

**Ref: CIB 15/18/2 XII**

## **LEGISLATIVE COUNCIL BRIEF**

Import and Export Ordinance  
(Chapter 60)

### **IMPORT AND EXPORT (STRATEGIC COMMODITIES) REGULATIONS (AMENDMENT OF SCHEDULES 1 AND 2) ORDER 2001**

#### **INTRODUCTION**

The Director-General of Trade and Industry has made the Import and Export (Strategic Commodities) Regulations (Amendment of Schedules 1 and 2) Order 2001 (“the Order”) to amend Schedules 1 and 2 to the Import and Export (Strategic Commodities) Regulations (“the Regulations”) to reflect the changes made by four international non-proliferation regimes to their control lists of strategic commodities. The Order is at Annex.

#### **BACKGROUND AND ARGUMENT**

2. The Regulations provide for licensing controls on the import, export, transshipment, and in some cases, transit of strategic commodities which include materials, equipment and technology capable of use for both industrial and military purposes. The licensing system is administered by the Trade and Industry Department and enforced by the Customs and Excise Department.

3. Schedules 1 and 2 to the Regulations set out the items under control. They have been drawn up on the basis of the control lists adopted by the various international non-proliferation regimes and convention, i.e. the Wassenaar Arrangement (WA), Australia Group (AG), Missile Technology Control Regime (MTCR), Nuclear Suppliers Group (NSG), and Chemical Weapons Convention (CWC). To keep pace with developments in export control of strategic commodities in the international scene, the Government has kept the Schedules under constant review and, where appropriate, amended them to take account of updates made by the international regimes to their respective control lists. Schedule 1 to the Regulations was last amended in January 2000.

4. Under Section 6B of the Import and Export Ordinance, the Director-General of Trade and Industry may, by order published in the Gazette, replace the Schedules to the Regulations or amend them to add or remove an article or class of articles to or from the Schedules to the Regulations.

## **THE ORDER**

5. The Order amends Schedules 1 and 2 to the Regulations to reflect changes made by the WA, MTCR, AG and NSG to their respective control lists. The major changes are:

- (a) the WA, which governs the controls over dual-use industrial goods and conventional weapons, has revised its control list in respect of a number of items, including the relaxation of the control threshold on the performance of microprocessors (from 3,500 million theoretical operations per second (Mtops) to 6,500 Mtops) and of computers (from 6,500 Mtops to 28,000 Mtops). Retail encryption products satisfying certain conditions are also released from control;
- (b) the MTCR, which focuses on controls on transfer of missile technology and equipment, has revised among others, the control on purity content of certain metallic elements in metal fuels;
- (c) the AG, which maintains controls over chemical and biological weapons agents, precursors and production equipment and technology, has relaxed the control on botulinum toxins for products formulated for human administration; and
- (d) the NSG, which governs controls over nuclear weapons and nuclear related dual use materials, equipment and technology, has added to its control list production plants for the conversion of plutonium.

## **PUBLIC CONSULTATION**

6. The amendments made by the Order are technical in nature. It is considered that public consultation is not necessary. The Trade and Industry Department will inform traders of the details of the amended Schedules through circulars and general enquiry service.

## **FINANCIAL AND STAFFING IMPLICATIONS**

7. The additional workload arising from the Order is insignificant and will be absorbed within the existing resources of the Trade and Industry Department and the Customs and Excise Department.

## **ECONOMIC IMPLICATIONS**

8. The Order will facilitate the trade by removing outdated restrictions on trade in strategic commodities. In particular, many traders will be relieved of the burden of taking out import and export licences for a variety of commonly used microprocessors, computers and software with encryption features.

## **LEGISLATIVE TIMETABLE**

9. The Order will be tabled at the Legislative Council on 13 June 2001.

## **PUBLICITY**

10. The Order will be published in the Gazette on 8 June 2001 and a press release will be issued on the same date. A spokesman will be available for answering media enquiries.

## **ENQUIRIES**

11. For any enquiries on this brief, please contact Miss Doris Chan, Principal Trade Officer of the Trade and Industry Department, at 2398 5554.

**IMPORT AND EXPORT (STRATEGIC COMMODITIES) REGULATIONS  
(AMENDMENT OF SCHEDULES 1 AND 2) ORDER 2001**

(Made under section 6B of the Import and  
Export Ordinance (Cap. 60))

**1. Commencement**

This Order shall come into operation, if the Legislative Council does not by resolution repeal the Order under section 6B of the Import and Export Ordinance (Cap. 60) before the expiry of the period to repeal it, on a day to be appointed by the Director-General of Trade and Industry by notice published in the Gazette after the expiry of that period.

**2. Strategic Commodities**

Schedule 1 to the Import and Export (Strategic Commodities) Regulations (Cap. 60 sub. leg.) is amended -

- (a) under the subheading "*MUNITIONS LIST*", by adding before "*GENERAL TECHNOLOGY NOTE (for the Munitions List)*" -

*Notes:*

1. Terms in "quotations" are defined terms. Refer to 'Definitions of Terms' annexed to these Lists.
2. CAS numbers are shown as examples. They do not cover all the chemicals and

mixtures controlled by the Munitions List.";

- (b) in the Munitions List, in ML1(d), by repealing "clips and flash suppressers" and substituting "clips, weapons sights and flash suppressers";
- (c) in the Munitions List, in ML2, by adding -
  - "(c) Weapons sights;"
- (d) in the Munitions List, in ML3, in the Notes, by adding -
  - "3. ML3 does not control cartridges specially designed for any of the following purposes:
    - (a) Signalling;
    - (b) Bird scaring; *or*
    - (c) Lighting of gas flares at oil wells.";
- (e) in the Munitions List, in ML4 -
  - (i) in ML4(a), by repealing ""military pyrotechnics"" and substituting ""military pyrotechnic" devices";
  - (ii) by adding under the Note to ML4(b) -
    - "Technical Note:*
    - Hand-held devices, limited by design solely to the detection of metal objects and incapable of distinguishing between mines and other metal objects, are not

considered to be specially designed for the detection of items controlled by ML4(a).";

- (f) in the Munitions List, in ML5 -
  - (i) by repealing "related systems and countermeasure equipment" and substituting "related systems, test and alignment and countermeasure equipment";
  - (ii) by adding -
    - "(d) Field test or alignment equipment, specially designed for items controlled by ML5(a) or ML5(b).";
- (g) in the Munitions List, in ML6, in Note 3, by repealing "automobiles or bank trucks having armoured protection" and substituting "automobiles or trucks designed for transporting money or valuables, having armoured protection";
- (h) in the Munitions List, in ML7 -
  - (i) by repealing "Toxicological agents, "tear gases", related equipment" and substituting "Chemical or biological toxic agents, "tear gases", radioactive materials, related equipment";
  - (ii) by repealing the Note before ML7(a);
  - (iii) by repealing ML7(d) and substituting -

- "(d) Equipment specially designed or modified for the dissemination of any of the following and specially designed components therefor:
- (1) Materials or agents controlled by ML7(a) or ML7(c); *or*
  - (2) CW made up of precursors controlled by ML7(b);"
- (iv) in ML7(e), by adding "or ML7(c)" after "ML7(a)";
- (v) in ML7(f), by adding "or ML7(c)" after "ML7(a)";
- (vi) by repealing Note 3 and substituting -
- "3. ML7(a) and ML7(c) do not control:
- (a) Cyanogen chloride (CAS 506-77-4);
  - (b) Hydrocyanic acid (CAS 74-90-8);
  - (c) Chlorine (CAS 7782-50-5);
  - (d) Carbonyl chloride (phosgene) (CAS 75-44-5);
  - (e) Diphosgene (trichloromethylchloroformate)

- (CAS 503-38-8);
  - (f) Ethyl bromoacetate (CAS 105-36-2);
  - (g) Xylyl bromide, ortho: (CAS 89-92-9), meta: (CAS 620-13-3), para: (CAS 104-81-4);
  - (h) Benzyl bromide (CAS 100-39-0);
  - (i) Benzyl iodide (CAS 620-05-3);
  - (j) Bromo acetone (CAS 598-31-2);
  - (k) Cyanogen bromide (CAS 506-68-3);
  - (l) Bromo methylethylketone (CAS 816-40-0);
  - (m) Chloro acetone (CAS 78-95-5);
  - (n) Ethyl iodoacetate (CAS 623-48-3);
  - (o) Iodo acetone (CAS 3019-04-3);
  - (p) Chloropicrin (CAS 76-06-2).";
- (i) in the Munitions List, in ML8 -

- (i) by repealing ML8(a)(4) and substituting -
  - "(4) Deleted (this item is transferred to 1c011(d) of the Dual-use Goods List);";
- (ii) in ML8(e)(26)(b), by repealing "tris[dioctyl]pyrophosphate" and substituting "tris[dioctyl]pyrophosphate";
- (iii) in ML8(e)(33), by repealing "polyamine and its salts" and substituting "polyamines and their salts";
- (iv) in ML8(e)(34), by repealing "polyamine adducted with glycidol and its salts" and substituting "polyamines adducted with glycidol and their salts";
- (j) in the Munitions List, in ML9(a), by repealing "Combatant vessels or vessels (surface or underwater)" and substituting "Combatant vessels and vessels (surface or underwater)";
- (k) in the Munitions List, in ML10(h)(1)(a), by repealing "Pin point dropping of military personnel" and substituting "Pin point dropping of rangers";
- (l) in the Munitions List, in ML13(b), by adding ", and specially designed components therefor" after "military systems";
- (m) in the Munitions List, in ML17 -

- (i) in ML17(k), by repealing "*and*" at the end;
- (ii) by adding -
  - "(m) Bridges specially designed for military use; *and*
  - (n) Test models specially designed for the "development" of items controlled by ML4, ML6, ML9 or ML10;"
- (n) in the Munitions List, in ML18 -
  - (i) in Note 2(b)(8), by repealing "(Note 2. (b)(8) of ML18 does not allow the export of "technology" or production equipment for non-antique small arms, even if used to produce reproductions of antique small arms.)";
  - (ii) by repealing Note 3 and substituting -
    - "3. Note 2(b)(8) to ML18 does not release from controls "technology" or production equipment for non-antique small arms, even if used to produce reproductions of antique small arms.";
  - (iii) by adding -
    - "4. ML18(d) does not control "technology" for civil

purposes, such as agricultural, pharmaceutical, medical, veterinary, environmental, waste management, or in the food industry.

*N.B.:*

See Note 4 to ML7.";

- (o) in the Munitions List, in ML19, by adding -
  - "(f) Continuous wave or pulsed "laser" systems specially designed to cause permanent blindness to unenhanced vision, i.e. to the naked eye or to the eye with corrective eyesight devices;"
- (p) in the Munitions List, in ML21 -
  - (i) in ML21(b)(1)(d), by adding "or Command, Communications, Control, Computer and Intelligence (C4I)" after "(C3I)";
  - (ii) in ML21(b), by adding -
    - "(3) "Software", not controlled by ML21(a), ML21(b)(1) or ML21(b)(2), specially designed or modified to enable equipment not controlled by the Munitions List to perform the military functions of equipment controlled by ML5, ML7(f),

ML9(c), ML9(e), ML10(e), ML11,  
ML14, ML15, ML17(i) or ML18;"

- (q) in the Dual-use Goods List, in Category 0, in sub-category 0B -
- (i) in 0B003, by adding -
    - "(i) Systems for the conversion of UO<sub>2</sub> to UCl<sub>4</sub>;"
  - (ii) in 0B006, in the Note, by repealing paragraphs (f) and (g);
  - (iii) in 0B006, in the Note, by renumbering paragraph (h) as paragraph (f);
  - (iv) by adding -
    - "0B007 Plant for the conversion of plutonium and equipment specially designed or prepared therefor, as follows:
      - (a) Systems for the conversion of plutonium nitrate to oxide;
      - (b) Systems for plutonium metal production;"
- (r) in the Dual-use Goods List, in Category 0, in sub-category 0C, by repealing 0C004 and substituting -
- "0C004 Graphite, nuclear grade, having a purity level of less than 5 parts

per million 'boron equivalent' and with a density greater than 1.5 g/cm<sup>3</sup>;

*N.B.:*

See also 1C107.

