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US Procurement of Weapon Components from Foreign Sources: Policy Implications

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Policy Implications of Procuring Components from Foreign Sources for Use in US Military Weapon Systems[1]

Guy J. Fritchman

Executive Summary

The inclusion of numerous foreign components and technologies in a wide range of US military weapon systems, a surprising fact to many, has become the focus of increasing scrutiny. Aircraft, tanks, ships, missiles, satellites, and communications equipment operated by the US armed forces all contain components purchased overseas. Procuring foreign components for use in military systems is, in several respects, beneficial—it takes advantage of the world's best technology, prices, and quality. In addition, foreign procurement fosters cooperative international networks.

At the same time, however, foreign procurement potentially renders the United States vulnerable to its suppliers—mostly US allies—who could cut off or delay delivery of components in pursuit of their own national interests. While the United States has never been harmed by such vulnerabilities, it encountered several "close calls" during the recent Persian Gulf War—if news accounts are correct. In addition, the United States has in the past exploited similar vulnerabilities in dealing with its allies.

Compounding vulnerability is a lack of knowledge about the true extent of foreign procurement. This lack of knowledge is the result of incomplete data collection. A dwindling manufacturing base within the United States also increases the likelihood that foreign procurement and its associated vulnerabilities are perpetuated. The Department of Defense (DOD) is a relatively insignificant buyer within the overall US manufacturing base and cannot, on its own, implement effective policies for reversing this trend. The strategic indifference of a free market economy, coupled with inconsistent policies and uncoordinated agencies within the US government, further perpetuates this trend.

The policy implications of such pervasive and beneficial, but risky, foreign procurements are multifaceted. One benefit—access to the world's best technologies for incorporation into technically-superior weapon systems—is an essential element of US military strategy. For strategic military reasons then, policy makers should not limit procurement to domestic sources.

Instead, policy should focus upon taking advantage of this essential benefit of foreign procurement, while at the same time mitigating factors that make the United States vulnerable. To preclude "planning in the dark," the United States must obtain greater knowledge of the extent to which foreign components are used in its weapon systems. An expanded database containing information about components procured at all levels of the supplier network is essential to determine where vulnerability is greatest. Once identified, risks can be mitigated by proliferating suppliers and establishing stockpiles of critical components.

To minimize the likelihood that vulnerabilities associated with foreign procurement might someday become unmanageable, policy making must also focus upon reversing the decline of the US industrial base. Future military capabilities are dependent upon having competitive domestic industries that produce the components DOD needs for its weapon systems. The US government should identify critical industries and then invest government funds in them to enhance future productivity. Strategic industrial planning, including review and revision of existing policies that negatively impact industry, is also necessary.

A viable plan for enhancing US industry and mitigating the vulnerabilities presented by foreign procurements requires more than just DOD; it requires "jointness"—close cooperation and coordination between

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[1]. This paper was written during the spring of 1991 while the author was assigned to the University of Illinois at Urbana-Champaign Program in Arms Control, Disarmament, and International Security. The views expressed in this paper are those of the author alone and should not be construed as official positions of the Department of Defense, US Air Force, or any other governmental agency.

government and industry. A single, joint organization including representatives from several executive branch agencies, along with liaisons from Congress and the commercial manufacturing sector, would be a useful mechanism for setting industrial priorities and establishing reasonable compromises, currently non-existent, within the US government. Under the leadership of an individual with clear and broad Presidential authority, a joint organization would focus policies concerning industrial affairs and future foreign procurement toward US national interests. In this manner US policy could become more responsive to trends and needs demonstrated by the current pervasive procurement of foreign components for use in US weapons systems.

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Introduction

The inclusion of numerous foreign components and technologies in a wide range of US military weapon systems, a surprising fact to many, has become the focus of increasing scrutiny. Aircraft, tanks, ships, missiles, satellites, and communications equipment operated by the US armed forces all contain components purchased overseas. Procuring foreign components for use in military systems is, in several respects, beneficial—it takes advantage of the world's best technology, prices, and quality. In addition, foreign procurement fosters cooperative international networks.

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This paper examines the policy implications of such pervasive and beneficial, but risky, foreign procurement practices. The analysis attempts to ascertain whether the risks of foreign procurement outweigh its benefits. Ultimately, the paper recommends policies that would be responsive to current trends and needs.

