv) is being developed using classified information.

(i) Technical data (as defined in § 120.10 of this subchapter) and defence services (as defined in § 120.9 of this subchapter) directly related to the defence articles enumerated in paragraphs (a) through (h) of this category. (See § 125.4 of this subchapter for exemptions.)

ITAR Part 121.3 - Aircraft and related articles.

(a) In Category VIII, except as described in (b) below, "aircraft" means developmental, production, or inventory aircraft that:

- (1) Are U.S.-origin aircraft that bear an original military designation of A, B, E, F, K, M, P, R or S;
- (2) Are foreign-origin aircraft "specially designed" to provide functions equivalent to those of the aircraft listed in (a)(1) of this section;

- (3) Are armed or are "specially designed" to be used as a platform to deliver munitions or otherwise destroy targets (e.g., firing lasers, launching rockets, firing missiles, dropping bombs, or strafing);
- (4) Are strategic airlift aircraft capable of airlifting payloads over 35,000 lbs to ranges over 2,000 nm without being refueled in-flight into short or unimproved airfields;
- (5) Are capable of being refueled inflight; or
- (6) Incorporate any "mission systems" controlled under this subchapter.

(b) Aircraft "specially designed" for military applications that are not identified in (a) of this section, including any unarmed military aircraft, regardless of origin or designation, **manufactured prior to 1956** and unmodified since manufacture are **subject to the EAR**. Modifications made to incorporate safety of flight features or other FAA or NTSB modifications such as transponders and air data recorders are considered "unmodified" for the purposes of this subparagraph.

Category X - Personal Protective Equipment and Shelters

(a) Personal protective equipment, as follows:

(1) Body armor providing a protection level equal to or greater than NIJ Type IV.

Note 1 to (a)(1): See National Institute of Justice Classification, NIJ Standard-0101.06.

Note 2 to (a)(1): For body armor providing a level of protection of Type I, Type II, Type IIA, Type IIIA, or Type III, see ECCNs 1A005 and 1A613.

(2) Personal protective clothing, equipment, or face paints "specially designed" to protect against or reduce detection by radar, IR, or other sensors at wavelengths greater than 900 nanometers.

Note to (a)(2): See Category XIII(j) for controls on related materials.

(3) [Reserved]

(4) [Reserved]

(5) Integrated helmets, not specified in Category VIII (h)(15) or Category XII, incorporating optical sights or slewing devices, which include the ability to aim, launch, track, or manage munitions.

(6) Helmets and helmet shells providing a protection level equal to or greater than NIJ Type IV.

(7) Goggles, spectacles, or visors, employing other than common broadband absorptive dyes and UV inhibitors as a means of protection (e.g., narrow band filters/dyes or broadband limiters/coatings with high visible transparency), with optical density greater than 3 that protect against:

- (i) Visible (in-band) wavelengths;
- (ii) Thermal flashes associated with nuclear detonations; or
- (iii) Near infrared or ultraviolet (out-of-band) wavelengths.

Note 1 to (a)(7): See Category XIII(j) for controls on related materials.

Note 2 to (a)(7): See Category XII for sensor protection equipment.

(8) Developmental personal protective equipment and shelters and "specially designed" parts, components, accessories, and attachments therefor, developed under a contract with the U.S. Department of Defence.

Note to (a)(8): Developmental personal protective equipment and shelters, and "specially designed" parts, components, accessories, and attachments therefor, determined to be subject to the EAR via a commodity jurisdiction determination (see § 120.4 of this subchapter) are not controlled by this paragraph.

(b) [Reserved]

(c) [Reserved]

(d) Parts, components, assemblies, and associated equipment for the personal protective equipment controlled in this category as follows:

- (1) Ceramic or composite plates that provide protection equal to or greater than NIJ Type IV.
- (2) Lenses for the goggles, spectacles, and visors controlled in paragraph (a)(7) of this category.
- (3) Any component, part, accessory, attachment, equipment, or system that:
 - (i) Is classified;
 - (ii) Contains classified software;
 - (iii) Is manufactured using classified production data; or
 - (iv) Is being developed using classified information.

(e) Technical data (as defined in S. 120.10 of this subchapter) and defence services (as defined in § 120.9 of this subchapter) directly related to the defence articles enumerated in paragraphs (a) through (d) of this category.

(f) [Reserved]

Category XII – Fire Control, Range Finder, Optical and Guidance and Control Equipment

It is not yet known what items and technologies will be proposed for removal from the USML. As Canada is a significant manufacturer of items that fall under this Category, any changes could have a major impact on Canadian industry. Proposed rule changes are expected in the near future (07 June 2012).