*Notes:*

1. 0C004 does not control the following:
  - (a) Manufactures of graphite having a mass less than 1 kg, other than those specially designed or prepared for use in a nuclear reactor;
  - (b) Graphite powder.
2. In 0C004, 'boron equivalent' (BE) is defined as the sum of BE<sub>Z</sub> for impurities (excluding BE<sub>carbon</sub> since carbon is not considered an impurity) including boron, where:

$$\text{BE}_Z(\text{ppm}) = \text{CF} \times$$

concentration of element  
Z in ppm;

where CF is the conversion

$$\text{factor} = \frac{\sigma_Z A_B}{\sigma_B A_Z}$$

and  $\sigma_B$  and  $\sigma_Z$  are the thermal neutron capture cross sections (in barns) for naturally occurring boron and element Z respectively; and  $A_B$  and  $A_Z$  are the atomic masses of naturally occurring boron and element Z respectively.";

- (s) in the Dual-use Goods List, in Category 1, in sub-category 1A -
- (i) in 1A001(c), by repealing "one vinylether monomer" and substituting "one vinylether group as a constitutional unit";
  - (ii) in 1A002(a), by adding at the end -
    - Note:*
    - 1A002(a) does not control finished or semi-finished items specially designed for purely civilian applications as follows:
      - (a) Sporting goods;
      - (b) Automotive industry;
      - (c) Machine tool industry;

- (d) Medical applications.";
- (iii) in 1A003, by repealing "with either of the following characteristics";
- (iv) in 1A004, by repealing "components, other than those controlled by the Munitions List" and substituting "components not specially designed for military use";
- (v) in 1A005, by repealing "other than those manufactured to military standards or specifications or to their equivalents in performance" and substituting "not manufactured to military standards or specifications, nor to their equivalents in performance";
- (vi) by repealing 1A102 and substituting -
  - "1A102 Resaturated pyrolyzed carbon-carbon components designed for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;"
- (vii) by repealing 1A226 and substituting -
  - "1A226 Specialized packings which may be used in separating heavy water from ordinary water, having both of the following characteristics:

- (a) Made of phosphor bronze mesh chemically treated to improve wettability; *and*
- (b) Designed to be used in vacuum distillation towers;"

(viii) by repealing 1A227 and substituting -

"1A227 High-density (lead glass or other) radiation shielding windows, having all of the following characteristics, and specially designed frames therefor:

- (a) A 'cold area' greater than 0.09 m<sup>2</sup>;
- (b) A density greater than 3 g/cm<sup>3</sup>; and
- (c) A thickness of 100 mm or greater;

Technical Note:

In 1A227, the term 'cold area' means the viewing area of the window exposed

to the lowest level of radiation in the design application.";

(t) in the Dual-use Goods List, in Category 1, in sub-category 1B -

(i) by repealing 1B002 and substituting -

"1B002 Equipment for producing metal alloys, metal alloy powder or alloyed materials, specially designed to avoid contamination and specially designed for use in one of the processes specified in 1C002(c)(2);";

(ii) by repealing 1B201 and substituting -

"1B201 Filament winding machines, other than those specified in 1B001 or 1B101, and related equipment, as follows:

(a) Filament winding machines having all of the following characteristics:

- (1) Having motions for positioning, wrapping, and winding fibres coordinated and programmed in two or more axes;
- (2) Specially designed to fabricate composite structures or laminates from "fibrous or filamentary materials"; *and*
- (3) Capable of winding cylindrical rotors of diameter between 75 mm and 400 mm and lengths of 600 mm or greater;

- (b) Coordinating and programming controls for the filament winding machines specified in 1B201(a);
  - (c) Precision mandrels for the filament winding machines specified in 1B201(a);";
- (iii) by repealing 1B228(c) and substituting -
- "(c) Constructed of either:
    - (1) Stainless steel of the 300 series with low sulphur content and with an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; *or*
    - (2) Equivalent materials which are both cryogenic and H2-compatible; *and*";
- (iv) in 1B228, by repealing the Technical Note;
- (v) by repealing 1B229 and substituting -

"1B229

Water-hydrogen sulphide exchange tray columns and 'internal contactors', as follows:

*N.B.:*

For columns which are specially designed or prepared for the production of heavy water, see 0B004.

(a) Water-hydrogen sulphide exchange tray columns, having all of the following characteristics:

- (1) Can operate at pressures of 2 MPa or greater;
- (2) Constructed of carbon steel having an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; *and*

- (3) With a diameter of 1.8 m or greater;
- (b) 'Internal contactors' for the water-hydrogen sulphide exchange tray columns specified in 1B229(a);

*Technical Note:*

'Internal contactors' of the columns are segmented trays which have an effective assembled diameter of 1.8 m or greater, are designed to facilitate countercurrent contacting and are constructed of stainless steels with a carbon content of 0.03% or less. These may be sieve trays, valve trays, bubble

cap trays, or turbogrid  
trays.";

- (u) in the Dual-use Goods List, in Category 1, in sub-category 1C -
  - (i) in 1C001(a), in Note 2, by repealing "in 1C001(a)" and substituting "in Note 1";
  - (ii) by repealing 1C002 and substituting -

"1C002 Metal alloys, metal alloy powder  
and alloyed materials, as follows:

*N.B.:*

See also 1C202.

*Note:*

1C002 does not control metal alloys, metal alloy powder and alloyed materials for coating substrates.

*Technical Notes:*

1. The metal alloys in 1C002 are those containing a higher percentage by weight of the stated metal than of any other element.

2. Stress-rupture life should be measured in accordance with ASTM standard E-139 or national equivalents.
3. Low cycle fatigue life should be measured in accordance with ASTM Standard E-606 'Recommended Practice for Constant - Amplitude Low-Cycle Fatigue Testing' or national equivalents. Testing should be axial with an average stress ratio equal to 1 and a stress-concentration factor (Kt) equal to 1. The average stress is defined as maximum stress minus minimum stress divided by maximum stress.

(a) Aluminides, as follows:

(1) Nickel aluminides containing a minimum of 15 weight percent aluminium, a maximum of 38 weight percent aluminium and at least one additional alloying element;

(2) Titanium aluminides containing 10 weight percent or more aluminium and at least one additional alloying element;

(b) Metal alloys, as follows, made from

material controlled by  
1C002(c):

(1) Nickel alloys  
with:

(a) A stress-rupture life of 10 000 hours or longer at 923 K (650 °C ) at a stress of 676 MPa;  
*or*

(b) A low cycle fatigue life of 10 000 cycles or more at 823 K (550 °C ) at a maximum stress of 1 095 MPa;

(2) Niobium alloys  
with:

(a) A stress-rupture life of 10 000 hours or longer at 1 073 K (800 °C ) at a stress of 400 MPa;  
*or*

(b) A low cycle fatigue life of 10 000 cycles or more at 973 K (700 °C ) at a maximum stress of 700 MPa;

(3) Titanium alloys with:

(a) A stress-rupture life of 10 000

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hours or  
longer at  
723 K  
(450 °C )  
at a  
stress of  
200  
MPa; *or*

(b) A low  
cycle  
fatigue  
life of  
10 000  
cycles or  
more at  
723 K  
(450 °C )  
at a  
maximu  
m stress  
of 400  
MPa;

(4) Aluminium  
alloys with a  
tensile  
strength of:

(a) 240 MPa  
or more  
at 473 K  
(200 °C );  
*or*

(b) 415 MPa  
or more  
at

(5) Magnesium alloys with:

(a) A tensile strength of 345 MPa or more; and

(b) A corrosion rate of less than 1 mm/year in 3% sodium chloride aqueous solution measured in accordance with ASTM standard G-31 or national equivalents;

(c) Metal alloy powder or particulate material, having all of the

following

characteristics:

- (1) Made from any of the following composition systems:

*Technical*

*Note:*

X in the following equals one or more alloying elements.

- (a) Nickel alloys (Ni-Al-X, Ni-X-Al) qualified for turbine engine parts or components, i.e. with less than 3 non-metallic particles (introduced during the manufacturing

process)  
larger than  
100  $\mu$  m in  
109 alloy  
particles;

- (b) Niobium alloys (Nb-Al-X or Nb-X-Al, Nb-Si-X or Nb-X-Si, Nb-Ti-X or Nb-X-Ti);
- (c) Titanium alloys (Ti-Al-X or Ti-X-Al);
- (d) Aluminium alloys (Al-Mg-X or Al-X-Mg, Al-Zn-X or Al-X-Zn, Al-Fe-X or Al-X-Fe); or

(e) Magnesium alloys (Mg-Al-X or Mg-X-Al);

(2) Made in a controlled environment by any of the following processes:

(a) "Vacuum atomisation";

(b) "Gas atomisation";

(c) "Rotary atomisation";

(d) "Splat quenching";

(e) "Melt spinning" and "comminution";

(f) "Melt extraction" and "comminution";

*or*

(g) "Mechanical alloying";

*and*

(3) Capable of forming materials controlled by 1C002(a) or 1C002(b);

(d) Alloyed materials, having all of the following characteristics:

(1) Made from any of the composition systems specified in 1C002(c)(1);

(2) In the form of uncomminuted flakes, ribbons or thin rods;  
*and*

(3) Produced in a controlled environment by

any of the following:

- (a) "Splat quenching";
- (b) "Melt spinning"; *or*
- (c) "Melt extraction";

- (iii) in 1C004(b), by repealing "1 250" and substituting "880";
- (iv) in 1C006(a)(1) -
  - (A) by repealing "hydrocarbon oils or";
  - (B) by repealing "*Note:*" and substituting "*Technical Note:*";
- (v) in 1C006(a)(2), by repealing "*Note:*" and substituting "*Technical Note:*";
- (vi) by repealing 1C007(c) and substituting -
  - "(c) Ceramic-ceramic "composite" materials with a glass or oxide-"matrix" and reinforced with fibres having all of the following:
    - (1) Made from any of the following materials:
      - (a) Si-N;
      - (b) Si-C;

(c) Si-Al-O-N; *or*

(d) Si-O-N; *and*

(2) Having a specific tensile strength exceeding  $12.7 \times 10^3 \text{m}$ ;"

(vii) in 1C011(a), by repealing -

*"N.B.:*

The metals or alloys listed in 1C011(a) are controlled whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium or beryllium."

and substituting -

*"Technical Note:*

The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.

