**RECORD OF COMMENTS: EFFECTS OF FOREIGN POLICY-BASED EXPORT CONTROLS**

**Published in the Federal Register**

**69 FR 57895**
**(Due November 19, 2004)**

| COMMENT | SOURCE | SIGNER(S) OF LETTER | DATE | NUMBER OF PAGES |
|---|---|---|---|---|
| 1 | **Jackson T. Marlow** | Same | October 18, 2004 | 3 |
| 2 | **William Root** | Same | November 10, 2004 | 33 |
| 3 | **Crescent Carpets** | Angela Kozuch | November 11, 2004 | 1 |
| 4 | **National Chamber of Industries & Commerce, U.P., India** | Chairman, SCX & UNIDO | November 15, 2004 | 3 |
| 5 | **InterAction** | Mary E. McClymont | November 17, 2004 | 6 |
| 6 | **Sartomer Company** | Bill Wittig | November 17, 2004 | 8 |
| 7 | **National Foreign Trade Council** | Haynes Roberts | November 18, 2004 | 2 |
| 8 | **Cordin Company** | Susan Wenger | November 18, 2004 | 37 |
| 9 | **Industry Coalition on Technology Transfer (ICOTT)** | Eric Hirschhorn | November 18, 2004 | 2 |
| 10 | **Sensors and Instruments Technical Advisory Committee 2004** | John Goodrich | November 19, 2004 | 7 |
| 11 | **GE Fanuc Automation North America, Inc.** | Bill Griffith | November 19, 2004 | 14 |
| 12 | **United Testing Systems** | ---------- | November 19, 2004 | 8 |

## DEPARTMENT OF COMMERCE

### Bureau of Industry and Security

### 15 CFR Chapter VII

**[Docket No. 040910262–4262–01]**

### Effects of Foreign Policy-Based Export Controls

**AGENCY:** Bureau of Industry and Security, Commerce.

**ACTION:** Request for comments on foreign policy-based export controls.

**SUMMARY:** The Bureau of Industry and Security (BIS) is reviewing the foreign policy-based export controls in the Export Administration Regulations to determine whether they should be modified, rescinded or extended. To help make these determinations, BIS is seeking comments on how existing foreign policy-based export controls have affected exporters and the general public.

**DATES:** Comments must be received by November 19, 2004.

**ADDRESSES:** Written comments (three copies) should be sent to Sheila Quarterman, Regulatory Policy Division, Bureau of Industry and Security, Department of Commerce, P.O. Box 273, Washington, DC 20044. Alternatively, comments may be e-mailed to Sheila Quarterman at *SQuarter@bis.doc.gov*.

**FOR FURTHER INFORMATION CONTACT:** Joan Roberts, Director, Foreign Policy Division, Office of Nonproliferation and Treaty Compliance, Bureau of Industry and Security, Telephone: (202) 482–4252. Copies of the current Annual Foreign Policy Report to the Congress are available at *http://www.bis.doc.gov/PoliciesAndRegulations/04ForPolControls/index.htm* and copies may also be requested by calling the Office of Nonproliferation and Treaty Compliance at the number listed above.

**SUPPLEMENTARY INFORMATION:** Foreign policy based controls in the Export Administration Regulations (EAR) are implemented pursuant to section 6 of the Export Administration Act of 1979, as amended. The current foreign policy-based export controls maintained by the Bureau of Industry and Security (BIS) are set forth in the EAR, including in parts 742 (CCL Based Controls), 744 (End-User and End-Use Based Controls) and 746 (Embargoes and Special Country Controls). These controls apply to a range of countries, items and activities including: high performance computers (§ 742.12); certain general purpose microprocessors for "military end-uses" and "military end-users" (§ 744.17); significant items (SI): hot section technology for the development, production, or overhaul of commercial aircraft engines, components, and systems (§ 742.14); encryption items (§ 742.15 and § 744.9); crime control and detection commodities (§ 742.7); specially designed implements of torture (§ 742.11); certain firearms included within the Inter-American Convention Against the Illicit Manufacturing of and Trafficking in Firearms, Ammunition, Explosives, and Other Related Materials (§ 742.17); regional stability commodities and equipment (§ 742.6); equipment and related technical data used in the design, development, production, or use of missiles (§ 742.5 and § 744.3); chemical precursors and biological agents, associated equipment, technical data, and software related to the production of chemical and biological agents (§ 742.2 and § 744.4) and various chemicals included in those controlled pursuant to the Chemical Weapons Convention (§ 742.18); nuclear propulsion (§ 744.5); aircraft and vessels (§ 744.7); embargoed countries (part 746); countries designated as supporters of acts of international terrorism (§§ 742.8, 742.9, 742.10, 742.19, 742.20, 746.2, 746.3, and 746.7); certain entities in Russia (§ 744.10); and individual terrorists and terrorist organizations (§§ 744.12, 744.13 and § 744.14. Attention is also given in this context to the controls on nuclear-related commodities and technology (§§ 742.3 and 744.2), which are, in part, implemented under section 309(c) of the Nuclear Non Proliferation Act.

Under the provisions of section 6 of the Export Administration Act of 1979, as amended (EAA), export controls maintained for foreign policy purposes require annual extension. Section 6 of the EAA requires a report to Congress when foreign policy-based export controls are extended. The EAA expired on August 20, 2001. Executive Order 13222 of August 17, 2001 (3 CFR, 2001 Comp., p. 783 (2002)), which has been extended by successive Presidential Notices, the most recent being that of August 6, 2004 (69 FR 48763, August 10, 2004), continues the EAR and, to the extent permitted by law, the provisions of the EAA, in effect under the International Emergency Economic Powers Act (50 U.S.C. 1701–1706 (2000). The Department of Commerce, insofar as appropriate, is following the provisions of section 6 in reviewing foreign policy-based export controls, requesting public comments on such controls, and submitting a report to Congress.

In January 2004, the Secretary of Commerce, on the recommendation of the Secretary of State, extended for one year all foreign policy-based export controls then in effect.

To assure maximum public participation in the review process, comments are solicited on the extension or revision of the existing foreign policy-based export controls for another year. Among the criteria considered in determining whether to continue or revise U.S. foreign policy-based export controls are the following:

1. The likelihood that such controls will achieve the intended foreign policy purpose, in light of other factors, including the availability from other countries of the goods, software or technology proposed for such controls;

2. Whether the foreign policy purpose of such controls can be achieved through negotiations or other alternative means;

3. The compatibility of the controls with the foreign policy objectives of the United States and with overall United States policy toward the country subject to the controls;

4. Whether reaction of other countries to the extension of such controls by the United States is not likely to render the controls ineffective in achieving the intended foreign policy purpose or be counterproductive to United States foreign policy interests;

5. The comparative benefits to U.S. foreign policy objectives versus the effect of the controls on the export performance of the United States, the competitive position of the United States in the international economy, the international reputation of the United States as a supplier of goods and technology; and

6. The ability of the United States to enforce the controls effectively.

BIS is particularly interested in the experience of individual exporters in complying with the proliferation controls, with emphasis on economic impact and specific instances of business lost to foreign competitors. BIS is also interested in industry information relating to the following:

1. Information on the effect of foreign policy-based export controls on sales of U.S. products to third countries (*i.e.*, those countries not targeted by sanctions), including the views of foreign purchasers or prospective customers regarding U.S. foreign policy-based export controls.

2. Information on controls maintained by U.S. trade partners. For example, to what extent do they have similar controls on goods and technology on a worldwide basis or to specific destinations?

3. Information on licensing policies or practices by our foreign trade partners

which are similar to U.S. foreign policy-based export controls, including license review criteria, use of conditions, requirements for pre and post shipment verifications (preferably supported by examples of approvals, denials and foreign regulations).

4. Suggestions for revisions to foreign policy-based export controls that would (if there are any differences) bring them more into line with multilateral practice.

5. Comments or suggestions as to actions that would make multilateral controls more effective.

6. Information that illustrates the effect of foreign policy-based export controls on the trade or acquisitions by intended targets of the controls.

7. Data or other information as to the effect of foreign policy-based export controls on overall trade at the level of individual industrial sectors.

8. Suggestions as to how to measure the effect of foreign policy-based export controls on trade.

9. Information on the use of foreign policy-based export controls on targeted countries, entities, or individuals.

BIS is also interested in comments relating generally to the extension or revision of existing foreign policy-based export controls.

Parties submitting comments are asked to be as specific as possible. All comments received before the close of the comment period will be considered by BIS in reviewing the controls and developing the report to Congress.

All information relating to the notice will be a matter of public record and will be available for public inspection and copying. In the interest of accuracy and completeness, BIS requires written comments. Oral comments must be followed by written memoranda, which will also be a matter of public record and will be available for public review and copying.

The Office of Administration, Bureau of Industry and Security, U.S. Department of Commerce, displays these public comments on BIS's Freedom of Information Act (FOIA) Web site at *http://www.bis.doc.gov/foia.* This office does not maintain a separate public inspection facility. If you have technical difficulties accessing this Web site, please call BIS's Office of Administration at (202) 482–2165 for assistance.

Dated: September 22, 2004.

**Matthew S. Borman,**

*Acting Assistant Secretary for Export Administration.*

[FR Doc. 04–21734 Filed 9–27–04; 8:45 am]

BILLING CODE 3510–33–P

## DEPARTMENT OF ENERGY

### Federal Energy Regulatory Commission

### 18 CFR Parts 35, 131, 154, 157, 250, 281, 284, 300, 341, 344, 346, 347, 348, 375, and 385

**[Docket No. RM01–5–000]**

### Electronic Tariff Filings

September 17, 2004.

**AGENCY:** Federal Energy Regulatory Commission, DOE.

**ACTION:** Notice of proposed rulemaking; extension of comment deadline.

**SUMMARY:** The Federal Energy Regulatory Commission is extending the October 4, 2004, deadline for comments on the Commission's July 8, 2004, Notice of Proposed Rulemaking. (69 FR 43929, July 23, 2004.) A document will be published in the **Federal Register** to establish the new comment date.

**DATES:** A document will be published in the **Federal Register** establishing the new comment date.

**ADDRESSES:** Comments may be filed electronically via the eFiling link on the Commission's Web site at *http://www.ferc.gov.* Commenters unable to file comments electronically must send an original and 14 copies of their comments to: Federal Energy Regulatory Commission, Office of the Secretary, 888 First Street, NE., Washington, DC 20426. Refer to the Comment Procedures section of the preamble of the Notice of Proposed Rulemaking for additional information on how to file comments.

**FOR FURTHER INFORMATION CONTACT:**

H. Keith Pierce (Technical Information), Office of Markets, Tariffs, and Rates, Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426. (202) 502–8525, *Keith.Pierce@ferc.gov.*

Jamie Chabinsky (Legal Information), Office of the General Counsel, Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426. (202) 502–6040, *Jamie.Chabinsky@ferc.gov.*

Bolton Pierce (Software Information), Office of Markets, Tariffs, and Rates, Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426. (202) 502–8803, *Bolton.Pierce@ferc.gov.*

**SUPPLEMENTARY INFORMATION:**

### Electronic Tariff Filings; Notice of Extension of Comment Deadline

Take notice that the Federal Energy Regulatory Commission is extending the October 4, 2004, deadline for comments on the Commission's July 8, 2004, Notice of Proposed Rulemaking [1] on electronic tariff and rate case filing. This extension is to allow time for continued development and experimental use of the software to be used for tariff and rate filings. A subsequent notice will be published establishing the new comment date as well as the date for the technical conference.

For more information, please contact: Keith Pierce, Office of Markets, Tariffs, and Rates, Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426. 202–502–8525, *Keith.Pierce@ferc.gov.*

**Magalie R. Salas,**

*Secretary.*

[FR Doc. 04–21467 Filed 9–27–04; 8:45 am]

BILLING CODE 6717–01–P

## DEPARTMENT OF THE TREASURY

### Internal Revenue Service

### 26 CFR Part 1

**[REG–129771–04]**

**RIN 1545–BD49**

### Guidance Under Section 951 for Determining *Pro Rata* Share; Correction

**AGENCY:** Internal Revenue Service (IRS), Treasury.

**ACTION:** Correction to notice of proposed rulemaking.

**SUMMARY:** This document contains corrections to notice of proposed rulemaking that were published in the **Federal Register** on August 6, 2004 (69 FR 47822) providing guidance for determining a United States shareholder's *pro rata* share of a controlled foreign corporation's (CFC's) subpart F income, previously excluded subpart F income withdrawn from investment in less developed countries, previously excluded subpart F income withdrawn from foreign base company shipping operations, and amounts determined under section.

**FOR FURTHER INFORMATION CONTACT:** Jonathan A. Sambur at (202) 622–3840 (not a toll-free number).

**SUPPLEMENTARY INFORMATION:**

### Background

The proposed regulations that are the subject of these corrections are under

[1] Electronic Tariff Filings, Notice of Proposed Rulemaking, 69 FR 43929 (July 23, 2004), FERC Stats. & Regs. Proposed Regulations ¶ 32,575 (July 8, 2004).

4740 E. University Blvd
Dallas, TX 75206

October 6, 2003

Ms. Sheila Quarterman
Regulatory Policy Division
Bureau of Industry and Security, Department of Commerce
P.O. Box 273
Washington, DC 20044

Dear Ms. Quarterman:

As a means to help continue maintaining high standards of human rights and crime control it is necessary for the Bureau of Industry and Security to review its foreign policy-based export controls under the Export Administration Regulations. I feel that the current regulations in the area of human rights/crime control act as effective deterrents toward human rights abuses. The export regulations that have been implemented in the past have helped ensure that U.S.-origin crime control equipment does not reach the hands of government's who fail to abide by international standards of human rights or other maltreatment of similar nature. By lowering the risk of human rights violations through the use of export restrictions it helps further solidify a U.S. interest in upholding high standards of human rights. Our concern to maintain a high standard of human rights is crucial to preserving the U.S. status as a leading activist against such crimes. Higher U.S. standards will help mobilize further support internationally with the hope of other countries subscribing to our beliefs on human rights. The above measures both act and fall under the intended purpose of controls by helping the U.S. combat further human rights violations throughout the world.

Upon examining these export regulations it is important to determine what these factors will bring as outcomes. The end-result of these regulations is crucial to study, using these as a gauge for the level of success brought on by such controls. It is evident that the probability of achieving the intended policy purpose is quite realistic. The current controls help restrict access of certain U.S. origin goods to human rights violators. The U.S. is better able to monitor items of potential use for human rights violators through the use of arduous licensing requirements for crime control goods.

The current export regulations also have been deemed compatible with foreign policy objectives. Determined by the Secretary of Commerce, an extension of the current controls will in no way have an adverse affect on U.S. foreign policy goals. Upholding the current controls are important to help maintain a high level of integrity; centering on consistent policy rather than a scattered plan that is not aligned with our objectives.

The construction or simply the maintenance of U.S. export controls should also be taken into consideration from a global perspective. What international actions, if any, will have

counterproductive results on the intended U.S. foreign policy towards export regulations? Despite the lack of regulations throughout the rest of the world, many still do have some restrictions towards exporting crime control items to regions that are considered unstable. Although these regulations exist, they are not up to par with U.S. standards and it seems necessary to maintain a consistent agenda to help create a need for other countries to adopt similar controls.

The high level of controls that is currently followed in the U.S. certainly has an effect on U.S. industry and the economy, but does this outweigh the need to control arms regulations? I feel that keeping a high standard on crime control items that are exported is crucial and that this far outweighs the economic risk that could be encountered. Thus, the benefits of upholding our current foreign policy objectives seem to be far greater than the risk of endangering the U.S. competitive position in the international economy.

Can the controls that we implement be effectively enforced throughout the world to help deter crime and human rights abusers? The U.S. has been effective in upholding these controls up to this point and it seems logical that this trend will continue. The main difficulty seems not to lie in our own enforcement of these controls, but really in other countries enforcement. The lack of a multilateral agreement on export controls for crime control items seems to hinder our own process of promoting a hard-line on human rights violators. The U.S. ability to be effective in enforcing regulations therefore does not simply fall on us alone, but actually on the ability of us to align our regulations with other nations.

The views of U.S. industry are important to take into account as a measure to both justify and expose shortcomings of the current U.S. export control policy. The Industry Coalition on Technology Transfer stated that these controls are unilateral and result in an ineffective system of regulation. ICOTT feels that these unilateral controls should be used sparingly only in the event to highlight the symbolism of one such control. The over-use of unilateral controls could ultimately hurt both U.S. workers and industry. The strong ability of the U.S. government to align itself with the worries of many human rights groups is a good indicator of the U.S. resolve to maintain high standards of human rights in the world. Effective response to the concerns and views of human rights groups is an important tool for the U.S. to exercise as a means of gaining international support for our policies.

The high standards upheld by the U.S. unfortunately do not reciprocate throughout the rest of the world. Both Canada and the United Kingdom have similar restrictions, but the underlying fact is that no one maintains our standards. U.S. consultation with other agencies is pivotal in establishing similar regulations throughout the world. Addressing these issues with other countries through the Wassenaar Arrangement, the Australia Group, the Nuclear Suppliers Group, and the Missile Technology Control Regime will help make our policies and regulations more multilateral. Without a unified agenda between the U.S. and its trading partners it seems difficult to reach the goals set forth in our current foreign policy initiative.

The provisions of Section 6(n) of the Export Administration Act require that the Department of Commerce uphold export controls on crime control items. Therefore, it seems that there are no alternative means in line to meet the needs of this requirement. In addressing various human rights violations the U.S. exercises sanctions and the process of diplomacy with other countries. There are no alternative means aside from these that seem effective, consequently it is necessary to follow our current policies with a strengthened attempt at achieving a multilateral agenda towards human rights.

The further development of this rule lies in the U.S. ability to foster international support that is in accordance with our own policies. By maintaining high standards for export controls it is hopeful that this trend will emanate in many other countries, thus creating multilateral agenda. The purpose of control is certainly a valid argument as we see that it is important for the U.S. to hold high levels of human rights standards. This can chiefly be accomplished by our failure to aid the intended abusers with our arms. A consistent policy is crucial to achieve this goal, therefore the current controls on crime control items are essential. We should not look for new controls or look to absolve the existing ones, but simply how we can make them better. Updating the controls will come with greater ease if we can gain more international support for the standards we maintain. Without a growing international support, our industries could suffer and human rights violations could escalate throughout the world.

Sincerely,

Jackson T. Marlow

November 10, 2004

To: BIS
From: Bill Root

Subject: Foreign Policy Controls

This memorandum responds to the following three specific requests in the solicitation for comments on foreign policy-based export controls in the Federal Register of September 28, 2004. They are numbered to correspond with the numbering in the Federal Register Notice.

4. Suggestions for revisions in foreign policy-based export controls that would (if there are any differences) bring them more into line with multilateral practice.

Attachment 1 shows how to bring into line the many differences between U.S. foreign policy controls and the multilateral texts on which they are based. This extraordinarily long list shows the magnitude of changes required to remove unilateral controls masquerading as multilateral controls and, in fewer but nevertheless also significant instances, to increase U.S. controls to conform with U.S. commitments in multilateral organizations.

5. Actions that would make multilateral controls more effective.

Multilateral controls now have very little effectiveness compared with the COCOM rule of unanimity in force from 1950 to the early 1990's. This was lost at the end of the cold war and never instituted for the newer MTCR, NSG, and AG regimes, because U.S. objections in COCOM to the exports of other countries were perceived by those countries as often insufficiently justified. It may become possible slowly to strengthen multilateral review of specific proposed MT, NP, CB, or CW exports if the United States were to demonstrate a stronger and more consistent commitment to work cooperatively with other countries to reduce the threat of weapons of mass destruction. For example, ratification of the nuclear test ban treaty and of an international accord on enforcing controls on biological weapons would help, as would avoidance of development of new nuclear weapons and adoption of a policy of no first use of nuclear weapons.

8. How to measure the effect of foreign policy-based export controls on trade.

The most dramatic impact of foreign policy-based export controls on U.S. exports was the rise of Airbus, which was made possible by U.S. restrictions on aircraft exports to the Middle East several decades ago. This illustrates the potentially great cost of unilateral foreign policy controls on big ticket items in the U.S. export trade.

Attachment 1

**Revisions in U.S. foreign policy-based export controls to bring them into line with multilateral controls**

This Attachment lists how the many differences between U.S. foreign policy-based export controls and the multilaterally-agreed texts on which they are based could be brought into line. It is encouraging that suggestions to bring U.S. controls into line with multilateral practice are being requested. But it is surprising that, based on the "(*if there are any differences*)" phrase in the FR Notice, BIS is uncertain whether there are, in fact, any differences.

The following suggestions for change are divided into three parts:

(1) Additions of definitions of terms to part 772
(2) Changes in Wassenaar-based ECCNs
(3) Changes in non-Wassenaar-based ECCNs

## (1) Definitions of Terms

The following definitions should be added to 772.1 to conform with the substance of MTCR, NSG, or AG texts:

**"AG related technology"** (Cat 1, 2) -
"Technology", including licenses, directly associated with CW agents; AG-controlled precursors; or AG-controlled dual-use chemical manufacturing equipment items.

**"Missile propulsion components, equipment, or material"** (MTCR context) (Cat.9)
Items controlled by 9A009, 9A011, 9A101, 9A106.b, 9A108, 9A109, 9A111, 9A117, 9A118, 9C101, 9C102, the MT portion of 9A001, or the portions of 9A006 or 9A008 also described in 9A106.b or 9A108

**"Missile subsystems"** (MTCR context) (Cat. 1, 2, 3, 4, 5, 6, 7, 9) -
Items controlled by 7A117, 9A007.a, 9A105.a, 9A106.c, 9A108.c, 9A116, 9A121, the portion of 9A119 "usable in" "missiles", or the portions of 9A006 or 9A008 also described in 9A106.c or 9A108.c
(9A121 would be a new item "Weapon or warhead safing, arming, fuzing, and firing mechanisms usable in 'missiles'", to conform with MTCR 2.A.1.f.)

**"MTCR General Technology Note"** (Cat. 1, 2, 3, 4, 5, 6, 7, 9) - "Technology" directly associated with any item controlled for MT purposes.

**"NSG technology controls"** (Cat 1, 2, 3, 6) - "Technology" directly associated with any item controlled for NP purposes.

**"Other rocket subsystems"** (MTCR context) (Cat. 9) -
Items controlled by 9A105.b, 9A107.b, or 9A119.b

**"Production facilities"** (MTCR context) (Cat. 9) -
Equipment and specially designed "software" therefor integrated into installations for "development" or for one or more phases of "production."

## (2) MT, NP, or CB Statements in ECCNs Based on Wassenaar Items

The following revisions should be made in ECCNs xx0xx to conform with the substance of MTCR, NSG, or AG texts:

**1A002**

MT applies to portions of 1A002 also described in 1A102 or 9A110

NP applies to composite structures also described in 1A202

(NSG 2.C.7.a specific modulus and specific tensile strength limits are higher than those in 1A002.b.1)

**Deleted:** 1A002.b.1 in the form of tubes with an inside diameter between 75 mm and 400 mm

**1A004**

MT applies to portion of 1A004 also described in 6A102.

CB applies to portion of 1A004 also described in 2B351

**1B001**

MT applies to the following for the production of structural "composites" usable in "missiles": 1B001.a, b except tow placement machines, c, d.1-3, and e

(MTCR 6.B.1. is limited to equipment for the production of structural composites usable in "missiles";

MTCR 6.B.1.b does not cover 1B001.b tow-placement machines)

NP applies...

(1B001 covers neither coordinating and programming controls nor precision mandrels)

**Deleted:** entire entry except 1B001.d.4 and .f

**Deleted:** and coordinating and programming controls and precision mandrels for these filament winding machines

**1C001**

MT applies to items controlled by 1C001 for applications "usable" for "missiles" or "missile subsystems"

(To conform with MTCR 17.C.1.)

**Deleted:** entire entry

**1C002**

MT applies to portion of 1C002 also described in 1C118.

NP applies to 1C002.b.3 or b.4 if they exceed the parameters stated in 1C202 or to portion of 1C002 also described in 1C228.

**1C004**

MT applies to portion of 1C004 also described in 1C117.

NP applies to portion of 1C004 also described in 1C226.

**1C007**

MT applies to portion of 1C007.d also described in 1C107.

(MTCR 8.C.3. contains other limits not in 1C007.d or .f, namely, usable in "missiles" and "usable for rocket nozzles and reentry vehicle nose tips.")

NP applies to portion of 1C007.d also described in 1C234.

**Deleted:** items described in 1C007.d (and .f when the dielectric constant is less than 6 at frequencies from 100 Hz to 10,000 MHz) for use in missile radomes

**1C010**

MT applies to portion of 1C010.e also described in 9C110

NP applies ... "fibrous or filamentary materials" ... "fibrous or filamentary materials" ...

**1C011**

MT applies to 1C011.a and the following portion of .b: metal fuels consisting of 97 percent by weight of boron

NP applies to portions of 1C011 also described in 1C225, 1C228, 1C230, 1C234, or 1C239

**1C111**

NP applies to portions of 1C111 also described in 1C225, 1C228, 1C230, 1C234, or 1C239

**1C118**

NP applies to portion of 1C118 also described in 1C202.

**1D001**

MT applies to "software" for the "use" of items controlled by 1B001 for MT reasons.

(MTCR 6.D.1. is limited to "use" software.)

NP applies to "software" specially designed for the "use" of items controlled by 1B001 for NP reasons.

(NSG 3.D.1 does not control "modified" software and does not control "development" or "production" software.)

**1E001**

MT applies to "technology" for items controlled by 1A002, 1A102, ... 1C010, ... for MT reasons

**1E002**

MT applies to portion of 1E002.e applicable to MT portion of 1C001 and to portions of 1E002.f applicable to MT portions of 1A002 or 1C007

NP applies to portion of 1E002.f applicable to NP portion of 1A002.

**2B001**

NP applies to 2B001.d and to portions of 2B001.a,b,c also described in 2B201.

(Existing "NP applies" paragraph does not take into consideration that Wassenaar uses a 1997 standard, mandatory after December 3, 2000, whereas NSG uses a 1988 standard.)

**2B004**

MT applies to portion of 2B004 also described in 2B104.

(MTCR 7.B.2. does not include Wassenaar 2.B.4.b.3. control of a facility for hydrocarbon impregnation and removal of resultant gaseous degradation products.)

NP applies to portion of 2B004 also described in 2B204

(2B004, unlike NSG 1.B.5, controls accessories)

Deleted: and

Deleted: and

Deleted: and .b

Deleted: "development", "production", or

Deleted: "development", "production" or

Deleted: 1E002.e

Deleted: 2B001.a,b,c, and d, except (1) turning machines under 2B001.a with a capacity equal to or less than 35 mm diameter; (2) bar machines (Swissturn) limited to machining only bar feed through, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. (Machines may have drilling and/or milling capabilities for machining parts with diameters less than 42 mm); or (3) milling machines under 2B001.b. with x-axis travel greater than two meters and overall "positioning accuracy on the x-axis more (worse) than 0.30 mm

Deleted: entire entry

Deleted: entire entry except 2B004.b.3 and presses with temperatures exceeding 1,733 K, and pressure below 69 MPa

**2B006**

NP applies to 2B006.b.1.a, b.1.c, and b.2 and portions of 2B006.a and .b.1.b also described in 2B206

(NSG 1.B.3.a. and 1.B.3.b.2 use parameters which differ from those in 2B006.a. and b.1.b)

**2B007**

NP applies to portions of 2B007.b and 2B007.c also described in 2B207

(NSG 1.A.3 covers only end-effectors having specified characteristics)

**2B009**

MT applies to spin-forming machines combining the functions of spin-forming and flow forming, and flow-forming machines, with more than two axes which can be coordinated simultaneously for contouring control and which are "usable in" the "production" of propulsion components and equipment (e.g., motor cases) for "missiles"

(MTCR 3.B.3.b "more than two axes which can be coordinated" *vs.* 2B009.a "two or more controlled axes")

**2B018**

MT applies to, portions of 2B018 also described in 1B115, 1B117, 7B001, 7B003, 7B101, 7B103, 9B007, 9B105, 9B106, 9B115, 9B116, or 9B117 for MT reasons

(MTCR 1.B.1 covers production facilities for only what is defined in "missiles." MTCR 19 does not control production equipment for other rocket systems or unmanned air vehicles. Pyrolytic deposition and densification is not the only MTCR-listed production equipment which overlaps ML 18.)

**2D001**

MT applies to "software" for the "use" of equipment controlled by 2B004, or 2B009 for MT reasons

(EU interprets software in MTCR 7.D.1. to be limited to "use." Most MTCR software items specify "use" only. MTCR 7.D.1. does not specify development or production.)

NP applies ... and to specially designed "software" for the "use" of equipment controlled by 2B004, 2B006, 2B007, or 2B009 for NP reasons

(NSG 1.D.1 is limited to "use" software.)

**2D002**

NP applies to, the following portion of 2D002.a: "software" for any combination of devices or system enabling such device(s) to function as a "numerical control" unit capable of controlling 5 or more interpolating axes that can be coordinated simultaneously for "contouring control"

Note 1: "Software" is controlled whether exported separately or residing in a "numerical control" unit or any electronic device or system.

Note 2: NP does not apply to "software" specially designed or modified by the manufacturers of the control unit or machine tool to operate a machine tool not controlled by 2B201.

Deleted: 2B006.a and .b

Deleted: and to specially designed controllers and "end-effectors" therefor

Deleted: ;

Deleted: that meet or exceed the parameters of 2B009.a and 2B109

Deleted: specialized machinery, equipment, and gear for producing rocket systems (including ballistic missile systems, space launch vehicles, and sounding rockets) and unmanned air vehicle systems (including cruise missile systems, target drones, and reconnaissance drones) usable in systems that are controlled for MT reasons including their propulsion systems and components and pyrolytic deposition and densification equipment

Deleted: and

Deleted: entire entry, except 2D002.b

**2D018**

MT applies to "software" for the "use" of equipment controlled by 2B018 for MT reasons; the portions of 2D018 also described in the portions of 7D101 for the portions of 2B018 also described in 7B001, 7B003, or 7B101 for MT reasons; the portions of 2D018 also described in the portions of 9D001-9D003 or 9D101 for the portions 2B018 also described in 9B007, 9B104, 9B106, 9B115-9B117 for MT reasons; and the portions of 2D018 also described in 7B103 or 9B116 (software is included in the definition of "production facilities").

(The only explicit MTCR "development" or "production" software is in 3.D.3. In addition 7.D.1. and 20.D.1 might be construed to cover "development" or "production" software. However, these three MTCR software items are for equipment which is not covered by the Wassenaar Munitions List.)

**2E001**

MT applies ...

Deleted: 2B018

**2E002**

MT applies ...

Deleted: 2B018

**2E018**

MT applies to "technology" for equipment controlled by 2B018 for MT reasons; the portion of 2E018 also described in the portions of 1E001 or 1E101 for 1B115 or 1B117; the portion of 2E018 also described in the portions of 7E001, 7E002, or 7E101 for 7B001, 7B003, 7B101, or 7B103 for MT reasons; and the portion of 2E018 also described in the portions of 9E001, 9E002, or 9E102 for 9B007, 9B105, 9B106, 9B115, 9B116, or 9B117 for MT reasons.

**3A001**

MT applies to 3A001.a.1.a. when usable in "missiles"; to portion of 3A001.a.2.a. also described in 3A101.c, and to portion of 3A001.a.5.a also described in 3A101.a

(3A101.a would be revised, as suggested in the second portion of this Attachment, to include all of MTCR 14.A.1, rather than just 14.A.1.b heading and 14.A.1.b.1.b and .c. 3A101.c would be a new sub-item to conform with MTCR 11.A.4. The suggested text is also in the second portion of this Attachment.)

Deleted: when "designed or modified" for military use, hermetically sealed and rated for operations in the temperature range from below - 54°C to above + 125°C

**4A001**

(NSG does not control 4A001 computers.)

Deleted: NP applies unless a License Exception is available ...¶

**4A003**

(MTCR does not control such computers.)

Deleted: MT applies to digital computers used as ancillary equipment for test facilities and equipment that are controlled by 9B005 or 9B006.

(NSG does not control such computers.)

Deleted: NP applies unless a License Exception is available. See ...

Note: For all destinations except Cuba, ...)

Deleted: Computers controlled in this entry for MT reasons are not eligible for NLR.

CTP: Yes, for computers controlled for 4A003.a or .b and "electronic assemblies" controlled by 4A003.c, to the exclusion of other technical parameters, with the exception of 4A003.e ...

Deleted: parameters specified as controlled for Missile Technology (MT) concerns and

**4D002**

... controlled by 4E (except the portion of 4E001 for 4A101, 4E980, 4E992 and 4E993)

(NSG does not list such software)

**4E001**

(NSG does not list such technology)

**6A002**

NP applies to portion of 6A002 also described in 6A202

**6A003**

NP applies to portion of 6A003 also described in 6A203

(NSG 5.B.3 and 5.B.4 use parameters which differ from those in 6A003.a.2, a.3, and a.4.)

**6A005**

NP applies ...

(j) para-hydrogen Raman shifters designed to operate at 16,000 nm output wavelength and at a repetition rate greater than 250 Hz with a pumping source "laser" controlled by 6A005

(to conform with NSG 3.A.2.i, per 6A005 Related Definitions (3).)

**6A007**

MT applies to portion of 6A007.b and c described in 6A107

(MTCR 12.A.3. controls less than 6A007, by being limited to airborne or marine gravimeters usable for "missiles")

**6A008**

MT applies to the portion of 6A008 also described in 6A108

(6A008 specifications differ in many respects from those in MTCR items 11.A.1. and 12.A.5. In addition, those MTCR items are limited for use in "missiles," *i.e.*, systems defined in MTCR Item 1, and do not include items for use in systems controlled for MT reasons because of MTCR items 2, 19, or 20)

**6B008**

MT applies to portion of 6B008 described in 6B108

(MTCR 17.B.1. is limited to systems specially designed for radar cross section measurement usable for "missiles" or "missile subsystems")

**6C004**

NP applies to portions of 6C004 also described in 1C230, 1C231, or 1C234.

**6D001**

(MTCR 11 and 12 do not cover development or production software; MTCR 17. does not cover any software for 17.B.1.)

**Deleted:** NP applies unless a License Exception is available. ...¶

**Deleted:** NP applies unless a License Exception is available. ...¶

**Deleted:** items controlled in paragraphs 6A003.a.2, a.3 and a.4

**Deleted:** when the accuracies in 6A007.b.1 and b.2 are met or exceeded

**Deleted:** items that are designed for airborne applications and that are usable in systems controlled for MT reasons

**Deleted:** entire entry

**Deleted:** MT applies to "software" for equipment controlled by 6A008 or 6B008 for MT reasons.¶

(NSG 3.D.1 does not control software for 3.A.2)

Deleted: NP applies to "software" for equipment controlled by 6A005 for NP reasons

**6D002**

MT applies to "software" for equipment controlled by 6A008 for MT reasons.

Deleted: or 6B008

(MTCR 17.D does not cover any software for 17.B.1.)

**6D003**

TSR: Yes, except for the following

...

Deleted: (1) Items controlled for MT reasons; or (2)

(No portion of 6D003 is controlled for MT reasons.)

**7A001**

MT applies to portion of 7A001.a and b also described in 7A101 and to 7A001.c if continuous output

Deleted: entire entry

(MTCR 9.A.3. threshold and linearity differ from 7A001.a and b bias stability and scale factor stability; MTCR 9.A.5. is narrower than the comparable 7A001.c, being limited to continuous output)

**7A002**

MT applies to portion of 7A002.a also described in 7A102 and to 7A002.b if continuous output

Deleted: entire entry

(MTCR 9.A.4. is narrower than the comparable 7A002.a, being limited to gyros usable in "missiles"; MTCR 9.A.5. is narrower than the comparable 7A002.b, being limited to continuous output)

**7A003**

MT applies to portion of 7A003 also described in 7A103.a

Deleted: entire entry

(MTCR 9.A.6. is limited to equipment or systems using 9.A.3. or 9.A.5. accelerometers or 9.A.4. or 9.A.5 gyros, whereas 7A003 is not so limited)

**7A005**

MT applies to portion of 7A005 also described in 7A105

**7A006**

MT applies to portion of 7A006 also described in 7A106

Deleted: entire entry

(MTCR 11.A.1. is limited to altimeters designed or modified for use in "missiles.")

**7B001**

MT applies to equipment specially designed to be used for 7A116 or 7A117 or to be used with 7A004 or the MT portions of 7A001, 7A002, or 7A003

Deleted: entire entry

(The MT portions of 7A005 and 7A006 are omitted because MTCR 11 does not control any test equipment. 7A007 is omitted, because MTCR does not control such direction finding equipment.)

**7B003**

Equipment specially designed for the "production" of equipment controlled by 7A001 to 7A007, or 7A117, including items, or portions thereof, subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls

(7A101 to 7A104 are omitted, because MTCR 9.B.1. controls production equipment used "with", not "for," equipment specified in 9.A. and this equipment is covered by 7B101. 7A105, 7A106, and 7A115 are omitted because MTCR 11 does not control any production equipment. 7A116 is omitted, because MTCR 10.B.1. does not cover production equipment other than test, calibration, and alignment equipment. 7A117 is included to conform with MTCR 2.B.1. and 2.B.2.)

MT applies to equipment specially designed to be used for 7A117 or to be used with 7A004 or the MT portions of 7A001, 7A002, or 7A003

(The MT portions of 7A005 and 7A006 are omitted because MTCR 11 does not control any production equipment. 7A007 is omitted, because MTCR does not control such direction finding equipment.)

**7D001**

"Software" specially designed or modified for the "development" or "production" of equipment controlled by 7A001 to 7A007 or 7B001 to 7B003

Related Controls: ... (2) The "software" related to 7A003.b, 7A005, or 7A007 ...

(MTCR 2, 9, 10, and 11 do not control development or production software.)

**7D002**

MT applies to portion of 7D002 also described in 7D101

(MTCR does not control "software" for uncontrolled equipment)

**7D003**

MT applies to portion of 7D003 also described in 7D002, 7D101, 7D102 or 7D103 for MT reasons

(MTCR does not control software pursuant to 7D003 specifications; but there may be some overlap between those specifications and MTCR controls.)

