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The following Act was passed by Parliament on 25th November 2002 and assented to by the President on 3rd December 2002:—

THE STRATEGIC GOODS (CONTROL) ACT 2002

(No. 40 of 2002)

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REPUBLIC OF SINGAPORE

No. 40 of 2002.

I assent.

(LS)

S R NATHAN,
President.
3rd December 2002.

An Act to control the transfer and brokering of strategic goods, strategic goods technology, goods and technology capable of being used to develop, produce, operate, stockpile or acquire weapons capable of causing mass destruction, and missiles capable of delivering such weapons; and for purposes connected therewith.

Be it enacted by the President with the advice and consent of the Parliament of Singapore, as follows:

PART I

PRELIMINARY

Short title and commencement

1. This Act may be cited as the Strategic Goods (Control) Act 2002 and shall come into operation on such date as the Minister may, by notification in the *Gazette*, appoint.

Interpretation

2.—(1) In this Act, unless the context otherwise requires —

“authorised officer” means —

(a) an officer appointed as an authorised officer under section 4;
or

(b) an officer of customs within the meaning of section 3 of the Customs Act (Cap. 70);

“Board” means the International Enterprise Singapore Board established under section 3 of the International Enterprise Singapore Board Act (Cap. 330);

“bring in transit” means to bring goods from any country into Singapore by land, water or air, where the goods are to be taken out from Singapore on the same conveyance on which they are brought into Singapore without any landing in Singapore, but does not include the passage through Singapore in accordance with international law of a foreign conveyance carrying goods;

“computer” has the same meaning as in section 2(1) of the Computer Misuse Act (Cap. 50A);

“conveyance” includes any vessel, train, vehicle, aircraft or other mode of transport;

“country” includes territory;

“device” means any tangible medium in which information, visual images, sounds or other data is or are recorded, stored or embodied

in any form so as to be capable (with or without the aid of other equipment) of being retrieved or produced therefrom;

“Director-General” means the Director-General of Customs and Excise appointed under section 4(1) of the Customs Act (Cap. 70);

“export” means to take out from Singapore goods by land, water or air, and includes the placing of the goods in a conveyance for the purpose of taking the goods out from Singapore; but does not include the taking out from Singapore of goods that have been brought in transit or transhipped;

“foreign country” means a country other than Singapore;

“goods” means any movable or personal property but does not include choses in action or money;

“permit” means a permit granted under section 7;

“registered” means registered under section 8;

“relevant activity” means —

(a) the development, production, handling, operation, maintenance, storage, detection, identification or dissemination of any nuclear, chemical or biological weapon; or

(b) the development, production, maintenance or storage of missiles which are capable of delivering any such weapon;

“senior authorised officer” means —

(a) an officer appointed as a senior authorised officer under section 4; or

(b) a senior officer of customs within the meaning of section 3 of the Customs Act;

“strategic goods” means any goods specified in Part II, III or IV of the Schedule;

“strategic goods technology” means any technology specified in Part II of the Schedule;

“technology” means any technology or software as defined in Part I of the Schedule, and includes an essential part of the technology;

“through bill of lading”, “through air way bill” and “through manifest” mean a bill of lading, air way bill and manifest, respectively, for the consignment of goods from a place outside Singapore to a destination which is also outside Singapore without a consignee in Singapore;

“tranship” means to remove goods from the conveyance on which they were brought into Singapore and to place the goods on the same or another conveyance for the purpose of taking them out of Singapore, where these acts are carried out on a through bill of lading, through air way bill or through manifest;

“transmit”, in relation to any technology, means to —

- (a) transmit it in Singapore by electronic means; or
- (b) make it available in Singapore on a computer,

so that it becomes accessible (whether on a request, or subject to a pre-condition, or otherwise) to a person in a foreign country, whether he is a specific person, a person within a specific class, any person in general or the person who carries out the transmission.

(2) For the purposes of the definition of the expression “bring in transit” —

- (a) a conveyance is in passage through Singapore in accordance with international law if it passes through or above Singapore territorial waters or airspace without stopping or anchoring in Singapore except in a situation of distress; and
- (b) a conveyance is a foreign conveyance if it is not registered in Singapore.

(3) In this Act, a reference to a document includes, in addition to any document or record on paper, a reference to any, or part of any —

- (a) document or record in an electronic form or kept on any magnetic, optical, chemical or other medium;
- (b) photograph;
- (c) map, plan, graph, picture or drawing; or
- (d) device.

(4) A reference in this Act to the value of goods or technology in respect of which an offence was committed is a reference to the value of the goods or technology at the time of the commission of the offence.

Act subject to section 4 of Arms and Explosives Act

3. This Act is subject to section 4 of the Arms and Explosives Act (Cap. 13).

Appointment of authorised officers and senior authorised officers

4. The Minister may appoint any public officer or officer of a statutory body as an authorised officer or a senior authorised officer for the purposes of this Act or any particular Part or provision of this Act.

PART II

TRANSFER AND BROKERING OF STRATEGIC GOODS AND STRATEGIC GOODS TECHNOLOGY

Transfer of strategic goods, etc.

5.—(1) No person shall —

- (a) export any goods specified in Part II of the Schedule;
- (b) export any document in which any strategic goods technology is recorded, stored or embodied;
- (c) transmit any strategic goods technology; or
- (d) tranship any goods specified in Part III of the Schedule.

(2) No person shall —

- (a) export, tranship or bring in transit any goods;
- (b) export any document in which any technology is recorded, stored or embodied; or
- (c) transmit any technology,

if —

- (i) he has been notified by an authorised officer or a senior authorised officer that the goods or technology is intended or

likely to be used, wholly or in part, for or in connection with a relevant activity;

- (ii) he knows that the goods or technology is intended to be used, wholly or in part, for or in connection with a relevant activity; or
- (iii) he has reasonable grounds to suspect that the goods or technology is intended or likely to be used, wholly or in part, for or in connection with a relevant activity.

(3) Subsections (1) and (2) do not apply to an act authorised by a permit.

(4) Subsections (1) and (2) do not apply to the export of any document in which any technology is recorded, stored or embodied, or to the transmission of any technology, to the extent that this is necessary to facilitate —

- (a) the installation, operation or maintenance of any goods which have been exported, transhipped or brought in transit, where a permit has been obtained or is not required for such export, transshipment or bringing in transit;
- (b) an application for a patent; or
- (c) any research in the technology the results of which have no practical application.

(5) Subsection (2)(a) does not apply to the bringing in transit of any goods with the approval of a senior authorised officer.

(6) Any person who contravenes subsection (1) or (2) shall be guilty of an offence and shall be liable —

- (a) on a first conviction, to a fine not exceeding \$100,000 or 3 times the value of the goods or technology in respect of which the offence was committed, whichever is the greater, or to imprisonment for a term not exceeding 2 years or to both; or
- (b) on a second or subsequent conviction, to a fine not exceeding \$200,000 or 4 times the value of the goods or technology in respect of which the offence was committed, whichever is the greater, or to imprisonment for a term not exceeding 3 years or to both.

(7) In proceedings for an offence for an act referred to in subsection (1)(c) or (2)(c), it is a defence for the accused to prove that, at the time of carrying out the act, he did not know nor have reason to believe that the technology in question would thereby become accessible to any person in a foreign country.

(8) In proceedings for an offence in respect of any goods or technology referred to in subsection (2)(iii), it is a defence for the accused to prove that he has made all reasonable inquiries as to the use or proposed use of those goods or technology and is satisfied from such inquiries that those goods or technology will not be used for or in connection with a relevant activity.

Brokering of strategic goods, etc.

6.—(1) No person shall arrange or negotiate, or do any act to facilitate the arrangement or negotiation of —

(a) a contract for the acquisition or disposal of any goods referred to in subsection (2) if he knows or has reason to believe that such a contract will or is likely to result in the removal of those goods from one foreign country to another foreign country; or

(b) a contract for the acquisition, disposal or transmission of —

(i) any technology referred to in subsection (3); or

(ii) any document in which such technology is recorded, stored or embodied,

if he knows or has reason to believe that such a contract will or is likely to result in the transmission of such technology or removal of such document from one foreign country to another foreign country.

(2) Subsection (1) applies to —

(a) any goods specified in Part IV of the Schedule; or

(b) any goods —

(i) which that person has been notified by an authorised officer or a senior authorised officer are intended or likely to be used, wholly or in part, for or in connection with a relevant activity;

(ii) which he knows are intended to be used, wholly or in part, for or in connection with a relevant activity; or

(iii) which he has reasonable grounds to suspect are intended or likely to be used, wholly or in part, for or in connection with a relevant activity.

(3) Subsection (1) applies to any technology —

(a) which that person has been notified by an authorised officer or a senior authorised officer is intended or likely to be used, wholly or in part, for or in connection with a relevant activity;

(b) which he knows is intended to be used, wholly or in part, for or in connection with a relevant activity; or

(c) which he has reasonable grounds to suspect is intended or likely to be used, wholly or in part, for or in connection with a relevant activity.

(4) Subsection (1) does not apply to an act in relation to any goods referred to in subsection (2)(a) by a person who is registered.

(5) Subsection (1) does not apply to an act in relation to —

(a) any goods referred to in subsection (2)(b); or

(b) any technology referred to in subsection (3), or any document in which such technology is recorded, stored or embodied,

that is authorised by a permit.

(6) Subsection (1) does not apply to any person whose sole involvement in the acquisition or disposal of the goods, technology or document, or the transmission of the technology, is the provision of —

(a) transportation service;

(b) financing or financial service;

(c) insurance;

(d) advertising service to the extent that it involves the dissemination of information that is generally available to the public; or

(e) such other service as may be prescribed.

(7) Subsection (1) does not apply to any contract for the acquisition, disposal or transmission of any technology, or of any document in which any technology is recorded, stored or embodied, to the extent that such acquisition, disposal or transmission is necessary to facilitate —

- (a) the installation, operation or maintenance in any foreign country of any goods which are not strategic goods;
- (b) an application for a patent; or
- (c) any research in the technology or part, the results of which have no practical application.

(8) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable —

- (a) on a first conviction, to a fine not exceeding \$100,000 or 3 times the value of the goods or technology in respect of which the offence was committed, whichever is the greater, or to imprisonment for a term not exceeding 2 years or to both; and
- (b) on a second or subsequent conviction, to a fine not exceeding \$200,000 or 4 times the value of the goods or technology in respect of which the offence was committed, whichever is the greater, or to imprisonment for a term not exceeding 3 years or to both.

(9) In proceedings for an offence in respect of any goods referred to in subsection (2)(b)(iii) or any technology referred to in subsection (3)(c), it is a defence for the accused to prove that he has made all reasonable inquiries as to the use or proposed use of those goods or technology and is satisfied from such inquiries that those goods or technology will not be used for or in connection with a relevant activity.

(10) In this section —

“acquisition”, in relation to any goods, technology or document, means the purchase, hire or borrowing of the goods, technology or document, or the acceptance of the goods, technology or document as a gift;

“disposal”, in relation to any goods, technology or document, means the sale, letting on hire or lending of the goods, technology or document, or the giving of the goods, technology or document as a gift.

Permits

7.—(1) An application for a permit to carry out an act referred to in section 5(1)(a), (b) or (d) or (2)(a) or (b) shall be made to the Director-General.

(2) An application for a permit to carry out an act referred to in section 5(1)(c) or (2)(c), or to carry out an act referred to in section 6(1) in relation to —

(a) any goods referred to in section 6(2)(b); or

(b) any technology referred to in section 6(3) or any document in which such technology is recorded, stored or embodied,

shall be made to the Board.

(3) An application for a permit shall be made in such manner and form as the Director-General or the Board may determine, and shall be accompanied by such fee as may be prescribed.

(4) The Director-General or the Board may, subject to the regulations made under subsection (8), grant a permit to the applicant and may impose such conditions on him as the Director-General or the Board thinks fit.

(5) The Director-General or the Board may, subject to the regulations made under subsection (8), renew a permit with or without conditions, or cancel a permit.

(6) A person aggrieved by a decision of the Director-General or the Board not to grant or renew a permit, or to cancel a permit, may appeal to the Minister whose decision shall be final.

(7) The Director-General or the Board may delegate any of his or its powers under this section to a senior authorised officer.

(8) The Minister may make regulations to prescribe the class or classes of permits that may be granted, the time, form and manner of application for a permit, the conditions of a permit, the circumstances under which an

application may be granted or refused, or a permit may be cancelled, renewed or replaced, and the fees payable in respect thereof.

Registration

8.—(1) An application for registration to carry out an act referred to in section 6(1) in relation to goods referred to in section 6(2)(a) shall be made to the Board in such manner and form as the Board may determine, and shall be accompanied by such fee as may be prescribed.

(2) The Board may, subject to the regulations made under subsection (6), register the applicant and may impose such conditions on him as the Board thinks fit.

(3) The Board may, subject to the regulations made under subsection (6), renew any registration with or without conditions, or cancel or suspend any registration.

(4) A person aggrieved by a decision of the Board not to register him or renew his registration, or to cancel or suspend his registration, may appeal to the Minister whose decision shall be final.

(5) The Board may delegate any of its powers under this section to a senior authorised officer.

(6) The Minister may make regulations to prescribe different classes of registration, the time, form and manner of application for registration, the duration of any registration, the conditions of registration, the circumstances under which an application may be granted or refused, or any registration may be suspended, cancelled, extended or renewed, and the fees payable in respect thereof.

Breach of condition of permit or registration an offence

9. If any person who holds a permit or who is registered contravenes, without lawful excuse, a condition of the permit or registration that is prescribed under section 7(8) or 8(6), he shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000 or to imprisonment for a term not exceeding 12 months or to both.

PART III

INFORMATION AND DOCUMENTS

Information and records on any act requiring permit or registration

10.—(1) A person who carries out any act under the authority of a permit, or in respect of which he is registered, shall —

- (a) give to a senior authorised officer, in the prescribed form and at the prescribed time, the prescribed particulars in respect of that act;
- (b) keep such records in relation to that act as are required by regulations made under this Act; and
- (c) prepare and give to a senior authorised officer from such records, such reports as are required by regulations made under this Act.

(2) Any person who refuses or fails, without reasonable cause, to comply with subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000 or to imprisonment for a term not exceeding 6 months or to both.

(3) The regulations relating to the keeping of records referred to in subsection (1)(b) may include regulations relating to —

- (a) the form and content of such records; and
- (b) the period for which such records are to be kept.

(4) The regulations relating to the preparation and giving of reports referred to in subsection (1)(c) may include regulations relating to —

- (a) the form and content of such reports;
- (b) the time within which such reports are to be made; and
- (c) the persons who are to sign such reports.

Senior authorised officer may seek information

11.—(1) This section applies if a senior authorised officer considers that any person is capable of giving information relating to any act referred to in section 5, 6 or 9.

(2) The senior authorised officer may, by written notice given to a person referred to in subsection (1), require the person to give such information to him within such reasonable period and in such manner as is specified in the notice.

(3) The senior authorised officer may, by written notice given to a person referred to in subsection (1), require the person to give the senior authorised officer particular documents, or documents of a particular kind, specified in the notice, within such reasonable period as is specified in the notice.

(4) Any person who refuses or fails, without reasonable cause, to comply with a notice under this section to the extent that the person is capable of complying with it shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000 or to imprisonment for a term not exceeding 6 months or to both.

(5) The power of a senior authorised officer under this section to require a person to give information or documents to him is in addition to any obligation to give information or documents that the person may have under section 10.

Confidentiality

12.—(1) No information or document given under this Part shall, except with the prior consent in writing of the person having the control, management or superintendence of the thing in relation to which the information or document was given —

- (a) be published; or
- (b) be communicated or disclosed to any other person,

except where it is necessary —

- (i) for the purposes of an investigation into or prosecution for an offence under this Act or any other written law; or
- (ii) to enable a foreign government authority to investigate or prosecute a person for an offence committed in a foreign country, if the conditions specified in subsection (2) are satisfied.

(2) The conditions referred to in subsection (1)(ii) are —

- (a) that the offence involves strategic goods or strategic goods technology, or anything that may be used to develop, produce, operate, stockpile or acquire any nuclear, chemical or biological weapon or a missile capable of delivering such weapon;
- (b) that the communication or disclosure is not likely to prejudice the sovereignty, security or other essential interests of Singapore;
- (c) that the information is used only for the investigation or prosecution for which it was requested and the foreign government authority undertakes to abide by any condition imposed by the Minister on the use of the information; and
- (d) such other conditions as the Minister may prescribe.

(3) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$6,000 or to imprisonment for a term not exceeding 12 months or to both.

PART IV

ENFORCEMENT

Preliminary provision

13.—(1) In this Part, “premises” means any land, place or building, whether open or enclosed, and whether built on or not, and includes any free trade zone within the meaning of the Free Trade Zones Act (Cap. 114).

(2) For the avoidance of doubt, the provisions of this Part shall have effect notwithstanding the provisions of the Free Trade Zones Act.

Search warrant

14.—(1) If a Magistrate is satisfied, on information given upon oath, that there is reasonable cause to believe that there is in any premises any article or document which is evidence that an offence under section 5, 6 or 9 has been, is being or is about to be committed, he may issue a warrant in writing authorising an authorised officer or a senior authorised officer to enter the premises, at any time within one month from the time of the issue of the warrant, to search them.

(2) An authorised officer or a senior authorised officer who enters the premises under the authority of the warrant may —

- (a) take with him such other person and such equipment as appear to him to be necessary;
- (b) rummage and search all parts of the premises for any such article or document;
- (c) inspect any document which he has reasonable cause to believe is such document, and make copies of, or seize and remove, such document;
- (d) inspect, seize and remove any article found on the premises which he has reasonable cause to believe to be such article;
- (e) search or cause to be searched any person found on the premises whom he has reasonable cause to believe to be in possession of any such article or document.

(3) No woman or girl may be searched except by a woman.

When search may be made without warrant

15. If a senior authorised officer has reasonable cause to believe that —

- (a) there is in any premises any article or document which is evidence that an offence under section 5 or 6 has been, is being or is about to be committed; and
- (b) the article or document is likely to be removed by reason of a delay in obtaining a search warrant under section 14,

he may exercise all the powers mentioned in section 14 as if he were authorised to do so by a warrant issued under that section.

Power to search conveyance

16.—(1) A senior authorised officer, or an authorised officer acting in accordance with the general or special directions of a senior authorised officer, may board any conveyance in Singapore and may rummage and search all parts of the conveyance for any article or document in respect of which an offence under section 5 or 6 has been, is being or is about to be committed.

(2) For the more effective exercise of the powers under subsection (1), the senior authorised officer or authorised officer may —

- (a) require the master of any vessel or the captain of any aircraft to give such information relating to the vessel or aircraft, cargo, stores, crew, passengers or voyage as he may consider necessary;
- (b) by direction to the master of any vessel or the pilot of any aircraft, require the vessel or aircraft, as the case may be, not to proceed until so authorised;
- (c) require any document which ought to be on board any vessel or aircraft to be brought to him for inspection and, if he has reasonable cause to believe that the document is evidence of the commission of an offence under section 5 or 6, to make copies of, or seize and remove, the document;
- (d) require the person in charge of a vehicle —
 - (i) to stop and not to proceed until so authorised; or
 - (ii) to bring the vehicle to any premises prescribed by the Minister as an examinations station for the purposes of this section.

(3) The senior authorised officer or authorised officer may seize and remove any article or document in respect of which he has reasonable cause for believing that an offence under section 5 or 6 has been, is being or is about to be committed.