*Note:*

The metals or alloys listed in 1C011(a) are controlled whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium or beryllium.";

(viii) in 1C011(b) -

(A) by repealing *"N.B.:"* and substituting *"Note:"*;

- (B) in the Note, by repealing "鋅" and substituting "鋳";
- (ix) in 1C011, by adding -  
    "(d) Nitroguanidine (NQ) (CAS 556-88-7);";
- (x) in 1C012, by repealing "Materials for nuclear heat sources, as follows:" and substituting -  
    "Materials as follows:  
    *Technical Note:*  
    These materials are typically used for nuclear heat sources.";
- (xi) in 1C012(a), in the Note, in paragraph (2), by repealing "grammes" and substituting "grams";
- (xii) by adding -  
    "1C102       Resaturated pyrolyzed carbon-carbon materials designed for space launch vehicles specified in 9A004 or sounding rockets specified in 9A104;";
- (xiii) by repealing 1C107 and substituting -  
    "1C107       Graphite and ceramic materials, other than

those specified in 1C007, as follows:

- (a) Fine grain recrystallised bulk graphites having a bulk density of 1.72 g/cm<sup>3</sup> or greater, measured at 288 K (15°C), and having a particle size of 100 micrometres or less, usable for "missile" nozzles and reentry vehicle nose tips;

*N.B.:*

See also 0C004.

- (b) Pyrolytic or fibrous reinforced graphites, usable for "missile" nozzles and reentry vehicle nose tips;

*N.B.:*

See also 0C004.

- (c) Ceramic composite materials (dielectric constant less than 6 at frequencies from

100 Hz to 10 000 MHz),  
usable for "missile"  
radomes;

- (d) Bulk machinable silicon-carbide reinforced unfired ceramic, usable for "missile" nose tips;"

(xiv) by repealing 1C111(a)(1) and substituting -

- "(1) Spherical aluminium powder, other than that controlled by the Munitions List, with particles of uniform diameter of less than 200  $\mu$  m and an aluminium content of 97% by weight or more, if at least 10% of the total weight is made up of particles of less than 63  $\mu$  m, according to ISO 2591:1988 or national equivalents such as JIS Z8820;

*Technical Note:*

A particle size of 63  $\mu$  m (ISO R-565) corresponds to 250 mesh (Tyler) or 230 mesh (ASTM standard E-11).";

(xv) by repealing 1C111(a)(2) and substituting -

"(2) Metal fuels, other than that controlled by the Munitions List, in particle sizes of less than 60  $\mu$  m, whether spherical, atomized, spheroidal, flaked or ground, consisting 97% or more by weight of any of the following:

- (a) Zirconium;
- (b) Beryllium;
- (c) Magnesium; *or*
- (d) Alloys of the metals controlled by (a) to (c) above;

*Technical Note:*

The natural content of hafnium in the zirconium (typically 2% to 7%) is counted with the zirconium.";

(xvi) by repealing 1C118(a)(2) and substituting -

- "(2) Having a titanium content of greater than 0.10 weight percent; *and*
- (3) A ferritic-austenitic microstructure (also referred

to as a two-phase microstructure) of which at least 10 percent is austenite by volume (according to ASTM E-1181-87 or national equivalents); *and*";

(xvii) by repealing 1C225 and substituting -

"1C225        Boron enriched in the boron-10 (10B) isotope to greater than its natural isotopic abundance, as follows: elemental boron, compounds, mixtures containing boron, manufactures thereof, waste or scrap of any of the foregoing;

*Note:*

In 1C225, mixtures containing boron include boron loaded materials.

*Technical Note:*

The natural isotopic abundance of boron-10 is approximately 18.5 weight percent (20 atom percent).";

(xviii) by repealing 1C231 and substituting -

"1C231       Hafnium metal, alloys containing more than 60% hafnium by weight, hafnium compounds containing more than 60% hafnium by weight, manufactures thereof, and waste or scrap of any of the foregoing;"

(xix) in 1C351(d)(1), by adding -

*"Note:*

1C351(d)(1) does not control botulinum toxins in product form meeting all of the following criteria:

- (1) Are pharmaceutical formulations designed for human administration in the treatment of medical conditions;
- (2) Are pre-packaged for distribution as medical products;
- (3) Are authorized by a state authority to be marketed as medical products.";

- (xx) in 1C450(c)(8), by repealing "phosponites" and substituting "phosphonites";
- (v) in the Dual-use Goods List, in Category 1, in sub-category 1D, by repealing 1D101 and substituting -  
"1D101 "Software" specially designed or modified for the "use" of goods specified in 1B101, 1B115 or 1B117;"
- (w) in the Dual-use Goods List, in Category 1, in sub-category 1E, by repealing 1E002(c)(1)(c) and substituting -
  - "(c) Being any of the following:
    - (1) Zirconia with an average particle size equal to or less than 1  $\mu$  m and no more than 10% of the particles larger than 5  $\mu$  m;
    - (2) Other base materials with an average particle size equal to or less than 5  $\mu$  m and no more than 10% of the particles larger than 10  $\mu$  m; *or*
    - (3) Having all of the following:
      - (a) Platelets with a length to thickness ratio exceeding 5;
      - (b) Whiskers with a length to diameter ratio exceeding 10 for diameters less than 2  $\mu$  m; *and*

- (c) Continuous or chopped fibres less than 10  $\mu$  m in diameter;"
- (x) in the Dual-use Goods List, in Category 2, in sub-category 2A -
  - (i) in 2A001(a), by repealing "ABEC 7, ABEC 7P, ABEC 7T or ISO Standard Class 4 or better (or national equivalents)" and substituting "ISO 492 Tolerance Class 4 (or ANSI/ABMA Std 20 Tolerance Class ABEC-7 or RBEC-7, or other national equivalents), or better";
  - (ii) in 2A001(b), by repealing "ABEC 9, ABEC 9P or ISO Standard Class 2 or better (or national equivalents)" and substituting "ISO 492 Tolerance Class 2 (or ANSI/ABMA Std 20 Tolerance Class ABEC-9 or RBEC-9, or other national equivalents), or better";
- (y) in the Dual-use Goods List, in Category 2, in sub-category 2B -
  - (i) by repealing Technical Notes 1 to 5 and substituting -
    - "1. Secondary parallel contouring axes, (e.g. the w-axis on horizontal boring mills or a secondary rotary axis the centre line of which is

parallel to the primary rotary axis) are not counted in the total number of contouring axes. Rotary axes need not rotate over  $360^\circ$ . A rotary axis can be driven by a linear device (e.g. a screw or a rack-and-pinion).

2. For the purposes of 2B, the number of axes which can be coordinated simultaneously for "contouring control" is the number of axes which affect relative movement between any one workpiece and a tool, cutting head or grinding wheel which is cutting or removing material from the workpiece. This does not include any additional axes which affect other relative movement within the machine. Such axes include:
  - (a) Wheel-dressing systems in grinding machines;

- (b) Parallel rotary axes designed for mounting of separate workpieces;
  - (c) Co-linear rotary axes designed for manipulating the same workpiece by holding it in a chuck from different ends.
3. Axis nomenclature shall be in accordance with International Standard ISO 841, 'Numerical Control Machines - Axis and Motion Nomenclature'.
  4. For the purposes of 2B001 to 2B009, a "tilting spindle" is counted as a rotary axis.
  5. Stated positioning accuracy levels derived from measurements made according to ISO 230/2 (1997) or national equivalents may be used for each machine tool model instead of individual machine tests. Stated positioning accuracy

means the accuracy value provided to national licensing authorities as representative of the accuracy of a machine model.

#### Determination of Stated Values

- (a) Select five machines of a model to be evaluated;
- (b) Measure the linear axis accuracies according to ISO 230/2 (1997);
- (c) Determine the A-values for each axis of each machine. The method of calculating the A-value is described in the ISO standard;
- (d) Determine the mean value of the A-value of each axis. This mean value  $\hat{A}$  becomes the stated value of

each axis for the model ( $\hat{A} \times \hat{A} y...$ );

(e) Since the Category 2 list refers to each linear axis there will be as many stated values as there are linear axes;

(f) If any axis of a machine model not controlled by 2B001(a) to 2B001(c) has a stated accuracy  $\hat{A}$  of 5 microns for grinding machines and 6.5 microns for milling and turning machines or better, the builder should be required to reaffirm the accuracy level once every eighteen months.";

(ii) in 2B001, by adding before "N.B.:" -

*"Notes:*

1. 2B001 does not control special purpose machine tools limited to the manufacture of gears. For such machines, see 2B003.
  
2. 2B001 does not control special purpose machine tools limited to the manufacture of any of the following parts:
  - (a) Crank shafts or cam shafts;
  - (b) Tools or cutters;
  - (c) Extruder worms;
  - (d) Engraved or faceted jewellery parts.";

(iii) by repealing 2B001(b)(1) and substituting -

- "(1) Having all of the following:
  - (a) Positioning accuracy with "all compensations available" equal to or less (better) than 4.5  $\mu$  m according to ISO 230/2 (1997) or national equivalents along any linear axis; *and*
  - (b) Three linear axes plus one rotary axis which can be

coordinated simultaneously for  
"contouring control";

- (iv) in 2B001(b)(2), by repealing "*or*" at the end;
- (v) in 2B001(b)(3), by adding "*or*" at the end;
- (vi) in 2B001(b), by adding -
  - "(4) Fly cutting machines, having all of the following characteristics:
    - (a) Spindle "run out" and "camming" less (better) than 0.0004 mm TIR;  
*and*
    - (b) Angular deviation of slide movement (yaw, pitch and roll) less (better) than 2 seconds of arc, TIR, over 300 mm of travel;"
- (vii) by repealing 2B001(c)(1) and substituting -
  - "(1) Having all of the following:
    - (a) Positioning accuracy with "all compensations available" equal to or less (better) than 3  $\mu$  m according to ISO 230/2 (1997) or national

equivalents along any linear axis;

*and*

- (b) Three or more axes which can be coordinated simultaneously for "contouring control"; *or*;

(viii) in 2B001(c), by repealing Note 3 and substituting -

"3. Tool or cutter grinding machines limited to the production of tools or cutters.";

(ix) by repealing 2B001(e) and substituting -

"(e) Machine tools for removing metals, ceramics or "composites", having all of the following characteristics:

- (1) Removing material by means of any of the following:

- (a) Water or other liquid jets, including those employing abrasive additives;

- (b) Electron beam; *or*

- (c) "Laser" beam; *and*

- (2) Having two or more rotary axes which:

- (a) Can be coordinated simultaneously for "contouring control"; *and*
  - (b) Have a positioning accuracy of less (better) than 0.003 Å";
- (x) in 2B004, by repealing "specially designed dies, moulds, components, accessories and controls therefor" and substituting "specially designed components and accessories therefor";
- (xi) in 2B004, by adding at the end -
  - "N.B.:*  
For specially designed dies, moulds and tooling see 1B003, 9B009 and ML18 of the Munitions List.";
- (xii) by repealing 2B005(c) and substituting -
  - "(c) "Stored programme controlled" electron beam physical vapour deposition (EB-PVD) production equipment incorporating power systems rated for over 80 kW, having any of the following:
    - (1) A liquid pool level "laser" control system

which regulates precisely the ingots feed rate; *or*

- (2) A computer controlled rate monitor operating on the principle of photo-luminescence of the ionized atoms in the evaporant stream to control the deposition rate of a coating containing two or more elements;"
- (xiii) in 2B007(a), by repealing "*Note:*" and substituting "*Technical Note:*";
- (xiv) in 2B008, by repealing "Assemblies, units or inserts specially designed for machine tools, or for equipment controlled by 2B006 or 2B007, as follows" and substituting "Assemblies or units, specially designed for machine tools, or dimensional inspection or measuring systems and equipment, as follows";
- (xv) in 2B008(a), by repealing "*Note:*" and substituting "*N.B.:*";
- (xvi) in 2B008(b), by repealing "Note:" and substituting "N.B.:";
- (xvii) by repealing 2B104 and substituting -

"2B104 "Isostatic presses", other than those specified in 2B004, having all of the following:

*N.B.:*

See also 2B204.