Pervasive Nature of Foreign Procurement

Procuring components from foreign sources for use within the DOD is a relatively recent phenomena. Few, if any, weapon systems in the military forces of the United States during the mid-1970s contained foreign components. During the past fifteen years, however, procurement from foreign sources has accelerated rapidly. According to a recent study at the Center for Strategic and International Studies (CSIS), the percentage of import penetration increased in 104 out of 122 critical defense sectors during the 1980s. In the components and subassemblies sector, import penetration had reached 19 percent by the end of the decade.[2]

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2. Testimony of James Blackwell, US Congress, House Committee on Banking, Finance, and Urban Affairs, *Internationalization of the Aerospace Industry: Hearings before the Subcommittee on Economic Stabilization*, 101st Congress, first session, 10 May 1989, (Washington, DC: US Government Printing Office, 1989, Serial No. 101-23), 25, 26. Detailed information also available in James Blackwell, Project Director, Co-chairmen: Senator Jeff Bingaman and Senator John McCain, *Deterrence in Decay: the Future of the US Defense Industrial Base. The Final Report of the CSIS Defense Industrial Base Project*, (Washington, DC: Center for Strategic and International Studies, May 1989), 36-38.

The overwhelming presence of foreign components in US weapon systems is documented in existing studies and literature. A sampling of citations demonstrates this phenomena:

• The US defense industry is now heavily, if not totally, dependent on foreign sources for computer memory chips, silicon for high-powered electronic switching, gallium arsenide-based semiconductors for high-speed data processing, precision glass for reconnaissance satellites and other military equipment, liquid crystal and luminous displays, and advanced fiber optics.[3]

• Semiconductors from foreign sources are contained in Global Positioning Satellites, the Integrated Underwater Surveillance System, Defense Satellite Communications System, Fleet Satellite Communications System, AN-53B SSQ Sonobuoy, the F-16 Fighting Falcon, AM-6988 Poet Decoy (an expendable jammer), the Army Helicopter Improvement Program (OH-58 Kiowa), APG-63 Airborne Radar (for the F-15 Eagle), M1 Abrams Tank, and the F/A-18 Hornet.[4]

• A recent article in the *Chicago Tribune* reported that Japanese-made technologies are in "night viewing equipment, air speed acceleration indicators, infrared missile homing devices, television tubes in aircraft cockpits, microwave weapons control and targeting systems, flat panel displays, advanced radiation communications equipment, submarine sensors, and video display terminals."[5]

• In perhaps the most extensive study ever accomplished on procurement of foreign components, researchers found numerous specific instances of using overseas sources for US precision guided missiles (PGMs) in 1987. Integrated circuit parts for all PGMs were assembled in East Asia. Radar components in PGMs were found to contain silicon field effect transistors (FETs) and gallium arsenide FETs from Japan, ferrite cores from Germany, and radome chemicals from Mexico. Rocket motor cases for the Skipper, HARM, and Harpoon missiles were obtained through sources in the United Kingdom (and Australia in the case of the Harpoon). The United Kingdom also provided copper-based printed-wiring board plating bath, actuator motors, and gear motors for the HARM. It also produced ball screws for the Patriot. Australia provided extrusions for the Harpoon. Switzerland produced copper preform for the Copperhead missile, and sapphire for the Standard, Patriot, Maverick, and Sidewinder missiles. Butan triol (used in making rocket fuel mixtures) for the Standard, Patriot, Maverick, and Sidewinder came from Germany. The HARM, Sidewinder, and Maverick missiles contained precision optics also procured from Germany, as well as Japan. Castings for the Standard missile and the launch tube for the Stinger missile were produced in Israel. Finally, the study found that molybdenum foil for the Patriot came from Austria.[6]

• The American Gear Manufacturers' Association estimated 30 percent of defense contracts for gears are awarded to foreign sources. Over twenty-four ships built between 1983 and 1989 were equipped with gear drives from German or British companies. Significant portions of aircraft gearing are provided by Japanese and North European sources. Vehicular gearing comes increasingly from the Asian basin and the Mediterranean states.[7]

• The US Navy purchases spare parts from various European sources: engine parts for a search and rescue ship come from Great Britain; Germany supplies diesel engine parts for a patrol coastal missile

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3. Jacques S. Gansler, *Affording Defense* (Cambridge, MA: MIT Press, 1989), 271.