Duties of authorised officer, etc., upon seizure

17.—(1) Whenever any article or document is seized and removed under section 14, 15 or 16, the authorised officer or senior authorised officer, as the case may be, shall give notice in writing of the seizure and removal and the grounds thereof to the owner of the article or document, if known, either by delivering the notice to him personally or by post at his business or residential address, if known.

(2) The notice need not be given if the seizure is made on the person or in the presence of the offender or the owner or his agent.

Access to computer information

18.—(1) In connection with the exercise of his powers under section 14, 15 or 16, an authorised officer or a senior authorised officer —

- (a) shall be entitled at any time to have access to, and inspect and check the operation of, any computer and any associated device, apparatus or material which is or has been in use in connection with any document to which section 14, 15 or 16 applies; and
- (b) may require —
 - (i) the person by whom or on whose behalf the computer is or has been so used; or
 - (ii) any person having charge of, or otherwise concerned with the operation of, the computer, device, apparatus or material, to provide the authorised officer or senior authorised officer with such reasonable assistance as he may require for the purposes of paragraph (a).

(2) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000 or to imprisonment for a term not exceeding 6 months or to both.

Use of force

19. If, for the purposes of the exercise of any power under section 14, 15 or 16, force is required to enter any premises or board any conveyance (whether by breaking down a door or otherwise) or gain access to anything on or in the premises or conveyance, the authorised officer or senior authorised officer may use such force as is reasonable in the circumstances.

Obstruction of authorised officer or senior authorised officer

20. Any person who, without lawful excuse —

- (a) refuses an authorised officer or a senior authorised officer, or a person acting in his assistance, access to any conveyance or premises which the officer is entitled under this Part;

- (b) obstructs or hinders an authorised officer or a senior authorised officer, or a person acting in his assistance, in the execution of any power conferred upon that officer by this Part; or
- (c) refuses to provide reasonable assistance to an authorised officer or a senior authorised officer, or a person acting in his assistance, in the execution of any power conferred upon that officer by this Part, when required to do so by that officer or person,

shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000 or to imprisonment for a term not exceeding 6 months or to both.

Power of arrest

21.—(1) An authorised officer or a senior authorised officer may arrest without warrant any person whom he has reason to believe to be committing or to have committed an offence under section 5 or 6, and may search the person arrested and seize anything which he reasonably considers to be evidence of the commission of the offence.

(2) No woman or girl may be searched except by a woman.

(3) Where the authorised officer or senior authorised officer makes an arrest without warrant, he shall, without unnecessary delay, produce the person arrested before a Magistrate.

(4) The authorised officer or senior authorised officer shall not detain in custody a person arrested without a warrant for a longer period than is reasonable under the circumstances of the case.

(5) Such period shall not exceed 48 hours, excluding the time for any necessary journey to the Magistrate's Court.

PART V

PROVISIONS AS TO PROCEEDINGS

Jurisdiction of court

22. Notwithstanding any provision to the contrary in the Criminal Procedure Code (Cap. 68), a District Court and a Magistrate's Court shall

have jurisdiction to try any offence under this Act and shall have power to impose the full penalty or punishment in respect of any such offence.

Who may prosecute

23. Prosecutions for offences under this Act may be conducted by a senior authorised officer authorised in writing by the Minister for this purpose.

Presumption

24. If any goods are found in or on any conveyance, it shall, until the contrary is proved, be presumed in any proceedings under this Act that the goods have been transported in or on that conveyance with the knowledge of the master, pilot, captain or person having control of the conveyance, as the case may be.

Proportional examination of goods seized to be accepted by courts

25.—(1) When any goods have been seized under section 14, 15 or 16, it shall be sufficient to open, examine and, if necessary, test the contents of such proportion of the goods seized as the authorised officer or senior authorised officer, as the case may be, may determine.

(2) The court shall presume, unless the contrary is shown, that the goods contained in the unopened packages or receptacles are of the same nature, quantity and quality as those found in similar packages or receptacles which have been opened.

Protection of informers

26.—(1) No witness in any proceedings for an offence under section 5 or 6 shall be obliged or permitted to disclose the name or address of an informer or the substance of the information received from him or to state any matter which might lead to his discovery.

(2) If any document which is in evidence or liable to inspection in any proceedings contains any entry in which any informer is named or described or which might lead to his discovery, the court shall cause the entry to be concealed from view or to be obliterated so far only as may be necessary to protect the informer from discovery.

(3) If, during any proceedings —

- (a) the court, after full inquiry into the case, believes that the informer wilfully made in his complaint a material statement which he knew or believed to be false or did not believe to be true; or
- (b) the court is of the opinion that justice cannot be fully done between the parties thereto without the discovery of the informer,

it shall be lawful for the court to require the production of the original complaint, if in writing, and permit inquiry, and require full disclosure of the informer.

Forfeiture

27.—(1) A court may order that anything shown to the court's satisfaction to be the subject-matter of an offence under section 5 or 6 or to have been used in the commission of such an offence shall be forfeited to the Government, and either destroyed or otherwise dealt with in such manner as the court may order.

(2) In particular, the court may order the thing to be dealt with as the Director-General may see fit and in such a case the Director-General may direct that it be destroyed or otherwise dealt with.

(3) Where —

- (a) the court proposes to order any thing to be forfeited under this section; and
- (b) a person claiming to have an interest in the thing applied to be heard by the court,

the court shall not order the thing to be forfeited unless that person has been given an opportunity to show cause why the order should not be made.

(4) The court may make an order of forfeiture notwithstanding that no person has been charged with or convicted of an offence under section 5 or 6 in relation to the thing to be forfeited.

Cost of enforcement

28. Where a person has been convicted by a court for an offence under section 5 or 6, the court may order that person to pay reasonable costs of

any enforcement action taken by an authorised officer or a senior authorised officer in respect of the offence, including any cost of storage of the subject-matter of the offence or anything used in the commission of the offence.

No damages recoverable for seizure unless made without reasonable or probable cause

29. No person shall, in any proceedings before any court in respect of the seizure of anything under any provision of Part IV, be entitled to the costs of the proceedings or to any damages or other relief other than an order for the return of that thing or the payment of its value, unless the seizure was made without reasonable or probable cause.

PART VI

MISCELLANEOUS

False or misleading document or information

30.—(1) Any person who, in connection with an application for a permit or registration, or being required under Part III to give any information or document to an authorised officer or a senior authorised officer —

- (a) gives any information that is false or misleading in a material particular; or
- (b) gives any document which contains a statement or omits any matter which renders it false or misleading in a material particular,

shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000 or to imprisonment for a term not exceeding 12 months or to both.

(2) In proceedings for an offence under subsection (1), it is a defence for the accused to prove that he has taken all reasonable steps to ascertain, and satisfy himself of, the truth of the matter in question.

Composition of offences

31.—(1) A senior authorised officer may, in his discretion, compound any offence under this Act which is prescribed as a compoundable offence by collecting from a person reasonably suspected of having committed the offence a sum not exceeding \$10,000.

(2) The Minister may make regulations to prescribe the offences which may be compounded.

Corporate offenders and unincorporated associations

32.—(1) Where an offence under this Act committed by a body corporate is proved to have been committed with the consent or connivance of, or to be attributable to any neglect on the part of an officer of the body corporate, the officer as well as the body corporate shall be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

(2) Where the affairs of the body corporate are managed by its members, subsection (1) shall apply in relation to the acts and defaults of a member in connection with his functions of management as if he were a director of the body corporate.

(3) Where an offence under this Act committed by a partnership is proved to have been committed with the consent or connivance of, or to be attributable to any neglect on the part of, a partner, the partner as well as the partnership shall be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

(4) Where an offence under this Act committed by an unincorporated association (other than a partnership) is proved to have been committed with the consent or connivance of, or to be attributable to any neglect on the part of, an officer of the association or a member of its governing body, the officer or member as well as the association shall be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

(5) In this section —

“officer” —

(a) in relation to a body corporate, means a director, member of the committee of management, chief executive, manager,

secretary or other similar officer of the body or person purporting to act in any such capacity; or

- (b) in relation to an unincorporated association (other than a partnership), means the president, the secretary or a member of the committee of the association and includes persons holding positions analogous to those of president, secretary or member of a committee;

“partner” includes a person purporting to act as a partner.

(6) Regulations may provide for the application of any provision of this section, with such modifications as the Authority considers appropriate, to a body corporate or unincorporated association formed or recognised under the law of a territory outside Singapore.

Public servants

33. All authorised officers and senior authorised officers shall be deemed to be public servants for the purposes of the Penal Code (Cap. 224).

Protection from personal liability

34. No suit or other legal proceedings shall lie personally against any authorised officer or senior authorised officer, or any person acting under his direction, for anything which is in good faith done or intended to be done in the execution or purported execution of this Act or any other written law.

Minister may declare whether particular goods or technology are regulated

35.—(1) The Minister may, by notification published in the *Gazette*, declare that —

- (a) goods specified in the notification are or are not strategic goods; or
- (b) technology specified in the notification is or is not strategic goods technology.

(2) In any proceedings for an offence under this Act alleged to have been committed after the publication of a notification referred to in

subsection (1) in relation to goods or technology specified in the notification, the notification shall be prima facie evidence of the matter stated therein.

Exemption

36. The Minister may, by regulations, exempt —

- (a) any person or class of persons; or
- (b) any activity in respect of all goods or technology, or goods or technology of a specified nature or description,

from all or any of the provisions of this Act, subject to such terms or conditions as may be prescribed.

Amendment of Schedule

37. The Minister may at any time, by order published in the *Gazette*, amend the Schedule, or add to it —

- (a) any military goods or goods capable of military application; or
- (b) any technology the sole or predominant function of which is to develop, produce or operate any such goods.

Regulations

38. The Minister may make regulations —

- (a) to prohibit the issue of a port clearance to the master of any vessel pending compliance with any provision of the regulations;
- (b) for the registration of any strategic goods to be exported, transhipped or brought in transit;
- (c) to prescribe offences in respect of the contravention of any regulations made under this section, and prescribing fines not exceeding \$10,000 that may, on conviction, be imposed in respect of any such offence; and
- (d) to prescribe anything which is required or permitted to be prescribed under this Act or is necessary or expedient to be prescribed for carrying out or giving effect to the provisions of this Act.

THE SCHEDULE

Sections 2(1), 5(1), 6(2) and 37

PART I

INTERPRETATION

1. In this Schedule, the following words and expressions take the definitions set out against them in this paragraph, but only where they are enclosed in quotation marks (“ ”):

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

“active tooling unit”, in relation to a workpiece, means a device for applying motive power, process energy or sensing to the workpiece;

“additive” means any substance used in an explosive formulation to improve its properties;

“aircraft” means a fixed wing, swivel wing, rotary wing (helicopter), tilt rotor or tilt-wing airborne vehicle;

“ASTM” means the organisation known as the American Society for Testing and Materials;

“asymmetric algorithm” means a cryptographic algorithm using different, mathematically-related keys for encryption and decryption (commonly known as key management encryption);

“Chemical and Biological List” means the list entitled “Chemical and Biological List” set out in Part II of this Schedule;

“circuit element” means a single active or passive functional part of an electronic circuit which may be a diode, transistor, resistor or capacitor;

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

“composite” means a “matrix” and an additional phase or phases consisting of particles, whiskers, fibres or any combination thereof, present for a specific purpose;

“contouring control” means 2 or more “numerically controlled” motions operating in accordance with instructions that specify the next required position and the required feed rates to that position, where the feed rates are varied in relation to each other so that a desired contour is generated;

“critical-temperature”, in relation to a specific “superconductive” material, means the temperature at which the material loses all resistance to the flow of direct electrical current, and is also known as the critical transition temperature;

“cryptanalysis” means the analysis of a cryptographic system or its inputs and outputs to derive confidential variables or sensitive data, including clear text (ISO 7498-2-1988 (E), paragraph 3.3.18);

“cryptography” means the discipline which embodies principles, means and methods for the transformation of data in order to hide its information content, prevent its undetected modification or prevent its unauthorised use, and is limited to the transformation of information using one or more “secret parameters” (such as crypto variables) or associated key management;

“depleted uranium” means uranium depleted in the isotope 235 below that occurring in nature;

“development”, in relation to any item in this Schedule, means all stages prior to serial production of the item, including the design, design research, design analyses, design concept, assembly and testing of prototypes, pilot production schemes, design data, process of transforming design data into a product, configuration design, integration design and layouts;

“discrete component” means a separately packaged “circuit element” with its own external connections;

“Dual Use List” means the list entitled “Dual Use List” set out in Part II of this Schedule;

“effective gram” or “effective gramme” means —

- (a) for plutonium isotopes and uranium-233, the isotope weight in grams or grammes;
- (b) for uranium enriched one percent 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; or
- (c) for uranium enriched below one percent in the isotope uranium-235, the element weight in grams or grammes multiplied by 0.0001;

“electronic assemblies” means 2 or more electronic components (including “circuit elements”, “discrete components” and integrated circuits) connected together to perform a specific function, and which are replaceable as an entity and normally capable of being disassembled;

“end-effectors” includes grippers, “active tooling units” and any other toolings attached to the baseplate on the end of a “robot” manipulator arm;

“fibrous or filamentary materials” includes —

- (a) continuous “monofilaments”;
- (b) continuous “yarns” and “rovings”;
- (c) “tows”, “tapes”, fabrics, random mats and braids;
- (d) chopped fibres, staple fibres and coherent fibre blankets;
- (e) whiskers, either monocrystalline or polycrystalline, of any length; and
- (f) aromatic polyamide pulp;

“first generation image intensifier tubes” means electrostatically focused tubes, employing input and output fibre optic or glass face plates, multi-alkali photocathodes (S-20 or S-25), but does not include microchannel plate amplifiers;

“frequency hopping” means a form of “spread spectrum” in which the transmission frequency of a single communication channel is made to change by a random or pseudo-random sequence of discrete steps;

“information security” means all means and functions used to ensure the accessibility, confidentiality or integrity of information or communication, and includes “cryptography”, “cryptanalysis”, and any protection against compromising emanations and computer security, but does not include any means or function intended to safeguard against malfunctions;

“isostatic presses” means equipment capable of pressurising a closed cavity through various media (such as gas, liquid and solid particles) to create equal pressure in all directions within the cavity upon a workpiece or material;

“laser” means an assembly of components which produce both spatially and temporarily coherent light that is amplified by stimulated emission of radiation;

“materials resistant to corrosion by UF_6 ” includes copper, stainless steel, aluminium, aluminium oxide, aluminium alloys, nickel, or alloy containing 60 weight percent or more nickel, and UF_6 -resistant fully fluorinated hydrocarbon polymers, as appropriate for the type of separation process;

“matrix” means a substantially continuous phase that fills the space between particles, whiskers or fibres;

“measurement uncertainty” means the characteristic parameter which specifies in what range around the output value the correct value of the measurable variable lies with a confidence level of 95%, and includes the uncorrected systematic deviations, the uncorrected backlash and the random deviations;

“microprogramme” means a sequence of elementary instructions, maintained in a special storage, the execution of which is initiated by the introduction of its reference instruction into an instruction register;

“military explosives” means any solid, liquid or gaseous substance or mixture of substances which, in its application as primary, booster, or main charges in warheads or in demolition or other military application, is required to detonate;

“military pyrotechnic” means a mixture of solid or liquid fuels and oxidisers which, when ignited, undergo an energetic chemical reaction at a controlled rate intended to produce specific time delays, or quantities of heat, noise, smoke, visible light or infrared radiation, and includes pyrophorics which contain no oxidisers but ignite spontaneously on contact with air;

“monofilament” means the smallest increment of fibre, usually several micrometers in diameter;

“multilevel security” means a computer security system containing information with different sensitivities that simultaneously permits access by users with different security clearances and needs-to-know, but prevents users from obtaining access to information for which they lack authorisation, but does not include any computer reliability system for the prevention of equipment fault or human error in general;

“Munitions List” means the list entitled “Munitions List” set out in Part II of this Schedule;

“natural uranium” means uranium containing the mixtures of isotopes occurring in nature;

“nuclear reactor”, in relation to a reactor vessel, means the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core of the reactor vessel, or the components which normally contain, come into direct contact with or control the primary coolant of the reactor core;

“numerical control” means the automatic control of a process performed by a device that makes use of numeric data usually introduced as the operation is in progress;

“personalised smart card” means a smart card containing a microcircuit which has been programmed for a specific application and cannot be reprogrammed for any other application by the user;

“precursor” means any specialty chemical used in the manufacture of “military explosives”;

“pressure transducer” means a device that converts pressure measurements into an electrical signal;

“production”, in relation to any item in Part II of this Schedule, means all production stages of the item, and includes product engineering, manufacture, integration, assembly (mounting), inspection, testing and quality assurance;

“programme” means a sequence of instructions —

- (a) to carry out a process in an electronic computer; or
- (b) which is convertible into a form executable by an electronic computer;

“robot” means any manipulation mechanism of the continuous path or the point-to-point variety, which may use sensors, and which has all the following characteristics:

- (a) it is multifunctional;
- (b) it is capable of positioning or orienting material, parts, tools or special devices through variable movements in 3 dimensional space;
- (c) it incorporates 3 or more closed or open loop servo-devices which may include stepping motors;
- (d) it has “user-accessible programmability” by means of the teach or playback method or by means of an electronic computer which may be a programmable logic controller (that is, without mechanical intervention),

but does not include the following devices:

- (i) manipulation mechanisms which are only manually controllable or controllable only by a tele-operator;
- (ii) fixed sequence manipulation mechanisms which are automated moving devices and operate according to mechanically fixed programmed motions, where —
 - (A) the programme is mechanically limited by fixed stops, such as pins or cams; and
 - (B) the sequence of motions and the selection of paths or angles are not variable or changeable by mechanical, electronic or electrical means;
- (iii) mechanically controlled variable sequence manipulation mechanisms which are automated moving devices and operate according to mechanically fixed programmed motions, where —
 - (A) the programme is mechanically limited by fixed, but adjustable stops, such as pins or cams;
 - (B) the sequence of motions and the selection of paths or angles are variable within the fixed programmes pattern; and

(C) variations or modifications of the programme pattern (for example, changes of pins or exchanges of cams) in one or more motion axes are accomplished only through mechanical operations;

(iv) non-servo-controlled variable sequence manipulation mechanisms which are automated moving devices and operate according to mechanically fixed programmed motions, where the programme is variable but the sequence proceeds only by the binary signal from mechanically fixed electrical binary devices or adjustable stops;

(v) stacker cranes; these are Cartesian coordinate manipulator systems manufactured as an integral part of a vertical array of storage bins and designed to access the contents of those bins for storage or retrieval;

“roving” means a bundle (typically 12 to 120) of approximately parallel “strands”;

“secret parameter” means a constant or key known only to one person or group of persons, and kept from the knowledge of others;

“software” means a collection of one or more “programmes” or “microprogrammes” fixed in any tangible medium of expression, but does not include software which is —

(a) software (not being one set out against Dual Use Code DL05 in Part II of this Schedule) that is —

(i) generally available to the public by being sold from stock at retail selling points without restriction, by means of over-the-counter transactions, mail order transactions or telephone call transactions; and

(ii) designed for installation by the user without further substantial support by the supplier; or

(b) made available without any restriction (other than copyright restriction) upon its further dissemination;

“space qualified” means designed, manufactured and tested to meet the special electrical, mechanical or environmental requirements for operation in space so that the item concerned can be used in the launch and deployment of satellites or high-altitude flight systems operating at altitudes of 100km or higher;

“special fissile material” means plutonium-239, uranium-233, “uranium enriched in the isotopes 235 or 233”, and any material containing all of these;

“specific modulus” means Young’s modulus in pascals, equivalent to N/m^2 divided by specific weight in N/m^3 , measured at a temperature of $(296 \pm 2)\text{K}$ $((23 \pm 2)^\circ\text{C})$ and a relative humidity of $(50 \pm 5)\%$;

“specific tensile strength” means ultimate tensile strength in pascals, equivalent to N/m^2 divided by specific weight in N/m^3 , measured at a temperature of $(296 \pm 2)\text{K}$ $((23 \pm 2)^\circ\text{C})$ and a relative humidity of $(50 \pm 5)\%$;

“spread spectrum” means the technique whereby energy in a relatively narrow-band communication channel is spread over a much wider energy spectrum;

“strand” means a bundle of “monofilaments” (typically over 200) arranged approximately parallel to each other;

“superconductive”, in relation to any equipment, means the equipment is made of any material (such as a metal, alloy or compound) which can lose all electrical resistance (that is, it can attain infinite electrical conductivity and carry very large electrical currents without joule heating) due to temperature or the magnetic field it is in;

“symmetric algorithm” means a cryptographic algorithm using an identical key for both encryption and decryption, and commonly used to protect the confidentiality of data;

“tape” means a material constructed of interlaced or unidirectional “monofilaments”, “strands”, “rovings”, “tows”, or “yarns” or other material, and usually pre-impregnated with resin;

“technology” means specific information necessary for the “development”, “production” or “use” of an item in this Schedule, and which takes the form of technical data contained or incorporated in —

(a) blueprints, plans, diagrams, models, formulae, tables or engineering designs; or

(b) specifications, manuals and instructions written or recorded on other media or devices such as disk, tape and read-only memories;

“tow” means a bundle of “monofilaments”, usually approximately parallel to each other;

“uranium enriched in the isotopes 235 or 233” means uranium containing the isotopes 235 or 233, or both, in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is more than the ratio of the isotope 235 to the isotope 238 occurring in nature (isotopic ratio 0.72 percent);

“use”, in relation to any item in this Schedule, means the operation, installation (including on-site installation), maintenance (including checking), repair, overhaul and refurbishing of that item;

“user accessible programmability” means a facility which enables a user to insert, modify or replace “programmes” by means other than —

(a) a physical change in wiring or interconnections; or

(b) the setting of function controls including entry of parameters;

“yarn” means a bundle of twisted “strands”.