- (a) Maximum working pressure of 69 MPa or greater;
- (b) Designed to achieve and maintain a controlled thermal environment of 873 K (600°C) or greater;  
*and*
- (c) Possessing a chamber cavity with an inside diameter of 254 mm or greater;"

(xviii) by adding -

"2B105 CVD furnaces, other than those specified in 2B005(a), designed or modified for the densification of carbon-carbon composites;"

(xix) by repealing 2B109 and substituting -

"2B109       Flow-forming machines, other than those specified in 2B009, and specially designed components as follows:

*N.B.:*

See also 2B209.

(a)   Flow-forming machines having all of the following:

(1)   According to the manufacturer's technical specification, can be equipped with "numerical control" units or a computer control, even when not equipped with such units; *and*

(2)   With more than two axes which can be coordinated

simultaneously for  
"contouring  
control";

- (b) Specially designed components for flow-forming machines specified in 2B009 or 2B109(a);

*Note:*

2B109 does not control machines that are not usable in the production of propulsion components and equipment (e.g. motor cases) for systems specified in 9A005, 9A007(a) or 9A105(a).

*Technical Note:*

Machines combining the function of spin-forming and flow-forming are for the purpose of 2B109 regarded as flow-forming machines.";

(xx) by adding -

"2B117

Equipment and process controls, other than those

specified in 2B004, 2B005(a), 2B104 or 2B105, designed or modified for densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips;"

(xxi) by repealing 2B204 and substituting -

"2B204 "Isostatic presses", other than those specified in 2B004 or 2B104, and related equipment, as follows:

(a) "Isostatic presses" having both of the following characteristics:

(1) Capable of achieving a maximum working pressure of 69 MPa or greater;  
*and*

(2) A chamber cavity with an inside diameter in

excess of 152 mm;

- (b) Dies, moulds and controls, specially designed for "isostatic presses" specified in 2B204(a);

*Technical Note:*

In 2B204, the inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.";

(xxii) by repealing 2B207 and substituting -

"2B207 "Robots", "end-effectors" and control units, other than those specified in 2B007, as follows:

- (a) "Robots" or "end-effectors" specially designed to comply with national safety standards applicable to handling high explosives (for example, meeting electrical code ratings for high explosives);
- (b) Control units specially designed for any of the "robots" or "end-effectors" specified in 2B207(a);";

(xxiii) by renumbering 2B229 as 2B219;

(xxiv) in 2B350(d)(7), by repealing "*or*" at the end;

(xxv) in 2B350(d), by adding -

"(9) Silicon carbide; *or*

(10) Titanium carbide;";

(xxvi) in 2B352(d), by repealing "Cross-flow filtration equipment" and substituting "Cross (tangential) flow filtration equipment";

(xxvii) in 2B352(f)(2) -

(A) by repealing "在 面" and substituting "在裏面";

(B) in the Note, by repealing "and glove boxes" and substituting ", glove boxes and laminar flow hoods";

(z) in the Dual-use Goods List, in Category 2, in sub-category 2D -

(i) in 2D001, by adding ", other than that controlled by 2D002," after ""Software"";

(ii) by repealing 2D002 and substituting -

"2D002       "Software" for electronic devices, even when residing in an electronic device or system, enabling such devices or systems to function as a "numerical control" unit, capable of coordinating simultaneously more than 4 axes for "contouring control";

*Note:*

2D002 does not control "software" specially designed or modified for the operation of machine tools not controlled by Category 2.";

(iii) in 2D201, by repealing "2B227 or 2B229" and substituting "2B219 or 2B227";

(za) in the Dual-use Goods List, in Category 2, in sub-category 2E -

(i) in 2E003(f), by adding at the end -

*"N.B.:*

This Table should be read to control the technology of a particular 'Coating Process' only when the 'Resultant Coating' in column 3 is in a paragraph directly across from the relevant 'Substrate' under column 2. For example, Chemical Vapour Deposition (CVD) coating process technical data are controlled for the application of 'Silicides' to 'Carbon-carbon, Ceramic and Metal "matrix" "composites"' substrates, but are not controlled for the application

of 'Silicides' to 'Cemented tungsten carbide(16), Silicon carbide(18)' substrates. In the second case, the 'Resultant Coating' is not listed in the paragraph under column 3 directly across from the paragraph under column 2 listing 'Cemented tungsten carbide(16), Silicon carbide(18)'.";

- (ii) by repealing the tables of "DEPOSITION TECHNIQUES", "DEPOSITION TECHNIQUES - NOTES" and "DEPOSITION TECHNIQUES - TECHNICAL NOTE" and substituting -

"TABLE - DEPOSITION TECHNIQUES

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

\* The numbers in parenthesis refer to the Notes following this Table.

	Cemented tungsten carbide <sup>(16)</sup> , Silicon carbide <sup>(18)</sup>	Carbides Tungsten Mixtures thereof <sup>(4)</sup> Dielectric layers <sup>(15)</sup>
	Molybdenum and Molybdenum alloys	Dielectric layers <sup>(15)</sup>
	Beryllium and Beryllium alloys	Dielectric layers <sup>(15)</sup> Diamond Diamond-like carbon <sup>(17)</sup>
	Sensor window materials <sup>(9)</sup>	Dielectric layers <sup>(15)</sup> Diamond Diamond-like carbon <sup>(17)</sup>
<b>B. Thermal Evaporation-Physical Vapour Deposition (TE-PVD)</b>		
1.	Physical Vapour Deposition (PVD): Electron Beam (EB- PVD): Electron Beam (EB-PVD)	"Superalloys"  Alloyed silicides Alloyed aluminides <sup>(2)</sup> MCrAlX <sup>(5)</sup> Modified zirconia <sup>(12)</sup> Silicides Aluminides Mixtures thereof <sup>(4)</sup>
	Ceramics <sup>(19)</sup> and Low- expansion glasses <sup>(14)</sup>	Dielectric layers <sup>(15)</sup>
	Corrosion resistant steel <sup>(7)</sup>	MCrAlX <sup>(5)</sup> Modified zirconia <sup>(12)</sup> Mixtures thereof <sup>(4)</sup>
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Refractory metals Mixtures thereof <sup>(4)</sup> Dielectric layers <sup>(15)</sup> Boron nitride
	Cemented tungsten carbide <sup>(16)</sup> , Silicon carbide <sup>(18)</sup>	Carbides Tungsten Mixtures thereof <sup>(4)</sup> Dielectric layers <sup>(15)</sup>

	Molybdenum and Molybdenum alloys	Dielectric layers <sup>(15)</sup>
	Beryllium and Beryllium alloys	Dielectric layers <sup>(15)</sup> Borides Beryllium
	Sensor window materials <sup>(9)</sup>	Dielectric layers <sup>(15)</sup>
	Titanium alloys <sup>(13)</sup>	Borides Nitrides
2. Physical Vapour Deposition (PVD): Ion Assisted Resistive Heating (Ion Plating)	Ceramics <sup>(19)</sup> and Low-expansion glasses <sup>(14)</sup>	Dielectric layers <sup>(15)</sup> Diamond-like carbon <sup>(17)</sup>
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Dielectric layers <sup>(15)</sup>
	Cemented tungsten carbide <sup>(16)</sup> , Silicon carbide <sup>(18)</sup>	Dielectric layers <sup>(15)</sup>
	Molybdenum and Molybdenum alloys	Dielectric layers <sup>(15)</sup>
	Beryllium and Beryllium alloys	Dielectric layers <sup>(15)</sup>
	Sensor window materials <sup>(9)</sup>	Dielectric layers <sup>(15)</sup> Diamond-like carbon <sup>(17)</sup>
3. Physical Vapour Deposition (PVD): "Laser" Vaporization	Ceramics <sup>(19)</sup> and Low-expansion glasses <sup>(14)</sup>	Silicides Dielectric layers <sup>(15)</sup> Diamond-like carbon <sup>(17)</sup>
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Dielectric layers <sup>(15)</sup>
	Cemented tungsten carbide <sup>(16)</sup> , Silicon carbide <sup>(18)</sup>	Dielectric layers <sup>(15)</sup>

	Molybdenum and Molybdenum alloys	Dielectric layers <sup>(15)</sup>
	Beryllium and Beryllium alloys	Dielectric layers <sup>(15)</sup>
	Sensor window materials <sup>(9)</sup>	Dielectric layers <sup>(15)</sup> Diamond-like carbon <sup>(17)</sup>
4. Physical Vapour Deposition (PVD): Cathodic Arc Discharge	"Superalloys"	Alloyed silicides Alloyed aluminides <sup>(2)</sup> MCrAlX <sup>(5)</sup>
	Polymers <sup>(11)</sup> and Organic "matrix" "composites"	Borides Carbides Nitrides Diamond-like carbon <sup>(17)</sup>
C. Pack Cementation (see A above for out-of-pack cementation) <sup>(10)</sup>	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof <sup>(4)</sup>
	Titanium alloys <sup>(13)</sup>	Silicides Aluminides Alloyed aluminides <sup>(2)</sup>
	Refractory metals and alloys <sup>(8)</sup>	Silicides Oxides
D. Plasma Spraying	"Superalloys"	MCrAlX <sup>(5)</sup> Modified zirconia <sup>(12)</sup> Mixtures thereof <sup>(4)</sup> Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester Alloyed aluminides <sup>(2)</sup>
	Aluminium alloys <sup>(6)</sup>	MCrAlX <sup>(5)</sup> Modified zirconia <sup>(12)</sup> Silicides Mixtures thereof <sup>(4)</sup>
	Refractory metals and alloys <sup>(8)</sup>	Aluminides Silicides

		Carbides
	Corrosion resistant steel <sup>(7)</sup>	MCrAlX <sup>(5)</sup> Modified zirconia <sup>(12)</sup> Mixtures thereof <sup>(4)</sup>
	Titanium alloys <sup>(13)</sup>	Carbides Aluminides Silicides Alloyed aluminides <sup>(2)</sup> Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester
E. Slurry Deposition	Refractory metals and alloys <sup>(8)</sup>	Fused silicides Fused aluminides except for resistance heating elements
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof <sup>(4)</sup>
F. Sputter Deposition	"Superalloys"	Alloyed silicides Alloyed aluminides <sup>(2)</sup> Noble metal modified aluminides <sup>(3)</sup> MCrAlX <sup>(5)</sup> Modified zirconia <sup>(12)</sup> Platinum Mixtures thereof <sup>(4)</sup>
	Ceramics <sup>(19)</sup> and Low- expansion glasses <sup>(14)</sup>	Silicides Platinum Mixtures thereof <sup>(4)</sup> Dielectric layers <sup>(15)</sup> Diamond-like carbon <sup>(17)</sup>
	Titanium alloys <sup>(13)</sup>	Borides Nitrides Oxides Silicides Aluminides Alloyed aluminides <sup>(2)</sup> Carbides

