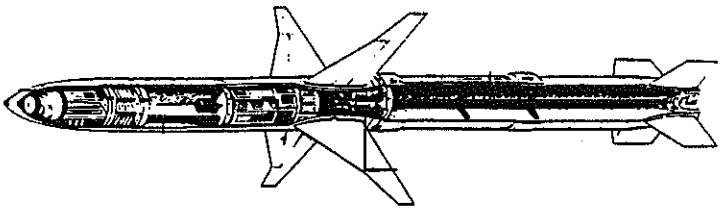
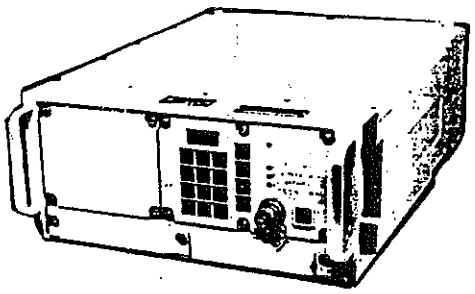
NATIONAL SECURITY ASSESSMENT OF THE DOMESTIC AND FOREIGN SUBCONTRACTOR BASE: A STUDY OF THREE U.S. NAVY WEAPON SYSTEMS

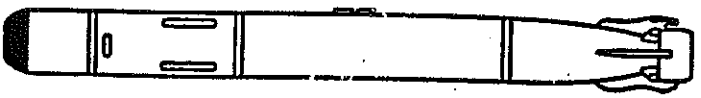
HARM MISSILE



VERDIN COMMUNICATION



MK-48 TORPEDO



U.S. DEPARTMENT OF COMMERCE
BUREAU OF EXPORT ADMINISTRATION
OFFICE OF INDUSTRIAL RESOURCE ADMINISTRATION
STRATEGIC ANALYSIS DIVISION

MARCH 1992

National Security Assessment of the Domestic and Foreign Subcontractor Base: A Study of Three U.S. Navy Weapon Systems

Prepared by

U.S. Department of Commerce
Bureau of Export Administration
Office of Strategic Industries and Economic Security
Strategic Analysis Division

March 1992

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ILLUSTRATIONS

EXECUTIVE SUMMARY

Overview

- This study was conducted to develop a factual base for assessing the extent to which U.S. Navy reliance on foreign suppliers for critical components may endanger the Navy's ability to initiate and complete its varied missions.

- The Navy requested the Department of Commerce's Office of Industrial Resource Administration (OIRA) to conduct this study due to past successful Navy collaboration with OIRA on other defense industrial base issues, as well as OIRA's mandatory data collection authority.

- Three representative naval weapon systems were chosen for analysis: the HARM missile; the Mark-48 ADCAP torpedo; and the Verdin communications system.

- The study focused on subtier suppliers to the three systems to examine whether foreign sourcing and dependency were greater lower down the supply chain. No known previous study of foreign dependency has systematically inventoried foreign sourcing at these lower tier levels.

- For purposes of our study, the prime and major subsystem contractors are cited as "tier 1" of the supply chain. These companies' immediate suppliers are thus referred to as "tier 2". The suppliers to these tier 2 companies are identified as "tier 3", and so forth. Understanding these terms is important to following the methodology of this assessment.

- A survey was distributed to each successive tier of suppliers to allow analysis of procurement patterns down to the fourth tier of subcontractors. These surveys provided a wealth of information on the domestic industrial base as well as on foreign procurement data. A coding system was implemented to allow up- and down-stream or individual tier traceability by weapon system or by firm.

- Over 15,000 companies were identified at the subcontractor level, with 11,638 firms still serving as active suppliers for the three weapon systems.

- The methodology developed for and improved upon throughout the course of this study can be applied to other defense procurement analyses. This should allow for more timely future assessments of sourcing patterns, including traceability of specific items or firms throughout the supply matrix.

Domestic Industrial Base Findings

- About 40 percent of identified suppliers were mentioned more than once, as survey information was received and analyzed tier by tier. The number of firms cited more than once increased by tier: 12 percent of the second tier firms; 17 percent of the third tier firms; and more than 50 percent of the fourth tier firms.

- This indicates that, once adjusted for the increasing number of duplicates at each lower tier, the defense industrial base is in fact more diamond-shaped, and less pyramid-shaped, than was expected. Such a core group of subtier firms could be inundated with orders and potentially lack the capacity to meet competing demands simultaneously during a national security emergency.

- The percentage of total shipments for defense applications decreased by tier -- with 28 percent of second tier shipments but only 7.5 percent of third tier shipments destined for defense applications. Lower tier suppliers produced a larger percentage of dual-use products (i.e., those with both defense and commercial applications), and were less likely to know the ultimate destination of their intermediate products.

- Subcontractor production supporting the three Navy systems was relatively equitably distributed throughout the United States. This is in contrast to the prime contractors for these systems, who were largely based in the South and West.

- Foreign-owned domestically-located firms supplied between two and three percent of the total value of all items supplied to the three Navy systems. These firms were found to import components at a slightly higher ratio than U.S.-owned firms.

Foreign Procurement Findings

- Foreign-located firms accounted for about five percent of identified companies in the project. As in the domestic industrial base, many foreign firms were mentioned repeatedly.

- Survey respondents reported that they sourced overseas for a variety of reasons including: lower price, better quality, better delivery terms, as part of a global marketing strategy, and when no U.S. source was available.

- The number of identified foreign suppliers increased by tier, increasing from one percent of second tier suppliers to five percent of third-tier suppliers, and about 12 percent of fourth-tier firms. A small percentage of these foreign suppliers were U.S.-owned production facilities abroad. This number may be understated as our statutory data collection authority does not allow us to survey identified second- and third-tier foreign suppliers who likely had a greater tendency to make use of non-U.S. lower-tier suppliers.

- The domestic and foreign sourcing data utilized in this report represent the total procurements by the entire group of domestic companies surveyed for those items or materials used to support the production of the three weapon systems. Originally, we had intended to analyze just those procurements of items solely destined for each of the weapons systems; however, lower tier subcontractors proved unable to determine the value of the parts and materials solely destined for a particular weapons system. As a result, our foreign sourcing information by value presents a broader picture of the defense industrial base than merely procurements for the three weapons systems.

A full explanation of the reasons for using total procurement is included in Chapter II, Study Methodology.

- Canada accounted for 42 percent of identified foreign procurements. Japan was second at around 19 percent, followed by the United Kingdom (seven percent), Germany (five percent), and South Africa (four percent).

- The value of identified purchases from foreign firms increased by tier, from ten percent of total purchases by second tier firms to 14 percent of purchases by third tier companies.

- The level of foreign sourcing differed among the suppliers to the individual weapon systems. At the second tier, foreign sources supplied around 5 percent of both the $1.3 billion total procurement by HARM suppliers and the $161 million total procurement by Mark-48 ADCAP torpedo suppliers. Foreign sources for the electronics-intensive Verdin system accounted for nearly 40 percent of the $251 million of total second tier procurements.

- Twenty-two different countries were suppliers to the second tier. By value, five countries -- Japan, Italy, Germany, the United Kingdom, and Mexico -- accounted for over 85 percent of second tier foreign procurement. Japan alone accounted for almost 59 percent of these purchases.

- At the third tier, foreign sourcing by the MK-48 ADCAP suppliers remained at around five percent of the total $1.3 billion in purchases, with the percentage for HARM suppliers increasing to 17 percent of the $3.3 billion in total third tier purchases. Identified third tier foreign sources for the Verdin declined to 16 percent of total purchases of $320 million, although the large number of foreign second tier Verdin suppliers could not be surveyed in order to identify their third tier suppliers.

- Third tier firms sourced from 39 different foreign countries. Leading foreign suppliers were Canada, Japan, the U.K., South Africa, and Germany, which together accounted for 78 percent of total fourth tier foreign supply. Canada, with its wealth of raw materials, was the number one foreign supplier to the third tier (53 percent of total foreign procurement). Japan was second with about 9 percent of foreign procurement.

Foreign Dependencies

- There were a total of 115 distinct items or products identified by survey recipients as foreign dependencies across all tiers and weapon systems. These items varied from raw materials, to integrated circuits, to resins and chemicals. The survey respondents also noted numerous associated constraints to production should the foreign supplies of these items become unavailable.

- Not unexpectedly, the most common foreign dependencies were for a number of raw materials for which the United States has no economically-viable concentration. Among the most significant foreign dependencies in this category were nickel, tantalum, and chromite.

- Although the National Defense Stockpile contains inventories of each of these materials, we determined that in some cases they are of insufficient quality for higher technology uses of these items (e.g., superalloys and capacitors).

- Survey respondents also reported that foreign dependencies existed for some manufactured products due to the lack of a competitive U.S. source. The most significant item falling into this category was ceramic packaging for semiconductors. Total reported foreign purchases of ceramic packaging was $85.2 million. For the HARM, over 95 percent of ceramic packaging originated in Japan -- most from a single company.

- Another apparent foreign dependency was for needle bearing wire rod, used to produce needle roller bearings. The one identified U.S. producer of these bearings indicated that it is dependent on foreign sources in Japan, France, and Sweden for wire rod because U.S. products are unavailable and/or inferior. There were a total of 98 references to needle bearing wire rod imports throughout the supply chain for the three weapons systems.

NATIONAL SECURITY ASSESSMENT OF THE DOMESTIC AND FOREIGN SUBCONTRACTOR BASE: A STUDY OF THREE U.S. NAVY WEAPON SYSTEMS

I. INTRODUCTION

United States and Allied forces in Operation Desert Storm introduced into combat a variety of sophisticated electronic weaponry capable of striking enemy targets with unprecedented precision. One such weapon was the HARM missile, carried by U.S. Air Force F-4G Wild Weasel and U.S. Navy F/A-18 Hornet aircraft. The HARM, or High Speed Antiradiation Missile, was designed to locate and destroy enemy radar. By quickly neutralizing a significant portion of Iraq's radar-controlled surface-to-air missile threat, Allied aircraft assumed air superiority over the skies of Iraq. This strategic advantage played a major role in the decisive defeat of Iraqi land forces with a minimal amount of Allied casualties, in both soldiers and materiel.

The U.S. emphasis on high-tech weaponry has been and will continue to be a major component of our military's overall strategy of engaging and defeating an adversary through technological rather than numerical superiority on the battlefield. However, the United States can no longer rely on a completely autarkic defense industrial base to design, develop, and manufacture its future generations of defense systems. The emergence of powerful financial and industrial competitors in Europe and East Asia and our increasing reliance on imported products and technology are combining to globalize the U.S. economy, including our defense industrial base.

Because markets for items used to manufacture defense systems are becoming increasing global rather than national in nature, the possibility exists that the United States could meet a future national emergency without the domestic manufacturing and research and development capability for some critical defense items, or be unable to fully participate in the development of some future defense systems. The security ramifications of such a possibility should be well understood.

BACKGROUND

In 1986 then Deputy Chief of Naval Operations for Logistics Admiral Hughes was tasked by the Navy Fleet Commanders-in-Chief (CINCs) to determine the extent and impact of foreign sourcing on naval weapons systems. They were concerned about reliance on foreign suppliers for critical parts, components, and equipment needed to produce Navy systems. The overriding objective was to ensure that the Navy's ability to initiate and complete its varied missions in a crisis were not inhibited.

In response to the Fleet CINCs' concerns, the Admiral implemented a pilot study to determine the degree of foreign dependency that exists for selected Navy systems. Three major objectives were put forth as follows:

- Identify foreign sourcing and dependencies for each weapon system under review;
- Quantify and analyze the impact foreign sourcing has on the surge and mobilization availability of the weapon systems; and
- Suggest alternatives to offset the adverse impacts of foreign sourcing in the event of a crisis or mobilization.

After an extensive selection process, three Naval Systems Commands -- Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), and Space Warfare (SPAWAR) -- each designated one system. The three systems selected were: the HARM Missile (NAVAIR), the Mark 48 ADCAP Torpedo (NAVSEA), and the Verdin Communications System (SPAWAR).

During the system selection phase, the Deputy Chief of Naval Operations formally requested the Department of Commerce, Office of Industrial Resource Administration (OIRA), to assist

in the foreign dependency study effort. This request was made in April, 1987, to Dr. Paul Freedenberg, then Assistant Secretary for Trade Administration.

Commerce Department participation was requested in the areas of methodology development, industrial data collection and analysis, and overall report preparation. The Navy was familiar with OIRA's experience in defense industrial base analysis through OIRA's membership in the Department of Defense, Joint Logistics Commanders' Joint Group on the Industrial Base. Previous cooperative efforts between the Department of Defense/Armed Services and OIRA resulted in detailed and effective national security assessments of the gas turbine engine, ball and roller bearing, and precision optics industries.

The Navy was particularly interested in utilizing OIRA's mandatory data collection authority provided by Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C. App. Sec. 2155), and delegated under Executive Order 12656. Without this authority, conducting a complete assessment of the subcontractor supply chain for each Navy system under study would have been extremely difficult. Dr. Freedenberg agreed in May, 1987, to jointly participate in the Navy project. Some weeks later a working level group was formed representing the various Navy Commands, the Office of the Deputy Chief of Naval Operations, and the Department of Commerce.

II. STUDY METHODOLOGY

At the outset of this joint Navy/Department of Commerce project, information was collected from government and private research organizations that had previously studied the foreign dependency issue, to provide insight in preparing our surveys and final report.[1] In reviewing these past works, the joint working group discovered that the data collected for use in these previous efforts stopped at either the prime contractor or the first tier subcontractor level. Information below the prime and first tier subcontractor level was largely anecdotal.

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[1] See the bibliography, which includes the reports reviewed.

After a number of meetings, the joint working group developed a strategy to assess foreign sourcing and dependency, with a particular focus on subtier suppliers. Identifying and measuring the degree of offshore purchases of raw materials, components, parts, and equipment for the three Naval weapon systems down to the fourth tier of supply was of primary interest. A corollary top-down review of the domestic supply chain was also an objective of the working group.

A two-phased process was agreed upon. The initial phase of the study was directed toward the weapon systems' prime and major subsystem contractors, while the second phase focused on the lower tier suppliers. Due to the paucity of data regarding foreign sourcing and dependency, it was also agreed that the overall analysis would be based almost entirely on information gathered from our industry surveys. OIRA staff was responsible for developing and disseminating the survey instruments used to trace domestic and foreign sourcing and dependencies throughout the weapon systems' supply chain.

A. Definitions

For the purpose of this assessment, **foreign sourced** items are defined as materials, parts, components, or subassemblies manufactured, assembled, or otherwise processed outside of the United States. **Foreign dependency** is defined as a material, part, component, or subassembly sourced abroad because it is not produced or otherwise available in the United States.

In the OIRA generated surveys both at the prime and subcontractor levels, each contractor was asked to "identify each establishment (and firm name) located outside the United States that supplies materials, parts, or components; or that upgrades, finishes, treats, inspects, tests, assembles, or provides special processing or other manufacturing services for the production of items." In addition, questions were asked as to why the item(s) or service(s) were foreign sourced.

B. Assessment Process

In the first phase, OIRA created a questionnaire for the Navy which it issued to the prime and major subtier system contractors, a copy of which is attached as *Appendix 1*. The Navy presented the questionnaires to the contractors at a meeting held in Arlington, Virginia, in February, 1988. At this meeting industry representatives were briefed on the overall project and its objectives, and encouraged to cooperate. At this stage of the study, because of the small number of firms involved, the Navy chose to administer the questionnaire on a voluntary basis rather than use OIRA's mandatory data collection authority. The response to the project from the prime contractors was positive, although not all of the companies subsequently chose to complete the survey or continue their participation.

The prime contractor survey requested information concerning the effect of foreign origin manufacturing services, processing supplies, parts, components, and capital equipment on each of their U.S. establishments which participate in some way in the production of the weapon system(s). The firms were also asked to identify each of their independent subcontractors (both domestic and foreign) from whom they purchased products or services used directly in support of the weapon system production. The domestic subcontractors identified by the primes were the basis for the second tier mailing list.

After receiving the completed prime contractor surveys and tabulating the data, OIRA developed a second industry survey questionnaire. The completion of this form by industry was made mandatory under OIRA's collection authority provided in Section 705 of the Defense Production Act of 1950 and related Executive Order 12656. Since more than 1,000 firms were identified as second tier suppliers, it was necessary to clear the questionnaire with the Office of Management and Budget (OMB) in accordance with the Paperwork Reduction Act of 1978. Included with each survey was an attachment identifying the weapon system(s) that the subcontractor supported, as well as a listing of the product(s) and/or service(s) provided by the subcontractor. A coding system was implemented by OIRA which would eventually allow for up- and down-stream or individual tier traceability by weapon system or

by firm. Once OMB clearance was obtained, the second survey and attachment was mailed to each identified second tier subcontractor in June 1989. A copy of this second tier survey is included as *Appendix 2*.

The survey requested information pertaining to the second tier subcontractors' domestic and foreign sources of supply (i.e., the third tier) for all parts, materials, or services which they used as inputs in the production of items sold to the prime and major subsystem contractors for the specified weapon system(s). The second tier companies were also asked the reason(s) for using each foreign source, which of these sources represented a dependency, and what contingency plans would be implemented if these foreign sources were unavailable.

After receipt of the completed second tier subcontractor surveys, OIRA continued the process by surveying the third tier domestic suppliers (those identified by the second tier), again with OMB clearance. Based on experience gained during the survey of the second tier, minor revisions were made to the survey to clarify areas with which responding firms had difficulty. For example, a more detailed definition of "subcontractor" was inserted to capture not only manufacturers, but also distributors, resellers, agents, and others. A copy of this revised questionnaire is included as *Appendix 3*.

OIRA asked each third tier company for information on their foreign and domestic sources of supply, as we had asked of the second tier companies. Also included in this survey was an attachment identifying the weapon system(s) and part(s) and/or service(s) provided. The data collected from the third tier identified the fourth tier of supply. No attempt was made to survey the fourth tier of suppliers. During the course of the study, over 15,000 companies were identified at the subcontractor level, with 11,638 companies still serving as active suppliers to the prime contractors for the three weapon systems.

C. Study Limitations

The analysis that follows is by no means a definitive assessment of foreign sourcing and dependency in Department of Defense weapon systems. The project was a learning process in which our methodology was developed partly by plan and partly by trial and error. For this reason, not all the objectives originally set forth by the Navy were accomplished. For example, an assessment of the surge and mobilization capability impacts of foreign sourcing was not performed. Most of the companies contacted were not defense contractors, particularly those at the lower tiers, and were thus unable to provide sufficient surge and mobilization information for us to conduct such an analysis. However, we did include a list of surge constraints by product based on information provided by the survey respondents.

A second area which could be considered a limitation was the manner in which the purchase values were reported. Although it was our original intention to measure domestic and foreign sourcing within each weapon system, it proved to be impossible. This is due to the fact that in most cases responding companies were unable to segregate the value of their purchases of a given material to determine the amount used solely in the production of an item for a customer supplying one of the three weapon systems. For example, a company may supply one item to Texas Instruments for use in the HARM missile. To support the production of this item, it may purchase three raw materials. Because the company produces and sells the identical item to scores of other companies, it was unable to distinguish how much of this material ultimately goes to Texas Instruments in product form. For this reason the company reported the total value of its purchases of these three materials. As a result, the reported value of material purchases is greater than the value of the sale of the one item to Texas Instruments.

Thus, our domestic and foreign sourcing data actually represents the total procurement patterns of the entire group of companies for those items or materials used to support the three weapon systems, rather than just the procurement pattern for items or materials solely destined for each weapon system, taken outside these companies' normal course of trade in

procuring the identified items or materials. Based on our analysis of the data collected, we have concluded that, rather than being a limitation, our resulting data identify not just the isolated purchases for the specific weapon system but the overall procurement pattern and capability of the identified subcontractor to supply the needed items to the specified weapon system. Moreover, we believe that the domestic and foreign sourcing patterns uncovered are comparable with those that would appear within each system. This is because, particularly at the lower tiers, companies did not alter their procurement patterns for the identified items or materials based on the end user (i.e., the products they sold to the defense market were largely the same as those to the commercial market; in fact, in most cases they were unaware that the ultimate use of their products was in these weapon systems).

Administrative limitations also impacted the scope of the project. We were unable to pursue each company issued a mandatory survey, contributing to our overall response rate of 63 percent. (This varied by weapon system, ranging from 60 percent for the MK-48 ADCAP to 69 percent for the Verdin. The HARM response rate was 64 percent.) In addition, because the original prime contractor survey was distributed on a voluntary basis, not all of the weapon system prime and major subsystem suppliers responded to the survey. Our coverage of the subcontractor base supporting the three weapon systems is thus incomplete. Finally, delays in each step of the process, from survey design, to the OMB forms approval process, to data entry, to resolution of survey discrepancies (which caused our having to recontact many firms), has limited the useful life span of OIRA's information base, which contains 1988 calendar year data for the three Navy weapon systems.

Despite these limitations, we believe the study contains much valuable information. It represents the first known comprehensive analysis of sourcing by weapon system at lower tier subcontractor levels, both domestic and foreign. From this analysis, a number of interesting patterns emerge in sourcing in particular industry sectors, as will be discussed later. From these trends, areas that merit further study are indicated.

Moreover, the methodology developed for and improved upon throughout the course of this study can be applied to other defense procurement analyses. This should allow for more timely future assessments of sourcing patterns, including the ability to track a specific part throughout the procurement process, as well as to identify those companies that are especially crucial to production of multiple weapon systems. This is important because our analysis has confirmed that prime contractors generally have little understanding of their vast supplier base. Similarly, lower tier subcontractors are often unaware that they are suppliers for a defense system. With the projected sharp cutbacks in defense expenditures, this type of information could be of particular use to defense planners.

III. WEAPON SYSTEMS SELECTED

A. HARM Missile

The HARM missile is a high-speed antiradiation air-to-surface missile that is designed to suppress and destroy enemy radar defense systems. Most surface-to-air missiles (SAMs), including the Soviet-built SAMs used by the Iraqis in the Gulf War, and some anti-aircraft artillery units are guided by radar installations. Each of these radar emitting sites sends a signal which serves as a beacon to the HARM. Radar detectors and avionics processors onboard friendly aircraft detect, locate, and classify the emitting sites for target selection before the HARM is fired.

The HARM Program is administered by the Naval Air Systems Command in association with the U.S. Air Force. It is currently deployed on the U.S. Navy's F/A-18 Hornet fighter-bomber, A-6E Intruder bomber, EA-6B Prowler aircraft, and A-7E Corsair attack jet. It is also operational on the U.S. Air Force's F-4G Wild Weasel and F-16 Fighting Falcon attack jets, as well as on the German/British Tornado attack fighter.

The research and development of the HARM was initiated in 1972, when the first contracts were awarded. The emphasis on high speed, with an ability to maintain target acquisition despite a break in radar emissions, reflects the experience gained in Vietnam, where Soviet-

built SAM radar systems sometimes detected the approach of first-generation Shrike antiradar missiles and temporarily ceased operation before the missiles could lock on to them.[2]

Texas Instruments was selected to study the missile guidance and avionics; Hughes Aircraft for the systems analysis and guidance support; Itek for the AN/ALR-45 radar warning receiver modifications; Lockheed for system studies; Dalmo-Victor for modification of the DSA-20N signal analyzer; and Stanford Research Institute for analysis.

The contract for system integration was granted to Texas Instruments in the latter part of 1974. Texas Instruments delivered its first completed missile to the Navy on December 2, 1983.[3] As can be seen in the left-hand side of *Graph 1*, several companies serve as major subsystem contractors for the HARM program. Hughes-Santa Barbara Research produces the target detecting device, while ATI Industries manufactures the missile's warhead. Two contractors, Morton Thiokol and Hercules, produce the rocket motor, and Piqua Engineering supplies the safe and aim device. Each of these six firms participated in the first phase of our assessment.

Graph 1 also presents the number of firms participating at the second, third, and fourth tier subcontractor levels (765, 1,904, and 4,149, respectively). A number of sample materials, parts, components, and/or subsystems are listed at each tier to give the reader a schematic understanding of the supplier chain.

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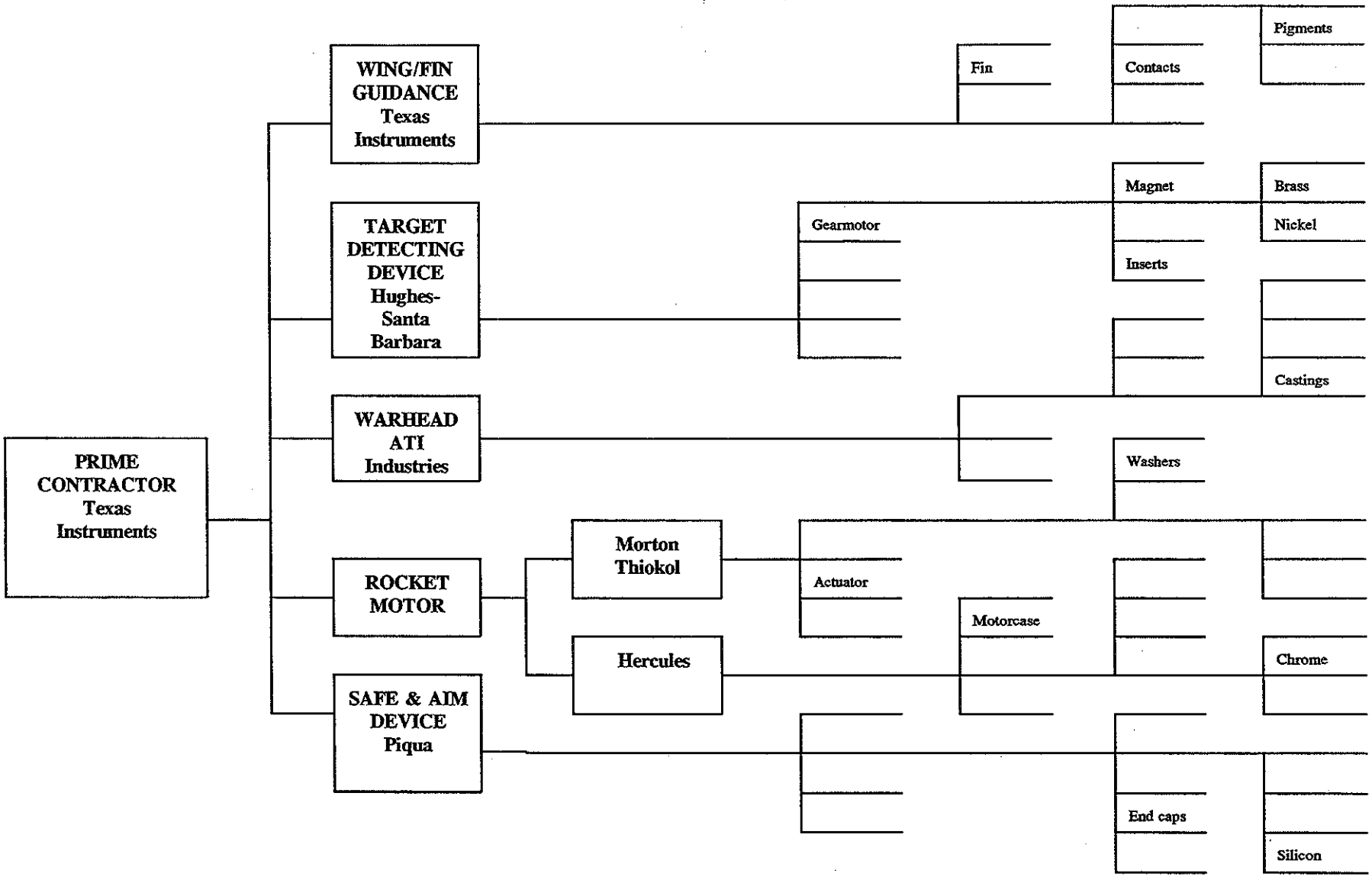
[2] Young, Susan H. H. "Gallery of USAF Weapons, Airborne Tactical and Defense Missiles." Air Force Magazine. May 1990. p. 157.

[3] Blake, Bernard, Editor. "HARM (AGM-88A) High-Speed Anti-Radiation Missile." Jane's Weapon Systems. New York: Jane's Publishing, Inc. 1986. pp. 188-189.

Graph 1
HARM MISSILE



PRIME & MAJOR SUBS | 2ND TIER SUBS (765) | 3RD & 4TH TIER SUBS (1,904+4,149)

PHASE I | PHASE II

NOTE: Graphs 1-3 are conceptual presentations only and are not meant to represent the true structure of the supplier trees for these weapon systems.

B. Mark 48 ADCAP Torpedo

The Mark 48 is a 21-inch-diameter, 19.5 foot long cylinder which carries a 600 pound high-explosive warhead. It can travel at a maximum speed of about 55 knots (63 mph) for a range of about 25 miles. The torpedo is powered by a six-cylinder swashplate internal combustion engine, burning Otto fuel II, a liquid that contains the fuel and oxygen necessary for underwater combustion. The torpedo uses wire guidance[4], as well as active and passive sonar, to locate its target.[5]

The Mark 48 has been in production since 1972 and is used aboard Navy attack and strategic submarines. A second generation version, called the Mark 48 ADCAP ("Advanced Capabilities") torpedo, entered production in March 1985, with Hughes Aircraft's Ground Systems Division as the lead producer. This revised version features an improved digital guidance and control system for the torpedo to enhance operational effectiveness and extend operational life.[6]

The impetus for improvements to the original Mark 48 stemmed from Soviet advances in submarine technology during the 1960s and 1970s. In 1975 the Chief of Naval Operations issued an Operational Requirement for modifications to the torpedo in order to keep up with the anticipated threat. This requirement led to the ADCAP program. The program was accelerated in 1979 in light of the potential challenges presented by the Soviet 'Alfa' class of submarines.[7]

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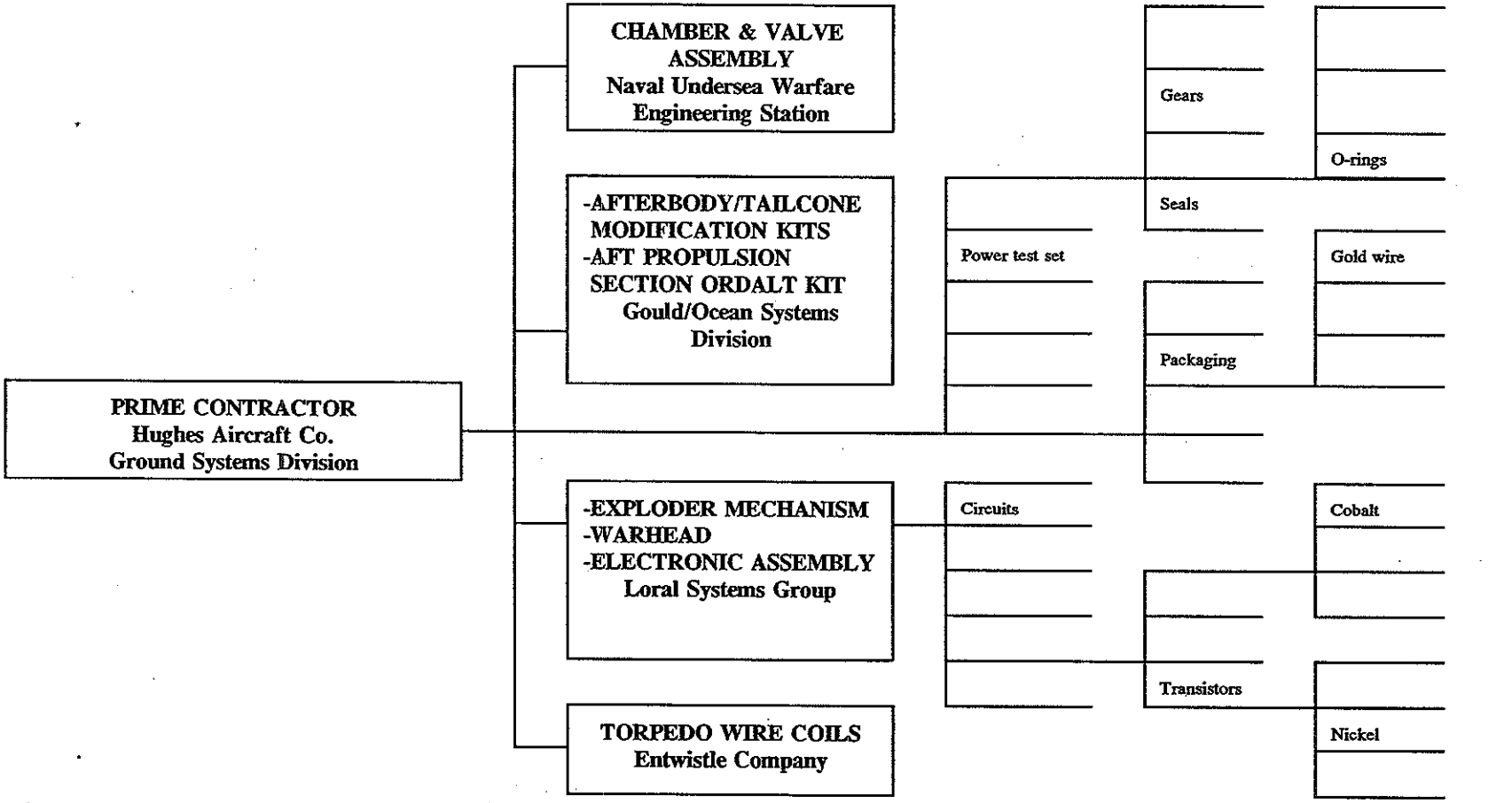
[4] In a wire guidance system, a fine wire extends from the submarine to the torpedo so that the torpedo's movement can be guided after release.