**7E001**

MT applies to "technology" for items controlled by 7A001 to 7A006, 7A101 to 7A106, 7B001 to 7B003, 7B101 to 7B104, 7D002, 7D003, or 7D101 to 7D103 for MT reasons

(MTCR does not cover technology for 7A007 or 7D001 or for the non-MT portions of 7A001 to 7A006, 7B001 to 7B003, 7D002, or 7D003.)

**7E002**

MT applies to "technology" for items controlled by 7A001 to 7A006, 7A101 to 7A106, 7B001 to 7B003, or 7B101 to 7B104 for MT reasons

(MTCR does not cover technology for 7A007 or for the non-MT portions of 7A001 to 7A006 or 7B001 to 7B003.)

Deleted: 7A (except 7A994)

Deleted: entire entry

Deleted: 7A (except 7A994) or 7B (except 7B994)

Deleted: MT applies to entire entry

Deleted: , 7A103, 7A105, 7A106, 7A115, 7A116, 7A117, or 7B103

Deleted: entire entry

Deleted: entire entry

Deleted: entire entry

Deleted: entire entry

**7E003**

MT applies to "technology" for equipment controlled by 7A001 to 7A004 for MT reasons

(MTCR does not cover technology for non-MTCR portions of 7A001 to 7A003.)

Deleted: entire entry

**7E004**

MT applies to portion of 7E004.b.5 also described in 7E104

Deleted: entire entry

**8D001**

TSR: Yes, except: Exports or reexports ...

Deleted: for the following:¶
(1) Items controlled for MT reasons; or¶
(2)

**8E001**

TSR: Yes, except: Exports or reexports ...

Deleted: for the following:¶
(1) Items controlled for MT reasons; or¶
(2)

**9A005**

MT applies to portion of 9A005 also described in 9A105

**9A006**

MT applies to portion of 9A006 also described in 9A106 or 9A108

**9A007**

MT applies to portion of 9A007 also described in 9A107

**9A008**

MT applies to portion of 9A008 also described in 9A106 or 9A108

**9A009**

MT applies to portion of 9A009 also described in 9A109

**9A010**

NP applies to structures also described in 1A202

**9B001**

MT applies to portion of 9B001 for "production equipment" or "production facilities" specially designed for "missile propulsion components, equipment, or materials"

(To conform with MTCR 3.B.1. and 3.B.2.)

Deleted: only

Deleted: equipment for engines that meet the characteristics described in 9A001

**9B002**

MT applies to portion of 9B002 for "production facilities" or "production equipment" specially designed for "missile propulsion components, equipment, or materials"

(To conform with MTCR 3.B.1. and 3.B.2.)

Deleted: only

Deleted: equipment for engines that meet the characteristics described in 9A001

**9B003**

MT applies to portion of 9B003 for "production facilities" or "production equipment" specially designed for "missile propulsion components, equipment, or materials"

(To conform with MTCR 3.B.1. and 3.B.2.)

**9B004**

MT applies to portion of 9B004 for "production facilities" or "production equipment" specially designed for "missile propulsion components, equipment, or materials"

(To conform with MTCR 3.B.1. and 3.B.2.)

**9B005**

(MTCR 15.B.2. controls specified wind tunnels but not control systems, instrumentation, or data processing equipment therefor)

**9B006**

MT applies to portion of 9B006 also described in 2B116 or 9B106

(9B006 overlaps 2B116 and 9B106.)

**9B007**

MT applies to portion of 9B007 also described in 9B115 to 9B117

(9B007 is broader than MTCR 2.B.1, 2.B.2, 20.B.1. and 20.B.2, which are limited to equipment to produce specified types of rocket motors)

**9D001**

"Software" ... for ... controlled by 9A001 to 9A011, 9A106.b, 9B001 to 9B009, the portion of 9B116 for "other rocket subsystems", or 9E003

MT applies to "software" for equipment controlled by 9A106.b or 9B116 for MT reasons

(MTCR does not cover "development" software (or any other software) for ablative liners (3.C.1 lining).)

**9D002**

"Software" ... for ... controlled by 9A001 to 9A011, 9B001 to 9B009, or the portion of 9B116 for "other rocket subsystems"

**9D003**

"Software" ... for ... controlled by 9A001 to 9A003, 9A005, 9A007, 9A009, 9A011, 9A101, 9A105, 9A107, 9A109, 9A111 or equipment controlled by 9B (except 9B990 or 9B991), as follows (see List of Items Controlled).

MT applies to "software" specially designed or modified for the "use" of FADEC for propulsions systems controlled by 9A001, 9A005, 9A007, 9A009, 9A011. 9A101, 9A105, 9A107, 9A109, or 9A111 for MT reasons or equipment controlled by 9B001 to 9B005, 9B007, 9B105, 9B106, 9B115 to 9B117 for MT reasons.

(To conform with MTCR 3.D.1. and 3.D.2.)

**9D004**

**Deleted:** only

**Deleted:** equipment for engines that meet the characteristics described in 9A001

**Deleted:** only

**Deleted:** equipment for engines that meet the characteristics described in 9A001

**Deleted:** MT applies to entire entry MT Column 1

**Deleted:** entire entry

**Deleted:** 9A (except 9A018, 9A990 or 9A991), 9B (except 9B990 or 9B991)

**Deleted:** a and

**Deleted:** 9A (except 9A018, 9A990 or 9A991), 9B (except 9B990 or 9B991)

**Deleted:** 9A (except 9A018, 9A990 or 9A991)

**Deleted:** required

**Deleted:** gas turbine engines

**Deleted:** 9A106, or 9A110

MT applies to portion of 9D004.a. specially designed or modified for equipment controlled by 9B105 and portions of 9D004.b. and d. specially designed or modified for equipment controlled by the MT portion of 9A001 or by 9A101.

(To conform with MTCR 3.D.2. and 15.D.1.)

Deleted: entire entry

**9E001**

... 9A004 to 9A011 ...

MT applies to "technology" for items controlled by 9A001.c, 9A005 to 9A011,... ... 9B115, ... for MT reasons

Deleted: or

Deleted: 9B005,

(To conform with MTCR 1.E.1., 2.E.1., 3.E.1., 12.E.1., 15.E.1., 19.E.1., and 20.E.1. MTCR does not cover 9B005 wind tunnel control systems.)

**9E002**

... 9A004 to 9A011 ...

MT applies to "technology" for items controlled by 9A001.c, 9A005 to 9A011, ... ... 9B115, ... for MT reasons

Deleted: 9A001

Deleted: 9B005,

(To conform with MTCR 1.E.1., 2.E.1., 3.E.1., 12.E.1., 15.E.1., 19.E.1., and 20.E.1. MTCR does not cover 9B005 wind tunnel control systems.)

### (3) MTCR, NSG, AG, and CWC Non-Wassenaar ECCNs

The following revisions should be made in ECCNs xx1xx, xx2xx, and xx3xx to conform with the substance of MTCR, NSG, AG, or CWC texts:

**1A101**

Devices for reduced observables such as radar reflectivity, ultraviolet/infrared signatures and acoustic signatures (i.e. stealth technology), for applications usable for "missiles", or "missile subsystems"

(To conform with MTCR 17.A.1.)

**1A102**

Resaturated pyrolized carbon-carbon components designed for rocket systems and usable in "missiles"

(to conform with MTCR 8.A.2.)

NP applies to composite structures also described in 1A202.

**1A202**

... not controlled by 1A002 , 1A102, 9A010, or 9A110 ...

b. Made with any of the "fibrous or filamentary materials", controlled by 1C210.a or with carbon prepreg materials, controlled by 1C210.c

**1B101**

Equipment, not controlled by ECCN 1B001, for the "production" of structural "composites", fibers, prepregs or preforms usable in "missiles", as follows, and specially designed components and accessories therefor

(MTCR 6.B.1. is limited to equipment for the production of structural composites usable in "missiles")

NP applies to portion of 1B101.a also described in 1B201

(NSG 3.B.4 is limited to machines "having motions for positioning, wrapping and winding fibers coordinated and programmed," rather than "of which the motions ... can be coordinated and programmed"; and NSG 3.B.4 is limited to machines "specially designed to fabricate composite structures or laminates from fibrous or filamentary materials", rather than simply being "designed" for that purpose (underlining added). 1B101 does not control precision mandrels.)

**1B115**

Equipment, not controlled by 1B002, 1B018, 1B102, or 2B018 for the "production" of propellant or propellant constituents, as follows, and specially designed components therefor

a. ... for liquid propellants or propellant constituents controlled by 1C011.a, 1C011.b, 1C111, or U.S. Munitions List Category V.a.12.i, a.20.i, b.3, c.3.i-iv, c.5, c.6.i.A, c.6.ii.A, c.6.ii.B, d.1, d.2, d.10, d.11, e.2, e.3, e.6, e.7, e.16, f.3.i-iv, f.10, f.14, f.16, f.17, or f.18;

Deleted: and their subsystems

Deleted: other than those

Deleted: specified in

Deleted: specified in

Deleted: other than that

Deleted: filament winding machines described in 1B101.a that are capable of winding cylindrical rotors having a diameter between 75 mm and 400 mm and lengths of 600 mm or greater and to coordinating and programming controls and precision mandrels for these filament winding machines

Deleted: other than that

Deleted: in

Deleted: or

Deleted: on the

b. ... for solid propellants or propellant constituents controlled by 1C011.a, 1C011.b, 1C111, or U.S. Munitions List V.a.12.i, a.20.i, b.3, c.3.i-iv, c.5, c.6.i.A, c.6.ii.A, c.6.ii.B, d.1, d.2, d.10, d.11, e.2, e.3, e.6, e.7, e.16, f.3.i-iv, f.10, f.14, f.16, f.17, or f.18.

**1B119**

Fluid energy mills for grinding or milling propellant or propellant constituents controlled by 1C011.a, 1C011.b, 1C111 or U.S. Munitions List V.a.12.i, a.20.i, b.3, c.3.i-iv, c.5, c.6.i.A, c.6.ii.A, c.6.ii.B, d.1, d.2, d.10, d.11, e.2, e.3, e.6, e.7, e.16, f.3.i-iv, f.10, f.14, f.16, f.17, or f.18, and specially designed components therefor.

**1B201**

... "fibrous or filamentary materials"

(The term which is defined is "fibrous or filamentary materials")

**1B225**

... with an output capacity

(Production capacity might be limited by factors other than output capacity)

**1B226**

ECCN Controls: (1) This entry includes separators capable of enriching stable isotopes as well as those for uranium (a separator capable of separating the isotopes of lead with a one-mass unit difference is inherently capable of enriching the isotopes of uranium with a three-unit mass difference). (2) This entry includes separators with the ion sources and collectors both in the magnetic field and those configurations in which they are external to the field.

**1B228**

Related Controls: Plants for the production, separation, or purification of heavy water, deuterium, and deuterium compounds and specially designed or prepared assemblies and components for these plants are subject to the export licensing authority of the Nuclear Regulatory Commission ...

Related Definitions: N/A

...

c. Constructed of either:

1. Stainless steel of the 300 series with low sulfur 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 $H_2$-compatible; and

**1B231**

b.2. Hydrogen isotope storage or purification systems using metal hydrides as the storage or purification medium

**1C101**

Materials for reduced observables ... usable in "missiles" or "missile subsystems"

(MTCR 17.C.1. limits the relevant subsystems to those listed in MTCR 2.A)

Deleted: described in

Deleted: or

Deleted: on the

Deleted: specified in

Deleted: or

Deleted: on the

Deleted: ¶

Deleted: and

Deleted: a production

Deleted: and

Deleted: collections

Deleted: Equipment specially designed or prepared for the production of heavy water is

Deleted: "Fine-grain stainless steels" in this entry are defined to be fine-grain austenitic stainless steels with an ASTM (or equivalent standard) grain size number of 5 or greater.

Deleted: "fine-grain s

Deleted: s"

Deleted: e

Deleted: materials

Deleted: and

Deleted: ,

Deleted: and their subsystems

**1C107**

Graphite and ceramic materials usable in "missiles," not controlled by 1C007

(For consistency with MTCR 8.C.5. and with MT reason for control in 1C007.)

**1C111**

NP applies to portions of 1C111 also described in 1C225, 1C228, 1C230, or 1C234

b.1. Carboxyl

b.2. Hydroxyl -terminated polybutadiene (HTPB), not controlled by the U.S. Munitions List (22 CFR 121.1 Category V(e)(7))

d. Composite and composite modified double base propellants

(Suggested d. is to conform with MTCR 4.C.1)

**1C116**

Maraging steels (steels generally characterized by ...) usable in "missiles" having ...

(Usable in "missiles" is to conform with MTCR 8.C.8.)

**1C117**

Tungsten, molybdenum, and alloys of these metals usable in "missiles" in the form of ...

(To conform with MTCR 8.C.7.)

**1C202**

Related Definition: The phrase "alloys capable of" encompasses aluminum alloys before or after heat treatment.

**1C210**

"Fibrous or filamentary materials" ...

a. Carbon and aramid "fibrous or filamentary materials" ... a "specific tensile strength" of $23.5 \times 10^3$m or greater except aramid ...

b. Glass "fibrous or filamentary materials" ... controlled by ...

**1C238**

Chlorine trifluoride

MT applies to entire entry

(Covered by MTCR 4.C.4.a.5)

**1C239**

High explosive substances or mixtures containing more than 2% by weight thereof, of any of the following (see List of Items Controlled):

Related Controls: ... (2) Sub-items a., b., c., and d. are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121.1 Category V.a.2.i, a.14, a.21, and a.20.i)

Items:

a. Cyclotetramethylenetetranitramine (HMX) (CAS 2691-41-0);

b. Cyclotrimethylenetrinitramine (RDX) (CAS 121-82-4);

Deleted: other than those

Deleted: Carboxy

Deleted: Hydroxy

Deleted: other than that

Deleted: and

Deleted: and

Deleted: and

Deleted: Aramid

Deleted: and

Deleted: described in

Deleted: s, other than those controlled by the U.S. Munitions List, or

Deleted: High explosives for military use

Deleted: Office

Deleted: 121.12

Deleted: The list of items controlled is contained in the ECCN heading

c. Triaminotrinitrobenzene (TATB) (CAS 3058-38-6);
d. Hexanitrostilbene (HNS) (CAS 20062-22-0); or
e. Any explosive with a crystal density greater than 1.8 gm/cm$^3$ and having a detonation velocity greater than 8,000 m/s

**1C350**
License Requirement Notes ...
2. MIXTURES ...
b. A license is not required, except to Cuba, Iran, Libya, Sudan, or Syria for ...
c. A license is not required, except to Cuba, Iran, Libya, Sudan,or Syria for ...
4. TESTING KITS: Medical, analytical, diagnostic, and food testing kits containing, a maximum of 300 grams per chemical identified in this ECCN 1C350 as a CWC Schedule 2 or 3 chemical, are excluded from the scope of this ECCN and are controlled under ECCN 1C395 or ECCN 1C995.

Deleted: Certain m
Deleted: small quantities of chemicals
Deleted: s

(The 300 grams threshold for 1C350 controls should be specified in 1C350.)

Related Controls: Change "The chemicals" to "The following chemicals, which appear on both the Australia Group list of precursor chemicals and CWC Schedules 1 or 2," and add "For a complete list of CWC chemicals controlled by the Department of State, see 22 CFR part 121.1 Category XIV(a)(1)(i-iii), (a)(3)(i-iii), and (c)(1-4) for CWC Schedule 1 chemicals and Category XIV.a.2, a.4.i, and c.5 for CWC Schedule 2 chemicals."

a.1 ... (CWC 1B(10))
a.2 ... (CWC 1B(9))
a.3 ... (CWC 1B(9))
b.1 ... (CWC 2B(7))
b.2 ... (CWC 2B(8))
b.3 ... (CWC 2B(4))
b.4 ... (CWC 2B(4))
b.5 ... (CWC 2B(6))
b.6 ... (CWC 2B(11))
b.7 ... (CWC 2B(12))
b.8 ... (CWC 2B(10))
b.9 ... (CWC 2B(11))
b.10 ... (CWC 2B(10))
b.11 ... (CWC 2B(4))
b.12 ... (CWC 2B(10))
b.13 ... (CWC 2B(4))
b.14 ... (CWC 2B(4))
b.15 ... (CWC 2B(4))
b.16 ... (CWC 2B(4))
b.17 ... (CWC 2B(4))
b.18 ... (CWC 2B(14))
b.19 ... (CWC 2B(9))
b.20 ... (CWC 2B(13))

c.1 ... (CWC 3B(11))
c.2 ... (CWC 3B(10))
c.3 ... (CWC 3B(5))
c.4 ... (CWC 3B(7))
c.5 ... (CWC 3B(6)
c.6 ... (CWC 3B(12))
c.7 ... (CWC 3B(13))
c.8 ... (CWC 3B(14))
c.9 ... (CWC 3B(17))
c.10 ... (CWC 3B(9))
c.11 ... (CWC 3B(8))

**1C351**

Move the following from 1C351 or 1C991 Related Controls or 1C991 Related Definitions to 1C351 License Requirement Notes:

1. All vaccines and "immunotoxins", as defined below, are excluded from the scope of this entry.
2. Certain "medical products" and "diagnostic and food testing kits", as defined below, that contain biological toxins controlled under paragraph (d) of this entry, with the exception of toxins controlled under d.5 and d.6, are excluded from the scope of this entry. Biological toxins in any other configuration, including bulk shipments, or for any other end-uses are not excluded from the scope of ECCN 1C351 by this Note.
3. For the purposes of this entry, only saxitoxin is controlled under ...
4. "Medical products" containing ricin in the form of ... and saxitoxin identified by ... are controlled for CW reasons under 1C351.

Move the following from 1C991 Related Definitions to 1C351 Related Definitions:

Related Definitions: ... (3) For the purpose of this entry, "medical products" are (a) pharmaceutical formulations designed for human administration in the treatment of medical conditions; (b) prepackaged for distribution as medical products; and (c) approved by the Food and Drug Administration to be marketed as medical products. (4) For the purpose of this entry "diagnostic and food testing kits" are specifically developed, packaged and marketed for diagnostic or public health purposes.

(AG omits the CCL definitions)

1C351 Related Controls: Change "Category XIV and 121.7" to "Category XIV(a)(1)(i-iii), (a)(3)(i-iii), and (c)(1-4)"

**1C352**

Related Controls: Move the vaccine exclusion to a Controls paragraph

**1C353**

Related Controls: Move the vaccine exclusion to a Controls paragraph

**1C354**

Related Controls: Move the vaccine exclusion to a Controls paragraph

**Deleted:** for CW reasons

**Deleted:** controlled by

**Deleted:** (1)

**Deleted:** (2)

**Deleted:** (3)

**1C355**

Related Controls: Add "Three chemicals in the family otherwise controlled by 1C355.a.2.a are subject to the export control jurisdiction of the Department of State, Directorate of Defense Trade Controls 22 CFR 121.1 Category XIV(c)(1 & 5)."

Items:

a.1.a. ... (CWC 2A(2))
a.2.a. ... (CWC 2B(4))
a.2.b. ... (CWC 2B(5))
a.2.c. ... (CWC 2B(6))
a.2.d. ... (CWC 2B(10))
a.2.e. ... (CWC 2B(11))
a.2.f. ... (CWC 2B(12))
b.1.a. ... (CWC 3A(1))
b.1.b. ... (CWC 3A(2))
b.1.c. ... (CWC 3A(3))
b.2.a. ... (CWC 3B15))
b.2.b. ... (CWC 3B(16))
b.3. ... (CWC 3A(4))

**1C395**

Reason for Control: CW, AT

Related Controls: (1) ... (2) ECCN 1C995 controls ... kits .. that contain ... 1C350.d and 1C991 contains such kits that contain 1C351.d (except d.5 or d.6). ...

**1C991**

Items: ...

b. "Immunotoxins";
c. "Medical products" ...
d. "Medical products" ... except ... controlled under 1C351.d.5 and d.6; and
e. "Diagnostic and food testing kits" ... except ... controlled under 1C351.d.5 and d.6

**1D101**

NP applies to "software" specially designed for the "use" of items controlled by 1B101.a for NP reasons.

**1D201**

"Software", not controlled by 1D001 or 1D101, specially designed for the "use" of items controlled by 1B201

**1E101**

**Deleted:** CB,

**Deleted:** CB applies to entire entry. The Commerce Country Chart is not designed to determine licesing requirements for items controlled for CB reasons in 1C395. A license is required, for CB reasons, to export or reexport mixtures controlled by 1C395.a amd test lots cpmtrp;;ed bu 1C395.b to States not Party to the CWC (destinations not listed in Supplement Nol 2 to part 745 of the EAR).

**Deleted:** for CW reasons

**Deleted:** for CW reasons

**Deleted:** or modified

"Technology", not controlled by 1E001 or 1E002, in accordance with the "MTCR General Technology Note" for the "development", "production", or "use" of items controlled by 1A002, 1A102,... 1C010, ... for MT reasons

(For consistency with MTCR 6.E.1. and 8.E.1;
1E001 does not cover all MTCR development or production technology, because "MTCR General Technology Note" is broader than the Wassenaar General Technology Note.)

NP applies to "technology" for items controlled by 1A002, 1B001, 1B101, 1C116, 1D001, or 1D101 for NP reasons

(For consistency with NSG 2.E.1;
portions of 1A002 are covered by both MTCR and NSG)

**1E102**

"Technology" according to "MTCR Related Technology" for the "development" of "software" controlled by 1D001, 1D101, or 1D103

(1E102 would become redundant if 1E101 were revised per the above.)

**1E201**

"Technology" according to "NSG Technology Controls" not controlled by 1E001 or 1E101, for the "development", "production", or "use" of items controlled by ... 1B001.a, 1B101, ... 1C116, ... 1D001, 1D101 or 1D201 for NP reasons

(Since "NSG Technology Controls" are broader than the Wassenaar General Technology Note, 1E001 does not cover all "development" and "production" technology for NSG items; NSG covers parts of 1B001a, 1C116, 1D001, and 1D101)

**1E202**

"Technology" according to "NSG Technology Controls" for the "development" or "production" of goods controlled by 1A202 or 1A225 to 1A227.

(Revised 1E201 would make 1E202 redundant).

**1E203**

"Technology" according to "NSG Technology Controls" for the "development" of "software" controlled by 1D201

(Revised 1E201 would make 1E203 redundant)

**1E350**

"Technology" according to "AG Related Technology" for the "development", "production", or "use" of chemicals controlled by 1C350

(1E350 is probably an empty box because of 1E001 coverage of technology for the production of 1C350 chemicals. If 1E350 is not an empty box, it would be helpful to indicate in what manner it supplements 1E001. "AG Related Technology" is broader than the Wassenaar General Technology Note and is not limited to facilities designed or intended to produce chemicals)

Deleted: the General Technology Note

Deleted: the General Technology Note

Deleted: the General Technology Note

Deleted: the General Technology Note

Deleted: the "General Technology Note"

Deleted: facilities designed or intended to produce

Deleted: 1E351

(AG does not list technology for disposal of chemicals or microbiological materials)

Deleted: "Technology" according to the "General Technology Note" for the disposal of chemicals or microbiological materials controlled by 1C350, 1C351, 1C352, 1C353, or 1C354

**2B116**

Vibration test systems, equipment, and components therefor usable for "missiles" or "missile subsystems".

(usable for "missiles" or "missile subsystems" is to conform with MTCR 15.B.1)

**2B201**

Unit: Number

Related Definition: "Positioning accuracy" of "numerically controlled" machine tools is to be determined and presented in accordance with this entry in conjunction with the requirements below:

(a) Test conditions (ISO 230/2 (1988), paragraph 3):

(1) For 12 hours before and during measurements, the machine tool and accuracy measuring equipment will be kept at the same ambient temperature. During the premeasurement time, the slides of the machine will be continuously cycled identically to the way they will be cycled during the accuracy measurements;

(2) The machine shall be equipped with any mechanical, electronic, or software compensation to be exported with the machine;

(3) Accuracy of measuring equipment for the measurements shall be at least four times more accurate than the expected machine tool accuracy;

(4) Power supply for slide drives shall be as follows:

(i) Line voltage variation shall not be greater than + or - 10% of nominal rated voltage;

(ii) Frequency variation shall not be greater than + or - 2 Hz of normal frequency;

(iii) Lineouts or interrupted service are not permitted.

(b) Test Program (paragraph 4):

(1) Feed rate (velocity of slides) during measurement shall be the rapid traverse rate;

N.B.: In the case of machine tools which generate optical quality surfaces, the feed rate shall be equal to or less than 50 mm per minute;

(2) Measurements shall be made in an incremental manner from one limit of the axis travel to the other without returning to the starting position for each move to the target position;

(3) Axes not being measured shall be retained at mid-travel during test of an axis

(c) Presentation of the test results (paragraph 2):

(1) "Positioning accuracy" (A) and

(2) The mean reversal error (B).

Note: Stated positioning accuracy levels derived under the following procedures from measurements made according to ISO 230/2 (1988) or national equivalents may be used for each machine tool model if provided to, and accepted by, national authorities instead of individual machine tests.

Stated "positioning accuracy" are to be derived as follows:

Deleted: Equipment in n

Deleted: ; parts and accessories in $ value

Deleted: N/A

1. Select five machines of a model to be evaluated;
2. Measure the linear axis accuracies according to ISO 230/2 (1988);
3. Determine the accuracy values (A) for each axis of each machine. The method of calculating the accuracy value is described in the ISO 230/2 (1988) standard;
4. Determine the average accuracy value of each axis. This average value becomes the stated "positioning accuracy" of each axis for the model ($A_x$, $A_y$, ...);
5. Since 2B201 refers to each linear axis, there will be as many stated "positioning accuracy" values as there are linear axes;
6. If any axis of a machine tool not controlled by this entry has a stated "position accuracy" of 0.006 mm or better (less) for grinding machines, and 0.008 mm or better (less) for milling and turning machines, both according to ISO 230/2 (1988), then the builder should be required to reaffirm the accuracy level once every eighteen months.

a.1. ... according to ISO 230/2 (1988) ...

Note: ... b. ... according to ISO 230/2 (1988)

b.1. ... according to ISO 230/2 (1988) ...

Technical Notes:

1. Axis nomenclature shall be in accordance with International Standard ISO 841, "Numerical Control Machines - Axis and Motion Nomenclature".
2. Not counted in the total number of contouring rotary axes are secondary parallel contouring rotary axes the center line of which is parallel to the primary rotary axis.
3. Rotary axes do not necessarily have to rotate over 360 degrees. A rotary axis can be driven by a linear device, e.g., a screw or a rack-and-pinion.

**2B206**

Unit: Number

**2B209**

Unit: Machines and mandrels in number

**2B228**

Rotor fabrication or assembly equipment, ...

.

**2B350**

Notes:

1. The controls in this entry do not apply to equipment that is (a) specially designed for use in civil applications ... and (b) inappropriate ... for use in storing, processing, producing or conducting and controlling the flow of chemical warfare agents or any of the chemical weapons precursors controlled by 1C350.
2. The objective of 2B350 should not be defeated by the transfer of any non-controlled item containing one or more controlled components where the controlled component or components are the principal element of the item and can feasibly be removed or used for other purposes.

**Deleted:** Equipment in n

**Deleted:** ; parts and accessories in $ value

**Deleted:** Equipment

**Deleted:** ; parts and accessories in $ value

**Deleted:** and

**Deleted:** Related Controls

N.B.: In judging whether the controlled component or components are the principal element, the following factors should be weighed: quantity, value, technological know-how involved, and other special circumstances.

3. The objective of 2B350 should not be defeated by the transfer of a whole plant, on any scale, which has been designed to produce any CW agent or AG-controlled precursor chemical (see 744.6(a)(3)).

(Suggested Notes 2 and 3 are to conform with Australia Group texts.)

Related Controls: Add "Also see ECCNs 0B001, 1B230, 2A226, 2A292, 2A293, and 2B231 and 22 CFR 121.1 Category XIV(f, j, k, l)."

**2B351**

Toxic gas monitoring systems and dedicated detectors, as follows (see List of Items Controlled)

(2B351 may be an empty box, because of ITAR Category XIV.f.2 controls. If not, it would be helpful to specify more clearly what it controls.)

Related Controls: Add "Equipment for monitoring and detection, and identification of chemical agents which have military application and produce a powerful physiological effect or biological agents which have been modified to increase their capability to produce casualties in humans or livestock, degrade equipment, or damage crops are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls (see 22 CFR part 121.1 Category XIV(f)(2))."

Related Definitions: Move (and revise) second sentence to two Notes, as follows:

Notes: 1. This entry controls ...

2. This entry does not control those used for batch mode operation in laboratories.

**2B352**

Related Controls: Add: "Equipment for dissemination, detection, identification, and production of, and defense against, chemical agents and biological agents are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls (see 22 CFR 121.1 Category XIV(f-l)). See also ECCN 2B225."

(In 2B352.d "capable of" conforms with AG, even though EU uses "designed for")

**2E101**

"Technology" according to the "MTCR General Technology Note" not controlled by 2E001 or 2E002 for the "development", "production", or "use" of equipment or "software" controlled by 2B004, 2B009, 2B104, 2B105, 2B109, 2B116, 2B117, 2B119 to 2B122, 2D001, 2D002 or 2D101 for MT reasons

(The undefined expression "directly associated" in the "MTCR General Technology Note" differs from the defined word "required" in the Wassenaar General Technology Note. Not all technology for 2B004, 2B009, 2D001, or 2D002 is covered by MTCR 3.E.1., 7.E.2., or 15.E.1.)

**2E201**

"Technology" according to NSG "Technology Controls" not controlled by 2E001, 2E002, or 2E101 for the "development", "production", or "use" of equipment or "software" controlled by ... 2B004, ..., ... 2B104, 2B109, 2B116, ... 2D001, ... 2D101 2D201 or 2D202 for NP reasons

Deleted: ;

Deleted: therefor

Deleted: The intent of this entry is to control

Deleted: , rather than

Deleted: the General Technology Note

Deleted: 2B008,

(The undefined expression "directly associated" in the "NSG Technology Controls" differs from the defined word "required" in the Wassenaar General Technology Note.)

**2E301**

"Technology" according to "AG Related Technology" not controlled by 2E001 or 2E002 for the "development", "production", or "use" of items controlled by 2B350, 2B351 and 2B352

Deleted: the "General Technology Note"

(The undefined expression "directly associated" in the "AG Related Technology" differs from the defined word "required" in the Wassenaar General Technology Note.)

**3A101**

NP applies to portion of 3A101.b also described in 3A201,c.

a. Analog-to-digital converters, usable in "missiles", having any of the following characteristics:

1. Designed to meet military specifications for ruggedized equipment; or

Deleted: d

2. Designed or modified for military use and being any of the following types:
   a. Analog-to-digital converter "microcircuits", which are "radiation-hardened" or have all of the following characteristics:
      1. Having a quantization corresponding to 8 bits or more when coded in the binary system;
      2. Rated for operation in the temperature range from below -54°C to above +125°C; and
      3. Hermetically sealed; or
   b. Electrical input type analog-to-digital converter printed circuit boards or modules, having all of the following characteristics:
      1. Having a quantization corresponding to 8 bits or more when coded in the binary system;
      2. Rated for operation in the temperature range from below -45°C to above +55°C; and
      3. Incorporating "microcircuits" specified in 3A101.a.2.a

(To conform with MTCR 14.A.1.)

b. Accelerators usable for "missiles" or "missile subsystems" capable of ...

(To conform with MTCR 15.B.5)

Note: 3A101.b. does not control equipment specially designed for medical purposes.

Deleted: include

c. Electronic assemblies and components, not controlled by 3A001.a.2.a, designed or modified for use in "missiles" and specially designed for military use and operation at temperatures in excess of 125°C.

**3A229**

Firing sets and equivalent high-current pulse generators as follows ...

Deleted: (for detonators controlled by 3A232)

(NSG 6.A.2.b is not limited to firing sets for detonators controlled by 3A232)

b.8 ... to operate ...

Deleted: for use

**3A233**

Mass spectrometers ..., as follows (see List of Items Controlled), and ion sources therefor.

**3D101**

"Software" specially designed or modified for the "use" of items controlled by 3A101.b. usable for testing "missiles" or "missile subsystems"or of the portion of 3A001.a.2.a. controlled for MT reasons

(To conform with MTCR 15.D.1. and 11.D.1)

**3E101**

"Technology" according to the "MTCR General Technology Note" not controlled by 3E001 for the "development", "production", or "use" of equipment or "software" controlled by 3A001.a.1.a, a.2.a, or a.5.a, 3A101, or 3D101 for MT reasons.

(The "MTCR General Technology Note" uses the undefined expression "directly associated," rather than the Wassenaar defined term "required." Therefore, 3E001 may not control all MTCR-controlled development or production technology.)

Deleted: General Technology Note

Deleted: 3A001.a.1 or .2,

**3E102**

"Technology" according to the "MTCR General Technology Note" for the "development" of "software" controlled by 3D101.

(The suggested revision of 3E101 would make 3E102 superfluous. MTCR 15.E.1. covers technology for the production or use, as well as the development, of 3D101, not 3E101.)

Deleted: General Technology Note

Deleted: 3E101

**3E201**

"Technology" according to "NSG Technology Controls" not controlled by 3E001 for the "development", "production", or "use" of equipment controlled by 3A001.e.2 or e.3, 3A201, 3A225 to 3A233 for NP reasons

("NSG Technology Controls" uses the undefined expression "directly associated," rather than the Wassenaar defined term "required." Therefore, 3E001 may not control all NSG-controlled development or production technology.)

Deleted: the General Technology Note

**4A101**

b. Designed as ruggedized

(4A001.a.2.a covers "radiation-hardened")

Deleted: or "radiation hardened"

**4A102**

"Hybrid computers" "specially designed" for 'modelling,' simulation, or design integration of "missiles" or "missile subsystems" These items are subject to the export licensing authority of the Department of State ...

Note 1:This control applies only when the equipment is supplied with software described in 7D103 or 9D103.

Note 2:The 'modelling' includes in particular the aerodynamic and thermodynamic analysis of the systems.

(To conform with MTCR 16.A.1.)

**4E101**

"Technology" according to "MTCR General Technology Note" not controlled by 4E001 for the "development", "production", or "use" of items controlled by 4A001 or 4A101 for MT reasons

(The "MTCR General Technology Note" uses the undefined expression "directly associated," rather than the Wassenaar defined term "required." Therefore, 4E001 may not control all MTCR-controlled development, production, or use technology.)

**5D101**

"Software" specially designed or modified for the "use" of items controlled by 5A101 usable for "missiles"

(MTCR 12.D.3. is limited to software usable for "missiles")

**5E101**

"Technology" according to the "MTCR General Technology Note" for the "development", "production", or "use" of equipment or "software" controlled by 5A101.or 5D101

(To conform with MTCR 12.E.1. The MTCR General Technology Note differs from the Wassenaar General Technology Note. The former uses the undefined expression "directly associated"; the latter uses the defined term "required.")

Deleted: General Technology Note

**6A102**

NP applies to portion of 6A102 also described in 6A202.

**6A108**

(MTCR does not include Related Controls part (1))

c. Radomes designed to withstand a combined thermal shock greater than $4.184 \times 10^6$ J/m$^2$ accompanied by a peak over pressure of greater than 50 kPa, usable in protecting rocket systems and unmanned air vehicles against nuclear effects (e.g., Electromagnetic Pulse (EMP), X-rays, combined blast and thermal effects), and usable for "missiles"

(To conform with MTCR 18.A.3.)

**6A203**

Unit: Equipment and components in number

(NSG 1.A.2, 5.B.3, and 5.B.4 do not control parts or accessories)

Deleted: ; parts and accessories in $ value

**6A205**

Unit: Equipment in number

(Existing 6A205.b is completely covered by 6A005.d.2.c)

b. Neodymium-doped (other than glass) lasers with an output wavelength between 1000 and 1100 nm incorporating frequency doubling to give an output wavelength between 500 and 550 nm with an average output power of greater than 40 W.

(New 6A205.b would cover NSG 3.A.2.c.2)

c. ...

Deleted: ; parts and accessories in $ value

Deleted: b.

Deleted: Tunable pulsed single-mode dye laser oscillators capable of an average power output of greater than 1 W, a repetition rate greater than 1 kHz, a pulse less than 100 ns, and a wavelength between 300 nm and 800 nm.

Deleted: , except single-mode oscillators

Note: 6A205.c. does not control single mode oscillators.

(Single-mode oscillators are covered by existing 6A205.b and by 6A005.d.2.c)

d. ...

Note: 6A205.d does not control the higher power (typically 1 to 5kW) industrial $CO_2$ lasers used in applications such as cutting and welding, as these latter lasers are either continuous wave or are pulsed with a pulse width greater than 200 ns.

| | | Recapitulation NSG 3.A.2 | 6A005 | |
|---|---|---|---|---|
| | | a. Copper | a.2.a all | |
| | | b. Argon | a.6 part | |
| | | c.1.a single-mode | c.2.b.2.a.2 all | |
| | | c.1.b multiple-mode | | |
| | | c.2.b.2.b.2 part | f. all | |
| | | c.2 doubling | - | new |
| d. dye single-mode | d.2.c all | old b all | | |
| | | e. dye other | - | c. a |
| | | f. Alexandrite | c.1.b.2 all | |
| | | g. carbon dioxide | a.4 part | |
| | | h. pulsed excimer | a.1.c.2 all | |
| | | i. Raman | | |
| | | Related Definition (3) | e. all | |

**6A225**

Unit: Equipment in number; parts and accessories in $ value

**6A226**

Unit: Number; Equipment in n

**6B108**

Systems ... specially designed for radar cross section measurement usable for "missiles", or "missile subsystems"; parts and accessories in $ value and their

(MTCR 17.B.1. is limited to systems usable for "missiles" and for those "missile" subsystems which are listed in MTCR 2.)

**6D102**

"Software" specially designed or modified for the "use" of equipment controlled by 6A008, 6A108, or 6B008 for MT reasons

(To conform with MTCR 11.D.1 and 12.D.3.)