Category XIII – Auxiliary Military Equipment

It is proposed to remove a significant number of items and their related parts and components from Category XIII and place them in the CCL. Below is the proposed Category XIII.

(a) Reserved

(b) Information security/information assurance systems and equipment, cryptographic devices, software and components “specially designed” for military applications (e.g., command, control and communications (C3), and government intelligence applications), as follows:

- (1) Military cryptographic (including key management) systems, equipment assemblies, modules, integrated circuits, components or software (e.g., cryptographic interfaces) capable of maintaining secrecy or confidentiality of information or information systems, including equipment and software for tracking, telemetry and control (TT&C) encryption and decryption;
- (2) Military cryptographic (including key management) systems, equipment, assemblies, modules, integrated circuits, components and software (e.g., cryptographic interfaces) capable of generating spreading or hopping codes for spread spectrum systems or equipment;
- (3) Military cryptanalytic systems, equipment, assemblies, modules, integrated circuits, components or software;
- (4) Military systems, equipment, assemblies, modules, integrated circuits, components and software that provide certified or certifiable multi-level security or user isolation, or control of the exchange of or access to information between or among systems operating at different classification levels, and software to certify such systems, equipment or software;

(5) Ancillary equipment specifically designed, developed, modified, adapted, or configured for the articles in paragraphs (b)(1) – (b)(4) of this category.

(c) Reserved

(d) Ablative Materials, as follows:

(1) Ablative materials fabricated or semi-fabricated from advanced composites (e.g., silica, graphite, carbon, carbon/carbon and boron filaments) "specially designed" for the articles in Category IV; or

(2) Carbon/carbon billets and preforms which are reinforced with continuous unidirectional fibres, tows, tapes, or woven cloths in three or more dimensional planes.

(e) Armour (e.g., organic, ceramic, metallic), active armour or reactive armour, and armour materials, as follows:

(1) Developmental armour developed under contract with the U.S. DOD;

(2) Spaced armour with Em greater than 1.4 and meeting NIJ Level III or better;

(3) Transparent armour having Em greater than or equal to 1.3 or having Em less than 1.3 and meeting NIJ Level III standards with areal density less than or equal to 40 pounds per square foot;

(4) Transparent ceramic plate greater than ¼ inch-thick and larger than 8 inches X 8 inches, exchanging glass for transparent armour;

(5) Non-transparent ceramic plate or blanks greater than ¼ inches thick and larger than 8 inches X 8 inches for transparent armour. This includes spinel aluminum oxynitride (ALON);

(6) Composite armour with Em greater than 1.4 and meeting NIJ Level III or better; or

(7) Metal laminate armour with Em greater than 1.4 and meeting NIJ Level III or better.

(f) Any material that:

(1) Is classified;

(2) Is manufactured using classified production data; or

(3) Is being developed using classified information.

"Classified" means classified pursuant to Executive Order 13526, or predecessor order, and a security classification guide developed pursuant thereto or equivalent, or to the corresponding classification rules of another government.

(g) Concealment and deception equipment, as follows (MT):

*(1) Polymers loaded with carbonyl iron powder, ferrites, iron whiskers, fibers, flakes, or other magnetic additives having a surface resistivity of less than 5000 ohms/square and isotropy of less than 5%;

(2) Multi-layer camouflage systems "specially designed" to reduce detection of platforms or equipment in

the infrared or ultraviolet frequency spectrums;

* (3) High temperature (greater than 300 deg F operation) ceramic or magnetic radar absorbing material (RAM) "specially designed" for use on defence articles or military items subject to the EAR; or

* (4) Broadband (greater than 30% bandwidth) lightweight (less than 2 lbs/ sq ft) magnetic radar absorbing material (RAM) "specially designed" for use on defence articles or military items subject to the EAR.

(h) Energy conversion devices, as follows:

(1) Fuel cells "specially designed" for platforms or soldier systems specified in this subchapter;

(2) Thermal engines "specially designed" for platforms or soldier systems specified in this subchapter;

(3) Thermal batteries (MT); or

(4) Thermionic generators.

(i) Signature reduction software, technical data, and services, as follows (MT):

* (1) Software associated with the measurement or modification of system signatures;

* (2) Software for design of low observable platforms;

* (3) Software for design, analysis, prediction, or optimization of signature management solutions;

* (4) Radar cross section or infrared signature measurement or prediction software;

* (5) Signature management techniques, codes, and algorithms;

* (6) Signature control design methodology;

* (7) Processes that use microencapsulation or micro-spheres to reduce infrared, radar, or visual detection of platforms or equipment;

* (8) Multi-layer camouflage system techniques to reduce detection of platforms or equipment;

* (9) Multi-spectral surface treatment techniques to modify infrared, visual or radio frequency signatures of platforms or equipment;

* (10) Shaping, active, or passive techniques to modify platform or equipment visual, electro-optical, radiofrequency, electric, magnetic, electromagnetic, or wake signatures (e.g., low probability of intercept (LPI) techniques, methods or applications); or

* (11) Shaping, active, or passive techniques to modify defence articles' acoustic signatures.