	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Refractory metals Mixtures thereof <sup>(4)</sup> Dielectric layers <sup>(15)</sup> Boron nitride
	Cemented tungsten carbide <sup>(16)</sup> , Silicon carbide <sup>(18)</sup>	Carbides Tungsten Mixtures thereof <sup>(4)</sup> Dielectric layers <sup>(15)</sup> Boron nitride
	Molybdenum and Molybdenum alloys	Dielectric layers <sup>(15)</sup>
	Beryllium and Beryllium alloys	Borides Dielectric layers <sup>(15)</sup> Beryllium
	Sensor window materials <sup>(9)</sup>	Dielectric layers <sup>(15)</sup> Diamond-like carbon <sup>(17)</sup>
	Refractory metals and alloys <sup>(8)</sup>	Aluminides Silicides Oxides Carbides
G. Ion Implantation	High temperature bearing steels	Additions of Chromium, Tantalum or Niobium (Columbium)
	Titanium alloys <sup>(13)</sup>	Borides Nitrides
	Beryllium and Beryllium alloys	Borides
	Cemented tungsten carbide <sup>(16)</sup>	Carbides Nitrides

TABLE - DEPOSITION TECHNIQUES - NOTES

1. The term 'coating process' includes coating repair and refurbishing as well as original coating.

2. The term 'alloyed aluminide' coating includes single or multiple-step coatings in which an element or elements are deposited prior to or during application of the aluminide coating, even if these elements are deposited by another coating process. It does not, however, include the multiple use of single-step pack cementation processes to achieve alloyed aluminides.
3. The term 'noble metal modified aluminide' coating includes multiple-step coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating.
4. The term 'mixtures thereof' includes infiltrated material, graded compositions, co-deposits and multilayer deposits and are obtained by one or more of the coating processes specified in the Table.
5. 'MCrAlX' refers to a coating alloy where M equals cobalt, iron, nickel or combinations thereof and X equals hafnium, yttrium, silicon, tantalum in any amount or other intentional additions over 0.01 weight percent in various proportions and combinations, *except*:
  - (a) CoCrAlY coatings which contain less than 22 weight percent of chromium, less than 7 weight percent of aluminium and less than 2 weight percent of yttrium;
  - (b) CoCrAlY coatings which contain 22 to 24 weight percent of chromium, 10 to 12 weight percent of aluminium and 0.5 to 0.7 weight percent of yttrium; *or*
  - (c) NiCrAlY coatings which contain 21 to 23 weight percent of chromium, 10 to 12 weight percent of aluminium and 0.9 to 1.1 weight percent of yttrium.
6. The term 'aluminium alloys' refers to alloys having an ultimate tensile strength of 190 MPa or more measured at 293 K (20°C).
7. The term 'corrosion resistant steel' refers to AISI (American Iron and Steel Institute) 300 series or equivalent national standard steels.
8. 'Refractory metals and alloys' include the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.
9. 'Sensor window materials', as follows: alumina, silicon, germanium, zinc sulphide, zinc selenide, gallium arsenide, diamond, gallium phosphide, sapphire and the following metal

halides: sensor window materials of more than 40 mm diameter for zirconium fluoride and hafnium fluoride.

10. "Technology" for single-step pack cementation of solid airfoils is not controlled by Category 2.
11. 'Polymers', as follows: polyimide, polyester, polysulphide, polycarbonates and polyurethanes.
12. 'Modified zirconia' refers to additions of other metal oxides (e.g. calcia, magnesia, yttria, hafnia, rare earth oxides) to zirconia in order to stabilise certain crystallographic phases and phase compositions. Thermal barrier coatings made of zirconia, modified with calcia or magnesia by mixing or fusion, are not controlled.
13. 'Titanium alloys' refers to aerospace alloys having an ultimate tensile strength of 900 MPa or more measured at 293 K (20°C).
14. 'Low-expansion glasses' refers to glasses which have a coefficient of thermal expansion of  $1 \times 10^{-7} \text{K}^{-1}$  or less measured at 293 K (20°C).
15. 'Dielectric layers' are coatings constructed of multi-layers of insulator materials in which the interference properties of a design composed of materials of various refractive indices are used to reflect, transmit or absorb various wavelength bands. Dielectric layers refers to more than four dielectric layers or dielectric/metal "composite" layers.
16. 'Cemented tungsten carbide' does not include cutting and forming tool materials consisting of tungsten carbide/ (cobalt, nickel), titanium carbide/(cobalt, nickel), chromium carbide/nickel-chromium and chromium carbide/nickel.
17. "Technology" specially designed to deposit diamond-like carbon on any of the following is not controlled:  
  
magnetic disk drives and heads, equipment for the manufacture of disposables, valves for faucets, acoustic diaphragms for speakers, engine parts for automobiles, cutting tools, punching-pressing dies, office automation equipment, microphones or medical devices.
18. 'Silicon carbide' does not include cutting and forming tool materials.
19. Ceramic substrates, as used in this entry, does not include ceramic materials containing 5% by weight, or greater, clay or cement content, either as separate constituents or in combination.

## TABLE - DEPOSITION TECHNIQUES - TECHNICAL NOTE

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

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

*N.B.:*

1. CVD includes the following processes: directed gas flow out-of-pack deposition, pulsating CVD, controlled nucleation thermal deposition (CNTD), plasma enhanced or plasma assisted CVD processes.
  2. Pack denotes a substrate immersed in a powder mixture.
  3. The gaseous reactants used in the out-of-pack process are produced using the same basic reactions and parameters as the pack cementation process, except that the substrate to be coated is not in contact with the powder mixture.
- (b) Thermal Evaporation-Physical Vapour Deposition (TE-PVD) is an overlay coating process conducted in a vacuum with a pressure less than 0.1 Pa wherein a source of thermal energy is used to vaporize the coating material. This process results in the condensation, or deposition, of the evaporated species onto appropriately positioned substrates.

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

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

Specific TE-PVD processes are as follows:

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

*N.B.:*

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

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

The substrate and powder mixture is contained within a retort which is heated to between 1 030 K (757°C) and 1 375 K (1 102°C) for sufficient time to deposit the coating.

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

*N.B.:*

1. Low pressure means less than ambient atmospheric pressure.
2. High velocity refers to nozzle-exit gas velocity exceeding 750 m/s calculated at 293 K (20°C) at 0.1 MPa.

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

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

*N.B.:*

1. The Table refers only to triode, magnetron or reactive sputter deposition which is used to increase adhesion of the coating and rate of deposition and to radio frequency (RF) augmented sputter deposition used to permit vaporization of non-metallic coating materials.
2. Low-energy ion beams (less than 5 keV) can be used to activate the deposition.

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

(iii) in 2E201, by adding "2B219," after "2B209,";

(iv) in 2E201, by adding "2B228, 2B230 to" after "2B225 to";

- (v) in 2E301, by repealing ""Technology" required for" and substituting ""Technology" according to the General Technology Note for";
- (zb) in the Dual-use Goods List, in Category 3, in sub-category 3A -
  - (i) in 3A001(a)(2), by repealing "field programmable gate arrays, field programmable logic arrays" and substituting "field programmable logic devices";
  - (ii) in 3A001(a)(3)(a), by repealing "3 500" and substituting "6 500";
  - (iii) by repealing 3A001(a)(3)(c) and substituting -
    - "(c) More than one data or instruction bus or serial communication port that provides a direct external interconnection between parallel "microprocessor microcircuits" with a transfer rate exceeding 150 Mbyte/s;"
  - (iv) in 3A001(a)(5)(a)(1) -
    - (A) by repealing "to maximum resolution";

- (B) by repealing "10" and substituting "5";
- (v) in 3A001(a)(5)(a)(2), by repealing "to maximum resolution";
- (vi) in 3A001(a)(5)(a)(3), by repealing "to maximum resolution";
- (vii) in 3A001(a)(5), by adding at the end -

*"Technical Notes:*

1. A resolution of  $n$  bit corresponds to a quantisation of  $2^n$  levels.
2. Total conversion time is the inverse of the sample rate.";

- (viii) by repealing 3A001(a)(7) and substituting -

"(7) Field programmable logic devices having any of the following:

- (a) An equivalent usable gate count of more than 30 000 (2 input gates);
- b) A typical "basic gate propagation delay time" of less than 0.4 ns; *or*
- (c) A toggle frequency exceeding 133 MHz;

*Note:*

3A001(a)(7) includes:

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

*N.B.:*

Field programmable logic devices are also known as field programmable gate or field programmable logic arrays.";

- (ix) by repealing 3A001(a)(8) and substituting -  
 "(8) Deleted;"
- (x) in 3A001(a)(10)(a), by repealing "208" and substituting "1 000";
- (xi) in 3A001(a)(10)(b), by repealing "0.35" and substituting "0.1";
- (xii) in 3A001(a)(11)(a), by repealing "300" and substituting "3 000";
- (xiii) by repealing 3A001(a)(12) and substituting -

"(12) Fast Fourier Transform (FFT) processors having a rated execution time for an N-point complex FFT of less than  $(N \log_2 N)/20$  480 ms, where N is the number of points;

*Technical Note:*

When N is equal to 1 024 points, the formula in 3A001(a)(12) gives an execution time of 500  $\mu$ s.";

(xiv) in 3A001(b)(1), by repealing the Note and substituting

-

*Note:*

3A001(b)(1) does not control tubes designed or rated for operation in any frequency band which meets all of the following characteristics:

1. Does not exceed 31 GHz; *and*
2. Is "allocated by the ITU" for radiocommunications services, but not for radio-determination.";

(xv) in 3A001(b)(1)(a)(1), by repealing "higher than" and substituting "exceeding";

(xvi) in 3A001(b)(1)(a)(3), by repealing "instantaneous" and substituting "fractional";

(xvii) by repealing 3A001(b)(1)(c) and substituting -

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

(xviii) by repealing 3A001(b)(2) and substituting -

"(2) Microwave integrated circuits or modules having all of the following:

- (a) Containing "monolithic integrated circuits" having one or more active circuit elements; *and*
- (b) Operating at frequencies exceeding 3 GHz;

*Notes:*

1. 3A001(b)(2) does not control circuits or modules for equipment designed or rated for operation in any frequency band which meets all of

the following characteristics:

- (a) Does not exceed 31 GHz;  
*and*
- (b) Is "allocated by the ITU" for radiocommunications services, but not for radio-determination.