4. John T. Correll, "Lifeline in Danger," *Air Force Magazine* 71 (November 1988): 76.

5. Ronald E. Yates, "Japan Claims Big Role in US Weapons Success," *Chicago Tribune*, 3 February 1991: 7.1.

6. Martin Libicki, Jack Nunn, and Bill Taylor, US Industrial Base Dependence/Vulnerability, Phase II—Analysis (Washington, DC: National Defense University Mobilization Concepts Development Center, Institute for National Strategic Studies, November 1987). Detailed discussion of this study can also be found in Martin C. Libicki, Industrial Strength Defense: A Disquisition on Manufacturing, Surge, and War (Washington, DC: National Defense University Mobilization Concepts Development Center, Institute for National Strategic Studies, 1988). A table summarizing several details about the components procured overseas for PGMs can be found on page 94 of this book.

7. Testimony by Richard B. Norment, Executive Director, and Thomas H. Lowry, President, American Gear Manufacturers' Association, US Congress, House Committee on Banking, Finance, and Urban Affairs, *Defense Production Act Amendments of 1989, H.R. 486: Hearings before the Subcommittee on Economic Stabilization*, 101st Congress, first session, 17, 18, 24 May and 20 June 1989 (Washington, DC: US Government Printing Office, 1989, Serial No. 101-27): 5, 140.

hydrofoil ship; and hull, mechanical, and electrical equipment for a coastal minesweeper are procured from Italy.[8]

• During the Persian Gulf War, several US defense contractors requested "rush" delivery from foreign companies for components used in military equipment. Japanese producers of semiconductors, video display terminals (for analyzing real-time intelligence data from reconnaissance planes), and battery packs to power command and control computers received such requests. France provided transistors for a Teledyne Corporation transponder for Identification of Friend or Foe uses. In addition, both France and Japan rushed electronic components for measuring and calibrating equipment. Finally, Great Britain surged production of radio gear and avionics for use in US weapon systems.[9]

The appendix to this essay details further revelations about the extent of foreign components already in US weapon systems as reported in the literature and in studies examined by this author. As demonstrated by the brief listing above, foreign components pervasively constitute both the "critical brain cells,"[10] and the essential mechanical parts of many US weapons. Today, components procured from foreign sources are "substantially embedded"[11] in weapon systems across the DOD force structure.

This trend toward foreign procurement is continuing. In April 1991, Groupement Industriel des Armements Terrestres (GIAT) of France won a contract to supply the gun turrets for the latest US Army light helicopter.[12] Great interest has been demonstrated in new Japanese components that have military applications. A recent demonstration of the SSMI, a ground-based anti-ship missile developed by Mitsubishi Heavy Industries, reportedly impressed DOD officials.[13] The *Chicago Tribune* also reported that Secretary of Defense Dick Cheney visited Japan in 1990 with a "shopping list" for Japanese equipment and technology:

• Keiko's advanced missile guidance system (a shoulder-fired surface-to-air missile which is claimed to outperform the Stinger;

• Carbon dioxide lasers to "blind" enemy aircraft and satellites;

• Ceramic engine components for two thousand mile-per-hour aircraft;

• Advanced aircraft wing technology; and

• Third generation tank armor which is incorporated into Japan's T-90 heavy battle tank and is claimed to be able to withstand direct hits by most anti-tank weapons currently in use.[14]

Mechanisms are currently being considered to "rent" or facilitate importation of actual Japanese weapons, according to Charles H. Ferguson, a postdoctoral research associate at the Center for Technology, Policy, and Industrial Development at the Massachusetts Institute of Technology.[15] Such mechanisms are significant because, in the past, Japanese laws have prohibited export of weapons. While the United States depends heavily on Japanese imports for use in its weapon systems, these have been "dual use" items such as semiconductors and optics components that have both military and commercial applications. If such obstacles are overcome, it is likely that the US military, in its pursuit of a force structure technologically superior to all other military forces, will increase its procurement of Japanese components.