[5] Csere, Csaba. "Understeer, Oversteer, Undersea, Nuclear Sub Dallas, Scene of Movie 'Hunt for Red October'". Car and Driver. Vol. 35; No. 11. May 1990. p. 69.

[6] "Raytheon Awarded Production Contract for 'ADCAP' Torpedo." PR Newswire. May 23, 1989.

[7] Blake, Bernard, Editor. "Mk 48 Torpedo." Jane's Underwater Warfare Systems. 1st Edition. New York: Jane's Publishing, Inc. 1989. p. 20.

Graph 2
MARK 48 ADCAP TORPEDO



PRIME & MAJOR SUBS — 2ND TIER SUBS (211) — 3RD & 4TH TIER SUBS (1,065+2,060)

PHASE I — PHASE II

The major subsystem contractors involved in the production of the Mark 48 ADCAP are identified in *Graph 2*. Of these five organizations, only Hughes and the Loral Systems Group chose to participate in this assessment; at this stage in the study, the Navy was administering the questionnaire on a voluntary basis. Hughes is the prime contractor for the torpedo, while Loral produces the exploder mechanism, the warhead, and performs the electronic assembly. Despite the lack of participation by several of the Mark 48 ADCAP major subsystem contractors, an estimated 60 percent of the subcontractors identified responded to the survey (211 firms at tier two, 1,065 at tier three, and 2,060 at tier four). *Graph 2* also includes a sampling of the types of materials, parts, and/or subsystems at each subcontractor level.

C. Verdin Communications Systems

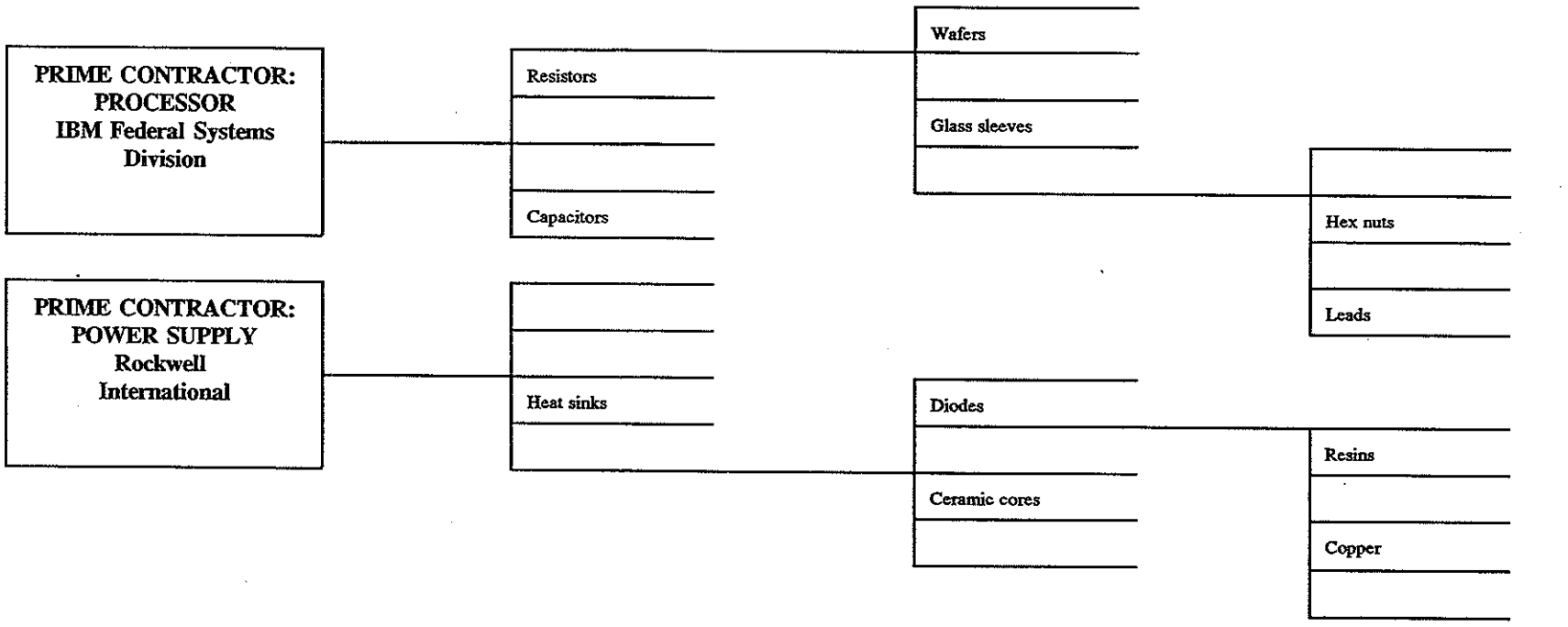
The Verdin is a shore-to-ship and air-to-ship transmit/receive communications system designed to provide reliable, secure, single and multi-channel communications in the very low/low frequency range with U.S. submarines. The Verdin was first introduced in 1978 after more than a decade of development. As with the Mark 48, an improved version, called the Enhanced Verdin System (EVS), has been developed and is already operational in strategic missile submarines, fleet ballistic missile tenders, and the Navy's E-6A "Take Charge and Move Out" (TACAMO) aircraft. The EVS has a channel rate operation twice that of the original communications system.

The EVS is operated with the use of the Enhanced Verdin Processor (EVP), a new general purpose computer in which messages are entered, multiplexed, encrypted, processed, and radiated in the transmit terminal. The data output receive terminal performs these steps in the reverse. In addition to increasing the channel rate operation, the EVP provides higher reliability, faster processing time, automatic mode recognition, improved self-diagnostics, better man/machine interfaces, and additional capacity and flexibility for integrating future enhancements.

Graph 3 lists the two companies involved at the prime and major subsystem contractor level for the production of the Verdin. Rockwell International manufactures the power supply,

Graph 3

VERDIN COMMUNICATION SYSTEM



and IBM's Federal Systems Division produces the processor. Both firms participated in this study effort. They are supported by 192 firms at the second tier, 425 firms at the third tier, and 866 firms at the fourth tier. Again, a few parts, components, or materials at each tier are listed.

IV. STUDY PARTICIPANTS

Table 1 lists the three weapon systems and shows the flow of firms surveyed from the first through the fourth tiers. While information on foreign sources was gathered at each tier, these foreign firms were not surveyed because Department of Commerce mandatory information collection authority does not extend beyond United States borders (including territories).

Table 1:
Flowchart of Firms Surveyed

SYSTEM	TIER 1 FIRMS IDENTIFIED	TIER 1 SURVEYS RECEIVED	TIER 2 FIRMS IDENTIFIED	-	TIER 2 FOREIGN	=	TIER 2 CONTACTED	TIER 2 SURVEYS REC.'D
HARM	6	6	765	-	13	=	752	394
MK-48 ADCAP	5	2	211	-	1	=	210	126
VERDIN	2	2	193	-	1	=	192	126
Grand Total	13	10	1,169	-	15	=	1,154	645

SYSTEM	TIER 3 FIRMS IDENTIFIED	-	TIER 3 FOREIGN	=	TIER 3 CONTACTED	TIER 3 SURVEYS RECEIVED	NUMBER OF TIER 4 FIRMS IDENTIFIED	NUMBER OF THESE FOREIGN
HARM	1,904	-	106	=	1,798	1,227	4,149	593
MK-48 ADCAP	1,065	-	11	=	1,054	636	2,060	156
VERDIN	425	-	52	=	373	264	866	110
Grand Total	3,394	-	169	=	3,225	2,127	7,075	859

SOURCE: OIRA Survey Data

As can be seen from *Table 1*, not all of the firms contacted at each tier completed the survey. Some firms were no longer in business, while others were mistakenly listed as being suppliers during 1988. Moreover, some firms chose not to respond to the mandatory survey.

With the information collected during the course of the study, four tiers of supply (the primes and three levels of subcontractors) were identified for each weapon system. A database was created which is, essentially, a supplier tree for each of the weapon systems covered. Moving further down the supply chain, the items supplied become more basic. For example, a second tier company supplied a gear motor to one of the primes for the HARM, after sourcing a magnet (among other items) from a third tier company to use to produce the motor. This third tier company, in turn, had purchased nickel from a fourth tier supplier in order to produce the magnet (see *Graph 1*).

Each company in these supplier trees was designated a unique code which allowed for traceability throughout the supply chain. One benefit of this system is that it allowed for identification of subcontractor companies who appeared more than once in the project, either as suppliers in different tiers or as suppliers to different companies within a tier who in turn supply one or more of the weapon systems. Of the total 11,638 active subcontractors identified in the study, 39.2 percent were identified more than once. The number of multiple occurrences increased by tier, with duplicate reportings *within* the second tier accounting for 11.7 percent of its total, 16.6 percent of the third tier total, and 56.3 percent of the fourth. Duplicate identification of firms *between* tiers increases the overall percentage, contributing to the 39.2 percent calculated for the total project. Items provided by firms appearing repeatedly throughout the supply chain include such products as aluminum wire, capacitor chips, diodes, magnets, resistors, and stainless steel.

V. DOMESTIC INDUSTRIAL BASE TRENDS

This section analyzes the survey data that pertain to the domestic industrial base, whereas Section VI presents a review of foreign procurement and foreign dependencies. As previously discussed, the total number of domestic and foreign companies addressed by our study was 11,638. Multiple mentions of the same companies reduce the number of unique firms throughout the supply chain to 7,074, of which 327 were foreign. This section addresses the 6,747 firms that are located in the United States.

The fact that so many subcontractors were identified more than once indicates that, while the number of total suppliers grows larger at each tier, the rate of growth declines with each successive tier. This suggests that **the supply matrix may not be pyramid-shaped, as expected, but diamond-shaped**. This recurrence also suggests that we have identified a previously-unassessed portion of the overall U.S. industrial base: a core group of subtier firms that appears repeatedly, permeating the defense industrial base. To identify this core group is vital, as during a national emergency these firms could be inundated with orders, potentially lacking the capacity to meet competing demands simultaneously.

A. Comparison of Shipment Data: Total and Defense

The existence of a core group of subtier companies is reinforced by an examination of the shipment data collected. While the three weapon systems covered in this assessment represent only a minuscule portion of the U.S. military's weaponry, the subcontractors supporting their manufacture account for a small but significant part of the nation's total manufacturing output. As the data in *Table 2* on the next page indicates, the total defense and non-defense shipments of domestic second and third tier companies, with no firm's output double-counted, constituted 3.55 percent of all shipments from U.S. manufacturing establishments during 1988 (excluding the shipments of tier four firms, which were identified, but not surveyed; inclusion of the shipments of these firms would certainly increase our coverage of total shipments by all U.S. manufacturing establishments).

Table 2:
Comparison of 1988 Shipments

HARM contractors' shipments (by establishment)	$70,541,685,348
MK-48 ADCAP contractors' shipments (by establishment)	$15,906,547,167
Verdin contractors' shipments (by establishment)	$8,773,539,968
Total shipments - Tier 2 and Tier 3	$95,221,772,483
Shipments from all manufacturing establishments*	$2,682,508,900,000
Percentage of U.S. shipments accounted for by Tier 2 and Tier 3 firms	3.55%

* U.S. Department of Commerce, Bureau of the Census. 1988 Annual Survey of Manufactures: Statistics for Industry Groups and Industries. Washington, D.C. October, 1990.

Note: Shipment data were collected only from Tier 2 and Tier 3 firms. Tier 4 firms were identified but not surveyed. Inclusion of the shipments of these firms would certainly increase our coverage of total shipments by all manufacturing establishments in the United States.

SOURCE: OIRA Survey Data.

We further analyzed the total shipment figures collected to determine the amount which defense applications represent of the totals. At the second tier defense shipments accounted for 27.7 percent of total shipments, while at the third tier the percentage dropped to 7.5 percent. *Table 3* provides the dollar amounts from which these percentages were calculated.

Table 3:
1988 Shipments: Defense vs. Total

	Defense Shipments	Total Shipments	Percentages: Defense/Total
Tier 2	$6,002,417,818	$21,643,468,755	27.7%
Tier 3	$5,520,467,286	$73,578,303,727	7.5%
Both	$11,522,885,104	$95,221,772,482	12.1%

Source: OIRA Survey Data

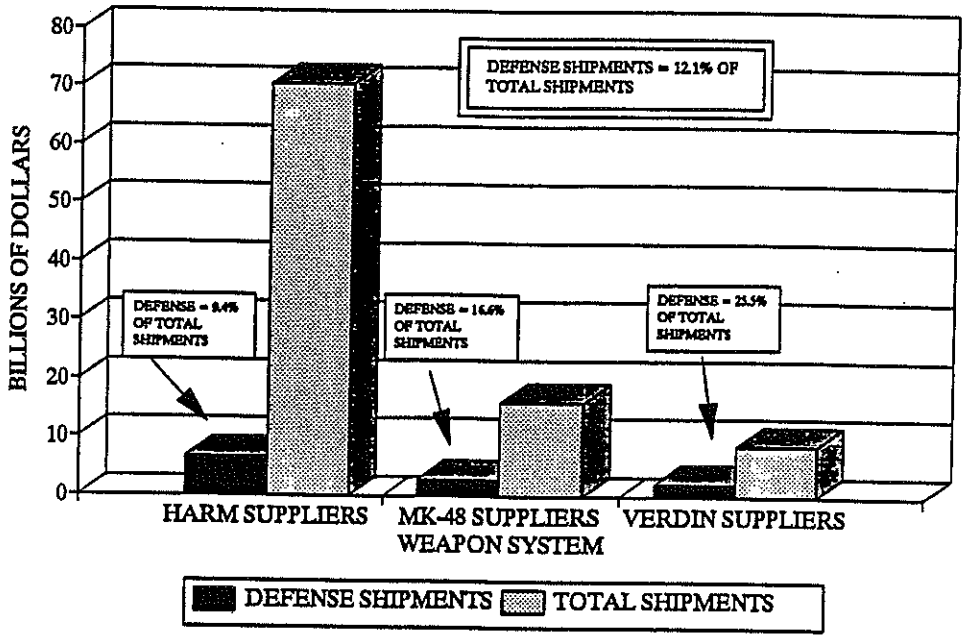
The drop in percentage of defense shipments as a portion of total shipments between the second and third tiers was consistent when reviewing each of the three weapon systems individually. This decrease is expected, as the further removed a supplier is from the prime and major subsystem contractors, the less likely the supplier would know the ultimate destination of a given product or item. With this in mind, it is probable that defense-related shipments reported by the third tier companies were understated. It is a logical assumption, however, that the third and subsequent tier suppliers would have a smaller overall percentage of defense shipments, as the items produced in these lower tiers, such as raw materials, would be less defense-dedicated and more commercially-applicable. The distinction between defense and non-defense use would thus decrease. It is reasonable to assume that this would be true throughout the industrial infrastructure.

These suppositions are derived from a review of the information collected on each weapon system. For example, the second tier HARM suppliers' shipment data indicated that defense shipments were 25.4 percent of total shipments. This percentage dropped to 5.5 percent of total shipments for third tier suppliers, with a resulting overall percentage of 9.4 percent of total shipments for both tiers of supply. Suppliers to the MK-48 ADCAP program had a higher percentage of shipments destined for defense applications, with 36.1 percent of second tier total shipments and 13.6 percent of third tier total shipments. The overall percentage of defense shipments by MK-48 ADCAP suppliers averaged 16.6 percent. Verdin suppliers exhibited the highest overall proportion of total shipments dedicated to defense uses. At the second tier, these shipments represented 30.3 percent of the total, and at the third tier, 16.5 percent. On an aggregate basis 25.5 percent of all shipments were identified as destined for defense use.

An illustration of the relationship of overall defense shipments to total shipments for the suppliers to each weapon system is shown in *Graph 4* on the next page. *Graphs 5* and *6* show this relationship by tier.

Graph 4

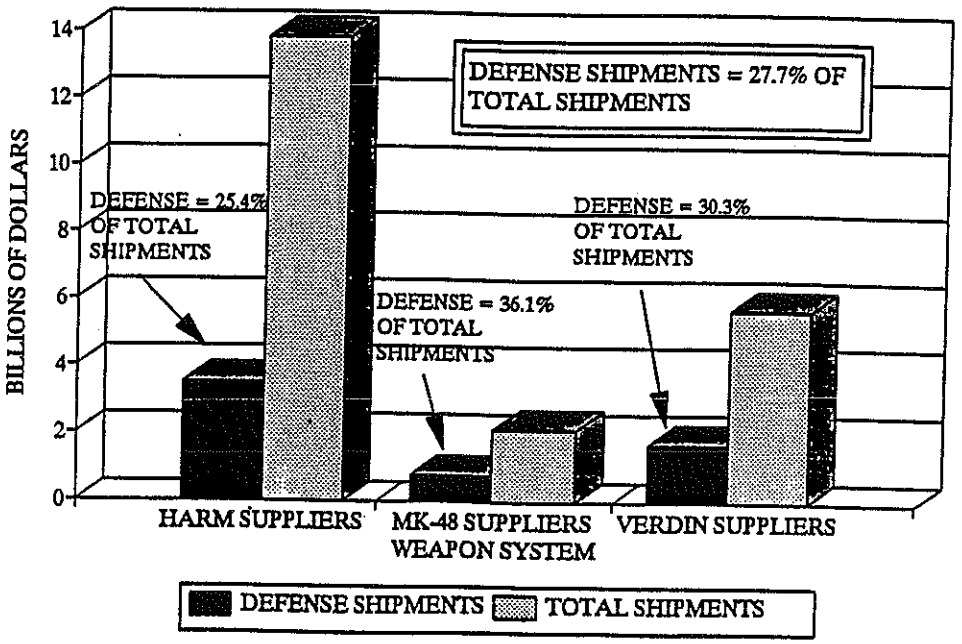
1988 SHIPMENTS: DEFENSE VS. TOTAL
TIER 2 AND TIER 3 COMPANIES



SOURCE: OIRA Survey Data

Graph 5

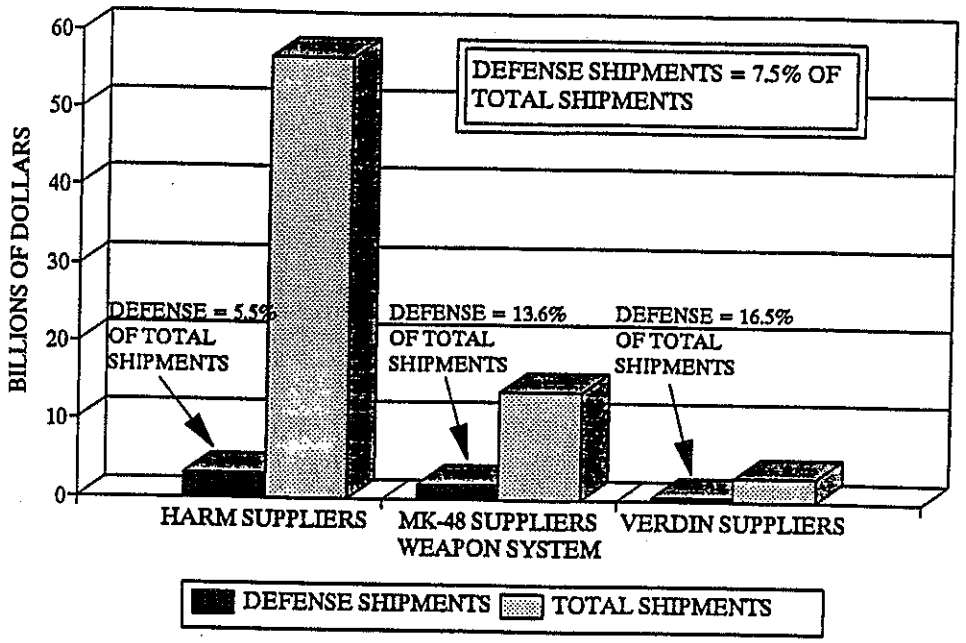
1988 SHIPMENTS OF TIER 2 COMPANIES
DEFENSE-RELATED VS. TOTAL



SOURCE: OIRA Survey Data

Graph 6

1988 SHIPMENTS OF TIER 3 COMPANIES
DEFENSE-RELATED VS. TOTAL



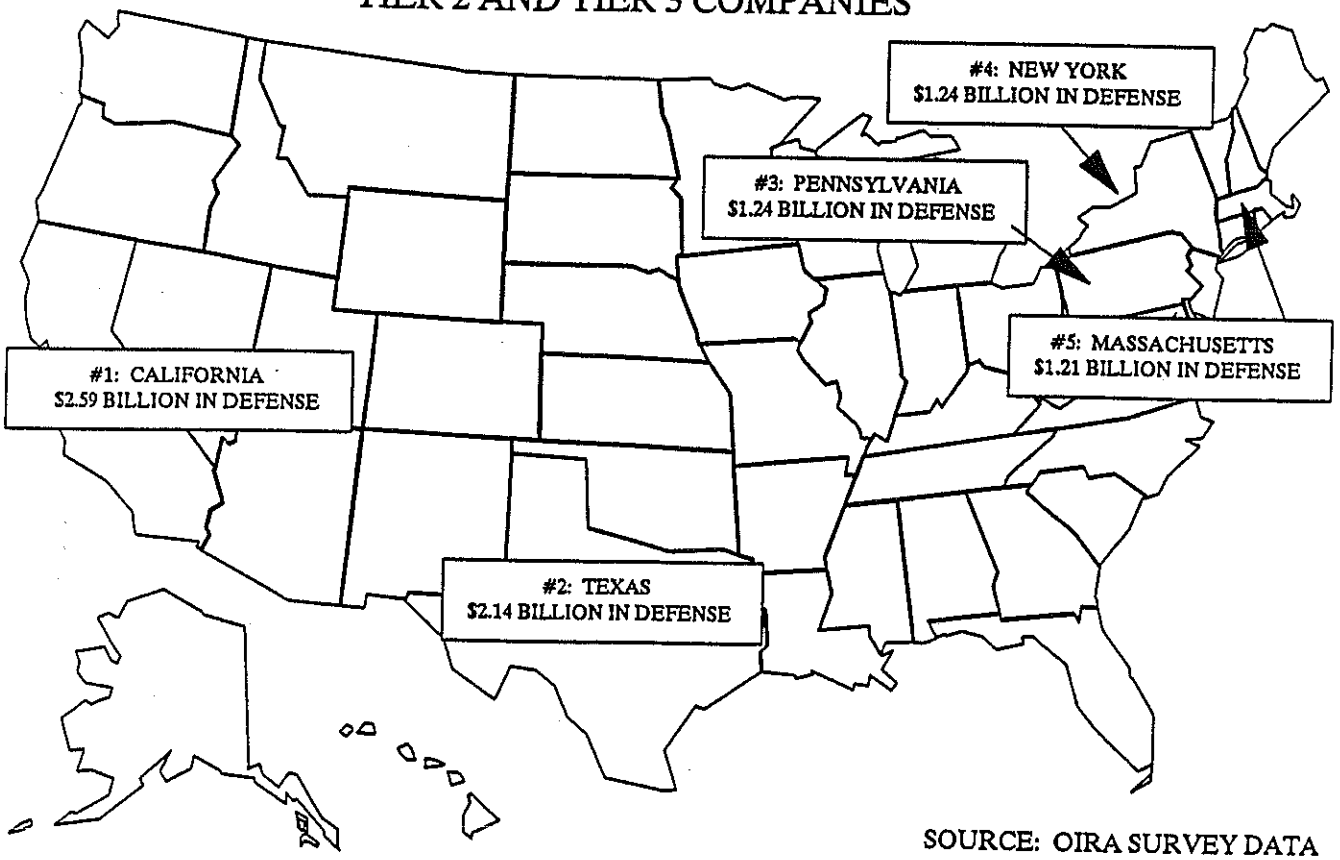
SOURCE: OIRA Survey Data

B. Regional Distribution of Defense Production

The defense shipment figures were further studied by location of production; no known previous study has analyzed shipment data at this level of detail for three tiers of manufacturers. The top five states by value are graphically depicted in *Graph 7*, while *Table 4* lists the top ten states. These ten states account for 85.1 percent of all the defense shipments reported. An assessment of the defense shipments from all states found that 53.1 percent were from the Southeast and West, while the remainder, 46.9 percent, originated in the Northeast and Midwest. These findings show a relatively equitable distribution of subcontractor defense production throughout the continental United States, a reversal from the geographic concentration in the South and West of the surveyed prime and major subsystem contractors. Of the ten prime and major subsystem contractors who participated in the study, eight are located in the southern and western regions.

Graph 7

TOP 5 STATES BY VALUE OF 1988 OVERALL DEFENSE SHIPMENTS
TIER 2 AND TIER 3 COMPANIES



SOURCE: OIRA SURVEY DATA

Note: Shipment data were collected only from Tier 2 and Tier 3 firms. Tier 4 firms were identified but not surveyed.

Table 4:

TOP 10 STATES BY VALUE OF 1988 DEFENSE SHIPMENTS TIER 2 AND TIER 3		
	DEFENSE SHIPMENTS	TOTAL SHIPMENTS
CALIFORNIA	$2,586,701,125	$ 7,312,047,452
TEXAS	2,136,125,624	12,051,334,390
PENNSYLVANIA	1,236,594,343	11,459,479,595
NEW YORK	1,235,767,645	11,788,392,549
MASSACHUSETTS	1,209,257,675	4,031,574,387
OHIO	386,195,951	7,879,175,362
FLORIDA	356,112,301	1,130,934,532
CONNECTICUT	233,521,786	1,172,079,560
ARIZONA	195,564,951	710,313,722
ILLINOIS	162,221,238	3,948,441,489
TOTAL FOR TOP 10 STATES	$9,738,062,639	$61,483,773,038
TOTAL FOR ALL 50 STATES	$11,439,322,043	$95,221,862,462
TOP 10/ALL 50	85.13%	64.57%

SOURCE: OIRA Survey Data

The regional concentration of the prime contractors in this study complements the findings of a recent report on this topic issued by the U.S. House of Representatives' Northeast-Midwest Congressional Coalition. In its report entitled *Defenseless: Declining Military Dollars for the Northeast-Midwest Region*, the coalition describes a shift in the geographic allocation of military contracts away from the Northeast and Midwest. In 1951, during the Korean Conflict, almost 72 percent of all prime defense contracts were awarded to industries in the Northeast and Midwest. By 1989, military contracts to this region had dropped to only 38 percent of the national total.[8]

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[8] Wegner, Merrill. Defenseless: Declining Military Dollars for the Northeast-Midwest Region. Washington, D.C.: U.S. House of Representatives Northeast-Midwest Congressional Coalition. July 1991.

While our prime contractor data agree with this finding, the subcontractors supporting these primes are shown to be distributed nationally; the southern and western regions, with 53 percent, hold only a slight lead in the total value of defense shipments reported. Whatever the reason for this apparent advantage, it cannot be said that manufacturing activity as a whole has shifted to these areas. In fact, the data collected indicate that the northeastern and midwestern manufacturing establishments surveyed account for 70 percent of the total shipments reported. *Table 5* below shows the top ten states by value of total (defense and nondefense) shipments, as reported by the surveyed tier 2 and tier 3 companies.

Table 5:

TOP 10 STATES BY VALUE OF 1988 TOTAL SHIPMENTS - TIER 2 AND TIER 3		
	TOTAL SHIPMENTS	DEFENSE SHIPMENTS
MICHIGAN	$16,943,779,258	$ 69,486,408
TEXAS	12,051,334,390	2,136,125,624
NEW YORK	11,788,392,549	1,235,767,345
PENNSYLVANIA	11,459,479,595	1,236,594,343
OHIO	7,879,175,362	386,195,951
CALIFORNIA	7,312,047,452	2,586,701,125
MASSACHUSETTS	4,031,574,387	1,209,257,675
ILLINOIS	3,948,441,489	162,221,238
NEW JERSEY	3,753,535,290	140,020,380
KENTUCKY	1,976,095,588	33,276,108
TOTAL	$81,143,855,360	$9,195,646,197

SOURCE: OIRA Survey Data

C. Foreign Ownership of Domestic Production

Another area in which information was collected was ownership of the manufacturing establishments surveyed. This has been a topic of increasing controversy in the past few years, as foreign investment in the United States has escalated fourfold between 1980[9] and 1990, outpacing U.S. investment abroad. Investment by the British, who lead in overall foreign investment, has increased 770 percent during this time period, from $16.3 billion to $125.3 billion. The Japanese are the second largest investors, with a dramatic 1,670.2 percent increase in investment during the 1980s, increasing from $4.7 billion to $78.5 billion. Additional countries which had significantly increased investments were France, Germany, South Korea, and Taiwan.[10]

This increase in investment has raised concerns that the United States is losing control of key industries and technologies which are vital to our national security and could represent one type of foreign dependency.[11] The ability to meet defense needs is equally important when assessing the subcontractor base which supports these prime contractors. As *Tables 6* and *7* show, the portions of total shipments and defense shipments accounted for by foreign-owned domestic production facilities for the three weapon systems are small, between two and three percent of value. The items produced by these foreign-owned facilities varied widely, from chemicals and pigments to machine parts and capacitors. The numbers alone would not suggest that national security would be endangered should these foreign-owned manufacturers refuse defense contracts or shut down. This scenario of refusing contracts is unlikely in any case, as under Title I of the Defense Production Act, the President can require that any

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[9] Tolchin, Martin. "Foreign Investors Held $2 Trillion in U.S. in '89." New York Times. June 13, 1990.

[10] Ross, Emma. "Legislation on Foreign Investment in U.S. Introduced in the House." Investor's Daily. May 14, 1991.

[11] U.S. General Accounting Office. Foreign Investment: Analyzing National Security Concerns. March 1990.

domestic facility's contracts or orders relating to certain approved defense or energy programs be accepted and performed on a preferential basis over all other contracts or orders.[12]

The relatively low percentage of foreign-owned U.S. production should not be taken lightly, however, as that two or three percent could be quite crucial if the items being produced were unique, requiring some proprietary technology not otherwise available domestically. Our limited examination of 1988 data indicates that this does not appear to be the case; there appear to be other U.S. firms with similar production capabilities as those that are foreign owned. This may change, and perhaps has already changed, for items produced for these and other weapon systems since 1988, the time period of our study, as foreign investment in the late 1980s has continued to increase, particularly in manufacturing, the largest sector of foreign direct investment.[13] This increase, in conjunction with cutbacks in defense budgets, could result in an increased use of foreign-owned production and technology for current and future weapon systems.