**6E101**

"Technology" according to "MTCR General Technology Note" not controlled by 6E001 or 6E002 for the "development", "production", or "use" of equipment or "software" controlled by 6A002, 6A007.b and .c, 6A008, 6A102, 6A107, 6A108, 6B108, 6D002, 6D102 or 6D103 for MT reasons

Deleted: the General Technology Note

(The MTCR General Technology Note differs from the Wassenaar General Technology Note. The former uses the undefined expression "directly associated"; the latter uses the defined term "required.")

**6E201**

"Technology" according to "NSG Technology Controls" other than that controlled by 6E001 or 6E002 for the "development", "production", or "use" of equipment controlled by 6A003, 6A005, 6A202, 6A203, 6A205, 6A225 or 6A226 for NP reasons

("NSG Technology Controls" uses the undefined expression "directly associated," rather than the Wassenaar defined term "required." Therefore, 6E001 and 6E002 may not control all NSG-controlled development or production technology.)

(Deletion made possible by addition of "for NP reasons" in the heading.)

**7A103**

a. Inertial or other equipment using accelerometers or gyros controlled by 7A001, or 7A002 for MT reasons, or 7A101 or 7A102 and systems incorporating such equipment.

(To conform with MTCR 9.A.6.)

**7A105**

... having any of the following characteristics:

a. Capable of providing navigation information under the following operational conditions:

4. At speeds in excess of 515 m/sec (1,000 nautical miles/hour); and

5. At altitudes in excess of 18 km (60,000 feet); or

b. Designed or modified for use with the unmanned vehicle portion of the definition of "missile".

(To conform with MTCR 11.A.3.)

**7B101**

... designed or modified to be used with equipment controlled by 7A004 or 7A101-7A104, or the MT portions of 7A001-7A003

**7B103**

"production facilities" or "production equipment," not controlled by 7B001 or 7B003, specially designed for equipment controlled by 7A117

(To conform with MTCR 2.B.1. and 2.B.2.)

**7D101**

"Software" specially designed or modified for the "use" of equipment controlled by 7A001 to 7A004, 7A006, 7A101 to 7A104, 7A106, 7A115, 7A116, 7A117, 7B001, 7B002, 7B003, 7B101, 7B102 or 7B103 for MT reasons and "software" specially designed for the "use" of equipment controlled by 7A005 or 7A105 for MT reasons

(To conform with MTCR 2.D.1., 2.D.3., 9.D.1., 10.D.1., 11.D.1., and 11.D.2.)

**7D102**

Deleted: the General Technology Note

Deleted: 6A003.a.2, 6A003.a.3, 6A003.a.4, 6A005.a.1.c, 6A005.a.2.a, 6A005.c.1.b, 6A005.c.2.c.2, 6A005.c.2.d.2.b,

Deleted: ECCN Controls: This entry only controls "technology" for "lasers" in 6A005 that are controlled for NP reasons.

Deleted: ,

Deleted: 7A001-

Deleted: Specially designed

b. Integration "software" specially designed for the equipment controlled by 7A003 or 7A103.a for MT reasons

(To conform with MTCR 9.D.2.)

**7D103**

"Software" specially designed for modelling, simulation, or design integration of the "guidance sets" controlled by 7A117.

(To conform with MTCR 16.D.1.)

**7E101**

"Technology", not controlled by 7E001, 7E002, or 7E003, according to the "MTCR General Technology Note" for the "development", "production", or "use" of equipment or "software" controlled by ... 7D001, 7D002, 7D003, ... for MT reasons

(The MTCR General Technology Note differs from the Wassenaar General Technology Note. The former uses the undefined expression "directly associated"; the latter uses the defined term "required.")

**7E104**

Design "technology", not controlled by 7E004.b.5, ...

**7E105**

Design "technology" for integration of air vehicle fuselage, propulsion system and lifting control surfaces, designed or modified for "missiles," to optimize aerodynamic performance throughout the flight regime of an unmanned air vehicle.

(To conform with MTCR 10.E.1.)

**9A101**

Unit: number

(MTCR 3.A.1. and ECCN 9A101 do not control parts or accessories)

**9A104**

Rocket and unmanned air vehicle systems, as follows (see List of Items Controlled)(also see 9A120) (These items are subject to the export licensing authority of the Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121)

Items:

a. Complete rocket systems (including ballistic missile systems, space launch vehicles, and sounding rockets) capable of delivering at least a 500 kg payload to a range of at least 300 km;

b. Complete unmanned air vehicle systems (including cruise missile systems, target drones and reconnaissance drones), capable of delivering at least a 500 kg payload to a maximum range of at least 300 km

(To conform with MTCR 1.A.1. and 1.A.2.)

**9A105**

Liquid propellant rocket engines, not controlled by 9A005, as follows:

Deleted: or

Deleted: or for their design integration with "missiles"

Deleted: General Technology Note

Deleted: Equipment in

Deleted: ; parts and accessories in $ value

Deleted: S

Items:

a. Liquid propellant rocket engines, usable in "missiles", having a total impulse capacity of 1.1 MNs or greater;

b. Liquid propellant rocket engines, usable in rockets with a range capability of 300 km or greater, other than those controlled by 9A105.a, having a total impulse capacity of 0.841 MNs or greater.

(Item detail needed to conform with MTCR 2.A.1.c. and 20.A.1.b.)

**9A106**

Systems or components, not controlled by 9A006 or 9A008, usable in "missiles", as follows ...

Unit: number;

(MTCR 2.A.1.e, 3.A.3, 3.A.5, and 3.C.1 (and 9A106) do not control parts or accessories)

a. Interior lining usable for rocket motor cases in "missiles";

(To conform with MTCR 3.C.1.)

b. Rocket nozzles;

c. . Thrust vector control subsystems: ....

d. Liquid and slurry propellant (including oxidizers) control systems ...

(To conform with MTCR 3.A.5.)

**9A107**

Solid propellant rocket motors, as follows, ...:

Items:

a. Solid propellant rocket motors, usable in "missiles", having a total impulse capacity of 1.1 MNs or greater; or

b. Solid propellant rocket motors, usable in rockets with a range capability of 300 km or greater having a total impulse capacity of 0.841 MNs or greater.

(Item detail needed to conform with MTCR 2.A.1.c. and 20.A.1.b.)

**9A108**

Rocket motor cases, 'insulation' components and nozzles therefor, other than those controlled by 9A008, usable in "missiles" (These items ...)

(To conform with MTCR 3.A.3.)

**9A109**

Hybrid rocket motors, other than those controlled by 9A009, and specially designed components therefor, usable in "missiles"

(To conform with MTCR 3.A.6.)

**9A110**

Composite structures, laminates and manufactures thereof, other than those controlled by 1A002, 1A102, or 9A010, specially designed for use in "missiles" or "missile subsystems"

(To conform with MTCR 8.A.1, which covers composite structures, laminates, and manufactures thereof specially designed for use in MTCR 2.A. subsystems, which omit the portion of 9A005 not also described in 9A105.a and omit all of

**Deleted:** other than those

**Deleted:** Equipment and components in

**Deleted:** parts and accessories in $ value

**Deleted:** Ablative liners for thrust bomustion chambers

**Deleted:** or

**Deleted:** engines

**Deleted:** Solid rocket propulsion components

**Deleted:** rockets with a range capability of 300 km or greater

**Deleted:** usable in rockets with a range capability of 300 Km or greater,

**Deleted:** entry

**Deleted:** the subsystems controlled by entries 9A005, 9A007, 9A105.a, 9A106 to 9A108, 9A116 or 9A119

9A007.b-e, 9A106.b, 9A107.b, 9A108, 9A117, 9A118, and 9A119.b, but which include 7A117 and "weapon or warhead safing, arming, fuzing, and firing mechanisms.")

NP applies to composite structures also described in 1A202

**9A116**

Reentry vehicles, and equipment designed or modified therefor usable in "missiles", as follows (see List of Items Controlled): (These items ... )

Items:

a. Heat shields, and components thereof, fabricated of ceramic or ablative materials;

b. Heat sinks and components thereof fabricated of light-weight, high heat capacity materials;

c. Electronic equipment specially designed for reentry vehicles.

(To conform with MTCR 2.A.1.b; the probable intent is to control reentry vehicles as well as the equipment therefor listed in a, b, and c, in which case MTCR should either delete the comma from before "as follows" or list reentry vehicles as another sub-item.)

**9A118**

Devices to regulate combustion of ramjet/scramjet/pulse jet/combined cycle engines which are usable in "missiles" (These items ... )

(For consistency with MTCR 3.A.2.)

**9A119**

Individual rocket stages, usable in rockets with a range capability equal to or greater than 300 Km ...

**9A121**

Weapon or warhead safing, arming, fuzing, and firing mechanisms usable in "missiles" (These items are subject to the export licensing authority of the U.S. Department of State, Directorate of Defense Trade Controls. See 22 CFR part 121.)

(To conform with MTCR 2.A.1.f.; all parts of MTCR 2.A.1. must appear on the CCL in order to provide a basis for numerous cross references to "missile subsystems.")

**9B105**

Wind tunnels for speeds of Mach 0.9 or more usable for "missiles" or "missile subsystems"

(MTCR 15.B.2. is limited to items usable for the subsystems listed in MTCR 2.A.)

**9B106**

Environmental chambers and anechoic chambers, usable for "missiles" or "missile subsystems," as follows:

(To conform with MTCR 15.B.4)

Deleted: usable in "missiles"

Deleted: usable in engines

Deleted: rockets with a range capability greater than 300 km or greater, controlled by 9A011 or 9A111

Deleted: or greater

Deleted: and their subsystems

**9B115**

Specially designed "production equipment" for the following:

Items:

a. "missile subsystems";

b. "missile propulsion components, equipment, or materials";

c. "other rocket subsystems"

(To conform with MTCR 2.B.2., 3.B.2., and 20.B.2. "production equipment"; MTCR 2, 3, and 20 omit the portions of 9A005 and 9A006 not overlapping 9A105, the portion of 9A009 not overlapping 9A109, and all of 9A106, 9A007.b-e, and 9A008 but include 7A117, the MT portion of 9A001, and "weapon or warhead safing, arming, fuzing, and firing mechanisms", which is proposed to become new 9A121.)

Deleted: systems, sub-systems, and components controlled by 9A004 to 9A009, 9A011, 9A101, 9A104 to 9A109, 9A111, 9A116 to 9A119

**9B116**

Specially designed "production facilities" for the following:Items:

a. "missiles";

b. "missile subsystems";

c. "missile propulsion components, equipment, and materials"; or

d. "other rocket subsystems"

(To conform with MTCR 1.B.1., 2.B.1., 3.B.1., and 20.B.1. "production facilities"; MTCR 1, 2, 3, and 20 omit 9A004, 9A007.b-e, 9A008, and 9A104, the portions of 9A005 and 9A006 not overlapping 9A105 or 9A106, and the portion of 9A009 not overlapping 9A109 but include "missiles," 7A117, the MT portion of 9A001, and "weapon or warhead safing, arming, fuzing, and firing mechanisms" proposed for new 9A121.)

Deleted: systems, sub-systems, and components controlled by 9A004 to 9A009, 9A011, 9A012, 9A101, 9A104 to 9A109, 9A111, 9A116 to 9A119

Deleted: ¶

**9B117**

Test benches and test stands for solid or liquid propellant rockets or rocket motors usable for "missiles" or "missile subsystems" having either of the following characteristics:

(MTCR 15.B.3. is limited to test equipment usable for "missiles" or "missile subsystems")

**9D101**

"Software" specially designed or modified for the "use" of goods controlled by 9B001 to 9B005, 9B007, 9B105, 9B106, 9B116 or 9B117 for MT reasons

(To conform with MTCR 1.D.1, 2.D.1, 3.D.1, 15.D.1, and 20.D.1.)

**9D103**

"Software" specially designed for modelling, simulation or design integration of "missiles", or "missile subsystems"

(To conform with MTCR 16.D.1.; MTCR 2 subsystems omit the portion of 9A005 not overlapping 9A105.a and omit all of 9A007.b-e, 9A106.a and .b, 9A107, 9A108.a and .b, 9A117, and 9A118 but include 7A117 and "weapon or warhead safing, arming, fuzing, and firing mechanisms" proposed for new 9A121)

Deleted: the subsystems controlled by 9A005, 9A007, 9A105.a, 9A106, 9A108, 9A116 or 9A119

**9E101**

"Technology" according to "MTCR General Technology Note" not controlled by 9E001 or 9E002 for the "development", "production", or "use" of commodities or software controlled by 9A001, 9A005 to 9A011, 9A012, 9A101.b, 9A104 to 9A111 or 9A115 to 9A119, 9A121, 9B001 to 9B004, 9B006, 9B007, 9B105, 9B106, 9B115 to 9B117, 9C110, 9D001 to 9D004, 9D101, 9D103, 9D104 or 9D105 for MT reasons

Related Controls: "Technology" controlled by 9E101 for items in ... 9A110 that are specially designed for use in "missiles" or "missile subsystems", ...

(To conform with MTCR 1.E.1., 2.E.1., 3.E.1., 12.E.1., 15.E.1., 16.E.1., 19.E.1., and 20.E.1. The MTCR General Technology Note differs from the Wassenaar General Technology Note. The former uses the undefined expression "directly associated"; the latter uses the defined term "required.")

**9E102**

"Technology" according to the "MTCR General Technology Note" for the "use" of space launch vehicles specified in 9A004, or commodities or software controlled by 9A001, 9A005 to 9A012, 9A101, 9A104 to 9A111, 9A115 to 9A119, 9A121, 9B001 to 9B004, 9B006, 9B007, 9B105, 9B106, 9B115, 9B116, 9B117, 9D001 to 9D004, 9D101, 9D103, 9D104 or 9D105 for MT reasons

(If 9E101 were revised as suggested above, 9E102 would become redundant except for technology for space launch vehicles in 9A004.)

Deleted: the General Technology Note

Deleted: or

Deleted: missile systems and subsystems

Deleted: General Technology Note

**From:** "Crescent Carpets" <crescentcarpets@yahoo.com>
**To:** <SQuarter@bis.doc.gov>
**Date:** 11/11/2004 1:13:07 PM
**Subject:** FW: comments on foreign policy-based export controls

-----Original Message-----
From: Crescent Carpets [mailto:crescentcarpets@yahoo.com]
Sent: Thursday, November 11, 2004 12:39 PM
To: SQuarter@bis.doc.gov.com
Subject: comments on foreign policy-based export controls

Dear Ms. Quarterman,
Crescent Carpet Importers is a small company which imports carpets mainly from Spain and Belgium into New York. The past year has been extremely difficult for us. Our shipments have been delayed at the European end because of regulations imposed there. When they get to the United States, they are held in customs for lengthy periods of time. Our terms with our vendors are 60 days; our terms with our clients are 30 days. Because of all the delays, we are forced to pay for our merchandise long before we receive payment from our clients. In many cases over the past year, our customers have cancelled because they could no longer wait for the goods.
In addition, the extra fees imposed for all the x-rays and handling by customs are a hardship. We cannot pass this cost on to our customers because we would price ourselves out of the market, between this and the climbing euro.
Best regards,
Angela Kozuch, Administrator

# NATIONAL CHAMBER OF INDUSTRIES & COMMERCE, U.P.

*Chief Patron His Excellency the Governor of U.P.*

| AMAR MITTAL | ANIL VERMA | RAJIV GUPTA | MANISH AGARWAL |
|---|---|---|---|
| PRESIDENT | VICE PRESIDENT | VICE PRESIDENT | TREASURER |
| (O) 3091561, 2344340 (R) 3094013 | (O) 2151247 (R) 2110479 | (O) 2623697 (R) 2520589 | (O) 2621923 (R) 2542401 |


**Ref. No.: NCIC/2004-05/SCX/834** **Dated : 6th November, 2004**

To,

Ms. Sheila Quarterman
Regulatory Policy Division
Bureau of Industry and Security
Department of Commerce, P.O. Box 273,
Washington DC 20044 (U.S.A)

Dear Madam,

We would like to refer to your notification asking for public opinion on US Government export control policies.

US Government export control is applicable to all goods which fall in the commerce control list as well as those falling under EAR-99 classification. Our very humble submission is that EAR-99 items should be removed from the purview of export controls all together.

The EAR 99 items are generally low technology goods and these do not have any material contribution towards Nuclear or Missile programme. Such items are readily available from other countries also. In case, USA would not sell their product to India then these items could be imported by the entity customer from some other countries as they are available from other sources. If the items are such that they can only be supplied from USA then there could have been some sort of material contribution. However, there is no material contribution because the EAR 99 items do not directly participate in a Nuclear or Missile programme. The EAR 99 items are not at all sensitive items and for this reason they are not on the commerce control list.

Contd....2..

NEW MARKET, JEONI MANDI, AGRA-282 004. : 91-562-2623552, 2621020 FAX : 91-562-2623550
E-mail : info@ncicagra.org Website : http://www.ncicagra.org

# NATIONAL CHAMBER OF INDUSTRIES & COMMERCE, U.P.

*Chief Patron His Excellency the Governor of U.P.*

| AMAR MITTAL | ANIL VERMA | RAJIV GUPTA | MANISH AGARWAL |
|---|---|---|---|
| PRESIDENT | VICE PRESIDENT | VICE PRESIDENT | TREASURER |
| (O) 3091561, 2344340 (R) 3094013 | (O) 2151247 (R) 2110479 | (O) 2623697 (R) 2520589 | (O) 2621923 (R) 2542401 |




The US Govt. has directly identified at least 2500 items which are on the commerce control list and it is advisable that only these items be controlled for export as these items are sensitive for Nuclear and Missile programmes. For these items, it may be worth to review and regulate the licence procedures for export control.

We are requesting your goodself for the above relaxations with regard to export control to India for the following reasons :-

1. Our honourable Prime Minister has publicly announced that India is a responsible nuclear power and act with restraint. India has "no first use" doctrine in place. The Indian Government has an impeccable record of export control, so that unauthorized use of sensitive nuclear material can be effectively prevented. The US Government has already agreed to continue Indo-US technology transfer deal through "Next steps in strategic partnership" (NSSP). This will become meaningless if there are export controls even on EAR 99 items.
2. The license application for EAR-99 items will eventually reduce and this in turn would mean less costs to the US Government.
3. Export controls have lot of effect on overall trade. The trade would never grow in the regime of controls. Even in India there are no longer any controls on trade for export or import.
4. A lot of US export goods have come to India prior to 1997 to these entity organizations and now they are in need of replacement parts, consumables and other accessories. It would be a national wastage if these US goods do not function for want of spares and consumables which are not supplied from USA due to this embargo.

Contd.....3..

# NATIONAL CHAMBER OF INDUSTRIES & COMMERCE, U.P.

*Chief Patron His Excellency the Governor of U.P.*

| AMAR MITTAL | ANIL VERMA | RAJIV GUPTA | MANISH AGARWAL |
|---|---|---|---|
| PRESIDENT | VICE PRESIDENT | VICE PRESIDENT | TREASURER |
| (O) 3091561, 2344340 (R) 3094013 | (O) 2151247 (R) 2110479 | (O) 2623697 (R) 2520589 | (O) 2621923 (R) 2542401 |




5. Supplier from other countries will come forward to supply these goods and thereby it will effect in Indo-US trade relationship. The trade of India with USA will eventually fall and decline. We are sure that you would not let this happen.

We are quite hopeful that you will consider that there should be no export controls on EAR 99 items. Since these are low technology consumer goods, testing instruments, accessories and consumables for simple use. These items are not used in activities related to nuclear, chemical or biological weapons or missile delivery system or weapons of mass destruction.

Thanking you,

Yours faithfully,
for **NATIONAL CHAMBER OF INDUSTRIES & COMMERCE U.P.**

**CHAIRMAN, SCX & UNIDO**

NEW MARKET, JEONI MANDI, AGRA-282 004. ✆ : 91-562-2623552, 2621020 FAX : 91-562-2623550
E-mail : info@nciagra.org Website : http://www.nciagra.org

InterAction®
American Council for Voluntary International Action

1717 Massachusetts Avenue NW #701 Washington, D.C. 20036 ♦ phone (202) 667-8227 ♦ email ia@interaction.org

# FAX

**Date:** November 16, 2004

**Total Pages:** 6 (incl cover page)

**To:** Sheila Quarterman

**Organization:** Bureau of Industry and Security

**Fax Number:** 202-482-3355

**From:** Jim Bishop, Director
Humanitarian Response
InterAction
Phone: 202 667-8227 ext. 104
Fax: 202 667-8236
jbishop@interaction.org

**Message:**

Dear Ms. Quarterman – Attached please find InterAction's response to your request for comments dated September 28, 2004. Please direct any questions or comments to myself at the contact information above.

Best regards,

Jim Bishop

InterAction®
American Council for Voluntary International Action

November 16, 2004

Sheila Quarterman
Regulatory Policy Division
Bureau of Industry and Security
Department of Commerce
P.O. Box 273
Washington, DC 20044

RE: Comments on Foreign Policy-Based Export Controls; Impact on Operations of Humanitarian Organizations in Sanctioned Countries

Dear Ms. Quarterman:

This responds to the request for comments issued by the Bureau of Industry and Security (BIS) on September 28, 2004 (69 Fed. Reg. 57895). Our comments focus on a particular aspect of existing foreign-policy based export controls: restrictions on the ability of humanitarian nonprofit organizations (NPOs) to export their standard operating equipment for their own use in countries subject to U.S. sanctions. We respectfully submit that such restrictions do little to further the U.S. foreign policy interest in denying useful technology to sanctioned countries. Furthermore, such restrictions undermine the acknowledged U.S. foreign policy interest in permitting NPOs to respond effectively to the often-severe humanitarian needs in such countries, and also drive NPOs to purchase non-U.S.-origin goods, to the detriment of U.S. manufacturers.

Our comments below address three major concerns:

1. The list of items controlled for these purposes is unnecessarily restrictive, as it contains some extremely broad categories, some where key technical parameters have not changed in over ten years, and generally encompasses standard off-the-shelf technology available throughout the world;
2. To the extent that standard items used by NPOs actually involve sensitive technology which is appropriate for controls, a license exception should be established which permits NPOs to export such items for their own use in conducting humanitarian operations; and
3. In what should be the rare cases where items utilized by NPOs are appropriately subject to specific BIS license requirements, the implementation of such requirements for countries which are subject to sanctions administered by the Treasury Department's Office of Foreign Assets Control (OFAC) should be consolidated with the OFAC licensing process, to avoid the need for NPOs to obtain separate licenses from both OFAC and BIS authorizing the same activity.

InterAction is the nation's largest alliance of relief and development nongovernmental organizations working overseas.



1717 Massachusetts Avenue, NW
Suite 701
Washington, DC 20036
PHONE: (202) 667-8227
FAX: (202) 667-8236
E-MAIL: ia@interaction.org
http://www.interaction.org

## I. Certain Entries on the List of Controlled Items are Unnecessarily Restrictive

We respectfully submit that some of the controls on exports to heavily sanctioned countries, i.e., generally Export Control Classification Numbers (ECCNs) in which the last three digits begin with "99," encompass standard "low technology" items which are readily available throughout the world. U.S. foreign policy-based export controls on such items have little, if any, impact on the targeted governments, serve only to punish U.S. manufacturers of such items by driving users (including humanitarian NPOs) to foreign manufacturers of the products, and most importantly in emergency situations delay the ability of NPOs to provide relief to vulnerable civilian populations.

Key specific examples of such low technology controlled items which are standard equipment for the operations of humanitarian NPOs are:

* Portable electric generators" (ECCN 2A994). This is an extremely broad definition, encompassing everything from small hand-carried gasoline powered generators to large truck-mounted diesel generators. To the extent there is specific generator technology possessed only by U.S. manufacturers which is of particular value to sanctioned governments, we suggest that this ECCN be narrowly defined to include only such technology.

* Personal computers classified under 4A994.b. Over the last several years BIS has regularly raised the computing power threshold for high-end computers and supercomputers classified under other ECCNs, to keep pace with rapidly advancing technology and enable U.S. manufacturers to compete with foreign manufacturers. However, for low-end computers falling within this ECCN, the computing power threshold has not been increased in more than ten years. We believe that the personal computers (desktops and notebooks) which are standard equipment for humanitarian NPOs are consumer items readily available throughout the world from a variety of non-U.S. manufacturers. Indeed, when NPOs responding to the Bam earthquake in Iran were told by OFAC earlier this year to remove all U.S.-origin computers controlled under ECCN 4A994.b, some of the NPOs responded by purchasing replacement computers within Iran itself. We respectfully suggest that forcing humanitarian NPOs to purchase consumer computers in Iran rather than from U.S. manufacturers does nothing to advance U.S. foreign policy interests, and that the computing power threshold in this ECCN should be increased to capture only technology which is truly unique to U.S. manufacturers

* Software, standard operating system and office applications classified under 5D992. Related to raising the control threshold for personal computers, we suggest that the encryption capabilities of the export versions of standard off-the-shelf business software are insufficiently advanced or unique to U.S. suppliers to justify special export controls for sanctioned countries, nor is it practical to try and control such software when it is easy to obtain from sources throughout the world and to transfer across borders.

* "Mobile Communications Equipment" (5A991.g.). This is another very broad category, which literally seems to encompass everything from satellite telephones and all kinds of two-way radios to cellular telephones and even low-power "walkie-talkies" used as children's toys. As with portable electric generators, we submit that a narrow specification of the precise technology of concern would be appropriate.

* "Navigation Direction Finding Equipment" (7A994). Again, the category is extremely broad, and literally would seem to include not only widely-available off-the-shelf Global Positioning Satellite receivers, but also any magnetic compass. NPOs sometimes must use consumer GPS equipment when operating in remote areas. Moreover, some ordinary radios and communications equipment include GPS systems as a standard function, so any modifications to the controls on "mobile communications equipment" should be coordinated with modifications to this ECCN. We again suggest that a narrowly defined control in this area is needed.

In advocating for the removal of BIS controls on the above items, we note that the U.S. Government of course is still able to restrict exports of these items, and indeed all items (even those classified under the generic EAR99), to certain countries by imposing broad economic sanctions (typically administered by OFAC). But if such sanctions are in place, the above item-specific controls add nothing. And in the absence of such broad economic sanctions, for the reasons discussed above, we submit that the BIS controls serve no meaningful purpose. Any conceivable purpose of the BIS controls on these items is far outweighed by the cost to domestic manufacturers, and to vulnerable civilian populations whom humanitarian NPOs seek to assist.

## II. A New License Exception Is Needed for Equipment Used in Humanitarian Operations

In the event that some of the above controls continue in one form or another, we request that a license exception be added to the Export Administration Regulations (EAR) which provides that NPOs engaged in humanitarian activities may export their normal "tools of the trade" for their own use in such activities.

Such an exception would be similar to the current License Exception TMP for "tools of trade" (15 CFR 740.9). But TMP has proven inadequate for NPOs engaged in humanitarian activities, for two reasons: (i) the exception often is revoked for countries subject to comprehensive sanctions; and (ii) the exception allows items to be exported only for a maximum period of one year. Concerning the former, such revocation would seem unnecessary, since the OFAC regulations would prohibit all exports. Yet if OFAC does in fact license an NPO to engage in humanitarian activity in such countries, the NPO should be able to bring in, for its own use, its normal tools. Concerning the latter, complex humanitarian emergencies can extend far beyond one year, as clearly shown by the example of Sudan.

The needs of NPOs are unique because the purposes for which they are "exporting" items are unique. Unlike commercial companies attempting to sell products into a foreign market for profit, the NPOs are exporting equipment and technology for their own use as they attempt to assist the most vulnerable people in the most desperate humanitarian situations. The objective of the NPOs is either to provide immediate humanitarian assistance in terms of food, medicine, and shelter, or to assist people in improving basic living conditions, e.g. building homes, drilling wells, improving farming methods, etc. The reality is that in many instances the most extreme humanitarian crises occur in the most volatile and troubled areas of the world. Moreover, because of the types of crises NPOs address, e.g., natural disasters, wars, and outbreaks of disease, the response time is often critical. As a result, we believe that the unique nature of NPOs themselves as well as the uniqueness of their objectives and challenges require the creation of a license exception to cover their operations.

There are existing license exception that pertain to specific destinations (GBS), specific end users (GOV and CIV), and specific products (CTP and TSR). Thus we believe there is ample precedent for creating a license exception to address a specific use or user.

We therefore request an exception that permits NPOs engaged in humanitarian activity, even in sanctioned countries, to export normal types and quantities of their standard tools of trade, provided that the NPO maintains possession and control of such items, removes such items when they are no longer needed by the NPO, and provided always that the NPO's activity is licensed by OFAC as necessary

Such an exception would be complementary to the existing "humanitarian donations" exception at Section 740.12(b) of the EAR, which allows NPOs to export donated materials intended to meet basic human needs. In fact, the list of such materials (Supplement 2 to Part 740) includes "office equipment and supplies" which may be "necessary to operate and administer the donative program," and specifically mentions generators. It is not clear whether such references are intended to override the specific ECCNs mentioned above, so one approach to the above-discussed issues would be to clarify that the "office equipment" reference includes items which may otherwise require a specific license, provided the conditions noted above are satisfied.

## III. Any BIS License Requirements for Embargoed Countries Should be Consolidated with the OFAC Licensing Process

If the recommendations described in Parts I and II of our letter above are implemented, the occasions when an NPO would need to apply for a specific BIS license to export tools for its own use should be rare. But should such occasions arise, and arise in countries which are also subject to export sanctions administered by OFAC, then we respectfully request that any BIS license requirements be consolidated into the OFAC licensing process.

The administrative burden and time delay involved when an NPO must file separate applications with two different agencies for the same activity can considerably hinder an emergency humanitarian program, and under some circumstances literally could result in the loss of human life. BIS has in fact recognized the value of consolidating licensing with OFAC and has implemented such a process, but only for certain countries, such as Iran (EAR Section 746.7(a)(3)). For other countries, confusion over dual licensing continues, most notably with Sudan, where InterAction's member NPOs have received conflicting responses from BIS over the last few years on whether BIS licenses are necessary in addition to OFAC licenses. We urge BIS to take a uniform approach and consolidate licensing with OFAC for all countries where OFAC export restrictions exist.

Finally, we are aware that the proposals made above will take time to review and analyze. NPOs are frequently faced with severe time constraints in their efforts to respond to requests for humanitarian aid. Delays directly impact the NPOs' ability to alleviate the suffering of these at risk people. It is essential that the necessary aid be provided to these individuals as soon as possible. Present licensing procedures, particularly when they require multi-agency review, take considerable time, upwards of 90 days. In order to avoid these delays we respectfully request that BIS develop expedited review and licensing procedures for NPOs responding to such emergency crisis

We thank you for your attention to these comments.

Sincerely,

Mary E. McClymont
President and CEO

**From:** "Wittig, Bill" <Bill.Wittig@sartomer.com>
**To:** <SQuarter@bis.doc.gov>
**Date:** 11/17/2004 9:19:44 AM
**Subject:** Comments on the effects of export controls

<<Regulatory Policy_Quarterman-2.doc>>

Dear Ms. Quarterman,

This email is in response to requests for comments on the Effects of Foreign Policy-Based Export Controls listed in the Federal Register on September 28, 2004.

Please contact me at 610-363-4152 if you would like additional information or clarification.

We appreciate the opportunity to offer these suggestions.

Best wishes,

Bill Wittig
Business Manager
Sartomer Company

November 29, 2004 Deleted: November 17, 2004

Ms. Sheila Quarterman
Regulatory Policy Division
Bureau of Industry and Security
U.S. Department of Commerce
P.O. Box 273
Washington, DC 20044

Re: Effects of Foreign Policy-Based Export Controls, 69 number 187 *Fed. Reg.* (September 28, 2004)

Dear Ms. Quarterman:

We appreciate this opportunity to provide our comments to the Bureau of Industry and Security ("BIS") on the effect of existing foreign policy-based export controls. Sartomer Company ("Sartomer"), based in Exton, Pennsylvania, produces hydroxyl terminated polybutadiene resins ("HTPB resins") at our facility in Channelview, Texas. We produce two grades of HTPB, as follows:

> Commercial: Poly bd® R-45HT/R-45HTLO HTPB resins are dual-use materials and are regulated under the Export Administration Regulations (the "EAR") (Export Control Classification Number 1C111b.2) due to their use both in civilian (e.g., insulated glass sealant, electronics potting, and various adhesives) and military/aerospace (e.g., missile propellant binder) applications; and
>
> Military: Poly bd® R-45M HTPB resins are used only in military/aerospace applications and are regulated under the International Traffic in Arms Regulations (United States Munitions List, Category V).

As detailed below, we respectfully submit that foreign policy-based export controls on commercial-grade HTPB resins, as currently implemented, have an adverse economic impact on our export activities, especially inasmuch as these controls create an unfair commercial advantage for foreign producers. We believe that easing these controls is consistent with the foreign policy, national security, and economic objectives of the United States, and we provide the following information in support of our views.

**BACKGROUND**

In 1969, ARCO Chemical (now Sartomer Company) was the sole producer of HTPB resins in the world. Now due to the implementation of U.S. export controls, there more than eight major foreign producers of HTPB resins in Brazil, Czech Republic, Italy, China (at least two), Japan (two companies) and Russia.

Several of these plants were built in response to denied U.S. export license applications or to avoid the lengthy delays in obtaining licenses. Moreover, Petroflex, the Brazilian producer, has sold HTPB resins in the United States for more than a decade and has at least 10% U.S. share in the commercial market. In addition, US military and aerospace companies have purchased HTPB from Petroflex. Meanwhile, the Brazilian military/aerospace industry (e.g., Avibras) only purchased material from the domestic source (i.e., (Petroflex). Consequently, Sartomer is competitively disadvantaged both abroad and domestically.

**BIS CRITERIA**

1. *Information on the effect of foreign policy controls on sales of U.S. products to third countries, including views of foreign purchasers or prospective customers regarding U.S. foreign policy controls.*

Because of the paperwork and significant time to obtain approval, Sartomer is disadvantaged because it cannot compete effectively with foreign producers that are not similarly burdened by such extensive controls. Even longstanding foreign customers continually express frustration and impatience with Sartomer because of the delays created by these controls; delays that would not exist if these customers took their business elsewhere.

2. *Information on controls maintained by U.S. trade partners (i.e., to what extent do they have similar controls on goods and technology on a worldwide basis or to specific destinations)?*

HTPB resins are controlled primarily for missile technology reasons based on voluntary standards established and followed by the Missile Technology Control Regime (the "MTCR"), an informal, political understanding among cooperating nations to limit the proliferation of missiles and missile technology. HTPB is readily available from not only MTCR countries but also from China.

3. *Information on licensing policies or practices by our foreign trade partners which are similar to U.S. foreign policy controls, including license review criteria, use of conditions, requirements for pre and post shipment verifications (preferably supported by examples of approvals, denials and foreign regulations).*

Each MTCR Partner country implements the voluntary standards through its own national legislation. Information about licensing policies and practices of these countries is not readily available, but anecdotal evidence, supported by our own experience in continually losing market share and business opportunities to foreign competitors because of licensing delays, informs us that U.S. implementation of these standards is far more comprehensive, complicated, and cumbersome than the practices of other MTCR Partners. For instance we understand that HTPB made in EU and shipped in the EU does not require a license. The requirements for export from Brazil to Europe also appear to be significantly less burdensome to the customers and customers can quickly obtain a license from Brazil without requiring any supporting documentation.

4. *Suggestions for revisions to foreign policy controls that would (if there are any differences) bring them more into line with multilateral practice.*

5. *Comments or suggestions as to actions that would make multilateral controls more effective.*

We address these two criteria together, as we believe they are interconnected. The MTCR sets voluntary baseline standards that require implementation at the national level. On the U.S. National level, we believe that implementation of these standards requires a greater focus on controlling activities that present a high risk of diversion, and more attention to streamlining the process of approving legitimate commercial transactions with reputable end users. To this end, we offer the following broad recommendations:

- Streamlined licensing renewal process. Instead of requiring submission of an entirely new application for previously licensed transactions, we recommend adopting procedures to provide for the renewal of existing licenses, especially involving MTCR Partner countries. We believe it is possible to re-certify the bona fides of previously approved end users and end uses without triggering a *de novo* review.

- Distribution licenses. We recommend providing for the continued and increased use of multiple end user/end use licenses, which dramatically reduce paperwork both for the government and the exporter. In addition, we would like the flexibility on a multi-user license to move unused volumes from one customer to another customer, which needs additional material, as long we do not exceed the total volume limit of the license. Due to the dynamic nature of business, providing precise estimates of the purchases by customer for two years is challenging and we are required to reinitiate the entire process when a customer's requirements even slightly exceed the initial forecast.

- License exception for samples. Under existing procedures, Sartomer must obtain an export license for any sample quantity of HTPB resin, which significantly hinders our ability to develop new business opportunities. We recommend the adoption of a licensing exception that would permit the exportation of minimal quantities of HTPB resin (e.g., 500 lbs.) to any non-proscribed party in an MTCR Partner country. In the chemical industry, customers frequently use up to a drum of material for their initial testing, qualification and trial batches. The current process of requiring a license for small quantities is significant impediment to developing new applications, and places Sartomer at severe competitive disadvantage.

- Broadening the MTCR "no undercut" policy. As part of the global missile technology control protocol, each MTCR Partner agrees to respect license denials issued by another – the so-called "no undercut" policy. But the disparities between national regimes lead to inequities, especially in view of cumbersome U.S. regulatory requirements, which we believe undercut U.S. economic interests. We believe that these disparities effectively provide non-U.S. Partners with an unfair commercial advantage. We recommend that the U.S. Missile Annex Review Committee ("MARC") or other appropriate government representative seek to level the competitive playing field for U.S. companies.

- Regulatory flexibility. The EAR provides BIS with inadequate flexibility to exercise administration discretion. In contrast, U.S. sanctions rules promulgated by the Treasury Department invariably empower the Office of Foreign Assets Controls ("OFAC") to grant exceptions, depart from the letter of regulatory procedures, and take other actions when in furtherance of U.S. interests. We recommend that the EAR be modified to provide BIS with the authority to make executive decisions with greater administrative discretion.