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8. Christopher D. Demeritt, Commander, USN, and Commander Geoffrey K. Renard, USN, "Navy Dependence on Foreign Spares—A Problem?" *Executive Research Project #S-16*, Fort McNair (Washington, DC: Industrial College of the Armed Forces, 1987): 6-7.

9. Stuart Auerback, "US Relied on Foreign-Made Parts for Weapons," *Washington Post*, 25 March 1991: 1.

10. British defense analyst Graham McCarty, quoted by Yates, "Japan Claims Big Role in US Weapons Success," 7.1.

11. This term was used by a civil servant within DOD during a "non-attribution" interview in January 1991.

12. "French Win US Helicopter Gun Deal," *London Financial Times*, 10 April 1991: 4.

13. "Japan's Weapons Makers: Ready and Able," *The Economist* 318 (2 February 1991): 67.

14. Yates, "Japan Claims Big Role in US Weapons Success," 7-6.

15. Charles H. Ferguson, "America's High Tech Decline," *Foreign Policy* 74 (Spring 1989): 183.

Benefits of Foreign Procurement

Greater availability of superior technology is one benefit of procuring foreign components. As the Office of Technology Assessment writes, " . . . high technology is a worldwide enterprise. The United States no longer has a monopoly on it."[16] In 1989, DOD began publishing listings of critical technologies for its future weapon systems. The most recent list contains twenty-one items.[17] It has been estimated by various sources that the United States is no longer dominant in one-quarter to one-half the technologies in this listing.[18]

By buying abroad, the United States has been able to incorporate the world's best technologies and components into its weapon systems. Numerous US weapon systems containing foreign components performed admirably during the Gulf War. Several of these systems are conspicuous in the list contained in the previous section.

It is essential that the best technologies continue to be incorporated in US weapon systems if the United States is to maintain its warfighting edge in an economical manner. For the foreseeable future, it is likely that wars fought by the United States will be "optional"—fought not to protect home soil, but to rescue governments or nations under threat, or to respond to aggression in areas of perceived vital interests.[19] In such wars, two strategic concerns for the country are US casualties[20] and non-combatant (civilian) casualties of the enemy. These strategic concerns necessitate precise and effective offensive action by US armed forces. Conflict must be quick, decisive, and to some extent surgical. Only weapon systems containing the world's most superior components and technologies (combined with superior personnel and training) can enable the armed forces of the United States to fight in this manner.

Continued procurement from sources around the world also maintains US access to technologies that are available to other nations, including enemies, either on the open market or through clandestine means.[21] If an enemy can purchase or otherwise obtain leading technology higher in quality than that available in the United States, then there is potential for harm to US military security. At the least, access to and application of superior technologies by an enemy would hinder the United States when fighting under those circumstances it is most likely to encounter over the next several decades. Thus, access to the best technology is a significant benefit to procuring components for DOD weapon systems from foreign sources.

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16. US Congress, Office of Technology Assessment, *Holding the Edge; Maintaining the Defense Technology Base* (Washington, DC: US Government Printing Office, April 1989, Serial No. OTA-ISC-420): 14.

17. The twenty one critical technologies contained in the May 1991 DOD Critical Technologies Plan include: semiconductor materials and microelectronic circuits; software producibility; parallel computer architectures; machine intelligence and robotics; simulation and modeling; photonics; sensitive radars; passive sensors; signal processing; signature control; weapon system environment; data fusion; computational fluid dynamics; air-breathing propulsion; pulsed power; hypervelocity projectiles; high energy density materials; composite materials; superconductivity; biotechnology materials and processes; and flexible manufacturing.

18. Theodore H. Moran, for instance, wrote of "foreign competitors taking the lead in more than a quarter" of the critical defense technologies. "The Globalization of America's Defense Industries: Managing the Threat of Foreign Dependence," *International Security* 15 (Summer 1990): 93. An April 1991 CBS *60 Minutes* segment reported that the US has lost competitiveness in ten of the (then twenty) technologies. Yet another source, *SDI Monitor* reports that "the Soviets are on par with the US in the areas of weapon system environment, hypervelocity projectiles and high energy density materials." They also have a "significant lead in some areas of pulsed power." With respect to US allies, "Both NATO and Japan are capable of making some contributions in sensitive radars, passive sensors, signal processing, signature control, hypervelocity projectiles and pulsed power. In addition, Sweden could make some contributions to sensitive radar and passive sensors, as could Israel, which also could make some contribution to data fusion research. NATO could make major contributions to the weapon system environment research, high energy density materials, and composite materials. Japan could make major contributions in both materials categories and is significantly ahead of the United States in superconductivity, semiconductor materials and microelectronic circuits. Israel could make significant contributions in composite materials and Switzerland could do the same for superconductivity." Reported in article entitled "DOD Wants $16 Billion for Critical Technology," 13 April 1990:□3.