The gear industry is one example of how the industrial base of 1992 is in many ways altered since 1988, our review period. The gear industry was the subject of an extensive Commerce/OIRA national security assessment completed in 1991. Twelve gear companies, of which one is foreign (British), were identified in this study, supplying the three weapons systems in 1988. By year-end 1991, five of the domestic and the one foreign gear manufacturer remain essentially the same. Of the remaining six, one, the premier U.S. gear manufacturer, was acquired by a second British company. Another major domestic gear company exited the business, while a third went out of business altogether. A fourth domestic manufacturer has been in bankruptcy proceedings since 1989 and has reduced its

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[12] U.S. Department of Commerce, Office of Industrial Resource Administration. The Defense Priorities and Allocations System. October 1984.

[13] U.S. Department of Commerce, Economics and Statistics Administration. Foreign Direct Investment in the United States: Review and Analysis of Current Developments. August 1991. p. 85.

employment by over 50 percent. The remaining two gear companies are on the verge of bankruptcy, according to company representatives and industry experts.

We expect that changes such as these in the gear industry would not be uncommon in other industrial sectors, particularly at lower tiers. It highlights the need to continue efforts to study and assess the domestic and foreign-owned domestic defense subcontractor base.

Table 6:
Foreign Ownership of Domestic Production, Ranked by Total Shipments

COUNTRY	TOTAL SHIPMENTS	PERCENTAGE OF TOTAL FOREIGN-OWNED SHIPMENTS	PERCENTAGE OF ALL SHIPMENTS
United Kingdom	$705,394,982	26.18%	0.7408%
Germany	552,437,347	20.50	0.5802
Canada	514,884,927	19.11	0.5407
Japan	451,601,984	16.76	0.4743
France	192,496,341	7.14	0.2022
Sweden	129,587,123	4.81	0.1361
Netherlands	88,504,205	3.28	0.0929
Luxembourg	26,287,993	0.98	0.0276
Italy	17,160,776	0.64	0.0180
Hong Kong	6,500,000	0.24	0.0068
Singapore	3,652,689	0.14	0.0038
South Korea	3,448,844	0.13	0.0036
Switzerland	2,811,875	0.10	0.0030
Bermuda*	0	0.00	0.0000
Foreign Total	$2,694,769,086	100.00%	2.8300%
Domestic Total	$92,527,003,396	N/A	97.1700%
TOTAL	$95,221,772,482	N/A	100.0000%

* Not all surveyed firms provided shipment information.

SOURCE: OIRA Survey Data

Table 7:
Foreign Ownership of Domestic Production, Ranked by Defense Shipments

COUNTRY	DEFENSE SHIPMENTS	PERCENTAGE OF DEFENSE FOREIGN-OWNED SHIPMENTS	PERCENTAGE OF ALL SHIPMENTS
United Kingdom	$149,666,894	56.03%	1.2989%
Japan	53,696,970	20.10	0.4660
France	33,438,875	12.52	0.2902
Germany	14,629,400	5.48	0.1270
Hong Kong	4,000,000	1.50	0.0347
Italy	3,497,958	1.31	0.0304
Netherlands	3,000,000	1.12	0.0260
Singapore	2,632,260	0.99	0.0228
Canada	1,702,000	0.64	0.0148
Sweden	400,000	0.15	0.0035
South Korea	372,765	0.14	0.0032
Switzerland	91,200	0.03	0.0008
Luxembourg*	0	0.00	0.0000
Bermuda*	0	0.00	0.0000
Foreign Total	$267,128,322	100.00%	2.3182%
Domestic Total	$11,255,756,782	N/A	97.6818%
TOTAL	$11,522,885,104	N/A	100.0000%

* Not all surveyed firms provided shipment information.

SOURCE: OIRA Survey Data

One issue that frequently arises in connection with foreign-owned domestic manufacturers is whether their sources of supply are primarily domestic or foreign. As indicated in the table on the next page, at the second tier, nearly 68 percent of purchases made by foreign-owned second tier companies were from foreign third tier firms. However, this percentage includes a notable anomaly, resulting almost entirely from just one company's purchases of one type

of item from a foreign firm. Excluding this purchase, the incidence of foreign purchases by foreign-owned second tier companies would drop to just under seven percent of total purchases, only slightly greater than U.S.-owned second tier firms' purchases of 6.5 percent from foreign firms. Likewise, adjusting for this one foreign source would reduce the overall project percentage of foreign-owned entities purchasing from foreign sources from 52.7 to 14.2 percent, compared with 11.9 percent for U.S.-owned firms.

Table 8

	Tier 3 U.S. firms	Tier 3 foreign firms	Total purchases	Foreign %
Domestic Tier 2 purchases from...	$1,475,253,283	$103,084,381	$1,578,337,664	6.53
Foreign-owned Tier 2 purchases from...	$30,731,065	$65,311,000	$96,072,065	67.90

	Tier 4 U.S. firms	Tier 4 foreign firms	Total purchases	Foreign %
Domestic Tier 3 purchases from...	$4,233,153,996	$670,260,406	$4,903,414,402	13.67
Foreign-owned Tier 3 purchases from...	$35,762,182	$8,706,459	$44,468,642	19.58

	U.S. firms	Foreign firms	Total purchases	Foreign %
Total domestic purchases from...	$5,708,407,279	$773,344,787	$6,481,752,066	11.93
Total foreign-owned purchases from...	$66,493,247	$74,017,459	$140,540,707	52.67

SOURCE: OIRA Survey Data

Excluding the behavior of one foreign-owned second tier firm prevents a distortion of the overall project's percentages and implies that these foreign-owned U.S. entities utilize domestic sources to a similar degree as domestically-owned subcontractors. Identifying this anomaly is important in explaining the significance of the percentages calculated, yet its inclusion is important because it indicates an area that could serve as a potential bottleneck to production. The product supplied by the foreign source (a subcontractor for the Verdin) is ceramic packaging, a key component in the production of military-specified semiconductors.

The involvement of such a critical product raises at least two issues. First is the issue of whether foreign firms in the U.S. (through greenfield investment or acquisition) should make efforts to seek and maintain domestic sources. Second, and probably more important, if the items were foreign-sourced because of the lack of a domestic supplier, then there may be a serious deficiency in our defense industrial base which could prove problematic in the event of a national emergency. A full discussion of the ceramic packaging issue is addressed in Section VI.

VI. FOREIGN PROCUREMENT OVERVIEW

Table 9:
Overview of Total Procurement Trends

PROCUREMENT PATTERN	VALUE	PERCENT FOREIGN	TOP 5 COUNTRIES, BY VALUE	
By All Tier 2:				
Domestic Purchases	$1.506 billion	10.1%	Japan	$98 mil.
Foreign Purchases	168 million		Italy	15 mil.
Total Purchases	$1.674 billion		Germany	14 mil.
			U.K.	10 mil.
			Mexico	5 mil.
By All Tier 3:				
Domestic Purchases	$4.269 billion	13.7%	Canada	$358 mil.
Foreign Purchases	679 million		Japan	60 mil.
Total Purchases	$4.948 billion		U.K.	51 mil.
			S. Africa	32 mil.
			Germany	26 mil.

SOURCE: OIRA Survey Data

Table 9 above provides an overview of the total procurement dollars by tier two and tier three reported in the study. These figures represent all responding domestic companies' total procurement of items or materials used to support the production of the three weapon systems, not just for the items solely destined for the three weapons systems. *Tables 10*, *11*, and *12* on the next three pages provide comparable overviews by weapon system.

Table 10:

Overview of HARM Supply Matrix Procurement Trends

PROCUREMENT PATTERN	VALUE	PERCENT FOREIGN	TOP 5 COUNTRIES, BY VALUE	
By All Tier 2:				
Domestic Purchases	$1.2 billion	4.7%	Japan	$23 mil.
			U.K.	8 mil.
Foreign Purchases	60 million		Germany	8 mil.
			Switzerl.	5 mil.
Total Purchases	$1.26 billion		France	5 mil.
By All Tier 3:				
Domestic Purchases	$2.7 billion	17.6%	Canada	$355 mil.
			U.K.	50 mil.
Foreign Purchases	582 million		Japan	47 mil.
			S. Africa	32 mil.
Total Purchases	$3.3 billion		France	23 mil.

SOURCE: OIRA Survey Data

Table 11:

Overview of MK-48 ADCAP Supply Matrix Procurement Trends

PROCUREMENT PATTERN	VALUE	PERCENT FOREIGN	TOP 5 COUNTRIES, BY VALUE	
By All Tier 2:				
Domestic Purchases	$143 million	5.3%	Japan	$6.5 mil.
			U.K.	2.0 mil.
Foreign Purchases	8 million		Germany	0.01 mil.
Total Purchases	$151 million			
By All Tier 3:				
Domestic Purchases	$1.3 billion	5.1%	Japan	$11 mil.
			Netherlands	9 mil.
Foreign Purchases	69 million		China (PRC)	8 mil.
			Germany	7 mil.
Total Purchases	$1.37 billion		Taiwan	5 mil.

SOURCE: OIRA Survey Data

Table 12:

Overview of Verdin Supply Matrix Procurement Trends

PROCUREMENT PATTERN	VALUE	PERCENT FOREIGN	TOP 5 COUNTRIES, BY VALUE	
By All Tier 2:				
Domestic Purchases	$151 million	39.8%	Japan	$70 mil.
			Italy	15 mil.
Foreign Purchases	100 million		Germany	6 mil.
			Thailand	5 mil.
Total Purchases	$251 million		Mexico	3 mil.
By All Tier 3:				
Domestic Purchases	$283 million	8.8%	Taiwan	$10 mil.
			Switzerland	7 mil.
Foreign Purchases	28 million		Germany	5 mil.
			Japan	2 mil.
Total Purchases	$311 million		Finland	2 mil.

SOURCE: OIRA Survey Data

A. Country Overview

As indicated earlier, the assessment identified 11,638 companies throughout the course of the project. Of these, 1,043 were foreign, representing 8.96 percent of the total project. Fifteen of the 1,169 companies (1.28 percent) at the second tier were foreign. At the third tier, it was 4.97 percent of the total (169 of 3,394). Foreign firms within the fourth tier accounted for 12.14 percent of its total, 859 companies of 7,075.

The number of firms identified more than once was also addressed earlier. Elimination of duplicates reduced the actual number of participating firms to 7,074. This identification process reduced the actual number of foreign firms as well, dropping from 1,043 to 327. This elimination of duplication, both for the project total and the foreign total, reduced the number of foreign firms to 4.62 percent of the project.

Some of the foreign firms identified as suppliers were U.S.-owned. At least 28 of the 327 foreign firms identified at the second, third, and fourth tiers (duplicates eliminated) were U.S.-owned.[14] Fourteen facilities identified in the third tier accounted for $5.6 million in purchases. These purchases from U.S.-owned foreign facilities comprised 3.3 percent of the total foreign procurement dollars by the second tier.

At the fourth tier, thirteen U.S.-owned foreign facilities accounted for $30.5 million in purchases, or 4.5 percent of the total foreign procurement dollars by the third tier. Only one overseas facility of a domestic firm appeared at both the third and fourth tiers. On an aggregate basis, U.S.-owned foreign production accounted for 4.3 percent of all foreign procurement dollars.

Minerals and chemicals were among the items supplied by these operations, as were electronic parts such as chips, silicon wafers, and transistors. Assembly and machining were

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[14] It was not possible in all cases to determine the nationality of ownership.

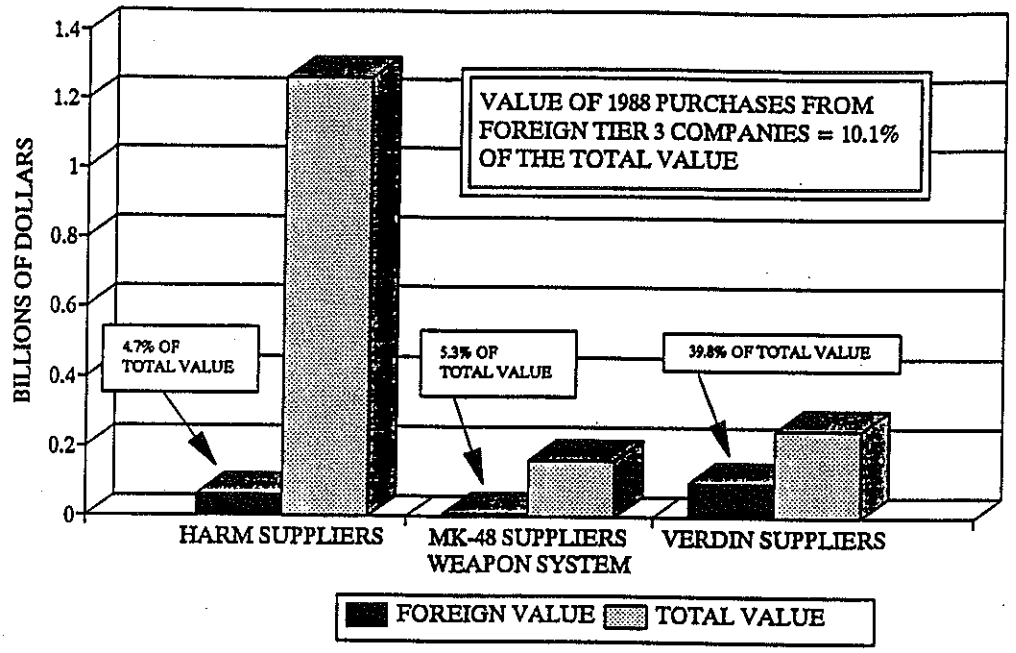
also performed by these establishments. Our data collection authority does not apply to firms located in foreign countries, so these domestically-owned foreign firms were not surveyed and it is possible only to guess at their reasons for producing abroad. It is likely that the proximity to natural resources and to customers shifted some of these producers overseas; it is also probable that less-expensive labor was an attractive feature for some. For the purpose of this analysis, the foreign operations of domestically-owned firms were considered foreign sources, just as the domestic operations of foreign-owned firms were considered as domestic sources.

The value of purchases abroad increased, both in actual numbers and in percentages of total procurement, at each lower tier of supply. At the second tier 10.1 percent of total procurement dollars went to foreign third tier firms. At the third tier this percentage increased to 13.7 percent. This varied between weapon systems, with 4.7 percent of total second tier procurement by HARM suppliers, 5.3 percent for the MK-48 ADCAP suppliers, and a significant 39.8 percent for the Verdin suppliers. (This high percentage for the Verdin includes the anomaly of one company's purchases of ceramic packaging from a Japanese firm. These purchases boost the overall foreign procurement percentage by Verdin suppliers at this tier from 24.7 to 39.8 percent.)

At the third tier the percentage of dollars expended to foreign firms once again varied by weapon system: among the HARM suppliers, the percentage grew to 17.6 percent; for the MK-48 ADCAP suppliers, the percentage declined slightly to 5.1 percent; and for the Verdin suppliers, a significant drop to 8.8 percent. The degree of total foreign sourcing by tier is depicted in *Graphs 8* and *9* on the next page. Similar graphs showing the degree of total foreign sourcing by weapon system suppliers, and the primary foreign sources, are included in *Graphs 10*, *11*, and *12*.

Graph 8

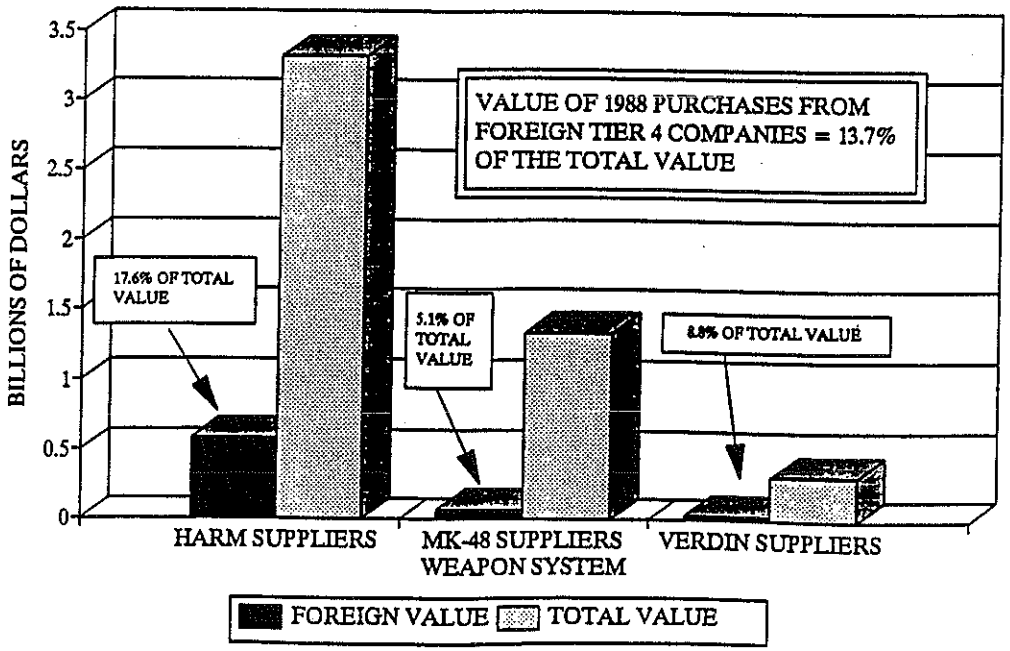
VALUE OF PURCHASES FROM TIER 3 FIRMS
FOREIGN VS. TOTAL



SOURCE: OIRA Survey Data

Graph 9

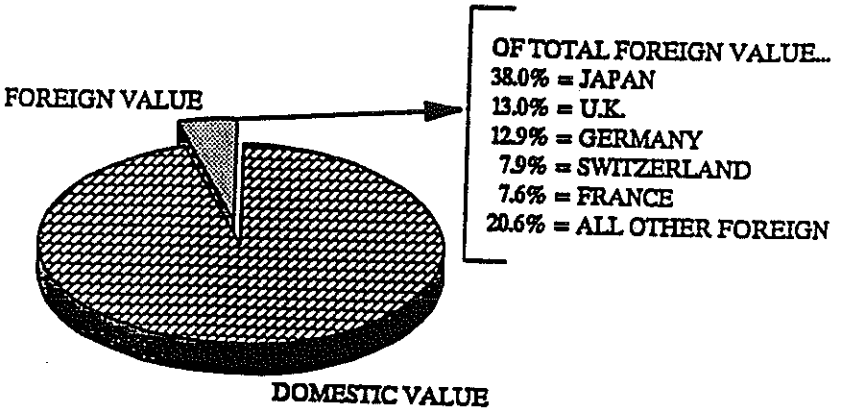
VALUE OF PURCHASES FROM TIER 4 FIRMS
FOREIGN VS. TOTAL



SOURCE: OIRA Survey Data

Graph 10

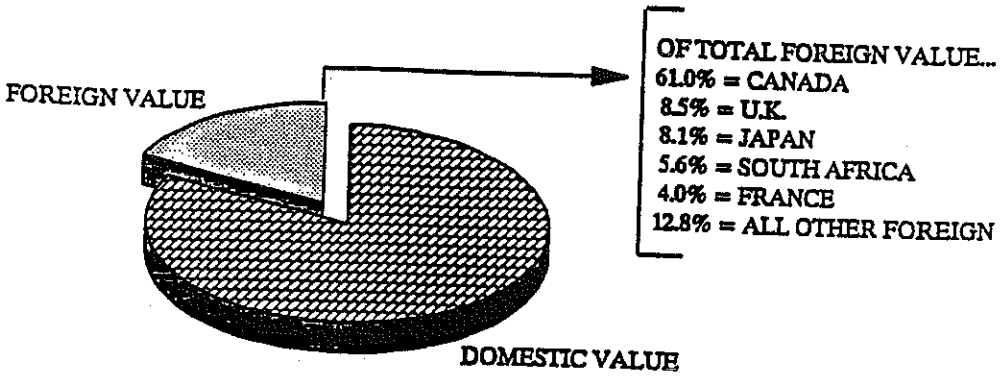
HARM: PURCHASES FROM TIER 3 FIRMS DOMESTIC VS. TOTAL



TOTAL VALUE OF FOREIGN PURCHASES = $59.9 MILLION

FOREIGN VALUE= 4.7% OF THE TOTAL VALUE OF PURCHASES AT TIER 3 FOR HARM SUPPLIERS

HARM: PURCHASES FROM TIER 4 FIRMS DOMESTIC VS. TOTAL



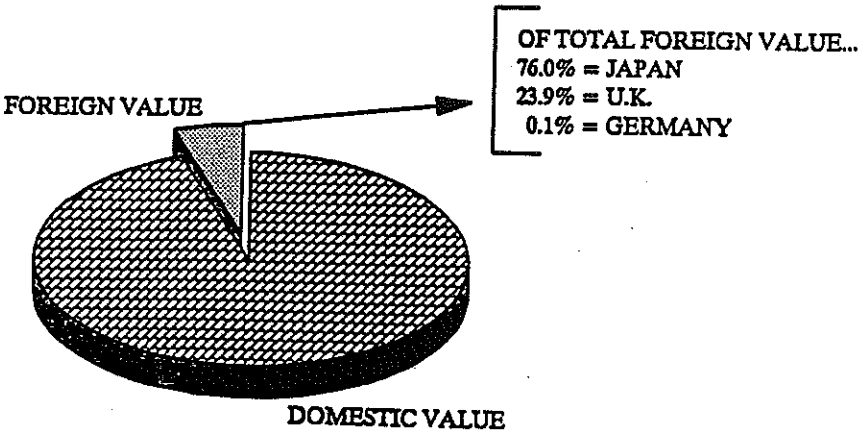
TOTAL VALUE OF FOREIGN PURCHASES = $582.1 MILLION

FOREIGN VALUE= 17.6% OF THE TOTAL VALUE OF PURCHASES AT TIER 4 FOR HARM SUPPLIERS

SOURCE: OIRA Survey Data

Graph 11

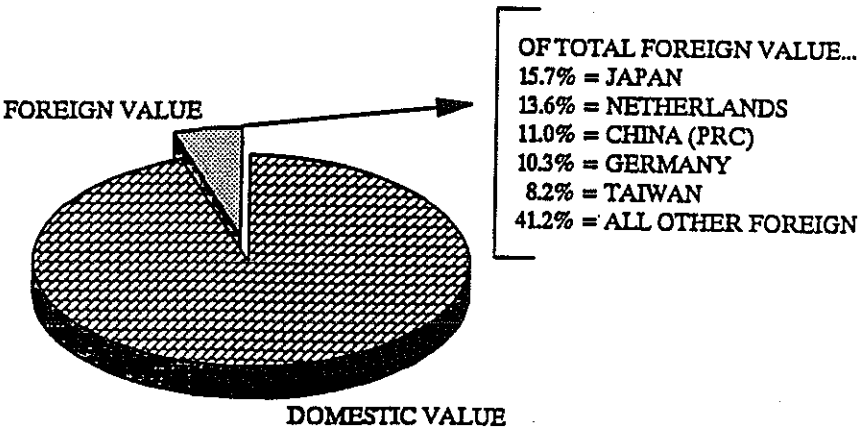
MK-48 ADCAP: PURCHASES FROM TIER 3 FIRMS DOMESTIC VS. TOTAL



TOTAL VALUE OF FOREIGN PURCHASES = $8.5 MILLION

FOREIGN VALUE = 5.3% OF THE TOTAL VALUE OF PURCHASES AT TIER 3 FOR MK-48 SUPPLIERS

MK-48 ADCAP: PURCHASES FROM TIER 4 FIRMS DOMESTIC VS. TOTAL



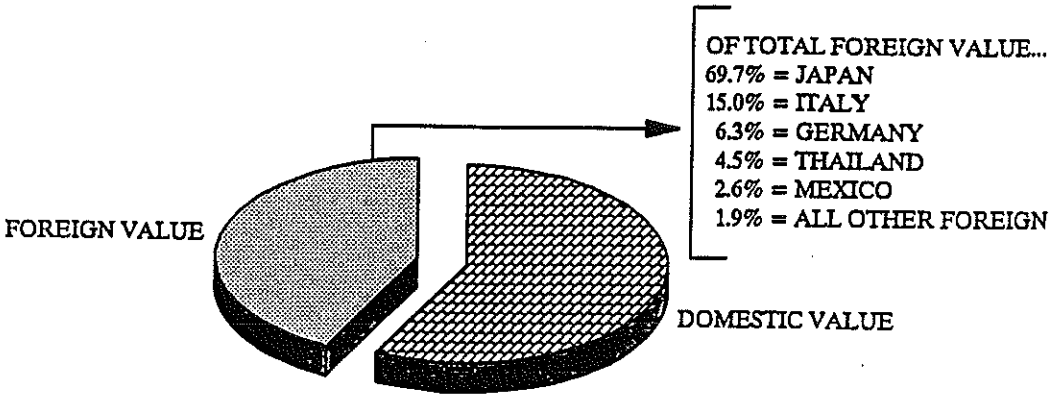
TOTAL VALUE OF FOREIGN PURCHASES = $68.6 MILLION

FOREIGN VALUE = 5.1% OF THE TOTAL VALUE OF PURCHASES AT TIER 4 FOR MK-48 SUPPLIERS

SOURCE: OIRA Survey Data

Graph 12

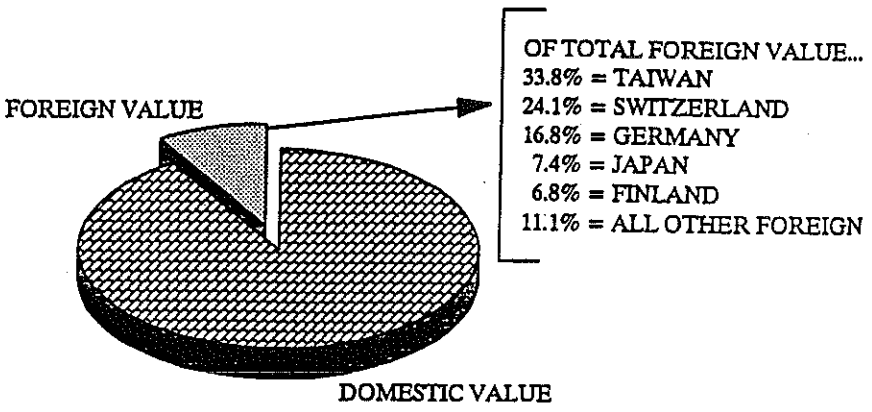
VERDIN: PURCHASES FROM TIER 3 FIRMS DOMESTIC VS. TOTAL



TOTAL VALUE OF FOREIGN PURCHASES = $99.9 MILLION

FOREIGN VALUE= 39.8% OF THE TOTAL VALUE OF PURCHASES AT TIER 3 FOR VERDIN SUPPLIERS

VERDIN: PURCHASES FROM TIER 4 FIRMS DOMESTIC VS. TOTAL



TOTAL VALUE OF FOREIGN PURCHASES = $28.3 MILLION

FOREIGN VALUE= 8.8% OF THE TOTAL VALUE OF PURCHASES AT TIER 4 FOR VERDIN SUPPLIERS

SOURCE: OIRA Survey Data

The foreign distribution of procurement dollars also varied by tier. At the second tier purchases of $168 million were made from foreign firms, or 10.1 percent of total second tier purchases of $1.7 billion. Purchases were made from twenty-two countries, although 85 percent of the value of these purchases were from only five countries - - Japan, Italy, Germany[15], the United Kingdom, and Mexico. Japan was by far the largest foreign supplier, accounting for almost 59 percent of the foreign purchases made by the second tier. The ranking of each of the twenty-two countries and their percentage share of total foreign purchases for this tier is listed in *Table 13* on the next page.

The distribution of the second tier foreign procurement dollars to the twenty-two identified foreign sources also varied by weapon system. Companies in seventeen countries served as suppliers for second tier HARM subcontractors, although 79.4 percent of the total $59.9 million originated from five countries: Japan (38.0 percent); the United Kingdom (13.0 percent); Germany (12.9 percent); Switzerland (7.9 percent); and France (7.6 percent). Only three foreign sources - - Japan (76.0 percent), the United Kingdom (23.9 percent), and Germany (0.1 percent) - - supplied the MK-48 ADCAP suppliers at this tier, accounting for $8.5 million in total procurement dollars. The Verdin program subcontractors were supported by sixteen foreign sources which comprised $99.9 million of the total second tier procurement. Five of these sixteen accounted for 98.1 percent of these purchases: Japan (69.7 percent); Italy (15.0 percent); Germany (6.3 percent); Thailand (4.5 percent); and Mexico (2.6 percent).

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[15] This assessment is based on 1988 calendar year data, before the reunification of the Federal Republic of Germany ("West Germany") and the German Democratic Republic ("East Germany"). As such, all references to Germany throughout this assessment are in fact to the former West Germany. No sourcing was reported from the former East Germany.

Table 13:
Value of Total Purchases by All Tier 2 Companies
from Tier 3 Foreign Firms, by Country

COUNTRY OF ORIGIN	VALUE OF PURCHASES	PERCENTAGE OF TOTAL
Japan	$98,947,670	58.76%
Italy	15,110,609	8.97
Germany	14,101,704	8.37
United Kingdom	9,901,747	5.88
Mexico	5,049,100	3.00
Switzerland	4,886,303	2.90
France	4,670,700	2.77
Thailand	4,461,280	2.65
Taiwan	3,768,150	2.24
Austria	2,000,000	1.19
South Korea	1,590,000	0.94
Canada	1,208,544	0.72
Singapore	1,086,000	0.64
Hong Kong	513,916	0.31
Brazil	462,000	0.27
Malaysia	439,782	0.26
Denmark	90,000	0.05
Zimbabwe	59,051	0.04
Philippines	26,325	0.02
India	20,000	0.01
Sweden	2,500	0.00
Ireland*	0	0.00
TOTAL	$168,395,381	100.00

* Not all surveyed firms provided shipment information.

SOURCE: OIRA Survey Data

The significance of foreign sourcing at this tier is brought into proper perspective when compared to the second tier's total (domestic and foreign) procurement distribution. Japan's share of procurement dollars drops to 5.9 percent of the total, ranking less than the procurement values from the states of Texas, Pennsylvania, New York, Illinois, Massachusetts, and California. These six states received 55.4 percent of this tier's total procurement dollars. The percentages for the other top five countries were small as well, ranging from 0.90 percent for Italy to 0.30 percent for Mexico. The top twenty recipients of second tier procurement dollars, and their portion of the total, are listed in *Table 14* on the next page. Three of these twenty recipients are foreign. A listing of the location and value of all tier 2 procurement dollars to tier 3 is included as *Appendix 4*.

Table 14:
Top Twenty Recipients of Second Tier Procurement Dollars

LOCATION	VALUE OF PURCHASES	PERCENTAGE
Texas	$305,289,097	18.2
Pennsylvania	146,011,603	8.7
New York	144,926,243	8.7
Illinois	125,424,464	7.5
Massachusetts	104,196,169	6.2
California	101,762,530	6.1
Japan	98,947,670	5.9
Ohio	83,113,615	5.0
South Carolina	63,166,407	3.8
New Jersey	61,741,439	3.7
Wisconsin	58,281,844	3.5
Utah	55,262,813	3.3
Connecticut	44,872,583	2.7
Delaware	33,375,425	2.0
Michigan	20,146,184	1.2
Florida	19,262,673	1.2
Minnesota	16,072,418	1.0
Nebraska	15,923,262	1.0
Italy	15,110,609	0.9
Germany	14,101,704	0.8
TOP 20 TOTAL	1,526,988,752	91.2
TOTAL, ALL LOCATIONS	$1,674,409,729	100.0

SOURCE: OIRA Survey Data

At the third tier purchases were made from a greater number of foreign countries, with purchases of $679 million from thirty-nine countries, representing 13.7 percent of total third tier procurement of $4.9 billion. As was seen in the second tier, the vast majority of these purchases were made from a few countries, with the top five countries absorbing almost 78 percent of the foreign procurement dollars. These top five countries differ somewhat from the top countries identified at the second tier, as the items procured become less value-added and more basic materials. For this reason Japan's share of total foreign procurement dollars from this tier is only 8.8 percent, significantly less than its 59 percent share of second tier foreign procurement dollars.