2. Wherever a word or expression that is defined in paragraph 1 is not enclosed in quotation marks (“ ”) in this Schedule, it shall take its dictionary meaning.

3. In this Schedule, an item is specially designed in relation to another item if it is specially designed for incorporation in or for use together with that item.

PART II

GOODS THE EXPORT OF WHICH, AND TECHNOLOGY THE EXPORT OR TRANSMISSION OF WHICH, ARE PROHIBITED EXCEPT WITH PERMIT

MUNITIONS LIST

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
Munition Code	Description of Item	Notes
ML01	Arms and automatic weapons with a calibre of 12.7 mm (calibre 0.50 inches) or less and accessories, as follows, and specially designed components therefor:	<p>1. Munition Code ML01 does not include the following:</p> <ul style="list-style-type: none">(a) smooth-bore weapons used or intended to be used for hunting or sporting purposes unless they are specially designed for military use or of the fully automatic firing type;(b) firearms specially designed for dummy ammunition and which are incapable of firing any ammunition under this Part;

First column

Second column

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- a. rifles, carbines, revolvers, pistols, machine pistols and machine guns;
- b. smooth-bore weapons specially designed for military use;
- c. weapons using caseless ammunition;
- d. silencers, special gun-mountings, clips, weapons sights and flash suppressers for any of the items under Munition Codes ML01.a, ML01.b and ML01.c.

- (c) weapons using non-centre fire cased ammunition and which are not of the fully automatic firing type.
2. Munition Code ML01.a does not include the following:
- (a) muskets, rifles and carbines manufactured earlier than 1938;
 - (b) reproductions of muskets, rifles and carbines the originals of which were manufactured earlier than 1890;
 - (c) revolvers, pistols and machine guns manufactured earlier than 1890, and their reproductions.

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3. Smooth-bore weapons specially designed for military use referred to in Munition Code ML01.b are those which —
 - (a) are proof tested at pressures above 1,300 bars;
 - (b) operate normally and safely at pressures above 1,000 bars; and
 - (c) are capable of accepting ammunition above 76.2 mm in length (for example, commercial 12-gauge magnum shot gun shells).
4. The parameters in Note 3 are measured according to the standards of the Commission Internationale Permanente.

ML02

Armament or weapons with a calibre greater than 12.7 mm (calibre 0.50 inches), projectors and accessories, as follows, and specially designed components therefor:

- a. guns, howitzers, cannon, mortars, anti-tank weapons, projectile launchers, military flame throwers, recoilless rifles and signature reduction devices therefor;
- b. smoke, gas and pyrotechnic projectors or generators specifically designed for military use, except signal pistols;
- c. weapons sights.

Munition Code ML02.a includes injectors, metering devices, storage tanks and other specially designed components for use with liquid propelling charges for any of the items under that Munition Code.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
ML03	<p>The following ammunition and components:</p> <ul style="list-style-type: none"> a. ammunition and specially designed components for any item under Munition Code ML01; b. ammunition and specially designed components for any item under Munition Code ML02; c. ammunition and specially designed components for any item under Munition Code ML11. 	<ul style="list-style-type: none"> 1. Specially designed components include — <ul style="list-style-type: none"> (a) metal or plastic fabrications such as primer anvils, bullet cups, cartridge links, rotating bands and munitions metal parts; (b) safing and arming devices, fuses, sensors and initiation devices; (c) power supplies with high one-time operational output; (d) combustible cases for charges; (e) sub-munitions including bomblets, minelets and terminally guided projectiles. 2. Munition Code ML03 does not include the following: <ul style="list-style-type: none"> (a) ammunition crimped without a projectile (blank star) and dummy ammunition with a pierced powder chamber;

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(b) cartridges specially designed for any of the following purposes:

- (i) signalling;
- (ii) bird scaring; or
- (iii) lighting of gas flares at oil wells.

ML04 Bombs, torpedoes, rockets, missiles, and related equipment and accessories, as follows, if specially designed for military use, and specially designed components therefor:

a. bombs, rockets and missiles;

1. Munition Code ML04.a includes missile rocket nozzles and re-entry vehicle nosetips.

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| <ul style="list-style-type: none"> b. torpedoes, grenades, smoke canisters, mines, depth charges, demolition-charges, demolition-devices and demolition-kits, “military pyrotechnics”, cartridges, and equipment simulating the characteristics of any of these; c. equipment specially designed for the handling, control, activation, powering with one-time operational output, launching, discharging, decoying, jamming, detonation or detection of any item under Munition Code ML04.a; | <ul style="list-style-type: none"> 2. Munition Code ML04.b includes smoke grenades, fire bombs, incendiary bombs and explosive devices. 3. Munition Codes ML04.c and ML04.d also include — <ul style="list-style-type: none"> (a) mobile gas liquefying equipment capable of producing 1,000 kg or more per day of gas in liquid form; and (b) buoyant electric conducting cable suitable for sweeping magnetic mines. |
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- d. equipment specially designed for the handling, control, activation, powering with one-time operational output, launching, laying, sweeping, discharging, decoying, jamming, detonation or detection of any item under Munition Code ML04.b.

4. Hand-held devices, limited by design solely for 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 any item under Munition Codes ML04.a and ML04.b.

ML05 Fire control and related alerting and warning equipment, and related systems, test and alignment and countermeasure equipment, as follows, if specially designed for military use, and specially designed components and accessories therefor:

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- a. weapon sights, bombing computers, gun laying equipment and weapon control systems;
- b. target acquisition, designation, range-finding, surveillance or tracking systems; detection, data fusion, recognition or identification equipment; and sensor integration equipment;
- c. countermeasure equipment for any item under Munition Codes ML05.a and ML05.b;
- d. field test or alignment equipment, specially designed for any item under Munition Codes ML05.a and ML05.b.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
ML06	<p>Ground vehicles (including trailers) and components therefor specially designed or modified for military use:</p> <ul style="list-style-type: none">a. tanks and other military armed vehicles and military vehicles fitted with mountings for arms or equipment for mine laying or the launching of any item under Munition Code ML04;b. armoured vehicles;c. amphibious and deep water fording vehicles;d. recovery vehicles and vehicles for towing or transporting ammunition or weapon systems and associated load handling equipment;e. other military ground vehicles.	<ul style="list-style-type: none">1. Modification of a ground vehicle for military use entails a structural, electrical or mechanical change involving one or more specially designed military components. Such components include —<ul style="list-style-type: none">(a) pneumatic tyre casings of a kind specially designed to be bullet-proof or to run when deflated;(b) tyre inflation pressure control systems, operated from inside a moving vehicle;(c) armoured protection of vital parts, (for example, fuel tanks or vehicle cabs); and(d) special reinforcements for mountings for weapons.2. Munition Code ML06 does not include civil automobiles, or trucks, designed for transporting money or valuables and having armoured protection.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
ML07	<p>“Military explosives” and fuels, including propellants, and related substances, as follows:</p> <p>a. the following substances and mixtures thereof:</p> <ol style="list-style-type: none"> 1. spherical aluminium powder (CAS 7429-90-5) with a particle size of 60 µm or less, manufactured from material with an aluminium content of 99% or more; 2. metal fuels in particle form whether spherical, atomized, spheroidal, flaked or ground, manufactured from material consisting of 99% or more of any of the following: 	<ol style="list-style-type: none"> 1. Military explosives and fuels containing any of the metals or alloys listed in Munition Codes ML07.a.1 and ML07.a.2 are included in these Munition Codes whether or not the metals or alloys are encapsulated in aluminium, magnesium, zirconium or beryllium. 2. Munition Code ML07 does not include boron and boron carbide enriched with boron-10 (20% or more of total boron-10 content). 3. Aircraft fuels under Munition Code ML07.d.1 are finished products not their constituents. 4. Munition Code ML07 does not include perforators specially designed for oil well logging.

- (a) metals and mixtures thereof:
- (i) Beryllium (CAS 7440-41-7) in particle sizes of less than 60 µm;
 - (ii) Iron powder (CAS 7439-89-6) with particle size of 3 µm or less produced by reduction of iron oxide with hydrogen;
- (b) mixtures, which contain any of the following:
- (i) Zirconium (CAS 7440-67-7), magnesium (CAS 7439-95-4) and alloys of these in particle sizes of less than 60 µm;
5. Munition Code ML07 does not include the following substances when not compounded or mixed with military explosives or powdered metals:
- (a) Ammonium picrate;
 - (b) Black powder;
 - (c) Hexanitrodiphenylamine;
 - (d) Difluoroamine (HNF₂);
 - (e) Nitrostarch;
 - (f) Potassium nitrate;
 - (g) Tetranitronaphthalene;
 - (h) Trinitroanisol;
 - (i) Trinitronaphthalene;
 - (j) Trinitroxylen;

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| | (ii) Boron (CAS 7440-42-8) or boron carbide (CAS 12069-32-8) fuels of 85% purity or higher and particle sizes of less than 60 µm; | (k) Fuming nitric acid non-inhibited and not enriched; |
| 3. Perchlorates, chlorates and chromates composited with powdered metal or other high energy fuel components; | | (l) Acetylene; |
| 4. Compounds composed of fluorine and one or more of the following: other halogens, oxygen, nitrogen; other than compounds under the “Chemical and Biological List”; | | (m) Propane; |
| 5. Carboranes; decaborane (CAS 17702-41-9); pentaborane and derivatives thereof; | | (n) Liquid oxygen; |
| | | (o) Hydrogen peroxide in concentrations of less than 85%; |
| | | (p) Misch metal; |
| | | (q) N-pyrrolidinone; 1-methyl-2-pyrrolidinone; |
| | | (r) Dioctylmaleate; |
| | | (s) Ethylhexylacrylate; |
| | | (t) Triethylaluminium (TEA), trimethylaluminium (TMA), and other pyrophoric metal alkyls and aryls of lithium, sodium, magnesium, zinc and boron; |

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| <p>6. Cyclotetramethylenetetranitramine (CAS 2691-41-0) (HMX); octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazine; 1,3,5,7-tetranitro-1,3,5,7-tetra-cyclooctane; (octogen, octogene);</p> <p>7. Hexanitrostilbene (HNS) (CAS 20062-22-0);</p> <p>8. Diaminotrinitrobenzene (DATB) (CAS 1630-08-6);</p> <p>9. Triaminotrinitrobenzene (TATB) (CAS 3058-38-6);</p> <p>10. Triaminoguanidinenitrate (TAGN) (CAS 4000-16-2);</p> <p>11. Titanium subhydride of stoichiometry TiH 0.65-1.68;</p> <p>12. Dinitroglycoluril (DNGU, DINGU) (CAS 55510-04-8); tetranitroglycoluril (TNGU, SORGUYL) (CAS 55510-03-7);</p> | <p>(u) Nitrocellulose;</p> <p>(v) Nitroglycerin (or glyceroltrinitrate, trinitroglycerine) (NG);</p> <p>(w) 2,4,6-trinitrotoluene (TNT);</p> <p>(x) Ethylenediaminedinitrate (EDDN);</p> <p>(y) Pentaerythritoltetranitrate (PETN);</p> <p>(z) Lead azide, normal and basic lead styphnate, and primary explosives or priming compositions containing azides or azide complexes;</p> <p>(za) Triethyleneglycoldinitrate (TEGDN);</p> <p>(zb) 2,4,6-trinitroresorcinol (styphnic acid);</p> <p>(zc) Diethyldiphenyl urea; dimethyldiphenyl urea; methylethyldiphenyl urea [Centralites];</p> <p>(zd) N, N-diphenylurea (unsymmetrical diphenylurea);</p> <p>(ze) Methyl-N,N-diphenylurea (methyl unsymmetrical diphenylurea);</p> |
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13. Tetranitrobenzotriazolobenzotriazole
(TACOT) (CAS 25243-36-1);
14. Diaminohexanitrobiphenyl (DIPAM)
(CAS 17215-44-0);
15. Picrylaminodinitropyridine (PYX)
(CAS 38082-89-2);
16. 3-nitro-1,2,4-triazol-5-one (NTO or
ONTA) (CAS 932-64-9);

- (zf) Ethyl-N,N-diphenylurea (ethyl
unsymmetrical diphenylurea);
- (zg) 2-Nitrodiphenylamine (2-NDPA);
- (zh) 4-Nitrodiphenylamine (4-NDPA);
- (zi) 2,2-dinitropropanol;
- (zj) Chlorine trifluoride.

17. Hydrazine (CAS 302-01-2) in concentrations of 70% or more; hydrazine nitrate (CAS 37836-27-4); hydrazine perchlorate (CAS 27978-54-7); Unsymmetrical dimethyl hydrazine (CAS 57-14-7); Monomethyl (CAS 60-34-4) hydrazine; Symmetrical dimethyl hydrazine (CAS 540-73-8);
18. Ammonium perchlorate (CAS 7790-98-9);
19. Cyclotrimethylenetrinitramine (RDX) (CAS 121-82-4); Cyclonite; T4; hexahydro-1,3,5-trinitro-1,3,5-triazine; 1,3,5-trinitro-1,3,5-triaza-cyclohexane (hexogen, hexogene);
20. Hydroxylammonium nitrate (HAN) (CAS 13465-08-2); Hydroxylammonium perchlorate (HAP) (CAS 15588-62-2);

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21. 2-(5-cyanotetrazolato) penta amine-cobalt (III) perchlorate (or CP) (CAS 70247-32-4);
22. cis-bis (5-nitrotetrazolato) tetra amine-cobalt (III) perchlorate (or BNCP);
23. 7-Amino-4,6-dinitrobenzofurazane-1-oxide (ADNBF) (CAS 97096-78-1); amino dinitrobenzofurozan;
24. 5,7-diamino-4,6-dinitrobenzofurazane-1-oxide (CAS 117907-74-1), (CL-14 or diamino dinitrobenzofurozan);
25. 2,4,6-trinitro-2,4,6-triazacyclohexanone (K-6 or Keto-RDX) (CAS 115029-35-1);
26. 2,4,6,8-tetranitro-2,4,6,8-tetraazabicyclo [3,3,0]-octanone-3 (CAS 130256-72-3) (tetranitrosemiglycouril, K-55 or keto-bicyclic HMX);

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27. 1,1,3-trinitroazetidine (TNAZ) (CAS 97645-24-4);
28. 1,4,5,8-tetranitro-1,4,5,8-tetraazadecalin (TNAD) (CAS 135877-16-6);
29. Hexanitrohexaazaisowurtzitane (CAS 135285-90-4) (CL-20 or HNIW); and clathrates of CL-20;
30. Polynitrocubanes with more than 4 nitro groups;
31. Ammonium dinitramide (ADN or SR 12) (CAS 140456-78-6);
32. Trinitrophenylmethylnitramine (tetryl) (CAS 479-45-8);

b. the following explosives and propellants:

1. any explosive with a detonation velocity exceeding 8,700 m/s or a detonation pressure exceeding 34 GPa (340 kbar);

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2. other organic explosives not listed in Munition Code ML07 yielding detonation pressures of 25 Gpa (250 kbar) or more that will remain stable at temperatures of 523 K (250⁰C) or higher for periods of 5 minutes or longer;
3. any other United Nations (UN) Class 1.1 solid propellant not listed in Munition Code ML07 with a theoretical specific impulse (under standard conditions) of more than 250 seconds for non-metallised, or more than 270 seconds for aluminised compositions;
4. any UN Class 1.3 solid propellant with a theoretical specific impulse of more than 230 seconds for non-halogenised, 250 seconds for non-metallised and 266 seconds for metallised compositions;

5. any other gun propellants not listed in Munition Code ML07 having a force constant of more than 1,200 kJ/kg;
 6. any other explosive, propellant or pyrotechnic not listed in Munition Code ML07 that can sustain a steady-state burning rate of more than 38 mm per second under standard conditions of 6.89 MPa (68.9 bar) pressure and 294 K (21⁰C); or
 7. elastomer modified cast double based propellants (EMCDB) with extensibility at maximum stress of more than 5% at 233 K (-40⁰C);
- c. “military pyrotechnics”;
- d. the following substances:
1. aircraft fuels specially formulated for military purposes;

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2. military materials containing thickeners for hydrocarbon fuels specially formulated for use in flamethrowers or incendiary munitions, such as metal stearates or palmates (also known as octal) (CAS 637-12-7) and M1, M2, M3 thickeners;
3. liquid oxidisers comprised of or containing inhibited red fuming nitric acid (IRFNA) (CAS 8007-58-7) or oxygen difluoride;
- e. the following “additives” and “precursors”:
 1. Azidomethylmethyloxetane (AMMO) and its polymers;
 2. Basic copper salicylate (CAS 62320-94-9); lead salicylate (CAS 15748-73-9);
 3. Bis(2,2-dinitropropyl) formal (CAS 5917-61-3) or Bis(2,2-dinitropropyl) acetal (CAS 5108-69-0);
 4. Bis-(2-fluoro-2,2-dinitroethyl) formal (FEFO) (CAS 17003-79-1);

5. Bis-(2-hydroxyethyl) glycolamide (BHEGA) (CAS 17409-41-5);
6. Bis(2-methyl aziridiny) methylamino phosphine oxide (Methyl BAPO) (CAS 85068-72-0);
7. Bisazidomethyloxetane and its polymers (CAS 17607-20-4);
8. Bischloromethyloxetane (BCMO) (CAS 142173-6-0);
9. Butadienenitrileoxide (BNO);
10. Butanetrioltrinitrate (BTTN) (CAS 6659-60-5);
11. Catocene (CAS 37206-42-1) (2,2-Bis-ethylferrocenyl propane); ferrocene carboxylic acids; N-butyl-ferrocene (CAS 319904-29-7); Butacene (CAS 125856-62-4) and other adducted polymer ferrocene derivatives;
12. Dinitroazetidine-t-butyl salt;