19. Colonel John Warden, Deputy Director for Warfighting Concepts, Headquarters, USAF, "Airpower Employment in the Future World," speech presented in conjunction with conference entitled "The United States Air Force: Aerospace Challenges and Missions in the 1990s" (Cambridge, MA: 3 April 1991).

20. US casualties as a strategic concern was described by a high-ranking Pentagon official during a "non-attribution" session in January 1991.

21. Libicki, Nunn, and Taylor, *US Industrial Base Dependence/Vulnerability, Phase II—Analysis*, 111.

Besides access to the most advanced technology, procurement from foreign sources brings several other benefits to DOD and the United States. Among these are quality control and price. Martin Libicki, a researcher in the detailed PGM study mentioned previously, found several instances of contracts awarded to overseas producers based on "inability of domestic producers to meet required quality control standards, particularly where material purity matters." He cited ferrites, silicon field-effect transistors, and integrated circuit material packaging as examples where Southeast Asian countries (especially Japan) produced better quality components. His study also found some components—gallium arsenide field effect transistors, glass, bearings, and assembly of integrated circuits, for example—could be purchased significantly cheaper overseas.[22]

Other studies have also emphasized the price advantages of components obtained through procurement overseas. In a study sponsored by the CSIS, project director James Blackwell reported that one US aerospace contractor pursued significant increases in its foreign supplier base as a means of reducing costs for manufacture and assembly of a high technology aircraft. Of thirty two hundred suppliers for its aircraft, the contractor expanded the foreign supplier base from 194 in 1985 to 263 in 1987 in an effort to promote cost efficiency.[23] A US Navy study in the 1980s found that a Spanish company could produce anchor chains significantly cheaper than the sole US manufacturer. The navy thus awarded anchor chain contracts to the Spanish company in a cost-reduction effort, although it also continued limited procurements from the sole US source.[24]

One additional example further demonstrates the cost/price advantages sometimes obtained from overseas suppliers. In some cases, the volume of DOD purchases has been so small that domestic manufacturers have been unable to attain economies of scale—enough production to be profitable for the manufacturer or cost-effective for DOD. As John A. Richards, Director of the Commerce Department's Office of Industrial Resource Administration, testified before a House of Representatives subcommittee in 1988:

> For example, the United States can produce all types of medium range artillery shells. Our ultra-long-range rounds, for which the military has a very low relative requirement, are of older design and no longer considered state-of-the-art. Several NATO European rounds have more sophisticated production capabilities. The establishment of a US production capability for this limited need, would not only involve substantial capital costs, but also an extensive and unnecessary R&D investment.

He further stipulates, " .□□the central effect is simple: it would lead to increased costs of ammunition in a period of scarce resources." In Richard's mind not only does it make better fiscal sense, but also it enhances NATO "standardization and interoperability" when DOD procures the "ultra-long-range" artillery shells from European allies.[25]

In alluding to enhancement of NATO "standardization and interoperability" during his 1988 testimony, Mr. Richards introduced a final important benefit of procuring weapons components from overseas—a spirit of international cooperation. A report published by the Air Force Association and the United States Naval Institute Military Database the same year expounds: "This nation does not envision a single-handed defense of either the European or Pacific theaters of operation. In any such conflict, it is committed to fighting alongside its allies. A reasonable degree of interdependence and interoperability is logical under those circumstances."[26]

Thus, procurement from foreign sources "clearly plays a strategic role in establishing [or enhancing] ties between the United States and other countries."[27] Pursuant to its strategic interests, the United States has negotiated a series of nineteen bilateral Memoranda of Understanding (MOUs) with foreign governments

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22. Libicki, *Industrial Strength Defense,* 101.