Japan's role is still an important one in supplying the third tier, as it is second only to Canada in the value of items supplied. Canada accounts for 52.7 percent of the foreign total. This is a significant switch from the second tier purchases, of which Canadian-sourced items represented only 0.7 percent of total foreign procurement dollars. The other leading foreign suppliers, after Canada and Japan, are the United Kingdom, South Africa, and Germany. *Table 15* on the next page lists each of the thirty-nine countries which served as sources of supply to the third tier, and each country's share of the total foreign procurement figure.

As in the second tier, the number of foreign sources supplying the three weapon systems varied. The number of foreign sources for the HARM increased at this tier from seventeen to thirty countries, with purchases of around $582 million. The top five countries accounted for 87.2 percent of these purchases. These five nations were Canada (61.0 percent), the United Kingdom (8.5 percent), Japan (8.1 percent), South Africa (5.6 percent), and France (4.0 percent).

The number of foreign sources for the MK-48 ADCAP increased from three supplying the second tier to twenty-three supporting the third. The value increased as well, from $8.5 million to almost $69 million. Purchases from the top five countries accounted for 58.8 percent of these purchases, led by Japan (with 15.7 percent), the Netherlands (13.6 percent), the People's Republic of China (11.0 percent), Germany (10.3 percent), and Taiwan (8.2 percent).

The number of foreign sources to the Verdin program declined from sixteen to thirteen. The dollar value of foreign purchases also declined from almost $100 million to approximately $28 million. Five countries - - Taiwan (33.8 percent), Switzerland (24.1 percent), Germany (16.8 percent), Japan (7.4 percent), and Finland (6.8 percent) - - accounted for 88.9 percent of these purchases.

Table 15:
Value of Total Purchases by All Tier 3 Companies
from Tier 4 Foreign Firms, by Country

COUNTRY OF ORIGIN	VALUE OF PURCHASES	PERCENT OF TOTAL	COUNTRY OF ORIGIN	VALUE OF PURCHASES	PERCENT OF TOTAL
Canada	$357,891,271	52.71	Bolivia	$2,000,000	0.30
Japan	59,828,884	8.81	Guatemala	2,000,000	0.30
United Kingdom	50,674,801	7.46	Mexico	1,584,280	0.23
South Africa	32,398,646	4.77	Saudi Arabia	1,500,000	0.22
Germany	26,394,875	3.89	Malaysia	840,000	0.12
France	25,459,679	3.75	Spain	780,000	0.12
Dominican Rep.	16,427,852	2.42	Singapore	720,000	0.11
Taiwan	16,131,040	2.38	India	590,290	0.09
Zimbabwe	15,285,045	2.25	Thailand	527,250	0.08
Switzerland	14,700,692	2.17	Norway	300,000	0.04
Italy	10,282,573	1.51	South Korea	238,578	0.04
Netherlands	9,140,802	1.35	Turkey	220,993	0.03
Sweden	7,351,142	1.08	Austria	85,501	0.01
China (PRC)	7,276,075	1.07	Ireland	76,907	0.01
Trinidad & Tobago	6,600,000	0.97	Denmark	13,046	0.00
Hong Kong	3,075,525	0.45	Philippines	2,000	0.00
Yugoslavia	2,214,239	0.33	Brazil*	0	0.00
Australia	2,177,044	0.32	USSR*	0	0.00
Finland	2,160,836	0.32	Zaire*	0	0.00
Belgium	2,017,000	0.30	TOTAL	$678,966,865	100.00

* Not all surveyed firms provided shipment information.

SOURCE: OIRA Survey Data

The total procurement distribution for the third tier is similar to that of the second tier, in that only three foreign sources are among the top twenty recipients of procurement dollars. Canada is the fourth largest recipient, with 7.2 percent of total procurement, following the states of Illinois, Pennsylvania, and Ohio. These three states accounted for 42.1 percent of all third tier procurement. Japan, the second largest foreign supplier to this tier, is the seventeenth largest recipient with 1.2 percent of the total, only slightly less than purchases from South Carolina. The United Kingdom is nineteenth; its share is 1.0 percent. *Table 16* on the next page lists the top twenty recipients of third tier procurement dollars, and their portion of the total. The distribution of all third tier procurement dollars, by location and value, is included as *Appendix 5*.

Table 16:
Top Twenty Recipients of Third Tier Procurement Dollars

LOCATION	VALUE OF PURCHASES	PERCENTAGE
Illinois	$907,981,806	18.4%
Pennsylvania	791,976,571	16.0
Ohio	380,733,606	7.7
Canada	357,891,271	7.2
New York	288,369,372	5.8
Texas	243,707,588	4.9
Delaware	216,434,529	4.4
California	170,576,559	3.4
Alabama	134,858,607	2.7
Minnesota	133,341,283	2.7
Arizona	99,503,831	2.0
New Jersey	95,680,566	1.9
Louisiana	93,522,152	1.9
Michigan	78,701,111	1.6
Connecticut	66,040,649	1.3
South Carolina	61,625,215	1.2
Japan	59,828,884	1.2
Massachusetts	51,775,590	1.0
United Kingdom	50,674,801	1.0
Kansas	47,736,434	1.0
TOP 20 TOTAL	$4,330,960,425	87.5%
TOTAL, ALL LOCATIONS	$4,947,883,044	100.0%

SOURCE: OIRA Survey Data

A summation of all purchases throughout the project resulted in foreign suppliers receiving $847 million, or 12.8 percent, of all reported procurement dollars at the subcontractor level. Canada was the largest foreign source, with 42.4 percent of the foreign total, followed by Japan with 18.7 percent. These findings loosely reflect broader trends seen in U.S. trade in 1988, with Japan as the largest single foreign supplier to the U.S. market, followed closely by Canada.[16] These two countries accounted for 61.1 of all foreign procurement dollars reported in our project. A ranking of all foreign nations identified as suppliers is provided in *Table 17*, as well as each nation's percentage of the foreign procurement total.

For the project total there were thirty-one foreign sources supplying the HARM missile program. Almost 85 percent of foreign purchases were made from five countries: Canada (55.5 percent); Japan (10.9 percent); the United Kingdom (8.9 percent); South Africa (5.0 percent); and France (4.3 percent). Twenty-four nations supplied the MK-48 ADCAP program, with the top suppliers being Japan (22.6 percent), the Netherlands (12.0 percent), the People' Republic of China (9.7 percent), Germany (9.1 percent), and Taiwan (7.3 percent). The Verdin program had twenty-two foreign suppliers. The top five nations identified accounted for 89.7 percent of all foreign purchases. These five were Japan (56.0 percent), Italy (11.7 percent), Germany (8.6 percent), Taiwan (8.0 percent), and Switzerland (5.4 percent).

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[16] U.S. Department of Commerce, International Trade Administration. United States: Economic, Foreign Trade and Foreign Investment Facts. March 21, 1989.

Table 17:
Value of All Purchases
from Foreign Firms, by Country

COUNTRY OF ORIGIN	VALUE OF PURCHASES	PERCENT OF TOTAL	COUNTRY OF ORIGIN	VALUE OF PURCHASES	PERCENT OF TOTAL
Canada	$359,099,815	42.38%	Finland	$2,160,836	0.26
Japan	158,776,554	18.74	Austria	2,085,501	0.25
United Kingdom	60,576,548	7.15	Belgium	2,017,000	0.24
Germany	40,496,579	4.78	Bolivia	2,000,000	0.24
South Africa	32,398,646	3.82	Guatemala	2,000,000	0.24
France	30,130,379	3.56	South Korea	1,828,578	0.22
Italy	25,393,182	3.00	Singapore	1,806,000	0.21
Taiwan	19,899,190	2.35	Saudi Arabia	1,500,000	0.18
Switzerland	19,586,995	2.31	Malaysia	1,279,782	0.15
Dominican Rep.	16,427,852	1.94	Spain	780,000	0.09
Zimbabwe	15,344,096	1.81	India	610,290	0.07
Netherlands	9,140,802	1.08	Brazil	462,000	0.06
Sweden	7,353,642	0.87	Norway	300,000	0.04
China (PRC)	7,276,075	0.86	Turkey	220,993	0.03
Mexico	6,633,380	0.97	Denmark	103,046	0.01
Trinidad & Tobago	6,660,000	0.78	Ireland	76,907	0.01
Thailand	4,988,530	0.59	Philippines	28,325	0.00
Hong Kong	3,589,441	0.42	USSR*	0	0.00
Yugoslavia	2,214,239	0.26	Zaire*	0	0.00
Australia	2,177,044	0.26	TOTAL	$847,362,247	100.00%

* Not all surveyed firms provided shipment information.

SOURCE: OIRA Survey Data

A ranking by location of purchases for the entire project found three countries - - Canada, Japan, and the United Kingdom - - among the top twenty recipients of all procurement dollars reported. Five states - - Illinois, Pennsylvania, Texas, Ohio, and New York - - led the list with 51.6 percent of all reported procurement dollars. Canada was the sixth largest recipient, receiving 5.4 percent of

the total. Japan received 2.4 percent of the total and was ninth on the list. The United Kingdom was twentieth, receiving less than one percent. A listing of the top twenty recipients is provided in *Table 18* below. A comprehensive listing is included in *Appendix 8.*

Table 18:
Top Twenty Recipients of All Subtier Procurement Dollars

LOCATION	VALUE OF PURCHASES	PERCENTAGE
Illinois	$1,033,406,270	15.6%
Pennsylvania	937,988,174	14.2
Texas	548,996,685	8.3
Ohio	463,847,221	7.0
New York	433,295,615	6.5
Canada	359,099,815	5.4
California	272,339,089	4.1
Delaware	249,809,954	3.8
Japan	158,776,554	2.4
New Jersey	157,422,005	2.4
Massachusetts	155,971,759	2.4
Minnesota	149,413,701	2.3
Alabama	136,365,349	2.1
South Carolina	124,791,622	1.9
Connecticut	110,913,232	1.7
Arizona	106,184,166	1.6
Michigan	98,847,295	1.5
Louisiana	93,713,411	1.4
Wisconsin	74,779,627	1.1
United Kingdom	60,576,548	0.9
TOP 20 PROJECT TOTAL	$5,726,538,092	86.5%
PROJECT TOTAL, ALL LOCATIONS	$6,622,292,773	100.0%

SOURCE: OIRA Survey Data

B. Product Overview

We further broke down foreign procurement by the type of materials, parts, or components by country of origin and weapon system at each subcontractor tier. *Table 19* highlights foreign procurement by the prime contractors from the second tier. Three countries are listed: Canada, Germany, and the United Kingdom.

Table 19:
Foreign-Sourced Items from Tier 2

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Canada	Castings	HARM, Verdin
	Electronics	MK-48, HARM
	Fin & Wing Spar	HARM
	Printed Wiring Boards	HARM
Germany	Castings	HARM
United Kingdom	Electronics	HARM
	Gear Motor	HARM
	Linear Actuator	HARM
	Rocket Motor Case Assembly	HARM
	Shroud Aft Skirt	HARM

SOURCE: OIRA Survey Data

Moving down the supplier chain, the second tier firms sourced from firms in twenty-two different countries, as indicated in *Table 20*. Of these, by the number of different items provided, Japan led, followed closely by Germany, Canada, and France.

Table 20:
Tier 2 Foreign-Sourced Items from Tier 3

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Austria	Unspecified*	HARM
Brazil	Alumina Oxide Sand	HARM, Verdin
	Capacitors	HARM
	Resistor Cap	Verdin
Canada	Alloy Steel Bar & Billet	HARM
	Brass Washers	HARM
	Cobalt Oxide	HARM
	Lead Metal Ingots	HARM
	Machined Parts	HARM
	Nickel Oxide	HARM
	Nylon Intermediate	HARM
	Screw Machine Parts	HARM
	Super Hi-Talc	HARM
	Thermal Black	HARM
Denmark	Silicon Wafers	Verdin
France	Contacts	HARM
	Diethyl Oxalate	HARM
	Quartz Fabric	HARM
	Resistor End Caps	HARM
	Silicon Wafers	HARM
	Silvered-Plated Copper Wire	Verdin
	Steel Bar for Inner Rings	HARM
	Strontium Chronate	HARM
Germany	Aluminum Carrier Tape	HARM, Verdin
	Brass Strip for Capacitors	HARM, Verdin
	Capacitors	HARM
	Cathode Foil	Verdin
	Dispersion Mills & Parts	HARM
	Dual Metallized Paper	HARM
	End Caps	HARM, Verdin
	Fumed Silica	HARM
	Glass Powder & Sleeves	HARM, Verdin
	Inserts	Verdin
	Lubricant	HARM

* Some companies reported foreign sourcing, but failed to specify the items or materials.

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Germany, cont'd.	Metallized Polycarb. Film	HARM
	Pigment	HARM
	Plain Polycarbonate Film	HARM
	Resistor Ceramic Cores	HARM, Verdin
	Resistors	HARM
	Steel Tubing-Outer Rings	HARM
	Tantalum Powder	HARM, Verdin
	Targets	HARM
	Toll Phosgenation Step	HARM
Hong Kong	Assembly	HARM
	Electronic Components	Verdin
	Headers	HARM
India	Raw Mica	Verdin
Ireland	Diodes	Verdin
Italy	Foil	Verdin
	Silicon Wafers	HARM
Japan	Bases & Lids C-Dip	Verdin
	Ceramic Packaging	HARM, MK48, Verdin
	Chlorimated Rubber	HARM
	Glass-to-Metal Seal Pkges.	MK-48
	Headers	HARM
	Lead Frames	HARM, Verdin
	Metal Film Sputter Target Material	HARM, Verdin
	Needle Roller Bearing	HARM
	Wire Rod	
	Package Parts	HARM
	PMDA	HARM
	Polytetrafluoroethylene Powder	Verdin
	Resin	HARM
	Resistor Ceramic Cores	HARM, Verdin
	Semiconductors	HARM
	Silicon Ingots	HARM
	Single Crystal Silicon	MK-48
	Steel Bar for Inner Rings	HARM

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Malaysia	Resistor Cores Silicon Wafers Static Ram	HARM HARM Verdin
Mexico	Burn-In Ceramic Insertion Capacitors	Verdin Verdin
Philippines	Assembly Transistors	Verdin MK-48
Singapore	Bases & Lids C-Dip	HARM, Verdin
South Korea	Integrated Circuit Assbly. Transistors	HARM MK-48, Verdin
Sweden	Needle Roller Bearing Wire Rod	HARM
Switzerland	Ball Bearings Carbide Hobs Flat Washers Gallium Machine Parts Metal Gears Screw Machine Parts Semiconductors	HARM HARM HARM Verdin HARM HARM, MK-48 HARM HARM
Taiwan	Assembly Burn-In Services CMOS Wafers Diodes Leads Plastic Fasteners	HARM, Verdin Verdin HARM Verdin HARM, Verdin HARM
Thailand	Subassembly	Verdin
United Kingdom	Bearings Capacitors Diethyl Oxalate Graphite Paste Hardener Plastic Fasteners	HARM HARM HARM HARM, Verdin HARM, Verdin HARM

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
United Kingdom, cont'd.	Retarder Rocket Motor Case Rucco Ink Tin Metal Ingots	HARM, Verdin HARM HARM, Verdin HARM
Zimbabwe	Asbestos Fiber	HARM

SOURCE: OIRA Survey Data

Firms from thirty-nine different countries supplied the third tier, as indicated in *Table 21*. Japan again provides the greatest number of different items, followed by Canada, Germany, France, Taiwan, and Sweden.

Table 21:
Tier 3 Foreign-Sourced Items from Tier 4

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Australia	Nickel	HARM, MK48, Verdin
Austria	Cans	Verdin
Belgium	X-Ray Film	HARM
Bolivia	Unspecified*	MK-48
Brazil	Alumina Sand	HARM, MK-48
	Aluminum Carrier Tape	MK-48
	Castor Wax	HARM
Canada	97% Utility Nickel Shot	HARM
	99% Nickel Briquettes	HARM
	Adjustment Shafts	MK-48
	Aluminum Fluoride	HARM
	Aluminum Ingot	MK-48
	Aluminum Oxide Crude	HARM
	Anhydrous Ammonia	HARM
	Black Nickel Oxide 77%	HARM
	Castings	HARM
	Cobalt	HARM, MK48, Verdin
	Cobalt Oxide	HARM
	Connector & Cable Clamps	MK-48
	Copper	HARM
	Gold Bullion	HARM, Verdin
	Hot Rolled Bars/Billets	HARM
	Ingot, Billet	HARM
	Lead Ingots	HARM
	Methanol	HARM, MK-48
	Nickel	HARM, MK48, Verdin
	O-Rings	MK-48
	Polyuethane	Verdin
	Potassium Chloride	HARM
	Propylene	HARM
	Silicon Carbon Crude	HARM
	Tantalum Bearing Ores	Verdin
	Titanium Dioxide	HARM
	Zinc Oxide	HARM, MK-48

* Some companies reported foreign sourcing, but failed to specify the items or materials.

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
China (PRC)	Lead Frames	MK-48
	Resistors	MK-48
Denmark	Silicon Wafers	HARM
Dominican Repub.	Nickel Cones	HARM
Finland	Copper	Verdin
	Zirconium Bearing Oxygen	Verdin
France	Can	MK-48, Verdin
	Gallium	HARM
	Kovar	HARM
	Laminating Resins	HARM, Verdin
	Needle Roller Bearing	HARM
	Wire Rod	
	Neodyaiom Oxide	HARM
	Polypropylene Film	HARM
	Quartz Yarn	HARM
	Screw Machine Parts	MK-48
	Silicon	HARM, MK-48
	Stainless Steel Rod	HARM
	Steel Tubing	HARM
Germany	96% Alumina Substrate	HARM
	Aluminum Carrier Tape	HARM, MK-48
	Alum. Polycarbonate Film	HARM, MK-48
	Barium Carbonate	HARM, Verdin
	Black Paper	HARM
	Blue Pigment	HARM, MK48, Verdin
	Carbon Black Pigment	HARM, MK48, Verdin
	Ceramic Cores	MK-48, Verdin
	Ceramic Substrates	HARM
	Copper Acetate	HARM
	Gallium	HARM
	Glass Powder & Sleeves	HARM, MK48, Verdin
	Niobium Pentoxide	HARM, MK48, Verdin
	Polycarb. Capacitor Film	HARM
	Polytetrafluoroethylene	HARM, Verdin
	Fine Powder	
	Resister Caps	MK-48, Verdin
	Silicon	MK-48

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Germany, cont'd.	Specialty Paper	Verdin
	Tantalum Ore	HARM
	Tantalum Powder	HARM, MK-48
	Towers	HARM
	Tungsten Carbide Blanks	HARM
	X-Ray Tube	HARM
	X-Ray Unit	HARM
Guatemala	Unspecified	MK-48
Hong Kong	Ceramic Piece Part Packages	HARM
	Tantalum Bearing Ore	Verdin
India	Backing Mica	MK-48, Verdin
	Plain Mica	MK-48, Verdin
	Silvered Mica	MK-48, Verdin
Ireland	Axial Leads	Verdin
Italy	Brass Sheet	Verdin
	Lead Oxide	MK-48
	Phosphorous Acid	MK-48
	Polytetrafluoroethylene Resin	HARM
	Stainless Steel Rod	HARM
Japan	Additives	HARM
	Alumina Substrates	HARM
	Arsenic	HARM
	Bisamines	HARM
	Boric Oxide	HARM
	Carrier Tape	HARM, MK-48
	Ceramic Packaging	HARM, MK-48
	Ceramic Piece Parts	HARM, Verdin
	Ceramic Substrates	HARM
	Copper Foil	HARM, Verdin
	Crucibles	HARM
	Diallyl Phthalate Resin & Monomer	HARM, MK48, Verdin
	Dyes	HARM
	Epoxy Mold Compound	MK-48
	Glass Beads	HARM
	Gold Paste	HARM
	Grids	HARM
	Header	MK-48, Verdin

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Japan, cont'd.	Hex Nuts	HARM
	Hot Rolled Pickled Steel	HARM
	Hot Rolled Steel Coils	HARM
	Iron Oxide	HARM
	Jam Nuts	HARM
	Kovar	HARM, Verdin
	Lead Frames	HARM, MK-48
	Lockwashers	HARM
	Magnetic Cores	HARM
	Malonic Acid	HARM
	Metal Film Sputter Target Material	MK-48, Verdin
	Methylene Dianiline	HARM
	Mixer	HARM
	Mold Compound	MK-48
	Needle Roller Bearing Wire Rod	HARM
	Nitrile Polymers	HARM
	Oils	HARM
	O-Rings	MK-48
	Pads	HARM
	Phenyl Silanes	HARM, MK-48
	Plastic Film	HARM
	Polysilicon	HARM
	Polytetrafluoroethylene Fine Powder	HARM, Verdin
	Resins	HARM, Verdin
	Rings	HARM
	Silicon Wafers	MK-48
	Silicone Junction Coating Resin	MK-48
	Stainless Angles	MK-48
	Steel Sheet	HARM
	Steel Tubing	HARM, MK-48
	Tantalum Powder	MK-48
	Tapping Screws	HARM
	Toluene Sulfonic Acid	HARM
	UV Lens	HARM
Malaysia	Silicon	MK-48
	Stearic Acid	HARM
Mexico	Assembly	MK-48
	Fluorspar	HARM

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Netherlands	Ceramic Packaging	MK-48
	Iron Oxide	HARM
	Tape	MK-48
Norway	Low Carbon Ferromanganese	HARM
Philippines	Assembly and Testing	MK-48
Saudi Arabia	Methanol	HARM, MK-48
Singapore	Burn-In Boards	HARM
	Gold Wire	MK-48
South Africa	Chrome	HARM, MK48, Verdin
	Electrolytic Manganese	HARM
	Metal Powder	
	High Carbon Ferrochrome	HARM
	High Carbon Ferromanganese	HARM
	Nickel	HARM
South Korea	Ceramic Powder	HARM
	Crystals	MK-48
	Gold Wires	MK-48
	Lead Frames	MK-48
	Stainless Angles	MK-48
Spain	Germanium Dioxide	HARM
Sweden	Coil Stock	Verdin
	Copper Foil	HARM, MK-48
	Gears	HARM
	Magnetite Iron Ore	HARM
	Needle Roller Bearing	HARM
	Wire Rod	
	Pinions	HARM
	Screws and Shafts	HARM
	Silicon Carbide Shapes	HARM
	Stainless Angles	MK-48
	Stainless Steel Rod	HARM
	Steel Bar Stock	HARM
	Tool Steel	HARM
Switzerland	Adjustment Shafts	MK-48
	Bearings	HARM
	Calcium Carbonate	HARM
	Carbide Bearing	HARM
	Contact Stubs	MK-48
	Jackscrews	MK-48

COUNTRY	ITEMS SUPPLIED	WEAPON SYSTEM(S)
Switzerland, cont'd.	Jacksockets	MK-48
	Screw Machined Components	HARM, Verdin
Taiwan	Assembly	HARM, MK48, Verdin
	Brass	HARM
	Electrolytic Capacitors	MK-48
	Ferrite Material	MK-48
	Leads	HARM, Verdin
	Mica Capacitors	MK-48
	Nuts	Verdin
	Plated Terminals	MK-48
	Shaft	MK-48
	Stainless Steel Fasteners	Verdin
	Stainless Steel Hex Nuts	Verdin
	Stainless Steel Lockwasher	HARM
	Teflon Tape	HARM
	Woven Fiberglass	Verdin
Thailand	Tantalum Bearing Ore	Verdin
Trinidad & Tobago	Methanol	HARM, MK-48
Turkey	Chromium Metal	HARM
	High Carbon Ferrochrome	HARM
United Kingdom	Brass	HARM
	Ceramic Substrate	HARM
	Chemicals	HARM
	Crosslink Polystyrene	HARM
	Polymer	
	Dyestuff	HARM
	Ferrosulfur	HARM
	Graphite Paste	HARM, MK-48
	Hardener	HARM, MK-48
	Retarder	HARM, MK-48
	Tin Can Body Marker	MK-48
	Tungsten Carbide Blanks	HARM
USSR	Palladium	HARM
Yugoslavia	High Carbon Ferrochrome	HARM
Zaire	Chrome	HARM
	Cobalt	HARM, MK48, Verdin
Zimbabwe	Chrome	HARM, MK48, Verdin
	Low Carbon Ferrochrome	HARM

SOURCE: OIRA Survey Data

VII. REASONS FOR FOREIGN PROCUREMENT

The preceding pages presented general trends in foreign procurement for the various tiers of supply for the three Navy systems under study. Survey respondents were also asked to explain the reasons for their decision to import parts, components, or materials (see pages 4-5 in the survey attached in *Appendix 3*). In all, there were 15 possible reasons for sourcing abroad, as detailed in *Table 22* below.

Table 22:
Reasons for Foreign Purchases

Reason for Foreign Purchases	Number of Responses
Foreign Dependencies	
1. The U.S. has no economic concentrations of this material for mining.	242
2. Item is not produced in the U.S. for environmental or other legal restrictions.	9
3. Foreign source holds patents or other proprietary rights for this item that have effectively blocked its production in the United States.	71
4. Item is not produced in sufficient quantities to justify investment in the needed equipment and production capabilities by a U.S. firm.	68
5. U.S. production would not be price/quality competitive with imported item.	125
6. Item may be produced in the U.S., but I am not aware of any firms that do.	50
7. Other dependencies (which respondents specified)	69
8. Loss of this foreign item in an emergency situation would adversely affect your surge and/or mobilization production capabilities.	189
Foreign Sources (Non-Dependencies)	
9. Foreign source offers item at a lower price.	169
10. Foreign source produces a higher quality item.	239
11. Foreign source provides quicker delivery.	36
12. Foreign source used to supplement domestic source(s).	149
13. Item is imported as a result of an "offset agreement".	4
14. Item is imported as part of a global marketing strategy.	97
15. Other sourcing reasons (which respondents specified)	29

SOURCE: OIRA Survey

The first eight of these reasons are classified as foreign dependencies, i.e., that there is no known domestic source. The most commonly reported foreign dependencies were for raw materials for which the U.S. had no economically viable concentration. A lack of U.S. production capability due to competitiveness factors (price/quality) was the second most frequently cited reason for foreign dependencies. Also included as foreign dependencies were imported items the unavailability of which would present surge or mobilization production problems.

The bottom half of *Table 22* covers foreign sourcing as a choice over a domestic source. Higher quality and lower price were the most often cited reasons in this category of foreign procurement. Another common reason for foreign sourcing was to supplement a domestic source. The next two subsections of this report provide detailed descriptions and reasons for items designated as foreign dependencies and as foreign sourced. Please note that there are some items that fall into both the foreign dependency and the foreign sourced categories, as well as some items with multiple reasons for importation within each of these two categories. This is because the survey respondents checked multiple responses for certain items, and in most cases no attempt was made to verify the responses.

A. Foreign Dependencies

Table 23 presents a list of all of the items or materials that were reported by surveyed firms as foreign dependencies.[17] The table is broken down by country of origin and by weapon system, and duplicate mentions have been eliminated. It should be reiterated that these are items that were named by the survey respondents as foreign dependencies; in some cases, U.S. production is known to exist. For example, one item reported as a foreign dependency is PTFE (polytetrafluoroethylene) fine powder, which is in fact available in ample quantities from such domestic companies as Ausimont of New Jersey and E. I. DuPont de Nemours of Delaware. In other cases, it is not known whether a U.S. source does actually exist. However, the fact that the survey respondents believed that a foreign dependency existed is an indication that further investigation is necessary on the domestic production capabilities and the relative strategic importance of these items, even for those items where U.S. production is known to exist.

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[17] These represent all responses in categories A-G of Part III of the subcontractor surveys attached as *Appendices 2* and *3*.

Table 23:
Items Reported Foreign-Dependent

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Adjustment Shafts	Canada Switzerland	MK-48
Alloy Steel Bar & Billet	Canada	HARM, Verdin
Alumina Oxide Sand	Brazil Germany	HARM, MK48, Verdin
Aluminum Carrier Tape	Germany	HARM
Aluminum Contact Tape	Germany	HARM
Aluminum Fluoride	Canada	HARM
Aluminum Polycarbonate Film	Germany	MK-48
Anhydrous Ammonia	Canada	HARM
Arsenic	Japan	HARM
Asbestos Fiber	Zimbabwe	HARM
Assembly	Hong Kong Philippines Taiwan	HARM MK-48 Verdin
Ball Bearings	Switzerland	HARM
Barium Carbonate Powder	Germany	HARM, Verdin
Bases and Lids C-Dip	Japan Singapore	HARM Verdin
Bisamines	Japan	HARM
Black Nickel Oxide 77%	Canada	HARM
Black Paper	Germany	HARM
Blue Pigment	Germany	Verdin
Burn-In Services	Taiwan	Verdin
Cable Clamp	Canada	HARM
Capacitors	Brazil Germany	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Carbide Bearings	Switzerland	HARM
Carbide Hobs	Switzerland	HARM
Carbon Black Pigment	Germany	HARM, Verdin
Castor Wax	Brazil	HARM
Cathode Foil	Germany	Verdin
Ceramic Dual-in-Line Packages	Japan	HARM
Ceramic Integrated Circuit Piece Parts	Japan	HARM Verdin
Ceramic Packaging	Hong Kong Japan	HARM, MK-48, Verdin
Ceramic Substrates	Germany Japan United Kingdom	HARM
Chlorimated Rubber	Japan	HARM
Chrome	South Africa Zimbabwe	HARM, MK-48, Verdin
Chromium Metal	Turkey	HARM
Cobalt	Canada Zaire	HARM, MK-48, Verdin
Connectors	Canada Mexico	HARM Verdin
Contacts	France	HARM
Copper	Canada	HARM
Copper Acetate	Germany	HARM
Copper Foil	Japan	Verdin
Cover Tape	Japan	HARM, MK-48
Crosslink Polystyrene Polymer	United Kingdom	HARM
Diallyl Phthalate Resin and Monomer	Japan	HARM, MK-48, Verdin

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Dispersion Mills & Parts	Germany	HARM
Dye	Japan United Kingdom	HARM
Electrolytic Capacitors	Taiwan	HARM
Epoxy Mold Compound	Japan	HARM, MK-48
Ferrite Material	Taiwan	MK-48
Ferrochrome	Zimbabwe	HARM
Foil	Italy	Verdin
Gallium	France Germany Switzerland	HARM Verdin
Germanium Dioxide	Spain	HARM
Glass Powder and Sleeves	Germany Japan	HARM Verdin
Glass-to-Metal Seal Packages	Japan	HARM, MK-48
Gold Paste	Japan	HARM
Gold Wires	Singapore South Korea	HARM
Graphite Paste	United Kingdom	HARM, MK-48
Hardener	France United Kingdom	HARM MK-48
Hardware	France	HARM
Headers	Hong Kong Japan	HARM, MK-48, Verdin
Hex Nuts	Japan Taiwan	HARM Verdin
High Carbon Ferrochrome 53%	South Africa	HARM
Hot Rolled Steel Coils	Japan	HARM
Inserts	Germany Taiwan United Kingdom	HARM Verdin

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Jam Nuts	Japan	HARM
Kovar	France	HARM
Laminating Resin	France	HARM, Verdin
Lead Frames	Japan	HARM, MK48, Verdin
Lockwashers	Japan	HARM
Low Carbon Ferromanganese	Norway	HARM
Magnetic Cores	Japan	HARM
Magnetite Iron Ore	Sweden	HARM
Manufacturing	Belgium United Kingdom	HARM MK-48
Methanol	Saudi Arabia	MK-48
Methylene Dianiline	Japan	HARM
Mica (Backing, Plain, and Silvered)	India Indonesia	MK-48 Verdin
Mica Capacitors	Taiwan	HARM
Mixer	Japan	HARM
Needle Roller Bearing Wire Rod	France Japan Sweden	HARM
Neodymium Oxide	France Germany	HARM, MK-48, Verdin
Nickel	Australia Canada South Africa	HARM MK-48 Verdin
Oxamide	Taiwan United Kingdom	HARM
Palladium	USSR	HARM
Paper	Germany	HARM, Verdin
Phenyl Silanes	Japan	HARM, MK-48
Polycarbonate Base Capacitor Film	Germany	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Polypropylene Film	France	HARM
Potassium Chloride	Canada	HARM
PTFE Fine Powder	Germany Japan	HARM Verdin
Quartz Fabric	France	HARM
Quartz Yarn	France	HARM
Resistors	China (PRC)	HARM
Retarder	United Kingdom	HARM, MK-48
Rings	Japan	HARM
Screw Machine Components	Switzerland	Verdin
Silicon	Germany Malaysia	HARM
Silicon Ingots	Japan	MK-48
Silicon Wafers	Denmark Japan	HARM Verdin
Specialty Paper for Electrical Capacitors	Germany	Verdin
Stainless Steel Fasteners	Taiwan	HARM, Verdin
Stainless Steel Rod	Italy	HARM
Steel Tubing	Japan	HARM
Sulfonic Acid	Japan	HARM
Tantalum Ore	Germany	HARM
Tantalum Powder	Germany	HARM, MK-48
Tapping Screw	Japan	HARM
Teflon Tape	Taiwan	HARM
Theic	Germany	HARM
Thermal Black	Canada	HARM
Tin Metal Ingots	United Kingdom	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Titanium Dioxide	Canada	HARM
Tungsten Carbide Blanks	Germany	HARM
UV Lens	Japan	HARM
X-Ray Tube	Germany	HARM
X-Ray Units	Germany	HARM
Zirconium-Bearing Oxygen-Free Copper	Finland	Verdin

SOURCE: OIRA Survey Data

(1) **Raw Materials**

The reason cited by the greatest number of firms for their foreign dependency was a **lack of an economic domestic concentration of raw materials** for mining. In total, 242 firms at the second and third tier of supply reported that foreign sources were used for this reason. Seven firms at the second tier reported items foreign-sourced for this reason, while 235 companies at the third tier cited this as the cause of their procurement abroad. The foreign items reported by the second tier companies in each instance were also reported by third tier firms; in fact, the same foreign suppliers were mentioned repeatedly, so that only 42 foreign companies were identified as the sources of supply for all 242 domestic companies.