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13. Energetic monomers, plasticisers and polymers containing nitro, azido, nitrate, nitraza or difluoroamino groups;
14. Poly-2,2,3,3,4,4-hexafluoropentane-1,5-diol formal (FPF-1);
15. Poly-2,4,4,5,5,6,6-heptafluoro-2-trifluoromethyl-3-oxaheptane-1,7-diol formal (FPF-3);
16. Glycidylazide Polymer (GAP) (CAS 143178-24-9) and its derivatives;
17. Hexabenzylhexaazaisowurtzitane (HBIW) (CAS 124782-15-6);
18. Hydroxyl terminated polybutadiene (HTPB) with a hydroxyl functionality equal to or greater than 2.2 and less than or equal to 2.4, a hydroxyl value of less than 0.77 meq/g, and a viscosity at 30⁰C of less than 47 poise (CAS 69102-90-5);

19. Superfine iron oxide (Fe_2O_3 hematite) with a specific surface area more than $250 \text{ m}^2/\text{g}$ and an average particle size of $0.003 \text{ }\mu\text{m}$ or less (CAS 1309-37-1);
20. Lead beta-resorcylate (CAS 20936-32-7);
21. Lead stannate (CAS 12036-31-6), lead maleate (CAS 19136-34-6), lead citrate (CAS 14450-60-3);
22. Lead-copper chelates of beta-resorcylate or salicylates (CAS 68411-07-4);
23. Nitratomethylmethyloxetane or poly (3-Nitratomethyl, 3-methyl oxetane); (Poly-NIMMO) (NMMO) (CAS 84051-81-0);
24. 3-Nitrazo-1,5-pentane diisocyanate (CAS 7406-61-9);
25. N-Methyl-p-Nitroaniline (CAS 100-15-2);

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26. Organo-metallic coupling agents, specifically:

- (a) Neopentyl [diallyl] oxy, tri [dioctyl] phosphato titanate (CAS 103850-22-2); also known as titanium IV, 2,2[bis 2-propenolato-methyl, butanolato, tris (dioctyl) phosphato] (CAS 110438-25-0); or LICA 12 (CAS 103850-22-2);
- (b) Titanium IV, [(2-propenolato-1) methyl, n- propanolatomethyl] butanolato-1, tris[dioctyl] pyrophosphate; or KR3538;
- (c) Titanium IV, [(2-propenolato-1) methyl, n-propanolatomethyl] butanolato-1, tris(dioctyl)phosphate;

27. Polycyanodifluoroaminoethyleneoxide (PCDE);

28. Polyfunctional aziridine amides with isophthalic, trimesic (BITA or butylene imine trimesamide), isocyanuric or trimethyladipic backbone structures and 2-methyl or 2-ethyl substitutions on the aziridine ring;
29. Polyglycidynitrate or poly (nitratomethyl oxirane); (Poly-GLYN) (PGN) (CAS 27814-48-8);
30. Polynitroorthocarbonates;
31. Propyleneimine, 2-methylaziridine (CAS 75-55-8);
32. Tetraacetyldibenzylhexaazaisowurtzitane (TAIW);
33. Tetraethylenepentaamineacrylonitrile (TEPAN) (CAS 68412-45-3); cyanoethylated polyamines and their salts;
34. Tetraethylenepentaamineacrylonitrileglycidol (TEPANOL) (CAS 68412-46-4); cyanoethylated polyamines adducted with glycidol and their salts;

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35. Triphenyl bismuth (TPB) (CAS 603-33-8);
36. Tris-1-(2-methyl)aziridiny] phosphine oxide (MAPO) (CAS 57-39-6); bis(2-methyl aziridiny] 2-(2-hydroxypropanoxy) propylamino phosphine oxide (BOBBA 8); and other MAPO derivatives;
37. 1,2,3-Tris[1,2-bis(difluoroamino)ethoxy] propane (CAS 53159-39-0); tris vinoxyl propane adduct (TVOPA);
38. 1,3,5-trichlorobenzene (CAS 108-70-3);
39. 1,2,4 trihydroxybutane (1,2,4-butanetriol);

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40. 1,3,5,7 tetraacetyl-1,3,5,7,-tetraaza
cyclo-octane (TAT)
(CAS 41378-98-7);
41. 1,4,5,8 Tetraazadecalin
(CAS 5409-42-7);
42. Low (less than 10,000) molecular
weight, alcohol-functionalised, poly
(epichlorohydrin); poly
(epichlorohydrindiol) and triol.

ML08

Vessels of war, special naval equipment and accessories, as follows, and components therefor, being vessels, equipment, accessories and components specially designed for military use:

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- a. combatant vessels and vessels (surface or underwater) specially designed or modified for offensive or defensive action, whether or not converted to non-military use, regardless of current state of repair or operating condition, and whether or not they contain weapon delivery systems or armour, and hulls or parts of hulls for such vessels;
- b. the following engines:
 - 1. diesel engines specially designed for submarines with both of the following characteristics:
 - (a) a power output of 1.12 MW (1,500 hp.) or more; and
 - (b) a rotary speed of 700 rpm or more;

2. electric motors specially designed for submarines having all of the following characteristics:
 - (a) a power output of more than 0.75 MW (1,000 hp.);
 - (b) quick reversing;
 - (c) liquid cooled; and
 - (d) totally enclosed;
3. non-magnetic diesel engines with a power output of 37.3 kW (50 hp.) or more and with a non-magnetic content in excess of 75% of total mass;
- c. underwater detection devices and controls thereof;
- d. submarine and torpedo nets;
- e. equipment for guidance and navigation;

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	<ul style="list-style-type: none"> f. hull penetrators and connectors that enable interaction with equipment external to a vessel; g. silent bearings, with gas or magnetic suspension, active signature or vibration suppression controls, and equipment containing those bearings. 	<p>Munition Code ML08.f includes connectors for vessels which are of the single-conductor, multi-conductor, coaxial or waveguide type, and hull penetrators for vessels, both of which are capable of remaining impervious to leakage from without and of retaining required characteristics at marine depths exceeding 100 m; and fibre-optic connectors and optical hull penetrators specially designed for “laser” beam transmission regardless of depth. It does not include ordinary propulsive shaft and hydrodynamic control-rod hull penetrators.</p>
ML09	<p>“Aircraft”, unmanned airborne vehicles, aero-engines and “aircraft” equipment, and related equipment and components, as follows, being “aircraft”, vehicles, aero-engines, equipment and components specially designed or modified for military use:</p>	

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| <ul style="list-style-type: none">a. combat “aircraft” and specially designed components therefor;b. other “aircraft” including military reconnaissance, assault, military training, transporting and air-dropping troops or military equipment, logistics support, and specially designed components therefor; | <ul style="list-style-type: none">1. Munition Code ML09.b does not include “aircraft” or variants of those “aircraft” specially designed for military use which —<ul style="list-style-type: none">(a) are not configured for military use and are not fitted with equipment or attachments specially designed or modified for military use; and(b) have been certified for civil use by the civil aviation authority in the recipient state. |
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- c. aero-engines and specially designed components therefor;

2. Munition Code ML09.c does not include —

(a) aero-engines designed or modified for military use which have been certified by the civil aviation authority in the recipient state for use in “civil aircrafts”, or specially designed components therefor; or

(b) reciprocating engines or specially designed components therefor.

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| <p>d. the following unmanned airborne vehicles and related equipment and specially designed components therefor:</p> <ol style="list-style-type: none">1. unmanned airborne vehicles including remotely piloted air vehicles (RPVs) and autonomous programmable vehicles;2. associated launchers and ground support equipment;3. related equipment for command and control; | <p>3. The references in Munition Codes ML09.b and ML09.c to specially designed components and related equipment shall, in the case of non-military “aircraft” or aero-engines modified for military use, include only those military components and military related equipment required for the modification of these aircrafts or aero-engines to military use.</p> |
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- e. airborne equipment, including airborne refuelling equipment, specially designed for use with an “aircraft” under Munition Code ML09.a or ML09.b or an aero-engine under Munition Code ML09.c, and specially designed components therefor or modified for military use;
- f. pressure refuellers, pressure refuelling equipment, equipment specially designed to facilitate operations in confined areas and ground equipment, developed specially for “aircraft” under Munition Code ML09.a or ML09.b, or for aero-engines under Munition Code ML09.c;
- g. pressurised breathing equipment and partial pressure suits for use in “aircraft”, anti-g suits, military crash helmets and protective masks, liquid oxygen converters used or intended to be used for “aircraft” or missiles, and catapults and cartridge actuated devices for emergency escape of personnel from “aircraft”;

- h. parachutes used or intended to be used for combat personnel, cargo dropping or “aircraft” deceleration, as follows:
 - 1. parachutes for —
 - (a) pin point dropping of rangers;
 - (b) dropping of paratroopers;
 - 2. cargo parachutes;
 - 3. paragliders, drag parachutes, drogue parachutes for stabilisation and attitude control of dropping bodies, (for example, recovery capsules, ejection seats, bombs);
 - 4. drogue parachutes for use with ejection seat systems for deployment and inflation sequence regulation of emergency parachutes;

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- 5. recovery parachutes for guided missiles, drones or space vehicles;
- 6. approach parachutes and landing deceleration parachutes;
- 7. other military parachutes;
- i. automatic piloting systems for parachuted loads; equipment for controlled opening jumps at any height, including oxygen equipment.

ML10 Electronic equipment, not specified elsewhere on the “Munitions List”, specially designed for military use, and specially designed components as follows:

- a. electronic countermeasure and electronic counter-countermeasure equipment (that is, equipment designed to introduce extraneous or erroneous signals into radar or radio communication receivers or to hinder the reception, operation or effectiveness of adversary electronic receivers, including their countermeasure equipment), including jamming and counter-jamming equipment;
- b. frequency agile tubes;
- c. electronic systems or equipment designed either for surveillance and monitoring of the electromagnetic spectrum for military intelligence or security purposes or for counteracting such surveillance and monitoring;
- d. underwater countermeasures, including acoustic and magnetic jamming and decoy, equipment designed to introduce extraneous or erroneous signals into sonar receivers;
- e. data processing security equipment, data security equipment and transmission and signalling line security equipment, using ciphering processes;

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- f. identification, authentication and keyloader equipment and key management, manufacturing and distribution equipment;
- g. other electronic equipment specially designed for military use.

ML11 High velocity kinetic energy weapon systems and related equipment, as follows, and specially designed components therefor:

1. Munition Code ML11 does not include weapon systems using sub-calibre ammunition or employing solely chemical propulsion, and ammunition therefor.
2. Munition Code ML11 includes the following when specially designed for kinetic energy weapon systems:

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- a. kinetic energy weapon systems specially designed for destruction or effecting mission-abort of a target;
- b. specially designed test and evaluation facilities and test models, including diagnostic instrumentation and targets, for dynamic testing of kinetic energy projectiles and systems.

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- (a) launch propulsion systems capable of accelerating masses larger than 0.1 g to velocities in excess of 1.6 km/s, in single or rapid fire modes;
- (b) prime power generation, electric armour, energy storage, thermal management, conditioning, switching or fuel-handling equipment; and electrical interfaces between power supply, gun and other turret electric drive functions;
- (c) target acquisition, tracking, fire control or damage assessment systems;
- (d) homing seeker, guidance or divert propulsion (lateral acceleration) systems for projectiles.

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3. Munition Code ML11 includes weapon systems using any of the following methods of propulsion:
 - (a) electromagnetic;
 - (b) electrothermal;
 - (c) plasma;
 - (d) light gas; or
 - (e) chemical (when used in combination with any of the above).
4. Munition Code ML11 does not include “technology” for magnetic induction for continuous propulsion of civil transport devices.

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ML12

Armoured or protective equipment and constructions and components, as follows:

- a. armoured plate that is —
 - 1. manufactured to comply with a military standard or specification; or
 - 2. suitable for military use;
- b. constructions of metallic or non-metallic materials or combinations thereof specially designed to provide ballistic protection for military systems, and specially designed components therefor;
- c. military helmets;

- 1. Munition Code ML12.b includes materials specially designed to form explosive reactive armour or to construct military shelters.
- 2. Munition Code ML12.c does not include conventional steel helmets which are neither modified or designed to accept, nor equipped with, any type of accessory device.

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| d. | body armour manufactured according to military standards or specifications, or equivalent, and specially designed components therefor; | 3. Munition Code ML12.d does not include an individual suit of body armour for personal protection and accessories therefor when carried on the person of its user. |
| e. | flak suits manufactured according to military standards or specifications, or equivalent, and specially designed components therefor. | |

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ML13

Specialised equipment for military training or for simulating military scenarios, and specially designed components and accessories therefor.

1. Munition Code ML13 includes image generating and interactive environment systems for simulators when specially designed or modified for military use.
2. In Munition Code ML13, “specialised equipment for military training” includes military types of attack trainers, operational flight trainers, radar target trainers, radar target generators, gunnery training devices, anti-submarine warfare trainers, flight simulators (including human-rated centrifuges for pilot or astronaut training), radar trainers, instrument flight trainers, navigation trainers, missile launch trainers, target equipment, drone “aircraft”, armament trainers, pilotless “aircraft” trainers and mobile training units.

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ML14

Imaging or countermeasure equipment, as follows, if specially designed for military use, and specially designed components and accessories therefor:

- a. recorders and image processing equipment;
- b. cameras, photographic equipment and film processing equipment;
- c. image intensifier equipment;
- d. infrared or thermal imaging equipment;
- e. imaging radar sensor equipment;

1. Munition Code ML14.f includes equipment designed to degrade the operation or effectiveness of military imaging systems or to minimize such degrading effects.
2. In Munition Code ML14, “specially designed components” includes the following when specially designed for military use:
 - (a) infrared image converter tubes;
 - (b) image intensifier tubes (other than first generation);
 - (c) microchannel plates;
 - (d) low-light-level television camera tubes;
 - (e) detector arrays (including electronic interconnection or read out systems);

- f. countermeasure or counter-countermeasure equipment for any item under Munition Codes ML14.a to ML14.e.

- (f) pyroelectric television camera tubes;
(g) cooling systems for imaging systems;
(h) electrically triggered shutters of the photochromic or electro-optical type having a shutter speed of less than 100 μ s, except in the case of shutters which are an essential part of a high speed camera;
(i) fibre optic image inverters;
(j) compound semiconductor photocathodes.

3. Munition Code ML14 does not include “first generation image intensifier tubes” or equipment specially designed to incorporate “first generation image intensifier tubes”.
4. For the status of weapons sights incorporating “first generation image intensifier tubes” see Munition Codes ML01.d, ML02.c and ML05.a.

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- ML15 Forgings, castings and other unfinished items the use of which in any item on the “Munitions List” is identifiable by material composition, geometry or function, and which are specially designed for any item under the following Munition Codes:
- a. ML01
 - b. ML02
 - c. ML03
 - d. ML04
 - e. ML06
 - f. ML08
 - g. ML09
 - h. ML11
 - i. ML18.

ML16

Miscellaneous equipment, materials and libraries, as follows, and specially designed components therefor:

- a. the following self-contained diving and underwater swimming apparatus:
 - 1. closed or semi-closed circuit (rebreathing) apparatus specially designed for military use (that is, specially designed to be non-magnetic);
 - 2. specially designed components for use in the conversion of open-circuit apparatus to military use;
 - 3. articles designed exclusively for military use with self-contained diving and underwater swimming apparatus;
- b. construction equipment specially designed for military use;
- c. fittings, coatings and treatments for signature suppression, specially designed for military use;

In Munition Code ML16, “library” (parametric technical database) means a collection of technical information of a military nature, reference to which may enhance the performance of military equipment or systems.

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- d. field engineer equipment specially designed for use in a combat zone;
- e. “robots”, “robot” controllers and “robot” “end-effectors”, having any of the following characteristics:
 - 1. specially designed for military use;
 - 2. incorporating means of protecting hydraulic lines against externally induced punctures caused by ballistic fragments (for example, incorporating self-sealing lines) and designed to use hydraulic fluids with flash points higher than 839 K (566⁰C); or
 - 3. specially designed or rated for operating in an electro-magnetic pulse (EMP) environment;
- f. libraries (parametric technical databases) specially designed for military use with items on the “Munitions List”;

- g. nuclear power generating equipment or propulsion equipment, including “nuclear reactors”, specially designed for military use and components therefor specially designed or modified for military use;
- h. equipment and material, coated or treated for signature suppression, specially designed for military use, other than those on the “Munitions List”;
- i. simulators specially designed for military “nuclear reactors”;
- j. mobile repair shops specially designed to service military equipment;
- k. field generators specially designed for military use;
- l. containers specially designed for military use;
- m. bridges specially designed for military use;
- n. test models specially designed for the “development” of any item under Munition Codes ML04, ML06, ML08 and ML09.

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ML17	<p>The following equipment:</p> <ul style="list-style-type: none"> a. specially designed or modified production equipment for the production of items on the “Munitions List”, and specially designed components therefor; b. specially designed environmental test facilities and specially designed equipment therefor, for the certification, qualification, or testing of items on the “Munitions List”. <p>The following “technology”:</p> <ul style="list-style-type: none"> c. specific production “technology”, even if the equipment with which such “technology” is to be used is not on the “Munitions List”; d. “technology” specific to the design of, the assembly of components into, and the operation, maintenance and repair of complete production installations even if the components themselves are not on the “Munitions List”, 	<ul style="list-style-type: none"> 1. Munition Codes ML17.a and ML17.b include the following equipment: <ul style="list-style-type: none"> (a) continuous nitrators; (b) centrifugal testing apparatus or equipment having any of the following characteristics: <ul style="list-style-type: none"> (i) driven by a motor or motors having a total rated horsepower of more than 298 kW (400 hp.); (ii) capable of carrying a payload of 113 kg or more; or (iii) capable of exerting a centrifugal acceleration of 8 g or more on a payload of 91 kg or more; (c) dehydration presses; (d) screw extruders specially designed or modified for military explosive extrusion; (e) cutting machines for the sizing of extruded propellants;

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if the technology is related to any item under the following Munition Codes:

1. ML01
2. ML02
3. ML03
4. ML04
5. ML05
6. ML06
7. ML07
8. ML08
9. ML09
10. ML10
11. ML11
12. ML12
13. ML13

- (f) sweetie barrels (tumblers) 1.85 m or more in diameter and having over 227 kg product capacity;
- (g) continuous mixers for solid propellants;
- (h) fluid energy mills for grinding or milling the ingredients of military explosives;
- (i) equipment to achieve both sphericity and uniform particle size in metal powder listed in Munition Code ML07.a.1;
- (j) convection current converters for the conversion of materials listed in Munition Code ML07.a.6.

2. Munition Code ML17.d does not include “technology” for civil purposes, such as agricultural, pharmaceutical, medical, veterinary, environmental, waste management, or in the food industry.
3. In Munition Code ML17, “production” means design, examination, manufacture, testing and checking.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	14. ML14	
	15. ML15	
	16. ML16	
	17. ML18	
	18. ML19.	
ML18	<p>Directed energy weapon systems (DEW), related or countermeasure equipment and test models, as follows, and specially designed components therefor:</p> <ul style="list-style-type: none"> a. “laser” systems specially designed for destruction or effecting mission-abort of a target; b. particle beam systems capable of destruction or effecting mission-abort of a target; 	<p>1. Directed energy weapon systems under Munition Code ML18 include systems whose capability is derived from the controlled application of —</p> <ul style="list-style-type: none"> (a) “lasers” of sufficient continuous wave or pulsed power to effect destruction similar to the manner of conventional ammunition; (b) particle accelerators which project a charged or neutral particle beam with destructive power; (c) high pulsed power or high average power radio frequency beam transmitters which produce fields sufficiently intense to disable electronic circuitry at a distant target.