- BIS delegation. Although we appreciate that missile technology controls often implicate multiple interests requiring interagency review, we believe that many categories of transactions that have previously passed muster qualify for delegation to BIS of approval authority without the need for repetitive interagency referral. Once again, we turn to the example of OFAC, which is delegated by the State Department to take licensing action on sanctions matters that have been reviewed categorically for U.S. policy concerns.

- Decontrol. In 1992, after a lengthy study, the Department of Commerce determined that foreign availability of HTPB resins exists to controlled destinations. *See 57 Fed. Reg.* 4,948 (February 11, 1992). Although we understand that the removal of national security-based controls because of foreign availability did not lift those based on foreign policy, we believe that this determination supports decontrol of HTPB resins to the extent permitted within the MTCR context. We note that the MTCR Guidelines require a "case-by-case" review of MTRCR Annex items, but do not impose specific requirements on how to implement such a review. We believe that adequate flexibility exists for the U.S. government to grant a licensing exception contingent upon prior notification by the exporter, or some other framework that would permit streamlined authorization for the exportation of HTPB resins for recognized commercial end uses by established end users.

6. *Information that illustrates the effect of foreign policy controls on the trade or acquisitions by intended targets of the controls.*

As a former Defense Department official noted during a congressional hearing on export controls:

The export control system has tried to stay current . . . by developing ever more elaborate and complex regulations. This has occurred at the same time that the American public has demanded streamlined processes and more efficient government. As such, too much of our export control resources are devoted to licensing relatively benign transactions, diverting resources away from far more important and dangerous transactions. In demanding to put a stamp on every export transaction, then ultimately approving 99.4% of the requests, we are not really protecting our security. In fact, we're diverting resources from protecting the most important technology and products.[1]

We agree with this candid assessment, and believe that far too much effort and resources are focused on transactions, such as ours, that are intended for legitimate commercial uses by end users whose bona fides have been verified time and time again by the U.S. government.

[1]Statement of Dr. John J. Hamre before the Committee on Banking, Housing and Urban Affairs, United States Senate, February 14, 2001.

Ironically, as foreign producers exploit the competitive disadvantages created by the inefficient or misplaced application of these controls, the risk increases that HTPB resins will be diverted for illegitimate purposes beyond the reach of U.S. jurisdiction. Conversely, easing the regulatory burdens faced by Sartomer and similarly situated companies ultimately provides the government with greater oversight and control by establishing U.S. jurisdiction over more transactions that involve HTPB resins and other controlled commodities.

7. *Data or other information as to the effect of foreign policy controls on overall trade, either for individual firms or for individual industrial sectors.*

As explained above, Sartomer has lost worldwide market share, as well as innumerable specific business opportunities, because of delays and uncertainties created by the export licensing process.

8. *Suggestions as to how to measure the effect of foreign policy controls on trade.*

We believe that the current state of the economy provides as good a yardstick as any against which to measure the effect of foreign policy-based controls. Certainly, these controls, as currently implemented, are not helping U.S. businesses to compete more effectively in the world marketplace. If anything, they are achieving the opposite effect by miring U.S. businesses in unnecessary delays and red tape, while foreign companies take up the slack. Now, more than ever, U.S. businesses need the support of our government to remain competitive, and opportunities for public participation such as this are positive steps.

9. *Information on the use of foreign policy controls on targeted countries, entities, or individuals.*

A greater emphasis on more targeted restrictions is critical to ensure that foreign policy controls are more effectively implemented. Instead of devoting inordinate resources to reviewing the particulars of proposed transactions involving reputable end users and established business relationships, we believe that a greater focus needs to be placed on screening for denied persons and entities, and specially designated nationals.

**CONCLUSION**

The importance of preventing the proliferation of weapons of mass destruction cannot be overstated, and Sartomer takes very seriously its responsibility to exercise due diligence in its global trade activities. Indeed, Sartomer devotes considerable time, expense, and resources to rigorous export compliance, thereby ensuring that its products are used for legitimate commercial purposes by reputable customers. But Sartomer has been hamstrung by a regulatory regime, that, with all due respect, emphasizes form over substance, and hobbles our ability to compete effectively in the global marketplace.

We believe that a strong economy is the backbone of a safe and secure country, and we respectfully submit that a greater emphasis should be placed on easing the regulatory burdens faced by companies such as Sartomer. We believe that these burdens can be alleviated without sacrificing our foreign policy and national security objectives.

In fact, we believe that promoting U.S. exports actually strengthens U.S. export controls over strategic commodities by establishing U.S. Jurisdiction over activities that might otherwise fall beyond the reach of the U.S. government. In addition, increasing US exports helps maintain a domestic source of this material.

Thank you, again, for providing us with this opportunity to present our views. We believe that BIS's efforts to solicit public participation in its review of foreign policy controls are commendable, and we hope that our comments might lead to regulatory and procedural improvements to better meet the important objectives of these important controls.

Sincerely,

William Wittig
Business Manager – Specialty Polymers

**From:** "Haynes Roberts" <hroberts@nftc.org>
**To:** <SQuarter@bis.doc.gov>
**Date:** 11/18/2004 11:53:40 AM
**Subject:** NFTC BIS comment on foreign policy export controls

NFTC Comments below:

This comment is submitted on behalf of the member companies of the National Foreign Trade Council in reference to Federal Register notice (Vol. 69, #187, p. 57895 - 09/28/04) concerning the effectiveness of foreign policy-based export controls under the Export Administration Regulations (15 CFR Chapter VII).

1) The pursuit at every opportunity of heightened multilateral cooperation to develop more uniform controls and to enforce controls on target countries is of the utmost importance:

a) The combination of U.S. corporations' commitment to compliance and the complexity and breadth of the U.S. export control regime relative to the regulations competitors are subject to creates a competitive disadvantage for U.S. exporters. In an increasingly globalized economy, both sensitive and non-sensitive commodities are increasingly available from other foreign sources. In the absence of significant price or availability issues, foreign customers may simply find doing business with foreign suppliers more efficient and less risky. As a result, U.S. companies surrender revenue and market share, while the target of our controls obtains the item it needs from other sources;

b) The potential for export controls to achieve intended foreign policy goals is extremely unlikely without multilateral cooperation. Only in cases where the U.S. is the only viable or measurably preferable supplier do controls have substantial impact - an increasingly unlikely situation. Otherwise, buyers simply turn to foreign suppliers for commodities to the exclusion of U.S. companies, rendering our policy goals moot;

c) The importance of multilateral efforts cannot be understated as efforts to impose U.S. export controls on foreign companies beyond U.S. jurisdiction are all the more ineffective. Efforts to extend U.S. law extraterritorially damage trade relationships with allies and can result in litigation and/or retaliation.

2) Bids by U.S. companies that would be eligible are often hindered by certain restrictions that make finalization of the deal, further investment, or continued maintenance or upgrade of product after the initial sale extremely difficult:

a) Current regulations for sales of high tech commodities to Libya to augment the so called "installed base" require verification of the origin of the base. Given the comprehensive trade restrictions in place for decades barring U.S. trade and investment in Libya, exporters must invest an enormous amount of time and resources in an effort to comply when in many cases the origin of the technology is essentially unknowable. In the meantime, transactions with foreign suppliers become increasingly easier to facilitate and thus more attractive;

b) In some cases, companies can obtain licensing for the initial sale of product but face significant delays or denial in obtaining licenses to export replacement parts needed for continued upkeep and maintenance. This damages the reputation of U.S. exporters as reliable suppliers throughout the life of an investment and ultimately damages their chances of obtaining future contracts.

Haynes Roberts
USA*Engage
Project Manager
(202) 887-0278
hroberts@nftc.org

*Comments from Cordin Company, Inc. 2230 South 3270 West, Salt Lake City, Utah 84119*
*Contact: Susan Wenger, Sales Manager*

*RE: Bureau of Industry and Security 15 CFR Chapter VII (Docket No. 040910262-4262-01)*
*Request for comment on foreign policy-based export controls.*

*Sheila Quarterman*
*Regulatory Policy Division*
*Bureau of Industry and Security*
*Department of Commerce*
*P.O. Box 273*
*Washington, D.C. 20044*

*e-mail: Squarter@bis.doc.gov.*

*Date: November 18, 2004*

**Background**

Cordin has been in business for 45 years as a supplier of high-speed scientific imaging equipment and for most of that time a major portion of our product line has been regulated by export restrictions. These comments are based my personal sales experience and other sales agents working for Cordin Company in talking with customers worldwide. I have been an employee of Cordin Company for over 11 years, but the President of Cordin Company, Sid Nebeker, has been a source of some of this information that predates my employment at Cordin Company

The high-speed imaging market is very small and there are only between 25 and 40 sales per year worldwide that require these ultra high-speed imaging systems. Researchers all over the world that require these systems know each other on a personal basis. There are five companies in the world that compete for this small number of sales. Cordin Company is the only company that manufactures ultra high-speed imaging systems in the USA. Cordin has remained a small company independently owned in spite of competition from our competitors that now are owned by strong healthy large parent companies.

Cordin is now the last remaining supplier of this ultra-high speed imaging technology in the USA. Cordin's survival as a supplier of this technology is now in jeopardy because of export regulations that are more stringent than competitors, and high costs of developing new digital high-speed imaging technology in this repressed US marketplace.

Cordin previously sold high speed rotating mirror film-based camera systems and now has developed new digital technology that uses rotating mirrors, image intensifiers and image converter tubes. Because of factors relating to the rotating mirror type of camera systems the following comments are directed mostly to this one portion of our product line. Other problems exist with controls on all three types of high-speed imaging system but they are not specifically being addressed in these comments.

**Comments**

***1. The likelihood that such controls will achieve the intended foreign policy purpose, in light of other factors, including the availability from other countries of the goods, software of technology proposed for such controls.***

High-speed rotating mirror film camera systems using the Miller Principle have been in existence as a commercial item since the 1950's. Originally the rotating mirror cameras were manufactured commercially in Europe, and the USA. Russia manufactured these systems also, but not on a free market basis. Most often the Russians just give away their technology to end-users to help them develop their

own systems. These rotating mirror film cameras while they are time consuming to make actually do not require a high technology type of manufacturing. The technology required to make one of these cameras has been available for over 50 years. A detailed description of how to make an ultra-high speed rotating mirror camera was published in The review of Scientific Instruments Volume 30, Number 11, November 1959, a copy of this document is included as EXIBIT #1. This is how Cordin obtained information on making these camera systems. This document is available at most university libraries in the US and many libraries not in the US. At that time a general release of drawing of the equipment developed by the U.S. Atomic Energy Commission and its Contractors was also released. One company selling these drawings was The Rapid Blue Print Company in Las Angeles, CA. Included in these drawings were detailed blueprints for High-speed rotating mirror camera systems and also associated rotating mirror turbines. A copy of that catalog is also included as EXHIBIT #2. Cordin was one of the original manufacturers of film based rotating mirror cameras systems starting in 1959. These articles and drawings were the stimulus that generated Cordin cameras and many other high-speed camera manufactures worldwide. The equipment used for manufacture at Cordin is now very old and outdated, but still is used to manufacture these sytems. Similar machinery is available all over the world. In fact any machine required to manufacture high-speed camera systems is available surplus or new on the internet with no limiting export controls. Many of the critical parts of the cameras are manufactured in countries were the licensing controls are most prohibitive. An example of this is the Cordin high-speed systems, both film and digital require somewhat complex lenses. Our lenses for many of our high-speed cameras systems are purchased from the China Daheng Corporation in Beijing, China. The most difficult component to manufacture in a high-speed rotating mirror camera was purchased years ago from China. This piece of equipment is locked in our bond room at the present time. It is equal to the precise that Cordin can offer in this component. At the present time Cordin is the last remaining commercial manufacturer of rotating mirror imaging systems. Not because the technology is difficult, only because Cordin has kept their costs low and made a high-quality cameras that functions reliably for years. This is 50-year old technology, based on scientific principles that are common knowledge all over the world. However, Cordin is not the only commercial company making multiple-frame ultra high-speed digital cameras.

This brings up another issue. Cordin and several other companies were manufacturing high-speed rotating mirror film camera systems in the past. Now these high-speed rotating mirror film camera systems are no longer the cameras of choice for researchers. Because of the convenience and the time-cost savings offered by the new digital high-speed cameras, the old film cameras are now being replaced and the old film cameras are being sold as surplus to the highest bidder. Because these cameras are sometimes as old as 40+ years the original researcher that knew these systems were on export licensing control are no longer using the system, or even in the same institution. Therefore these old cameras, that function very well at many millions of frames per second are being surplused by governments labs, private companies, and universities all over the world, even in the USA. Many old high-speed cameras and accessories, not just Cordin cameras, but all manufactures models are now even being offered for sale by government surplus and private firms on the internet for pennies on the dollar. We have purchased some of these systems from private citizens who were keeping them in their garages. It is not unusual to purchase a whole high-speed camera system for $2,000 to $5,000. The original price of these systems was between $100,000 to $300,000 USD. Cordin in the past 10 to 15 years has made an effort to purchase back old systems and we would refurbish them and sell them to customers as used in line with export regulations. Now there is no commercial interest in new rotating mirror film cameras. We have not sold a rotating mirror film camera or talked to a customer who has an interest in these systems, anywhere in the world, including India, Pakistan and China for at least two years. These old film cameras now have almost no value and Cordin is not able to continue to purchase this old equipment that is out for sale to the highest bidder. If someone is interested in making one of these old film camera systems work, it is not very difficult and all the old electronic functions, there were somewhat difficult in the past, can now be done with a small personal computer by a good computer programmer. We have in the past six months seen one Cordin Camera and several different types of camera electronics that were manufactured by Cordin. Also it should be noted we did not do a comprehensive search for these items, these were items that we ran across inadvertently while doing other tasks. Many more items are out for sale than we have made and effort to locate. Three items are being offered in evidence, these items are currently as of November 19, 2004 on the internet for sale as surplused equipment.. The three items are offered for sale on the internet by resellers who have no idea what they are selling or that these items are on control. These items are offered are only a sample of what is on the internet. Some researchers are mentioning on their websites that they purchased their high-speed camera systems used on the internet or from government surplus sales. These items are offered as EXHIBIT #3.

**Competitors**

The recent switch of camera systems from film to CCD has been an even larger burden on Cordin Company, the only remaining US manufacturer of ultra-high speed cameras. Cordin has always had competition in the high-speed camera market. The main competitors in the high-speed digital framing market are DRS Hadland, a company incorporated originally in England, that has now been purchased by a parent company in Canada. Their website is http://www.drs.com/products/index.cfm?gID=11 and then click on Ultra high speed camera systems. PCO a high-speed camera manufacturer located in Germany. Their corresponding website is http://www.pco.de/php/products/index_1-en__01030201.html . These are the companies that make multiple frame intensified, gated CCD camera systems. Both companies have several high-speed models that have exposure times to 5 ns or less. There are also a number of single frame camera manufactures worldwide who manufacture cameras that can take one or two frames at speeds to 1.5 ns. I have supplied the website of three of these companies located outside of the USA. The websites are: http://www.jobinyvon.com/usadivisions/OSD/iccd.htm, http://lavision.de/index.shtml, http://www.photek.co.uk/systems/ICNSGC.html This is just a sample of some of the foreign competitors in the ultra-high speed imaging market in Europe using just single digital camera technology. There are many of these companies, but they are not always a direct competitor to Cordin because of their inability to do multiple frames in one sequence. However, a researcher not able to obtain a multiple frame camera often will purchase single frame cameras. There is a new competitor who is working on a camera system also in Japan, the Shimatzu camera. This camera should have framing rates up to 1 million fps. This system is not quite ready for release commercially, but has a high interest level from researchers and many papers have been presented at seminars and conferences by the researcher in Japan making this system.

The main image converter streak camera competitors are Hamamatsu in Japan. A list of competing products is available at the following website, http://usa.hamamatsu.com/en/products/system-division/ultra-fast/streak-systems/productlist.php?&overview=20288. Bifo is the second competitor located in Russia. Their official website is http://bifo.firmsite.ru/. These competitors have imaging systems that are equal to and sometimes better than, in relation to faster exposure times, than imaging systems that Cordin sells. The countries that our competition are located in, even though they have signed the Wassener Treaty, do not have licensing regulations that are as restrictive as those that are imposed on Cordin Company by the US export licensing policies. Many times when we are in competition with them for foreign sales they can ship to customers in areas of the world we cannot ship to. They can and do ship to customers that we are restricted from shipping to because they are on the USA Entity list or under some type of US Government trade restriction such as embargos. But even in foreign sales not on special restriction these companies are granted licenses to places we can never sell to because we cannot obtain an export license. The high-speed camera market is small and many of the researchers worldwide are acquainted with each other. Word spreads fast that our competitors can sell to them with less hassle than Cordin can. They take away many sales just because of the perception that we may not get a license for them. Many customers tell us they do not wish to make such an effort to obtain a US export license when they will likely get an imaging system from our competitors more easily. The only reason we are considered at all is price, we are required to sell for much less than competitors, or we have a specific feature in our system that is a much better answer for the customer's specific reseach. These features might consist of higher number of frames or better pixel resolution, not anything related to speed or ability of the system to do the required application.

**Examples:**

An Indian Government lab purchased a camera from Hadland with an Export License issued from the UK while Cordin was totally restricted from making sales to India. This will be discussed in more detail in another area of this communication.

PCO located in Germany has a much easier time obtaining licenses in China and in India than Cordin does because Germany is much less restrictive in selling equipment to these locations.

Hamamatsu in Japan and Bifo in Russia have less stringent export licensing restrictions and take foreign image converter camera sales away from Cordin on a regular basis.

***2. Whether the foreign policy purpose of such controls can be achieved through negotiations or other alternative means.***

High-speed camera systems are used for research both for commercial, medical and weapons research. A high-speed camera is not a weapon, it is a scientific tool controlled as if it were a weapon. Most of the uses for the camera systems are not in weapons research, but material testing, plasma studies, nanotechnology, medical research, fluid studies, particle image velocity and much more. It can also be used in research to make weapons of mass destruction and is useful for conventional weapons research. This is in line with the current definition for the cameras as a dual-use item. However, the current mindset of the licensing boards is to not let the high-speed camera systems into the third world countries in question even if the use is not weapons of mass destruction. This attitude will not stop the proliferation of nuclear or conventional weapons, it will only force the customers to either purchase the camera from a competitor, purchase from the internet or as a last resort make their own camera.

It would seem that monitoring the country's weapons research is more productive than prohibiting scientific research equipment and therefore hampering peacetime research at the same time. The weapons research is continuing unrestricted in countries that are determined to do this type of research. Licensing controls control only good people that obey the USA rules and regulations.

***3. The compatibility of the controls with the foreign policy objectives of the United States and with overall United States policy toward the country subject to the controls.***

No Comment on this item

***4. Whether reaction of other countries to the extension of such controls by the United States is not likely to render the controls ineffective in achieving the intended foreign policy purpose or be counterproductive to the United States foreign policy interests.***

The attitude of foreign researchers is one of distain that the US government feels they are not deserving of scientific research equipment. This tends to alienate the educated research community in general. When a country is under strict export licensing controls the perception is that all goods of similar types are under US export control. The US export licensing rules are not being explained to the researchers who want the equipment, only to their governments. This is even more the case when a reseacher is not doing weapons research. Reseachers doing work that is not considered a security risk often do not understand that they might obtain an imaging system form the US. They are just being told they cannot have certain types of technology, in our case camera systems. We have slower speed cameras that are for sale, but these are not being purchased in foreign countries because of the misconception that all Cordin imaging equipment is under US export control, not just the higher-speed systems. However, the lesser restrictions of other countries on camera controls allows customers to purchase from our competitors. These countries are then perceived by the customers to be more friendly and more supportive of their work. Therefore our competitors obtain more sales of restricted and non-restricted equipment in the foreign marketplaces.

5. ***The comparative benefits to the U.S. foreign policy objectives versus the effect of the controls on the export performance of United States, the competitive position of the United States in the international economy, the international reputation of the United States as a supplier of goods and technology.***

It is human nature to purchase from a friendly source. If a customer is given the opportunity to purchase from a friendly source and a source that appears judgmental and restrictive, the consumer will purchase from the source that appears to be the most supportive of their position. The USA has tried to keep all its technology that might be used in weapons research or production away from developing countries. These countries then perceive the USA as a non-supportive source of goods of all types not just restricted items. The USA has a reputation for being controlling and not listening to individual objections. This has certainly been supported by our experience with licensing agencies over the years.

In our experience in the high-speed camera marketplace all the restrictions have accomplished is to restrict the development and sales of high-speed camera systems by US companies and allow competing foreign companies to take over the marketplace. There is little restriction on customers obtaining high-speed cameras in the foreign marketplace, only a restriction on US high-speed cameras. Our competitors now all offer cameras that have faster exposure times than Cordin offers. We are now behind in development

because of lack of financial resources. A visit to the websites that I have supplied above will show the wide variety of high-speed cameras offered with exposure times in the nanosecond range.

***6. The ability of the United States to enforce the controls effectively. BIS is particularly interested in the experience of individual exporters in complying with the proliferation controls, with emphasis on economic impact and specific instances of business lost to foreign competitors.***

Our experience with enforcement of the licensing controls is that we have been penalized in world sales by export licensing rules that are more restrictive than our competitors face. Added to this is the fact we need to obtain an export license to sell the camera discourages sales even in the European community . When our competitors come to the US to compete with us there is no such restriction. They pay a duty tax to have their goods brought into the US but it is certainly not that they do have to obtain an export license to sell here. They can compete on equal ground with us here in the US, but we are not able to compete equally with them outside of the US. One competitor, PCO in Germany, has a much less restrictive export licensing policy to deal with from Germany. Our other competitor DRS Hadland based in Canada also has a somewhat less restrictive policy and almost no duty or tax when they come to the US to compete with Cordin in the US markets. We hear very often from customers that if they cannot purchase our camera they will purchase from another source. We are not always able to find out from the customer what camera was purchased or have definite proof that the customer has purchased a camera, but they are no longer interested in our systems. Therefore, evidence that we have obtained that they have purchased a competing high-speed system is likely valid. There are some examples listed below where we have been able to determine that the customers were not able to purchase a camera from Cordin because of export licensing restrictions, but they obtained a comparable or higher high-speed camera from another source.

## Examples

Beijing, China - Cordin applied for a US export license to send a rotating mirror camera system with the framing rate of 2 million fps in 1996. The US Export License application was denied. The customer was no longer interested in communicating with us on a commercial basis but some follow up a year or two later revealed that this customer had obtained a camera with very similar capabilities. They would not reveal the source of this system. Recent discoveries on our part in China has revealed that a camera system that is a rotating mirror, continuous access camera system is being made and used in China. One such camera is in use by Dr. Li Jingzhen at Shenzhen University. We know that the Xian Institute of Optical and Precise Mechanics in China has previously made rotating mirror camera systems and they were involved in the design of this camera system. Their Model S-150 has a framing rate even better than our Model 330 camera. They are able to achieve rates of 2.5 million fps, our Model 330 acheives only 2 million fps. A copy of the corresponding papers and names of researchers is included with this document. This document is EXHIBIT #4. I have met Dr. Li Jingzhen in person and he is now thinking of designing a digital rotating mirror camera similar to our camera.

India in Oct 28, 2002 Chandipur Proof and Experimental Establishment wanted a high-speed range camera system. They contacted both Cordin and Hadland. Cordin was not able to sell to India then and even now a camera that might be used in missile technology would be prohibited. On Oct 28, 2002 Hadland, then based in the UK was able to obtain an English export license to sell their SVRII range camera to Chandipur. Therefore, giving them an adequate camera to develop missile technology. A document containing the exact specifications of that camera system is no longer available on Hadland's website. So I am including a copy of the newer version of that system the Model SVR3. The specification difference is that the camera had exposure times of 100 ns and the resolution was 1000 x 1000 pixels. Otherwise the specifications are essentially the same. Also I am including a copy of the actual purchase order issued for that system and specifications for the SVR 3 as EXHIBIT #5

These are two instances that I have absolute proof that the US had prohibited Cordin from selling to a customer and the customer has obtained a camera from another competitor or manufactured one for themselves. These are not the only instances, but these are times when I have documented proof that the customer purchased another system from a competitor. We hear that this is the case often, but we do not often have absolute documented proof, especially in India and China.

Dialogs with customers in countries previously on embargo or other total restrictions has revealed that they were not seriously hampered by not being able to buy from the US. The goods (not just cameras systems) were purchased from other countries or they will admit to a black market purchase that the prohibited items were routed through Hong Kong or Singapore and then shipped to them. The price was higher, but that

was the only limitation they incurred. Researchers in Russia, India, China and other third world countries have disclosed information to Cordin that they used high-speed camera systems in their research, when they could not obtain a camera from the US they obtained a camera from another country or they manufactured the cameras themselves. This is only hear-say evidence, but this has happened many times in sales conversations with prospective customers.

An example of this is a customer in Spain was discussing specifications of Cordin cameras for a possible purchase. He disclosed that while he was in Brazil he used a Cordin camera system for his research. Cordin has never sold a camera system to anyone in Brazil.

Again the possibility of cameras being given or lent by other researchers or sold as surplus to the highest bidder is likely the source of some of these systems.

We have information of numerous researchers, not just in the USA, who have given away their old film camera systems or lent a camera system to other researchers out of the USA. They did not know that an export license was required for this and none was obtained. They were just trying to help move research forward.

***1. Information on the effect of foreign policy-based export controls on sales of U.S. Products to third world countries (i.e., those countries not targeted by sanctions), including the views of foreign purchasers or prospective customers regarding U.S. foreign policy based export controls.***

Customers in all countries of the world see export licensing as an intrusion into their privacy. The research is often not secret or sensitive, but research that is being published. The thought of having to be checked out by the US government before they can have US goods is not appealing. If they can obtain goods from another source they will. Cordin does sell some camera systems that are not fast enough to require export licensing and similar systems are available through other sources. They will often not purchase these from us because they feel that all our cameras require a license and therefore we are not considered when they require photographic equipment.

The researchers are a very small group of people that work with high-speed photography and many belong to worldwide groups of researchers. Because of this if one researcher in a country is turned down for an export license, then all the others feel they will also be turned down and therefore, they purchase their photographic equipment from our competitors because they have less restrictive licensing requirements in their countries (Canada Japan, Russia and Germany).

***2. I nformation on controls maintained by U.S. trade partners. For example, to what extent do they have similar controls on goods and technology on a worldwide basis or to specific destinations?***

We have previously given two examples of other countries less restrictive licensing practices. There are many others that are not hard copy documented. There are many cases of customers in India and China where, I knew they had funds to purchase equipment. They could not purchase our equipment, they did purchase some type of a high-speed system. Two more specific areas are the Synchotron at Indore, the customers were interested in a Cordin Image converter streak camera. We were not able to supply this because of Export restrictions so the Russians stepped in and developed a high-speed image converer camera system for them. China, We have not been able to sell intensified gated CCD camera systems to China or India. When we cannot sell without an export license our competitors in many cases have been able to sell to those same customers similar or like equipment.. China is an excellent example where German regulations are much more lenient and India is an excellent example where European restrictions are much more lenient. We know of numerous sales and cooperations in these countries that we have been excluded from but the customer obtained the same equipment from a competitor. Examples of this are the Customer at Chanidpur purchasing a system from Hadland, when they were located in the UK. The customer in China developing their own camera system in cooperation with their own industrial suppliers and funding from the National Natural Science Foundation of China under a grant. There is also another thing to consider in controls is most of the researchers are highly educated engineers and they have access to other engineering talents in their country. What has been happening lately is if the customer is not able to obtain the photographic system they want from a commercial vendor, then they have manufactured the cameras themselves. The theory of high-speed cameras is well known worldwide and in many cases the researcher can make his system, most researcher would rather not spend the time to develop a high-speed camera , but when it is the only option then they often can and will make their own camera. This has happened in Europe, India, Russia, and China. A good example is a Russian engineer who wanted a

Cordin Streak camera system. We were eventually able to sell the streak system to the customer but the discussions for the export license lasted 6 months. The customer wanted also a framing camera with femosecond exposure times. Rather than hassle the USA again to obtain this system, he simply made his own femtosecond camera.

***3. Information on licensing policies or practices by our foreign trade partners which are similar to U.S. foreign policy based export controls, including license review criteria, use of conditions, requirements for pre and post shipment verifications.***

We have no first hand knowledge of any licensing policies that are as rigorous as the US imposes. Our experience with competitors obtaining a license on a sale that we were not able to make has been they have a very short process and a much greater success rate that Cordin has. The only documented example we have to give is again the sale at Chandipur by Hadland. Cordin was not able to sell to this customer. Hadland applied for a license, it was quickly granted, the customers were allowed to travel to the UK for training and acceptance of the camera with no visa delays. In order for Cordin to do the same thing (if it were hypothetically granted), the licensing process would take from 3 to 9 months time. We have often had licenses take this much time in the past. This process is seriously affecting our ability to remain in business. Our competitors grow stronger with increased sales and Cordin is weakened more each year with less of the worldwide sales being directed to Cordin. Our competitors are growing stronger with a worldwide market. We are growing financially weaker even though we are the only company that sells ultra-high speed cameras in the USA that is located in the USA, all our competitors can sell on equal footing in the US. We have distinct disadvantages in selling anywhere out of the US from over zealous export licensing practices.

The only first hand experience I have is that none of the customers are aware of where to obtain the documents required for US Export Licensing. This is usually something they have never heard of. They obviously are not purchasing other American goods that are on restriction. This is true expecially in Europe.

***4. Suggestions for revision to foreign policy-based export controls that would (if there are any differences) bring them more into line with multilateral practice.***

Other foreign trade countries are developing partnerships with the third world researchers who are working on government research projects. We are just telling researchers no you cannot have equipment so you cannot develop any technology, not just weapons. European Universities are working with Indian and Chinese researchers to help them to develop technology to improve their lives and their safety. The US is just saying no technology and no help. No wonder our image in the world is so flawed. We are opening our doors to our universities to educate foreign research engineers. When they return to their own countries we tell them, now you cannot have any scientific equipment that you need for your research. There is not a logical explanation for this policy. It is becoming more obvious that the US is loosing ground with the present export licensing policies regulating high-speed camera systems. I have talked with researchers in the former Soviet Union and have asked how they obtained their research equipment when no equipment from other countries could be legally sold to them. I was told that they did not have a problem obtaining the equipment they wanted on the black market. The price was higher, but it was always available. I have asked this question of Indian Researchers and the same answer was given. They will obtain the goods they just have to pay a higher price and then they are shipped to Hong Kong or Singapore then routed to them.

We are spending huge amounts of money to try to control exports out of the USA. In the case of the high-speed camera systems, it is no longer possible to control technology that is as old as this technology is. The cameras were developed in the 1940's and in the 1950's information on how to build these cameras was released to the US public and essentially at that time to the whole world as in EXHIBIT #1. The technology is not impossibly difficult to master. Cordin has very old machinery and yet manages to manufacture high-speed cameras with speeds to 10 ns. Yes, there is skill involved, but not skill that people all over the world cannot master also. The equipment required to make these rotating mirror film cameras is available in any country in the world. Many of our parts are purchased out of the US such as high quality lenses for our cameras are purchased from China. Old high-speed film cameras perceived in the US research community as surplus are being sold for pennies on the dollar through government surplus sales and this has been happening for more than 15 years. The internet has given more information to would be researchers who would like to obtain high-speed photography equipment by researchers all over the world using current researcher's websites to tell how they obtained their camera systems on government

surplus. The case in point of the researcher I mentioned earlier in this document from Spain who had been using a Cordin camera in Brazil. Cordin has not in the past sold a camera to anyone in Brazil.

The new digital camera systems are more high-tech and take more expertise to make than the old film cameras. However, the old film cameras will take a higher resolution picture than any of the high-speed digital cameras that are available in the world at the present time.

Our licensing committees are too much into what will happen if this camera is relocated, if it is stolen, if it is used by unauthorized people. The research engineers are not doing work that is a threat to the US or the world at large in the cases we have presented to the licensing committees, we try to weed out questionable cases. We are most often denied because of a "what if" frame of mind. The regulations state that each case will be evaluated on a "case by case" basis. This is not happening. They are concocting scenarios of what might happen sometime in the future. From our experience the customer often obtains a similar systems anyway, just not a Cordin system. Other licensing foreign partners are not using this what if frame of mind. They evaluate on the research being done by the researcher and quit trying to forecast the future. The reality of high-speed cameras is at this point in time is if someone wants a high-speed camera they will obtain one. In third world countries they will usually first will try to purchase according to rules. They will purchase from a commercial company and apply for a license. The US will likely deny the licensing but the other countries are more likely to allow the cameras to be sold. If that does not work because their research is questionable, then they have the alternatives of making their own camera and this is sometimes done or looking for a used surplused system or last resort purchasing from the black market. There are 45 years of old high-speed film cameras out in the world. Most of these systems combined with a personal computer and a good programmer will operate at the same level as when they were brand new. This is no longer a controllable technology. The only thing the US has managed to do is to force all US companies making high-speed cameras out of business over the years. Cordin is the last company in the USA. Cordin is not the last company in the world making ultra high-speed imaging systems. If the restrictions are going to continue unchanged Cordin will also be put out of business our competitors will be the winners. They are already stronger financially than Cordin is by a significant degree. They have all the advantages.

***5. Comments or suggestions as to actions that would make multilateral controls more effective.***

If high-speed camera systems are to be controlled then all the countries must use the same criteria or there must be one committee worldwide that will regulate the licensing. One country even as large and as powerful as the USA cannot stop items being sold or given to undesirable researchers if the rest of the countries are not willing to regulate in the same manner. At this point in time they are not using the same criteria. The USA is regulating very strictly the sales of ultra high-speed cameras. The rest of the world is regulating on a moderate basis or not at all. The Chinese have high-speed rotating mirror film camera systems that rival our rotating mirror camera systems and in some cases exceed our capabilities. We are still not being allowed to sell high-speed rotating mirror camera systems to China. Perhaps in the future the only place US companies can obtain high-speed rotating mirror cameras will be from China, Cordin's survival is seriously threatened. Unequal licensing restrictions are forcing Cordin, the last US high-speed imaging manufacturer out of business.

***6. Iformation that illustrates the effect of foreign policy-based export controls on the trade or acquisitilons by intended targets of the control.***

Again I reiterate the information that I have been told by Russian and Indian researchers. They obtained whatever equipment they required when they required it. They just had to pay more for it. This is coming from Entities on the highest level of controls such as facilities on the Entity List and Countries under US Embargos.

***7. Data or other information as to the effect of foreign policy-based export controls on overall trade at the level of individual industrial sectors.***

The high-speed camera market is not a large market and in order for Cordin to survive we must also include foreign markets. The total number of high-speed camera system orders in the world per year is about 25-40 systems. This is divided between five companies. The market in the USA is not large enough to support any one company. Cordin has on the average 6 to 8 sales of high-speed camera systems per year. In a normal year in the past about one-third of the sales are from outside of the US. Since 9/11 the US economy has been in a recession and our US sales have been less than one-half of our business. Now with the addition of the Iraq war draining research funds less than one-quarter of our business is now in the

US. Our presence in the foreign market is now more than ever absolutely necessary. Our foreign competitors have a very great advantage over us in the foreign market because of the following factors:

1. The US export licensing regulations are far more restrictive than our competitors countries are. The countries that our competitors are in are Japan, Germany, Canada, and Russia, (possibly also soon China).
2. There is the added time and effort required to obtain the Export Licensing for the customer. A lot of time is spent in obtaining information and passing it on and trying to be sure that the customer is a valid researcher. Helping the customer to obtain documents from their government. Because these documents such as import certificates are not often used in their countries. We are doing work for the US government in this instance and there is no reimbursement for our efforts. With all of these disadvantages against us Cordin has been slipping into debt and is having an increasingly difficult time remaining in business.
3. Our competitors compete against us in the USA on an equal basis and they obtain some of the sales for high-speed systems in the US.

Basically we compete again foreign suppliers on an equal basis in the US, but we are not able to compete with them on any type of equal basis in the foreign markets, even Europe.

***8. Suggestions as to how to measure the effects of foreign policy-based export controls on trade.***

We have not researched this area thoroughly and our comments maybe somewhat superficial. However, it does seem that more and more small companies are being caught breaking the US export laws. I do not think that small companies that are healthy and doing a good business would take the risks involved with being caught and punished. The fines and punishment seem very high and the risk in getting caught seems quite high also.

I think maybe the question might be asked why is this happening? One or two foreign sales must be very important to the survival of these companies if they are willing to take this risk. What in the marketplace is causing the small companies at this time to be so financially dependent on a few foreign sales that they are willing to take this risk.

Perhaps small businesses manufacturing dual-use items are being forced by the poor US economy to pursue more foreign sales and the unfair competition with over restrictive licensing and high import duties on their goods are causing them to take risks they usually would not take.

Maybe just taking a look at these types of parameters and talking with the small companies. I am sure they are willing to comment on what is happening to them individually in the marketplace. Small companies will feel the financial pinch first. Large companies that have such a large voice in the government arena already are not going to feel the impact so easily.

Also how many companies are now going outside of the US to manufacture their dual-use goods. I am sure none of our competitors would even consider moving to the USA to manufacture.

***9. Information on the use of foreign policy-based export controls on targeted countries, entities or individuals.***

We can only give information that we see in respect to High-speed camera systems. The countries that are under the strictest controls now are developing the research that they were put on controlling restrictions to prevent. India and Pakistan even though they were on strict high-speed camera controls still developed nuclear weapons and missile technology. They have high-speed cameras from many sources but not the US. China has nuclear weapons, they could not purchase camera systems, so they made their own. Russia when they could not obtain high-speed camera systems. They made their own. These controls do not seem to be working they seem to be giving the researchers incentives to become more independent and create more technology on their own if they cannot obtain it from the marketplace. Perhaps we need to stop playing big brother is policing you and start being a helpful neighbor to these countries instead. The internet has been a great equalizer for the whole world in transferring information and technology. This will increase as time goes on. This is a different type of world than we previously developed the export restrictions for. Perhaps we need to have a new type of foreign policy, the old ways do not appear to be working. We are losing our place in the world view as a strong controlling nation, now is the time to make positive changes for the future and make an effort to be a contributor to the goal of world peace.