The number of materials sourced from these foreign firms is even less, with only seventeen different classifications of items. Three of these seventeen - - **nickel, ferrochrome, and tantalum ore** - - represent 94.9 percent of the total shipments of $377.4 million for all seventeen items.

-- Nickel

By value, **nickel** was the largest single raw material reported in this category. This is not surprising, as imports accounted for 100 percent of the United States' primary metal supply

in 1987. Re-use of nickel scrap, however, reduced 1987 imports to 85 percent of supply.[18] The main use for nickel is as an ingredient for stainless steel, although it is also used for electroplating and in other alloys. Nickel is also the major component in superalloys, which generally display high-temperature strength and oxidation resistance. Applications include aircraft and missile structural parts, and gas-turbine engine parts.[19]

Total nickel purchases reported were valued at almost $310 million in 1988, 82.1 percent of all materials reported in this category. The uses of the reported purchases were varied, but in many instances the nickel was used to produce alloy wires and stainless steel.[20] Seventy-one domestic companies[21] (one firm at the second tier and the remainder at the third tier) reported sourcing from Canada, which accounted for $304 million, or 98 percent, of total nickel purchases. Twenty-eight third tier firms[22] sourced from Australia, while one third tier company (supplying the HARM missile program) sourced from South Africa.

In terms of a long term foreign dependency, the supply of nickel from Canada, the leading supplier, is not likely to be interrupted. The short term supply could be more problematic, however, given the few number of companies actually supplying nickel. The seventy-one companies who reported sourcing from Canada in fact sourced from only two Canadian firms; one supplied forty-two of these domestic customers, while the other supplied the

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[18] U.S. Air Force Systems Command, Manufacturing Productivity and Critical Materials Support Division. High Technology Materials: A Study of Seven Materials on Supply and Demand. Volume 1. Columbus, Ohio: January 1990. p. III-5.

[19] U.S. Department of Commerce, Office of Industrial Resource Administration. Investment Castings: A National Security Assessment. December 1987. pp. 74, B3.

[20] The various wires produced were used in many applications, with a concentration in resistors and in aerospace fasteners.

[21] Fifty-five companies were subtier suppliers for the HARM missile program, twelve for the Verdin, and four for the MK-48 ADCAP.

[22] Twenty firms supplying the HARM program, six supplying the Verdin, and two supplying the MK-48 ADCAP.

remaining twenty-nine. The same holds true for the twenty-eight companies purchasing nickel from Australia, as all twenty-eight bought from a single firm. The issue thus becomes less of a dependency on foreign countries and more of a dependency on the economic viability of four foreign firms. This potential short term foreign dependency could be alleviated by a release of nickel from the National Defense Stockpile, which maintains a 2.8 month supply of this metal.[23]

Eleven companies reported that the loss of their Canadian nickel supply would adversely affect their **surge production capabilities.** Seven of these companies indicated that the loss of supply of 97 percent nickel shot and 99 percent nickel briquettes could result in worldwide shortages of this material, resulting in higher prices and difficulty in locating sufficient quantities. One of these seven stated that its corrective costs would be an estimated $5 million. Two other third-tier companies stated that their Canadian suppliers were their primary source of nickel, and the loss of these suppliers would force them to maximize the use of domestic scrap until alternate sources could be developed. Another company reported that the loss of its Canadian supplier of black nickel oxide 77 percent would cause the loss of its highest quality nickel oxide, and would necessitate building its own inventory of strategic high purity nickel. Another company indicated that without its Canadian supplier all its sales would be halted until imports resumed.

Three third-tier HARM suppliers who source nickel cones from the Dominican Republic indicated that the loss of their common Dominican supplier would cause shortages, resulting in higher prices and difficulties in availability.

-- Ferrochrome

By value, **ferrochrome** is the second largest material identified as a raw material foreign dependency. Sixty-four companies, all at the third tier, reported total purchases of $43.4

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[23] High Technology Materials: A Study of Seven Materials on Supply and Demand. p. III-13.

million of ferrochrome from abroad because of the **lack of domestic chromite ore reserves.** Chromite is the chief ore of chromium; ferrochrome is a type of alloy of chromium used for making tool steels, ball bearing steels, and other alloy steels.[24] Lesser amounts are used in refractories and chemicals. An estimated two percent of U.S. consumption is used in superalloys.[25] The uses reported by domestic companies include each of these areas, with particular emphasis in steel bars, castings, and steel sheet.

South Africa, Zimbabwe, and Turkey provide 82 percent of the world's supply. Thirty-four companies[26] purchased the material from South Africa, with purchases of $28 million, or 64.9 percent, of the total ferrochrome purchases. These purchases were made from three companies, although one firm was dominant with 28 of the 34 customers. Two firms in Zimbabwe supplied ferrochrome to 29 domestic customers[27]; one supplied 28 of these 29. The value of these shipments was $15 million. One domestic customer[28] procured the material from a Turkish firm; the value of these purchases was minimal.

As with nickel, the dependency on foreign sources for ferrochrome is the result of the lack of domestic ore resources. The concentration of foreign resources in the hands of only a few companies, in this case six firms, once again raises the issue of dependency on a few firms' economic health. One firm indicated that if it lost its two South African suppliers for high

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[24] Brady, George S. "Ferrochromium." Materials Handbook: An Encyclopedia for Purchasing Agents, Engineers, Executives, and Foremen. 8th Edition. New York: McGraw Hill Book Company. 1956. p. 325.

[25] High Technology Materials: A Study of Seven Materials on Supply and Demand., pp. III-10 and VI-Cr-1.

[26] Twenty-six firms were subtier suppliers for the HARM missile, six for the Verdin, and two for the MK-48 ADCAP torpedo.

[27] Twenty-one firms supplied the HARM program, six supplied the Verdin, and two supplied the MK-48 ADCAP.

[28] A supplier for the HARM missile program.

carbon ferrochrome, it would not have enough material to meet its production needs for an indefinite period.

The concern is not as great as with nickel, as the National Defense Stockpile does maintain a nine month supply of chromium metal with which to counter a short-term supply crisis. The area of vulnerability lies in superalloy production, as the stockpile of ferrochromium and chromium does not meet the vacuum-melt specifications needed to create superalloys. In fact, the U.S. Air Force has indicated that the lack of vacuum-melt quality chromium or nickel could halt production of all superalloys, impacting most weapon systems.[29]

-- Tantalum

Tantalum ore was the third largest foreign-sourced item by value reported in the category of raw material foreign dependency. There has been no significant tantalum mining industry in the United States since 1959.[30] For this reason the United States imports 100 percent of its supply. Tantalum ore is mined primarily in Thailand, Australia, and Brazil, although Germany is the largest single supplier to the United States, representing 30 percent of imports.[31] Thailand is the second largest supplier, accounting for 27 percent of imports. The end uses of tantalum are dominated by capacitor production, which represents 59 percent of domestic use. Superalloys account for an additional 15 percent, carbide cutting tools 14 percent, and chemical equipment 5 percent.[32]

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[29] High Technology Materials: A Study of Seven Materials on Supply and Demand, p. III-16.

[30] Cunningham, Larry D. "Tantalum." Mineral Commodity Summaries 1991. Washington, D.C.: U.S. Department of the Interior, Bureau of Mines. 1991. p. 164.

[31] Germany maintains no domestic mining capability of tantalum, so must import the material that it processes. Germany is known to import significant levels from Thailand.

[32] Cunningham, p. 164.

Five third tier companies reported sourcing tantalum ore from Germany. Each indicated that the ore was used in the production of capacitors for the HARM missile. Total purchases were $5 million. One of these suppliers (which supplies three different second tier companies) reported that loss of its German tantalum ore supplier would result in depletion of its raw material supply within six months.

The Department of Defense maintains a stockpile of tantalum, mainly ores and concentrates, which constitutes a 6.7 year supply (based on 1987 consumption rates). This is equivalent to a three year supply, if converted to metal.[33]

While the National Defense Stockpile maintains a large supply of tantalum, this supply has been deemed unsuitable for the "capacitor-grade" needed for the production of capacitors. The stockpiled metal and powder are also unsuitable for use in the production of vacuum-melted superalloys. These two applications comprise 74 percent of domestic uses for this material. The tantalum stockpile, thus, while the largest of the three materials reviewed thus far, actually has the least applicability for relieving a domestic shortage during a national emergency.

-- Other Raw Material Dependencies

The other items reported as sourced abroad for lack of domestic ore concentration were of lesser quantities and values. These items, and those discussed above, are shown in *Table 24* on the next page, as are the reported values of purchases and the countries of origin.

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[33] High Technology Materials: A Study of Seven Materials on Supply and Demand. p. III-15.

Table 24:
Materials with Little or No Domestic Ore Concentrations

ITEM	VALUE OF PURCHASES	COUNTRY OF ORIGIN
Nickel	$309,711,744	Australia, Canada South Africa
Ferrochrome	43,362,203	South Africa, Turkey, Zimbabwe
Tantalum Ore	5,000,000	Germany
Magnetite Iron Ore	3,429,220	Sweden
Titanium Dioxide	1,000,000	Canada
Mica	610,292	India, Indonesia
Barium Carbonate	400,000	Germany
Alumina Oxide Sand	285,000	Brazil
Potassium Chloride	43,500	Canada
Cobalt	15,000	Canada, Zaire
Gallium	15,000	France, Germany
Arsenic	5,000	Japan
Blue Pigment	3,300	Germany
Carbon Black Pigment	2,300	Germany
Ferrite	500	Taiwan
Palladium	0	USSR
Unspecified*	13,535,531	Austria, Bolivia, Canada, Germany, Guatemala, Hong Kong, Italy, Japan, Mexico
TOTAL	$377,418,590	N/A

* Some companies reported foreign sourcing, but failed to specify the items or materials.

SOURCE: OIRA Survey Data

The relatively small purchases of these materials could be misleading, in that small quantities do not necessarily correspond to small importance of these materials for the production of items for military use, although only a few of these items were found to represent a potential dependency.

Cobalt serves as an example. Thirty domestic companies (one in the second tier and twenty-nine in the third tier) reported sourcing cobalt from foreign sources, with total reported purchases of only $15,000 (a number of firms declined to report values). In 1988 the net U.S. import reliance as a percentage of consumption was 87 percent. U.S. domestic mine production had ceased at the end of 1971, and the sole U.S. cobalt refinery discontinued processing in late 1985.[34] Cobalt is imported in metal form from Zambia, Zaire, Canada, and Norway. Zaire and Zambia maintain 68 percent of the world's mine production. Twenty-eight of the domestic companies reported sourcing from one firm in Zaire, while the remaining two firms sourced from two Canadian companies.

The largest single use of cobalt is in the production of superalloys for industrial and aircraft gas turbine engines. This use accounts for 40 percent of U.S. cobalt consumption. Magnetic alloys account for 12 percent, catalysts an additional 12 percent, and paint driers 10 percent.[35] The National Defense Stockpile contains a 1.9 year supply of cobalt metal. Unlike the stockpile of nickel, ferrochrome, or tantalum ore, this supply is suitable for vacuum-melted superalloy production. In the event that African sources become unavailable and the stockpile is depleted[36], nickel may be substituted for cobalt in most applications. The long term dependency thus returns to the availability of nickel from a few foreign suppliers.

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[34] Shedd, Kim B. "Cobalt." Mineral Commodity Summaries 1991. Washington, D.C.: U.S. Department of the Interior, Bureau of Mines. 1991. p. 42.

[35] Ibid.

[36] Current purchase specifications for cobalt used in superalloys are not met by some Canadian materials.

Gallium is another material which the United States procures from foreign sources. Three domestic companies, two subtier suppliers for the HARM program and one for the Verdin, reported sourcing gallium from foreign sources, one in France[37], one in Germany, and one in Switzerland. Their combined purchases were valued at $65,000 in 1988. In that year there was no domestic U.S. production of gallium. Each of the domestic companies indicated that if their foreign sources for gallium were lost, their gallium arsenide (GaAs) component production operations would be paralyzed.

Gallium is found in very small concentrations in many rocks and ores. Most is derived as a byproduct of bauxite, and the remainder is produced from residues from zinc processing. Production levels of gallium are very low. Australia, Germany, and Japan are the largest producing countries, distantly followed by the People's Republic of China, Czechoslovakia, France, Hungary, and Norway. France is the largest U.S. supplier with 49 percent of U.S. imports. Switzerland is the second largest with 31 percent, followed by Germany at 16 percent.[38]

GaAs components represent about 95 percent of domestic gallium consumption. About 65 percent of the gallium was consumed in optoelectronic devices, while integrated circuits accounted for 22 percent.[39] The use of GaAs components is still small in comparison to silicon-based integrated circuits, although GaAs-based semiconductor devices operate at two to four times the speeds of similar silicon devices. Cost is the point of difference between the two materials, as GaAs devices cost nearly ten times that of silicon.[40] However,

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[37] The French supplier was also identified by other domestic companies as a source of laminating resins and neodymium oxide. These companies indicated that the loss of these items from this French firm would adversely impact their surge capabilities as well (see entries for these items in the Surge section). This French firm is thus important to U.S. defense capabilities for multiple reasons and is among the core group of companies that make up the U.S. subcontractor industrial base.

[38] Kramer, Deborah A. "Gallium." Mineral Commodity Summaries 1991. Washington, D.C.: U.S. Department of the Interior, Bureau of Mines. 1991. p. 56.

[39] Ibid.

[40] Cates, Ron. "Gallium Arsenide Finds a New Niche." IEEE Spectrum. New York: Institute of Electrical and Electronics Engineers, Inc. April 1990. p. 25.

because of their enhanced properties, gallium arsenide-based integrated circuits are used instead of silicon in many defense-related applications. In these applications there are no effective substitutes for gallium arsenide.[41]

(2) Environmental Restrictions

A few domestic companies reported that they were dependent on foreign sources for specific items because **environmental or other legal restrictions** either prohibit production in the United States or cause the domestically produced items to be too expensive.

As can be seen from *Table 25* below, only four items were reported in this category. The largest single item in terms of value is diallyl phthalate (DAP) resin and monomer. DAP was reported by one domestic third tier supplier who uses the DAP in the production of military-specified electronic connectors. This company supplied completed connectors to three second tier companies, who each in turn sold the connectors without further processing to three prime contractors, one from each weapon system program. This firm reported that it was unaware of any domestic suppliers for this material and would set up its own in-house production at a cost of $5 million in an emergency.

Table 25:
Item Is Not Produced in the U.S. for
Environmental or Other Legal Restrictions

ITEM	VALUE OF PURCHASES	COUNTRY OF ORIGIN
Diallyl Phthalate Resin and Monomer	1,228,691	Japan
Dyestuff	250,000	United Kingdom
Bisamines	15,833	Japan
Ferrite	500	Taiwan
TOTAL	1,495,024	N/A

SOURCE: OIRA Survey Data

[41] Kramer, p. 56.

DAP is an ester in the allyl family. It is produced as a monomer, which is used as a cross-link in polyester compounds to improve properties and handling characteristics. The monomer can be further processed to create a pre-polymer which is used for coatings or for impregnating materials. The pre-polymer is particularly suited for critical electronic components and metal castings that serve in severe environmental conditions, as it has good chemical resistance and negligible post-mold shrinkage when used in the production of close-tolerance components. DAPs are often reinforced with glass fibers to meet military specifications.[42]

Research has found that there are in fact no environmental or other legal restrictions on DAP production and that the foreign sourcing of this material does not represent a dependency. In fact, this was found to be true for each of the items reported in this category. The DAP monomer is produced domestically in large quantities; however, the last domestic manufacturer of the pre-polymer powder stopped production in 1980. Since that time Japanese producers have been the sole sources of this powder. Industry specialists have indicated that, while there are currently no domestic producers of the DAP pre-polymer, at least one domestic company has the ability to begin its production immediately. Furthermore, in a crisis resin companies could produce the needed quantities of DAP pre-polymers, making use of the domestically-produced DAP monomer.[43]

From our findings the issue thus becomes one not of foreign dependency but of awareness on the part of domestic suppliers of what items and products could be available domestically during an emergency. Based on the responding companies' perceptions, DAP would probably be more suitably listed in the "U.S. Not Competitive" or "U.S. Production Unknown" sections.

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[42] "Interconnections and Wiring: 1986 Electrical Industrial Electronics Reference Issue." Machine Design. Vol. 58. May 15, 1986. p. 231.

[43] Telephone conversation with company representatives of the Rogers Corporation/Molding Materials Division, of Manchester, Connecticut, on November 26, 1991.

(3) Foreign-Held Patents

Another possible reason for the existence of a foreign dependency was that a foreign firm holds **proprietary rights** to the production of an item. There were a total of 71 survey responses in this foreign dependency category. *Table 26* presents a list of those items that the survey respondents indicated were foreign sourced for this reason, with duplicates eliminated. As in most other cases, no attempt was made to verify these responses.

Table 26:
Items for Which Foreign Sources Hold
Patents or Other Proprietary Rights

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Black Nickel Oxide 77%	Canada	HARM
Chrome	South Africa Zimbabwe	HARM, MK-48, Verdin
Cobalt	Canada Zaire	HARM, MK-48, Verdin
Dispersion Mills & Parts	Germany	HARM
Methanol	Saudi Arabia	MK-48
Nickel	Australia Canada	HARM, MK-48, Verdin

SOURCE: OIRA Survey Data

(4) Insufficient Quantity

A fourth possible reason for a foreign dependency was that the item is **not produced in sufficient quantities** to justify investment in equipment and production capabilities by a U.S. firm. There were 68 responses in this category, which are detailed on *Table 27* on the next page. Many of these items are also included in other foreign dependency/foreign sourcing categories, indicating that the survey respondents may have been unclear as to the true reasons for the lack of U.S. sources.

Table 27:
Item Is Not Produced in Sufficient Quantities to Justify Investment in Equipment and Production Capabilities by a U.S. Firm

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Assembly	Taiwan	HARM, Verdin
Bases and Lids C-Dip	Japan	Verdin
Carbide Hobs	Switzerland	HARM
Castor Wax	Brazil	HARM
Ceramic Packaging	Japan	HARM, Verdin
Chrome	South Africa Zimbabwe	Verdin
Cobalt	Canada Zaire	Verdin
Diallyl Phthal. Resin & Monomer	Japan	HARM, MK-48
Dispersion Mills & Parts	Germany	HARM
Epoxy Mold Compound	Japan	MK-48
Ferrite Material	Taiwan	MK-48
Glass Powder & Sleeves	Germany	Verdin
Lead Frames	Japan	HARM, MK-48, Verdin
Manufacturing	United Kingdom	MK-48
Neodymium Oxide	Germany	MK-48
Nickel	Australia Canada	Verdin
Paper	Germany	Verdin
Rings	Japan	HARM
Silicon Wafers	Denmark	HARM, Verdin
Tantalum Powder	Germany	HARM
X-Ray Tube	Germany	HARM
X-Ray Unit	Germany	HARM

SOURCE: OIRA Survey Data

(5) U.S. Not Competitive

Lack of U.S. production due to **competitiveness factors** was yet another reason for foreign dependency. A total of 125 survey responses fell into this category, itemized in *Table 28* below.

Table 28:
U.S. Production Would Not Be Price/Quality Competitive With the Imported Item

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Adjustment Shafts	Canada Switzerland	MK-48
Alloy Steel Bar & Billet	Canada	HARM
Alumina Oxide Sand	Brazil Germany	HARM, Verdin
Aluminum Carrier Tape	Germany	HARM
Aluminum Contact Tape	Germany	HARM
Aluminum Fluoride	Canada	HARM
Anhydrous Ammonia	Canada	HARM
Assembly	Hong Kong Taiwan Philippines	HARM Verdin
Bases and Lids C-Dip	Japan Singapore	HARM Verdin
Black Nickel Oxide 77%	Canada	HARM
Burn-In Services	Taiwan	Verdin
Cable Clamp	Canada	HARM
Carbon Black Pigment	Germany	MK-48
Capacitors	Brazil Germany	HARM
Carbide Bearings	Switzerland	HARM
Carbide Hobs	Switzerland	HARM
Cathode Foil	Germany	Verdin

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Ceramic Dual-in-Line Packages	Japan	HARM
Ceramic Integrated Circuit Piece Parts	Japan	HARM Verdin
Ceramic Packages	Japan	HARM, Verdin
Ceramic Substrates	Germany Japan United Kingdom	HARM
Connectors	Canada Mexico	HARM Verdin
Contacts	France	HARM
Copper	Canada	HARM
Crosslink Polystyrene Polymer	United Kingdom	HARM
Diallyl Phthalate Resin & Monomer	Japan	HARM, MK-48, Verdin
Dye	Japan United Kingdom	HARM
Electrolytic Capacitors	Taiwan	HARM
Epoxy Mold Compound	Japan	HARM
Foil	Italy	Verdin
Gallium	Switzerland	Verdin
Glass Powder and Sleeves	Germany Japan	HARM Verdin
Glass-to-Metal Seal Packages	Japan	HARM
Gold Wires	Singapore South Korea	HARM
Hardware	France	HARM
Headers	Hong Kong Japan	HARM Verdin
Hex Nuts	Japan Taiwan	HARM Verdin

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Hot Rolled Steel Coils	Japan	HARM
Inserts	Germany Taiwan United Kingdom	HARM Verdin
Jam Nuts	Japan	HARM
Lead Frames	Japan	HARM, Verdin
Lockwashers	Japan	HARM
Mica Capacitors	Taiwan	HARM
Neodymium Oxide	France Germany	HARM
Paper	Germany	HARM, Verdin
Polycarbonate Base Capacitor Film	Germany	HARM
Potassium Chloride	Canada	HARM
Resistors	China (PRC)	HARM
Rings	Japan	HARM
Stainless Steel Fasteners	Taiwan	HARM, Verdin
Stainless Steel Rod	Italy	HARM
Steel Tubing	Japan	HARM
Sulfonic Acid	Japan	HARM
Tapping Screw	Japan	HARM
Tin Metal Ingots	United Kingdom	HARM
Tungsten Carbide Blanks	Germany	HARM
UV Lens	Japan	HARM
Zirconium-Bearing Oxygen-Free Copper	Finland	Verdin

SOURCE: OIRA Survey Data

-- Ceramic Packaging

A major item identified repeatedly in this foreign dependency category as well as others was ceramic packaging. Because of the pervasiveness of the use of ceramic packaging throughout the supply chain for each weapon system, we broke this item out for further analysis. Ceramic packaging is important because it encases the actual semiconductor chip, protecting it from moisture and heat. Nearly half of the U.S. demand for ceramic packaging is derived from the military, and almost all military chips are packaged in ceramics.[44] Total reported procurement of ceramic packaging in this study was $85.2 million (includes all purchases not just those destined for the three weapons systems).

Second tier companies sourced $74.4 million of ceramic packaging from foreign sources, in every instance except one from Japan (the one other reported source was in Hong Kong). Suppliers for the HARM program accounted for 6.5 percent of these purchases. Suppliers in the MK-48 ADCAP program accounted for an additional 7.7 percent. Verdin suppliers accounted for the remaining 85.8 percent of purchases. This includes one company's purchases of $63 million, as discussed earlier in Section V (C) of this report.

Suppliers in the third tier also sourced ceramic packaging from abroad, with $10.8 million in purchases. Third tier HARM suppliers accounted for 8.3 percent of this total. MK-48 ADCAP suppliers accounted for the bulk of purchases from the fourth tier, with 91.2 percent of procurement. One Verdin supplier accounted for the remaining 0.5 percent.

The vast majority of the companies purchasing foreign packaging, comprising $70.3 million, or 82.5 percent of the purchases, reported that this item was foreign sourced because they were unaware of any domestic production, indicating a foreign dependency. However, our research has revealed that there is in fact production of ceramic packaging in the United States by such firms as Alcoa, Ceramics Process Systems Corporation, and Coors Ceramics. Thus, the problem in part appears to be one of awareness of this production, as well as competitiveness factors.

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[44] Schlesinger, Jacob M. "Kyocera's Ambivalent Role in Weapons." Wall Street Journal. February 5, 1991. p. A19.

An example taken from the subcontractor supply chain for the HARM program indicates the seriousness of limited U.S. production and U.S. control of ceramic packaging production. The majority of the Japanese-supplied items identified by second tier HARM suppliers was ceramic packaging. Ceramic packaging was also a major item foreign sourced by third tier suppliers as well. In 1988 these shipments from three Japanese firms were valued at $2.4 million. Of even more significance, $2.2 million of these shipments were from a single Japanese firm who supplied packaging to 34 different third tier companies. Although over half of these 34 companies indicated that they were sourcing from a Japanese-owned facility in the United States, we have found that in only four instances out of 34 was the U.S. facility the actual source of the packaging, accounting for only 5.5 percent of the Japanese firm's total value of fourth tier shipments for the HARM program. Three Japanese firms and one Japanese-owned U.S. firm account for over 95 percent of the ceramic packaging supplied to the HARM system.

This dominance by the Japanese results in part from the recent consolidation of the U.S. ceramic capacitor industry. Since 1985 two of the top eight U.S. producers, Unitrode and Corning, were acquired by AVX, the largest U.S. producer which has subsequently been acquired by Kyocera of Japan. A third U.S. producer, Sprague Electric, was acquired by Sanken Electric of Japan in 1990. Finally, Kemet Electronics Division of Union Carbide, the second largest U.S. producer, was sold to Citcorp Venture Capital, Heller Financial (a subsidiary of Fuji Bank of Japan), and Westinghouse Credit Corp. in late 1990.

A number of companies in the supply matrix identified ceramic packaging as an item whose permanent loss would adversely impact **surge production**. While the reported impact of the permanent loss of these foreign suppliers varied from company to company, taken together these responses indicate a potential problem area that requires the immediate attention of defense planners. Two Japanese companies were reported seventeen times as a potential surge problem, five times in the third tier and twelve times in the fourth. The first of these two companies was reported twice, both times in the third tier. A second tier HARM supplier which sources packaging from this Japanese company indicated that it would be unable to build its product to required specifications for six to nine months, and would need to switch to metal packaging. Another second tier supplier (supporting the Verdin program) reported that it would have no packaging for its production for six to eight months, during which time a domestic source would be sought.

These responses were similar to those of the other fifteen domestic companies sourcing from the other reported Japanese company. This Japanese firm was reported three times in the third tier, once for the HARM and twice for the MK-48 ADCAP program. The second tier HARM supplier indicated that it would have to redesign its product to use a domestically-available metal package. This conversion would take six to nine months. One of the second tier MK-48 ADCAP suppliers stated that its production would eventually stop due to a lack of ceramic piece parts, lasting from nine to eighteen months. The other second tier MK-48 ADCAP supplier indicated that another foreign source would be sought, as there are no U.S. producers capable of producing the volume needed.

Another key third tier subcontractor indicated that the permanent loss of its Japanese supply of ceramic packaging would render it unable to produce circuits using specified packaging. The production stoppage would last twenty-four to thirty-six months. As an alternative, plastic packaging could be used, but plastics do not meet military specifications. The other third tier HARM supplier which sourced from this same Japanese supplier reported that the loss of this supplier would halt its production of ceramic dual-in-line packaging for three to six months. The company also indicated that the only domestic source is the U.S. manufacturing facility of the same Japanese company.

This Japanese company was identified two more times in the fourth tier, once in the MK-48 ADCAP program and once in the Verdin program. The third tier MK-48 ADCAP supplier stated that volume manufacturing of ceramic packaging is done only in Japan, so to replace its current Japanese supplier would simply mean switching to yet another Japanese source. The third tier Verdin supplier reported that the permanent loss of its Japanese supplier would halt its production for three to six months while an alternate source is sought. To this company's knowledge there is no domestic production.

(6) U.S. Production Unknown

There were fifty responses in this category of potential foreign dependencies, in which the survey respondents were **not aware of any U.S. production**. Again, many of these items are the same as those mentioned in other foreign dependency categories.

Table 29:
Item May Be Produced in the U.S., but Respondents Unaware of Any Firms That Do

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Arsenic	Japan	HARM
Blue Pigment	Germany	Verdin
Carbide Hobs	Switzerland	HARM
Carbon Black Pigment	Germany	Verdin
Ceramic Integrated Circuit Piece Parts	Japan	HARM Verdin
Ceramic Packaging	Japan	HARM, MK-48, Verdin
Cobalt	Canada	HARM
Copper Acetate	Germany	HARM
Dye	Japan	HARM
Gallium	France Germany	HARM
Glass-to-Metal Seal Packages	Japan	MK-48
Gold Paste	Japan	HARM
Lead Frames	Japan	HARM
Low Carbon Ferromanganese	Norway	HARM
Methylene Dianiline	Japan	HARM
Mixer	Japan	HARM
Oxamide	United Kingdom	HARM
Phenyl Silanes	Japan	HARM, MK-48
Rings	Japan	HARM
Silicon	Germany Malaysia	HARM
Silicon Wafers	Denmark Japan	HARM Verdin
Stainless Steel Rod	Italy	HARM
Teflon Tape	Taiwan	HARM
Theic	Germany	HARM

SOURCE: OIRA Survey Data

(7) Other Foreign Dependencies

Finally, a "catch-all" category of foreign dependencies is presented in the table below. For these items, the survey respondents provided an individual explanation of the reason for the dependency. A common explanation was the existence of a sole or single source for a particular item.