- | | |
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| <ul style="list-style-type: none">c. high power radio-frequency (RF) systems capable of destruction or effecting mission-abort of a target;d. equipment specially designed for the detection or identification of, or defence against, systems under Munition Code ML18.a, ML18.b or ML18.c;e. physical test models and related test results for the systems, equipment and components under this Munition Code;f. continuous wave or pulsed “laser” systems especially designed to cause permanent blindness to unenhanced vision; i.e. to the naked eye or to the eye with corrective eyesight devices. | <ul style="list-style-type: none">2. Munition Code ML18 includes the following when specially designed for directed energy weapon systems:<ul style="list-style-type: none">(a) prime power generation, energy storage, switching, power conditioning or fuel-handling equipment;(b) target acquisition or tracking systems;(c) systems capable of assessing target damage, destruction or mission-abort;(d) beam-handling, propagation or pointing equipment;(e) equipment with rapid beam slew capability for rapid multiple target operations;(f) adaptive optics and phase conjugators;(g) current injectors for negative hydrogen ion beams; |
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ML19

Cryogenic and “superconductive” equipment, as follows, and specially designed components and accessories therefor:

a. equipment specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications, capable of operating while in motion and of producing or maintaining temperatures below 103K (-170⁰C);

- (h) “space qualified” accelerator components;
- (i) negative ion beam funnelling equipment;
- (j) equipment for controlling and slewing a high energy ion beam;
- (k) “space qualified” foils for neutralising negative hydrogen isotope beams.

1. Munition Code ML19.a includes mobile systems incorporating or employing accessories or components manufactured from non-metallic or non-electrical conductive materials, such as plastics or epoxy-impregnated materials.

- | | |
|--|--|
| b. “superconductive” electrical equipment (rotating machinery and transformers) specially designed or configured to be installed in a vehicle for military ground, marine, airborne or space applications, capable of operating while in motion. | 2. Munition Code ML19.b does not include direct-current hybrid homopolar generators that have single-pole normal metal armatures which rotate in a magnetic field produced by superconducting windings, provided those windings are the only superconducting component in the generator. |
|--|--|

ML20

The following “software”:

- | | |
|---|---|
| a. “software” specially designed or modified for the “development”, “production” or “use” of any equipment or materials under the following Munition Codes: | 1. ML01
2. ML02
3. ML03
4. ML04
5. ML05
6. ML06
7. ML07 |
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8. ML08

9. ML09

10. ML10

11. ML11

12. ML12

13. ML13

14. ML14

15. ML15

16. ML16

17. ML17

18. ML18

19. ML19;

- b. “software” specially designed for —
 - 1. modelling, simulation or evaluation of military weapon systems;
 - 2. “development”, monitoring, maintenance or up-dating of “software” embedded in military weapon systems;
 - 3. modelling or simulating military operation scenarios, not under Munition Code ML13;
 - 4. Command, Communications, Control and Intelligence (C³I) or Command, Communications, Control, Computer and Intelligence (C⁴I) applications;
- c. “software” for determining the effects of conventional, nuclear, chemical or biological warfare weapons;

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- d. “software”, not included under Munition Code ML20.a, ML20.b.1 or ML20.b.2, specially designed or modified to enable any item not on the “Munitions List” to perform the military functions of any item under Munition Code ML05, ML08.c, ML08.e, ML09.e, ML10, ML13, ML14, ML16.i or ML17.

ML21 “Technology” for the “development”, “production” or “use” of items on the “Munitions List”, other than “technology” under Munition Code ML17, and which is related to any item under the following Munition Codes:

1. ML01
2. ML02
3. ML03
4. ML04
5. ML05
6. ML06

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7. ML07
8. ML08
9. ML09
10. ML10
11. ML11
12. ML12
13. ML13
14. ML14
15. ML15
16. ML16
17. ML18
18. ML19
19. ML20.

CHEMICAL AND BIOLOGICAL LIST

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ChemBio Code	Description of Item	Notes
BL01	The following biological agents and toxins:	<ol style="list-style-type: none"> 1. “Biological agents” means any organism, either natural or modified which can cause death, or disease to, or incapacitate human beings and animals, or which can cause death, disease or harm to plants. 2. “Toxin” means any compound which — <ol style="list-style-type: none"> (a) originated from any organisms including micro-organisms, animals or plants, whatever its method of production, whether natural or modified; or (b) is chemically synthesised, which can cause death, disease or other harm to human beings, animals or plants.

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BL01-A

HUMAN AND ZOONOTIC PATHOGENS

Viruses

- a. Crimean-Congo haemorrhagic fever virus;
- b. Eastern equine encephalitis virus;
- c. Ebola virus;
- d. Sin Nombre virus;
- e. Junin virus;
- f. Lassa fever virus;
- g. Machupo virus;
- h. Marburg virus;
- i. Rift Valley fever virus;
- j. Tick-borne encephalitis virus;
- k. Variola major virus (Smallpox virus);
- l. Venezuelan equine encephalitis virus;
- m. Western equine encephalitis virus;
- n. Yellow fever virus;

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- o. Monkeypox virus.

Bacteria

- a. Bacillus anthracis;
- b. Brucella abortus;
- c. Brucella melitensis;
- d. Brucella suis;
- e. Burkholderia mallei;
- f. Burkholderia pseudomallei;
- g. Francisella tularensis;
- h. Yersinia pestis;
- i. Coxiella burnetti;
- j. Rickettsia prowazekii;
- k. Rickettsia rickettsii.

Protozoa

- a. Naegleria fowleri;
- b. Naegleria australiensis.

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BL01-B

ANIMAL PATHOGENS

Bovine pathogens

- a. Contagious bovine (pleuropneumonia)/mycoplasma mycoides var mycoides;
- b. Foot and mouth disease virus (including the ovine and swine strains of the virus);
- c. Rinderpest virus;
- d. Vesicular stomatitis virus.

Ovine pathogens

- a. Peste des petits ruminants virus;
- b. Blue tongue virus.

Swine pathogens

- a. African swine fever virus;
- b. Teschen disease virus (porcine enterovirus type 1).

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Avian pathogens

- a. Avian influenza virus (fowl plague virus);
- b. Newcastle disease virus.

Equine pathogens

- a. African horse sickness virus.

BL01-C PLANT PATHOGENS

Cereal pathogens

- a. Tilletia indica.

Sugar cane pathogens

- a. Sugar cane Fiji disease virus;
- b. Xanthomonas albilineans.

Cash crop pathogens

- a. Colletotrichum coffeanum var. virulans;
- b. Erwinia amylovora;
- c. Ralstonia solanacearum;

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	d. Peronospora hyoscyami de Bary f.sp. tabacina (Adam) skalicky.	
	<i>Forest pathogens</i>	
	a. Dothistroma pini (Scirrhia pini).	
BL01-D	TOXINS	
	<i>Bacteriotoxins</i>	
	a. Botulinum toxins;	
	b. Clostridium perfringens toxins;	
	c. Staphylococcal enterotoxins;	
	d. Shigatoxins.	
	<i>Phycotoxins</i>	
	a. Anatoxins;	
	b. Ciguatoxins;	
	c. Saxitoxins;	
	d. Abrins;	
	e. Ricins.	

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	<i>Mycotoxins</i>	
	a. Trichothecene toxins.	
	<i>Zootoxins</i>	
	a. Bungarotoxins.	
CL01	The following toxic chemicals, their precursors (binary and key precursors) and chemical warfare agents:	<div><div>1. “Toxic chemical” means any chemical, which through its chemical action on life processes, can cause death, temporary incapacitation or permanent harm to human beings and animals, regardless of its origin or method of production, and whether it is produced in facilities, munitions or elsewhere.</div><div>2. “Precursor” means any chemical reactant, which takes part at any stage of the production by whatever method of a toxic chemical, and includes any key component of a binary or multi-component chemical system.</div></div>

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CL01-1A

TOXIC CHEMICALS

- a. O-Alkyl (equal to or less than C10, including cycloalkyl) alkyl (Methyl, Ethyl, n-Propyl or Isopropyl)-phosphonofluoridates, for example:
Sarin(GB):O-Isopropyl methylphosphonofluoridate (CAS 107-44-8); Soman(GD):O-Pinacolyl methylphosphonofluoridate (CAS 96-64-0);
- b. O-Alkyl (equal to or less than C10, including cycloalkyl) N, N-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphoramidocyanidates, for example:
Tabun(GA):O-Ethyl N,N-dimethylphosphoramidocyanidate (CAS 77-81-6);

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- c. O-Alkyl (H or equal to or less than C10, including cycloalkyl) S-2-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl)-aminoethyl alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphonothiolates and corresponding alkylated and protonated salts, for example: VX:O-Ethyl S-2-diisopropylaminoethyl methyl phosphonothiolate (CAS 50782-69-9);
- d. Sulphur mustards, 2-Chloroethylchloromethylsulphide (CAS 2625-76-5); Mustard gas (H): Bis(2-chloroethyl) sulphide (CAS 505-60-2); Bis(2-chloroethylthio) methane (CAS 63869-13-6); 1,2-bis (2-chloroethylthio) ethane (CAS 3563-36-8); 1,3-bis (2-chloroethylthio)-n-propane (CAS 63905-10-2); 1,4-bis (2-chloroethylthio)-n-butane (CAS 142868-93-7); 1,5-bis (2-chloroethylthio)-n-pentane (CAS 142868-94-8); Bis (2-chloroethylthioethyl) ether (CAS 63918-89-8);

- e. Lewisites:
 - 1. Lewisites 1: 2-chlorovinyl dichloroarsine (CAS 541-25-3);
 - 2. Lewisites 2: Bis (2-chlorovinyl) chloroarsine (CAS 40334-69-8);
 - 3. Lewisites 3: Tris (2-chlorovinyl) arsine (CAS 40334-70-1);
- f. Nitrogen mustards:
 - 1. HN1: bis (2-chloroethyl) ethylamine (CAS 538-07-8);
 - 2. HN2: bis (2-chloroethyl) methylamine (CAS 51-75-2);
 - 3. HN3: tris (2-chloroethyl) amine (CAS 555-77-1);
- g. Saxitoxin (CAS 35523-89-8);
- h. Ricin (CAS 9009-86-3).

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CL01-1B

PRECURSORS

- a. Alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphonyldifluorides,

for example: DF:

Methylphosphonyldifluoride
(CAS 676-99-3);

- b. O-Alkyl (H or equal to or less than C10, including cycloalkyl) O-2-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl)-aminoethyl alkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphonites and corresponding alkylated or protonated salts,

for example: QL: O-Ethyl O-2
diisopropylaminoethyl
methylphosphonite (CAS
57856-11-8);

- c. Chlorosarin:

O-Isopropyl methylphosphonochloridate
(CAS 1445-76-7);

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- d. Chlorosoman:
O-Pinacolyl methylphosphonochloridate
(CAS 7040-57-5);

CL01-2A

TOXIC CHEMICALS

- a. Amiton: o,o-diethyl s-[2-(diethylamino)ethyl] phosphorothiolate and corresponding alkylated or protonated salts (CAS 78-53-5);
- b. PFIB: 1,1,3,3,3-pentafluoro-2-(trifluoromethyl)-1-propene (CAS 382-21-8);
- c. BZ: 3-quinuclidinyl benzilate (*) (CAS 6581-06-2).

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CL01-2B

PRECURSORS

- a. Chemicals, except for those under ChemBio Codes CL01-1A and CL01-1B, containing a phosphorus atom to which is bonded one methyl, ethyl or propyl (normal or iso) group but not further carbon atoms, such as —
 1. Methylphosphonyl dichloride (CAS 676-97-1);
 2. Dimethyl methylphosphonate (CAS 756-79-6);
 3. Exemption: Fonofos: O-Ethyl S-phenyl ethylphosphonothiolothionate (CAS 944-22-9);
- b. N-N-Dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphoramidic dihalides;
- c. Dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) N,N-dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) phosphoramidates;
- d. Arsenic trichloride (CAS 7784-34-1);

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- e. Benzilic acid: 2,2-Diphenyl-2-hydroxyacetic acid (CAS 76-93-7);
- f. Quinuclidine-3-ol (CAS 1619-34-7);
- g. N,N-Dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) aminoethyl-2-chlorides and corresponding protonated salts;
- h. N,N-Dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) aminoethane-2-ols and corresponding protonated salts, but not —
 - 1. N,N-Dimethylaminoethanol and corresponding protonated salts (CAS 108-01-0); or
 - 2. N,N-Diethylaminoethanol and corresponding protonated salts (CAS 100-37-8);
- i. N,N-Dialkyl (Methyl, Ethyl, n-Propyl or Isopropyl) aminoethane-2-thiols and corresponding protonated salts;
- j. Thioglycol: Bis(2-hydroxyethyl) sulfide (CAS 111-48-8);

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	k. Pinacolyl alcohol: 3,3-Dimethylbutan-2-ol (CAS 464-07-3).	
CL01-3A	TOXIC CHEMICALS	
	a. Phosgene: Carbonyl dichloride (CAS 75-44-5);	
	b. Cyanogen chloride (CAS 506-77-4);	
	c. Hydrogen cyanide (CAS 74-90-8);	
	d. Chloropicrin: Trichloronitromethane (CAS 76-06-2).	
CL01-3B	PRECURSORS	
	a. Phosphorus oxychloride (Phosphoryl chloride) (CAS 10025-87-3);	
	b. Phosphorus trichloride (CAS 7719-12-3);	
	c. Phosphorus pentachloride (Phosphorane, pentachloro) (CAS 10026-13-8);	

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- d. Trimethyl phosphite (Phosphorous acid, trimethyl ester) (CAS 121-45-9);
- e. Triethyl phosphite (Phosphorous acid, triethyl ester) (CAS 122-52-1);
- f. Dimethyl phosphite (Phosphonic acid, dimethyl ester) (CAS 868-85-9);
- g. Diethyl phosphite (Phosphonic acid, diethyl ester) (CAS 762-04-9);
- h. Sulfur monochloride (Sulfur chloride) (CAS 10025-67-9);
- i. Sulfur dichloride (Sulfur chloride) (CAS 10545-99-0);
- j. Thionyl chloride (CAS 7719-09-7);
- k. Ethyldiethanolamine (CAS 139-87-7);
- l. Methyldiethanolamine (CAS 105-59-9);
- m. Triethanolamine (CAS 102-71-6).

DUAL USE LIST

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STRATEGIC GOODS (CONTROL)

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Dual Use Code	Description of Item	Notes
DL01	CATEGORY 1 – NUCLEAR MATERIALS, FACILITIES, AND EQUIPMENT SUB-CATEGORY 1A – SYSTEMS, EQUIPMENT AND COMPONENTS	
DL01A-01	The following “nuclear reactors” and specially designed or prepared equipment and components therefor: a. “nuclear reactors” capable of operation so as to maintain a controlled self-sustaining fission chain reaction;	

- b. metal vessels, or major shop-fabricated parts therefor, specially designed or prepared to contain the core of a “nuclear reactor”, including the reactor vessel head for a reactor pressure vessel;
- c. manipulative equipment specially designed or prepared for inserting or removing fuel in a “nuclear reactor”;
- d. control rods specially designed or prepared for the control of the fission process in a “nuclear reactor”, support or suspension structures therefor, rod drive mechanisms and rod guide tubes;
- e. pressure tubes specially designed or prepared to contain fuel elements and the primary coolant in a “nuclear reactor” at an operating pressure in excess of 5.1 MPa;
- f. zirconium metal and alloys in the form of tubes or assemblies of tubes in which the ratio of hafnium to zirconium is less than 1:500 parts by weight, specially designed or prepared for use in a “nuclear reactor”;

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
g. coolant pumps specially designed or prepared for circulating the primary coolant of “nuclear reactors”;		
h. “nuclear reactor internals” specially designed or prepared for use in a “nuclear reactor”, including support columns for the core, fuel channels, thermal shields, baffles, core grid plates, and diffuser plates;	In Dual Use Code DL01A-01.h, “nuclear reactor internals” means any major structure within a reactor vessel which has one or more of the following functions:	
i. heat exchangers (steam generators) specially designed or prepared for use in the primary coolant circuit of a “nuclear reactor”;		(a) supporting the core; (b) maintaining fuel alignment; (c) directing primary coolant flow; (d) providing radiation shields for the reactor vessel; (e) guiding in-core instrumentations.
j. neutron detection and measuring instruments specially designed or prepared for determining neutron flux levels within the core of a “nuclear reactor”.		

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SUB-CATEGORY 1B – TEST INSPECTION
AND PRODUCTION
EQUIPMENT

- DL01B-01 The following plants for the separation of isotopes of “natural uranium”, “depleted uranium” and “special fissile materials”, and specially designed or prepared equipment and components therefor:
- a. the following plants specially designed for separating isotopes of “natural uranium”, “depleted uranium”, and “special fissile materials”:
1. gas centrifuge separation plant;
 2. gaseous diffusion separation plant;
 3. aerodynamic separation plant;

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4. chemical exchange separation plant;
5. ion-exchange separation plant;
6. atomic vapour “laser” isotope separation (AVLIS) plant;
7. molecular “laser” isotope separation (MLIS) plant;
8. plasma separation plant;
9. electro magnetic separation plant;

- b. gas centrifuges and assemblies and components, specially designed or prepared for gas centrifuge separation process, as follows:

In Dual Use Code DL01B-01.b, “high strength-to-density ratio material” means any of the following:

1. gas centrifuges;
 2. complete rotor assemblies;
 3. rotor tube cylinders with a wall thickness of 12 mm or less, a diameter of between 75 mm and 400 mm, made from “high strength-to-density ratio materials”;
 4. rings or bellows with a wall thickness of 3 mm or less and a diameter of between 75 mm and 400 mm and designed to give local support to a rotor tube or to join a number together, made from “high strength-to-density ratio materials”;
 5. baffles of between 75 mm and 400 mm diameter for mounting inside a rotor tube, made from “high strength-to-density ratio materials”;
- (a) maraging steel capable of an ultimate tensile strength of 2,050 MPa or more;
 - (b) aluminium alloys capable of an ultimate tensile strength of 460 MPa or more;
 - (c) “fibrous or filamentary materials” with a “specific modulus” of more than 3.18×10^6 m and a “specific tensile strength” greater than 76.2×10^3 m.