**SUMMARY**

In the opinion of our president, Sidney J. Nebeker, denial of export licenses has been our greatest single external problem limiting our prosperity and growth. The market is small and that margin has made a big difference. One lost sale is $200,000 to $400,000 this makes a difference to a company that only has a 1-2 million dollar business per year. The technology is old, 50 years old, and certainly not controllable anymore. The most difficult aspects have been described in widely distributed publications beginning in 1959. Years ago we ordered a sample of our most difficult component fro a Chinese Institute and we have it still in our bond room. The quality of this part is equal to or better than what Cordin can do.

Researchers at Universities in the USA are now most often people whose first language is not English. Our universities have trained thousands of foreign engineers, who seem to have dominated the research market both here and in foreign universities. Some of these engineers have opted to stay in the US, but many with equal skills have returned to their native countries to do research there. Using one University specifically as an example I use the prestigious CALTECH University in California. We have three high-speed camera systems there at that University. All the researchers and students that I deal with at that University are foreign born. I am sure that some of the students using these cameras are American's but seldom do I have any dealing with anyone except foreign-born researchers. (I do not have an explanation for this phenomena.) The point I wish to make is this facility is highly capable and does make some of their own high-speed camera systems to do their research, I am sure that these foreign students are making contributions to these systems and are learning to make the cameras also. I work with other students who graduate from Caltech who graduate and want to return home to their respective countries. Researchers from China and India and other third world countries are usually prohibited from purchasing our Cordin Camera systems. Many would like to do do. What is the logic of training research engineers and then telling them they cannot have research equipment when they return home. These people are certainly well trained enough to make their own cameras if they desire.

Controlling export regulations on ultra high-speed camera systems have been in force for many years. There are many foreign companies making ultra high-speed camera systems worldwide. I have provided many concrete examples of these competitors. What is the explanation for the US having only one company, and if the regulations continue the US will very soon have no high-speed camera manufacturing company. Could it be our market is being unfairly restricted, while our competitors sell much more freely. Researchers despite US export regulations are still obtaining ultra-high speed cameras even in third world countries and have had them for many years. Nuclear proliferation is continuing to increase despite overly restrictive licensing practices. This system is not working, it is limiting only one thing, the ability of US dual-use manufactures to survive. If something is not done to equalize this, the US will not have any high-tech equipment that the world will want anyway. Commercial companies must be able to make a profit to survive. The small world markets for this high-tech equipment is heavily restricted for US manufacturers.

The high-speed film camera business has now collapsed, we have developed electronic sensor cameras at great expense to Cordin. There are many US military and university laboratories that want our equipment but funding is slow in this difficult time of recession and war on terror. We need these foreign orders now just to survive.

IF YOU HAVE QUESTIONS OR DESIRE ADDITIONAL INFORMATION ON THESE COMMENTS OR CORRESPONDING EXHIBITS PLEASE CONTACT:

SUSAN WENGER, SALES MANAGER
801 972-5272 EX 213
susan@cordin.com

Exhibit #1 page 1



cocks and G is a Bayard-Alpert ionization gauge. Leaving $C_1$ closed all the system was thoroughly outgassed, the ionization gauge was electron-bombarded over 1 hr, and then the experiment was begun. When $C_2$ and $C_3$ are closed and $C_1$ is opened the ionization gauge reading should not change if the ultimate pressure in the volume between $C_1$ and $C_2$ (attained only with the diffusion pump) is equal to that on side G, that is, if the ultimate pressure of the diffusion pump is the same as the pressure measured with the ionization gauge. If ionization pumping comes into play, the pressure reading should increase when $C_1$ is opened, that is, the intrinsic ultimate pressure with the diffusion pump is higher than that measured with the ionization gauge. Repeated measurements made on this principle indicate that the ultimate pressure is better than $1\times10^{-10}$ mm Hg.

In comparison with the oil diffusion pump, it is very important to investigate the components of the residual gas in an ultra-high vacuum attained with a mercury diffusion pump. For this purpose an attempt was made to apply an omegatron-type mass spectrometer. Preliminary results indicated that the main constituents of residual gas are possibly $H_2$ and He after the system had been evacuated for several days, although at the beginning there existed components such as CO, which presumably came out of metal electrodes.[9]

ACKNOWLEDGMENTS

The authors wish to thank Mr. H. Arata and Mr. O. Ochi for their assistance in fabricating vacuum apparatus and measurements.

[9] J. H. Reynolds, Rev. Sci. Instr. 27, 928 (1956). From his analysis the portion of the spectrum lighter than mass number 12 is missing.

---

THE REVIEW OF SCIENTIFIC INSTRUMENTS VOLUME 30, NUMBER 11 NOVEMBER, 1959

# High-Speed Turbine-Driven Rotating Mirrors: Notes on Design, Construction, and Performance*

BERLYN BRIXNER
*Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico*
(Received June 9, 1959)

Described in detail are the main features of design and fabrication which contribute to the production of the reliable long-lived drives of several styles of high-speed turbine-driven rotating mirrors. The subjects analyzed are steel mirror fabrication, which includes heat treatment; mirror balancing and surface finishing techniques; important bearing design features; construction of the turbine; and performance of selected models.

## INTRODUCTION

SINCE the highly successful initial designs were completed in 1951 and 1952, many high-speed turbine-driven rotating mirrors have been made in a variety of styles and used at the Los Alamos Scientific Laboratory.[1] Rotating mirrors have been built with from one to nine polished faces, with mirror face sizes from $10\times17\frac{1}{2}$ mm to $3\frac{1}{2}\times3$ in. and with maximum speeds ranging from 550 to 24 000 rps. The same design features that were used in the early drives continue to be used in current models, since it has been found that these were sound. Many minor improvements in the designs and refinements in the fabricating techniques have been made, but these have mainly been concerned with ease of fabrication, reliability of operation, and long life with a minimum of upkeep. As a result of these features, very little maintenance is required. Many drives have been run intermittently for three or more years without servicing. Most mirror drives are used with rotating-mirror cameras, the maximum time for each run usually being less than 5 min and the average number of runs per day only two.

## MIRROR-BLANK FABRICATION

The rotating mirrors are still made from Allegheny Ludlum 609 steel since no other material with an appreciably superior ratio of tensile strength to density has yet been discovered. Although superior materials are available in thin sections, the strength and reliability of these for the thick sections needed for larger rotating mirrors have not been established. During the course of years five of the 609-steel mirrors have exploded either as a result of the initial testing or when in use in cameras. In only one case, however, was defective steel found to be the cause of the failure; the steel in the others showed no evidence of defect, and it can only be assumed that there were undetected flaws or that the operators inadvertently ran the mirrors at higher than rated speeds and simply exceeded the elastic limit of the mirrors. The discovery that in some cases the pressure controls on the lines were inadequate

* Work done under the auspices of the U. S. Atomic Energy Commission.

[1] This paper gives additional information about the drives which have been made since publication of the article by W. E. Buck, Rev. Sci. Instr. 25, 115 (1954).

for reliable pressure regulation supplies evidence for the latter theory.

The steel used for mirror construction is the ordinary mill-run bar stock, a steel whose grain structure runs in the direction in which the bar was passed through the rolling mill. The amount of segregation and the dendritic structure is determined by the metallurgical department, which gives deep-etch tests to sections from the ends of each bar. It has been found that in rectangular bars there is an appreciably greater segregation at a center band than in the remainder of the bar. Another defect which tends to collect near the center comes from slag inclusions, which take the form of stringers oriented in the direction of the grain structure. Therefore bars should be thick enough to permit obtaining the mirrors from the stock near the surface and discarding the center section. The rotating mirror is usually cut from the bar so that the grain structure runs in the direction of the centrifugal force. This procedure insures that any flaws in the steel will present the least area to the centrifugal force.

HEAT TREATMENT

Since the high tensile strength required is dependent upon the heat treatment of the steel, this is the most important part of the fabrication procedure. Special precautions are necessary during the heat-treatment operation because the high-silicon steel used is very sensitive to decarburization, which softens the steel. The cause of decarburization is the presence of oxygen from the air adjacent to the hot metal. It was found that decarburization could be avoided if, during the heating, the steel was in either a graphite or an iron boat and covered with powdered graphite for both austenitizing and tempering. Since a certain amount of warpage of the piece and decarburization of the surface is unavoidable, it was found desirable to leave 0.030 to 0.050 in. of extra material on all surfaces prior to heat treatment. This extra thickness is ground off during the finishing process; circular grinding wheels are used to remove this extra stock and to finish the piece to the required size and surface smoothness.

To austenitize the steel, the rough-machined mirror is covered with graphite and placed in a furnace at 1650°F, where it is heated for such a time as to reach and remain at 1650°F for about ½ hr. It has been found that heating in a 2 kw electric furnace requires 1 hr for the smallest mirror and about 3 hr for the largest mentioned in the first paragraph. For quick cooling, after the piece is removed from the graphite, it is immediately immersed in quenching oil, where it is continuously agitated. Rapid cooling is essential to keep the transformation to martensite at a maximum. To clear the knee of the isothermal transformation diagram for this steel and thus to avoid the formation of weak perlite structure, all parts of the piece must cool to 900°F within 15 sec after the start of cooling and to 500°F within 90 sec. The temperature of the piece is then lowered to at least 200°F but not below room temperature. Immediate tempering or drawing of the piece minimizes the possibility of crack formation by spontaneous stress relief. The hardened mirror blank is tempered by again covering it with powdered graphite and returning it to a furnace at 600°F, where it is left for 4 hr or longer. It has been found that heating in air at 600°F will cause considerable decarburization of the steel, which in turn reduces the surface hardness. This reduction in surface hardness leads to spurious readings if one wishes to know the interior hardness, and that is, of course, the most important guide to gauging the strength of the piece. The time required for tempering the steel is not critical but probably should not be less than the time suggested. When two test pieces of 609 steel were tempered for 4 and 24 hr, respectively, both were found to have the same hardness, Rockwell C-56 to C-57, the hardness at which this material develops its optimum strength with appreciable ductility still remaining.

The tempered steel still has a small amount of retained austenite, which may be partially converted to martensite by cooling to very low temperatures. Hence the piece is cycled several times between the ambient temperatures of liquid nitrogen (−325°F) and boiling water (200°F). After this treatment the piece is again tempered for 4 hr at 600°F. The hardness should not be changed by this additional treatment, which is optional but which is recommended to give maximum strength and stress relief to the steel mirror.

## MIRROR BALANCING AND FINISHING

The machine shop now finishes the tempered mirror blank to size, using ordinary grinding techniques, i.e., abrasive wheels and liquid coolants. It has been found that a concentricity tolerance of 0.0002 in. can be maintained for the surfaces of the steel blank. Since any cracks or checks in the metal surface would greatly increase the chance of mirror failure, it is important at this stage to be sure that neither the heat treatment nor the grinding has produced any cracks or checks in the metal surface. One of the standard methods, such as Magnaflux or Magnaglow, is used to test the surface for defects. Cracks caused by the heat treatment are the most serious, since they generally penetrate deeply into the steel and will rarely disappear during the remainder of the grinding operation. Hence, examination for cracks should be made at several stages in the fabrication process, for much labor is saved by discarding a defective piece as early as the fault can be discovered. Shallow grinding cracks, which are generally caused by glazed or improperly bonded wheels, may be removed by continued grinding with a suitable wheel.

As soon as the final grinding has been completed, the blank is tested for balance on a dynamic balancing machine. A commercial machine with a sensitivity rating of 10 μoz-in. has been found satisfactory. Since the bearing vibration transducers of the balancing machine will trans-

Exhibit 1 page 3



late roughness of the shaft as noise, care should be taken to have the bearing and shaft free of all burrs and the surface roughness not more than 10 μin. The shaft is smoothed by lapping it with a brass lap and 600-mesh abrasive compound. The lap consists of a small brass block with a hole for the shaft and a split in the side to permit clamping as much as necessary to obtain sufficient abrasive action. To eliminate another source of transducer noise, avoid using a belt drive to rotate the mirror blank in the balancing machine. A jet of air from a ¼-in. tube on a 40-lb pressure line is quite satisfactory for rotating most blanks on the balancing machine. During the final stages of balancing, the noise of the air impinging on the mirror blank can be avoided by turning the air jet off and taking the reading while the piece is coasting but before it has slowed below whatever speed has been found to give satisfactory sensitivity. If the mirror blank has been finished within the required tolerance, it will usually be found that the blank can be balanced by local lapping on one or more of the faces. All the faces which are to be polished are lapped with #900 abrasive suspended in an oil vehicle. Lapping should be continued until all marks from the abrasive wheel grinders have been removed and the surface presents an even light gray tone. If the abrasive and vehicle are scrubbed off the surface with industrial or similar tissue paper, sufficient polish will have been obtained to permit the flatness of the metal surface to be determined by interference methods in monochromatic light.

There are many semiautomatic machines suitable for the lapping process; one such is the Crane Packing Company's Lapmaster. These machines have an automatic abrasive feed, a rotating lapping plate, and conditioning rings to maintain the surface of this plate. The contour of the lapping plate can be changed at will to concave, flat, or convex by lateral adjustment of the conditioning rings, as described in the operating instructions for the machine. Mirrors as large as 4 in. in size have been flattened to within one-half fringe of sodium light, and most of the departure from flatness comes from turndown at the edge.

By chrome plating the surfaces which are to be polished, it is possible to avoid such defects as the resistance of the steel mirror to polish and its sensitivity to tarnish and rust from fingerprints, humid atmospheric conditions, etc. When the flat-lapped mirror blank has been prepared as described above, it is degreased by treating it with hot trichloroethylene or other solvent vapors. These condense on the surface and effectively remove the adsorbed oil and grease. The degreased blank is then mounted in a jig which protects those parts of the piece not to be plated. The whole assembly is next transferred to the plating bath where, for about a minute, the surface is stripped. Then the chrome is plated directly onto the steel surface, no intermediate coat of metal being required since the bond between the steel and chrome is sufficient for rotating

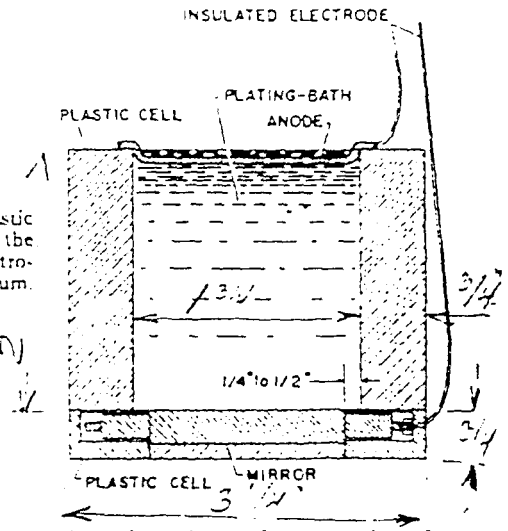



Fig. 1. The plastic cell used to mount the steel mirror for electroplating with chromium.

mirrors. Many mirrors have been in use for more than five years without noticeable deterioration of the chrome plating. A coat of chrome 0.0003 in. thick will cover the steel surface generously to provide a very hard homogeneous metal surface which will take a high polish. To obtain a flat coat, a uniform plating current density must be maintained across the faces of large mirrors. At the edge of the mirror face, however, a slightly thicker coat, say 0.0004 in., is preferable as the subsequent lapping progress can be easily observed by the ring-shaped pattern that appears on the surface. By mounting the mirror at the end of a cell of insulating material of suitable cross section as shown in Fig. 1, a greater current density at the edge can easily be produced. The desired variation in mirror plate thickness can be given to mirrors in the size range of 1½ to 4 in. by making the cell width ¼ to ½ in. larger than the mirror size. The cell should be as long as the maximum dimension of its cross section. The anode may be an electrode at the end of the cell, or if the assembly is immersed in a large bath, it may be the entire plating bath tank. The plate should be laid down at the rate recommended by the manufacturer of the bath being used.

When the mirror surface has been plated, it is again lapped flat by the same technique previously used. It is ready for the polishing operation when the surface is within one fringe of flatness. The chrome surface is given alternate polishings with a soft metal lap and a hard pitch lap, the former dry and the latter wet. The first soft metal lap which we tried was a Lapmaster polishing plate manufactured by the Crane Company. This did not give a satisfactory polish but did indicate a method of attacking the polishing problem. Excellent results have been obtained with a 6-in.-diameter polishing lap made of either Cerrotru or block tin, whose surface is grooved to cover it with facets about ⅛-in. square. Since the surface is easily nicked, the plate must be handled with great care. Conditioning for 5 min or more on the lapping machine charges the lap with #900 abrasive. After this conditioning, the polishing plate is

Exhibit 1 Page 4



scrubbed with a hand brush and a soap solution, flushed with tap water, and dried quickly with an air blast from a compressed air line, to free it of the oil vehicle and excess abrasive. It is important to keep the surface free of water spots and the minute oil film which results from touching the plate with the skin as it is handled.

The flat mirror blank is carefully laid on the polishing lap, which is now impregnated with abrasive, and the mirror is then moved over the surface with light pressure and figure eight strokes. It will be found that this treatment polishes the surface quickly. The abrasive action of the polishing lap wears out after a few minutes' use, but the texture of the polished surface improves as the lap wears. Before a satisfactory polish is obtained, it will probably be necessary to repeat this operation several times.[2] As the polishing is continued, there is a progressive tendency for the edge of the mirror surface to become convex; it may be necessary to relap the chrome surface and start the polishing over. To obtain a good polish, considerable manual dexterity is necessary, and some practice will be needed before a satisfactory technique is acquired. At best, the mirror surface will still be found to have many fine scratches. These can easily be removed by polishing the surface with a small pitch lap and a water suspension of rouge, barnsite, or other polishing agent. Since the flatness of the mirror surface may also deteriorate as a result of pitch polishing, it may be found advantageous to repolish at intervals with a soft metal lap. The white-light specular reflectivity of the finished mirror will be about 65%. Although the reflectivity can be increased to about 85% by the application of a relatively fragile aluminum film deposited by the vacuum evaporation process, this small gain in reflectivity is not significant for photographic recording.

## BEARING DESIGN

The original sleeve bearing, as developed from Professor J. W. Beams' design,[3] has been very successful, and its use has continued to the present time. It is the purpose of this section merely to give an analysis of the bearing problem and to show how the conditions for a satisfactory solution were met by the design used.

The difficulty in designing bearings for these turbine-drives was caused by the exceptionally high speeds to be attained. Under these conditions conventional bearing designs developed excessive friction. This excessive friction was mainly caused by the high linear velocity of the shaft surface over the bearing. A maximum linear velocity of 200 ft/sec had been the previously established limit beyond which the oil film broke down and allowed the metal surfaces to touch. The diameter of the mirror shaft at the bearing was, therefore, reduced to a minimum consistent with the strength needed for the support of a high-speed rotating mirror. The maximum bearing velocity was then found to be 350 ft/sec, a value considerably in excess of the allowable value. Another factor which contributed to the failure of the bearing-oil film was the excessive vibration of the shaft, which led to oil-film loading pressures far in excess of those allowable with useful lubricants. The conventional sleeve bearing burned out immediately when used under these conditions.

It was subsequently found that the previously accepted maximum bearing velocity attainable without loss of the bearing-oil film could be exceeded beyond our requirements if the axial length of the bearing was no greater than the shaft diameter and if oil was supplied to the bearing at 50 psi or greater pressure. This advance was established by a series of tests with a compact, turbine-driven shaft which was designed to run at even the highest speeds with practically no vibration.

The vibration of the mirror shaft at high speeds was the most difficult condition to overcome before bearings which would operate with long life and reliability could be constructed. The shaft vibration was assumed to be caused by an unbalance of the mirror, since vibration-free drives without mirrors had already been constructed. It was found that the objectionable shaft vibration persisted even after the most careful mirror balancing and that the frequency was either the fundamental or a harmonic frequency of the mirror. The fundamental frequencies of most of the mirrors used had been far below the maximum speed at which they were designed to be driven. Redesigning the mirror to raise its fundamental frequency above the maximum speed required did not appear to be practicable. The amplitude of the vibration is further increased because the moment of inertia of the mirror is minimal for the axis about which it is usually revolved. This mode of vibration is unstable since any unbalance will generate forces which tend to orient the piece until it rotates with the maximum moment of inertia. This difficulty was overcome by mounting the bearings so that they could vibrate with the shaft to avoid excessive loading of the bearing surface, while at the same time providing sufficient damping to prevent the amplitude of vibration from exceeding tolerable limits. The bearing was reduced in size and mounted inside a Neoprene O-ring. Mounted in this fashion, the bearing could vibrate with the shaft without excessive pressure on the oil film, while at the same time the internal friction of the Neoprene provided damping which was fortuitously of the required magnitude.

This bearing design is illustrated in Fig. 2. The bearing is housed in a cylindrical chamber sealed at the end with

[2] In some cases, a water suspension of Linde-A abrasive used during the final stages of polishing has produced especially good results. But this technique tends to produce more scratches unless a test piece, on which scratches can do no harm, is first polished to free the lap surface from the coarser abrasive, which is then flushed off with water. After this precaution the mirror can be polished with small chance of being scratched.

[3] Beams, Linke, and Sommer, Rev. Sci. Instr. 9, 248 (1938).

Exhibit #1 Page 5



a conventional Neoprene hydraulic O-ring which encircles the bearing surface. The use of the O-ring encircling the bearing is advantageous because there is little bending force set up if the shaft is displaced by mirror vibration. The bearing material is still silver (99.5% pure) because this metal is strong, can be machined easily, has a low coefficient of friction, and has high heat conductivity. The lateral excursion of the bearing is limited by the radial clearance, which in most cases has been set at 0.005 in. However, in those cases in which a particular mirror shape has caused excessive vibration, this clearance has been increased as necessary to obtain normal performance. If large radial clearance is required, mirror balance becomes suspect. Pressure lubrication fills the chamber with oil and maintains an oil film on the bearing surface; some of this oil unfortunately leaks slowly from the bearing surface into the exhaust. When the oil pressure is increased, the bearing moves from the position indicated by dashed lines to the one indicated by solid lines. If the pressure is increased too much, the end of the bearing will be forced against the mirror shaft shoulder and stop the rotation of the mirror. Though oil pressure is required at all times, circulation of oil is not required for short intermittent operation. In fact, the need for the continual circulation of oil through the bearing housing has not been established.

Partly because liquid-lubricated bearings have exceeded expectations, the potentialities of ball bearings for the turbine-driven mirrors have not been fully explored, although the work which has been done suggests that they may have a considerable field of application. Ball bearings are found to give satisfactory intermittent performance at speeds far in excess of the manufacturer's ratings. The type of bearing which has proved best is the one which has a single race, a phenolic ball retainer, ball races of the lightest

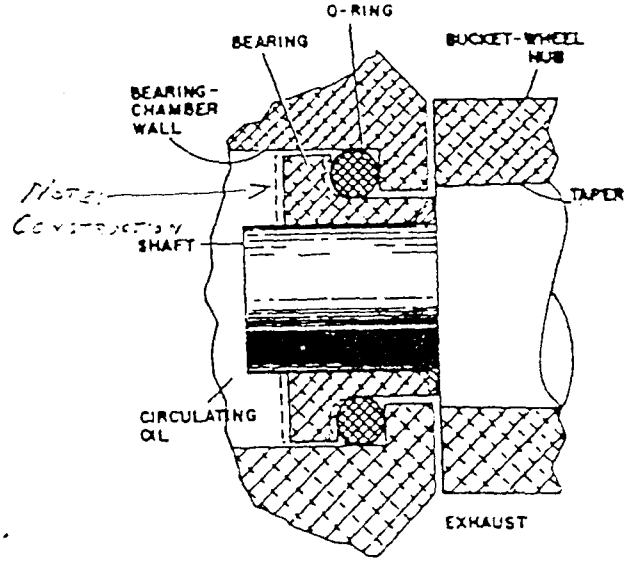



FIG. 2. The sleeve bearing and mount used with high-speed rotating mirrors.

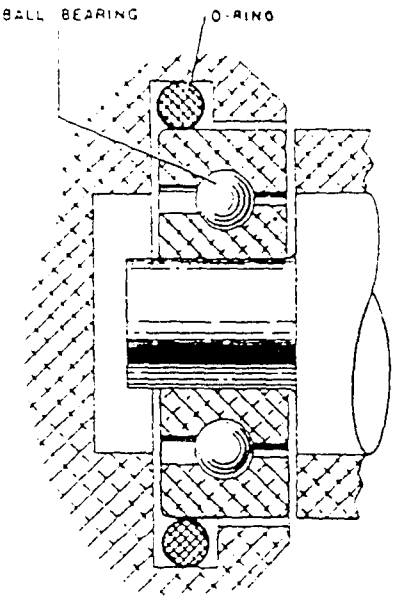



FIG. 3. The ball bearing and mount used with high-speed rotating mirrors.

weight, and the highest precision construction. In this super-precision grade the parts of the assembled bearing fit almost perfectly and the bore has little eccentricity. Although bearings of lower precision have given perfectly satisfactory operation, the reasons for the good performance are obscure. With ball bearings the principal problem is the method of mounting them in the body of the turbine drive. This problem is particularly troublesome when very large mirrors are to be used. For example, we constructed a 2000 rps turbine drive for a $\frac{1}{2}$-×2-×3-in. mirror with ball bearings mounted in the conventional manner in the turbine housing. The mirror was very carefully balanced because it was expected that mirror vibration would be the principal condition which would limit the successful operation of the drive. Tests showed this to be the case, for the speed could not be raised above 1000 rps, the natural frequency of the mirror. The type of bearing mounting shown in Fig. 3 was then installed. The manufacturer's suggested size specifications and tolerances for static seals on shafts were followed, and the peripheral race of the bearing was held inside a conventional Neoprene O-ring. There is no thrust bearing because the symmetry of the double-turbine drive centers the rotating parts automatically. The drive was found to operate smoothly up to the maximum rated speed of 2000 rps. Pressure-speed measurements showed a very slight decrease in speed from expected values at 1000 and 2000 rps, corresponding to the natural frequency and first harmonic of the mirror. The drive is not regularly run at these speeds, so that it is not known what reduction in bearing life can be expected. Five of these units have been used for short runs at 800 rps several times each working day for two years or more. Each bearing is lubricated with one drop of spindle oil for every 100 runs. The bearings have been replaced in only one unit during this time.

ve all these prismatic mirrors at speeds high enough to plode them. A prismatic steel mirror will explode when e centrifugal forces exceed the tensile strength of the aterial. Instead of the ultimate tensile strength, the nsile strength at the elastic limit is used for calculations. nce the mirror surface would be rendered useless if ressed beyond the elastic limit, and the prism would be tely to explode after being repeatedly overstressed. The perience of ultracentrifuge workers is applicable here. he prism will, in general, fracture along the cross section f smallest area; a calculation of the centrifugal force xerted by the center of the outboard mass will give an pproximation to the integrated forces. The very limited xperience at LASL with some nondefective steel mirrors hich have burst at known speeds indicates that this calulation is as useful as an exact one because of the spread n bursting speeds caused by undetermined factors. The maximum operating speeds of our turbine drives are based on a tensile strength which is only 75% of the elastic limit, which has been measured at 240 000 psi. Although this speed gives a relatively small safety factor, its use has been justified by experience. Exceeding the elastic limit will cause the mirror surface to be permanently distorted. This effect can be detected before the next run by observing the astigmatism introduced into the optical system when the mirror is in the static condition. An optical system described elsewhere[4,5] permits easy measurement of the distortion of the mirror surface under dynamic conditions. When compressed air or nitrogen is used for operating the drives, the maximum speeds obtained are well below the safe limits.

If a mirror of specified size is to be rotated at maximum speed, there is an optimum prism shape. In these calculations the axial length of the mirror is no factor. The plot shown in Fig. 5 illustrates the results of these calculations. The relative bursting speeds are shown not only for various regular prisms of the same mirror size but also for the special case of the two-faced prism. The plot shows that the prism of triangular cross section is the shape capable of highest speed operation. As would be expected, this shape also requires the greatest amount of driving power.

TABLE I. Summary of turbine drives.

| Graph symbol | Turbine model | LASL Drawing number* | Number of faces | Mirror face size | Maximum speed (rps) |
|---|---|---|---|---|---|
| + | 213E | 21Y16203 | 2 | 1×1¼ in. | 5 000 |
| ▼ | 216B | 21Y16216 | 2 | 15×17½ mm | 10 000 |
| ○ | 220 | 21Y80091 | 8 | ¾×1 in. | 4 000 |
| □ | 222 | 21Y80096 | 2 | 3½×3 in. | 550 |
| ● | 223A | 21Y16217 | 3 | 10×17½ mm | 24 000 |
| △ | 225 | 21Y16206 | 2 | 2×3 in. | 2 000 |
| × | 228 | 21Y16281 | 3 | 40×60 mm | 4 500 |

* Engineering drawings are available at nominal cost from U. S. Atomic Energy Commission, Technical Information Service, P. O. Box 62, Oak Ridge, Tennessee.

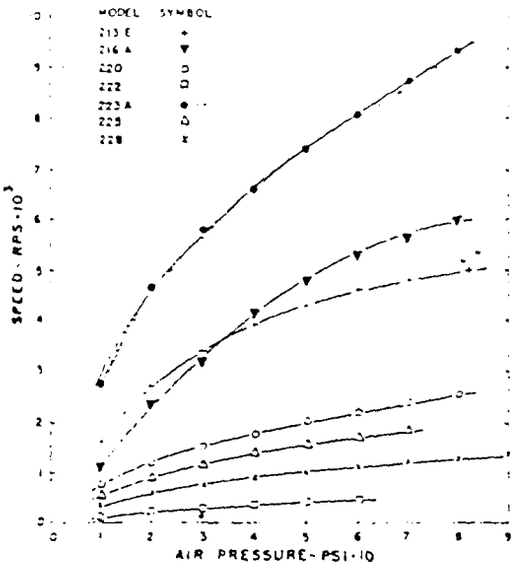



FIG. 6. Graphs of air pressure vs speed for typical turbine drives.

## PERFORMANCE DATA

Seven representative turbine-driven rotating mirrors have been selected to illustrate performance characteristics. Table I gives the identifying nomenclature and the most important design parameters for these units. Compressed air, which is the most convenient driving power,

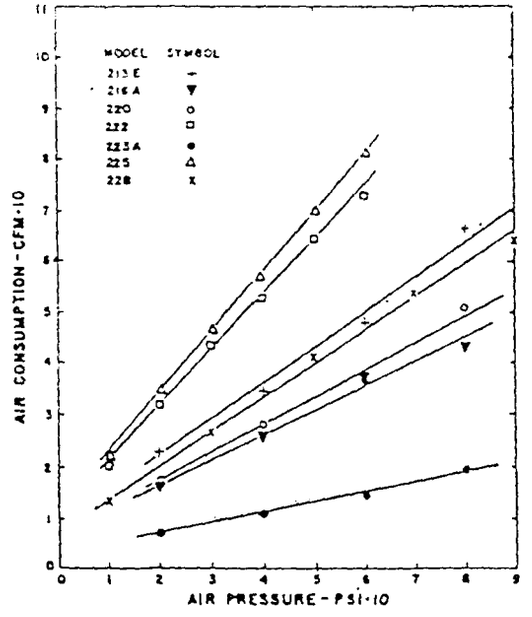



FIG. 7. Graphs of air pressure vs air consumption for typical turbine drives.

[4] B. Brixner, *Proceedings of the Third International Congress on High Speed Photography*, edited by R. B. Collins (Academic Press Inc., New York, 1957), pp. 319–323.

[5] W. W. Davis and T. E. Holland, J. Opt. Soc. Am. 48, 365 (1958).

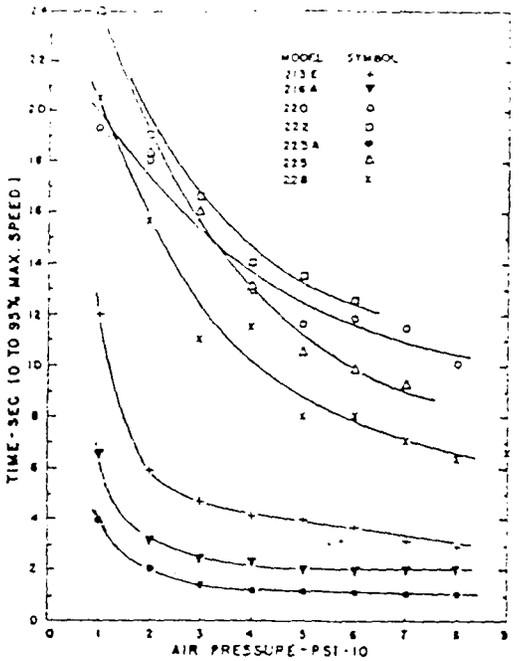



FIG. 8. Graphs of air pressure vs time for typical turbine drives.

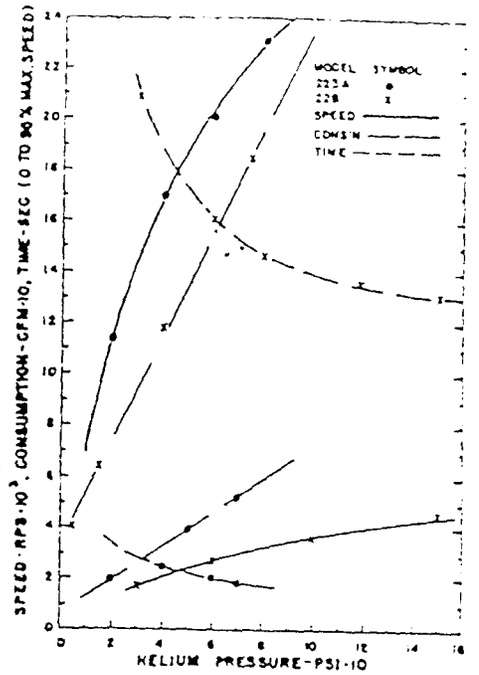



FIG. 9. Graphs showing the performance of two turbine drives with compressed helium.

has been used to determine the operating characteristics of all these drives. Those units to be driven at the highest speeds are given further tests with compressed helium as the driving power. The graphs of performance with compressed air are given first. Figure 6 shows the pressure vs speed curves, which are most important. The pressure is measured by a gauge on the air-supply line at a point adjacent to the air-inlet connection on the drive. One is thus assured that the pressure indicated is the amount actually applied to the inlet of the drive. It can be seen that although the asymptotic speeds have not been reached they do not appear to be much higher than the maximums given. Figure 7 shows the pressure vs air-consumption curves. The consumption rate is for air at ambient temperature and pressure (about 25°C and 590 mm). These measurements were made by collecting the exhaust air in a large balloon whose volume was then calculated from its size, care being taken to avoid exerting significant pressure on the contained gas. It can be seen that for all models the rate of use is substantially linear with pressure. The pressure vs time curves are shown in Fig. 8. These give the time required for the drive to reach 95% of maximum speed because there was considerable spread in the data of the 100% curves, depending on the ambient temperature and the type of lubricant used. The 95% curves are reproducible under a variety of normal operating conditions and can be applied generally to the preparation of plans for the intermittent use of these drives. Figure 9 shows the performance of two of the drives with helium; all three functions are plotted on the graph.

## ACKNOWLEDGMENTS

The author wishes to thank the many people at the Los Alamos Scientific Laboratory who have encouraged him to continue the development of these turbine drives. Special thanks go to Edward T. Gleason and William J. Wynne for the fine workmanship in the fabrication and assembly of the components; to Charles P. Moore, Calvin W. Hunter, and Leonard Crogstad for their precision machine grinding of the steel mirrors; to Arthur H. Williams and Charles G. Phelps for the excellent mirror balancing and polishing; and to Eugene A. Igel for making the many performance measurements.

Exhibit #2 page1

THE RAPID BLUE PRINT CO.

# Price List

# ENGINEERING DRAWINGS FOR NUCLEAR APPLICATIONS

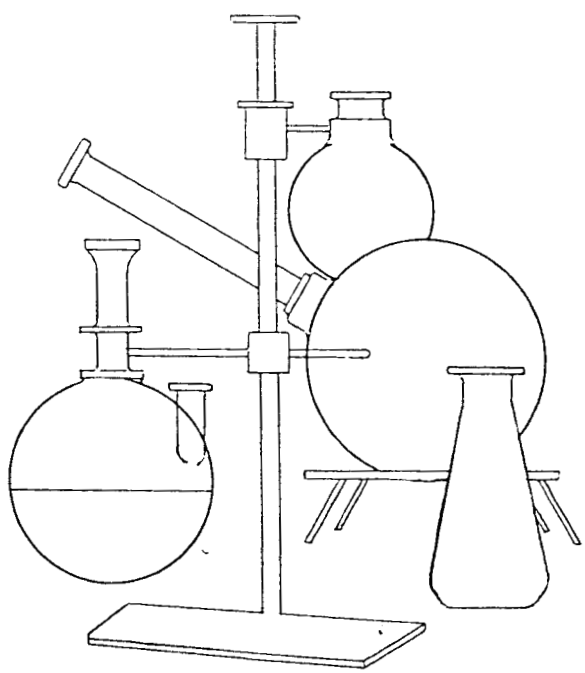
DEVELOPED BY THE U. S. ATOMIC ENERGY COMMISSION AND ITS CONTRACTORS

AS OF

May 1, 1959

## Engineering Drawings and Plans for:

- NUCLEAR REACTORS
- POWER REACTORS
- [illegible]
- CHEMICAL PROCESS
- [illegible]



*(See A.E.C. Publication TID—4100 (first revision), and Supplement #2 ENGINEERING MATERIALS LIST)*

GAU 3 2717

The A.E.C. has engaged RAPID BLUE PRINT to provide these drawings for INDUSTRY, RESEARCH, PRODUCTION and EDUCATION.

Reproductions are available from our Master file of 105mm MICRO-MASTER negatives filmed from source material at Oak Ridge, Tenn., which are identical to those furnished to A.E.C. for their use.

THE RAPID BLUE PRINT COMPANY

818 SANTEE STREET • LOS ANGELES • MADISON 2-2061

Exhibit #2 Page 2

# A.E.C. Engineering Drawings and Related Services available from RAPID BLUE PRINT COMPANY

ITEM #1 – Full-Size Photographic Projection Prints on Translucent Tracing Paper.