Table 30:
Other Dependencies (Which Respondents Specified)

ITEMS SUPPLIED/REASON	COUNTRY	WEAPON SYSTEM(S)
Alumina Oxide Sand: Single source	Brazil	HARM MK-48
Aluminum Carrier Tape: Sole source	Germany	HARM
Aluminum Polycarbonate Film: Single source	Germany	MK-48
Asbestos Fiber: Only current source in world	Zimbabwe	HARM
Barium Carbonate Powder: Only U.S. producer has too high strontium in ore	Germany	HARM Verdin
Ball Bearings: Source is parent company	Switzerland	HARM
Black Paper: Source is sister company	Germany	HARM
Burn-In Services: Process flow dictates logistical proximity to manufacturing	Taiwan	Verdin
Chlorimated Rubber: Last U.S. source discontinued production	Japan	HARM
Cover Tape: Single source	Japan	HARM MK-48
Germanium Dioxide: Only U.S. source is foreign-owned and production is abroad	Spain	HARM

ITEMS SUPPLIED/REASON	COUNTRY	WEAPON SYSTEM(S)
Graphite Paste: Sole source	United Kingdom	HARM MK-48
Hardener: Single source	United Kingdom	HARM MK-48
Inserts: Our intercompany manufacturing is done overseas	Taiwan United Kingdom	HARM
Magnetic Cores: Exclusive distributor for foreign company	Japan	HARM
Manufacturing: We are U.S. distributor	Belgium	HARM
Needle Roller Bearing Wire Rod: U.S. production of 52100 wire rod just beginning domestically	France Japan Sweden	HARM
Polypropylene Film: Source from parent company	France	HARM
PTFE Fine Powder: Limited U.S. production to meet overall demand	Germany Japan	HARM Verdin
Quartz Fabric: Foreign supplier is wholly-owned subsidiary	France	HARM
Quartz Yarn: No domestic source until mid-1988	France	HARM
Retarder: Single source	United Kingdom	HARM MK-48
Screw Machine Components: No manufacturing in the U.S.	Switzerland	Verdin
Silicon Ingots: Most U.S. producers have been bought out by foreign interests	Japan	MK-48

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Specialty Paper for Electrical Capacitors: Produced by parent; would not be profitable to produce in U.S.	Germany	Verdin
Tantalum Powder: Single source	Germany	HARM MK-48
Thermal Black: Only available by distributor agreement with foreign supplier	Canada	HARM
Titanium Dioxide: Our parent owns 50 percent of foreign supplier	Canada	HARM

SOURCE: OIRA Survey Data

One item appearing on this table, needle roller bearing wire rod, was selected for further examination because of its repeated mentions and the critical role that needle roller bearings play in the performance of gear systems and other mechanical devices used in all three Navy weapon systems. The sole U.S. manufacturer of needle roller bearings participating in our study indicated that it is dependent on foreign sources for needle roller bearing wire rod because of the lack of availability in the United States and the inferior quality of what is available domestically.

Eight foreign firms (six Japanese, one French, and one Swede) have been identified as suppliers of this product, providing a total of $9.4 million in 1988. The Japanese shipments totalled $7.5 million, while the purchases from the French firm were valued at $1.3 million and $625,000 from the Swedish firm.

Using our database, we tracked imports of needle roller bearing wire rod by three different plants of the domestic bearing manufacturer. Each of these three plants was identified as a supplier to four different companies who, in turn, serve as suppliers to Texas Instruments for

the HARM missile program. In addition, the U.S. manufacturer is a fourth tier supplier to the MK-48 ADCAP and Verdin systems, supplying needle roller bearings to four more firms at the second and third tiers. In sum, three prime contractors and eight of their immediate (second tier) suppliers all rely on this single U.S. bearing manufacturer, which in turn is dependent on foreign sources of supply. This company's eight foreign needle roller bearing wire rod suppliers appear a total of 98 times in the supply matrix, indicating both the significance of this foreign-produced item to the three weapon systems and the pervasiveness of certain companies, in this case a single bearing manufacturer, in the domestic industrial base infrastructure. The bearing company reported that the loss of its foreign suppliers for needle roller bearing wire rod would incapacitate its production line until domestic sources could improve their capabilities, thus adversely impacting the production of all three weapon systems under review.

Further research has identified additional U.S. manufacturers of needle roller bearings; however, these firms, too, must import 52100 wire rod product from abroad. There is an apparent lack of capacity in the U.S. to extrude the wire rod to the appropriate specifications. According the needle roller bearing manufacturer participating in our study, efforts to produce the 52100 wire rod product in the United States in sufficient quantity and of necessary quality for needle rollers are in the initial stages of development.

(8) Surge Constraints

This section alphabetically lists miscellaneous foreign sourced items and materials that survey respondents indicated the loss of which would severely impact their production operations. They are included in the "foreign dependency" category because, in the short term, a loss of foreign sources could negatively effect production of one or more of the three weapon systems in an emergency situation.

-- Adjustment Shafts

One third tier supplier for the MK-48 ADCAP reported sourcing adjustment shafts from two foreign firms, one in Switzerland and the other in Canada. In 1988 this supplier made purchases of $129,155 from these two firms. The permanent loss of these suppliers would halt production for up to six months. A U.S. source which has a competitive price would have to be located.

-- Alumina Oxide Sand

Two companies, one in the second tier and the other in the third, reported sourcing alumina oxide sand from abroad. The second-tier supplier supports two of the prime contractors for the HARM and one for the Verdin. It reported sourcing alumina oxide sand from one company in Brazil. The material is used as a firing sand for ceramic chips. The permanent loss of this foreign supplier would have a serious impact on production, causing an interruption from anywhere between six and twenty-four months. Another source would have to be located and the firm's current processing methods would have to be redefined. Corrective costs would be about $190,000.

A third-tier firm which supports the HARM production reported sourcing the sand from a Canadian company. The loss of this supplier could stop production, with an impact lasting twelve to eighteen months.

-- Arsenic

One third tier company which supplies semiconductor chips for the HARM program reported sourcing arsenic from a supplier in Japan. The loss of this supplier would stop production until an alternate supplier could be located.

-- Asbestos Fiber

One second-tier supplier reported sourcing asbestos fiber from a firm in Zimbabwe. The fiber is used to produce asbestos felt for one of the prime contractors for the HARM program. The permanent loss of this supplier would halt production once the in-house

supply is depleted. The company indicated that it would turn to the U.S. Government for assistance. This issue is indicative of the need for timely information in this type of assessment, as the Environmental Protection Agency's three part phaseout of asbestos began in August 1990. In any case, Canadian producers account for 95 percent of U.S. imports of asbestos, while two U.S. producers are still available.[45]

-- Assembly

One foreign subsidiary of a U.S. company was identified five times - - twice in the third tier for and three times in the fourth tier - - as providing assembly of military and commercial diodes and rectifiers for its parent U.S. company. This U.S. firm was reported as a supplier for both the HARM and Verdin programs. The company indicated that the permanent loss of its facility in Taiwan would result in a drastic drop in production to one percent of current levels. The duration of the stoppage would be between 24 and 36 months, during which time a new domestic production facility would be built at an estimated cost of $10 million.

-- Barium Carbonate Powder

Two third tier companies, one a supplier for the HARM and the other for the Verdin, reported sourcing barium carbonate powder from a single supplier in Germany. Both companies use the powder in their production of ceramic material which is used by their customers (two second-tier companies) for the production of capacitors. Both companies purchasing the powder reported that, in the event of the permanent loss of their German supplier, they would have to consider higher priced Japanese sources. There would be no time impact in switching from the German to a Japanese supplier, but one of the firms indicated that to do so would involve an estimated expense of $50,000.

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[45] Virta, Robert L. "Asbestos." Mineral Commodity Summaries 1991. Washington, D.C.: U.S. Department of the Interior, Bureau of Mines. 1991. pp. 18-19.

-- Bearings

Two foreign firms, one Swiss and one British, were reported supplying bearings for the HARM program. The Swiss company was identified twice, once in the third tier and once in the fourth. In both instances the company provided bearings to its U.S. sales office, which was identified twice in the supply matrix for the HARM. The sales office reported that it would need to maintain higher domestic inventories to offset the loss of supply from its parent. The British firm was a third tier supplier for the HARM program. The second tier company indicated that its British supplier maintains the capacity required for high volume HARM production, and that the loss of this supplier would affect surge capability.

-- Boric Oxide

One third tier supplier for the HARM program reported sourcing boric oxide from a Japanese supplier for use in the production of semiconductor chips. This company indicated that, if it experienced a permanent loss of this supplier, the company would have to stop production until the interruption ended. The perceived dependence on a foreign source on the part of this company is in fact erroneous, as the United States is second only to Turkey as the world's largest producer of boron compounds. In fact, the United States exports about one-half of its domestic production.[46]

-- Burn-In Services

The loss of burn-in services provided by a third tier Taiwanese company to a domestic second tier Verdin supplier would either restrict or eliminate the domestic company's production for up to six months. The loss of these services would necessitate converting to an alternate foreign supplier.

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[46] Lyday, Phyllis A. "Boron." Mineral Commodity Summaries 1991. Washington, D.C.: U.S. Department of the Interior, Bureau of Mines. 1991. pp. 28-29.

-- Carbide Hobs

One second tier HARM supplier reported sourcing carbide hobs from a Swiss company. The permanent loss of this supplier would have an adverse effect, as there are no domestic manufacturers who can produce the required quality of hobs. To offset the loss, a domestic company would have to begin production from the ground up.

-- Cathode Foil

One second tier Verdin supplier reported that the loss of its German supplier of cathode foil would halt its production of four different capacitors for three to six months. An alternate supplier, domestic or foreign, would need to be located.

-- Ceramic Bases and Lids

One second tier Verdin supplier indicated that the loss of its five foreign suppliers (four in Japan and one in Singapore) of ceramic bases and lids would likely restrict or completely eliminate its production for up to six months. It would need to convert to an alternate foreign supplier. The cost to make this switch was unknown.

-- Ceramic Cores

In twelve instances foreign-sourced ceramic cores were identified as potential bottlenecks to surge production should the availability of the foreign-sourced items be lost. In eleven of these twelve reported instances, the same domestic company was identified in the supply matrix, and serves as an example of how some domestic companies appear repeatedly in the base. This company's response that the loss of its German supplier would have an adverse effect on its surge capability thus appears eleven times throughout the supply matrix. Another company, a second tier supplier for the Verdin program, also identified the same German company. Both domestic companies indicated that the loss of their German supplier would result in a quantity shortage which could take three to four months to correct. The items could be sourced from domestic sources, although domestically-sourced ceramic cores are of an inferior quality.

-- Chromium Metal

One third tier HARM supplier reported sourcing charged chromium metal from a Turkish supplier. The loss of this supplier would entail the loss of its primary supply source. To overcome, the company would need to maximize its utilization of domestic scrap while developing an alternate foreign source.

-- Chlorimated Rubber

One second tier HARM supplier reported sourcing chlorimated rubber from its subsidiary in Japan. The permanent loss of supply from its foreign affiliate would stop its production for the items it supplies for the HARM system for three months, during which time a new source would have to be developed. The company further stated that the material is available from German sources. There are no domestic sources for this material. The last U.S. producer, Hercules, could potentially resume its domestic production if necessary.

-- Copper Foil

One third tier HARM supplier reported sourcing copper foil from Japan, and that the permanent loss of this supply would necessitate building or purchasing its own manufacturing facility at an estimated cost of $40 million. Otherwise the material would no longer be available.

-- Dyestuff

One third tier HARM supplier reported sourcing dyestuff from a British company whose permanent loss would halt its production of penetrant supplies.

-- Glass Powder, Glass Sleeves

Foreign-sourced glass powder and sleeves were reported seven times as potentially having an adverse impact on surge production should these supplies be lost. In six of the seven instances, the same German company was reported, twice in the third tier and four times in the fourth. In all six cases this German supplier was the source for a single domestic company which serves as a second and third tier supplier for four prime contractors for the

HARM and Verdin weapon systems. This domestic supplier reported that the permanent loss of its German source would decrease its production for four to six months, during which time a domestic supplier would need to be requalified. The corrective costs were estimated at $15,000. The seventh reported instance was a third tier HARM supplier which sources glass powder and sleeves from a Japanese company. This supplier indicated that the loss of this Japanese source would result in its production line shutting down until a new source could be found. The corrective costs were estimated at $3 million.

-- Laminating Resins

One domestic company identified as a third tier supplier for both the HARM and Verdin programs reported sourcing laminating resins from a French company. The loss of this supplier would slow production for one to three months, while either an alternate source or alternate resin could be identified. This same French supplier was identified by other domestic companies as a supplier of gallium and neodymium oxide, two other products whose loss would adversely impact those companies surge capabilities as well.

-- Lead Frames

Japanese lead frames were reported four times in the third tier as items whose loss would adversely impact surge capabilities. These items were produced by three Japanese companies, each who supply the same second tier HARM and Verdin supplier (one of the three Japanese companies appears twice, once in the Verdin supply matrix and once in the HARM, which explains why these items appear four times in the third tier). The second tier company reported that the loss of its Japanese suppliers would restrict or eliminate production for up to six months. To offset this the company would need to find an alternative foreign supplier.

-- Leads

Leads sourced from a single Taiwanese company appear eleven times in the fourth tier of the supply matrix. This is another case where a single domestic company was identified multiple times in the matrix, serving as a supplier to both the HARM and Verdin programs. The

company indicated that the loss of its Taiwanese source would cause a decrease in production for four to six months while a domestic supplier is requalified. Corrective costs would be $15,000.

-- Magnetic Coils

One third tier HARM supplier reported sourcing magnetic coils from a Japanese supplier. It indicated that the permanent loss of this supplier would prevent it from providing the coils to its customer, a second tier company who uses the coils in the production of a transformer for the HARM program. The corrective costs of the interruption were estimated to be $30,000.

-- Magnetite Iron Ore

A third tier HARM supplier indicated that the loss of its Swedish supplier of magnetite iron ore would render it unable to produce sponge iron powder for up to twelve months. A different ore would have to be located that, with processing, would meet the needed specifications.

-- Mica - Plain, Backing, and Silvered

Plain, backing, and silvered mica was identified ten times in the supply matrix. In nine instances, three Indian companies were identified at the fourth tier. These three firms were all identified by the same third tier domestic company who was identified three times in the supply matrix, twice in support of the MK-48 ADCAP program and once for the Verdin. This third tier company uses the material for the production of capacitors. It indicated that if it lost its suppliers in India, it would need to find other foreign suppliers. The company also reported that this type of mica is available only in India and Russia.

A second tier Verdin supplier reported sourcing raw mica from an Indonesian company to be used in the production of washers. This domestic supplier stated that mica of this quality is not mined in the United States due to the high costs involved. The loss of its Indonesian source would impact the company's production for about six months, during which time the needed material could be released from the National Defense Stockpile.

-- Neodymium Oxide

One of the third tier HARM suppliers reported that the loss of its French supplier of neodymium oxide would necessitate switching to higher priced firms. The conversion would take three to six months. This French supplier was also identified by other domestic companies as a supplier of gallium and laminating resins, two other products whose loss would adversely impact those companies surge capabilities.

-- Phenyl Silanes

One Japanese producer of phenyl silanes was identified nine times in the fourth tier supply matrix. This producer was identified by a single domestic third tier company who reported that it has no other immediate source available for this product other than its current Japanese supplier. It further stated that the loss of this supplier would have an adverse impact for six months, during which time a new source would have to be located and investment in in-house production of this item would be initiated. The company was unable to provide an estimated cost for these corrective actions.

This third tier supplier was identified by nine different second tier companies who, in turn, serve as suppliers to five of the ten prime contractors who participated in this project (four of the HARM producers and one for the MK-48 ADCAP).

-- Polycarbonate Base Capacitor Film

One of the third tier companies reported sourcing polycarbonate base capacitor film from a German company. The loss of this German supplier would result in having no source which meets the qualifications outlined by the customer, a second tier producer of capacitors for the HARM program. There is one domestic company available that produces a comparable film, but the customer (the second tier company) would have to approve its use.

-- Polypropylene Film

One of the third tier HARM suppliers indicated that the permanent loss of its French supplier of polypropylene film would close its business.

-- Screw Machine Contacts, Pads, & Parts

One of the third tier MK-48 ADCAP suppliers reported sourcing screw machine pads from a French company for use in the production of connectors. The loss of this supplier would result in a domestic shortage as U.S. companies compete for what products are available. The loss could impact the company for nine months and would necessitate either finding any existing U.S. production or creating its own capacity. Corrective costs are estimated to be $250,000.

Another third tier supplier, this one for the Verdin program, reported sourcing screw machine contacts from its parent company in Switzerland. The domestic operation has no second source readily available and estimates that it would take four months to find and qualify new suppliers, who would then need eight to sixteen week leadtimes for production. Corrective costs would be around $25,000.

One other company in the second tier supply matrix for the HARM reported sourcing screw machine parts from a Swiss company. The loss of this Swiss supplier would reduce its stock for about three months.

-- Silicon

One of the third tier MK-48 ADCAP suppliers reported sourcing silicon from a German company's plants in Germany and Malaysia. The loss of these two affiliated suppliers would require locating other sources, which would take three months.

-- Silicon Ingots

One second tier HARM supplier reported that the loss of its Japanese supplier of silicon ingots would halt its production of silicon resistors for an indefinite period. A domestic source would need to be found. Corrective costs are estimated between $6 and $7 million.

-- Silicon Wafers

A second tier Verdin supplier indicated that the permanent loss of its Danish supplier of silicon wafers would necessitate finding an alternate foreign source, due to non-availability in

the United States. The interruption could adversely impact operations for six months. The company indicated that it could resort to developing domestic manufacturing capability. Costs are unknown.

-- Specialty Paper

Two fourth tier German firms were identified as suppliers of specialty papers to their U.S. subsidiaries. One of these third tier subsidiaries supplied black filter paper to two second tier HARM suppliers, who each use the paper in the production of temperature indicator markers. The third tier company knows of no other source of this type of paper, although by value it is a minor component. The other fourth tier German firm supplied its U.S. subsidiary with specialty paper for electrical capacitors for the Verdin. The loss of supply from its German parent would have a severe impact, with a corrective cost in the millions.

-- Stainless Angles

One of the third tier MK-48 ADCAP suppliers reported sourcing stainless angles from four foreign firms, two in Japan, one in South Korea, and one in Sweden. The company indicated that it sources only 22 percent of its stock domestically. The loss of its four foreign suppliers would require finding additional domestic sources, requiring an undetermined amount of time and money.

-- Stainless Steel Fasteners and Hex Nuts

One of the third tier Verdin suppliers indicated that it sources stainless steel fasteners from a Taiwanese company because there is insufficient domestic production to meet demand. The loss of its Taiwanese source could be offset by a boost in production by other current suppliers. This same third tier supplier also sources stainless steel hex nuts from another Taiwanese company, citing the same reasons.

-- Stainless Steel Rod

Foreign-sourced stainless steel rod appears six times in the fourth tier of the HARM supply matrix. This involves three foreign firms - - one French, one Italian, and one Swedish - - that each supply two different plants of the same domestic third tier firm. This firm

indicated that the type of steel rod sourced is not available domestically. The loss of foreign supply would last six months, while a domestic source could be sought.

-- Teflon Tape

A third tier HARM supplier reported sourcing teflon tape from a Taiwanese supplier. The loss of this source would halt its supply until a domestic source could be found. The time and costs involved are unknown. A foreign dependency on this product is doubtful, as "teflon" is actually a registered trade name of E. I. DuPont de Nemours, a company with ample domestic production capabilities.

-- Zinc Oxide

One of the third tier MK-48 ADCAP suppliers indicated that the loss of its Canadian zinc oxide supplier would reduce the number of sources currently used for six months, costing an estimated $5,000.

B. Foreign Sourcing

In addition to the foreign dependencies described in the previous subsection, the surveyed firms purchased foreign goods and services for a number of other non-dependency reasons, even when a domestic source was available. Foreign sourcing data were compiled from the responses in categories H-N of Part III of the subcontractor survey (see *Appendices 2* and *3*) and were presented in aggregated form in the bottom part of *Table 22* on page 65, above. The most common reason given for sourcing overseas was the foreign source produced a higher quality item. Other frequently cited reasons were lower prices, and foreign sources used to supplement domestic sources. There are a total of seven reasons for foreign sourcing that will be described in this section.

(1) Lower Price

There were 169 incidences of foreign sourcing for reasons of lower price. A total value of $132 million of goods and services were purchased for this reason. *Table 31* details all of the items in this foreign sourcing category. Purchases of five items - - methanol, tantalum

powder, screw machine parts, lead frames, and steel bar - - accounted for over half of the value of all lower priced foreign sourced items, and are looked at in more detail.

Table 31:
Foreign Source Offers Item at a Lower Price

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Assembly	Taiwan	HARM, Verdin
Axial Leads	Ireland	Verdin
Barium Carbonate	Germany	HARM
Bearings	Switzerland	HARM
Black Oxide Nickel 77%	Canada	HARM
Calcium Carbonate	Switzerland	HARM
Capacitors	United Kingdom	HARM
Carbide Hobs	Switzerland	HARM
Carrier Tape	Japan	HARM, MK-48
Ceramic Integrated Circuit Piece Parts	Japan	HARM Verdin
Ceramic Cores	Germany	MK-48, Verdin
Ceramic Packaging	Germany Hong Kong Japan Netherlands	HARM MK-48 Verdin
Ceramic Substrates	Germany Japan United Kingdom	HARM
CMOS Wafers	Taiwan	HARM
Cobalt Oxide	Canada	HARM
Contact Stubs	Switzerland	MK-48
Copper Foil	Japan	HARM, Verdin
Copper Tubing	Japan	HARM, Verdin
Crucibles	Japan	HARM
Dual Metallized Paper	Germany	HARM
End Caps	Germany	HARM, Verdin

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Fumed Silica	Germany	HARM
Gears	Sweden	HARM
Glass Beads	Japan	HARM
Glass Powder and Sleeves	Germany	HARM, Verdin
Gold Bullion	Canada	HARM, Verdin
Graphite Paste	United Kingdom	HARM, Verdin
Grids	Japan	HARM
Hardener	United Kingdom	HARM
High Carbon Ferromanganese	South Africa	HARM
Hot Rolled Pickled Steel Sheet	Japan	HARM
Jackscrews	Switzerland	HARM
Jacksockets	Switzerland	HARM
Kovar	France Japan	HARM Verdin
Laminating Resins	France	HARM
Lead Ingots	Canada	HARM
Lead Frames	China (PRC) Japan	HARM MK-48
Lead Oxide	Italy	MK-48
Leaders	Japan	Verdin
Machine Parts	Switzerland	HARM
Metal Film Sputter Target Material	Japan	MK-48 Verdin
Metallized Polycarbonate Film	Germany	HARM
Molding Compound	Japan	MK-48
O-rings	Japan	MK-48
Oils	Japan	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Pads	Japan	HARM
Phosphorous Acid	Italy	MK-48
Pigment	Germany	HARM
Pinions	Sweden	HARM
Plain Polycarbonate Film	Germany	HARM
Plastic Film	Japan	HARM
Polycarbonate Base Capacitor Film	Japan	HARM
PTFE Fine Powder	Germany Japan	HARM Verdin
Resistors	China (PRC) Germany	HARM MK-48
Resistor Caps	France Germany	HARM, MK-48, Verdin
Resistor Cores	Malaysia	HARM
Retarder	United Kingdom	HARM, Verdin
Rucco Ink	United Kingdom	HARM, Verdin
Screw Machine Parts	France Switzerland	HARM MK-48
Screws	Sweden	HARM
Semiconductors	Japan	HARM
Shafts	Sweden	HARM
Silicone Junction Coating Resin	Japan	MK-48
Stainless Steel Rod	France Sweden	HARM
Stainless Bar Stock	Sweden	HARM
Tantalum Powder	Germany	HARM, Verdin
Targets	Germany	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Towers	Germany	HARM
Wire Rod	Japan Sweden	HARM
X-Ray Film	Belgium	HARM
X-Ray Tube	Germany	HARM
X-Ray Unit	Germany	HARM

SOURCE: OIRA Survey Data

-- Methanol

Methanol accounts for by far the greatest value of foreign sourced items for reasons of lower cost. Total purchases were $35 million and accounted for over a quarter of all foreign sourced items. Methanol, which is commonly used in the process of manufacturing synthetic molding materials, was purchased from Trinidad & Tobago, Canada, and Saudi Arabia. Trinidad & Tobago supplied 92.4 percent of total methanol purchases, while Canada supplied 4.3 percent, followed by Saudi Arabia with 3.3 percent. By weapon system, suppliers to the HARM missile and the MK-48 ADCAP identified methanol as a foreign sourced item.

-- Tantalum Powder

Tantalum powder was also a frequently foreign sourced item due to price, in support of the HARM and Verdin programs. The major end use for tantalum, as tantalum metal powder, is in the production of electronic components, mainly tantalum capacitors. Applications for tantalum capacitors include computers, communication systems, and instruments and controls for aircraft, missiles, ships, and weapon systems. The total value of foreign imports of tantalum was $15.4 million, which accounted for 11.7 percent of items purchased abroad for reasons of price. Germany supplied 100 percent of these tantalum purchases.

-- Screw Machine Parts

The surveyed firms reported $8 million of imported screw machine parts for cost reasons. The firms supplying items for the MK-48 ADCAP program imported their screw machine parts from France (98 percent of the value) and Switzerland (the remaining 2 percent by value).

-- Lead Frames

Lead frames imported for reasons of price totalled about $7 million. Lead frames are metal (usually copper) devices at the heart of the protective packaging of semiconductors. All of the lower cost lead frame purchases were sourced from the People's Republic of China by suppliers to the MK-48 ADCAP program.

-- Steel Bar for Inner Rings

Imports of lower-priced steel bar for use in the manufacture of inner rings for bearings totalled $5.5 million. The firms supplying the HARM reported that of this imported value they imported 64 percent from Japan and 36 percent from France.

(2) Higher Quality

One hundred and sixty nine firms indicated that they sourced overseas because **foreign sources offered higher quality** than domestic sources. *Table 32* on the next page presents a complete list of items sourced for this reason, with duplicates eliminated.

Table 32:
Foreign Source Produces a Higher Quality Item

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S
Alloy Steel Bar and Billet	Canada	HARM
Alumina Substrates 96%	Germany	HARM
Assembly	Germany Hong Kong Philippines South Korea Taiwan	HARM MK-48 Verdin
Axial Leads	Ireland	Verdin
Black Nickel Oxide 77%	Canada	HARM
Brass	Taiwan United Kingdom	HARM
Brass Casters	Canada	HARM
Brass Strip for Capacitors	Germany	HARM, Verdin
Cable Clamp	Canada	MK-48
Calcium Carbonate	Switzerland	HARM
Capacitors	Germany United Kingdom	HARM
Carbide Bearings	Switzerland	HARM
Carbide Hobs	Switzerland	HARM
Ceramic Cores	Germany Japan	HARM, MK-48, Verdin
Ceramic Burn-In Inspection	Mexico	Verdin
Ceramic Integrated Circuit Piece Parts	Japan	HARM Verdin
Ceramic Packaging	Japan	HARM, MK-48
Ceramic Powder	South Korea	HARM
CMOS Wafers	Taiwan	HARM
Connectors	Canada	MK-48
Contact Stubs	Switzerland	MK-48

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S
Copper Foil	Japan	HARM, Verdin
Copper Tubing	Japan	HARM, Verdin
Crosslink Polystyrene Powder	Japan	HARM
Crucibles	Japan	HARM
Crystals	South Korea	MK-48
Dual Metallized Paper	Germany	HARM
Electrolytic Capacitors	Switzerland	MK-48
End Caps	Germany	HARM, Verdin
Epoxy Mold Compound	Japan	MK-48
Ferrosulfur	United Kingdom	HARM
Flat Washer	Switzerland	HARM
Fluorspar	Mexico	HARM
Germanium Dioxide	Spain	HARM
Glass Beads	Japan	HARM
Glass Powder and Sleeves	Germany	HARM, Verdin
Graphite Paste	United Kingdom	HARM, Verdin
Hardener	United Kingdom	HARM, Verdin
Headers	Japan	MK-48
High Carbon Ferrochrome 64%	Turkey Yugoslavia	HARM
Hot Rolled Bars and Billets	Canada	HARM
Iron Oxide	Japan Netherlands	HARM
Jackscrews	Switzerland	MK-48
Jacksockets	Switzerland	MK-48
Lead Frames	China (PRC) Japan South Korea	HARM MK-48

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S
Leads	Taiwan	HARM, Verdin
Low Carbon Ferrochrome	Zimbabwe	HARM
Mabric Acid	Japan	HARM
Machine Parts	Canada Switzerland	HARM
Manufacturing	United Kingdom	MK-48
Metal Film Sputter Target Material	Japan	HARM, MK-48, Verdin
Metal Gears	Switzerland	HARM, MK-48
Metallized Polycarbonate Film	Germany	HARM
Methanol	Canada Saudi Arabia Trinidad & Tobago	HARM MK-48
Mica Capacitors	Switzerland	MK-48
Molding Compound	Japan	MK-48
Neodymium Oxide	France	HARM
Nickel	Australia	HARM
Nuts	Taiwan	Verdin
O-Rings	Japan	MK-48
Phosphorous Acid	Italy	MK-48
Plain Polycarbonate Film	Germany	HARM
PTFE Fine Powder	Germany Italy Japan	HARM Verdin
Resistors	China (PRC) Germany	HARM MK-48
Resistor Caps	France Germany	HARM, MK-48, Verdin
Resistor Cores	Malaysia	HARM
Retarder	United Kingdom	HARM, Verdin

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S
Rucco Ink	United Kingdom	HARM, Verdin
Screw Machine Parts	Canada France Switzerland	HARM MK-48
Shaft	Taiwan	MK-48
Silane	Germany	MK-48
Silicon	France	MK-48
Silicon Carbide Shapes	Sweden	HARM
Silicone Junction Coating Resin	Japan	MK-48
Silver Plated Copper Wire	France	Verdin
Stainless Angles	Japan South Korea Sweden	MK-48
Stainless Steel Rod	France Sweden	HARM
Stearic Acid	Malaysia	HARM
Steel Bar for Inner Rings	France Japan	HARM
Steel Bar Stock	Sweden	HARM
Steel Tubing	France Japan	HARM
Steel Tubing for Outer Rings	Germany	HARM
Strontium Chronate	France	HARM
Subassembly	Thailand	Verdin
Sulfonic Acid	South Korea	MK-48
Tantalum Powder	Germany	HARM, Verdin
Tape (Insulating & Protecting)	Japan Netherlands	MK-48
Titanium Dioxide	Canada	HARM

SOURCE: OIRA Survey Data

(3) Quicker Delivery

A third possible reason for foreign sourcing was that foreign sources offered **quicker delivery** than available domestic sources. The 36 responses received in this category are detailed on *Table 33* below.

Table 33:
Foreign Source Provides Quicker Delivery

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Assembly	Taiwan	HARM, Verdin
Carbide Hobs	Switzerland	HARM
Ceramic Packaging	Hong Kong Japan	HARM
Cobalt Oxide	Canada	HARM
Dual Metallized Paper	Germany	HARM
Electrolytic Capacitors	Taiwan	HARM
Epoxy Mold Compound	Japan	HARM
Headers	Japan	HARM
Lead Frames	Japan	HARM
Lead Metal Ingots	Canada	HARM
Machine Parts	Switzerland	HARM
Metallized Polycarbonate Film	Germany	HARM
Mica Capacitors	Taiwan	HARM
Plain Polycarbonate Film	Germany	HARM
Resistor End Caps	France	HARM
Resistors	Germany	HARM
Stainless Angles	Japan South Korea Sweden	HARM

SOURCE: OIRA Survey Data

(4) Supplement Domestic Sources

Another very common reason for foreign sourcing, with 149 responses, was to **supplement domestic sources** of the same type of item. These items are detailed in *Table 34* below.