2. 3A001(b)(2) does not control broadcast satellite equipment designed or rated to operate in the frequency range of 40.5 to 42.5 GHz.";

(xix) in 3A001(b)(8), by repealing the Note and substituting

-

*Note:*

3A001(b)(8) does not control equipment designed or rated for operation in any frequency band which is "allocated by the ITU" for radiocommunications services, but not for radio-determination.";

(xx) by repealing 3A001(d) and substituting -

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

- (1) Current switching for digital circuits using "superconductive" gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than 10-14 J; *or*
- (2) Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10 000;"

(xxi) by repealing 3A002(a)(2) and substituting -

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

*Note:*

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

(xxii) in 3A002(c)(2) -

- (A) by repealing "25.6" and substituting "500";
- (B) by repealing the Note and the Technical Note and substituting -

*Note:*

3A002(c)(2) does not control those "dynamic signal analysers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).";

(xxiii) in 3A225, by repealing "controlled by 0B001(c)(11)" and substituting "specified in 0B001(b)(13)";

- (zc) in the Dual-use Goods List, in Category 3, in sub-category 3B -
- (i) in 3B001(a)(3), by adding "or solid" after "gas";
  - (ii) in 3B001(b)(1), by repealing "An accelerating voltage exceeding 200 keV" and substituting "A beam energy (accelerating voltage) exceeding 1 MeV";
  - (iii) in 3B001(b)(2), by repealing "an accelerating voltage of less than 10 keV" and substituting "a beam energy (accelerating voltage) of less than 2 keV";
  - (iv) by repealing 3B001(c)(1)(a) and (b) and substituting -
    - (a) Designed or optimized to produce critical dimensions of 0.3  $\mu$  m or less with  $\pm$  5% 3 sigma precision; *or*
    - (b) Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1  $\mu$  m in diameter;"
  - (v) by repealing 3B001(c)(2)(a) and (b) and substituting -

- "(a) Designed or optimized to produce critical dimensions of 0.3  $\mu$  m or less with  $\pm$  5% 3 sigma precision; *or*
  - (b) Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1  $\mu$  m in diameter;"
- (vi) by repealing 3B001(d)(1)(a) and (b) and substituting -
- "(a) Designed according to the manufacturer's specifications or optimized to produce critical dimensions of 0.3  $\mu$  m or less with  $\pm$  5% 3 sigma precision; *or*
  - (b) Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1  $\mu$  m in diameter;"
- (vii) by repealing 3B001(d)(2)(a) and (b) and substituting -
- "(a) Designed according to the manufacturer's specifications or optimized to produce

critical dimensions of 0.3  $\mu$  m or less  
with  $\pm$  5% 3 sigma precision; *or*

- (b) Designed for generating less than 0.04 particles/cm<sup>2</sup> with a measurable particle size greater than 0.1  $\mu$  m in diameter;"

(viii) in 3B001(f)(1), by repealing -

"(1) Align and expose step and repeat equipment for wafer processing using photo-optical or X-ray methods, having any of the following:

- (a) A light source wavelength shorter than 400 nm; *or*
- (b) Capable of producing a pattern with a minimum resolvable feature size of 0.7  $\mu$  m or less;

*Note:*"

and substituting -

"(1) Align and expose step and repeat (direct step on wafer) or step and scan (scanner) equipment for wafer processing using photo-optical or X-ray

methods, having any of the following:

- (a) A light source wavelength shorter than 350 nm; *or*
- (b) Capable of producing a pattern with a minimum resolvable feature size of 0.5  $\mu$  m or less;

*Technical Note:*";

(ix) in 3B002(b), by repealing "60" and substituting "333";

(x) in 3B002(b), in the Note, by adding -

"3. Memories.

*Technical Note:*

For the purpose of this entry, pattern rate is defined as the maximum frequency of digital operation of a tester. It is therefore equivalent to the highest data rate that a tester can provide in non-multiplexed mode. It is also referred to as test speed, maximum digital frequency or maximum digital speed.";

(xi) by repealing 3B002(c) and substituting -

- "(c) For testing microwave integrated circuits controlled by 3A001(b)(2);";
- (xii) by repealing 3B002(d);
- (zd) in the Dual-use Goods List, in Category 3, in sub-category 3C -
  - (i) by repealing 3C001(b) and (c) and substituting -
    - "(b) Germanium;
    - (c) Silicon carbide; *or*
    - (d) III/V compounds of gallium or indium;";
  - (ii) in 3C002(a), by repealing "370" and substituting "350";
- (ze) in the Dual-use Goods List, in Category 3, in sub-category 3D, by repealing 3D003 and substituting -
  - "3D003 Computer-aided-design (CAD) "software", having all of the following:
    - (a) Designed for the "development" of semiconductor devices or integrated circuits; *and*
    - (b) Designed to perform or use any of the following:
      - (1) Design rules or circuit verification rules;

(2) Simulation of the physically laid out circuits; or

(3) Lithographic processing simulators for design;

*Technical Note:*

A lithographic processing simulator is a "software" package used in the design phase to define the sequence of lithographic, etching and deposition steps for translating masking patterns into specific topographical patterns in conductors, dielectrics or semiconductor material.

*Notes:*

1. 3D003 does not control "software" specially designed for schematic entry, logic simulation, placing and routing, layout verification or pattern generation tape.

2. Libraries, design attributes or associated data for the design of semiconductor devices or integrated circuits are considered as "technology".;
- (zf) in the Dual-use Goods List, in Category 3, in sub-category 3E -
- (i) in 3E001, by repealing the Note and the N.B.;
  - (ii) by repealing 3E002 and substituting -  
"3E002       "Technology" according to the  
General Technology Note other  
than that controlled by 3E001 for  
the       "development"       or  
"production" of "microprocessor  
microcircuits", "micro-computer  
microcircuits"               and  
microcontroller       microcircuits  
having a "composite theoretical  
performance" ("CTP") of 530  
million theoretical operations per  
second (Mtops) or more and an  
arithmetic logic unit with

an access width of 32 bits or more;

*Note:*

3E001 and 3E002 do not control "technology" for the "development" or "production" of:

(a) Microwave transistors operating at frequencies below 31 GHz;

(b) Integrated circuits controlled by 3A001(a)(3) to 3A001(a)(12), having all of the following:

(1) Using "technology" of 0.7  $\mu$ m or more;  
*and*

(2) Not incorporating multi-layer structures;

*Technical Note:*

The term multi-layer structures

in Note (b)(2) above does not include devices incorporating a maximum of two metal layers and two polysilicon layers.";

(iii) by adding -

"3E003

Other "technology" for the "development" or "production" of:

- (a) Vacuum microelectronic devices;
- (b) Hetero-structure semiconductor devices such as high electron mobility transistors (HEMT), hetero-bipolar transistors (HBT), quantum well and super lattice devices;
- (c) "Superconductive" electronic devices;

- (d) Substrates of films of diamond for electronic components;
  - (e) Substrates of silicon-on-insulator (SOI) for integrated circuits in which the insulator is silicon dioxide;
  - (f) Substrates of silicon carbide for electronic components;"
- (zg) in the Dual-use Goods List, in Category 4, by repealing Notes 1 and 2 and substituting -
- "1. Computers, related equipment and "software" performing telecommunications or "local area network" functions must also be evaluated against the performance characteristics of Category 5, Part 1 (Telecommunications).
  2. Control units which directly interconnect the buses or channels of central processing units, "main storage" or disk controllers are not regarded as

telecommunications equipment described in Category 5, Part 1 (Telecommunications).

*N.B.:*

For the control status of "software" specially designed for packet switching, see Category 5D001 (Telecommunications).

3. Computers, related equipment and "software" performing cryptographic, cryptanalytic, certifiable multi-level security or certifiable user isolation functions, or which limit electromagnetic compatibility (EMC), must also be evaluated against the performance characteristics in Category 5, Part 2 ("Information Security").";
- (zh) in the Dual-use Goods List, in Category 4, in sub-category 4A -
- (i) in 4A003(b), by repealing "6 500" and substituting "28 000";
  - (ii) in 4A003(d), by repealing "3 000 000" and substituting "200 000 000";
  - (iii) in 4A003(g), by repealing "80 Mbyte/s" and substituting "1.25 Gbyte/s";
- (zi) in the Dual-use Goods List, in Category 4, in sub-category 4D, by repealing 4D003(b) and substituting -
- "(b) Deleted;"

(zj) in the Dual-use Goods List, in Category 5, in Part 1, in sub-category 5A1 -

- (i) in 5A001(b)(3), by repealing "employing "spread spectrum" or "frequency agility" (frequency hopping) techniques" and substituting "employing "spread spectrum" techniques, including "frequency hopping" techniques,";
- (ii) in 5A001(b)(3)(b), in the Note, by repealing "cellular radio equipment operating in civil bands" and substituting "radio equipment specially designed for use with civil cellular radiocommunications systems";
- (iii) in 5A001(b)(4), in the Note, by repealing "cellular radio equipment operating in civil bands" and substituting "radio equipment specially designed for use with civil cellular radiocommunications systems";
- (iv) in 5A001(c)(1), by repealing the Technical Note and the N.B. and substituting -

*Technical Note:*

Proof Test: on-line or off-line production screen testing that dynamically applies a prescribed

tensile stress over a 0.5 to 3 m length of fibre at a running rate of 2 to 5 m/s while passing between capstans approximately 150 mm in diameter. The ambient temperature is a nominal 293 K and relative humidity 40%. Equivalent national standards may be used for executing the proof test.";

(zk) in the Dual-use Goods List, in Category 5, in Part 1, in sub-category 5B1, by repealing 5B001(b)(4) and substituting -

"(4) Radio equipment employing quadrature-amplitude-modulation (QAM) techniques above level 128; *or*";

(zl) in the Dual-use Goods List, in Category 5, in Part 1, in sub-category 5D1 -

(i) by repealing 5D001(c)(2) and substituting -

"(2) Deleted;"

(ii) in 5D001(d)(2)(b), in the Note, by repealing "equipment" and substituting "'software'";

(iii) by repealing 5D001(d)(4) and substituting -

"(4) Radio equipment employing quadrature-amplitude-modulation (QAM) techniques above level 128;"

(zm) in the Dual-use Goods List, in Category 5, in Part 1, in sub-category 5E1 -

(i) in 5E001(b)(4), by repealing "'spread spectrum" or "frequency agility" (frequency hopping) techniques" and substituting "'spread spectrum" techniques, including "frequency hopping" techniques";

(ii) in 5E001(c)(2)(e), by repealing the Note and substituting -

*Note:*

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

(iii) in 5E001(c)(4)(b), by repealing the Note and substituting -

*Note:*

5E001(c)(4)(b) does not control "technology" for the "development" or "production" of equipment designed or modified for operation in any frequency band which is "allocated by the ITU" for radiocommunications services, but not for radio-determination.";

- (zn) in the Dual-use Goods List, in Category 5, in Part 2, in Note 3 (Cryptography Note) -
- (i) in paragraph (c), by adding "*and*" at the end;
  - (ii) by repealing paragraph (d) and substituting -  
"(d) Deleted;"
  - (iii) in paragraph (e), by repealing "(d)" and substituting "(c)";
- (zo) in the Dual-use Goods List, in Category 5, in Part 2, in sub-category 5A2 -
- (i) in 5A002(a)(5), by repealing "for "spread spectrum" or the hopping code for "frequency agility" systems" and substituting "for "spread spectrum" systems, including the hopping code for "frequency hopping" systems";
  - (ii) in 5A002(a), by repealing Note (a) and substituting -  
"(a) "Personalized smart cards" where the cryptographic capability is restricted for use in equipment or systems excluded from control under entries (b) to (f) of this Note. If a "personalized smart card" has multiple functions,

the control status of each function is assessed individually;"

- (iii) in 5A002(a), in Note (b), by repealing "television of the consumer type" and substituting "broadcast of the consumer type";
  - (iv) in 5A002(a), in Note (c)(2)(a), by adding "contents stored on" after "Copy-protected";
- (zp) in the Dual-use Goods List, in Category 6, in sub-category 6A -
- (i) in 6A001(a)(1)(a), by adding "designed" after "systems";
  - (ii) in 6A001(a)(1)(c)(2), by adding "or" at the end;
  - (iii) by repealing 6A001(a)(1)(c)(3);
  - (iv) by renumbering 6A001(a)(1)(c)(4) as 6A001(a)(1)(c)(3);
  - (v) by repealing 6A001(a)(1)(d) and substituting -
    - "(d) Acoustic systems, equipment and specially designed components for determining the position of surface vessels or underwater vehicles designed to operate at a range exceeding 1 000 m with

a positioning accuracy of less than 10 m rms (root mean square) when measured at a range of 1 000 m;