PURPOSE: Master reproducible that may be used in some manner as the Original and for producing blueprints and whiteprints.

FEATURES: 100% rag natural tracing paper – Excellent pencil and ink tooth – Easily eradicated with eradicating fluid – Tough, durable and will not fade or become yellow or brittle.

ITEM #1A – Half-Size Photographic Projection Prints on Translucent Tracing Paper. (Same as Item #1) Image one-half size of Original drawing.

ITEM #2 – Full-Size Blueprints when Ordered with Item #1.

PURPOSE: Inexpensive reproduction of Original drawings made from Master reproducibles (Item #1) generally used for reference and distribution.

FEATURES: Blueprints – White line on a blue background recommended for outdoor use in the field.

ITEM #2A – Half-Size Blueprints (Same as above when ordered with Item #1A) Image one-half size of Original drawing.

ITEM #3 – Duplicate Diazo 105mm Foil (4 x 6). Furnished in Archival Envelope indexed with the CAPE number.

PURPOSE: Excellent for use either in projection or magnifying viewing equipment.

FEATURES: Identical in appearance to the Original 105mm Micro-Master 4 x 6 film – Economical for duplicate compact files for quick reference.

ITEM #4 – Contact Positive Glossy Card Prints – 105mm (4 x 6).

PURPOSE: Primarily used for very durable reference card file.

FEATURES: Durable, glossy print easily read by naked eye or with magnifying glass.

REMARKS: A CAPE is a complete set of drawings for a given piece of equipment. Prices for individual drawings from a CAPE will be furnished on request. (Minimum order $5.00).

Drawings smaller than 12 x 18 are reproduced full-size only.

For a complete list of drawings available see A.E.C. Publication: TID–4100 (first and second revision) and Supplement #1 – Unclassified Engineering Materials List.

| Order No. | Description | Number of Negs. | Number of Prints | Item #1 | Item #1A | Item #2 | Item #2A | Item #3 | Item #4 |
|---|---|---|---|---|---|---|---|---|---|
| Cape–1 | MTR Hot Cell Windows | 26 | 27 | 110.25 | 49.50 | 8.82 | 3.00 | 12.15 | 13.50 |
| Cape–2 | Portable Fast- and Slow-Neutron Survey Meter | 23 | 23 | 41.25 | * | 3.30 | * | 10.35 | 11.50 |
| Cape–3 | Water Boiler (Supo Model) | 150 | 150 | 510.75 | 265.37 | 40.86 | 17.34 | 67.50 | 75.00 |
| Cape–4 | Master UCRL Scaler | 45 | 50 | 84.75 | 63.88 | 6.78 | 3.85 | 22.50 | 25.00 |
| Cape–5 | Lead Shielded Manipulator Box | 33 | 33 | 74.25 | 44.25 | 5.94 | 3.06 | 14.85 | 16.50 |
| Cape–6 | 2 KV 10 MA Regulated DC Power Supply | 26 | 27 | 42.00 | 28.75 | 3.36 | 2.10 | 12.15 | 13.50 |
| Cape–7 | Geneva Conference Reactor | 64 | 64 | 275.25 | 122.00 | 22.02 | 7.32 | 28.80 | 32.00 |
| Cape–8 | Geneva Conference Reactor Controls | 41 | 41 | 177.75 | 80.75 | 14.22 | 4.92 | 18.45 | 20.50 |
| Cape–9 | High-Speed Rotating-Mirror Framing Camera | 56 | 71 | 213.75 | 118.00 | 17.10 | 7.92 | 31.95 | 35.50 |
| Cape–10 | 10 Channel Pulse Height Analyzer | 24 | 24 | 50.25 | 30.63 | 4.02 | 2.13 | 10.80 | 12.00 |
| Cape–11 | $Co^{60}$ High Gamma Source Unit | 77 | 76 | 186.75 | 114.63 | 14.94 | 8.04 | 34.20 | 38.00 |
| Cape–12 | Radioactive Storage Container | 2 | 2 | 3.00 | * | .24 | * | .90 | 1.00 |
| Cape–13 | Chain Drive Manipulator | 36 | 37 | 69.00 | 51.75 | 4.14 | 1.14 | 16.65 | 18.50 |
| Cape–14 | Beta-Counter | 1 | 1 | 6.00 | 2.50 | .48 | .15 | .45 | .50 |
| Cape–15 | 100 Channel Pulse Height Analyzer | 8 | 8 | 30.75 | 15.25 | 2.46 | .81 | 3.60 | 4.00 |
| Cape–16 | Scintillation Counter Shield | 16 | 16 | 21.00 | 21.00 | 1.68 | 1.68 | 7.20 | 8.00 |
| Cape–17 | Argonne Research Reactor, CP–5 | 130 | 134 | 656.25 | 326.75 | 52.50 | 20.88 | 60.30 | 67.00 |
| Cape–18 | Oak Ridge Research Reactor Building | 353 | 353 | 2,103.75 | 1,150.00 | 168.30 | 76.74 | 158.85 | 176.50 |
| Cape–19 | Oak Ridge Research Reactor | 120 | 120 | 576.00 | 256.00 | 46.08 | 15.36 | 54.00 | 60.00 |
| Cape–20 | Oak Ridge Research Reactor Core | 255 | 255 | 1,174.50 | 529.00 | 93.96 | 32.04 | 114.75 | 120.75 |
| Cape–21 | Scintillation Hand and Foot Counter | 39 | 45 | 81.75 | 48.13 | 6.54 | 3.39 | 20.25 | 22.50 |
| Cape–22 | 3 MEV Electron Linear Accelerator | 64 | 60 | 187.50 | 113.38 | 15.00 | 7.92 | 27.00 | 30.00 |
| Cape–23 | Tower Shielding Facility | 236 | 236 | 1,690.50 | 751.00 | 135.24 | 45.06 | 106.20 | 118.00 |
| Cape–24 | Tower Shielding Facility Instrumentation | 178 | 189 | 498.75 | 271.25 | 39.90 | 18.06 | 85.05 | 94.50 |
| Cape–25 | Tower Shielding Facility Reactor Controls | 67 | 67 | 284.25 | 126.00 | 22.74 | 7.56 | 30.15 | 33.5( |
| Cape–26 | Bulk Shielding Facility | 242 | 242 | 1,191.75 | 530.00 | 95.34 | 31.80 | 108.90 | 121.0( |
| Cape–27 | Oak Ridge Reactor Controls | 170 | 183 | 759.75 | 362.63 | 60.78 | 22.65 | 82.35 | 91.5( |
| Cape–28 | Hot Analytical Facility | 124 | 228 | 626.25 | 349.25 | 50.10 | 23.52 | 102.60 | 114.0( |
| Cape–29 | Decade Scaler | 46 | 52 | 112.50 | 63.75 | 9.00 | 4.32 | 23.40 | 26.0 |
| Cape–30 | Extraman Manipulator | 4 | 4 | 18.00 | 8.00 | 1.44 | .48 | 1.80 | 2.0 |
| Cape–31 | Low Intensity Training Reactor (LITR) | 523 | 509 | 2,160.00 | 1.084.00 | 172.80 | 69.48 | 229.05 | 254.5 |
| Cape–32 | 65 Liter Waste Disposal Carrier | 24 | 26 | 66.00 | 36.38 | 5.28 | 2.43 | 5.85 | 6.5 |
| Cape–33 | Ball Joint Manipulator | 46 | 48 | 68.25 | * | 5.46 | * | 21.60 | 24.( |

Exhibit #2 page 3

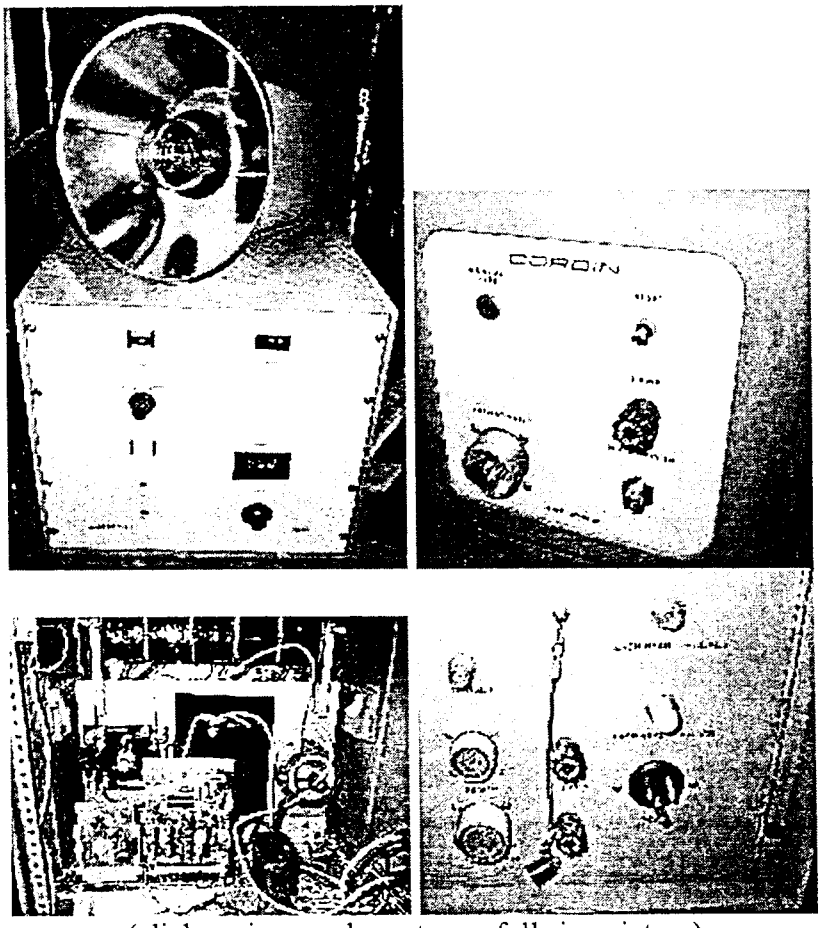
# TEMPORARY LIST OF A.E.C. DRAWINGS RECENTLY MADE AVAILABLE

| Cape No: | Description | Number of Negatives | Number of Prints | Item # 1 | Item #1A | Item #6 | Item #7 |
|---|---|---|---|---|---|---|---|
| 365 | Thermoconductivity Test Apparatus | 9 | 9 | 30.80 | 13.92 | 4.05 | 4.50 |
| 389 | Nonbond Detector, Model 18A | 8 | 8 | 28.50 | 12.67 | 3.60 | 4.00 |
| 390 | Pneumatic Squeeze Valve | 1 | 1 | 2.25 | 1.00 | .45 | .50 |
| 391 | Vacuum Bench-Enclosed, 8' | 2 | 2 | 11.25 | 5.00 | .90 | 1.00 |
| 392 | Controlled-Atmosphere Welding Chamber | 4 | 4 | 16.50 | 7.34 | 1.80 | 2.00 |
| 393 | Hot Lab Periscope for Open Top Cells | 11 | 11 | 47.25 | 21.00 | 4.95 | 5.50 |
| 394 | M T R Velocity Selector | 17 | 17 | 105.00 | 46.67 | 7.65 | 8.50 |
| 395 | Bellows Pump | 10 | 10 | 41.25 | 18.33 | 4.50 | 5.00 |
| 396 | Argonne Low Power Reactor Support Facility | 139 | 160 | 607.88 | 298.08 | 62.55 | 69.50 |
| 397 | Shielded Manipulator Dry Box | 20 | 20 | 127.13 | 56.50 | 9.00 | 10.00 |
| 398 | Hot Cell Access System | 6 | 6 | 27.00 | 12.00 | 2.70 | 3.00 |
| 399 | Portable Impactor Air Sampler | 1 | 1 | 4.13 | 1.89 | .45 | .50 |
| 400 | Transistorized Portable Count Rate Meter | 11 | 11 | 15.00 | 10.00 | 4.95 | 5.50 |
| 401 | Alpha Chamber (D. P. West) | 8 | 8 | 30.00 | 13.93 | 3.60 | 4.00 |
| 402 | Sintering Furnace | 19 | 19 | 78.75 | 38.75 | 8.55 | 9.50 |
| 403 | Ion Chamber Type G N 3 | 4 | 4 | 12.38 | 5.50 | 1.80 | 2.00 |
| 404 | Arc-Research 50 Cable High Current Switch | 21 | 21 | 31.50 | 20.46 | 9.45 | 10.50 |
| 405 | 12" × 60" Analyzer Magnet 11 | 41 | 36 | 118.88 | 72.63 | 18.45 | 20.50 |
| 406 | Beaker Handling Device | 8 | 8 | 9.00 | 7.33 | 3.60 | 4.00 |
| 407 | Permanent Waste Disposal Sampling Device | 8 | 8 | 25.88 | 13.38 | 3.60 | 4.00 |
| 408 | Camera Cradle, Model 100 | 20 | 20 | 32.63 | 25.33 | 9.00 | 10.00 |
| 409 | Puncture Mechanism for Gas Sampling | 4 | 4 | 9.00 | 5.25 | 1.80 | 2.00 |
| 410 | General Purpose Hood | 10 | 10 | 82.50 | 36.67 | 4.50 | 5.00 |
| 411 | Remotely Controlled Lathe | 70 | 70 | 315.00 | 140.00 | 31.50 | 35.00 |
| 412 | Beryllium Fabrication Shop Ventilation and Exhaust System | 11 | 11 | 79.50 | 35.33 | 4.95 | 5.50 |
| 413 | Peristaltic Pump-Model 3 | 17 | 18 | 28.88 | 25.13 | 7.65 | 8.50 |
| 414 | Remote Shielded Metallograph | 99 | 103 | 164.63 | 109.63 | 44.55 | 49.50 |
| 415 | Scintillation Transistorized Alpha Hand Counter | 12 | 19 | 80.25 | 40.67 | 5.40 | 6.00 |
| 416 | Remotely Controlled Micropipetter | 1 | 1 | 4.50 | 2.00 | .45 | .50 |
| 417 | Bubble Chamber, 15" | 418 | 408 | 962.25 | 550.17 | 188.10 | 209.00 |
| 418 | Controlled Plant Growing Chambers | 4 | 5 | 21.38 | 10.75 | 1.80 | 2.00 |
| 419 | Model B Pipetter | 23 | 23 | 67.88 | 33.50 | 10.35 | 11.50 |
| 420 | Shielded Sample Carrier | 5 | 5 | 5.25 | N R | 2.25 | 2.50 |
| 421 | Turbine Driven Mirror, 216-B | 6 | 6 | 33.75 | 15.00 | 2.70 | 3.00 |
| 422 | Mass Spectrometer used in CPP | 150 | 150 | 359.63 | 231.50 | 67.50 | 75.00 |
| 423 | Bolt-Removal Wrench | 6 | 6 | 19.50 | 9.50 | 2.70 | 3.00 |
| 424 | Right-Angle Drive Socket Wrench | 6 | 6 | 29.25 | 13.00 | 2.70 | 3.00 |
| 425 | Disconnect Tool | 3 | 3 | 9.75 | 4.75 | 1.35 | 1.50 |
| 426 | Impact Tester | 12 | 12 | 52.13 | 23.17 | 5.40 | 6.00 |
| 427 | Linear Count Rate Meter | 6 | 9 | 20.25 | 11.09 | 2.70 | 3.00 |
| 428 | Turbine Driven Mirror, Model 223-A | 5 | 5 | 22.50 | 10.00 | 2.25 | 2.50 |
| 429 | Bent Crystal Gamma Ray Spectrometer | 346 | 365 | 666.38 | 432.45 | 155.70 | 173.00 |
| 430 | Shielded Pipette Control | 1 | 1 | 1.87 | 1.00 | .45 | .50 |
| 431 | Warm Sample Carrier | 1 | 1 | 3.38 | 1.50 | .45 | .50 |
| 432 | Rotating Bomb Calorimeter | 73 | 78 | 141.00 | 87.05 | 32.85 | 36.50 |
| 433 | Junior Cave | 41 | 41 | 202.50 | 90.00 | 18.45 | 20.50 |
| 434 | Plant Bed Chamber | 56 | 56 | 117.75 | 69.63 | 23.85 | 26.50 |
| 435 | To Be Announced | | | | | | |
| 436 | Remotely Controlled Balance | 5 | 6 | 27.38 | 13.00 | 2.25 | 2.50 |
| 437 | To Be Announced | | | | | | |
| 438 | Rosen and Brolley Proton Polarizer | 14 | 14 | 63.00 | 28.00 | 6.30 | 7.00 |
| 439 | Multistage Fluidized Bed Reactors, Models 2 & 3 | 9 | 9 | 27.00 | 13.25 | 4.05 | 4.50 |
| 440 | To Be Announced | | | | | | |
| 441 | To Be Announced | | | | | | |
| 442 | Shielded Autoclave Equipment | 47 | 47 | 81.75 | 53.63 | 21.15 | 23.50 |
| 443 | To Be Announced | | | | | | |
| 444 | To Be Announced | | | | | | |
| 445 | Constant Temperature Bath | 3 | 3 | 20.25 | 9.00 | 1.35 | 1.50 |
| 446 | Diaphragm Valve | 10 | 10 | 12.38 | 11.13 | 4.50 | 5.00 |
| 447 | Hand Changer Fixture for BNL Rectilinear Manipulators | 1 | 1 | 3.00 | 1.50 | .45 | .50 |
| 448 | Stang Reactor (Improved) | 6 | 6 | 11.63 | 6.63 | 2.70 | 3.00 |
| 449 | Slug Transfer Shield | 8 | 8 | 21.75 | 11.75 | 3.60 | 4.00 |
| 450 | Nesting Casks | 5 | 5 | 25.50 | 11.33 | 2.25 | 2.50 |
| 451 | Uranium Shielded Cask | 3 | 3 | 10.13 | 4.50 | 1.35 | 1.50 |
| 452 | Canal Electrometer | 153 | 151 | 215.25 | 156.92 | 68.85 | 76.50 |
| 453 | Multicurie Fission Products Pilot Plant Specifications | 168 | 371 | 277.50 | N R | 75.60 | 84.00 |
| 454 | Fluidized Bed Denitration Reactor | 10 | 10 | 34.50 | 15.75 | 4.50 | 5.00 |

| Order No. | Description | Number of Negs. | Number of Prints | Item #1 | Item #1A | Item #2 | Item #2A | Item #3 | Item #4 |
|---|---|---|---|---|---|---|---|---|---|
| Cape-105 | Crane Hook | 14 | 14 | 21.75 | * | 1.74 | * | 6.30 | 7.00 |
| Cape-106 | Hot Cell Periscope | 57 | 57 | 101.25 | 79.25 | 8.10 | 6.00 | 25.65 | 28.50 |
| Cape-107 | High Stability Amplifier Scalers, Models L1 and L2 | 11 | 17 | 44.25 | 22.13 | 3.54 | 1.40 | 7.65 | 8.50 |
| Cape-108 | Student Vacuum Furnace | 17 | 19 | 35.25 | 23.50 | 2.82 | 1.68 | 8.55 | 9.50 |
| Cape-109 | Liquid Metal Fuel Reactor Experiment (LMFRE) | 34 | 34 | 196.50 | 87.00 | 15.72 | 5.22 | 15.30 | 17.00 |
| Cape-110 | Rotary Multicrucible Arc Furnace | 22 | 23 | 42.75 | 29.75 | 3.42 | 2.16 | 10.35 | 11.50 |
| Cape-111 | Service Waste Monitoring and Condensate Monitoring System | 47 | 66 | 175.50 | 86.63 | 14.04 | 5.49 | 29.70 | 33.00 |
| Cape-112 | H.C. 6" Lead Cave | 91 | 91 | 207.00 | 132.75 | 16.56 | 9.42 | 40.95 | 45.50 |
| Cape-113 | Model 302 Coincidence System | 3 | 9 | 10.50 | 4.75 | .84 | .30 | 4.05 | 4.50 |
| Cape-114 | Junior Cave, Model 1 | 90 | 93 | 179.25 | 126.63 | 14.34 | 9.27 | 41.85 | 46.50 |
| Cape-115 | Shielded Hood, Model 2 | 72 | 76 | 164.25 | 108.50 | 13.14 | 7.80 | 34.20 | 38.00 |
| Cape-116 | Army Package Power Reactor (APPR-1) | 209 | 205 | 1,251.75 | 560.13 | 100.14 | 33.75 | 92.25 | 102.50 |
| Cape-117 | Omega West Reactor (OWR) | 219 | 207 | 1,265.25 | 570.75 | 101.22 | 34.56 | 93.15 | 103.50 |
| Cape-118 | 107 K Beta Monitor | 17 | 17 | 106.50 | 47.00 | 8.52 | 2.82 | 7.65 | 8.50 |
| Cape-119 | X-Ray Diffraction Apparatus | 34 | 34 | 164.00 | 75.00 | 13.44 | 4.50 | 15.30 | 17.00 |
| Cape-120 | 2000 Curie Gamma Source | 147 | 145 | 412.50 | 240.88 | 33.00 | 16.53 | 65.25 | 72.50 |
| Cape-121 | Neutron Diffraction Spectrometer | 245 | 255 | 822.75 | 490.25 | 65.82 | 33.90 | 114.75 | 127.50 |
| Cape-122 | Sodium Reactor Experiment (SRE) | 52 | 46 | 447.75 | 199.00 | 35.82 | 11.94 | 20.70 | 23.00 |
| Cape-123 | Portable Sniffer, Model NR 1 | 15 | 26 | 45.75 | 24.38 | 3.66 | 1.59 | 11.70 | 13.00 |
| Cape-124 | Automatic Sample Counter | 38 | 38 | 93.00 | 56.25 | 7.44 | 3.90 | 17.10 | 19.00 |
| Cape-125 | Automatic Gamma Counter | 28 | 28 | 64.50 | 41.13 | 5.16 | 2.91 | 12.60 | 14.00 |
| Cape-126 | Continuous Air Monitor (Filter Paper Transport System) | 63 | 63 | 143.25 | 94.00 | 11.46 | 6.72 | 28.35 | 31.50 |
| Cape-127 | Liter Waste Pot | 21 | 22 | 63.75 | 35.00 | 5.10 | 2.34 | 9.90 | 11.00 |
| Cape-128 | STR (Mark II) Fuel Element Shipping Container | 5 | 5 | 45.00 | 20.00 | 3.60 | 1.20 | 2.25 | 2.45 |
| Cape-129 | Rotating Ring Stand, Model 2 | 9 | 10 | 15.00 | * | 1.20 | * | 4.50 | 5.00 |
| Cape-130 | Rod Runner, Model 2 | 13 | 14 | 18.00 | * | 1.44 | * | 6.30 | 7.00 |
| Cape-131 | Chemical Engineering Junior Cave, Model 1 | 29 | 34 | 159.75 | 71.00 | 12.78 | 4.26 | 15.30 | 17.00 |
| Cape-132 | Junior Cave, Model 2 | 79 | 90 | 188.25 | 117.50 | 15.06 | 8.28 | 40.50 | 45.00 |
| Cape-133 | Redox Laboratory Junior Cave Manipulator | 12 | 12 | 27.00 | * | 2.16 | * | 5.40 | 6.00 |
| Cape-134 | Experimental Boiling Water Reactor (EBWR) | 192 | 196 | 722.25 | 367.38 | 57.78 | 23.73 | 88.20 | 98.00 |
| Cape-135 | Argonne Naught Research Reactor (Argonaut) | 320 | 357 | 831.75 | 526.88 | 66.54 | 37.29 | 160.65 | 178.50 |
| Cape-136 | Universal Extension Wrench | 6 | 6 | 31.50 | 14.00 | 2.52 | .84 | 2.70 | 3.00 |
| Cape-137 | Remote Metallography Polishing Wheel | 7 | 7 | 39.00 | 17.00 | 3.12 | 1.02 | 3.15 | 3.50 |
| Cape-138 | Portable Gamma Scintillation Counter | 11 | 13 | 48.75 | 21.50 | 3.90 | 1.29 | 5.85 | 6.50 |
| Cape-139 | Boiling Reactor Experiment I (Borax-I) | 71 | 78 | 381.25 | 140.88 | 22.50 | 2.98 | 35.10 | 39.00 |
| Cape-140 | Boiling Reactor Experiment II (Borax-II) | 55 | 55 | 189.75 | 102.62 | 15.18 | 6.81 | 24.75 | 27.50 |
| Cape-141 | Boiling Reactor Experiment III (Borax-III) | 50 | 50 | 182.25 | 94.75 | 14.58 | 6.18 | 22.50 | 25.00 |
| Cape-142 | Brookhaven Cosmotron | 220 | 227 | 809.25 | 434.63 | 64.74 | 28.77 | 102.15 | 113.50 |
| Cape-143 | Medical Scintillation Spectrometer | 27 | 46 | 84.00 | 44.75 | 6.72 | 3.90 | 20.70 | 23.00 |
| Cape-144 | Turbine Driven Mirror, Model 213D | 7 | 7 | 30.75 | 15.12 | 2.46 | .96 | 3.15 | 3.50 |
| Cape-145 | Bubble Chamber | 177 | 176 | 1,337.25 | 594.00 | 106.98 | 35.64 | 79.20 | 88.00 |
| Cape-146 | 100 Channel Pulse Height Analyzer, Model 2A | 97 | 114 | 270.00 | 135.88 | 21.60 | 9.32 | 51.30 | 57.00 |
| Cape-147 | Portable Scintillation Poppy | 7 | 7 | 25.50 | 11.00 | 2.04 | .66 | 3.15 | 3.50 |
| Cape-148 | G.E. Man II M/S Manipulator | 225 | 232 | 330.75 | * | 26.46 | * | 104.40 | 116.00 |
| Cape-149 | Slug Pot M-2.5 | 9 | 9 | 30.00 | 16.63 | 2.40 | 1.11 | 4.05 | 4.50 |
| Cape-150 | Pot-Hot Rock | 10 | 10 | 36.00 | 18.88 | 2.88 | 1.23 | 4.50 | 5.00 |
| Cape-151 | ICPP Multicurie Cell | 15 | 15 | 84.75 | 37.50 | 6.78 | 2.25 | 6.75 | 7.50 |
| Cape-152 | LASL High Speed Frame Camera, Model 2 | 13 | 13 | 56.25 | 25.50 | 4.50 | 1.56 | 5.85 | 6.50 |
| Cape-153 | Bevatron Injector Ion Gun | 12 | 11 | 72.75 | 33.50 | 5.82 | 2.04 | 4.95 | 5.50 |
| Cape-154 | Profile Recorder | 13 | 13 | 66.75 | 30.00 | 5.34 | 1.80 | 5.85 | 6.50 |
| Cape-155 | Vacuum Furnace | 21 | 21 | 54.75 | 31.88 | 4.38 | 2.18 | 9.45 | 10.50 |
| Cape-156 | Shipping Port Pressurized Water Reactor | 1830 | 3393 | 10,863.38 | 6,405.67 | 869.07 | 441.12 | 1,526.85 | 1,696.50 |
| Cape-157 | H. C. Filter Paper Box | 46 | 48 | 80.25 | * | 6.42 | * | 21.60 | 24.00 |
| Cape-158 | Capacitor Bank | 40 | 46 | 69.75 | * | 5.58 | * | 20.70 | 23.00 |
| Cape-159 | LITR In-Pile Loop | 27 | 26 | 151.50 | 67.00 | 12.12 | 4.02 | 11.70 | 13.00 |
| Cape-160 | Control Rod Drive (ALPR) | 77 | 77 | 165.75 | 108.25 | 13.26 | 7.74 | 34.65 | 38.50 |
| Cape-161 | Electronic Master Slave Manipulator Model #2 | 239 | 262 | 448.50 | 336.88 | 35.88 | 25.35 | 117.90 | 131.00 |
| Cape-162 | Experimental Breeder Reactor No. 1 (EBR-1) | 199 | 227 | 616.50 | 481.50 | 49.32 | 25.50 | 102.15 | 113.50 |
| Cape-163 | Engineering Test Reactor (ETR) | 201 | 175 | 1,337.25 | 594.00 | 106.98 | 35.64 | 78.75 | 87.50 |
| Cape-164 | Engineering Test Reactor Building | 346 | 346 | 1,946.25 | 865.00 | 155.70 | 51.90 | 155.70 | 173.00 |
| Cape-165 | Junior Cave Doorstop Dolly | 3 | 3 | 24.75 | 11.00 | 1.98 | .66 | 1.35 | 1.50 |
| Cape-166 | 40 Watt Spot Heater | 9 | 9 | 13.50 | * | 1.08 | * | 4.05 | 4.50 |
| Cape-167 | Metallographic Cell Extension | 6 | 6 | 27.00 | 12.00 | 2.16 | .72 | 2.70 | 3.00 |
| Cape-168 | Multiple Fusion Burner Device | 7 | 7 | 28.50 | 13.50 | 2.28 | .84 | 3.15 | 3.50 |
| Cape-169 | Thermocouple Instrument Rod | 1 | 1 | 9.00 | 4.00 | .72 | .24 | .45 | .50 |
| Cape-170 | Radio Frequency Beam Deflector | 2 | 3 | 5.25 | * | .42 | * | 1.35 | 1.50 |
| Cape-171 | MANIAC II | 27 | 27 | 92.25 | 49.00 | 7.38 | 3.24 | 12.15 | 13.50 |
| Cape-172 | Impact Wrench | 3 | 3 | 21.00 | 9.00 | 1.68 | .54 | 1.35 | 1.50 |
| Cape-173 | Master Slave Manipulator Model 7 | 197 | 207 | 327.00 | 260.25 | 26.16 | 19.74 | 93.15 | 103.50 |
| Cape-174 | Spherical Radius Fixture | 29 | 31 | 53.25 | 38.75 | 4.26 | 2.80 | 13.95 | 15.50 |
| Cape-175 | Shielded Transfer Tank | 8 | 8 | 39.75 | 18.00 | 3.18 | 1.08 | 3.60 | 4.00 |

Exhibit #3






(click on image above to see full size picture)

# Cordin Model 607 Light Source

This is a High Speed Flash Unit for use with Cordin camera systems and other high speed cameras. It features a square pulse, high intensity (up to 3 million foot lamperts) single pulse xenon flash for events less than 625 microseconds. It originally sold for around $27,000US and is a current model listed on the Cordin Website. NASA uses this unit for Photographic Acquisition of Ballistic Impact Events, so you know it is built well!

This unit is in excellent condition and appears to have seen little if any use. When powered up, all functions worked properly. The flash worked well, with no problems observed. I don't know much about these, but if I omitted any info or if you have a question, e-mail me.

- Cordin Model 607 Light Source.
- Includes cables for connecting the power unit to the flash.

Exhibit #3



- Includes a 115v power cable.
- NEW instruction manual is included.
- This unit is in very good physical condition. It may have some tape/sticker residue and may have dust from storage. Some of the specs and features may have been taken from other eBay ads. I don't know much about these, but if you have a question, e-mail me.

# All Offers Considered


Back to Main

Exhibit #3

Susan Wenger

**From:** stephen@cordin.com
**Sent:** Thursday, November 11, 2004 1:28 PM
**To:** susan@cordin.com
**Subject:** cordinbuyer sent you this eBay item: CORDIN 432 DELAY GENERATOR PULSE SYSTEM (#3851989169)

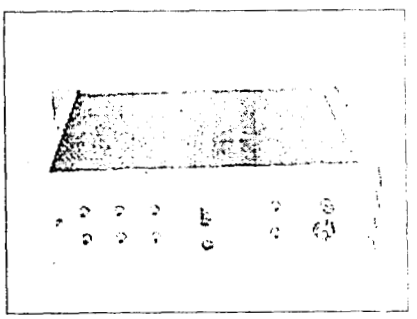
## cordinbuyer sent you this eBay item

**Personal message:**
I saw this item for sale on eBay, The World's Online Marketplace, and thought that you might be interested.

View This Item On eBay

## CORDIN 432 DELAY GENERATOR PULSE SYSTEM

Item number: 3851989169



| | |
|---|---|
| Seller: | smithjunior90 ( 464)☆ me |
| | **Positive Feedback: 98.7%**<br>Member since Feb-27-03 in United States |
| Starting bid: | **US $9.99** |
| Time left: | **8 days 3 hours**<br>10-day listing<br>Ends Nov-19-04 15:35:19 PST |
| Item location: | Knoxville, TN<br>United States |
| Ships to: | United States, Canada |

## Summary

KENTUCKY EQUIPMENT 7240 Barbourville Road London, KY 40744-9321 Office: (606) 878-8498 Fax: (606) 878-8498 Email: kentuckyequipment@charter.net CORDIN 432 DELAY GENERATOR PULSE SYSTEM * Starting Price $9.99 Condition Used UPS or Fedex Ground (Shipping & Handling within the USA ) $32.00 CORDIN 432 DELAY GENERATOR PULSE SYSTEM * DESCRIPTION: This auction is for the sale a CORDIN 432 DELAY GENERATOR PULSE SYSTEM. This item looks to be in fair to good physical condition. This item powers up but is being sold as-is. If you have any questions do not hesitate to email. Thank you and have a nice day. CORDIN 432 DELAY GENERATOR PULSE SYSTEM * WARRANTY & DISCLOSURES: PAYMENT IS DUE WITHIN THE FIRST TEN DAYS AFTER THE AUCTION ENDS. Buyer will pay a flat rate fee for shipping and handling within the continental US. The Flat rate fee is listed in the table above. Shipping insurance is included in the shipping and handling fee for most item(s). WE ARE NOT RESPONSIBLE FOR DAMAGE, WHICH MAY OCCUR DURING

Exhibit #3

SHIPMENT. Again, shipping insurance to the value of each item is included in the shipping and handling charge (for all items greater than $100.00 USD). The buyer is 100% responsible for collecting compensation for any shipping related damages. ALL ITEMS ARE SOLD AS-IS UNLESS OTHERWISE STATED. In the unlikely event that an item was DEAD ON ARRIVAL (DOA) which was sold as NOT DOA the following rules apply: The BUYER MUST make email contact fully notifying that the item was DOA within the first 7-days after receiving the item shipment; The item MUST be returned (shipped CAREFULLY as if it was still in good working order); After we test and investigate the items condition and conclude that the item(s) was(were) DOA a FULL REFUND (MINUS ANY ACQUIRED SHIPPING RELATED CHARGES will be promptly issued). By bidding on this(these) item(s) you are AGREEING COMPLETELY with these TERMS AND CONDITIONS. Thank you and have a nice day. Have A Question Or Comment? Please Use Or Customer Support Center By Clicking On The Customer Support Button Below.

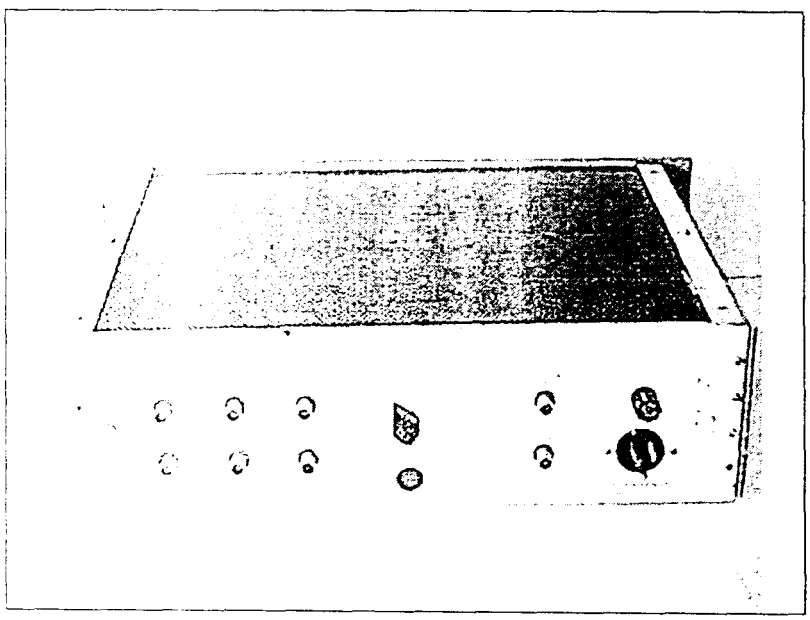


Exhibit #3



Budget Machinery: We deal in new & used machine tools - Vertical borers, grinders, lathes, millers, drills, horizontal borers, slotters, saws.
Please click on the links below to see stock details. *"We deal world wide".*
*Buying or selling? Contact Budget Machinery NOW!*


Hyspeed camera

Hadland Hyspeed camera with leads, lens & stand

Exhibit #4 page 1 of 6

# Model S-150 ultra-high speed framing camera with continuous access

Li Jingzhen, Li Shanxiang and Gong Xiangdong[a*]
Tan Xianxiang and Liu Ningwen[b]
Sun Fengshan and Zhang Boheng[c]

[a] Shenzhen University, Shenzhen, China (518060)
[b] Institute of Fluid Physics, CAEP, Mianyang, China (621900)
[c] Xian Institute of Optical and Precise Mechanics, Academia Sinica, Xian, China (710068)

## ABSTRACT

Model S-150 ultra-high speed framing camera with continuous access, characterized by a three faced, high velocity motor driven rotating mirror of aluminium substratum with a reflective overcoat made direct coating or transposition coating, a coaxial speed increaser with ratio of 2×13:1, a pre-magnetic-field fast open shutter with opening speed of 0.7mm/μs, and a computer-electronic camera control with virtual buttons substituted for tens of real buttons and real monitoring of whole photographic process, has successfully been made. Specifications of the camera are as follows: the maximum economical photographic rate of $1.4\times10^6$pps and the maximum rate of $2.24\times10^6$pps corresponding to a rotating mirror velocity of $4\times10^5$rpm and its peripheral velocity of 800 mps, the dynamic visual resolution of 34 lp/mm along the temporal direction, the frame format of 14mm×20mm. Tests and experiments verify that it is very useful and available with high quality pictures taken from the transient events with random triggering time and very strong anti-interference property.