Table 34:
Foreign Source Used to Supplement Domestic Source(s)

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Alloy Coil	Sweden	Verdin
Alumina Substrates	Japan	HARM
Assembly	Mexico	MK-48
Bearings	United Kingdom	HARM
Brass	Taiwan United Kingdom	HARM
Burn-In Boards	Singapore	HARM
Burn-In Ceramic Inspection	Mexico	Verdin
Cable Clamp	Canada	HARM
Cap Brass Strip	Germany	HARM
Capacitors	Germany United Kingdom	HARM
Ceramic Integrated Ceramic Piece Parts	Japan	HARM
Ceramic Packaging	Japan	HARM
Chrome	Australia South Africa Zaire Zimbabwe	HARM MK-48
Cobalt	Canada Zaire	HARM, MK-48, Verdin
Connector	Canada	HARM
Copper Foil	Japan	HARM, Verdin
Crucible Glass Beads	Japan	HARM
Dual Metallized Paper	Germany	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Germanium Dioxide	Spain	HARM
Grids	Japan	HARM
Hardener	United Kingdom	HARM
Hot Rolled Pickled Steel Sheet	Japan	HARM
Ingot, Billet	Canada	HARM
Lead Oxide	Italy	MK-48
Leader	Japan	Verdin
Metallized Polycarbonate Film	Germany	HARM
Methanol	Canada Saudi Arabia Trinidad & Tobago	HARM MK-48
Nickel	Australia Canada	HARM, MK-48, Verdin
Nylon Intermediate	Canada	HARM
Oils	Japan	HARM
Pads	Japan	HARM
Phosphorous Acid	Italy	MK-48
Plain Polycarbonate Film	Germany	HARM
Polysilicon	Japan	HARM
PTFE Fine Powder	Germany Japan	HARM Verdin
Resistor Cap	Brazil	Verdin
Resistor Ceramic Cores	Germany	HARM, Verdin
Retarder	United Kingdom	HARM
Rucco Ink	United Kingdom	HARM
Screw Machine Components	Switzerland	HARM, Verdin
Screw Machine Parts	Switzerland	HARM
Silicon	France	HARM, MK-48

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Silicon Wafers	Italy Malaysia	HARM
Stainless Angles	Japan South Korea	HARM
Stainless Steel	Sweden	HARM
Stainless Steel Rod	France Sweden	HARM
Steel Bar for Inner Rings	France Japan	HARM
Steel Bar Stock	Sweden	HARM
Steel Tubing for Outer Rings	Germany	HARM
Subassembly	Thailand	Verdin
Tantalum Powder	Germany	HARM
Woven Fiberglass	Taiwan	MK-48, Verdin

SOURCE: OIRA Survey Data

(5) Offset Agreements

Only four survey recipients reported that they sourced overseas because an **offset agreement** committed or influenced them to do so.[47] The items in this category are detailed in the table at the top of the next page.

[47] Offsets are mandatory industrial or commercial compensation practices demanded by foreign governments in exchange for a purchase of a U.S. weapon system. Offsets can take the form of licensed production, subcontracting, countertrade, technology transfer, or any other form that would be of economic or industrial benefit to the procuring country's industry.

Table 35:
Item Is Imported as a Result of an Offset Agreement

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Bearings	United Kingdom	HARM
Castings	Canada	HARM
PTFE Fine Powder	Germany	Verdin

SOURCE: OIRA Survey Data

(6) Global Marketing Strategy

A sixth reason for foreign sourcing was as part of a firm's **overall marketing strategy** to procure from various sources throughout the world. The 97 responses in this category of procurement are listed in *Table 36.*

Table 36:
Item Is Imported as Part of a Global Marketing Strategy

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
97% Utility Nickel Shot	Canada	HARM
99% Nickel Briquettes	Canada	HARM
Assembly	Philippines Taiwan	HARM Verdin
Brass	Taiwan United Kingdom	HARM
Capacitors	Germany United Kingdom	HARM
Carbide Hobs	Switzerland	HARM
Ceramic Powder	South Korea	HARM
Ceramic Substrates	Germany Japan United Kingdom	HARM
Dual Metallized Paper	Germany	HARM

ITEMS SUPPLIED	COUNTRY	WEAPON SYSTEM(S)
Epoxy Mold Compound	Japan	HARM
Glass Powder and Sleeves	Germany	HARM, Verdin
Graphite Paste	United Kingdom	HARM, Verdin
Headers	Japan	HARM
Lead Frames	Japan	HARM
Leads	Taiwan	HARM, Verdin
Manufacturing	Belgium United Kingdom	HARM
Metallized Polycarbonate Film	Germany	HARM
Methanol	Canada Saudi Arabia Trinidad & Tobago	HARM Verdin
Nickel Cones	Dominican Republic	HARM
Nitrate Polymers	Japan	HARM
Nylon Intermediate	Canada	HARM
Plain Polycarbonate Film	Germany	HARM
Semiconductors	Switzerland	HARM
Silicon	France	HARM, Verdin
Stainless Steel Rod	France Sweden	HARM
Subassembly	Thailand	Verdin
Tantalum Powder	Germany	HARM, Verdin
Woven Fiberglass	Taiwan	Verdin

SOURCE: OIRA Survey Data

(7) Other Foreign Sourcing

Finally, survey respondents indicated that they procured from foreign sources for reasons other than those mentioned above, which they specified. There were 29 responses in this category, the most common of which was that the foreign source was affiliated (parent or subsidiary).

Table 37:
Other Sourcing Reasons
(Non-Dependencies Which Respondents Specified)

ITEMS SUPPLIED/REASON	COUNTRY	WEAPON SYSTEM(S)
Assembly: Wholly-owned subsidiary	Japan	HARM
Black Paper: Source is sister company	Germany	HARM
Castings: One of multiple sources	Canada	HARM
Burn-In Ceramic Inspection: Related party for competitive manufacturing	Mexico	Verdin
Polypropylene Film: Source is parent company	France	HARM
Tool Steel: Source is parent company	Sweden	HARM
Towers: This primary source is specified by our parent company	Germany	HARM
Woven Fiberglass: Foreign source owned by parent for vertical integration	Taiwan	Verdin
Zinc Oxide: Process parameters designed around grade sourced from this company	Canada	HARM

SOURCE: OIRA Survey Data

Appendix 1: Prime and Major Subsystem Contractor Survey

JOINT U.S. NAVY/DEPARTMENT OF COMMERCE
NATIONAL SECURITY ASSESSMENT
OF FOREIGN DEPENDENCIES

Instructions for Completing Questionnaire

- Your company is the manufacturer of the (subassembly) for the (weapon system). We request that you fill out and return this questionnaire on foreign sourcing and foreign dependencies. The questionnaire is divided into three parts:

Part A -	Section I:	Firm Identification
	Section II:	Use of Foreign Manufacturing Services
	Section III:	Use of Foreign Processing Materials and Supplies
	Section IV:	Use of Foreign Machinery, Equipment, and Parts
Part B -	Section I:	Subcontractor Addresses and Item Identification
Part C -	Section I:	Foreign Dependency
	Section II:	Other Foreign Sourcing
	Appendix:	SIC Based Product Code Classification Reference

- Part A concerns the affect of foreign origin manufacturing services, processing supplies and capital equipment on all U.S. establishments under your ownership that participate in the production of your subassembly.

- Part B asks for the identity of all independent foreign and domestic subcontractors from whom you purchase items used directly in your subassembly. The subcontractors you identify in Part B will form the "mailing list" for a "subcontractor questionnaire" in the second phase of this assessment.

- Part C asks several questions about each foreign material, part, or component used in your subassembly.

- It is not our desire to create an excessive burden on your firm. IF INFORMATION IS NOT "READILY" AVAILABLE FROM YOUR COMPUTERIZED DATA FILES IN THE FORM WE ASK, PLEASE MAKE A REASONABLE ESTIMATE. If you do make estimates, place an "e" next to it.

- Please read the "definitions" on the following page before completing the questionnaire. Certain definitions are restated in the Sections to which they apply while others are referenced. It would be helpful for you to have these definitions near at hand when completing the questionnaire.

- Questions related to this questionnaire should be directed to (reserve officer coordinator) at (phone number).

- Information furnished in response to this questionnaire will be treated as proprietar and will not be published or otherwise divulged to reveal the operations of individua firms.

- Please return the completed questionnaire no later than 30 days after receipt.

Name
Address

DEFINITIONS

CAGE CODE - Commercial and Government Entity Code: A five digit alpha/numeric code that identifies all entities in the U.S. Government procurement system.

ESTABLISHMENT - A facility(ies) at a single physical location where manufacturing or production takes place. Includes auxiliary facilities operated in conjunction with such production facilities (whether or not in the same building).

FIRM - An individual proprietorship, partnership, joint venture, association, corporation (including any subsidiary corporation in which more than 50 percent of the outstanding voting stock is owned), business trust, cooperative, trustee in bankruptcy, or receivers under decree of any court, owning or controlling one or more establishments as defined above.

FOREIGN DEPENDENCY - Foreign sourcing of a material, part, component or subassembly because it is not (currently) produced in the United States. (See definition of United States.)

FOREIGN SOURCE - A source located outside the United States from which you purchase a material, part, component or subassembly.

LEAD TIME - The time interval, in weeks, between the placement of an order for a material part or component and its delivery to the end-user.

MAKE/BUY RATIO - A dollar value measure of parts and components made "in-house" by your firm compared with parts and components purchased from outside sources.

MOBILIZATION PRODUCTION - The maximum realistic increase of sustainable defense productic a manufacturing establishment can acheive in the 12 month period following a declared national emergency. Non-Defense production limited to 25% of annual peacetime levels (th essential civilian target) under the Defense Priorities and Allocation System. Governmen financial assistence and prioritization of construction materials and outfitting equipmen is available. Your existing manufacturing buildings may be enlarged, new buildings constructed or existing buildings currently used by you for non-manufacturing purposes ma be converted into manufacturing facilities, and plant equipment acquired. Consider critical labor skills to operate at maximum sustained production levels. Minimum defense target is 4X the maximum monthly defense delivery rate in your contract.

NATIONAL STOCK NUMBER (NSN) - The name for the thirteen-digit number used in all United States Government materiel management functions. Not all items have assigned NSN's.

OFFSET AGREEMENTS - In international trade a range of industrial and commercial compensation practices when mandated, directly or indirectly, by a purchasing government or company as a condition of purchase of U.S. military related exports. Offsets include co-production, licensed production, subcontractor production, overseas investment, technology transfer, and countertrade.

SINGLE SOURCE - An item currently being purchased from one source; other sources may be available, however, they may not be qualified or were not considered.

SOLE SOURCE - An item being purchased from one source, and no other production capability exists.

SUBCONTRACTOR - A vendor or supplier outside the reporting firm from which a material, part, component, or subassembly is purchased.

SURGE PRODUCTION - The maximum sustainable level of defense production that can be acheived within an existing establishment by the end of the 6 month period immediately following surge day (Defense Priorities and Allocations System in full effect). Procurement actions for additional materials to sustain surge production levels will be initiated on surge day. Existing idle equipment may be activated as is, repaired, or upgraded and brought into service, or new or used equipment may be purchased and install if possible within the 6 month time frame. Labor may be hired and trained in numbers sufficient to operate around the clock and weekends alowing for necessary equipment maintenance and downtime. Minimum defense target is 2X the maximum monthly defense delivery rate in your contract.

UNITED STATES - The term "United States" includes the fifty States, Puerto Rico, the District of Columbia, and the Virgin Islands.

PART A. SECTION I: FIRM IDENTIFICATION

Company Name_____
CAGE Number:_____

Primary Address_____

_____

1. ESTABLISHMENT IDENTIFICATION: (Please photocopy as necessary.)

DOMESTIC ESTABLISHMENTS

PLEASE IDENTIFY ALL ESTABLISHMENTS LOCATED IN THE UNITED STATES UNDER YOUR FIRM'S OWNERSHIP THAT MANUFACTURE MATERIALS, PARTS OR COMPONENTS, OR UPGRADE, FINISH, TREAT, INSPECT, TEST, ASSEMBLE OR PROVIDE SPECIAL PROCESSING OR OTHER MANUFACTURING SERVICES FOR THE PRODUCTION OF YOUR SYSTEM/SUBASSEMBLY.

Name of Facility:_____ Point of Contact:_____

Address:_____ Title:_____

_____ Telephone Number:___( )_____

CAGE Code:_____

Primary Activity of Facility:_____

FOREIGN ESTABLISHMENTS

PLEASE IDENTIFY ALL ESTABLISHMENTS LOCATED OUTSIDE THE UNITED STATES UNDER YOUR FIRM' OWNERSHIP THAT MANUFACTURE MATERIALS, PARTS OR COMPONENTS, OR UPGRADE, FINISH, TREAT, INSPECT, TEST, ASSEMBLE OR PROVIDE SPECIAL PROCESSING OR OTHER MANUFACTURING SERVICES FOR THE PRODUCTION OF YOUR SYSTEM/SUBASSEMBLY.

Name of Facility:_____ Point of Contact:_____

Address:_____ Title:_____

_____ Telephone Number:___( )_____

CAGE Code:_____

Primary Activity of Facility:_____

PART A. SECTION II: USE OF FOREIGN MANUFACTURING SERVICES

1. PLEASE IDENTIFY ANY FIRM AND ITS ESTABLISHMENT (including any that you own) LOCATED OUTSIDE THE UNITED STATES THAT PROVIDES MANUFACTURING SERVICES FOR ANY MATERIAL, PAR OR COMPONENT OR COMBINATION OF THE FOREGOING USED IN YOUR SYSTEM/SUBASSEMBLY. THIS INCLUDES SERVICES SUCH AS HEAT TREATING, FINISHING, ASSEMBLING, INSPECTING, TESTING AND OTHER SIMILAR MANUFACTURING SERVICES. (Please photocopy as necessary)

Reason(s) Used: (Select as many as apply)

a. lower price
b. better quality
c. faster service
d. offset agreement
e. U.S. environmental or other legal restrictions
f. service protected by patents or proprietary rights
g. service not available in United States
h. other (specify)

Name of Firm _____

Locality and Country _____

Item Serviced

Part Name _____

Part Number _____

NSN (if any) _____

Service Provided _____

Reason(s) Used (Letter Code) _____

IN AN EMERGENCY, WOULD THE LOSS OF THE SERVICES FROM THIS FOREIGN SOURCE ADVERSELY IMPACT YOUR SURGE AND/OR MOBILIZATION CAPABILITIES?

IF NO, PLEASE EXPLAIN: _____

IF YES, PLEASE COMPLETE THE FOLLOWING:

The nature of the adverse impact - _____

_____

Actions that could be taken to reduce or eliminate it - _____

_____

And, an estimate of the time and cost of the corrective action - _____

_____

PART A. SECTION III: USE OF FOREIGN PROCESSING MATERIALS AND SUPPLIES

---

1. PLEASE IDENTIFY ANY FIRM AND ITS ESTABLISHMENT (including any that you own) LOCATED OUTSIDE THE UNITED STATES THAT PROVIDES PROCESSING MATERIALS OR SUPPLIES (SUCH AS CUTTING TOOLS, DIES, CUTTING OILS, FUELS, ABRASIVES, CHEMICALS, ETC.) WHICH ARE USED OR CONSUMED IN THE PRODUCTION OF YOUR SYSTEM/SUBASSEMBLY BUT DO NOT BECOME PART OF THE FINISHED PRODUCT. (Please photocopy as necessary)

Reason(s) Used: (Select as many as apply)

a.	lower price	e.	U.S. environmental or other legal restrictions
b.	better quality	f.	supply protected by patents or proprietary rights
c.	faster service	g.	supply not available in United States
d.	offset agreement	h.	other (specify)

Name of Firm _____

Locality and Country _____

Item Supplied _____

Reason(s) Used (Letter Code) _____

IN AN EMERGENCY, WOULD THE LOSS OF THE PROCESSING MATERIALS OR SUPPLIES FROM THIS FOREIGN SOURCE ADVERSELY IMPACT YOUR SURGE AND/OR MOBILIZATION CAPABILITIES?

IF NO, PLEASE EXPLAIN: _____

IF YES, PLEASE COMPLETE THE FOLLOWING:

The nature of the adverse impact (Please specify parts or components that would be impacted)

_____

_____

Actions that could be taken to reduce or eliminate it - _____

_____

And, an estimate of the time and cost of the corrective action - _____

_____

Part A. Section I (continued)

2. WHAT IS YOUR MAKE/BUY RATIO FOR THIS SYSTEM/SUBASSEMBLY? (See definition of Make/Buy Ratio)

Make _____ percent Buy _____ percent

3. ENTER YOUR ANNUAL PRODUCTION FOR THIS SYSTEM/SUBASSEMBLY FOR THE YEARS 1982 - 1987 BELOW.

	Quantity	Dollars
1982		
1983		
1984		
1985		
1986		
1987		

4. HAS YOUR SYSTEM/SUBASSEMBLY EVER BEEN INVOLVED IN AN OFFSET AGREEMENT(S)? (See definition of Offset Agreement)

yes_____ no_____

IF YES, PLEASE COMPLETE THE FOLLOWING INFORMATION:

a. Type of offset - Co-production _____ Licensed Production _____
Overseas Investment _____ Technology Transfer _____
Countertrade _____ Subcontractor Production _____

b. The value and duration of the offset obligation- $_____ _____mont

c. The percent of the offset obligation to the export dollar value- _____perc

d. Name and location of foreign firm receiving offset - _____

e. Identify any foreign competitors that the offset agreement helped create and/or enhance._____

_____

f. What percent of the offset obligation did you commit to fulfill? _____percent; and pass on to subcontractors? _____percent

g. What has been the impact (positive and negative) of the offset on domestic subcontractors?

_____

_____

Part A. Section I (continued)

5. WHAT IS YOUR COMPANY POLICY (OR PREFERENCE) ON FOREIGN SOURCING ON DOD CONTRACTS?

(letter code)

a. free and open market
b. prefer domestic sourcing
c. foreign source from selected countries only
d. foreign source to promote exports
e. foreign source when beneficial but maintain domestic alternatives
f. foreign source because of U.S. Government procurement policy
g. other (specify:_____)

PART B. SECTION I - SUBCONTRACTOR ADDRESSES AND ITEM IDENTIFICATION

INSTRUCTIONS

Definition: SUBCONTRACTOR - A vendor or supplier outside the reporting firm from which a material, part, or component is purchased.

- Please provide the information listed below for each subcontractor (both domestic and foreign) from whom you have purchased material, parts, or components for use in your subassembly since January 1, 1982. Please include all subcontractors used since 1-1-82 whether they are still active or not.
- This information may be provided IN THE FORMAT THAT IS EASIEST FOR YOU with your specific computer capabilities. A sample format follows on the next page. Data may be provided on computer tapes or disks; contact (Naval Reservist) at _____ to arrange for this.
- If certain elements present a problem, please contact for further instructions.

Data Elements

1. Subcontractor Name
2. Subcontractor Address
3. Subcontractor Point-of-Contact (POC)
4. POC title
5. POC telephone number
6. Part Name
7. 5 digit SIC Based Product Code (see Appendix)
8. Your Part Number
9. Subcontractor's Part Number
10. National Stock Number (NSN) of the Part, if applicable (see definition of NSN)
11. Specify if Sole or Single Source (see definitions)
12. Estimated Lead Time (Weeks)
13. Quantity required/subassembly
14. Annual purchasing history, units and value, 1982 to date
15. Identify Substitute Part(s), if any

SAMPLE FORMAT FOR

SUBCONTRACTOR AND ITEM IDENTIFICATION COMPUTER RUN

Subcontractor Name
Subcontractor Address

Point of Contact
Title
Telephone Number

Part Name	5 digit SIC Code	Your Part Number	Subcontractor Part Number	NSN of Part	Sole/Single Source(y/n)	Normal Lead Time	# Required/ Subassembly	Normal Lead Time	Purchase History	Substitute Part

PART A. SECTION IV: USE OF FOREIGN MACHINERY, EQUIPMENT, AND PARTS

1. WHAT IS THE APPROXIMATE PERCENTAGE OF FOREIGN MACHINERY AND EQUIPMENT YOU USE IN PRODUCING YOUR SYSTEM/SUBASSEMBLY?

_____ percent

2. WOULD ANY ADDITIONAL FOREIGN ORIGIN MACHINERY OR EQUIPMENT BE REQUIRED IN A SURGE AND/OR MOBILIZATION EMERGENCY?

yes_____ no_____

IF YES, PLEASE IDENTIFY THE MACHINERY OR EQUIPMENT AND COMPLETE THE TABLE BELOW. IF YOU HAVE (OR COULD ESTABLISH IN A TIMELY MANNER) A DOMESTIC SOURCE TO SUPPLY THE MACHINERY OR EQUIPMENT IN A SURGE OR MOBILIZATION EMERGENCY, PLEASE CHECK THE COLUMN HEADED BY "Y" AFTER THE ITEM DESCRIPTION AND ENTER THE NAME OF THE U.S. SOURCE.

Machinery or Equipment	"Y"	U.S. Source Name and State	Number Needed	Foreign Company Name and Country

IF A DOMESTIC SOURCE WILL NOT BE AVAILABLE, PLEASE EXPLAIN HOW IT WOULD AFFECT YOUR SURGE AND/OR MOBILIZATION CAPABILITIES AND WHAT CORRECTIVE ACTION, IF ANY, YOU THINK SHOULD BE TAKEN.

Part A. Section IV (continued)

3. DO YOU UTILIZE ANY FOREIGN SOURCE FOR PARTS OR SERVICES FOR MAINTAINING ANY MACHINERY OR EQUIPMENT YOU USE IN PRODUCING YOUR SUBASSEMBLY?

yes_____ no_____

IF YES, PLEASE IDENTIFY THE PARTS OR SERVICES AND COMPLETE THE TABLE BELOW. IF YOU HAVE (OR COULD ESTABLISH IN A TIMELY MANNER) A DOMESTIC SOURCE TO SUPPLY THE PARTS OR SERVICES IN A SURGE OR MOBILIZATION EMERGENCY, PLEASE CHECK THE COLUMN HEADED BY "Y" AFTER THE ITEM DESCRIPTION AND ENTER THE NAME OF THE U.S. SOURCE.

Parts or Services	"Y"	U.S. Source Name and State	Number Needed	Foreign Company Name and Country

IF A DOMESTIC SOURCE WILL NOT BE AVAILABLE, PLEASE EXPLAIN HOW IT WOULD AFFECT YOUR SURGE AND/OR MOBILIZATION CAPABILITIES AND WHAT CORRECTIVE ACTION, IF ANY, YOU THINK SHOULD BE TAKEN.

PART C.

SECTION I: FOREIGN DEPENDENCY

INSTRUCTIONS

Definition: FOREIGN DEPENDENCY - Foreign sourcing of a material, part or component because it is not produced in the United States.

- Please answer the following questions for each item used in your system/subassembly that is a foreign dependency. Please photocopy as necessary.
- Please begin by completing the item identification information requested in the space immediately following these instructions.
- For questions (1) and (2), select the most appropriate answer from the letter coded responses following the question and enter the applicable letter code in the space provided. Some of the letter coded responses include blank spaces for entering particular information. If you select one or more of these responses, please complete the blank spaces with the requested information.
- If the item is not a foreign dependency, but is foreign sourced, respond to the questions in Part C. Section II.

ITEM IDENTIFICATION

Item Name_____ Your Part Number_____

Operating Inventory Level_____Months

1. WHY IS THIS ITEM NOT PRODUCED IN THE UNITED STATES?

_____
(letter code)

a. The United States has no economic concentrations of this material for mining
b. The item is not produced in the U.S. because of environmental or other legal restrictions. (specify:_____)
c. The foreign source holds patents or other proprietary rights respecting this item that have effectively blocked its production in the U.S. (specify:_____)
d. The item is not produced in sufficient quantities to justify investment in the needed equipment and production capabilities by a U.S. firm.
e. U.S. production would not be price/quality competitive with imported item.
f. Item may be produced in the U.S., but I am not aware of any firms that do.
g. other (specify:_____)

Part C. Section I (continued)

2. IN AN EMERGENCY HOW WOULD THE LOSS OF THIS ITEM AFFECT YOUR SURGE AND MOBILIZATION CAPABILITIES?

_____
(letter code)

a. Production would shut down if current inventories are depleted;

   i. and could not resume until the foreign source is restored.
   ii. but could resume by relaxing certain environmental or other legal restrictions and qualifying a domestic source. The qualifying period would take approximately _____ months, and would cost an estimated $_____
   iii. but could resume after certain patents or other proprietary rights were mad available to a domestic source. The qualifying period would take approximately _____ months, and would cost an estimated $_____
   iv. but could resume by qualifying a domestic source. The qualifying period would take approximately _____ months, and would cost an estimated $_____

b. no impact (explain: _____)
c. other (specify: _____)

3. WHAT MEASURES COULD BE (OR HAVE BEEN) TAKEN TO REDUCE OR AVERT THE IMPACT OF AN INTERRUPTION IN THE AVAILABILITY OF THIS ITEM?

_____

_____

_____

4. HAVE YOU EVER EXPERIENCED AN INTERRUPTION IN THE SUPPLY OF THIS ITEM THAT CAUSED YOU TO CURTAIL, SLOWDOWN, OR OTHERWISE MODIFY PRODUCTION OPERATIONS (e.g., an unacceptabl or lost shipment, labor disruptions, foreign supplier unable to obtain needed material, political actions, etc.)?

yes_____ no_____

IF YES, PLEASE DESCRIBE BELOW THE NATURE OF THE INTERRUPTION AND THE ACTION YOU TOOK TO RESOLVE IT.

_____

_____

_____

_____

PART C.

SECTION II: OTHER FOREIGN SOURCING

INSTRUCTIONS

Definition: FOREIGN SOURCE - A source located outside the United States from which you purchase a material, part, or component.

- Please answer the following questions for each item used in your system/subassembly that is foreign sourced (except foreign dependency items documented in Part C - Section I). Please photocopy as necessary.
- Please begin by completing the item identification information requested in the space immediately following these instructions.
- For question (1), select the appropriate answer from the letter coded responses following the question and enter the applicable letter code in the space provided. Select as many letter coded responses as apply.

ITEM IDENTIFICATION

Item Name_____ Your Part Number_____

Operating Inventory Level_____Months

1. WHY IS THIS ITEM FOREIGN SOURCED? (Select as many as apply)

(letter code)

a. Foreign source offers item at a lower price.
b. Foreign source produces a higher quality item.
c. Foreign source provides quicker delivery.
d. Foreign source used to supplement domestic source(s).
e. The item is imported as a result of an "offset agreement".
f. The item is imported as part of a global marketing strategy.
g. other (specify:_____)

Please use this space if you desire to further qualify your answer:_____

Part C. Section II (continued)

2. WOULD THE LOSS OF THIS FOREIGN SOURCED ITEM IN AN EMERGENCY SITUATION ADVERSELY AFFE(YOUR SURGE AND/OR MOBILIZATION PRODUCTION CAPABILITIES?

IF YES, PLEASE DESCRIBE THE FOLLOWING:

a. The nature of the adverse impact - _____

_____

b. Its likely duration - _____ months

c. Actions needed to correct the impact - _____

_____

d. The estimated cost of correction - $ _____

IF NO, HOW WOULD THE ADVERSE IMPACTS BE AVERTED? (Select as many as apply)

_____
(letter code)

a. Would boost production from existing domestic subcontractors
b. Would qualify an additional domestic source
c. Would produce item "in-house"
d. Would use substitute item
e. Other (Specify: _____)

Appendix 2: Tier 2 Survey

Form BXA-9061
(06-89)

U.S. Department of Commerce
Bureau of Export Administration
JOINT U.S. NAVY/DEPARTMENT OF COMMERCE
NATIONAL SECURITY ASSESSMENT
OF FOREIGN DEPENDENCY

OMB # 0694-006
expires 10-31-8

This report is required by law (50 U.S.C. App. Sec. 2155). Failure to report can result in a maximum fine of $1,000 or imprisonment up to one year, or both. Information furnished herewith is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C. App. Sec. 2155).

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 1.5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to BXA Reports Clearance Officer, Room 5612, Bureau of Export Administration, U.S. Department of Commerce, Washington, D.C. 20230 and to the Office of Management and Budget, Paperwork Reduction Project (0694-0061), Washington, D.C. 20503.

Instructions for Completing Questionnaire

- Attachment A contains the name of a Navy defense system(s) and listing of item(s) your firm supplies for production of that system(s). The foreign content of the items(s) listed on Attachment A is the primary focus of this survey and the overall assessment. Please complete this questionnaire in its entirety for each of your U.S. establishments that supplies Attachment A items. The survey has three parts:

  Part I: FIRM IDENTIFICATION
  Part II: DOMESTIC SOURCES OF SUPPLY
  Part III: FOREIGN SOURCES OF SUPPLY

- Please photocopy Part II (for domestic sources) and Part III (for foreign sources) as needed so as to account separately for each supplier that provides any material, part, or component you use to produce the item(s) listed in Attachment A. If you purchase certain items through domestic distributors, and do not know the origin, treat them as domestic suppliers. Please read the "definitions" on the following page before completing the questionnaire.

- It is not our desire to create an excessive burden on your firm. IF INFORMATION IS NOT "READILY" AVAILABLE FROM YOUR FILES IN THE FORM REQUESTED, PLEASE MAKE A REASONABLE ESTIMATE. If you do make estimates, place an "E" next to it. If an answer is "none", please so indicate.

- Questions related to this questionnaire should be directed to John Tucker, Senior Industry Analyst, (202) 377-3984, or Ms. Judi Philipson, Trade and Industry Analyst, (202) 377-2323 of the Department of Commerce, or Mr. Edward Purcell, Industrial Planning Assistant, (202) 695-3293, Office of the Chief of Naval Operations.

- Before returning completed questionnaire, be sure to sign the certification and identify the person and phone number who will be the contact in your firm. Return completed questionnaire by July 21, 1989 to:

  Mr. Brad Botwin
  Office of Industrial Resource Administration
  Room 3878
  U.S. Department of Commerce
  14th and Constitution Ave., N.W.
  Washington, D.C. 20230

SUPPLIER - A U.S. or foreign vendor or supplier (including any that you own or are affiliated with) from whom is sourced or purchased a material, part, component, or manufacturing service (e.g., heat treating, assembly, testing, etc.) that is needed for the production of any item(s) listed on Attachment A.

SURGE PRODUCTION - The maximum sustainable level of defense production that can be achieved within an existing establishment by the end of the 6 month period immediately following surge day (Defense Priorities and Allocations System in full affect). Procurement actions for additional materials to sustain surge production levels will be initiated on surge day. Existing idle equipment may be activated as is, repaired, or upgraded and brought into service, or new equipment or used equipment may be purchased and installed if possible within the 6 month time frame. Labor may be hired and trained in numbers sufficient to operate around the clock and weekends allowing for necessary equipment maintenance and downtime. Minimum defense target is 2X your average monthly defense production in 1988. (See definition of defense shipments.)

UNITED STATES - The term "United States" includes the fifty States, Puerto Rico, the District of Columbia, and the Virgin Islands.

DEFINITIONS

DEFENSE SHIPMENTS - Estimate the defense portion of shipments of all products, including those listed on Attachment A and report in dollar value for Part I question 2b. The defense portion of your business may be identified by those purchase orders bearing a DO or DX rating and/or a contract number from the Department of Defense, NRC, CIA, FAA, or NASA, as well as the orders of your customers whom you could identify as producing products for defense purposes, and items tested and certified to military specifications shipped to qualified distributors.