* (j) Equipment, materials, coatings, and treatments not elsewhere specified, as follows:

(1) Laser eye-safe media including narrow band dyes/coatings and wide band non-linear optical material "specially designed" for goggles, spectacles, or visors that provide narrow band filtering or broad band limiting with optical density greater than 3 that protect against:

(i) Visible (in-band) wavelengths;

(ii) Thermal flashes associated with nuclear detonations; or

(iii) Near Infrared or Ultra Violet (outof-band) wavelengths. **Note:** See Category X(a)(7).

(2) Specially treated or formulated dyes, coatings, and fabrics used in the design, manufacture, or production of personnel protective clothing, equipment, or face paints designed to protect against or reduce detection by radar, infrared, or other sensors at wavelengths greater than 900 nanometers.

Note: See Category X(a)(2).

(3) Equipment, materials, coatings, and treatments that are “specially designed” to modify the electro-optical, radiofrequency, infrared, electric, laser, magnetic, electromagnetic, acoustic, electro-static, or wake signatures of defence articles or military items subject to the EAR through control of absorption, reflection, or emission.

(k) Tooling and equipment, as follows:

(1) Tooling and equipment “specially designed” for production of low observable (LO) components; or

(2) Portable platform signature field repair validation equipment (e.g., portable optical interrogator that validates integrity of a repair to a signature reduction structure).

(l) Technical data (as defined in § 120.10 of this subchapter), and defence services (as defined in § 120.9 of this subchapter) directly related to the defence articles enumerated in paragraphs (a) through (h), (j), and (k) of this category. (See also § 123.20 of this subchapter.) (MT for technical data and defence services related to articles designated as such.)

(m) The following interpretations explain and amplify terms used in this category and elsewhere in this subchapter:

(1) Composite armor is defined as having more than one layer of different materials or a matrix.

(2) Spaced armors are metallic or non-metallic armors that incorporate an air space or obliquity or discontinuous material path effects as part of the defeat mechanism.

(3) Reactive armor employs explosives, propellants, or other materials between plates for the purpose of enhancing plate motion during a ballistic event or otherwise defeating the penetrator.

(4) Electromagnetic armor (EMA) employs electricity to defeat threats such as shaped charges.

(5) Materials used in composite armor could include layers of metals, plastics, elastomers, fibers, glass, ceramics, ceramic-glass reinforced plastic laminates, encapsulated ceramics in a metallic or non-metallic matrix, functionally gradient ceramic-metal materials, or ceramic balls in a cast metal matrix.

(6) For this Category, a material is considered transparent if it allows 75% or greater transmission of light in the visible spectrum through a 1 mm thick nominal sample.

(7) The material controlled in paragraph (e)(3) of this category has not been treated to reach the 75% transmission level referenced in (m)(6) of this category.

(8) Metal laminate armors are two or more layers of metallic materials which are mechanically or adhesively bonded together to form an armor system.

(9) Em is the line-of-sight target mass effectiveness ratio and provides a measure of the tested armor's performance to that of rolled homogenous armor, where Em is defined as follows:

Where:

rRHA = density of RHA, (7.85 g/cm³)

Po = Baseline Penetration of RHA, (mm)

Pr = Residual Line of Sight Penetration,
either positive or negative (mm RHA equivalent)

ADTARGET = Line-of-Sight Areal Density of

Target (kg/m²)

(10) NIJ is the National Institute of Justice and Level III refers to the requirements specified in NIJ standard 0108.01 Ballistic Resistant Protective.

USML Category XIX - Gas Turbine Engines and Associated Equipment

The US proposes to introduce USML Category XIX to cover gas turbine engines and associated equipment currently covered in Categories VI, VII, and VIII. The USML identifies engine subcategories in all three of these categories, but there has been confusion concerning the controls in Category VI (which currently lists only "naval nuclear propulsion plants," leading exporters to question whether other types of propulsion systems are controlled as "components" in Category VI(f)), Category VII (which controls both diesel and gas turbine engines under the same general term "engines" in Category VII(f)), and Category VIII (which controls "military aircraft engines" but not reciprocating engines).

The intent of this change is to make clear that gas turbine engines for surface vessels, vehicles, and aircraft that meet certain objective parameters are controlled on the USML. All other engines are controlled **under the EAR**.