**Keywords:** framing camera, continuous access, fast open shutter, coaxial speed increaser, virtual buttons

## 1. INTRODUCTION[1,2]

Model S-150 ultra-high speed framing camera with continuous access, based upon ZFK-500 ultra-high speed rotating mirror camera, ZFD-250 ultra-high speed camera with continuous access, ZFD-50 ultra-high speed camera and ZFD-80 ultra-high speed camera, has successfully been made in order to study transient phenomena such as explosive detonations, ultra-high voltage discharge, hypersonic wind tunnel, chemical propellent and so on. This camera, verified available to test explosive detonations, is featured with bigger format, more frames, wider photographic frequency range, higher spatial resolution, easier control of virtual buttons, very stronger anti-interference property, and pre-magnetic field fast open shutter and aluminium rotating mirror that is first time used in ultra-high speed rotating mirror cameras.

This camera is mainly composed of optical-mechanical system, computer-electronic camera controlling system,

* This work was supported by the National Natural Science Foundation of China under grant No. 69778005 and 60127501
Further author information:
Li Jingzhen: E-mail: lijz@szu.edu.cn, Telephone: +86(0755)26536217



25th International Congress on High-Speed Photography and Photonics,
Claude Cavailler, Graham P. Haddleton, Manfred Hugenschmidt, Editors,
SPIE Vol. 4948 (2003) © 2003 SPIE · 0277-786X/03/$15.00

and motor driven ultra high speed aluminium rotating mirror system.

## 2. OPTICAL SYSTEM

In this camera, a three faced rotating mirror and two incident beams optical axes of which are perpendicular to the rotating mirror axis, are designed to carry out continuous access. It is necessary to arrange a set of shutter including an electro-magnetic shutter, an explosive shutter and a fast open shutter to avoid re-exposure on the film because of three time sweeps over a revolution.

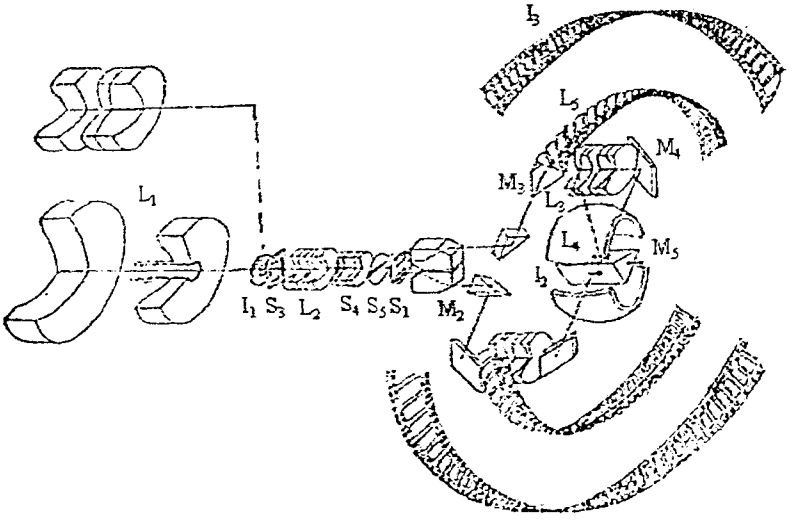



Fig.1 schematic diagram of optical system for S-150 camera

As shown in Fig. 1, the typical Miller's optical system of the camera can be described as follows[3]: main objective $L_1$ forms the first image $I_1$ on the front focal plane of OK lens $L_2$ and this image is then transferred to the reflecting surface of the three faced rotating mirror $M_5$ by K lens $L_3$, the second image $I_2$ subsequently on to photo emulsion layer ($I_3$) by relay lenses $L_5$ on the surface of which, the aperture diaphragm $S_1$ is imaged in the form of a lit rectangle, that is the exit pupil of the system which moves along the relay lenses surface to build framing while the mirror $M_5$ rotates to build framing. In this camera, the non-redundancy design has been used to increase the frame size in temporal direction and spatial information magnitude, which makes the best use of the inner optical system, especially the width of the rotating mirror according to the rotating mirror center in the third quadrant, asymmetric design of the image and reasonable vignette of off-axis image point.

There are three kinds of shutter. The electro-magnetic shutter $S_5$, which is a safe shutter or a mechanical shutter, is named a ms order one which means the behaviour time, open time or close time, being about ms. The explosive shutter is named a fast close shutter with behaviour time of μ s order and composed of two protected glasses, one explosive glass and one or two detonating caps. The fast open shutter with electric-surge $S_3$, the opening time of which is up to 0.7mm/μ s, is composed of pre-magnetic field unit, controlling unit, shutter frame made of aluminium strips and two strips of aluminium foils, the repulsion force between which will take place while two contrary electric surges go

through them, in order to avoid exposure in advance. Fig. 2 shows the fast opening principle of the shutter.

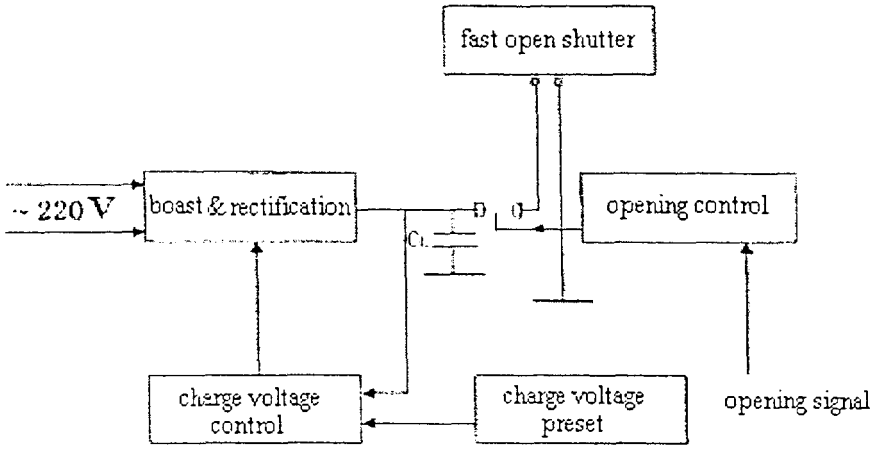


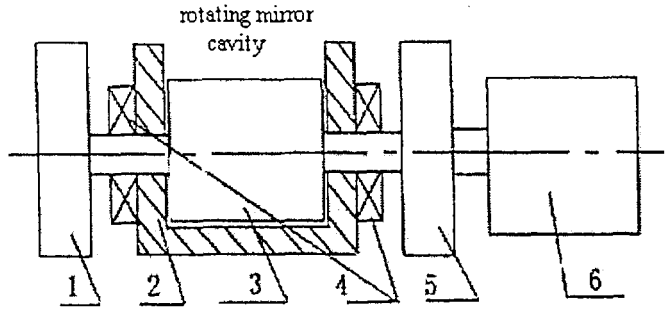

Fig.2 block diagram for the fast opening shutter

## 3. ALUMINIUM ROTATING MIRROR SYSTEM

Specifications of the motor driven aluminium alloy rotating mirror system with a coaxial speed increaser are as follows[4]:

| | |
|---|---|
| Rotating mirror: | three faced aluminium mirror |
| Face format: | $33 \times 27.4 mm^2$ |
| Face quality: | N=3, $\Delta$ N=0.3 |
| | reflectivity>80% |
| Mirror rate: | up to $40 \times 10^4$rpm |
| Motor: | DC, $3 \times 10^4$rpm, 2KW |
| Speed governing: | pulse width governed speed continuously |

As shown in Fig. 3, the motor driven aluminium rotating mirror system is composed of tachogenerator 1 which




1. tachogenerator 2. assembled bearing seat 3. rotating mirror 4. bearing support unit 5. speed increaser 6. motor

Fig.3 structure of the rotating mirror system

consists of an infra-red source, a small hole cross the spindle of the mirror and a photosensitive diode, as shown in Fig. 4, an assembled bearing seat 2, the three faced rotating mirror 3 of aluminium alloy substratum with a reflective

overcoat made direct coating or transposition coating, a bearing support unit 4 composed of 2×3 bearings, a coaxial speed increaser 5 with ratio of 2×13:1 that means one stage with ratio of 2:1 and other stage with 13:1, a DC motor 6.

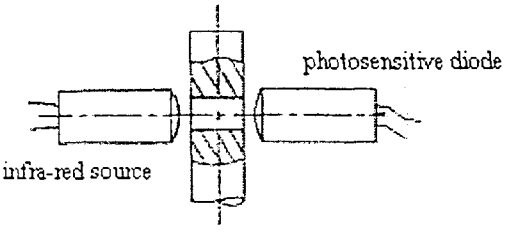



Fig.4 sensing unit for rotating speed

The rotating mirror rate from $1.8\times10^3$rpm to $40\times10^4$rpm is correspondent to the photographic frequency from $1\times10^4$pps to $2.24\times10^6$pps corresponding to the rotating mirror peripheral velocity of 800 mps which would be the maximum recording up to date.

## 4. COMPUTER-ELECTRONIC CAMERA CONTROL SYSTEM

As shown in Fig. 5, the computer-electronic camera controlling system with virtual buttons substituted for tens of real buttons and real monitoring of whole photographic process is a more accurate control one used for firing event,

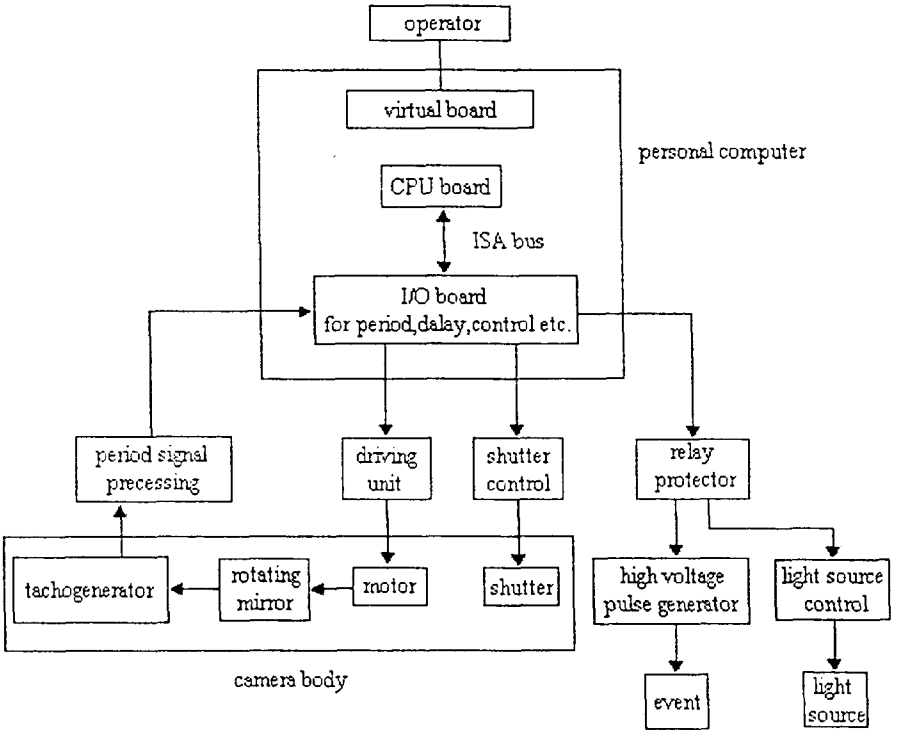



Fig.5 block diagram of camera control system

firing shutters and sources, measuring mirror period and initiating camera controlled events, the features of which are high period accuracy within ±0.1 μs, freezing the value of the mirror speed at the exposure time, and adjusting the

delay time between initialing and fire pulse signal output[5,6].

Specifications of the control system are mentioned below.

| | |
|---|---|
| Framing frequency: | $1\times10^4$ - $2.24\times10^6$pps, continuously governing |
| Velocity accuracy: | $\pm$0.1% |
| Stabled velocity accuracy: | $\pm$3% |
| Mirror control range: | 0.1 to 999.9 μ s period |
| Delay control range: | 0.1 to 999.9 μ s with increment of 0.1 μ s for four delay circuits |
| Delay control accuracy: | $\pm$0.1 μ s |
| Delay signal pulse: | 10V, ~10 μ s in width |
| Mirror power requirement: | DC, 3.5 – 180V, continuous, max. 20 amps. |
| Fire pulse: | (12 – 15) KV, < 0.1 μ s (front edge), ≥ 3J (energy) |

## 5. PROPERTY SPECIFICATIONS

A long time tests and experiments indicate that this camera is very useful and available in high quality pictures taken from explosive detonations and high voltage discharge with random triggering time and very strong anti-interference property; meanwhile, a lot of valuable results have been attained. Main property specifications of this mirror driven mirror camera with continuous access can be described in this way:

| | |
|---|---|
| Photographic rate: | max. rate $2.24\times10^6$pps |
| | max. economical rate $1.4\times10^6$pps |
| | min. rate $1\times10^4$pps |
| Effective aperture (at film): | f/17.93 |
| Frame size: | $14\times20$mm$^2$ |
| Total number of frames: | 112 (effective 110) |
| Resolution in temporal direction: | 48lp/mm (static visual) |
| | 34lp/mm (dynamic visual) |
| Objective lens: | 743mm; 390mm |
| Focusing range: | 20m – ∞; 2m – ∞ |
| Explosive shutter time: | ≤ 10 μ s, up to 5 μ s |
| Fast open shutter time: | ≤ 28 μ s, up to 22 μ s |
| Velocity measurement accuracy: | $\pm$0.1% |
| Velocity stabling accuracy: | $\pm$3% |
| Delay accuracy: | $\pm$0.1 μ s |
| Triggering pulse: | (12 – 15) KV, < 0.1 μ s (front edge), ≥ 3J (energy) |
| Rotating mirror: | trihedral, $33\times27.4$mm$^2$ |
| Mirror speed: | max. speed $40\times10^4$rpm |
| | max. economical speed $25\times10^4$rpm |
| | min. speed $0.178\times10^4$rpm |
| DC motor: | $3\times10^4$rpm, 2KW |
| Motor power: | DC, 3.5V – 180V, continuous, max. current 20 A |

Exhibit #4 page 6 of 6

## ACKNOWLEDGMENTS

This work has got the support of National Nature Science Foundation of China (grant No.: 69778005 and 60127501), thanks a lot.

## REFERENCES

1. E. A. Igel, M. Kristiansen, *Rotating Mirror Streak and Camera, Introduction,* SPIE Optical Engineering Press, Bellingham, 1997.
2. Li Jian, et al, "Application of Model S-150 ultra-high speed framing camera with continuous access to explosive detonation tests", Preprints of the 4th National Congress on Photonics (NCP), National Committee on High Speed Photography and Photonics of Optics Society of China and National Committee on Integrated Optics and Fibre Optics of Optics Society of China, 131, Mianyiang, China, 2002.
3. Miller, C.D., J. SMPTE, 53(5), 479 – 488, 1949.
4. Li Jingzhen, Sun Fengshan, "Dynamic property of rotating mirrors of high intensity aluminium alloy for ultra-high speed photography, Acta Photonica Sinica, 30(5), 636 – 640, 2001.
5. Lai Guji, "Rotating mirror controlling system in fluid physics study", Preprints of the 2nd NCP, 721 – 728, 1998.
6. Liu Ningwen, Wu Yunfen, et al, "Control system for several rotating mirror camera synchronization operation", SPIE, vol. 2869, 695 – 699, 1997.

Exhibit #5 Page 1 of 4

PROOF & EXPERIMENTAL ESTABLISHMENT Chandipur

PROCEDURE 'A' TO ISSUE VOUCHER NO. PES/146 DATED 28.10.2002

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|

55 1. SVR II Electronic Ballistic range camera, 25mm Bi-Planner Intensifier type with exposure times 200 ns-1ms including: 1 No

(a) 100m camera to control rom cable on drum
(b) 60-300mm Zoom lens
(c) Lens support
(d) Lens hood
(e) Built in focus monitor
(f) 4 way flash trigger distribution box
(g) Laptop control unit consisting of :

(a) 166 MHz Pentium Processor
(b) 13.3" TFT colour display screen
(c) 2 GB Hard drive
(d) 32 MB RAM
(e) MS Mouse/Keyboard pointer
(f) Windows 95
(g) PCMCIA Ethernet card
(h) Built in Modem
(i) CD ROM Drive
(j) 3.5" Floppy drive
(k) Operator's manual
(l) Aluminium transit case

Stock Number : 04-100-00

56 2. Heavy Duty Tripod with positive quick release tension plate 1 No
Stock Number : 034-116-00

57 3. High power flash Model RF250, suitable for both small and large Calibre projectiles 4 Nos
Stock Number 7002-014

58 4. SVR Optical trigger 1 Nos
Stock Number 7050-061

59 5. SVR II software/remote control/analysis package Ethernet link and Windows 95 software to perform the following functions : 1 Nos

(a) Remote control of either single or multiple camera heads
(b) Storage and display of image including rapid zoom and scroll function
(c) Calibration of the stored images
(d) Measurement of distance, velocity, angle and spin rate
(e) Grey level and binary image enhancement routines
(f) TIFF conversion utility

Stock Number : 107-100-00

Contd. to ..... P 2/-

Exhibit #5 Page 2 of 4

PROOF & EXPERIMENTAL ESTABLISHMENT Chandipur

No
Date

CHANDIPUR

PROOF

| | | | |
|---|---|---|---|
| 8/(4) 60 | 6. | 17" SVGA Multi Sync | 1 No |
| 60- 61 | 7. | Spare flash tube for higher flash Model RF250<br>Stock Number : 7002-425 | 4 Nos |
| 60- 62 | 8. | Spare 100m camera to computer control cable on drum | 1 No |

Exhibit #5 page 3 of 4



Products & Services

Commercial Products
High-Speed Digital Imaging
LADARVision® System
Propulsion Systems
Control & Automation
Advanced Motor Development
Advanced Electrical Machine Applications
Weather Systems
Ultra High-Speed Digital Imaging
Photo Gallery
Power Systems
Intelligence
C3
Tactical Computing
RSTA
Test
Training

Printer F

# SVR 3

The SVR 3 Ballistic Range Camera has been designed as a replacement for the existing SV-553BR/SVR and SVRII cameras currently in service on ballistic ranges around the world. The camera incorporates many new improvements in image quality, handling, and general ease of operation keeping it up to date with the current operational requirements for a High Speed Electronic Ballistic Imaging system.

The 2048 x 2048-pixel 12-bit CCD sensor fibre optically coupled to a high reso 40mm Microchannel Plate (MCP) Intensifier gives exceptional image quality, d' range and optical sensitivity. Reduced size, weight and 'through the lens' peris focusing, simplifies set up time and offers increased reliability and ruggedness Windows® 95®/98®/2000®/NT® software offers all of the functionality of the p versions with full downward compatibility for control of mixed camera types.

## Features

**- 2048 x 2048-pixel 12-bit CCD sensor**
**- 1:1 fibre optic coupling to a 40mm high resolution Microchannel Plat Intensifier**
**- Fast 200 Mbits/s digital video serial data link over fibre cable**
**- 'Through the lens' periscope focusing**
**- Windows® 95®/98®/2000®/NT® control and image analysis softwa**
**- 20ns – 1ms exposure times**
**- Single shot or up to 16 independently controlled superimposed expo**

## Specifications

### Optical

- Objective lens: Nikon® bayonet mount. 60-300mm zoom lens supplied as sta
- Intensifier: 40mm Microchannel Plate type, high resolution
- Sensor: 2048 x 2048 pixel 12 bit CCD
- Viewfinder: Periscope type, through the lens

Timing

- Exposure times: 20ns – 1ms, adjustable in 10ns increments
- Number of exposures: 1 to 16
- Interframe times: 50ns – 20ms, independent and adjustable in 10ns increme
- Delay generator: Internal. Variable from 100ns to 100ms in 10ns increments
- Delay to first exposure: 100ns minimum

- Preflash timing: Variable between 50ns and 400m s in 10ns increments

Input/output signals

- Input trigger: TTL positive or negative, make or break
- Preflash output: TTL to external light source, 4 separate outputs
- Sync. output: TTL synchronized with first exposure (Cam fired), TTL synchro trigger in (Trig out
- Image transfer: 200 Mbits/s digital video serial data link, fibre optic as stand kilometres, 100m fibre optic cable on drum supplied with the system
- Remote control: RS 422 19.2Kbits/s fibre optic as standard up to 2 kilometre fibre optic cable on drum supplied with the system
- Power requirements: 90 – 260v 50 – 60 Hz autoselecting, 100w

Dimensions

- Length: 480mm (without lens) 295mm
- Width: 160mm
- Height: 295mm
- Weight: 7Kg

Email: DRS Data & Imaging, Ltd.

Contact DRS Technologies

**ICOTT INDUSTRY COALITION ON TECHNOLOGY TRANSFER**
1400 L Street, N.W., Washington, D.C. 20005 Suite 800 (202) 371-5994

November 18, 2004

Ms. Shiela Quarterman
Regulatory Policy Division
Bureau of Industry and Security
U.S. Department of Commerce
P.O. Box 273
Washington DC 20044

Re: Effects of Foreign Policy-Based Export Controls, 69 Fed. Reg. 57895 (Sept. 28, 2004)

Dear Ms. Quarterman:

The Industry Coalition on Technology Transfer (ICOTT) is pleased to respond to the Department's request for comments on the renewal of foreign policy-based export controls.

In large measure these controls are unilateral in character. Therein lies their ineffectiveness. While there can be instances where unilateral controls are justified, they are rarer than the broad array of such United States controls would indicate. From the standpoint of effectiveness, unilateral controls are like damming half a river. The builder may take pride in the majesty of the dam but there is every bit as much water downstream as before the first shovelful of earth was turned. For this reason, unilateral controls should be invoked—or continued—only where the resulting injury to American workers and businesses can be justified when balanced against the symbolic character of the restrictions. "National security" includes economic as well as military security, and both of these elements must be taken into account in the administration of our export control system.

Another argument frequently advanced in support of unilateral controls is that their imposition is necessary while the United States seeks multilateral support. The historical record of this tactic has been mixed at best. At a minimum, controls imposed unilaterally under this rationale should be of limited duration unless sufficient multilateral control is achieved.

We urge that any controls that do not meet the foregoing criteria be removed.

In addition to noting the general ineffectiveness of unilateral controls, we recommend that where such controls are imposed for anti-terrorism reasons, License Exception RPL be available for emergency services, including one-for-one replacement of parts, rendered to commercial aircraft that are located in, owned by, or registered in sanctioned countries. Were

an aircraft to crash because maintenance was unavailable due to United States export controls, the adverse publicity for our country would far outweigh any benefit derived from the controls themselves. Moreover, even absent a safety problem, the unavailability of scheduled aircraft could inconvenience nationals of many countries that are not sanctioned by the United States and be costly to affected airports and other international airlines (i.e., not of sanctioned countries) providing connecting flights.

Founded in 1983, ICOTT is a group of major trade associations (names listed below) whose thousands of individual member firms export controlled goods and technology from the United States. ICOTT's principal purposes are to advise U.S. Government officials of industry concerns about export controls, and to inform ICOTT's member trade associations (and in turn their member firms) about the U.S. Government's export control activities.

Sincerely,

Eric L. Hirschhorn
Executive Secretary

**ICOTT Members**

American Association of Exporters and Importers (AAEI)
Semiconductor Equipment and Materials International (SEMI)
Semiconductor Industry Association (SIA)

cc: Hon. Kenneth Juster
Hon. John Bolton
Hon. Peter Lichtenbaum
Hon. Lincoln Bloomfield
Hon. Condolezza Rice

DC:383412.2

**From:** "John Goodrich" <John.Goodrich@infraredsolutions.com>
**To:** <SQuarter@BIS.Doc.Gov>
**Date:** 11/19/2004 11:13:16 AM
**Subject:** SITAC comments on how existing foreign policy-based export controls ...

Dear Sheila,

Attached is the Sensors and Instrument Technical Advisory Committee 2004 response to your request. Please confirm receipt. I would be happy to discuss any questions or comments. Thank you.

John Goodrich
Infrared Solutions Inc.
763-398-6458
John.Goodrich@infraredsolutions.com

November 17, 2004

Ms. Sheila Quarterman
Regulatory Policy Division
Bureau of Industry and Security
Department of Commerce
PO Box 273
Washington, DC 20044

Subject: Effects of Foreign Policy-Based Export Controls

Reference: Federal Register Notice Vol. 69, No. 187, September 28, 2004

Dear Ms. Quarterman:

Please accept this letter on behalf of the Sensors and Instrumentation Technical Advisory Committee (SITAC) in response to the referenced request for comments on the effects of foreign policy-based export controls.

As a new member of the SITAC and elected Chairman, President of an emerging commercial Infrared camera company (Infrared Solutions, Inc.) and son of a retired U.S. Air Force General, my perspective on these matters may be somewhat unique. Over the past four years issues and concerns have been raised regarding the United States uncooled thermal imaging products and the fact that US manufacturers have been constrained by US export controls. Of the controls subject to extension, those of most concern to the industry represented by the SITAC are the Regional Stability (RS) controls outlined in Part 742.6 and applying to commodities in categories 6A002, 6A003, 6E001 and 6E002, all related to commercial night vision and thermal imaging equipment. Part 742.6 states that these controls are

*"maintained in support of the U.S. foreign policy to maintain regional stability".*

The legitimacy of RS controls has been a longstanding topic with the SITAC. It is widely felt that RS controls and, in particular, the RS1 country list have little to do with regional stability concerns. Arguments have been presented over the past four years on Criteria in determining whether to continue or revise U.S. foreign policy-based export controls. Unfortunately for our Military troops and the U.S. commercial infrared camera industry, concerns raised over the past four years have come to fruition. The annual SITAC letters in the years 2000 through 2003 SITAC are hereby incorporated by reference.

Following is information on the state of the industry. It points out the high degree of thermal imaging cameras' uncontrolled proliferation. It shows that there is no solution proposed that can "manage" the situation. The United States military advantage of "we own the night" is at risk. Moreover, the United States commercial infrared industry is being significantly hampered by inconsistent policies. It is a no win scenario for our Serviceman and U.S. commercial infrared industry. Next is a brief history leading up to the current state of affairs.

U.S. companies pioneered the world-wide commercial infrared camera market during the 1990's based on technology developed for the U.S. Department of Defense in the 1980's (vanadium oxide infrared sensor or VO Sensor). The United States Department of Defense required that this technology be export controlled to ensure our military night vision advantage would not be compromised. The thirty-three country members of the Wassenaar Treaty adopted control of the VO Sensor technology and related international export sales licensing requirements. This treaty basically attempts to implement consistency in export licensing regulations throughout the Wassenaar countries.

In the 1990's a French company (Sofradir) and a U.S. company (Raytheon Commercial Infrared now owned by L-3 Communications) developed a slightly different type of infrared sensor (amorphous silicon infrared sensor or AS Sensor). This sensor has comparable performance specifications as the VO Sensor. There is no clear and inherent advantage to VO Sensor vs. AS Sensor technology even though the US DoD has aligned its development efforts with VO Sensor technology. Since the AS Sensor is a silicon-based technology, it is covered by a control note excluding it from export control under the Wassenaar Treaty and the U.S. Export Administration Regulations. There is a slight material component difference (0.05% of a specific material) that precluded the new AS Sensor from meeting the technical definitions to require export license controls. While the writers of the existing regulations probably did not anticipate the emergence of the present AS Sensors, the regulations have been a factor in the investment decisions of the US company that produces this technology.

The stated intent of the U.S. Government is to maintain control of infrared imaging technology. The Department of Defense does not want any enemy to have access to such devices and put our soldiers at greater risk. We all share the concerns of the Department of Defense. The US delegation has sought to minimize these threats by modifying the technical definitions in the Wassenaar Treaty and U.S. Export Administration Regulations to require licensing of international export sales of AS Sensors. However, to ratify such a change, all participating Wassenaar Treaty member countries must unanimously approve it. Otherwise, the status quo is maintained. Over the past three years the United States has backed proposals at the annual Wassenaar negotiations to adopt uniform export controls of both VO and AS Sensors. These proposals have not been unanimously approved by all country delegations, partially because the US has not entertained counterbalancing proposals from other nations that would remove some controls in this technology area. Therefore, any infrared cameras using AS Sensors continue to be unfettered by licensing requirements. Further, French products are being freely sold throughout the world while the US source of AS Sensor technology applies at least some self-regulation respecting US foreign policy and national security interests.

In 2002 the French Company, Sofradir, transferred its AS Sensor technology into a new subsidiary, ULIS, located in Grenoble France, to begin commercial AS Sensor production. During 2003 and 2004 industrial infrared cameras incorporating these new sensors dramatically increased. In 2004 ULIS sold over 8000 high-resolution As Sensors to infrared camera manufacturers throughout the world including manufacturers located in China, Israel, France, Sweden, Germany and the United States (note that China and

Israel are not Wassenaar-member countries and therefore not bound by any export controls). Based on industry member visits to ULIS and comments made by ULIS personnel, their Grenoble facility is currently capable of producing 50,000 AS Sensors annually. They expect significant growth due to the fact they fabricate high quality infrared detectors and because of their lack of export licensing requirements compared to U.S. competitors.

In 2003, the Japanese company NEC launched commercial production of its uncooled VO Sensors incorporating them in cameras made by NEC Sanei. These cameras formerly used VO Sensors manufactured in the US. Infrared sensor technology developments elsewhere in Russia, China, Japan, Belgium and Israel are potentials for future competitive threats.

**Recent Activity**

The 2004 Wassenaar negotiations have not yet resulted in any agreement with AS Sensors and related infrared cameras. Therefore, there are no anticipated treaty changes. Regardless if there is a last minute negotiated Wassenaar Treaty update, under European Union (EU) trade agreements, any infrared cameras manufactured in an EU country can be shipped to another EU country without a license. So at a minimum, commercial infrared cameras manufactured in the EU can be freely shipped throughout the EU without license controls. If there is no Wassenaar agreement, EU manufactured cameras with an AS Sensor will be able to be shipped license-free to most of the world.

The United States has announced its intention to unilaterally control AS Sensors under the auspices of the U.S. Export Administration Regulations. This means all AS Sensors and infrared cameras using AS Sensors exported out of the United States would require an export license. A noteworthy exception to this requirement may be that export of AS Sensors and infrared cameras with AS Sensors to the twenty-five NATO countries would not require a license for export. These details have not been announced. Companies represented by the SITAC view this with mixed feelings in that it does not entirely close the gap between regulatory treatment of VO and AS sensors but it does move in a direction similar to the TAC's longstanding desire to see category 6 technology moved from the RS1 to the RS2 control criterion. At the same time, it seems that adding regulation in our advancing technology area rather than gradually removing maturing technology from control is counter to the approach used in other technology industries such as computers and semiconductors, industries with much stronger lobbies than ours.

Under current regulations all U.S. export sales of VO Sensors and infrared cameras with VO Sensors would continue to require export licenses...even to the NATO countries. This puts the U.S. commercial infrared industry at a huge disadvantage for those utilizing "American Made" VO Infrared Sensors. Current policy could motivate U.S. companies to incorporate the French-made ULIS infrared sensors into their cameras and establish manufacturing capability outside the United States! A U.S. commercial infrared company has already done that.

As disclosed in SITAC's 2003 letter," Opgal in Israel has produced uncooled thermal imaging cameras for several years using ULIS detectors. In China (PRC), an entire industry has been created in the past three years. These companies, Dali, Wuhan Guide, SAT, Associated Technology and North China Research Institute of Electro-Optics, all use the ULIS AS Sensors. While the US restricts exports of VO Sensors to the EU and other closest allies ostensibly under guise of concern for the regional stability in those countries, a new industry is developed in the PRC! It is presumed that the PRC might be an intended target of RS controls. If not a direct target, the PRC offers a possible path for products to target countries. Thus any rational view by the US government must regard this as an example of failure to achieve the foreign policy objective." Moreover, under the current control environment AS Infrared Sensors and related infrared cameras are being sold throughout most of the world license-free.

Following is a table to highlight the current commercial infrared camera export license requirements:

| To/From | U.S. VO Sensor commercial infrared camera | U.S. AS Sensor commercial infrared camera (Note 1) | EU AS Sensor commercial infrared camera | Non-Wassenaar country AS Sensor commercial infrared camera |
|---|---|---|---|---|
| EU country | Yes | No | No | No |
| NATO country | Yes | No | No | No |
| Canada | No | No | No | No |
| Rest of the World (Note 2) | Yes | Yes | No | No |

Note 1) Assumes the U.S implements unilateral AS Sensor controls but still allows license-free exports to NATO Countries.

Note 2) There are some export restrictions to "prohibited countries". Note that China and Israel do not restrict exports to the prohibited countries as the U.S.

Following is discussion of the current state of the industry as it relates to the specific criteria considered in determining whether to continue or revise U.S. foreign policy-based export controls as stated in the Federal Register:

1. The likelihood that such controls will achieve the intended foreign policy purpose, in light of other factors, including the availability from other countries of the goods or technology proposed for such controls.

*Response: As shown above there is already world-wide availability of commercial infrared cameras on a license-free basis. Detailed documentation of the companies and infrared camera technical specifications has been provided to Defense Technology Security Administration (DTSA) and the U.S. Department of Commerce under separate cover.*

2. Whether the foreign policy purpose of such controls can be achieved through negotiations or other alternative means.

   *Response: The Wassenaar negotiations have not been successful over the past three years as pertaining to thermal imaging devices. The SITAC is not aware of any initiatives to control thermal imaging devices exported from China or Israel. In 2005 Israel is expected to come online with VO Sensors. AS Infrared Sensors continue to be sold license-free throughout the world.*

3. The compatibility of the controls with the foreign policy objectives of the United States and with overall United States policy toward the country subject to the controls.

   *Response: The RS1 country restriction is a significant disadvantage for domestic U. S. companies because international infrared commercial camera demand is being met primarily by European and Chinese manufacturers. Other international manufacturers are gearing up which will further exacerbate the situation.*

4. Whether reaction of other countries to the extension of such controls by the United States is not likely to render the controls ineffective in achieving the intended foreign policy purpose or be counterproductive to United States foreign policy interest.

   *Response: Most foreign competitors would prefer the United States to extend the controls in order to maintain their competitive advantage. International customers do not like to hassle with obtaining a U.S. export license when they have alternative equipment providers that do not require an export license.*

5. The comparative benefit to U.S. foreign policy objectives versus the effect of the controls on the export performance of the United States, the competitive position of the United States as a supplier of goods and technology.

   *Response: Again, the stated intent of the U.S. Government is to maintain control of infrared imaging technology. The Department of Defense does not want any enemy to have access to such devices and put our soldiers at greater risk. The critical question is does restricting U.S. manufacturers achieve this when there are alternative sources? Additionally, these commercial infrared cameras are not designed or practical for military uses. There are now cameras being made in China that are specifically designed for military applications.*

   *The United States is clearly losing relative commercial infrared camera market share.*

6. The ability of the United States to enforce the controls effectively.

   *Response: Due to the fact infrared cameras are being sold throughout the world on a license-free basis the current controls are not meeting the U.S. National Security concerns. A world-wide strategy needs to be developed and implemented to meet the U.S. foreign policy objectives. There is no control of AS infrared cameras under the current environment.*

Your request solicits suggestions for "revisions to foreign policy-based controls that would bring them into line with multilateral practice." We have seen one result of the multilateral practice above in the citing of the industry growth in China and Israel. The SITAC does not suggest creating a similar wide-open situation for US technology. However, we have long proposed a change of control criterion in 6A002, 6A003, 6E001 and 6E002 to RS2 vs. RS1. This change would put our industry on a level playing field with European competitors at least in sales to the EU and our closest allies, eliminating a large regulatory competitive advantage that our Wassenaar partners have over us at this time.

In closing, the SITAC offers these summary comments.

1. **RS control of thermal imaging and night vision technology is not accomplishing an enhanced regional stability in many of the stable countries on the RS1 list. Instead they serve only to limit US industries opportunities in these countries.**

2. **Rapid growth of the foreign industry is hard evidence of the effect of RS controls on trade and US industry's participation therein.**

3. **The Secretary should consider moving category 6 items from RS1 to RS2 controls as a first step to reconsidering RS controls in entirety. This would not only address the level playing field but also decrease BIS caseload by decontrolling exports to countries where stability is not at risk.**

We thank BIS for the opportunity to comment.

Respectfully submitted,

John R. Goodrich
Chair
Sensors and Instrumentation Technical Advisory Committee

**From:** "Griffith, Bill (GE Infrastructure)" <Bill.Griffith@gefanuc.com>
**To:** <SQuarter@bis.doc.gov>
**Date:** 11/19/2004 11:46:05 AM
**Subject:** RE: foreign policy-based export controls

Dear Ms. Quarterman:

Please see attached file, "Foreign Policy letter.doc" and the other attached files that are referenced in this letter for the GE Fanuc comments relative to US foreign policy-based export controls.

Best Regards,
Bill Griffith

-----Original Message-----
From: LEE ANN CARPENTER [mailto:LCARPENT@bis.doc.gov]
Sent: Friday, November 05, 2004 10:05 AM
To: PWarndorf@amtonline.org; chasruth@aol.com; GEORGE LOH; bill.griffith@cho.ge.com; Chip_Storie@cinmach.com; rvm154@earthlink.net; dsoroka@hardinge.com; ranstead@ida.org; nmarsilius@pmt-group.com
Subject: foreign policy-based export controls

Dear MPETAC,

In order to prepare the annual foreign policy report to the Congress, the Foreign Policy Division published a notice in the Federal Register to solicit comments on how existing foreign policy-based export controls have affected exporters and the general public. The notice is available on the BIS website and is also attached.

If you would like to submit comments, please send them to Sheila Quarterman, either by e-mail at SQuarter@bis.doc.gov or via mail to the Regulatory Policy Division; Bureau of Industry and Security; Department of Commerce; P.O. Box 273; Washington, DC 20044.

The comment period closes on November 19, 2004.

We would welcome your input.