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6. top or bottom caps of between 75 mm and 400 mm diameter to fit the ends of a rotor tube, made from “high strength-to-density ratio materials”;
7. magnetic suspension bearings consisting of an annular magnet suspended within a housing made of or protected by “materials resistant to corrosion by UF₆” containing a damping medium and having the magnet coupling with a pole piece or second magnet fitted to the top cap of the rotor;
8. specially prepared bearings comprising a pivot-cup assembly mounted on a damper;
9. molecular pumps comprised of cylinders having internally machined or extruded helical grooves and internally machined bores;

10. ring-shaped motor stators for multiphase AC hysteresis (or reluctance) motors for synchronous operation within a vacuum in the frequency range of 600 Hz to 2,000 Hz and a power range of 50 Volt-Amps to 1,000 Volt-Amps;
11. centrifuge housing or recipients to contain the rotor tube assembly of a gas centrifuge, consisting of a rigid cylinder of wall thickness up to 30 mm with precision machined ends and made of or protected by "materials resistant to corrosion by UF₆";

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12. scoops consisting of tubes of up to 12 mm internal diameter for the extraction of UF₆ gas from within a centrifuge rotor tube by a Pitot tube action, made of or protected by “materials resistant to corrosion by UF₆”;
13. frequency changers (converters or inverters) specially designed or prepared to supply motor stators for gas centrifuge enrichment, having all of the following characteristics, and specially designed components therefor:
 - (a) multiphase output of 600 Hz to 2,000 Hz;
 - (b) frequency control better than 0.1%;

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(c) harmonic distortion of less than 2%;

(d) an efficiency greater than 80%;

c. the following equipment and components, if specially designed or prepared for gaseous diffusion separation process:

1. gaseous diffusion barriers made of porous metallic, polymer or ceramic “materials resistant to corrosion by UF_6 ” with a pore size of 10 nm to 100 nm, a thickness of 5 mm or less, and, for tubular forms, a diameter of 25 mm or less;

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2. gaseous diffuser housings made of or protected by “materials resistant to corrosion by UF₆”;
3. compressors (positive displacement, centrifugal and axial flow types) or gas blowers with a suction volume capacity of 1 m³/min or more of UF₆, and discharge pressure up to 666.7 kPa, made of or protected by “materials resistant to corrosion by UF₆”;
4. rotary shaft seals for compressors or blowers included under Dual Use Code DL01B-01.c.3 and designed for a buffer gas in-leakage rate of less than 1,000 cm³ per minute;

5. heat exchangers made of aluminium, copper, nickel, or alloys containing more than 60 weight percent nickel, or combinations of these metals as clad tubes, designed to operate at sub-atmospheric pressure with a leak rate that limits the pressure rise to less than 10 Pa per hour under a pressure differential of 100 kPa;
6. bellow valves made of or protected by “materials resistant to corrosion by UF₆”, with a diameter of 40 mm to 1,500 mm;

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- d. the following equipment and components, if specially designed or prepared for aerodynamic separation process:
 1. separation nozzles consisting of slit-shaped, curved channels having a radius of curvature less than 1 mm, resistant to corrosion by UF_6 , and having a knife-edge contained within the nozzle which separates the gas flowing through the nozzle into 2 streams;
 2. tangential inlet flow-driven cylindrical or conical tubes (vortex tubes), made of or protected by "materials resistant to corrosion by UF_6 ", with a diameter of between 0.5 cm and 4 cm and a length to diameter ratio of 20:1 or less and with one or more tangential inlets;

3. compressors (positive displacement, centrifugal and axial flow types) or gas blowers with a suction volume capacity of 2 m³ per minute, made of or protected by “materials resistant to corrosion by UF₆”, and rotary shaft seals therefor;
4. heat exchangers made of or protected by “materials resistant to corrosion by UF₆”;
5. aerodynamic separation element housings, made of or protected by “materials resistant to corrosion by UF₆” to contain vortex tubes or separation nozzles;

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6. bellows valves made of or protected by “materials resistant to corrosion by UF₆”, with a diameter of 40 mm to 1,500 mm;
7. process systems for separating UF₆ from carrier gas (hydrogen or helium) to 1 ppm UF₆ content or less, including —
 - (a) cryogenic heat exchangers and cryoseparators capable of temperatures of 153 K (-120⁰C) or less;
 - (b) cryogenic refrigeration units capable of temperatures of 153 K (-120⁰C) or less;

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- (c) separation nozzle or vortex tube units for the separation of UF₆ from carrier gas;
- 8. UF₆ cold traps capable of temperatures of 253 K (-20⁰C) or less;
- e. fast-exchange liquid-liquid pulse columns with stage residence time of 30 seconds or less and resistant to concentrated hydrochloric acid (for example, if they are made of or protected by a suitable plastic material such as fluorocarbon polymers or glass):

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1. fast-exchange liquid-liquid centrifugal contactors with stage residence time of 30 seconds or less and resistant to concentrated hydrochloric acid (for example, if they are made of or protected by a suitable plastic material such as fluorocarbon polymers or glass);
2. electrochemical reduction cells resistant to concentrated hydrochloric acid solutions, for reduction of uranium from one valence state to another;
3. electrochemical reduction cells feed equipment to take U^{+4} from the organic stream and, for those parts in contact with the process stream, made of or protected by a suitable material such as glass, fluorocarbon polymers, polyphenyl sulphate, polyether sulfone and resin-impregnated graphite;

4. feed preparation systems for producing high purity uranium chloride solution consisting of dissolution, solvent extraction or ion exchange equipment (or more than one of these) for purification and electrolytic cells for reducing the uranium U^{+6} or U^{+4} to U^{+3} ;
 5. uranium oxidation systems for oxidation of U^{+3} to U^{+4} ;
- f. the following equipment and components, if specially designed or prepared for ion-exchange separation process:
1. fast reacting ion-exchange resins, pellicular or porous macro-reticulated resins in which the active chemical exchange groups are limited to a coating on the surface of an inactive porous support structure, and other composite structures in any suitable

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form, including particles or fibres, with diameters of 0.2 mm or less, resistant to concentrated hydrochloric acid and designed to have an exchange rate half-time of less than 10 seconds and capable of operating at temperatures in the range of 373 K (100⁰C) to 473 K (200⁰C);

2. ion exchange columns (cylindrical) with a diameter greater than 1,000 mm, made of or protected by materials resistant to concentrated hydrochloric acid (for example, titanium or fluorocarbon plastics) and capable of operating at temperatures in the range of 373 K (100⁰C) to 473 K (200⁰C) and pressures above 0.7 MPa;

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3. ion exchange reflux systems (chemical or electrochemical oxidation or reduction systems) for regeneration of the chemical reducing or oxidizing agents used in ion exchange enrichment cascades;
- g. the following equipment and components, if specially designed or prepared for atomic vapour “laser” isotope separation process (AVLIS):
 1. high power strip or scanning electron beam guns with a delivered power of more than 2.5 kW/cm for use in uranium vaporization systems;

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2. liquid uranium metal handling systems for molten uranium or uranium alloys, consisting of crucibles, made of or protected by suitable corrosion and heat resistant materials (for example, tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof), and cooling equipment for the crucibles;
3. product and tails collector systems made of or lined with materials resistant to the heat and corrosion of uranium metal vapour or liquid, such as yttria-coated graphite or tantalum;

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4. separator module housings (cylindrical or rectangular vessels) for containing the uranium metal vapour source, the electron beam gun and the product and tails collectors;
 5. “lasers” or “laser” systems for the separation of uranium isotopes with a spectrum frequency stabilizer for operation over extended periods of time;
- h. the following equipment and components, if specially designed or prepared for molecular “laser” isotope separation process (MLIS) or chemical reaction by isotope selective laser activation (CRISLA):

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1. supersonic expansion nozzles for cooling mixtures of UF_6 and carrier gas to 150 K (-123°C) or less and made from “materials resistant to corrosion by UF_6 ”;
2. uranium pentafluoride (UF_5) product collectors consisting of filter, impact, or cyclone-type collectors or combinations thereof, and made of materials resistant to corrosion by UF_5/UF_6 ;
3. compressors made of or protected by “materials resistant to corrosion by UF_6 ”, and rotary shaft seals therefor;
4. equipment for fluorinating UF_5 (solid) to UF_6 (gas);
5. process systems for separating UF_6 from carrier gas (for example, nitrogen or argon) including —

- (a) cryogenic heat exchangers and cryoseparators capable of temperatures of 153 K (-120⁰C) or less;
 - (b) cryogenic refrigeration units capable of temperatures of 153 K (-120⁰C) or less;
 - (c) UF₆ cold traps capable of temperatures of 253 K (-20⁰C) or less;
- 6. “lasers” or “laser” systems for the separation of uranium isotopes with a spectrum frequency stabilizer for operation over extended periods of time;
- i. the following equipment and components, if specially designed or prepared for plasma separation process:

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1. microwave power sources and antennae for producing or accelerating ions, with an output frequency greater than 30 GHz and mean power output greater than 50 kW;
2. radio frequency ion excitation coils for frequencies of more than 100 kHz and capable of handling more than 40 kW mean power;
3. uranium plasma-generation systems;

4. liquid metal handling systems for molten uranium or uranium alloys, consisting of crucibles, made of or protected by suitable corrosion and heat resistant materials (for example, tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof), and cooling equipment for the crucibles;
5. product and tails collectors made of or protected by materials resistant to the heat and corrosion of uranium vapour such as yttria-coated graphite or tantalum;

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6. separator module housings (cylindrical) for containing the uranium plasma source, radio-frequency drive coil and the product and tails collectors and made of a suitable non-magnetic material (for example, stainless steel);
- j. the following equipment and components, if specially designed or prepared for electromagnetic separation process:
 1. ion sources, single or multiple, consisting of a vapour source, ionizer, and beam accelerator made of suitable non-magnetic materials (for example, graphite, stainless steel, or copper) and capable of providing a total ion beam current of 50 mA or greater;

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2. ion collector plates for collection of enriched or depleted uranium ion beams, consisting of 2 or more slits and pockets and made of suitable non-magnetic materials (for example, graphite or stainless steel);
3. vacuum housings for uranium electromagnetic separators made of non-magnetic materials (for example, stainless steel) and designed to operate at pressures of 0.1 Pa or lower;
4. magnet pole pieces with a diameter greater than 2 m;
5. high voltage power supplies for ion sources, having all of the following characteristics:

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- (a) capable of continuous operation;
 - (b) output voltage of 20,000 V or greater;
 - (c) output current of 1 A or greater; and
 - (d) voltage regulation of better than 0.01% over a period of 8 hours;
6. magnet power supplies (high power, direct current) having one or both of the following characteristics:
- (a) capable of continuous operation with a current output of 500 A or greater at a voltage of 100 V or greater;
 - (b) current or voltage regulation better than 0.01% over a period of 8 hours.

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DL01B-02

Specially designed or prepared auxiliary systems, equipment and components, as follows, for isotope separation plant included under Dual Use Code DL01B-01, made of or protected by “materials resistant to corrosion by UF_6 ”:

- a. feed autoclaves, ovens or systems used or intended to be used for passing UF_6 to the enrichment process;
- b. desublimers or cold traps, used or intended to be used to remove UF_6 from the enrichment process for subsequent transfer upon heating;
- c. product and tails stations for transferring UF_6 into containers;

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- d. liquefaction or solidification stations used or intended to be used to remove UF_6 from the enrichment process by compressing, cooling and converting UF_6 to a liquid or solid form;
- e. piping systems and header systems specially designed for handling UF_6 within gaseous diffusion, centrifuge or aerodynamic cascades;
- f. vacuum manifolds or vacuum headers —
 - 1. having a suction capacity of 5 m^3 per minute or more;
 - 2. specially designed for use in UF_6 bearing atmospheres;

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- g. UF₆ mass spectrometers or ion sources specially designed or prepared for taking on-line samples of feed, product or tails from UF₆ gas streams and having all of the following characteristics:
1. unit resolution for mass of more than 320 amu;
 2. ion sources constructed of or lined with nichrome or monel, or nickel plated;
 3. electron bombardment ionization sources; and
 4. collector system suitable for isotopic analysis.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL01B-03	<p>Plant for the conversion of uranium and equipment if specially designed or prepared for such conversion, as follows:</p> <ol style="list-style-type: none"> systems for the conversion of uranium ore concentrates to UO_3; systems for the conversion of UO_3 to UF_6; systems for the conversion of UO_3 to UO_2; systems for the conversion of UO_2 to UF_4; systems for the conversion of UF_4 to UF_6; systems for the conversion of UF_4 to uranium metal; systems for the conversion of UF_6 to UO_2; 	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ul style="list-style-type: none">h. systems for the conversion of UF_6 to UF_4;i. systems for the conversion of UO_2 to UC_{14}.	
DL01B-04	<p>The following plants for the production or concentration of heavy water, deuterium and deuterium compounds and specially designed or prepared equipment and components therefor:</p> <ul style="list-style-type: none">a. the following if used or intended to be used for the production of heavy water, deuterium or deuterium compounds:<ul style="list-style-type: none">1. water-hydrogen sulphide exchange plant;2. ammonia-hydrogen exchange plant;	

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- b. the following equipment and components:
1. water-hydrogen sulphide exchange towers fabricated from fine carbon steel (for example, “ASTM” A516) with diameters of 6 m to 9 m, capable of operating at pressures greater than or equal to 2 MPa and with a corrosion allowance of 6 mm or greater;
 2. single stage, low head (that is, 0.2 MPa) centrifugal blowers or compressors for hydrogen sulphide gas circulation (that is, gas containing more than 70% H₂S) with a throughput capacity greater than or equal to 56 m³ per second when operating at pressures greater than or equal to 1.8 MPa suction and having seals designed for wet H₂S service;
 3. ammonia-hydrogen exchange towers greater than or equal to 35 m in height with diameters of 1.5 m to 2.5 m capable of operating at pressures greater than 15 MPa;

4. tower internals, including stage contactors, and stage pumps, including those which are submersible, for heavy water production utilizing the ammonia-hydrogen exchange process;
5. ammonia crackers with operating pressures greater than or equal to 3 MPa for heavy water production utilizing the ammonia-hydrogen exchange process;
6. infrared absorption analysers capable of on-line hydrogen or deuterium ratio analysis where deuterium concentrations are equal to or greater than 90%;
7. catalytic burners for the conversion of enriched deuterium gas into heavy water utilizing the ammonia-hydrogen exchange process;
8. complete heavy water upgrade systems, or columns therefor, for the upgrade of heavy water to reactor-grade deuterium concentration.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL01B-05	Plant specially designed for the fabrication of “nuclear reactor” fuel elements and specially designed or prepared equipment therefor.	<p>Reference to a plant for the fabrication of “nuclear reactor” fuel elements includes equipment which —</p> <ul style="list-style-type: none"> (a) normally comes into direct contact with, or directly processes or controls the production flow of, nuclear materials; (b) seals the nuclear materials within the cladding; (c) checks the integrity of the cladding or the seal; or (d) checks the finish treatment of the solid fuel.
DL01B-06	Plant for the reprocessing of irradiated “nuclear reactor” fuel elements, and specially designed or prepared equipment and components therefor, including —	

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- a. plant for the reprocessing of irradiated “nuclear reactor” fuel elements including equipment and components which normally come into direct contact with, and directly control, the irradiated fuel and the major nuclear material and fission product processing streams;
- b. fuel element chopping or shredding machines, that is, remotely operated equipment to cut, chop, shred or shear irradiated “nuclear reactor” fuel assemblies, bundles or rods;
- c. dissolvers, critically safe tanks (such as small diameter, annular or slab tanks) specially designed or prepared for the dissolution of irradiated “nuclear reactor” fuel, which are capable of withstanding hot, highly corrosive liquids, and which can be remotely loaded and maintained;

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- d. counter-current solvent extractors and ion-exchange processing equipment specially designed or prepared for use in a plant for the reprocessing of irradiated “natural uranium”, “depleted uranium” or “special fissile materials”;
 - e. holding or storage vessels specially designed to be critically safe and resistant to the corrosive effects of nitric acid;
 - f. process control instrumentation specially designed or prepared for monitoring or controlling the reprocessing of irradiated “natural uranium”, “depleted uranium” or “special fissile materials”; and
 - g. other such plants.
- Holding or storage vessels may have any of the following features:
- (a) walls or internal structures with a boron equivalent (calculated for all constituent elements as defined in the Note to DL01C-04) of at least 2 percent;
 - (b) a maximum diameter of 175 mm for cylindrical vessels; or
 - (c) a maximum width of 75 mm for either a slab or annular vessel.

SUB-CATEGORY 1C – MATERIALS

DL01C-01	<p>“Natural uranium”; “depleted uranium”; or thorium, in the form of metal, alloy, chemical compound or concentrate; and any other material containing one or more of these.</p>	<p>Dual Use Code DL01C-01 does not include the following:</p> <ul style="list-style-type: none">(a) four grammes or less of “natural uranium” or “depleted uranium” when contained in a sensing component in instruments;(b) “depleted uranium” specially fabricated for the following civil non-nuclear applications:<ul style="list-style-type: none">(i) shielding;(ii) packaging;(iii) ballasts having a mass not greater than 100 kg;(iv) counter-weights having a mass not greater than 100 kg;(c) alloys containing less than 5% thorium;(d) ceramic products containing thorium, which have been manufactured for non-nuclear use.
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DL01C-02	<p>“Special fissile materials”</p> <p>This includes only separated plutonium and “uranium enriched in the isotopes 235 or 233” to more than 20%.</p>	<p>Dual Use Code DL01C-02 does not include 4 “effective grammes” or less “special fissile materials” when contained in a sensing component in instruments.</p>
DL01C-03	<p>Deuterium, heavy water (deuterium oxide) and other compounds of deuterium, and mixtures and solutions containing deuterium, in which the isotopic ratio of deuterium to hydrogen exceeds 1:5000.</p>	

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DL01C-04

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/cm³.

1. Dual Use Code DL01C-04 does not include 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 Dual Use Code DL01C-04, “boron equivalent” (BE) means the sum of BE_Z for impurities (excluding BE_{carbon}) including boron, where —

BE_Z(ppm) = CF × concentration of element Z in ppm

Where CF is the conversion factor = $\sigma_z A_B / \sigma_B A_Z$ and σ_B and σ_z are the thermal neutron capture cross sections (in barns) for naturally occurring boron and element Z respectively; and A_B and A_Z are the atomic masses of naturally occurring boron and element Z, respectively.

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DL01C-05 Specially prepared compounds or powders for the manufacture of gaseous diffusion barriers, resistant to corrosion by UF₆ (for example, nickel or alloy containing 60 weight percent or more nickel, aluminium oxide and fully fluorinated hydrocarbon polymers), having a purity of 99.9 weight percent or more and a mean particle size of less than 10 micrometres measured by “ASTM” B330 standard and a high degree of particle size uniformity.

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DL02	CATEGORY 2 — MATERIALS AND CHEMICALS	
	SUB-CATEGORY 2A — SYSTEMS, EQUIPMENT AND COMPONENTS	
DL02A-01	Composite structures, in the form of tubes with an inside diameter of between 75 mm and 400 mm, and made with “fibrous or filamentary materials” or with carbon prepreg materials.	
DL02A-02	Platinized catalysts specially designed or prepared for promoting the hydrogen isotope exchange reaction between hydrogen and water for the recovery of tritium from heavy water or for the production of heavy water.	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL02A-03	<p>Specialised packings for use in separating heavy water from ordinary water, having both of the following characteristics:</p> <ol style="list-style-type: none"> made of phosphor bronze mesh (chemically treated to improve wettability); and designed for use in vacuum distillation towers. 	
DL02A-04	<p>High-density (lead glass or other) radiation shielding windows, having all of the following characteristics, and specially designed frames therefor:</p> <ol style="list-style-type: none"> the viewing area of the window exposed to the lowest level of radiation in the design application (the “cold area”) is greater than 0.09 m²; a density greater than 3 g/cm³; and a thickness of 100 mm or greater. 	<p>“Cold area” means the viewing area of the window exposed to the lowest level of radiation in the design application.</p>

SUB-CATEGORY 2B – TEST, INSPECTION
AND PRODUCTION EQUIPMENT

DL02B-01

Filament winding machines, as follows:

- a. filament winding machines having all of the following characteristics:
 1. having motions for positioning, wrapping, and winding fibres are co-ordinated and programmed in 2 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;

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ul style="list-style-type: none"> b. co-ordinating and programming controls for the filament winding machines specified in Dual Use Code DL02B-01.a.; c. precision mandrels for the filament winding machines specified in Dual Use Code DL02B-01.a. 	
DL02B-02	Electrolytic cells for fluorine production with an output capacity greater than 250 g of fluorine per hour.	
DL02B-03	Electromagnetic isotope separators designed for, or equipped with, single or multiple ion sources capable of providing a total ion beam current of 50 mA or greater.	<p>Dual Use Code DL02B-03 includes separators —</p> <ul style="list-style-type: none"> (a) capable of enriching stable isotopes; (b) the ion sources and collectors of which are both in the magnetic field; and the configurations of which are external to the field.