*Note:*

6A001(a)(1)(d) includes:

- (a) Equipment using coherent "signal processing" between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle;
- (b) Equipment capable of automatically correcting speed-of-sound propagation errors for calculation of a point.";

(vi) in 6A001(a)(2)(a), by repealing "Hydrophones (transducers) having any of the following characteristics:" and substituting -

"Hydrophones having any of the following characteristics:

*Note:*

The control status of hydrophones specially designed for other

equipment is determined by the control status of the other equipment.";

- (vii) by repealing 6A001(a)(2)(a)(4), 6A001(a)(2)(a)(5), 6A001(a)(2)(a)(6) and 6A001(a)(2)(a)(7) and substituting -

"(4) When designed to operate at depths exceeding 35 m with acceleration compensation; *or*

(5) Designed for operation at depths exceeding 1 000 m;"

- (viii) in 6A001(a)(2)(b)(2), by repealing "Hydrophone group spacing of 12.5 m to less than 25 m and designed or able to be modified to operate at depths exceeding 35 m" and substituting "Designed or able to be modified to operate at depths exceeding 35 m";

- (ix) by repealing 6A001(a)(2)(b)(3);

- (x) by renumbering 6A001(a)(2)(b)(4), 6A001(a)(2)(b)(5), 6A001(a)(2)(b)(6), 6A001(a)(2)(b)(7) and 6A001(a)(2)(b)(8) as 6A001(a)(2)(b)(3), 6A001(a)(2)(b)(4), 6A001(a)(2)(b)(5), 6A001(a)(2)(b)(6) and 6A001(a)(2)(b)(7) respectively;

- (xi) by repealing 6A001(a)(2)(d)(2) and substituting -

"(2) Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m;"

(xii) by repealing 6A001(a)(2)(e) and substituting -

"(e) Bottom or bay cable systems having any of the following:

(1) Incorporating hydrophones specified in 6A001(a)(2)(a); *or*

(2) Incorporating multiplexed hydrophone group signal modules having all of the following characteristics:

(a) Designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m;  
*and*

- (b) Capable of being operationally interchanged with towed acoustic hydrophone array modules;"

(xiii) in 6A002(a)(3), by repealing Note 2 and substituting -

"2. 6A002(a)(3) does not control:

- (a) Silicon "focal plane arrays";
- (b) Multi-element (not to exceed 16 elements) encapsulated photoconductive cells using either lead sulphide or lead selenide;
- (c) Pyroelectric detectors using any of the following:
  - (1) Triglycine sulphate and variants;
  - (2) Lead-lanthanum-zirconium titanate and variants;
  - (3) Lithium tantalate;

(4) Polyvinylidene fluoride  
and variants; *or*

(5) Strontium barium niobate  
and variants.";

(xiv) in 6A003(a), by adding "and specially designed  
components therefor" after "Instrumentation cameras";

(xv) by adding before 6A003(a)(1) -

*Note:*

Instrumentation cameras, controlled by  
6A003(a)(3) to 6A003(a)(5), with modular  
structures should be evaluated by their  
maximum capability, using plug-ins available  
according to the camera manufacturer's  
specifications.";

(xvi) in 6A003(a), by adding -

"(6) Plug-ins, having all of the following  
characteristics:

(a) Specially designed for  
instrumentation cameras which  
have modular structures and  
which are controlled by  
6A003(a); *and*

- (b) Enabling these cameras to meet the characteristics specified in 6A003(a)(3), 6A003(a)(4) or 6A003(a)(5), according to the manufacturer's specifications;"

(xvii) in 6A003(b)(1), by adding at the end -

*Technical Note:*

For the purpose of this entry, digital video cameras should be evaluated by the maximum number of "active pixels" used for capturing moving images.";

(xviii) in 6A003(b)(4), by adding at the end -

*Note:*

6A003(b)(4) does not control imaging cameras incorporating linear "focal plane arrays" with 12 elements or fewer, not employing time-delay-and-integration within the element, designed for any of the following:

- (a) Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;

- (b) Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;
  - (c) Industrial equipment used for inspection, sorting or analysis of the properties of materials;
  - (d) Equipment specially designed for laboratory use; *or*
  - (e) Medical equipment.";
- (xix) in 6A004, by adding -

"(e) Aspheric optical elements having all of the following characteristics:

- (1) The largest dimension of the optical-aperture is greater than 400 mm;
- (2) The surface roughness is less than 1 nm rms for sampling lengths equal to or greater than 1 mm; *and*
- (3) The coefficient of linear thermal expansion's absolute magnitude is less than  $3 \times 10^{-6}/\text{K}$  at  $25^{\circ}\text{C}$ ;

*Technical Notes:*

- (1) An 'aspheric optical element' is any element used in an optical system whose imaging surface or surfaces are designed to depart from the shape of an ideal sphere.
- (2) Manufacturers are not required to measure the surface roughness listed in 6A004(e)(2) unless the optical element was designed or manufactured with the intent to meet, or exceed, the control parameter.

*Note:*

6A004(e) does not control aspheric optical elements having any of the following:

- (a) A largest optical-aperture dimension less than 1 m and a focal length to aperture ratio equal to or greater than 4.5:1;
- (b) A largest optical-aperture dimension equal to or

greater than 1 m and a focal length to aperture ratio equal to or greater than 7:1;

- (c) Being designed as Fresnel, flyeye, stripe, prism or diffractive optical elements;
- (d) Being fabricated from borosilicate glass having a coefficient of linear thermal expansion greater than  $2.5 \times 10^{-6}/\text{K}$  at  $25^{\circ}\text{C}$ ; or
- (e) Being an X-ray optical element having inner mirror capabilities (e.g. tube-type mirrors).

*N.B.:*

For aspheric optical elements specially designed for lithography equipment, see 3B001.";

- (xx) in 6A005(a)(1)(a)(2), by repealing "or CW";
- (xxi) in 6A005(a)(1)(b)(2), by repealing "or CW";

(xxii) in 6A005(a)(1)(c)(2), by repealing "or CW";

(xxiii) in 6A005(a)(1)(d)(2), by repealing "or CW";

(xxiv) in 6A005(a)(1), by adding at the end -

"*N.B.*:"

For excimer "lasers" specially designed  
for lithography equipment, see 3B001.";

(xxv) in 6A005(a)(2)(a), by repealing "or CW";

(xxvi) in 6A005(a)(2)(b), by repealing "or CW";

(xxvii) in 6A005(a)(2)(d), by repealing "or CW";

(xxviii) by repealing 6A005(b) and substituting -

"(b) Semiconductor "lasers", as  
follows:

(1) Individual single-  
transverse mode  
semiconductor "lasers",  
having all of the  
following:

(a) A wavelength of  
less than 950 nm  
or more than 2 000  
nm; *and*

(b) An average or CW  
output power  
exceeding 100  
mW;

- (2) Individual, multiple-transverse mode semiconductor "lasers", having all of the following:
- (a) A wavelength of less than 950 nm or more than 2 000 nm; *and*
  - (b) An average or CW output power exceeding 10 W;
- (3) Individual arrays of individual semiconductor "lasers", having any of the following:
- (a) A wavelength of less than 950 nm and an average or CW output power exceeding 60 W; or
  - (b) A wavelength equal to or greater than 2 000 nm and an average or CW output power exceeding 10 W;

*Technical Note:*

Semiconductor "lasers" are commonly called "laser" diodes.

*Notes:*

1. 6A005(b) includes semiconductor "lasers" having optical output connectors (e.g. fibre optic pigtails).
  
2. The control status of semiconductor "lasers" specially designed for other equipment is determined by the control status of the other equipment.";

(xxix) by repealing 6A203(b) and substituting -

"(b) Electronic streak cameras, electronic framing cameras, tubes and devices, as follows:

- (1) Electronic streak cameras capable of 50 ns or less time resolution;
- (2) Streak tubes for cameras specified in 6A203(b)(1);
- (3) Electronic (or electronically shuttered)

framing cameras capable of 50 ns or less frame exposure time;

- (4) Framing tubes and solid-state imaging devices for use with cameras specified in 6A203(b)(3), as follows:
  - (a) Proximity focused image intensifier tubes having the photocathode deposited on a transparent conductive coating to decrease photocathode sheet resistance;
  - (b) Gate silicon intensifier target (SIT) videcon tubes, where a fast system allows gating the photoelectrons from the photocathode before they impinge on the SIT plate;
  - (c) Kerr or Pockels cell

electro-optical shuttering;

- (d) Other framing tubes and solid-state imaging devices having a fast-image gating time of less than 50 ns specially designed for cameras specified in 6A203(b)(3);";

(xxx) in 6A203(c), by adding at the end -

*Technical Note:*

The term grays (Silicon) refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.";

(xxxi) in 6A226(a) and (b), by repealing "100 kilobars" and substituting "10 GPa";

(zq) in the Dual-use Goods List, in Category 6, in sub-category 6C, by repealing 6C002(b) and substituting -

"(b) Single crystals (including epitaxial wafers) of any of the following:

- (1) Cadmium zinc telluride (CdZnTe) with zinc content of less than 6% by mole fraction;

- (2) Cadmium telluride (CdTe) of any purity level; *or*
- (3) Mercury cadmium telluride (HgCdTe) of any purity level;

*Technical Note:*

Mole fraction is defined as the ratio of moles of ZnTe to the sum of the moles of CdTe and ZnTe present in the crystal.";

- (zr) in the Dual-use Goods List, in Category 6, in sub-category 6D, by repealing 6D103 and substituting -

"6D103 "Software" which processes post-flight, recorded data, enabling determination of vehicle position throughout its flight path, specially designed or modified for "missiles";";

- (zs) in the Dual-use Goods List, in Category 6, in sub-category 6E, by repealing 6E003 and substituting -

"6E003 Other "technology", as follows:

- (a) ACOUSTICS None;
- (b) OPTICAL SENSORS None;
- (c) CAMERAS None; OPTICS

- (d) "Technology", as follows:
- (1) Optical surface coating and treatment "technology" "required" to achieve uniformity of 99.5% or better for optical coatings 500 mm or more in diameter or major axis length and with a total loss (absorption and scatter) of less than  $5 \times 10^{-3}$ ;  
*Note:*  
See also 2E003(f).
  - (2) Optical fabrication "technology" using single point diamond turning techniques to produce surface finish accuracies of better than 10 nm rms on non-planar surfaces exceeding 0.5 m<sup>2</sup>;

#### LASERS

- (e) "Technology" "required" for the "development", "production" or "use" of specially designed

diagnostic instruments or targets in test facilities for "SHPL" testing or testing or evaluation of materials irradiated by "SHPL" beams; MAGNETOMETERS

- (f) "Technology" "required" for the "development" or "production" of fluxgate "magnetometers" or fluxgate "magnetometer" systems, having any of the following:
  - (1) A "noise level" of less than 0.05 nT rms per square root Hz at frequencies of less than 1 Hz; *or*
  - (2) A "noise level" of less than  $1 \times 10^{-3}$  nT rms per square root Hz at frequencies of 1 Hz or more;
- (g) GRAVIMETERS None;
- (h) RADAR None;"

- (zt) in the Dual-use Goods List, in Category 7, in sub-category 7A -
- (i) in 7A001, by repealing "Accelerometers" and substituting "Linear accelerometers";
  - (ii) in 7A001, by adding at the end -  
"N.B.:  
For angular or rotational accelerometers, see 7A002.";
  - (iii) in 7A002, by repealing "Gyros having" and substituting "Gyros, and angular or rotational accelerometers, having";
- (zu) in the Dual-use Goods List, in Category 7, in sub-category 7D, by repealing 7D102 and substituting -
- "7D102 Integration "software" as follows:
- (a) Integration "software" for the equipment specified in 7A103(b);
  - (b) Integration "software" specially designed for the equipment specified in 7A003 or 7A103(a);";
- (zv) in the Dual-use Goods List, in Category 8, in sub-category 8A -
- (i) in 8A001(i), in the Technical Note, by repealing "draught" where it twice appears and substituting "draft";

(ii) in 8A002(b), by repealing "equipment for";

(iii) in 8A002(q), by adding at the end -

*Note:*

8A002(q) does not control an individual apparatus for personal use when accompanying its user.";

(zw) in the Dual-use Goods List, in Category 9, in sub-category 9A -

(i) by repealing 9A004 and substituting -

"9A004 Space launch vehicles and "spacecraft";

*N.B.:*

See also 9A104.