Regards,
Lee Ann

Lee Ann Carpenter
Bureau of Industry and Security
MS 1099D
U.S. Department of Commerce
14th Street & Pennsylvania Avenue NW
Washington, DC 20230
(202) 482-2583
Fax: (202) 482-2927

**CC:** "Mpetac - Paul Warndorf" <PWarndorf@amtonline.org>

GE Fanuc Automation

Bill Griffith
CNC Product Manager

GE Fanuc Automation North America, Inc.
PO Box 8106
Charlottesville, VA 22911 - U.S.A..
Tel.804-978-5670 Fax 804 978-6942
Email: Bill.Griffith@GEFanuc.COM

November 18, 2004

Ms. Quarterman
Regulatory Policy Division;
Bureau of Industry and Security;
Department of Commerce;
P.O. Box 273;
Washington, DC
20044.

Dear Ms. Quarterman:

Subject: Foreign policy-based export controls

GE Fanuc is a joint-venture company formed by FANUC LTD and General Electric. Our business sells CNC, PLC, Software, and many other products as part of GE's Infrastructure business. GE Fanuc North America is the sales arm and voice for FANUC CNC products in the North American market. Our market boundaries that we sell to include all of the CNC products in the Americas (North America, South America, and Central America). Based on this, GE Fanuc's CNC business, that I work for, does very little direct export business of CNC products. However, we sell our CNC products to Machine Tool Builders in North America who would like to expand their markets into some of the new emerging world markets like China but for many reasons that are all caused by US foreign policy-based export controls, are not successful selling into the Chinese markets.

I am also a member of the Materials Processing Equipment Technical Advisory Committee. Over the years, there have been many attempts and many proposals submitted and reviewed by this committee to make Category 2 of the CCL be less restrictive so that our MTB's could expand their markets into the growing world markets like China. However, the proposals are reviewed but little or no action is taken to change the policies. GE Fanuc's North American CNC business has felt the impact of this as we have seen many of our Machine Tool Builder customers close their doors over the last 5 to 10 years and some of the failure of these businesses is related to foreign policy that restricted them to open their markets into the growing world markets.

The current restrictions for 5 Axis machines and CNC products capable of more than 4 Axes simultaneous contouring are the restrictions that hurt the US Machine Tool industry the most. At one time, the US was the leader in 5 Axis Machine Tool technology. This is not the case any longer! There are only a handful of Machine Tool Builder left in the US who can manufacture a 5 Axis Milling machine. Even when a large US Manufacturer wants to purchase a 5 Axis milling machine, they look to MTB's in the WA or Asian companies. The root of this drastic change over the past decade has been the decline of our US Machine Tool Industry caused directly by US foreign policy.

The Association For Manufacturing Technology (AMT) is the voice of this US Machine Tool industry and speaks for its members. Over the years they have written many letters and sent many warnings concerning the decline of our industry and how this will impact the US ability to be self-sufficient in protecting our country. They have also been the source of many of the proposals

submitted by the MPETAC over the years to attempt to get the US policies to be less restrictive. They have shown evidence of indigenous 5 Axis Machine Tools and CNC products in China that, according to the BIS definition of "Foreign Availability" is all that needs to be proven to have restrictive policies be revised or removed. Dr. Paul Freedenberg of AMT recently wrote in a letter to our industry members to ask all of us to send statements to our Congressman and State Government leaders concerning the US policies. In his letter he notes the following:

- There are a number of Chinese companies who will soon be exporting 5 Axis machine tools into the US. These companies are also quoting their products into US defense related businesses.
- 5 Axis machine tool technology is a mature technology (in existence for almost 40 years).
- Where the US perceives the spread of 5 Axis technology as a threat to national security, our allies see a huge and attractive market.
- The US does not have a veto over other nations' exports in Wassenaar.
- Our allies are free to pursue their own foreign policies and technology-transfer policies as they see fit.
- The Chinese are not only entering our domestic market but also threatening our civilian manufacturing/defense industrial base.
- The current US policies have prevented US companies from entering a machine tool market that is twice as large as the US market. However, our Co-Com allies grab the lion's share of the China market with no restrictions.

Mr. Freedenberg ends his letter with the following statement:

"The Defense Dept. needs to change its technology-transfer policy to deal with this new reality. But will US Companies ever recover from the harm that has already been done?"

I think that our industry can recover if these policies are changed now! The reason I say this is because I attended a joint AMT/NCMS meeting this year in Florida that dealt with the creation of new innovative technology for our industry in the Global market. This was a great meeting and made me feel good about where our industry is headed in the future. However, this growth of these new technologies must be funded somehow and the change of the current US policy will help provide the funds that are needed for this innovation to come to market. During one of the dinner sessions, we discussed Globalization and what it meant to our various businesses and it was interesting to see some of the comments that were made in this discussion relative to the US export policies. The following is taken from the AMT notes that were distributed from this dinner session:

- Concern about different rules and regulations faced by U.S. manufacturers and not faced by foreign competition.
- 5-axis export licenses take 6-12 months in the U.S. Other countries can get them in about one week.
- For U.S. machine tool builders, need to offer unique technology to survive. If China can build domestically, can't compete on price.
- Globalization has opened up new markets for US manufacturing to sell to which is good but, in China, it appears as though Manufacturers from Europe and other countries have a big advantage because of the problems the US government causes when trying to sell products into China. It takes too long for a US company to get an export license from the DoC and even if they do get a license and the Chinese

customer needs to come to US to buy-off on the machine, he can't get a Visa for his customer.

- For many years US Manufacturing was fed by high prices and a growing world need for those products. Globalization has driven pricing down for many years in our industry. As prices were decreased, margins also decreased and companies had to start running with fewer resources. The R&D effort by US Companies was hurt the most and few smaller companies cannot afford to do research any longer. Also, these companies no longer have the development infrastructure to do the development for new innovations after the research is completed. As the support and technology growth started to decrease in these US Companies, US industries began looking to the world to supply the products it needed. The Internet opened up things like global sourcing and orders going to the global companies who could supply the lowest cost product that could meet the requirement specifications. This increase of competition further declined the U.S. Manufacturing base.
- The Chinese and some of the other Asian countries are using illegal pricing schemes by purposely undervaluing their currency to allow them to supply the product at a lower price.

I will attach the file "AMT - Table Topics notes.doc" for your reference in case you would like to see all of the notes from this Globalization discussion.

A US delegation consisting of a US, MTB and representatives from the United States DoC (Dept. of Commerce), the DoD (Department of Defense), and some other US Government agencies visited China in November of 2002. Their goal was to understand more about the Machine Tool market in China. The following are my notes from what I heard when this report was read during the public meeting at a 2002 MPETAC meeting in Washington, DC. Keep in mind that this is a DoD report and that members of the DoE, DoC, State, and several other US agencies heard this same report.

1. Key points at all locations visited:
   - The Chinese have a large market for Machine Tools
   - The US export license is too difficult for the Chinese to deal with and the process takes too much time
   - The US visa approval process is not acceptable for customers in China who are purchasing Machines.
   - The Chinese are entering into more subcontracts with international aircraft manufacturers like Boeing and Airbus.
   - Chinese productivity is 15%-20% of US productivity and the challenge from these subcontracts is to improve productivity quickly to meet cost targets.
   - Chinese prefer US machine tools and customer service because they feel that the US companies can help them meet these productivity gains but they use mostly European machine tools because there is no problem with the export license or the Visa.
   - The biggest complaint from these Chinese locations was over the length and uncertainty of the US licensing process and this is leading them to select machine tools from the WA countries.
   - War stories were described where a US Visa took months to get or in some cases they were denied entirely and this has frustrated the Chinese.
   - 3 years ago 75% of all foreign tool orders went to the US. The percentage for US Machine Tools is now 25% and dropping.

- Chinese consumption of VMC's went from 1000 three years ago to 3000 units this year. US consumption of VMC's went from 7000 in 1997 to only 300 in 2002.
- The Chinese Turning market is twice that of the VMC market (6000 units/year).
- All of the Users visited were leery of ordering US machine tools due to license process and impact on their development when denial occurs.
- The problems with Visas are frustrating Chinese customers because they cannot get their personnel trained on tools and processes so they are going to Europe.
- The US is undercutting their ability to compete with Europe in foreign markets.
- The Chinese view 5 Axis machines as key to improving their productivity.

2. Points from individual companies visited:

- One Chinese Manufacturing plant has just signed a 160M Euro contract with Airbus for A320 components.
- This plant uses European Machine Tools but they view them as higher cost and lower quality than US Machine Tools.
- It was suggested by the Chinese that key US Senators and Congressman visit some of these locations to discuss business development and export/visa issues.
- One of the plants visited was a Chinese Machine Tool Builder who manufactures a 5 Axis CNC machine. They use CNC's from Siemens.
- Another MTB plant was visited who also makes a 5 Axis machine and their brochure states that they are "equipping China with China made equipment". The machine is equipped with a Siemens 840D.
- One End User visited stated that they expected that the automobile effort in China would increase significantly in the near future.

I am going to attach an EMAIL from Mr. Gary Mead from Monarch Machine Tool Inc. that I received in 2002. Please review his EMAIL to understand how current US Foreign Policy is affecting Monarch's business.

Bottom line is that although we all agree (US government as well as US Industry) that Foreign Policy must not be a factor in letting Globalization continue to grow the world economies, we know that there must be certain restrictions for the transfer of technology to unfriendly countries. Thus, the technology that the US is attempting to restrict with Foreign Policy must be reviewed again. It is not too late to save the US Machine Tool Industry!

Best Regards,

Bill Griffith
CNC Product Manager
GE Fanuc Automation North America, Inc.

Cc: J. Spearman

**From:** "Gary Mead" <gmead@monarchmt.com>
**To:** "Griffith, Bill (GE Infrastructure)" <Bill.Griffith@gefanuc.com>
**Date:** 12/18/2002 2:05:08 PM
**Subject:** China issues

Bill
Here are a couple of items for you.

Zhengzhou Hitech Mould company purchased a machine from us, this is a straight 3 axis with prewire for a 4th axis. In accepting the contract we of course agreed to a preacceptance run off at our facility. This customer was denied a visa 3 times.
After the 2nd time we contacted the US embassy in Beijing and arranged a personal interview to review the paperwork prior to the 3rd attempt. We had contacted our local senators who also had sent letters on our and our customers behalf. All to no avail, they were denied in less than 90 seconds.

We are now negotiating with our customer to perform all the testing on site in China. This is a machine we originally intended to ship late August early September.

Shenyang Liming is a supplier for GE Aircraft, Pratt & Whitney and Rolls Royce. We have a machine at their facility and this year received another order from them for a 2nd machine. Once again it came time for acceptance testing and the wait was on. It took about 15 weeks to find out if they were getting visas for the acceptance testing.

Meanwhile we're here with lots of inventory and no cash coming in.

We have had many chances to quote 5 axis machines but have walked away from them due to the uncertainty of getting the export doc's to ship it.
Customers will not wait a minimum of 160 days to see if a US company can supply the machine when our NATO(Italy, France, Great Briton) allies ship just about from stock with virtually no questions. We cannot afford to purchase inventory on speculation.

The Chinese government is pushing for domestic machine to be sold rather than imported. A 3 axis imported machine the customer gets no duty tax deduction for. A imported 5 axis machine is 100% duty deductible as the China builders are not ready yet for this business segment.

Hope this helps
Gary Mead
product manager
Monarch Machine Tool Inc

**Globalization – What effects, issues, and opportunities does it bring to product innovation and commoditization?**

General

- Need to realize that globalization is a fact of life and companies have to find a way to compete.
- Can't stop globalization – challenge is how do we (USA) grow our own U.S. based resource of USA students/engineers?
- Manufacturing companies have to play in the world market.
- Must embrace and change to survive.
- Globalization forces innovation and pushes the labor force.
- Globalization is good for the industry. Manufacturing brings together all the sciences. Manufacturing has a good reputation outside the U.S., but a bad reputation inside the U.S.
- All products will be built where they get produced most economically. Quality is a given. Specialization may be the differentiator.
- Specialize products may be our ticket to stay in. Commodity will go to lowest priced producer. Specialization could keep us on top.
- Use USA thinking and innovation for speed, but change "policy" to take advantage of the innovative spirit of USA.
- Opportunities: We have been given a wake-up call: utilize automation; 7-day a week processing; opportunity to streamline your business; look at doing more business in foreign markets.
- Automation: U.S. labor-quality cannot be compromised.
- Like giving birth: endure the pain for a payback and let go when mature.
- Most of the companies at the table have a worldwide presence and were not too concerned.
- Work smarter/work together.
- The quality of life is better in the USA.

Companies and Countries

- Caron Engineering, Inc. is doing business in Australia (15 years), Europe, and China.
- Control Gaging, Inc. has 20% of its sales outside the U.S.
- Caterpillar has 50% of its sales outside the U.S. Their largest manufacturing plant is in Europe.
- German based manufacturers have not seen a dramatic effect as a result of globalization.
- Contract manufacturers have lost a significant amount of work to foreign competition (approximately 10% - 15%) this doesn't account for price reductions.
- Custom equipment is very regional and has suffered.
- Mostly consumable product manufacturers have taken the biggest hits (mold makers, die makers).
- Machine and tooling remains better in Europe.

Considerations

- Foreign countries are more aggressive.
- See problem in U.S. not knowing foreign languages.
- "Franchising" the process – best practices that are developed by one "Advanced Engineering" group are then transferred to other countries (6M example).
- University students (foreign) that work on technology, take it back home to their country.
- How do we change "lazy" culture in USA as many "hungry" foreign students learn/get educated here.
- Competition on a global scale will not let us keep our "lazy" attitude.
- Foreign workers are hungry, however, US kids not interested.
- See Eastern Europe as big threat – higher skilled workforce.
- The USA is losing talent and manufacturing capability.
- Some foreign labor is/was cheaper, but we outsource work and therefore technology.
- Auto – Commoditization - stifle innovation with too much control over process development.
- Customers not allowing U.S. manufacturers to even quote to compete.
- Issues: Quality is key, but quality is only as good as the customer's requirements.
- Most at the table felt that many US companies do not utilize some of the programs available to assist in R&D funding opportunities.
- Third world countries where manufacturing growth is booming can only grow so large because they don't have the transportation infrastructure to ship products. The roads, shipping etc. will take decades of successful growth. Thus, they will peak out at some point and then they will not be able to continue the growth.

Policy and the Government

- Offsets play a big part. In some cases, they can exceed the value of the contract.
- Industrial/Political issue – resources, technology and policy.
- Concern about different rules and regulations faced by U.S. manufacturers and not faced by foreign competition. Additional costs in health insurance, liability litigation, etc.
- See issues with patent protection.
- Some international countries do not enforce patents.
- Intellectual Property issues when selling to (non-US and allied) defense sector.
- 5-axis export licenses take 6-12 months in the U.S. Other countries can get them in about one week. In some cases, this makes the U.S. manufacturers non-competitive.
- Risks of delivery problems due to political climate and terrorism.
- All at the table felt that government intervention would be a negative. However, government funding keeping companies a float outside the US was an issue and presented an unfair advantage for US suppliers.

Competing - General

- Need to focus on core competency and marketing creativity.
- Must transform the business model to combine domestic value-add (design and mfg. technology advances) with off-shore (low cost) commodity content.
- Business transformation: Focus on supply-chain and partnering (Wal-Mart effect).
- Integrate in business plan and prepare for new market opportunities as well as natural shift to low labor regions (Japan to Korea to China).
- U.S. has been cherry-picking the best people (skills) so must continue to be technologically advanced (to develop new market segments/industries and reduce labor).
- Need industry/government joint agenda to level the field: regulatory burden, streamlining of standards and metrication.
- See issues with lead time.

Competing - China

- Question on how much technology to ship to China.
- For U.S. machine tool builders, need to offer unique technology to survive. If China can build domestically, can't compete on price.
- Developing yet a better technology that simply gets copied by China, doesn't here.
- Good quality products are starting to come out of China.
- China has a good educational system.
- Globalization has opened up new markets for US manufacturing to sell to which is good but, in China, it appears as though Manufacturers from Europe and other countries have a big advantage because of the problems the US government causes when trying to sell products into China. It takes too long for a US company to get an export license from the DoC and even if they do get a license and the Chinese customer needs to come to US to buy-off on the machine, he can't get a Visa for his customer.

**What issues are there concerning the insertion and adoption of new technologies?**

Technology

- End users don't understand them (new technologies).
- Small companies tend to embrace new technologies. They are constantly looking for an edge on the competition.
- Funding can be a detriment to machine tool builders (MTB). MTBs may not do it on their own. They may need a push & funding from the end users.
- If a competitor embraces new technology, then there is pressure to follow.
- Need to be easy to use.
- The U.S. needs to be accelerating technologies where we currently have an edge to spawn off new technologies to support it. A lot of good research is being done, but it takes too long to bring it to market.
- The operators, maintenance personnel, production engineering, etc. are probably aware of the fact that this technology is available, but they have difficulties explaining the benefit and justifying the purchase of the new technology with good ROI data. Thus, the fact that the technology exists never gets up to the uppers levels of management.
- We must begin developing reconfigurable products for the future of the world environment. Our world must be a sustainable place where we re-use all of the older products or the world will become a giant land-fill.

Training

- End users have ease of use & training issues.
- Sellers have problems training end users.
- Problem with skill of workforce.
- Training necessary.
- When a company purchases new technology, the operator learns how to use it for his needs, but typically only uses 10% of what the product is capable of doing.
- No one wants to read a manual to find out how something works so the product must have a human interface that makes it easy to use new features.
- Ease of use of new Technology - The US has a workforce that is willing to work very hard, is very dedicated, and is committed to the business goals. But with fewer and fewer people, it is becoming difficult to keep this momentum going. We must begin to adopt new technologies that are easier to use and require no people for operation and if a person is required, it must be user friendly and must be as easy as "point and click" to use.

Implementation

- Biggest hurdle is getting over fear of change – must change culture.
- There are cultural issues with new technologies.
- There are psychological issues with new technologies – "We have never done that before!"
- New technology is often pushed off as "not needed." It's worked for 20 years, why change.
- Education is key to the adoption of new technology - almost all of the technology that the guys on the "job-shop panel" presentations talked about is available today but the speakers were not aware of it. Also, new technology is more complex today and requires some Engineering know-how to get full use of the product.
- Need to have someone champion change.
- A champion/expert may embrace a new technology, but if he leaves there may be a void.
- Workforce skills to absorb new technology can be an obstacle.
- IT department can block access to new technology (i.e. PC-based controls and internet access).

Companies and Countries

- Caterpillar has a "New Technology Introduction Process" with Six Sigma Gate Reviews.
- Caterpillar tries to force new technology when recapitalizing. Caterpillar, MTBs, and other vendors form an "Alliance for New Manufacturing". Willing participants (Caterpillar management of new plants & vendors) are required to make this work.
- Ford Motor Co. has the policy to prove out any new technology before implementation to avoid future problems.

Considerations

- For many years US Manufacturing was fed by high prices and a growing world need for those products. Globalization has driven pricing down for many years in our industry. As prices were decreased, margins also decreased and companies had to start running with fewer resources. The R&D effort by US Companies was hurt the most and few smaller companies can afford to do research any longer. Also, these companies no longer have the development infrastructure to do the development for new innovations after the research is completed. As the support and technology

growth started to decrease in these US Companies, US industries began looking to the world to supply the products it needed. The Internet opened up things like global sourcing and orders going to the global companies who could supply the lowest cost product that could meet the requirement specifications. This increase of competition further declined the U.S. Manufacturing base.

- Most of the people at the table felt that the U.S has a moral obligation to the rest of the world to make the entire world a better place to live. Thus, we need to let the current manufacturing base leave the U.S., but quickly replace it with new innovative technologies that will be the growing technology for the next couple decades. The consensus was that we don't want to "protect" the manufacturing that is left in the US - we need to grow new manufacturing businesses for the emerging technologies.
- Need to show benefits to operator and bottom line.
- Need to get in at design level – hard to change after design is done.
- Must balance the 3R - Risk, Resistance and Resources.
- Standardization will make it easier to implement new technologies.
- Sometimes, more pressing issue is how to stay in business (without resources for new technology).
- Issues discussed were emerging technologies and how to deal with them, new technologies in the control world and how to keep up with fewer resources available and how do you deal with end users who rely on more help than in prior years.
- Technical support is a must to insert new technologies.
- Infrastructure costs in U.S. are driving U.S. jobs out. New technology must create requirements for a new type infrastructure that will replace the jobs lost from moving manufacturing offshore.
- Many new jobs and technologies were created by the invention of the PC. We are still seeing the technology growth but the jobs for those programming the PC's and using the PC's have stopped growing and are moving off-shore due to globalization.
- Simulation is not comprehensive enough so that the transition to new technology is easier on the machine tool.
- U.S. executive salaries are too high and this inhibits investment in the adoption of new technology.
- Infra-structure dislocation, e.g., fabless commodity production is typically off-shore whereas IP-sensitive and value-add production needs to be kept (preferred) domestic.
- Technology needs to have customers, we need a cause.

<u>Policy and the Government</u>

- Foreign government subsidy of new technology far outstrips U.S. support.
- Lack of U.S. government support for new product development.
- Not enough focus on manufacturing. High school, etc. do not support education of young "to be" manufacturing engineers.
- Need a national cause, e.g., going to moon.
- Pricing is being driven to such low levels today that U.S. companies can't afford to bid for some of the jobs against China. The Chinese and some of the other Asian countries are using illegal pricing schemes by purposely undervaluing their currency to allow them to supply the product at a lower price.
- As Manufacturing has decreased the job opportunities have also decreased. College students choosing their careers today are not going into the Engineering fields because the job opportunities aren't there. This discussion centered around how we can get students interested in Engineering fields until the new jobs from new innovations show up? Can the government help?

- Foreign Policy must not be a factor in letting Globalization continue to grow the world economies.

**What does a smart machine mean to you?**

Capability

- Machines that will convert engineering drawings into code.
- E-mail part drawing & everything else is done automatically.
- Take part directly from CAD into a system with little or no human interface and make a part.
- Take a (3 D) model to generate the code.
- Direct from CAD, Health monitor, process understanding, learning, fault tolerant, adaptable, in-process gauging.

-

- Machine that learns.
- Machine learns from its mistakes.
- Self-learning control: Combine part-program knowledge base with machine characterization to optimize processes without operator intervention.
- The knowledge of the machining process would be in the smart machining system for the machine making the part.
- The smart machining system would learn how to make variations of parts as other processes were added to the machining process (i.e. add a probe for metrology and for measuring offsets and the system would automatically include it in the final process).
- Automates routine tasks.
- Taking available data (stiffness, capabilities, material knowledge) to optimize feed rates during the cut.
- Machine control knows (gathers) lot more than we currently use. Exploit the knowledge with right HMI.
- Process and part handling rules and wizards with real time problem solving.
- Total intelligence - machine tool – fixture – working together.
- First piece correct.

-

- Adaptive control.
- More adaptive controls.
- Optimize cutting process
- Recognizes good from bad.
- Makes adjustments to make something good from bad.

-

- Monitor diagnostics.
- Reliable and tells you when it will fail.
- Self diagnostic – finds problem and gives solution advice.
- The system should be able to predict machine process problems and take early action.
- Tells you when you have tool problems.
- Real time remote machine tool monitoring.
- Embedded sensors.
- Need embedded sensors for in-situ (in-process) feedback and adaptive control.

-

- Maintenance detail – associate a fault condition.
- Maintenance assistance, build in fool proof diagnostics on new applications to assist the lack of maintenance staffs many of our end users now have. There is an

expectation that the machine supplier will provide more and more of the maintenance function. Predictive and preventative maintenance to be part of standard control offering.

- Fault tolerant and mission capable.
- The system should be fault tolerant - in other words, when a fault occurs a particular process can no longer be done on a machine, the smart machining system will only do the things that it can do on that machine until the fault is corrected but it will not completely halt the production of parts on the machine.
- Can communicate unilaterally with entire operational system.

Issue

- Weak link is the operator.
- No such thing, computers and machines are not smart.
- Smart Machine document is not fully or easily understandable.

Consideration

- Need leap in technology for edge over competition.
- Still need low price, easy setup, good speed, and reliability.
- Portable and easily reconnectable.
- Easily upgradeable with new controls.
- Should reduce setup time, maintenance.
- Should be easy to use.
- Integrated solution – not bolt-on
- Easily changed to another platform.
- Smart machines need to get info to management – not an island on its own – look at complete process.
- Updated controls beyond 1960 "G" codes
- Must be able to capture knowledge base of experts today before they retire.
- Smart machining is not making the machine smarter than humans - the human will always be smarter than the machine.
- Building in machine intelligence to either replace or enhance the lack of skills that some of the operators tend to have. Major concern on the lack of new blood entering our field.
- Combinations of technologies.

**From:** "United Calibration Corp." <united@tensiletest.com>
**To:** <squarter@bis.doc.gov>
**Date:** 11/19/2004 2:42:37 PM
**Subject:** COMMENTS ON EFECTS OF FOREIGN POLICY-BASE EXPORT CONTROLS

Attached are comments requested by the Bureau of Industry and Security pertaining to the above subject.

United Testing Systems

DEPARTMENT OF COMMERCE
BUREAU OF INDUSTRY AND SECURITY
15 CFR Chapter VII
[Docket No. 040910262–4262–01]

**COMMENTS ON EFFECTS OF FOREIGN POLICY-BASED EXPORT CONTROLS**

**Summary**

Companies engaged in exporting create roughly 25 percent of the growth in our economy, and employ 12 million workers. As the world globalization process continues, the need to maintain a competitive edge becomes that much more important. Current numbers demonstrate that our balance of trade reached a record deficit in June to $ 55.8 billion while exports fell 4.3 % in the same month. Figures also show that America has lost more than 2.7 million manufacturing jobs over the last three years, largely because of the trade deficit. To offset this alarming situation, American companies engaged in exports should be afforded a level playing field against the stiff international competitors. This not only includes reducing unfair trade barriers against American products, but also allowing US exporters to participate in markets open to its world-wide competitors.

With the above in mind, our national strategy should have policies conducive to correcting our balance of trade. Policy-based export controls, only worsen the situation by unfairly penalizing the American industry. The complexity of export control rules and regulations make it expensive for exporters to comply, and makes it unaffordable for small and medium size companies to survive. Export controls should have the objective of penalizing the targeted countries, but when the adverse impact to our own economy becomes greater than the benefit, the policy is no longer purposeful. The policy constitutes a true "lose-lose" situation; First, money and jobs are lost to international competitors that are free to sell in the international arena with no export controls, then the American industry dedicates resources in export control and compliance procedures thus creating an unnecessary financial burdens, and finally the government also has to expend human and important financial resources to implement, monitor and enforce the export controls.

The United States must maintain consistent export control policies and enforcement procedures. Inconsistent government policies and actions create liability to the American industry, and to the American government (which impacts and affects the taxpaying citizens). Government agencies cannot not have missions that prove to be contrary to each other. The Department of Commerce has the mission to promote trade and exports, while the Bureau of Industry and Security seeks to control exports while in fact imposing severe restrictions on those activities.

If maintained, controls should *only* be imposed on goods technology and software that are used as weapons. All other goods technology and software are available from hundreds of suppliers from around the world; they offer no benefit to the interests of our country or to our national security, but do restrict our international competitiveness and damage our economy.

Comments on the specific points in the criteria to determine whether or not to continue or revise export controls follow:

1. Export controls *do not* achieve the foreign policy purposes in view of the fact that the controls are national applicable exclusively to US companies. American manufacturers face fierce international competition while the countries, companies or foreign entities have numerous international options to substitute American goods, software or technology. International competitors of equivalent goods from around the world celebrate and reap the crops of attractive business opportunities that are afforded to them by American foreign policy-based export controls. At the same time, the American industry and the American economy suffer from the negative impact of these controls. Furthermore, these policies generate unnecessary negative propaganda in the international community by being the only country in the world applying such extensive controls. Finally, these policies and the practices used to enforce controls create a sense of fear in the exporting community as exporters face civil and even criminal charges if these laws are violated willfully or not. Whatever the case, if charges are filed, expensive attorneys are required to defend against the powerful forces of the American justice system.
2. Negotiations should always be alternatives to achieve foreign policy objectives. We should seek joint efforts with the UN and our main allies, and we should establish a common consensus in the understanding that unilateral and individual foreign based policies have a larger negative backlash on our economies and interests. In addition to negotiations with friendly countries and allies, we should seek to open a framework of respect with the international community and particularly with the so called enemy countries. At this point there is no country that can stand up to our military force. Greater danger is faced by terrorist methods than by so called weapons of mass destruction. Efforts should be redirected to our internal national security rather than violate the national sovereignty of"rogue" countries without the support of the United Nations and without the support of our main allies.
3. There are cases where policies are confusing and difficult to follow. A case and point is India. At this time the US government is linking close ties with the Indian government, and still there are numerous Indian entities on the debarred or denied entity lists. A similar situation occurs with China and a multitude of other "friendly" countries that are either subject to goods, software or technology controls of certain products, or where there are entities or individuals on denied lists.
4. The extension of foreign policy-based controls will not achieve the purposes of such policy and will be counterproductive to the interests of the United States. Again, both countries and foreign entities continue to obtain goods, software and technology from alternate sources from around the world and such a foreign policy has not demonstrated any clear benefits for our country or our national interests.
5. The point of comparative benefit or cost-benefit relationship is an important issue. As mentioned, companies engaged in exporting create roughly 25 percent of the growth in our economy, and employ 12 million workers. At the same time our trade deficit continues to grow at an alarming rate. Maintaining these policies unfairly penalizes the American industry weakening our position in the international marketplace. American companies engaged in exports should be afforded a level

playing field against the stiff international competitors. Governments from countries like Japan, France and Germany maintain patriotic practices that strongly support their industry in their efforts to create and maintain jobs at home. In fact, many of those governments take a further step by subsidizing their industries, reflecting the cooperative support of the government to their industry.

While American companies are charged with civil and criminal violations in the United States, their international counterparts are treated like heroes at home for contributing to their economy and for creating jobs for their people. The United States can ill afford to punish their own economy and maintain an environment of intimidation to its own industry with harsh enforcement practices. This not only hurts the existing export community but discourages other potential exporters to engage in those activities to avoid being subject to such dangers. Exporters should have the highest regard amongst the manufacturing community and should be fully supported by the government with consistent policies. It is unacceptable for the Department of Commerce to be actively promoting exports while the Bureau of Industry and Security is busy enforcing with intimidations and other methods such as entrapment operations that offend the people and threaten our constitutional rights. The export policies and the enforcement practices not only damage the reputation of American products in the international marketplace, the damage the reputation of our country abroad and the credibility of our government at home.

6. The United States has been unable to enforce export controls in a consistent manner. Enforcement actions by the government create confusion, and in many instances seem arbitrary. This is illustrated by the fact that numerous American companies (400 according to some sources), conduct business with "rogue" countries while the government apparently turns the other way, or is lenient in their enforcement proceedings. On the other hand, companies that have never violated the laws are subject to sting operations that seek to provoke violations.

   If export controls are to continue, the government has to proceed with reasonable and consistent actions that afford credibility to the government. Actions by the BIS (such as the proposed rules seeking to facilitate prosecution), intimidating and harassing the private sector and the citizens should not be recourse available to the government. All efforts and resources should be channeled through positive actions with a "teamwork" attitude that looks upon the industry as an instrument that strengthens our economy, and not as an enemy. Just as we seek to help a partner or brother, the government should maintain a policy to help the private sector. The US has to give its industry and citizens the benefit of the doubt. Overzealous actions should be avoided at all cost.

   No specific instances of lost sales can be mentioned, but an estimate is that about 5 % our total business is lost because of export controls. In addition to the direct lost business, additional loses can be attributed to loses due to inefficiency caused by time and resources dedicated to maintain controls. That time and those resources reduce the amount of time and resources available to promote export sales. The 5 % can be prorated to a national level if considering the total number

of exports. In a global context, this can also be visualized by the national GNP which is roughly one third of the world GNP.

1. Countries not targeted by export controls are bewildered as to why the United States such has policies in place, which from their perspective renders no benefits to the United States, and facilitates business opportunities for them, by having one less competitor to deal with. Not knowing the United Stated export control laws, some entities seek to re-export, and become irate when the United States government seeks to impose penalties on them for violations to the laws. Foreign countries take offence when the United States government seeks to impose US laws on their activities. The negative impact is not only on the targeted countries, but on "friendly" countries that see the United States as a self appointed policeman seeking to impose their national laws and interests on the international community. After hundreds of international trips, it can be stated that the United States is frequently seen as the "bad guy" and bully in the international community. It is an understatement to emphasize that the world from our internal perspective is much different than from the international perspective. Americans have to make an effort to improve our international image.
2. As far as we understand, a few of out trading partners have some level of export controls, but no other country in the world has similar and such strict, complicated and sophisticated controls on a world-wide basis as the United States.
3. No information is available relative to equivalent licensing policies from other countries. Normally, their licensing policies apply to imports rather than to exports. They defend their industry by making it difficult to buy, but not to sell.
4. Suggestions on revisions of foreign policy-based export controls are:
    a) Controls should *only* be imposed on goods and technology that are applicable to weapons. All other goods technology and software are available from hundreds of suppliers from around the world and should not be part of the controls; they offer no benefit to the interests of our country or to our national security, and restrict our international competitiveness and damage our economy.
    b) The government should focus efforts on stopping existing violators, not on inducing violations with sting operations. These types of actions intimidate the industry, create fear, uncertainty and discourage export growth. The exporting community should not feel that they are walking on a field of landmines in trying to execute "do diligence" in their exports.
    c) First time violators should receive a warning letter before being subject to administrative enforcement procedures.
    d) If after receiving a warning, the party commits a second violation, then civil administrative action should follow, unless the goods at issue are weapons related.

e) As a final measure and after multiple violations or recurring violations, criminal action should be considered.
f) Guiding principles and guidelines should be honored, respected and applied by the government. Some of the closed enforcement cases published by the BIS demonstrate a disregard for those principles, guidelines and rules. We must not lose site that the companies being controlled are American companies generating American jobs, and they are *our* side.
g) There is a clear disconnect between some government agencies in terms of their missions and actions. The United States must maintain consistent export control policies and enforcement procedures. Government agencies cannot have missions that prove to be contrary to each other. The Department of Commerce has the mission to promote trade and exports, while the Bureau of Industry and Security seeks to control exports while in fact imposing severe restrictions on those activities. The Department of Commerce has to be more proactive in informing the export community via their web site and through their trade specialists of the controls and even dangers associated with exports. Events such as export control seminars should be widely promoted by the Department of Commerce, not by the BIS.
h) Having multiple agencies regulating export controls converts any effort to comply into a monumental nightmare. Diverse government agencies such as the Department of Commerce (Bureau of Industry and Security), the Department of Treasury, and the Department of State, all have authority over export controls. The only way to assure confident compliance is to have cooperate attorneys on staff, have a compliance department with compliance officers, and then contract an expensive software service to help identify denied persons and entities. The government has to find a way to streamline interagency policies and activities.
i) Complex, sophisticated and complicated laws, rules and regulations have to be eliminated or dramatically simplified. Trying to learn all of the applicable regulations is a career in itself. These rules and regulations constitute a major obstacle to the exporting community.
j) The government has to implement a program to inform, assure and be sure that the export community is well aware of the export laws, rules and regulations that apply. The government cannot be careless in making laws and regulations difficult to find, then turn around and be harsh in enforcing those laws. The industry and the citizens have a right to know the dangers they face when they get involved in export related activities. Ignorance of the law does not justify a crime, but the government should likewise be held accountable and co-responsible for it's negligence in not making

the laws available to the affected community, industry or individuals. As a case and point, a driver with a driver's license cannot use "ignorance of the law" as an excuse because he had to pass a test to obtain his drivers license. By the same token the Department of Motor Vehicles is likewise not co-responsible because it has taken the necessary action to assure that the laws are available to the public.

k) The government has to ease harsh enforcement policies. Everyone makes mistakes in their daily jobs and people cannot be working under pressure knowing that a mistake cannot only cost them their job, but their liberty as well. Employees and executives are sometimes reluctant to get involved in export related activities because they know that a mistake can result in civil and even criminal action against them. This creates a tense working environment that only damages productivity on export related activities. The government has to be lenient and supportive of small and medium size industry. Mistakes by this sector can have devastating effects on their business, their persons and their families. Overzealous prosecutors can cause cruel and unjust punishment in the name of administration of justice, and can terminate the American dream in an eyelash because of a harmless mistake, or because the magnitude of a mistake is not visualized. As expressed by the report of the 9/11 commission, America should offer an example of moral leadership to the world and harassing your own industry with complicated and complex regulations sets a negative example.

5. Multilateral controls can only be effective if they are in fact multilateral. The impression is that export controls imposed by the United States are unilateral actions.
6. The effect of foreign trade policy-based export controls on acquisitions by intended targets is irrelevant to the spirit of the controls. End users in the targeted countries are mainly private or public sector industries that generate jobs to their own country and pose no danger or have no relevance on the interests of the policy, or on the interests of American national security.
7. With such a growing trade deficit, United States policy should be oriented to supporting and promoting export business and should by not means take any measures to loose sight of this objective. The overall impact of the deficit numbers are reflected on our activities in an individual scale.
8. A practical way to measure the effects of foreign policy-based export controls is to perform a survey with the complete export community. The BIS will be surprised to see that a significant percentage of the companies engaged in exports do not know about export controls, their complexity, or the magnitude of the risks.

9. Foreign policy-based export controls on targeted countries has a major impact on industries posing no risk to national security and offering no benefit to the export control policies. Those industries are generally not related to hostile enemy governments and innocently suffer the consequences of the export controls. Foreign policy-based export controls should be redirected to assure that punishment is applied on enemy governments and not on innocent people that may have sympathy for Americans under normal circumstances, but instead develop hatred to the American government and its peoples because of these foreign policy-based export controls.

In conclusion, unless the foreign policy-based export controls are *revised dramatically* to support the American industry and to stop constituting an insurmountable obstacle to the competitiveness of the American industry in the international market, those controls should be *immediately terminated*. Changes include eliminating complex rules and regulations and implementing programs to inform the export community of the controls and the risks involved. Changes should also include seeking a legitimate partnership with the industry in assisting it to comply, not in devising ways to justify non-compliance and prosecution. Policies should be conducive to helping our own industry, our own people, and our own economy. Policies should defend the principles of what America stands for, and should defend American jobs, American values.

United Testing Systems
5802 Engineer Dr.
Huntington Beach, CA. 92649