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DL02B-04 Ammonia synthesis converters or ammonia synthesis units in which the synthesis gas (nitrogen and hydrogen) is withdrawn from an ammonia or hydrogen high-pressure exchange column and the synthesised ammonia is returned to that column.

DL02B-05 Hydrogen-cryogenic distillation columns having all of the following characteristics:

- a. designed to operate with internal temperatures of 35 K (-238⁰C) or less;
- b. designed to operate at an internal pressure of 0.5 MPa to 5 MPa (5 - 50 atmospheres);

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ul style="list-style-type: none"> c. constructed of either — <ul style="list-style-type: none"> 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 d. with internal diameters of 1 m or greater and effective lengths of 5 m or greater. 	
DL02B-06	Water-hydrogen sulphide exchange tray columns and “internal contactors”, as follows:	<p>“Internal contactors” of 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.</p>

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a. water-hydrogen sulphide exchange tray columns, having all of the following characteristics:

1. able to 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. has a diameter of 1.8 m or greater;

b. “internal contactors” for the water-hydrogen sulphide exchange tray columns.

DL02B-07

Pumps capable of circulating solutions of concentrated or dilute potassium amide catalyst in liquid ammonia (KNH_2/NH_3), having all of the following characteristics:

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	<ul style="list-style-type: none"> a. is airtight (that is, hermetically sealed); b. has a capacity greater than 8.5 m³/h; c. has either of the following characteristics: <ul style="list-style-type: none"> 1. for concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 MPa to 60 MPa (15-600 atmospheres); or 2. for dilute potassium amide solutions (less than 1%), an operating pressure of 20 MPa to 60 MPa (200-600 atmospheres). 	
DL02B-08	Tritium facilities or plants, and equipment therefor, as follows:	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ol style="list-style-type: none">a. facilities or plants for the production, recovery, extraction, concentration, or handling of tritium;b. equipment for tritium facilities or plants, as follows:<ol style="list-style-type: none">1. hydrogen or helium refrigeration units capable of cooling to 23 K (-250⁰C) or less, with heat removal capacity greater than 150 watts; or2. hydrogen isotope storage and purification systems using metal hydrides as the storage, or purification medium.	
DL02B-09	Turboexpanders or turboexpander-compressor sets having both of the following characteristics:	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ul style="list-style-type: none"> a. designed for operation with an outlet temperature of 35 K (-238⁰C) or less; and b. designed for a throughput of hydrogen gas of 1,000 kg/h or greater. 	
DL02B-10	<p>Lithium isotope separation facilities or plants, and equipment therefor, as follows:</p> <ul style="list-style-type: none"> a. facilities or plants for the separation of lithium isotopes; b. equipment for the separation of lithium isotopes, as follows: <ul style="list-style-type: none"> 1. packed liquid-liquid exchange columns specially designed for lithium amalgams; 	

2. mercury or lithium amalgam pumps;
3. lithium amalgam electrolysis cells;
4. evaporators for concentrated lithium hydroxide solution.

SUB-CATEGORY 2C – MATERIALS

In this Sub-Category, unless provision to the contrary is made, “metals” and “alloys” mean the following:

- (a) crude forms: anodes, balls, bars (including notched bars and wire bars), billets, blocks, blooms, brickets, cakes, cathodes, crystals, cubes, dice, grains, granules, ingots, lumps, pellets, pigs, powder, rondelles, shot, slabs, slugs, sponge, sticks;
- (b) semi-fabricated forms (whether or not coated, plated, drilled or punched):

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- (i) wrought or worked materials fabricated by rolling, drawing, extruding, forging, impact extruding, pressing, graining, atomising, and grinding, that is, angles, channels, circles, discs, dust, flakes, foils and leaf, forging, plate, powder, pressings and stampings, ribbons, rings, rods (including bare welding rods, wire rods, and rolled wire), sections, shapes, sheets, strip, pipe and tubes (including tube rounds, squares, and hollows), drawn or extruded wire;
- (ii) cast material produced by casting in sand, die, metal, plaster or other types of moulds, including high pressure castings, sintered forms, and forms made by powder metallurgy.

DL02C-01

The following alloys:

- a. aluminium alloys capable of an ultimate tensile strength of 460 MPa or more at 293 K (20°C), in the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm;
- b. titanium alloys capable of an ultimate tensile strength of 900 MPa or more at 293 K (20°C), in the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm.

Dual Use Codes DL02C-01.a and DL02C-01.b encompass alloys before or after heat treatment.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL02C-02	<p>The following “fibrous or filamentary materials” or preregs:</p> <ol style="list-style-type: none"> carbon or aramid “fibrous or filamentary materials” having a “specific modulus” of 12.7×10^6 m or greater or a “specific tensile strength” of 235×10^3 m or greater; except: aramid “fibrous or filamentary materials” having 0.25 percent or more by weight of an ester based fibre surface modifier; glass “fibrous or filamentary materials” having a “specific modulus” of 3.18×10^6 m or greater and a “specific tensile strength” of 76.2×10^3 m or greater; or thermoset resin impregnated continuous “yarns”, “rovings”, “tows” or “tapes” with a width no greater than 15 mm (preregs), made from carbon or glass “fibrous or filamentary materials” under Dual Use Code DL02C-02.a or DL02C-02.b. 	<ol style="list-style-type: none"> In Dual Use Code DL02C-02, “fibrous or filamentary materials” is restricted to continuous “monofilaments”, “yarns”, “rovings”, “tows” or “tapes”. The resin forms the matrix of the composite.

DL02C-03	Maraging steels, capable of an ultimate tensile strength of 2,050 Mpa or more, at 293 K (20 ⁰ C) except: forms in which no linear dimension exceeds 75 mm.	Dual Use Code DL02C-03 encompasses maraging steel before or after heat treatment.
DL02C-04	<p>Boron enriched in the boron-10 (¹⁰B) isotope to greater than its natural isotopic abundance, as follows:</p> <ol style="list-style-type: none">elemental boron;compounds and mixtures containing boron;manufactures, waste or scrap of any of the foregoing.	<ol style="list-style-type: none">1. In Dual Use Code DL02C-04, mixtures containing boron include boron loaded materials.2. The natural isotopic abundance of boron-10 is approximately 18.5 weight per cent (20 atom per cent).

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL02C-05	<p>Tungsten, tungsten carbide, and alloys containing more than 90% tungsten by weight, having both of the following characteristics:</p> <ul style="list-style-type: none"> a. in forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 mm and 300 mm; and b. a mass greater than 20 kg. 	<p>Dual Use Code DL02C-05 does not include manufactures or parts specially designed for use as weights or gamma-ray collimators.</p>
DL02C-06	<p>Calcium, having both of the following characteristics:</p> <ul style="list-style-type: none"> a. containing less than 1,000 parts per million by weight of metallic impurities other than magnesium; and b. containing less than 10 parts per million by weight of boron. 	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL02C-07	<p>Magnesium, having both of the following characteristics:</p> <ul style="list-style-type: none">a. containing less than 200 parts per million by weight of metallic impurities other than calcium; andb. containing less than 10 parts per million by weight of boron.	
DL02C-08	<p>Bismuth, having both of the following characteristics:</p> <ul style="list-style-type: none">a. a purity of 99.99% or greater by weight; andb. containing less than 10 parts per million by weight of silver.	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL02C-09	Beryllium metal, alloys containing more than 50% of beryllium by weight, beryllium compounds, manufactures and waste and scrap of any of the foregoing.	<p>Dual Use Code DL02C-09 does not include the following:</p> <ul style="list-style-type: none"> (a) metal windows for X-ray machines, or for bore-hole logging devices; (b) oxide shapes in fabricated or semi-fabricated forms specially designed for electronic component parts or as substrates for electronic circuits; (c) beryl (silicate of beryllium and aluminium) in the form of emeralds or aquamarines.
DL02C-10	Hafnium metal, alloys containing more than 60% hafnium by weight, hafnium compounds containing more than 60% hafnium by weight, manufactures and waste and scrap of any of the foregoing.	
DL02C-11	Helium-3 (^3He), mixtures containing helium-3, and products or devices containing Helium-3 (^3He) mixtures or any such mixture.	Dual Use Code DL02C-11 does not include a product or device containing less than 1 g of helium-3.

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DL02C-12	Lithium enriched in the lithium-6 (^6Li) isotope to greater than its natural isotopic abundance, and products or devices containing enriched lithium, as follows: elemental lithium, alloys, compounds, mixtures containing lithium, manufactures and waste or scrap of any of the foregoing.	<ol style="list-style-type: none">1. Dual Use Code DL02C-12 does not include thermoluminescent dosimeters.2. The natural isotopic abundance of lithium-6 is approximately 6.5 weight per cent (7.5 atom per cent).
DL02C-13	Zirconium with a hafnium content of less than one part hafnium to 500 parts zirconium by weight, in the form of a metal, alloys containing more than 50% zirconium by weight, or compounds, manufactures wholly of, and waste and scrap of, such metal, alloys or compounds; but not Zirconium the form of foil of which does not exceed 0.10 mm in thickness.	

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DL02C-14	Tritium, tritium compounds, mixtures containing tritium in which the ratio of tritium to hydrogen atoms exceeds one part in 1,000, and products or devices containing any of the foregoing.	Dual Use Code DL02C-14 does not include a product or device containing less than 1.48×10^3 GBq (40 Ci) of tritium in any form.
DL02C-15	<p>Alpha-emitting radionuclides having an alpha half-life of 10 days or greater but less than 200 years, in the following forms:</p> <ul style="list-style-type: none"> a. elemental; b. compounds having a total alpha activity of 37 GBq/kg (1 Ci/kg) or greater; c. mixtures having a total alpha activity of 37 GBq/kg (1 Ci/kg) or greater; d. products or devices containing any of the matters in DL02C-15.a, DL02C-15.b, DL02C-15.c. 	Dual Use Code DL02C-15 does not include a product or device containing less than 3.7 GBq (100 millicuries) of alpha activity.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL02C-16	Radium-226 (²²⁶ Ra), radium-226 alloys, radium-226 compounds, mixtures containing radium-226, manufactures and products or devices containing any of the foregoing.	Dual Use Code DL02C-16 does not include — (a) medical applicators; or (b) a product or device containing less than 0.37 GBq (10 millicuries) of radium-226 in any form.
DL02C-17	Chlorine trifluoride (ClF ₃)	
DL02C-18	High explosives, other than those specified in Munition Code ML08, or substances or mixtures containing more than 2% by weight thereof, with a crystal density greater than 1.8 gm/cm ³ and having a detonation velocity greater than 8,000 m/s.	
DL02C-19	Nickel powder and porous nickel metal, as follows:	Dual Use Code DL02C-19 does not include — (a) filamentary nickel powders; or (b) single porous nickel sheets not exceeding 1,000 cm ² per sheet.

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a. nickel powder having both of the following characteristics:

1. a nickel purity content of 99.0% or greater by weight; and
2. a mean particle size of less than 10 micrometers (mm) measured by “ASTM” B330 standard; but not Filamentary nickel powders;

b. porous nickel powder produced from materials specified in Dual Use Code DL02C-19.a.

Dual Use Code DL02C-19.b refers to porous metal formed by compacting and sintering any material under Dual Use Code DL02C-19.a to form a metal material with fine pores interconnected throughout the structure.

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DL03 CATEGORY 3 – MATERIALS PROCESSING

SUB-CATEGORY 3A – SYSTEMS,
EQUIPMENT AND
COMPONENTS

DL03A-01 Crucibles made of materials resistant to liquid
actinide metals, as follows:

- a. crucibles with a volume of between 150 ml
(cm³) and 8 litres (8,000 cm³) and made of or
coated with any of the following materials
having a purity of 98% or greater by weight:

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1. Calcium fluoride (CaF_2);
 2. Calcium zirconate (metazirconate) (CaZrO_3);
 3. Cerium sulphide (Ce_2S_3);
 4. Erbium oxide (erbia) (Er_2O_3);
 5. Hafnium oxide (hafnia) (HfO_2);
 6. Magnesium oxide (MgO);
 7. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W);
 8. Yttrium oxide (yttria) (Y_2O_3);
 9. Zirconium oxide (zirconia) (ZrO_2);
- b. crucibles with a volume of between 50 ml (cm^3) and 2 litres ($2,000 \text{ cm}^3$) and made of or lined with tantalum, having a purity of 99.9% or greater;

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	<ul style="list-style-type: none"> c. crucibles with a volume of between 50 ml (cm³) and 2 litres (2,000 cm³), made of or lined with tantalum (having a purity of 98% or greater) and coated with tantalum carbide, nitride or boride (or any combination of these). 	
DL03A-02	<p>Valves having all of the following characteristics:</p> <ul style="list-style-type: none"> a. a nominal size of 5 mm or greater; b. having a bellows seal; c. wholly made of or lined with aluminium, aluminium alloy, nickel, or nickel alloy containing more than 60% nickel by weight. 	For valves with different inlet and outlet diameters, the nominal size refers to the smallest diameter.

SUB-CATEGORY 3B – TEST, INSPECTION
AND PRODUCTION EQUIPMENT

DL03B-01

Machine tools, as follows, for removing or cutting metals, ceramics or “composites”, which, according to the manufacturer’s technical specification, can be equipped with electronic devices for simultaneous “contouring control” in 2 or more axes:

- a. machine tools for milling, having either of the following characteristics:
 1. positioning accuracy, after all feasible measures available to the manufacturer to minimise all systematic positioning errors for the tools have been taken, is equal to or less than 6 µm (0.006 mm) along any linear axis (overall positioning);
 2. two or more contouring rotary axes;
1. Dual Use Code DL03B-01.a does not include milling machines having the following characteristics:
 - (a) x-axis travel greater than 2 m; and
 - (b) overall positioning accuracy on the x-axis more (worse) than 30 µm (0.030 mm).

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| <p>b. machine tools for grinding, having any of the following characteristics:</p> <ol style="list-style-type: none">1. positioning accuracies, after all feasible measures available to the manufacturer to minimise all systematic positioning errors for the tools have been taken, is equal to or less (better) than 4 μm (0.004 mm) along any linear axis (overall positioning);2. two or more contouring rotary axes. | <p>2. Dual Use Code DL03B-01.b does not include the following grinding machines:</p> <p>(a) cylindrical, whether external, internal, or external-internal grinding machines, having all of the following characteristics:</p> <ol style="list-style-type: none">(i) limited to cylindrical grinding;(ii) a maximum workpiece outside diameter or length of 150 mm;(iii) not more than 2 axes that can be coordinated simultaneously for “contouring control”;(iv) no contouring c-axis. |
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		<p>(b) jig grinders with axes limited to x, y, c and a where c-axis is used or intended to be used to maintain the grinding wheel normal to the work surface, and the a-axis is configured to grind barrel cams;</p> <p>(c) tool or cutter grinding machines with “software” specially designed for the production of tools or cutters;</p> <p>(d) crankshaft or camshaft grinding machines.</p>
DL03B-02	“Isostatic presses”, and related equipment, as follows:	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 the inside diameter of the pressure chamber and the inside diameter of the insulated furnace chamber, depending on which of the 2 chambers is located inside the other.

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a. “isostatic presses” having both of the following characteristics:

1. capable of achieving a maximum working pressure of 69 MPa or greater;
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 Dual Use Code DL03B-02.a.

DL03B-03

Dimensional inspection machines, instruments or systems, as follows:

1. Dual Use Code DL03B-03 includes machine tools that can be used as measuring machines if they meet or exceed the criteria specified in Dual Use Code DL03B-03.a or DL03B-03.b, as the case may be.

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- a. computer controlled or numerically controlled dimensional inspection machines having both of the following characteristics:
 1. two or more axes;
 2. a one-dimensional length “measurement uncertainty” equal to or less (better) than $(1.25 + L/1\ 000)$ μm tested with a probe of an “accuracy” of less (better) than 0.2 μm (L is the measured length in millimeters);
- b. systems for simultaneously linear-angular inspection of hemishells, having both of the following characteristics:
 2. Dual Use Code DL03B-03.a applies only if the machine exceeds the control threshold in that Code anywhere within its operating range.
 3. All parameters of measurement values in Dual Use Code DL03B-03 represent plus-minus, that is, not total band.

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1. “measurement uncertainty” along any linear axis is equal to or less (better) than 3.5 μm per 5 mm;
2. the maximum difference between the angular position and the actual, accurately measured angular position after the workpiece mount of the table has been turned out of its initial position is equal to or less than 0.02° .

DL03B-04 “Robots” or “end-effectors”, specially designed to comply with national safety standards applicable to the handling of high explosives (for example, to comply with electrical code ratings for high explosives) and specially designed controllers therefor.

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DL03B-05

Flow forming machines, spin forming machines capable of flow forming functions, and mandrels, as follows:

- a. machines having both of the following characteristics:
 1. three or more rollers (active or guiding);
 2. according to the manufacturer's technical specification, can be equipped with "numerical control" units or a computer control;
- b. rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 mm and 400 mm.

Dual Use Code DL03B-05 includes machines which have only a single roller designed to deform metal plus 2 auxiliary rollers which support the mandrel, but do not participate directly in the deformation process.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL03B-06	<p>Remote manipulators that can be used to provide remote actions in radiochemical separation operations and hot cells, which have —</p> <p>a. a capability of penetrating 0.6 m or more of hot cell wall (through-the-wall operation); or</p> <p>b. a capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-the-wall operation).</p>	<p>Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of master or slave type or operated by joystick or keypad.</p>
DL03B-07	<p>Vacuum or controlled environment (inert gas) induction furnaces capable of operation above 1,123 K (850°C) and having induction coils which are 600 mm or less in diameter, and designed for power inputs of 5 kW or more, and power supplies specially designed therefor with a specified power output 5 kW or more.</p>	<p>Dual Use Code DL03B-07 does not include furnaces designed for the processing of semi-conductor wafers.</p>

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DL03B-08 Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment, as follows:

- a. arc remelt and casting furnaces with consumable electrode capacities between 1,000 cm³ and 20,000 cm³, capable of operating with melting temperatures above 1,973 K (1,700⁰C);
- b. electron beam melting and plasma atomization and melting furnaces, with a power of 50 kW or greater, capable of operating with melting temperatures above 1,473 K (1,200⁰C).

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DL03B-09

Rotor fabrication or assembly equipment, rotor straightening equipment, bellows-forming mandrels and dies, as follows:

- a. rotor assembly equipment for assembly of gas centrifuge rotor tube sections, baffles and end caps, including associated precision mandrels, clamps and shrink fit machines;
- b. rotor straightening equipment for alignment of gas centrifuge rotor tube sections to a common axis;
- c. bellows-forming mandrels and dies for producing single-convolution bellows, where the bellows have all of the following characteristics:

Equipment in Dual Use Code DL03B-09 will normally consist of precision measuring probes linked to a computer that subsequently controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.

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1. inside diameter 75 mm to 400 mm;
2. length equal to or greater than 12.7 mm;
3. single convolution depth greater than 2 mm;
4. made of high-strength aluminium alloys, maraging steel or high strength “fibrous or filamentary materials”.