*Note:*

9A004 does not control payloads.

*N.B.:*

For the control status of products contained in "spacecraft" payloads, see the appropriate Categories.";

(ii) by repealing 9A105(b) and substituting -

"(b) Liquid propellant rocket engines, usable in complete rocket systems or unmanned air

vehicles, capable of a range of 300 km, other than those specified in 9A005 or 9A105(a), having a total impulse capacity of 0.841 MNs or greater;"

(iii) by repealing 9A110 and substituting -

"9A110 Composite structures, laminates and manufactures thereof, other than those specified in 9A010, specially designed for use in space launch vehicles specified in 9A004 or sounding rockets specified in 9A104 or the subsystems specified in 9A005, 9A007, 9A105(a), 9A106 to 9A108, 9A116 or 9A119;

*N.B.:*

See also 1A002.";

(zx) in the Dual-use Goods List, in Category 9, in sub-category 9B -

(i) in 9B001, by repealing "or measuring";

(ii) by repealing 9B001(c);

(iii) by repealing 9B001(d);

(zy) in the Dual-use Goods List, in Category 9, in sub-category 9C -

- (i) by repealing "None";
- (ii) by adding -
  - "9C110 Resin impregnated fibre prepregs and metal coated fibre preforms therefor, for composite structures, laminates and manufactures specified in 9A110, made either with organic "matrix" or metal "matrix" utilizing fibrous or filamentary reinforcements having a "specific tensile strength" greater than  $7.62 \times 10^4$  m and a "specific modulus" greater than  $3.18 \times 10^6$  m;

*N.B.:*

See also 1C010 and 1C210.

*Note:*

The only resin impregnated fibre prepregs specified in 9C110 are those using resins with a glass transition temperature (T<sub>g</sub>), after cure, exceeding 418 K (145°C) as determined

by ASTM D4065 or equivalent.";

- (zz) in the Dual-use Goods List, in Category 9, in sub-category 9D -
- (i) in 9D001, 9D002 and 9D003, by repealing ""Software" required for" and substituting ""Software" specially designed or modified for";
  - (ii) by adding -
    - "9D104 "Software" specially designed or modified for the "use" of goods specified in 9A001, 9A005, 9A006(d), 9A006(g), 9A007(a), 9A008(d), 9A009(a), 9A010(d), 9A011, 9A101, 9A105, 9A106(c), 9A106(d), 9A107, 9A108(c), 9A109, 9A111, 9A115(a), 9A116(d), 9A117 or 9A118;
    - 9D105 "Software" which coordinates the function of more than one subsystem, specially designed or modified for "use" in space launch

vehicles specified in 9A004 or  
sounding rockets specified in  
9A104;"

(zza) in the Dual-use Goods List, in Category 9, in sub-category 9E -

(i) in 9E002, by repealing the Note and substituting -

*"N.B.:*

For "technology" for the repair of controlled structures, laminates or materials, see 1E002(f).

*Note:*

"Development" or "production" "technology" controlled by 9E001 to 9E003 for gas turbine engines remains controlled when used as "use" "technology" for repair, rebuild and overhaul. Excluded from control are: technical data, drawings or documentation for maintenance activities directly associated with calibration, removal or replacement of damaged or unserviceable line replaceable units, including replacement of whole engines or engine modules.";

(ii) by repealing 9E003(a)(3) and substituting -

- "(3) Components manufactured from any of the following:
- (a) Organic "composite" materials designed to operate above 588 K (315°C);
  - (b) Metal "matrix" "composite", ceramic "matrix", intermetallic or intermetallic reinforced materials controlled by 1C007;  
*or*
  - (c) "Composite" materials controlled by 1C010 and manufactured with resins controlled by 1C008;"
- (iii) in 9E003(a)(10)(c), by adding "*or*" at the end;
- (iv) by repealing 9E003(a)(11);
- (v) by renumbering 9E003(a)(12) as 9E003(a)(11);
- (vi) by repealing 9E003(d) and substituting -
- "(d) "Technology" "required" for the "development" or "production" of helicopter power transfer systems or tilt rotor or tilt

wing "aircraft" power transfer systems;"

- (vii) in 9E003(e)(1), in the Technical Note, by adding "is" after "dimensions" where it first appears;

(zzb) in the Definitions of Terms -

- (i) in the definition of "Asymmetric algorithm", by repealing "*N.B.:*" and substituting "*Technical Note:*";
- (ii) in the definition of "Basic gate propagation delay time", by repealing the N.B. and the Technical Note and substituting -

*Technical Notes:*

1. "Basic gate propagation delay time" is not to be confused with the input/output delay time of a complex "monolithic integrated circuit".
2. 'Family' consists of all integrated circuits to which all of the following are applied as their manufacturing methodology and specifications except their respective functions:

- (a) The common hardware and software architecture;
  - (b) The common design and process technology; *and*
  - (c) The common basic characteristics.";
- (iii) by repealing the definition of "Biocatalysts" and substituting -

"ML7 "Biocatalysts" (生物催化劑) Enzymes for specific chemical or biochemical reactions or other biological compounds which bind to and accelerate the degradation of CW agents.

*Technical Note:*

'Enzymes' means "biocatalysts" for specific chemical or biochemical reactions.";

- (iv) in the definition of "Biopolymers", by repealing "*N.B.:*" and substituting "*Technical Notes:*";
- (v) by repealing the definition of "Commingled" and substituting -

"1 "Commingled" (混合)

Filament to filament blending of thermoplastic fibres and reinforcement fibres in order to produce a fibre reinforcement "matrix" mix in total fibre form.";

- (vi) in the definition of "Cryptography", by repealing "*N.B.*:" and substituting "*Technical Note:*";
- (vii) in the definition of "Data signalling rate", by repealing the N.B. and substituting -

*Note:*

When determining the "data signalling rate", servicing and administrative channels shall be excluded.

*Technical Note:*

It is the maximum one-way rate, i.e. the maximum rate in either transmission or reception.";

- (viii) in the definition of "Digital computer", by repealing "*N.B.*:" and substituting "*Technical Note:*";

- (ix) in the definition of "Dynamic adaptive routing", by repealing "*N.B.:*" and substituting "*Note:*";
- (x) by repealing the definition of "Effective gramme" of "special fissile material" and substituting -
  - ""Effective gram", "Effective gramme" (有效克)
  - (a) For plutonium isotopes and uranium-233, the isotope weight in grams or grammes;
  - (b) For uranium enriched 1 per cent or greater in the isotope uranium-235, the element weight in grams or grammes multiplied by the square of its enrichment expressed as a decimal weight fraction;
  - (c) For uranium enriched below 1 per cent in the isotope uranium-235, the element weight in grams or grammes multiplied by 0.0001.";

- (xi) in the definition of "Film type integrated circuit", by repealing the N.B.;
- (xii) in the definition of "Focal plane array", by repealing "*N.B.:*" and substituting "*Note:*";
- (xiii) by repealing the definition of "'Frequency agility" (frequency hopping)" and substituting -
  - "5 "Frequency hopping" (跳頻) A form of "spread spectrum" in which the transmission frequency of a single communication channel is made to change by a random or pseudo-random sequence of discrete steps.";
- (xiv) in the definition of "Information security", by repealing "*N.B.:*" and substituting "*Technical Note:*";
- (xv) in the definition of "In the public domain", by repealing "*N.B.:*" and substituting "*Note:*";
- (xvi) in the definition of "Laser", by repealing -

"0 2 3 5

6 7 9

ML23"

and substituting -

"0 2 3 5

6 7 8 9

ML9

ML19";

(xvii) by repealing the definition of "Microcomputer microcircuit" and substituting -

"3 "Microcomputer microcircuit" (微電腦  
微電路)

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

*Technical Note:*

The internal storage may be augmented by an external storage.";

- (xviii) in the definition of "Microprocessor microcircuit", by repealing the N.B. and substituting -

*"Technical Note:*

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

*Note:*

This definition includes chip sets which are designed to operate together to provide the function of a "microprocessor microcircuit".";

- (xix) in the definition of "Military pyrotechnics", by repealing "'Military pyrotechnics" (軍用焰火訊號彈)" and substituting "'Military pyrotechnic(s)" (各種軍用焰火訊號彈)";
- (xx) in the definition of "Multilevel security", by repealing "N.B.:" and substituting "Technical Note:";

- (xxi) in the definition of "Robot", by repealing "*N.B.:*" and substituting "*Note:*";
- (xxii) in the definition of "Signal processing", by repealing "3 4 5" and substituting "3 4 5 6";
- (xxiii) in the definition of "Space qualified", by repealing "ML23";
- (xxiv) in the definition of "Stored programme controlled", by repealing "*N.B.:*" and substituting "*Technical Note:*";
- (xxv) in the definition of "Superconductive", by repealing "*N.B.:*" and substituting "*Technical Note:*";
- (xxvi) in the definition of "Symmetric algorithm", by repealing "*N.B.:*" and substituting "*Technical Note:*";
- (xxvii) in the definition of "Technology", by repealing "*N.B.:*" and substituting "*Technical Notes:*";
- (xxviii) by adding -

"2 "All compensations available" (所有補償機制)

"All compensations available"  
means after all feasible measures

available to the manufacturer to minimize all systematic positioning errors for the particular machine-tool model are considered.

3.5 "Allocated by the ITU" (由國際電訊聯盟指配)

The allocation of frequency bands according to the ITU Radio Regulations (Edition 1998) for primary, permitted and secondary services.

*N.B.:*

Additional and alternative allocations are not included.

3 "Fractional bandwidth" (分頻寬)

The "instantaneous bandwidth" divided by the centre frequency, expressed as a percentage."

**3. Schedule 2 amended**

Schedule 2 is amended, in paragraph 1(d) -

- (a) by adding "2B219," after "2B209,";
- (b) by repealing "2B229,".

**(Joseph Y T LAI)**  
**Acting Director-General of Trade**  
**and Industry**

**6 June 2001**

**Explanatory Note**

This Order revises Schedule 1 to the Import and Export (Strategic Commodities) Regulations (Cap. 60 sub. leg.) (which contains lists of strategic commodities) and consequentially amends Schedule 2 to the Regulations.