ESTABLISHMENT - One or more facilities at a single physical location where manufacturing or production of item(s) listed on Attachment A takes place. Includes auxiliary facilities operated in conjunction with such production facilities (whether or not in the same building).

FIRM - An individual proprietorship, partnership, joint venture, association, corporation (including any subsidiary corporation in which a controlling interest of the outstanding voting stock is owned), business trust, cooperative, trustee in bankruptcy, or receivers under decree of any court, owning or controlling one or more establishments as defined above.

FOREIGN DEPENDENCY - Foreign sourcing of a material, part, component or subassembly because it is <u>not</u> produced in the United States. (See definition of United States.)

FOREIGN SOURCE - A source located outside the United States from which you purchase a material, part, component or subassembly.

MOBILIZATION PRODUCTION - The maximum sustainable level of defense production a manufacturing establishment can achieve in the 12 month period following a declared national emergency. Non-Defense production limited to 25% of annual peacetime levels (the essential civilian target) under the Defense Priorities and Allocation System. Government financial assistance and prioritization of construction material and outfitting equipment is available. Your existing manufacturing buildings may be enlarged, new buildings constructed or existing buildings currently used by you for non-manufacturing purposes may be converted into manufacturing facilities, and plant equipment acquired. Consider critical labor skills to operate at maximum sustained production levels. <u>Minimum</u> defense target is 4X your average monthly defense production in 1988. (See definition of defense shipments.) Note: In providing definitions of surge (see below) and mobilization production, it is our objective to identify any foreign sourced item that would prevent you from attaining the minimum mobilization production target. This definition is needed for you to properly respond to the following questions: Part I-3 and Part III-3.

OFFSET AGREEMENTS - In international trade, a range of industrial and commercial compensation practices when mandated, directly or indirectly, by a purchasing government or company as a condition of purchase. Offsets include co-production, licensed production, subcontractor production, overseas investment, technology transfer, and countertrade.

SHIPMENTS - For Part I question 2b, estimate the total dollar value of all products, including those listed on Attachment A, shipped from this establishment in 1988. Such shipments should include inter-plant and intra-plant transfers, but should exclude shipments of products produced by other manufacturers for resale under your brand name. Do not adjust for returned shipments.

Please complete Parts I, II & III for each of your U.S. establishments that supplies any item listed on Attachment A. Please photocopy the survey if additional copies are needed.

PART I.

FIRM IDENTIFICATION

1. Name and address of your firm or corporate division.

_____

_____

_____

If your firm is wholly or partly owned by another firm, enter the name and address of the parent firm and extent of ownership.

_____

_____

_____

Extent of Ownership:_____(percent)

2a. Identify location of manufacturing establishment in United States that manufactures or adds value to the Attachment A item(s). (See definition of establishment.)

Establishment Location

_____
(Locality) (State) (Zip Code)

2b. For all products produced at this establishment, please estimate the dollar value of total shipments, total defense shipments, and shipments of Attachment A items that were made from this establishment in 1988. (See definitions of shipments and defense shipments.)

1988 Shipment Totals

$_____	$_____	$_____
(Total Shipments)	(Defense Shipments)	(Attachment A Shipments)

3. In a surge or mobilization emergency would any additional foreign origin machinery, equipment or replacement parts for existing machinery or equipment be required at this establishment to produce the item(s) listed on Attachment A. (Please see definitions of surge and mobilization production.)

yes_____ no_____If yes, please complete the following table:

Mach., Equipmt. or Part	Number Needed	Foreign Supplier	Country of Origin

PART II. DOMESTIC SOURCES OF SUPPLY

Instructions

- Please complete this page for each of your domestic suppliers that provides any parts, materials, or services for the production of the item(s) listed on Attachment A.
- See definition of supplier.
- Please photocopy this page as necessary.

This domestic supplier used for the production of:_____
(list relevant Attachment A item(s))

1. Please identify each establishment (and the firm name) located in the United States that supplies materials, parts or components; or that upgrades, finishes, treats, inspects, tests, assembles or provides special processing or other manufacturing services for the production of item(s) listed on Attachment A.

Name of Supplier Firm:_____

Establishment Address:_____

_____

Type or class of item(s) or service(s) supplied:_____

1988 value purchased from this suppler: $_____

Point of Contact:_____

Title:_____

Telephone Number:_____

2. Have you in the last five years experienced an interruption in the supply of any item or service you purchase from the above named firm that caused you to curtail, slowdown, or otherwise modify production operations (e.g., an unacceptable or lost shipment, labor disruptions, supplier unable to obtain needed material, etc.)?

yes_____ no_____

If yes, please describe below the nature of the interruption and the action you took to resolve it.

_____

_____

_____

_____

PART III.

FOREIGN SOURCES OF SUPPLY

Instructions

- Please complete this and the next page for each of your foreign suppliers that provide any parts, materials, or services (including partial foreign processing) for the production of the item(s) listed on Attachment A.
- See definition of supplier, foreign dependency, foreign sourcing and offset agreement.
- Please complete Part III questions 2, 3, & 4 separately for each type or class of item your purchase from a foreign supplier.
- Please photocopy this and the next page as necessary.

This foreign supplier used for the production of: _____
(list relevant Attachment A item(s))

1. Please identify each establishment (and the firm name) located outside the United States that supplies materials, parts or components; or that upgrades, finishes, treats, inspects, tests, assembles or provides special processing or other manufacturing services for the production of item(s) listed on Attachment A.

Name of Supplier Firm: _____

Establishment Address: _____ (Locality) _____ (Country)

Type or class of item(s) or service(s) supplied: _____

1988 value purchased from this supplier: $_____

2. For what reason is this item or service foreign sourced? (Select as many as apply)

_____
(letter code)

If foreign sourced item is because of a foreign dependency select answer from A thru G.

A. The United States has no economic concentrations of this material for mining.
B. The item is not produced in the U.S. because of environmental or other legal restrictions. (specify: _____)
C. The foreign source holds patents or other proprietary rights respecting this item that have effectively blocked its production in the U.S. (specify: _____)
D. The item is not produced in sufficient quantities to justify investment in the needed equipment and production capabilities by a U.S. firm.
E. U.S. production would not be price/quality competitive with imported item.
F. Item may be produced in the U.S., but I am not aware of any firms that do.
G. Other (specify: _____)

If foreign sourced item is NOT because of a foreign dependency, select answer from H thru N.

H. Foreign source offers item at a lower price.
I. Foreign source produces a higher quality item.
J. Foreign source provides quicker delivery.
K. Foreign source used to supplement domestic source(s).
L. The item is imported as a result of an "offset agreement".
M. The item is imported as part of a global marketing strategy.
N. Other (specify: _____)

PART III. (FOREIGN SUPPLIERS continued)

3. Would the permanent loss of this foreign sourced item in an emergency situation adversely affect your surge and/or mobilization production capabilities? (See definition of surge and mobilization production.)

   If yes, please describe the following:

   a. The nature of the adverse impact - _____

   _____

   b. Its likely duration - _____ months

   c. Actions needed to correct the impact - _____

   _____

   d. The estimated cost of corrective actions- $ _____

   If no, how would the adverse impacts be averted? (Select as many as apply)

   _____
   (letter code)

   a. Would boost production from existing domestic subcontractors
   b. Would qualify an additional domestic source
   c. Would produce item "in-house"
   d. Would use substitute item (Identify:_____)
   e. Other (Specify:_____)

4. Have you in the last five years experienced an interruption in the supply of any item or service you purchase from the above named firm that caused you to curtail, slowdown, or otherwise modify production operations (e.g., an unacceptable or lost shipment, labor disruptions, supplier unable to obtain needed material, etc.)?

   yes_____ no_____

   If yes, please describe below the nature of the interruption and the action you took to resolve it.

   _____

   _____

   _____

   _____

CERTIFICATION

The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct. The U.S. Code, Title 18 (Crimes and Criminal Procedure), Section 1001, makes it a criminal offense to willfully make a false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

(Date) _____ (Signature of Authorized Official) _____

(Area Code and Telephone Number) _____ (Type or Print Name and Title of Authorized Official) _____

(Area Code and Telephone Number) _____ (Type or Print Name and Title of Person to Contact Regarding this Report) _____

Comments: Please use the space below to provide any additional comments or information you may wish regarding your operations, or other related issues that impact your firm.

Appendix 3: Tier 3 Survey

Form BXA-9061
(06-89)

U.S. Department of Commerce
Bureau of Export Administration

OMB # 0694-0061
Expires 12-30-90

JOINT U.S. NAVY/DEPARTMENT OF COMMERCE NATIONAL SECURITY ASSESSMENT OF FOREIGN DEPENDENCY

THIS REPORT IS REQUIRED BY LAW

Failure to report can result in a maximum fine of $1,000 or imprisonment up to one year, or both. Information furnished herewith is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C.App. Sec. 2155).

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 1.5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to BXA Reports Clearance Officer, Room 5612, Bureau of Export Administration, U.S. Department of Commerce, Washington, D.C. 20230, and to the Office of Management and Budget, Paperwork Reduction Project (0694-0061), Washington, D.C. 20503.

PURPOSE

The U.S. Navy Fleet Commanders-in-Chief have identified three weapons systems that are critical to our warfighting capability: the HARM missile, the MK-48 torpedo, and the Verdin communication system. The emphasis of this study is to identify the degree of foreign sourcing and dependency for each of these weapon systems at each subcontractor tier and to develop alternatives to offset such dependency in the event of a national emergency.

Your firm has been identified as a subcontractor for the specific parts and components for one or more of these systems. This information is listed in Attachment A of this questionnaire. The information that you provide will enable us to identify any dependencies on foreign sources for each weapon system and the impact of such dependencies on our defense industrial base.

INSTRUCTIONS FOR COMPLETING QUESTIONNAIRE

o Please complete this questionnaire in its entirety for each of your U.S. establishments that supplies Attachment A items. The survey has three parts:

Part I: FIRM IDENTIFICATION
Part II: DOMESTIC SOURCES OF SUPPLY
Part III: FOREIGN SOURCES OF SUPPLY

- If you are not the manufacturer of the Attachment A items, please indicate the nature of your business (distributor, broker, reseller, etc.) and identify your sources for these items in Parts II a III, as applicable.

- Please photocopy Part II (for domestic sources) and Part III (for foreign sources) as needed so a account separately for each supplier that provides any material, part, component or service that y use to produce the item(s) listing in Attachment A. If you purchase certain items through dome distributors, and do not know the origin, treat them as domestic suppliers. Please read the "definitions" on the following page before completing the questionnaire.

- If you have been identified as a supplier to more than one firm, a separate Attachment A has bee enclosed for each firm. Each Attachment A also provides the point of contact and telephone number of your customer. Please contact this person if you are unable to identify the listed items your records.

- The data that you provide will be assessed for each of the three weapon systems listed above. For this reason you are requested to report each of your suppliers only once, even if your firm is a supplier for more than one of these systems. Please indicate for each of your suppliers the system(s) and prime contractor(s) that are listed as "Case Study" on the top of Attachment A, as well as the Attachment A item(s).

- It is not our desire to create an excessive burden on your firm. IF INFORMATION IS NOT "READILY" AVAILABLE FROM YOUR FILES IN THE FORM REQUESTED, PLEASE MAKE REASONABLE ESTIMATE. If you do make estimates, place an "E" next to it. If an answer is "none", please so indicate.

- Additional questions related to this questionnaire should be directed to Brian Nilsson, Trade and Industry Analyst, (202) 377-2322, or Jeannette Dykes, Trade and Industry Analyst, (202) 377-3795 the Department of Commerce, or Edward Purcell, Industrial Planning Assistant, (202) 695-3293, Office of the Chief of Naval Operations.

- Before returning the completed questionnaire, be sure to sign the certification and identify the person and phone number who will be the contact in your firm. Return completed questionnaire in 30 days to:

Mr. Brad Botwin
U.S. Department of Commerce
Office of Industrial Resource Administration
14th and Constitution Avenue, N.W., Room 3878
Washington, D.C. 20230

DEFINITIONS

DEFENSE SHIPMENTS - Estimate the defense portion of shipments of all products, including those listed on Attachmen A and report in dollar value for Part I question 2b. The defense portion of your business may be identified by those purchase orders bearing a DO or DX rating and/or a contract number from the Department of Defense, NRC, CIA, FAA, or NASA, as well as the orders of your customers whom you could identify as producing products for defense purposes, and items tested and certified to military specifications shipped to qualified distributors.

ESTABLISHMENT - One or more facilities at a single physical location where manufacturing or production of item(s) listed on Attachment A takes place. Includes auxiliary facilities operated in conjunction with such production facilities (whether or not in the same building).

FIRM - An individual proprietorship, partnership, joint venture, association, corporation (including any subsidiary corporation in which a controlling interest of the outstanding voting stock is owned), business trust, cooperative, trustee i bankruptcy, or receivers under decree of any court, owning or controlling one or more establishments as defined above.

FOREIGN DEPENDENCY - Foreign sourcing of a material, part, component, or subassembly because it is <u>not</u> produced the United States. (See definition of United States.)

FOREIGN SOURCE - A source located outside the United States from which you purchase a material, part, component, subassembly.

MOBILIZATION PRODUCTION - The maximum sustainable level of defense production a manufacturing establishment can achieve in the 12 month period following a declared national emergency. Non-Defense production limited to 25% of annual peacetime levels (the essential civilian target) under the Defense Priorities and Allocation System. Government financial assistance and prioritization of construction material and outfitting equipment is available. Your existing manufacturing buildings may be enlarged, new buildings constructed, or existing buildings currently used by you for non-manufacturing purposes may be converted into manufacturing facilities, and plant equipment acquired. Consider critical labor skills to operate at maximum sustained production levels. <u>Minimum</u> defense target is 4X your average monthly defense production in 1988. (See definition of defense shipments.) Note: In providing definitions of surge (see below) and mobilization production, it is our objective to identify any foreign sourced item that would prevent you from attainin the minimum mobilization production target. This definition is needed for you to properly respond to the following questions: Part I-3 and Part III-3.

OFFSET AGREEMENTS - In international trade, a range of industrial and commercial compensation practices when mandated, directly or indirectly, by a purchasing government or company as a condition of purchase. Offsets include co-production, licensed production, subcontractor production, overseas investment, technology transfer, and countertrade.

SHIPMENTS - For Part I question 2b, estimate the total dollar value of all products, including those listed on Attachmer A, shipped from this establishment in 1988. Such shipments should include inter-plant and intra-plant transfers, but should exclude shipments of products produced by other manufacturers for resale under your brand name. Do not adjus for returned shipments.

SUPPLIER - A U.S. or foreign vendor or supplier (including any that you own or are affiliated with) from whom is sourced or purchased a material, part, component, or manufacturing service (e.g., heat treating, assembly, testing, etc.) that is needed for the production of any item(s) listed on Attachment A.

SURGE PRODUCTION - The maximum sustainable level of defense production that can be achieved within an existing establishment by the end of the 6 month period immediately following surge day (Defense Priorities and Allocations System in full affect). Procurement actions for additional materials to sustain surge production levels will be initiated or surge day. Existing idle equipment may be activated as is, repaired, or upgraded and brought into service, or new equipment or used equipment may be purchased and installed if possible within the 6 month time frame. Labor may be hired and trained in numbers sufficient to operate around the clock and weekends allowing for necessary equipment maintenance and downtime. <u>Minimum</u> defense target is 2X your average monthly defense production in 1988. (See definition of defense shipments.)

UNITED STATES - The term "United States" includes the fifty States, Puerto Rico, the District of Columbia, and the Virgin Islands.

List the weapon system(s) and prime contractor(s) that are listed as "Case Study" on the top of Attachment A:_____

Please complete Parts I, II, & III for each of your U.S. establishments that supplies any item listed on Attachment A. Please photocopy the survey if additional copies are needed.

PART I. **FIRM IDENTIFICATION**

1a. Name and address of your firm or corporate division.

_____

_____

_____

If your firm is wholly or partly owned by another firm, enter the name and address of the parent firm and extent of ownership.

_____

_____

_____

Extent of Ownership:_____(percent)

1b. Indicate the nature of your business (check one):

Manufacturer _____
Distributor _____
Broker _____
Reseller _____
Other _____

(Specify: _____)

2a. Identify location of your manufacturing establishment(s) (if applicable) in the United States that manufacture(s) or add(s) value to the Attachment A item(s). (See definition of establishment.)

Establishment Location

1. _____
(Locality) (State) (Zip Code)

2. _____
(Locality) (State) (Zip Code)

PART I. (FIRM IDENTIFICATION, continued)

2b. For all products produced, sold, or distributed from your establishment (whether or not you manufacture), please estimate the dollar value of total shipments, total defense shipments, and shipments of Attachment A items that were made from this establishment in 1988. If more than one Attachment A is attached to this form, report a separate total Attachment A shipment value for each attachment. If there are common items on these Attachments, do not double-count in these figures. (See definitions of shipments and defense shipments.)

1988 Shipment Totals

Total Shipments: $_____

Defense Shipments: $_____

Attachment A Shipments (per Attachment A): (1) $_____

(2) $_____

3. In a surge or mobilization emergency would any additional foreign origin machinery, equipment or replacement parts for existing machinery or equipment be required at this establishment to produce the item(s) listed on Attachment A? (Please see definitions of surge and mobilization production.)

No _____
Yes_____ If yes, please complete the following table:

Mach., Equipmt. or Part	Number Needed	Foreign Supplier	Country of Origin

PART II.

DOMESTIC SOURCES OF SUPPLY

- Please complete this page for each of your domestic suppliers that provides any parts, materials, or services for the production of the item(s) listed on Attachment A. Photocopy this page as necessary.
- See definition of supplier.

Your company name: _____

Case study: _____
(Weapon system(s)/prime contractor(s) listed on top of Attachment A.)

1. This domestic supplier used for the production of: _____
(list relevant Attachment A item(s))

2. Please identify by each establishment located in the United States firms that supply materials, parts or components; or that upgrade, finish, treat, inspect, test, assemble or provide special processing or other manufacturing services for the production of item(s) listed on Attachment A.

Name of Supplier Firm: _____

Establishment Address: _____

_____

Point of Contact/Title: _____

Telephone Number: _____

Type or class of item(s) or service(s) supplied to produce Att. A item(s): _____

1988 value purchased from this supplier: $_____

3. Have you in the last five years experienced an interruption in the supply of any item or service you purchase from the above-named firm that caused you to curtail, slowdown, or otherwise modify production operations (e.g., an unacceptable or lost shipment, labor disruptions, supplier unable to obtain needed material, etc.)?

No _____ Yes_____

If yes, please describe below the nature of the interruption and the action you took to resolve it. Also indicate, to the best of your knowledge, if there are other domestic suppliers of the indicated item or items from whom you could source, should the above-cited supplier become unavailable.

_____

_____

_____

PART III. **FOREIGN SOURCES OF SUPPLY**

- Please complete this section for each of your foreign suppliers that provide any parts, materials, or services (including partial foreign processing) for the production of the item(s) listed on Attachment A. Please photocopy this page as necessary.
- See definition of supplier, foreign dependency, foreign sourcing, and offset agreement.
- Please complete Part III questions 2, 3, & 4 separately for each type or class of item your purchase from a foreign supplier.

Your company name: _____ .

Case study: _____
(Weapon system(s)/prime contractor(s) listed on top of Attachment A.)

1. This foreign supplier used for the production of: _____
(list relevant Attachment A item(s))

2. Please identify by each establishment located outside the United States firms that supply materials, parts or components; or that upgrade, finish, treat, inspect, test, assemble or provide special processing or other manufacturing services for the production of item(s) listed on Attachment A.

Name of Supplier Firm: _____

Establishment Address: _____
(Include Country)

_____

Type or class of item(s) or service(s) supplied to produce Att. A item(s): _____

1988 value purchased from this supplier: $_____

3. For what reasons is this item or service foreign sourced? (Select as many as apply.)

_____
(letter code)

If foreign sourced item is because of a foreign dependency, select answer from A thru G.

A. The United States has no economic concentrations of this material for mining.

B. The item is not produced in the U.S. because of environmental or other legal restrictions. (Specify: _____)

PART III. (FOREIGN SUPPLIERS, continued)

C. The foreign source holds patents or other proprietary rights respecting this item that have effectively blocked its production in the U.S. (Specify:_____)

D. The item is not produced in sufficient quantities to justify investment in the needed equipment and production capabilities by a U.S. firm.

E. U.S. production would not be price/quality competitive with imported item.

F. Item may be produced in the U.S., but I am not aware of any firms that do.

G. Other (Specify:_____)

If foreign sourced item is NOT because of a foreign dependency, select answer from H thru N.

H. Foreign source offers item at a lower price.

I. Foreign source produces a higher quality item.

J. Foreign source provides quicker delivery.

K. Foreign source used to supplement domestic source(s).

L. The item is imported as a result of an "offset agreement".

M. The item is imported as part of a global marketing strategy.

N. Other (Specify:_____)

4. Would the permanent loss of this foreign sourced item in an emergency situation adversely affect your surge and/or mobilization production capabilities? (See definition of surge and mobilization production.)

Yes _____ No _____

If yes, please describe the following:

a. The nature of the adverse impact- _____

b. Its likely duration - _____ months

c. Actions needed to correct the impact - _____

d. The estimated cost of corrective actions - $_____

PART III. (FOREIGN SUPPLIERS, continued)

If no, how would the adverse impacts be averted? (Select as many as apply.)

_____
(letter code)

a. Would boost production from existing domestic subcontractors
b. Would qualify an additional domestic source
c. Would produce item "in-house"
d. Would use substitute item (Identify:_____)
e. Other (Specify:_____)

5. Have you in the last five years experienced an interruption in the supply of any item or service you purchase from the above-named firm that caused you to curtail, slowdown, or otherwise modify production operations (e.g., an unacceptable or lost shipment, labor disruption, supplier unable to obtain needed material, etc.)?

No _____ Yes_____

If yes, please describe below the nature of the interruption and the action you took to resolve it. Also indicate, to the best of your knowledge, if there are other suppliers (domestic or foreign) of the indicated item or items from whom you could source, should the above-cited supplier become unavailable.

_____

_____

_____

_____

CERTIFICATION

The undersigned certifies that the information herein supplied in response to this questionnaire is complete and correct. The U.S. Code, Title 18 (Crimes and Criminal Procedure), Section 1001, makes it a criminal offense to willfully make a false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

(Date)	(Signature of Authorized Official)
(Area code and Telephone Number)	(Indicate Name and Title of Authorized Official)
(Area Code and Telephone Number)	(Indicate Name and Title of Person to Contact Regarding this Report)

Comments: Please use the space below to provide any additional comments or information you may wish regarding your operations, or other related issues that impact your firm.

Appendix 4: Value of All Domestic and Foreign Purchases from the Third Tier

VALUE OF ALL DOMESTIC AND FOREIGN PURCHASES FROM THE THIRD TIER

TEXAS	$305,289,097	TAIWAN	3,768,150
PENNSYLVANIA	146,011,603	OREGON	2,349,584
NEW YORK	144,926,243	TENNESSEE	2,209,893
ILLINOIS	125,424,464	AUSTRIA	2,000,000
MASSACHUSETTS	104,196,169	ALASKA	1,880,900
CALIFORNIA	101,762,530	SOUTH KOREA	1,590,000
JAPAN	98,947,670	ALABAMA	1,506,742
OHIO	83,113,615	MAINE	1,417,005
SOUTH CAROLINA	63,166,407	CANADA	1,208,544
NEW JERSEY	61,741,439	SINGAPORE	1,086,000
WISCONSIN	58,281,844	WASHINGTON	701,510
UTAH	55,262,813	VIRGINIA	617,948
CONNECTICUT	44,872,583	WEST VIRGINIA	596,808
DELAWARE	33,375,425	HONG KONG	513,916
MICHIGAN	20,146,184	BRAZIL	462,000
FLORIDA	19,262,673	MALAYSIA	439,782
MINNESOTA	16,072,418	LOUISIANA	191,259
NEBRASKA	15,923,262	KANSAS	115,757
ITALY	15,110,609	MISSISSIPPI	114,424
GERMANY	14,101,704	DENMARK	90,000
NORTH CAROLINA	13,584,286	OKLAHOMA	88,208
INDIANA	13,056,101	ZIMBABWE	59,051
MARYLAND	12,798,026	VERMONT	54,877
UNITED KINGDOM	9,901,747	PHILIPPINES	26,325
IOWA	8,918,066	INDIA	20,000
MISSOURI	7,784,529	NEVADA	12,006
GEORGIA	7,315,316	SWEDEN	2,500
ARIZONA	6,680,335	SOUTH DAKOTA	500
RHODE ISLAND	5,780,043	MONTANA	0
KENTUCKY	5,290,142	HAWAII	0
ARKANSAS	5,135,557	WASHINGTON, DC	0
MEXICO	5,049,100	WYOMING	0
NEW HAMPSHIRE	5,002,874	IDAHO	0
SWITZERLAND	4,886,303	NEW MEXICO	0
FRANCE	4,670,700	NORTH DAKOTA	0
THAILAND	4,461,280	IRELAND	0
COLORADO	3,982,883	TOTAL	$1,674,409,729

SOURCE: OIRA Survey Data

NOTE: For foreign countries, zero dollar values appear because the amounts were not provided by respondents; zero values appear for some states because no purchases were made from them at this tier.

Appendix 5: Value of All Domestic and Foreign Purchases from the Fourth Tier

VALUE OF ALL DOMESTIC AND FOREIGN PURCHASES FROM THE FOURTH TIER

ILLINOIS	$907,981,806	CHINA(PRC)	7,276,075
PENNSYLVANIA	791,976,571	TRINIDAD	6,600,000
OHIO	380,733,606	NEW HAMPSHIRE	6,463,859
CANADA	357,891,271	ARKANSAS	5,133,473
NEW YORK	288,369,372	IDAHO	4,000,000
TEXAS	243,707,588	HONG KONG	3,075,525
DELAWARE	216,434,529	WEST VIRGINIA	2,764,768
CALIFORNIA	170,576,559	YUGOSLAVIA	2,214,239
ALABAMA	134,858,607	AUSTRALIA	2,177,044
MINNESOTA	133,341,283	FINLAND	2,160,836
ARIZONA	99,503,831	BELGIUM	2,017,000
NEW JERSEY	95,680,566	BOLIVIA	2,000,000
LOUISIANA	93,522,152	GUATEMALA	2,000,000
MICHIGAN	78,701,111	VIRGINIA	1,597,034
CONNECTICUT	66,040,649	MEXICO	1,584,280
SOUTH CAROLINA	61,625,215	SAUDI ARABIA	1,500,000
JAPAN	59,828,884	MAINE	1,058,513
MASSACHUSETTS	51,775,590	UTAH	1,000,000
UNITED KINGDOM	50,674,801	MALAYSIA	840,000
KANSAS	47,736,434	NEW MEXICO	798,506
MARYLAND	44,033,011	SPAIN	780,000
KENTUCKY	41,493,433	SINGAPORE	720,000
FLORIDA	39,467,465	INDIA	590,290
WASHINGTON	34,502,514	THAILAND	527,250
SOUTH AFRICA	32,398,646	VERMONT	456,854
INDIANA	31,723,602	NEVADA	378,540
OKLAHOMA	29,232,643	NORWAY	300,000
GEORGIA	27,146,828	MISSISSIPPI	285,140
GERMANY	26,394,875	SOUTH DAKOTA	244,500
FRANCE	25,459,679	SOUTH KOREA	238,578
MISSOURI	24,947,390	TURKEY	220,993
TENNESSEE	24,229,895	OREGON	212,300
NORTH CAROLINA	20,657,693	ALASKA	181,500
WISCONSIN	16,497,783	AUSTRIA	85,501
DOMINICAN REPUBLIC	16,427,852	IRELAND	76,907
TAIWAN	16,131,040	MONTANA	49,875
ZIMBABWE	15,285,045	DENMARK	13,046
SWITZERLAND	14,700,692	PHILIPPINES	2,000
IOWA	13,967,810	WYOMING	0
NEBRASKA	12,625,842	WASHINGTON, DC	0
RHODE ISLAND	11,418,756	HAWAII	0
ITALY	10,282,573	NORTH DAKOTA	0
COLORADO	9,781,182	BRAZIL	0
NETHERLANDS	9,140,802	USSR	0
SWEDEN	7,351,142	ZAIRE	0
	TOTAL = $4,947,883,044		

SOURCE: OIRA Survey Data

NOTE: For foreign countries, zero dollar values appear because the amounts were not provided by respondents; zero values appear for some states because no purchases were made from them at this tier.

Appendix 6: Value of All Domestic and Foreign Purchases

VALUE OF ALL DOMESTIC AND FOREIGN PURCHASES

ILLINOIS	$1,033,406,270	ARKANSAS	10,269,030
PENNSYLVANIA	937,988,174	NETHERLANDS	9,140,802
TEXAS	548,996,685	SWEDEN	7,353,642
OHIO	463,847,221	CHINA (PRC)	7,276,075
NEW YORK	433,295,615	MEXICO	6,633,380
CANADA	359,099,815	TRINIDAD	6,600,000
CALIFORNIA	272,339,089	THAILAND	4,988,530
DELAWARE	249,809,954	IDAHO	4,000,000
JAPAN	158,776,554	HONG KONG	3,589,441
NEW JERSEY	157,422,005	WEST VIRGINIA	3,361,576
MASSACHUSETTS	155,971,759	OREGON	2,561,884
MINNESOTA	149,413,701	MAINE	2,475,518
ALABAMA	136,365,349	VIRGINIA	2,214,982
SOUTH CAROLINA	124,791,622	YUGOSLAVIA	2,214,239
CONNECTICUT	110,913,232	AUSTRALIA	2,177,044
ARIZONA	106,184,166	FINLAND	2,160,836
MICHIGAN	98,847,295	AUSTRIA	2,085,501
LOUISIANA	93,713,411	ALASKA	2,062,400
WISCONSIN	74,779,627	BELGIUM	2,017,000
UNITED KINGDOM	60,576,548	BOLIVIA	2,000,000
FLORIDA	58,730,138	GUATEMALA	2,000,000
MARYLAND	56,831,037	SOUTH KOREA	1,828,578
UTAH	56,262,813	SINGAPORE	1,806,000
KANSAS	47,852,191	SAUDI ARABIA	1,500,000
KENTUCKY	46,783,575	MALAYSIA	1,279,782
INDIANA	44,779,703	NEW MEXICO	798,506
GERMANY	40,496,579	SPAIN	780,000
WASHINGTON	35,204,024	INDIA	610,290
GEORGIA	34,462,144	VERMONT	511,731
NORTH CAROLINA	34,241,979	BRAZIL	462,000
MISSOURI	32,731,919	MISSISSIPPI	399,564
SOUTH AFRICA	32,398,646	NEVADA	390,546
FRANCE	30,130,379	NORWAY	300,000
OKLAHOMA	29,320,851	SOUTH DAKOTA	245,000
NEBRASKA	28,549,104	TURKEY	220,993
TENNESSEE	26,439,788	DENMARK	103,046
ITALY	25,393,182	IRELAND	76,907
IOWA	22,885,876	MONTANA	49,875
TAIWAN	19,899,190	PHILIPPINES	28,325
SWITZERLAND	19,586,995	WYOMING	0
RHODE ISLAND	17,198,799	HAWAII	0
DOMINICAN REP	16,427,852	WASHINGTON, DC	0
ZIMBABWE	15,344,096	NORTH DAKOTA	0
COLORADO	13,764,065	USSR	0
NEW HAMPSHIRE	11,466,733	ZAIRE	0

GRAND TOTAL = **$6,622,292,773**

SOURCE: OIRA Survey Data

NOTE: For foreign countries, zero dollar values appear because the amounts were not provided by respondents; zero values appear for some states because no purchases were made from them at either the third or the fourth tier.

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