DL03B-10 Centrifugal multiplane balancing machines, whether fixed or portable, and whether horizontal or vertical, as follows:

- a. centrifugal balancing machines designed for balancing flexible rotors, having a length of 600 mm or more and having all of the following characteristics:
 - 1. a swing or journal diameter of 75 mm or more;
 - 2. mass capability from 0.9 kg to 23 kg;
 - 3. capable of balancing speed of revolution more than 5,000 rpm;
- b. centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics:
 - 1. a journal diameter 75 mm or more;
 - 2. mass capability from 0.9 kg to 23 kg;
 - 3. capable of balancing to a residual imbalance of 0.01 kg x mm/kg per plane or better;
 - 4. belt drive type.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL03B-11	<p>“Pressure transducers” capable of measuring absolute pressures at any point in the range 0 kPa to 13 kPa and having both of the following characteristics:</p> <ol style="list-style-type: none"> pressure sensing elements made of or protected by aluminium, aluminium alloy, nickel or nickel alloy with more than 60% nickel by weight; having either of the following characteristics: <ol style="list-style-type: none"> a full scale of less than 13 kPa and an “accuracy” of better than $\pm 1\%$ (full-scale); a full scale of 13 kPa or greater and an “accuracy” of better than ± 130 Pa. 	In Dual Use Code DL03B-11, “accuracy” includes non-linearity, hysteresis and repeatability at ambient temperature.

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DL03B-12

Vacuum pumps with an input throat size of 380 mm or greater with a pumping speed of 15,000 litres/s (15 m³/s) or greater and capable of producing an ultimate vacuum better than 13 mPa.

1. The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.
2. The pumping speed is determined at the measurement point with nitrogen gas or air.

DL03B-13

Multistage light gas guns or other high-velocity gun systems (coil, electromagnetic, and electrothermal types and other advanced systems) capable of accelerating projectiles to 2 km/s or greater.

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DL04

CATEGORY 4 – ELECTRONICS

SUB-CATEGORY 4A – SYSTEMS,
EQUIPMENT AND
COMPONENTS

DL04A-01

Electronic components, as follows:

- a. capacitors with either of the following characteristics:
 1. voltage rating greater than 1.4 kV, energy storage greater than 10 J, capacitance greater than 0.5 μ F and series inductance less than 50 nH;
 2. voltage rating greater than 750 V, capacitance greater than 0.25 μ F and series inductance less than 10 nH;

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| <p>b. superconducting solenoidal electromagnets having all of the following characteristics:</p> <ol style="list-style-type: none">1. capable of creating magnetic fields of more than 2 teslas (20 kilogauss);2. with a ratio of length to inner diameter greater than 2;3. with an inner diameter greater than 300 mm; and4. with a magnetic field over the central 50% of the inner volume being of uniform field strength to better than 1%; <p>c. flash X-ray generators or pulsed electron accelerators having either of the following characteristics:</p> | <p>1. Dual Use Code DL04A-01.b does not include magnets specially designed as part of medical nuclear magnetic resonance (NMR) imaging systems, whether it forms part of the same shipment as the system or as a shipment from a source different from that of the system.</p> <p>2. Dual Use Code DL04A-01.c includes accelerators that are component parts of devices designed for purposes other than electron beam or X-ray radiation (for example, electron microscopy), and those designed for medical purposes.</p> |
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1. an accelerator peak electron energy of 500 keV or greater but less than 25 MeV; and with a “figure of merit” (K) of 0.25 or greater; or
2. an accelerator peak electron energy of 25 MeV a “peak power” greater than 50 MW.

3. The “figure of merit” K is arrived at as follows:

$$K = 1.7 \times 10^3 V^{2.65} Q,$$

V is the peak electron energy in million electron volts.

If the accelerator beam pulse duration is less than or equal to 1 μ s, then Q is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than 1 μ s, then Q is the maximum accelerated charge in 1 μ s.

Q equals the integral of I with respect to t, over the lesser of 1 μ s or the time duration of the beam pulse ($Q = [\text{integral}] \text{ idt}$), where I is beam current in amperes and t is time in seconds).

4. “Peak power” = (peak potential in volts) x (peak beam current in amperes)

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DL04A-02

Frequency changers (also known as converters or inverters) or generators, having all of the following characteristics:

- a. a multiphase output capable of providing a power of 40 W or more;
- b. capable of operating in the frequency range between 600 Hz and 2,000 Hz;
- c. total harmonic distortion better (less) than 10%;
- d. frequency control better (less) than 0.1%.

5. In machines based on microwave accelerating cavities, the duration of the beam pulse is the lesser of 1 μ s or the duration of the bunched beam packet resulting from one microwave modulator pulse.
6. In machines based on microwave accelerating cavities, the peak beam current is the average current in the duration of a bunched beam packet.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL04A-03	Direct current high-power supplies, capable of continuously producing, over a period of 8 hours, 100 V or greater with current output of 500 A or greater and with current or voltage stability better than 0.1% over a period of 8 hours.	
DL04A-04	High-voltage direct current power supplies, capable of continuously producing, over a period of 8 hours, 20,000 V (20 kV) or greater with current output of 1 A or greater and with current or voltage regulation better than 0.1% over a period of hours.	

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DL04A-05

Switching devices, as follows:

- a. cold-cathode tubes (including gas krytron tubes and vacuum spraytron tubes), whether gas filled or not, operating in a similar manner as a spark gap, containing 3 or more electrodes, and having all of the following characteristics:
 1. anode peak voltage rating of 2,500 V or more;
 2. anode peak current rating of 100 A or more; and
 3. anode delay time of 10 μ s or less;

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ul style="list-style-type: none"> b. triggered spark-gaps having an anode delay time of 15 μs or less and rated for a peak current of 500 A or more; c. modules or assemblies with a fast switching function having all of the following characteristics: <ul style="list-style-type: none"> 1. anode peak voltage rating greater than 2,000 V; 2. anode peak current rating of 500 A or more; and 3. turn-on time of 1 μs or less. 	
DL04A-06	<p>Firing sets and equivalent high-current pulse generators (for controlled detonators), as follows:</p> <ul style="list-style-type: none"> a. explosive detonator firing sets designed to drive multiple controlled detonators specified in Dual Use Code DL04A-09; 	

b. modular electrical pulse generators (pulsers) designed for portable, mobile or ruggedized use (including xenon flash-lamp drivers) having all of the following characteristics:

1. capable of delivering their energy in less than 15 μ s;
2. having an output greater than 100 A;
3. having a “rise time” of less than 10 μ s into loads of less than 40 ohms;
4. enclosed in a dust-tight enclosure;
5. no dimension greater than 254 mm;
6. weight less than 25 kg; and

The “rise time” is the time interval from 10% to 90% current amplitude when driving a resistive load.

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	<p>7. specified for use over an extended temperature range (223 K (-50⁰C) to 373 K (100⁰C)) or specified as suitable for aerospace applications.</p>	
DL04A-07	High-speed pulse generators with output voltage greater than 6 volts into a less than 55 ohms resistive load, and with “pulse transition time” less than 500 picoseconds (ps).	“Pulse transition time” means the time interval between 10% and 90% voltage amplitude.
DL04A-08	Neutron generator systems, including tubes, designed for operation without an external vacuum system and utilising electrostatic acceleration to induce a tritium-deuterium nuclear reaction.	

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL04A-09	<p>Detonators and multipoint initiation system, as follows:</p> <p>a. electrically driven explosive detonators, as follows:</p> <ol style="list-style-type: none">1. exploding bridge (EB);2. exploding bridge wire (EBW);3. slapper;4. exploding foil initiators (EFI); <p>b. arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface (over greater than 5,000 mm²) from a single firing signal (with an initiation timing spread over the surface of less than 2.5 μs).</p>	<ol style="list-style-type: none">1. Dual Use Code DL04A-09 does not include detonators using only primary explosives, such as lead azide.2. Dual Use Code DL04A-09 is concerned only with detonators which utilise a small electrical conductor (bridge, bridge wire or foil) that explosively vapourises when a fast, high-current electrical pulse is passed through it. In nonslapper types, the exploding conductor starts a chemical detonation in a contacting high-explosive material such as PETN (Pentaerythritoltetranitrate). In slapper detonators, the explosive vaporization of the electrical conductor drives a flyer or slapper across a gap and the impact of the slapper on an explosive starts a chemical detonation. The slapper in some designs is driven by a magnetic force. The term “exploding foil detonator” may refer to either an EB or a slapper-type detonator. Also, the word “initiator” is sometimes used in place of the word “detonator”.

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- DL04A-10 Mass spectrometers, capable of measuring ions of 230 atomic mass units or greater and having a resolution of better than 2 parts in 230, as follows, and ion sources therefor:
- a. inductively coupled plasma mass spectrometers (ICP/MS);
 - b. glow discharge mass spectrometers (GDMS);
 - c. thermal ionization mass spectrometers (TIMS);
 - d. electron bombardment mass spectrometers which have a source chamber constructed from, lined with or plated with “materials resistant to corrosion by UF₆”;

- e. molecular beam mass spectrometers having either of the following characteristics:
 - 1. a source chamber constructed from, lined with or plated with stainless steel or molybdenum and equipped with a cold trap capable of cooling to 193 K (-80°C) or less; or
 - 2. a source chamber constructed from, lined with or plated with “materials resistant to corrosion by UF_6 ”;
- f. mass spectrometers equipped with a microfluorination ion source designed for use with actinide or actinide fluorides.

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DL05

CATEGORY 5 – “INFORMATION
SECURITY”

Introductory Note for Category 5

1. “Information security” equipment, “software”, systems, application specific “electronic assemblies”, modules, integrated circuits, components and functions are included in this category even if they are components or “electronic assemblies” of other equipment.
2. An item when carried on the person of its user and for the user’s personal use is not included.
3. An item that meets all of the following characteristics is not included:

- (a) it is generally available to the public by being sold, without restriction, from stock at retail selling points by means of any of the following:
 - (i) over-the-counter transactions;
 - (ii) mail order transaction;
 - (iii) electronic transactions; or
 - (iv) telephone call transactions;
 - (b) its cryptographic functionality cannot easily be changed by the user;
 - (c) it is designed for installation by the user without further substantial support by the supplier.
4. A reference to key length excludes parity bits of the item concerned.

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SUB-CATEGORY 5A - SYSTEMS,
EQUIPMENT AND COMPONENTS

DL05A-01

Systems, equipment, application specific “electronic assemblies”, modules and integrated circuits for “information security”, meeting any of the following characteristics, and other specially designed components therefor:

1. Dual Code Use DL05A-01 does not include —

- (a) “personalised smart cards” the cryptographic capability of which is restricted for use in equipment or systems excluded by virtue of Notes (b) to (f); if a “personalised smart card” has multiple functions, that “personalised smart card” is also excluded if it is not capable of a function set out in that Dual Use Code;
- (b) receiving equipment for radio broadcast, pay television or similar restricted audience broadcast of the consumer type, without digital encryption except if it is exclusively used for sending the billing or programme-related information back to the broadcast providers;

- (c) equipment where the cryptographic capability is not user-accessible and which is specially designed and limited to allow any of the following:
 - (i) execution of copy-protected software;
 - (ii) access to any of the following:
 - (A) copy-protected read-only media;
 - (B) information stored in encrypted form on media (for example, in connection with the protection of intellectual property rights) when the media is offered for sale in identical sets to the public; or
 - (C) one-time copying of copyright protected audio or video data;
- (d) cryptographic equipment specially designed for and limited to banking use or money transactions, including the collection and settlement of fares or credit functions;
- (e) portable or mobile radiotelephones for civil use (for example, those for use with commercial civil cellular radio-communication systems) that are not capable of end-to-end encryption;

- a. designed or modified to use “cryptography” employing digital techniques and performing any cryptographic function other than authentication or digital signature, and having any of the following:
 - 1. a “symmetric algorithm” employing a key length in excess of 56 bits; or
 - 2. an “asymmetric algorithm” where the security of the algorithm is based on any of the following:
 - (f) cordless telephone equipment not capable of end-to-end encryption where the maximum effective range of unboosted cordless operation (that is, a single, unrelayed hop between terminal and home base station) is less than 400 metres according to the manufacturer’s specifications.
- 2. Authentication and digital signature functions include their associated key management function.
- 3. Authentication includes all aspects of access control where there is no encryption of files or text except encryption directly related to the protection of passwords, Personal Identification Numbers (PINs) or similar data to prevent unauthorised access.
- 4. “Cryptography” does not include fixed data compression or coding techniques, that is, data compression or coding techniques which cannot accept externally supplied parameters such as cryptographic and key variables, and cannot be modified by the user.
- 5. Items in Dual Use Code DL05A-01.a include equipment designed or modified to use “cryptography” employing analogue principles when implemented with digital techniques.

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- (a) factorisation of integers in excess of 512 bits (for example, RSA);
 - (b) computation of discrete logarithms in a multiplicative group of a finite field of size greater than 512 bits (for example, Diffie-Hellman over $\mathbb{Z}/p\mathbb{Z}$); or
 - (c) discrete logarithms in a group other than mentioned in sub-item a.2.(b) in excess of 112 bits (for example, Diffie-Hellman over an elliptic curve);
- b. designed or modified to perform cryptanalytic functions;

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- c. specially designed or modified to reduce emanations of information-bearing signals to levels that meet health, safety or electromagnetic interference standards;
- d. designed or modified to use cryptographic techniques to generate the spreading code for “spread spectrum” including the hopping code for “frequency hopping” systems;
- e. designed or modified to provide certified or certifiable “multilevel security” or user isolation at a level exceeding Class B2 of the Trusted Computer System Evaluation Criteria (TCSEC) or equivalent;
- f. communications cable systems designed or modified using mechanical, electrical or electronic means to detect surreptitious intrusion.

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SUB-CATEGORY 5B – TEST, INSPECTION
AND PRODUCTION
EQUIPMENT

- DL05B-01 a. Equipment specially designed for —
1. the “development” of equipment or functions under Category 5, including measuring or test equipment;
 2. the “production” of equipment or functions under Category 5, including measuring, test, repair or production equipment.
- b. Measuring equipment specially designed to evaluate and validate the “information security” functions under Dual Use Code DL05.

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SUB-CATEGORY 5D – SOFTWARE

DL05D-01

- a. “Software” specially designed or modified for the “development”, “production” or “use” of equipment or “software” under Category 5.
- b. “Software” specially designed or modified to support “technology” under Category 5.
- c. Specific “software”, as follows:
 - 1. “software” having the characteristics, or performing or simulating the functions of the equipment under Category 5;
 - 2. “software” to certify “software” under Category 5.

This category does not include —

- (a) “software” required for the “use” of equipment excluded under the Introductory Note to Category 5;
- (b) “software” providing any of the functions of equipment excluded under the Introductory Note to Category 5.

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SUB-CATEGORY 5E – TECHNOLOGY

DL05E-01 “Technology” for the “development”,
“production” or “use” of equipment or
“software” under Category 5.

DL06 CATEGORY 6 – SENSORS AND “LASERS”

SUB-CATEGORY 6A – SYSTEMS,
EQUIPMENT AND
COMPONENTS

DL06A-01 Photomultiplier tubes having both of the
following characteristics:

- a. photocathode area of greater than 20
 cm²;
- b. anode pulse rise time of less than 1 ns.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL06A-02	<p>Cameras and components, as follows:</p> <ol style="list-style-type: none"> a. mechanical rotating mirror cameras, as follows, and specially designed components therefor: <ol style="list-style-type: none"> 1. framing cameras with recording rates greater than 225,000 frames per second; or 2. streak cameras with writing speeds greater than 0.5 mm per microsecond; b. electronic streak cameras, electronic framing cameras, tubes and devices, as follows: <ol style="list-style-type: none"> 1. electronic streak cameras capable of 50 ns or less time resolution and streak tubes therefor; 2. electronic (or electronically shuttered) framing cameras capable of 50 ns or less frame exposure time; 	<ol style="list-style-type: none"> 1. Components of such cameras include their synchronizing electronic units and rotor assemblies consisting of turbines, mirrors and bearings.

3. framing tubes and solid-state imaging devices for use with cameras specified in paragraphs 1 and 2, 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 pockel 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 above;

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
	<ul style="list-style-type: none"> c. radiation-hardened TV cameras, or lenses therefor, specially designed or rated as radiation hardened to withstand a total radiation dose greater than 50×10^3 Gy(silicon) (5×10^6 rad (silicon)) without operational degradation. 	<ul style="list-style-type: none"> 2. “Gy(silicon)” refers to the energy in Joules per kilogram absorbed by an unshielded silicon sample when exposed to ionising radiation.
DL06A-03	<p>“Lasers”, “laser” amplifiers and oscillators, as follows:</p> <ul style="list-style-type: none"> a. argon ion “lasers” having both of the following characteristics: <ul style="list-style-type: none"> 1. operating at wavelengths between 400 nm and 515 nm; 2. an average output power greater than 40 W; 	

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| b. | tunable pulsed single-mode dye laser oscillators having all of the following characteristics: <ol style="list-style-type: none">1. operating at wavelengths between 300 nm and 800 nm;2. an average output power of greater than 1 W;3. a repetition rate greater than 1 khz;
and4. a pulse width less than 100 ns; | |
| c. | tunable pulsed dye “laser” amplifiers and oscillators, having all of the following characteristics: <ol style="list-style-type: none">1. operating at wavelengths between 300 nm and 800 nm;2. an average output power greater than 30 W; | Dual Use Code DL06A-03.c does not include single mode oscillators. |

First column

Second column

Third column

- 3. a repetition rate greater than 1 kHz;
- 4. a pulse width less than 100 ns;
- d. pulsed carbon dioxide “lasers” having all of the following characteristics:
 - 1. operating at wavelengths between 9,000 nm and 11,000 nm;
 - 2. a repetition rate greater than 250 Hz;
 - 3. an average output power greater than 500 W; and
 - 4. a pulse width less than 200 ns;

First column

Second column

Third column

- e. para-hydrogen Raman shifters designed to operate at 16 micrometre output wavelength and at a repetition rate greater than 250 Hz;
- f. pulse-excited, Q-switched Neodymium-doped (other than glass) “lasers”, having all of the following characteristics:
 - 1. an output wavelength exceeding 1,000 nm but not exceeding 1,100 nm;
 - 2. a pulse duration equal to or more than 1 ns;
 - 3. a multiple-transverse mode output having an average power exceeding 50 W.

<i>First column</i>	<i>Second column</i>	<i>Third column</i>
DL06A-04	Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 microseconds.	Dual Use Code DL06A-04 includes velocity interferometers such as VISARs (Velocity interferometer systems for any reflector) and DLIs (Doppler laser interferometers).
DL06A-05	Pressure sensors, as follows: <ul style="list-style-type: none"> a. manganin gauges for pressures greater than 10 Gpa; b. quartz pressure transducers for pressures greater than 10 Gpa. 	

PART III**GOODS THE TRANSHIPMENT OF WHICH IS PROHIBITED
EXCEPT WITH PERMIT**

1. All items set out against the following Munition Codes in Part II of this Schedule:

ML01

ML02

ML03

ML04

ML06

ML07

ML08

ML09.

2. All items set out against the following ChemBio Codes in Part II of this Schedule:

BL01-A

BL01-B

BL01-C

BL01-D

CL01-1A

CL01-1B

CL01-2A

CL01-2B

CL01-3A

CL01-3B.

3. All items set out against the following Dual Use Codes in Part II of this Schedule:

DL01A-01

DL01B-01

DL01B-02

DL01B-03

DL01B-04

DL01B-05

DL01B-06

DL01C-01

DL01C-02

DL01C-03

DL01C-04

DL01C-05

DL05A-01

DL05B-01.

PART IV**GOODS THE BROKERING OF WHICH IS PROHIBITED EXCEPT BY A PERSON
REGISTERED UNDER SECTION 7**

All items set out against the following Munition Codes in Part II of this Schedule:

ML01

ML02

ML03

ML04

ML07.