Category XIX - Gas Turbine Engines and Associated Equipment, as follows:

*(a) Turbofan and Turbojet engines, whether in development, production, or inventory (including technology demonstrators), capable of 15,000 lbf (66.7 kN) of thrust or greater that have any of the following:

- (1) with or capable of thrust augmentation (afterburner);
- (2) thrust or exhaust nozzle vectoring;
- (3) contains parts or components controlled in paragraph (f)(4) of this category;
- (4) capable of inverted flight;
- (5) capable of high power extraction (greater than 50 percent of engine thrust) at altitudes greater than 40,000 feet; or
- (6) capable of directed flow thrust reversing using bypass/fan and core flow air and also capable for being deployed in flight.

*(b) Turboshift and Turboprop engines, whether in development, production, or inventory (including technology demonstrators), capable of 1500 shp (1119 kW) or greater that have any of the following:

- (1) Cooled low pressure turbine, cooled intermediate pressure turbine, or cooled power turbine;
- (2) contains parts or components controlled in paragraph (f)(4)(i) or (f)(4)(ii) of this category; or
- (3) capable of oil sump sealing when the engine is in the vertical position.

(c) Engines, whether in development, production, or inventory (including technology demonstrators), "specially designed" for armed or military unmanned aerial vehicle systems, cruise missiles, or target drones.

*(d) AGT1500, CTS800, TF40B, T55, TF60, T700, and TF50 engines.

*(e) Digital engine controls (e.g., Full Authority Digital Engine Controls (FADEC) and Digital Electronic Engine Controls (DEEC)) "specially designed" for gas turbine engines controlled in this category.

(f) Components, parts, accessories, attachments, or associated equipment as follows:

(1) components, parts, accessories, attachments, and equipment "specially designed" for the following U.S.-origin engines (and military variants thereof): AE1107C, F101, F107, F112, F118, F119, F120, F124, F125, F135, F136, F414, F415, J402, GE38, TF40B, and TF60;

Note: Digital engine controls (e.g., Full Authority Digital Engine Controls (FADEC) and Digital Electronic Engine Controls (DEEC)) "specially designed" for the engines identified in (f)(1) of this category are controlled by (e) of this category.

*(2) hot section components (i.e., combustors, turbine blades, vanes, nozzles, disks and shrouds) "specially designed" for gas turbine engines controlled in this category and related cooled components (i.e., cooled low pressure turbine blades, vanes, disks; cooled augmenters; and cooled nozzles) "specially designed" for gas turbine engines controlled in this category. The cowl, diffuser, dome, chamber, shells, and liners for the combustors are also controlled by this paragraph;

(3) engine monitoring systems (i.e., prognostics, diagnostics, and health) "specially designed" for gas turbine engines and components controlled in this category; or

(4) any component, part, accessory, attachment, equipment, or system that:

- (i) is classified;
 - (ii) contains classified software;
 - (iii) is manufactured using classified production data; or
 - (iv) is being developed using classified information.
- (g) Technical data and defence services directly related to the defence articles enumerated in paragraphs (a) through (f) of this category.

USML Category XX - Submersibles and Related Articles

This proposed rule revises USML Category XX, covering submersible vessels and related articles (see ITAR Part 121.14 for list of vessel types). The proposed revision accounts for the movement of submarines from Category VI and consolidates the controls that will apply to all submersible vessels in a single category. In addition, naval nuclear propulsion power plants for submersible vessels controlled under Category XX, formerly controlled under Category VI(e), will now be controlled under Category XX(b), as follows:

(a) Submersible and semi-submersible vessels that are:

- *(1) submarines;
- (2) mine countermeasure vehicles;
- (3) anti-submarine warfare vehicles;
- (4) armed;
- (5) swimmer delivery vehicles "specially designed" for the deployment, recovery, or support of swimmers or divers from submarines;
- (6) vessels equipped with any mission systems controlled under the USML; or
- *(7) developmental vessels developed under a contract with the U.S. Department of Defence.

*(b) Naval nuclear propulsion plants, their land prototypes, and special facilities for their construction, support, and maintenance (see ITAR Part 123.20 for types).

(c) Components, parts, accessories, attachments, and associated equipment “specially designed” for any of the articles in paragraphs (a) and (b) of this category.

Note to paragraph (c): Parts, components, accessories, and attachments that are common to vessels subject to the EAR, or that are enumerated on the CCL or elsewhere in the ITAR are not included in paragraph (c).

The proposed rule controls only those parts, components, accessories, and attachments that are specifically designed for an article controlled in Category XX. All other parts, components, accessories, and attachments will be **subject to the EAR**.

(d) Technical data (as defined in ITAR Part 120.10) and defence services (as defined in § 120.9 of this subchapter) directly related to the defence articles enumerated in paragraphs (a) through (c) of this category.