23. Blackwell, *Deterrence in Decay*, 47.

24. Tim Carrington, "Vital Parts: Military's Dependence on Foreign Suppliers Causes Rising Concern," *The Wall Street Journal*, 24 March 1988: 17.

25. Testimony of John A. Richards, US Congress, House Committee on Banking, Finance and Urban Affairs, *Defense Production Act Amendments of 1988, HR 4037: Hearings before the Subcommittee on Economic Stabilization*, 100th Congress, second session, 30 and 31 March 1988 (Washington, DC: US Government Printing Office, 1988, Serial No. 100-56): 97, 98.

26. Correll, "Lifeline in Danger," 79.

27. Virginia C. Lopez, and Loren Yager, *The US Aerospace Industry and the Trend Toward Internationalization* (Washington, DC: Aerospace Industries Association of America, Inc., March 1988): 61.

establishing reciprocity in defense procurement matters.[28] With each MOU, "the US strategy of 'coalition defense' has been backed up by 'coalition research, development, production, procurement, and follow-on support,' according to James M. Compton, [then] acting undersecretary of defense for industrial and international programs."[29]

In a broad sense, such interdependence "tends to strengthen the alliance itself because it raises the costs for an ally that would choose to withdraw from the alliance."[30] More narrowly, this cooperation helps nations within NATO avoid "procurements which re-invent the wheel." The United States, for instance, evaluated thirty-two foreign items (mostly European) in 1989 for this purpose.[31]

Even more specifically, previously established cooperative mechanisms between the United States and its allies enabled quick procurement during the mobilization period prior to the Gulf War. Several examples have already been mentioned concerning rushed component procurement for accelerating or "surging" production of weapon systems. These cooperative networks also enabled immediate bolstering of US capabilities in the Gulf by using foreign sources to work around known US weaknesses while preparing for war. Foreign-flagged vessels were chartered to transport equipment to the Gulf as part of the massive sealift and mobilization effort. More than half of the ships (175 out of 330) used in this effort were foreign-flagged.[32]

Several other examples were reported throughout the Gulf crisis and war. Though never used during the war, purchase of two dozen "Have Nap" missiles from Israel would have enabled B-52 bombers to perform in a standoff role using conventional munitions.[33] Sixty "Fuchs" tanks were also procured from Germany to enable early and remote sensing of the initiation of chemical warfare by the Iraqis. In addition, the United States obtained more than one thousand other vehicles from Germany as part of its "burden sharing" effort. Many of these vehicles, in fact, had been part of the East German military force structure prior to the unification and had been manufactured in East Germany, Czechoslovakia, or the Soviet Union! Examples of vehicles obtained from Germany included: Mercedes military ambulances, five-ton trucks, fuel tankers, water tankers, Soviet-made Ural trucks, construction equipment, loading and off-loading vehicles, and heavy-duty Czech-made transporters for pulling tanks.[34] These tank transporters (approximately two hundred) played an especially important part in the fast-paced flanking movement that outsmarted the Iraqis at the beginning of the ground war in February 1991.[35] Thus, a cooperative, interdependent network with its allies certainly paid off for the United States during the Gulf crisis.

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28. Ten of the nineteen MOUs are with industrialized NATO partners. They define general and reciprocal policies affecting research and development, production, procurement, and logistic support. These ten participants include: the United Kingdom (MOU established in 1975); France, Germany, Italy, Netherlands, Norway and Portugal (each established MOUs with the United States in 1978); Belgium (1979); Denmark (1980); and Luxembourg (1982). Three other MOUs were established with less industrialized NATO partners—Turkey in 1980, Spain in 1982, and Greece in 1986. These agreements defined general and reciprocal terms for defense industrial cooperation. Six other agreements covered terms for defense procurement or for defense industrial cooperation, depending on the ally: a codevelopment agreement with Canada began in 1963; an industrial participation agreement has been in effect since 1973 with Australia; general and reciprocal procurement MOUs were signed with Israel and Sweden in 1987, and with Switzerland and Egypt in 1988. "The Impact of Buy American Restrictions Affecting Defense Procurement: A Report to the United States Congress by the Secretary of Defense" (July 1989): 23.

29. Richard G. O'Lone, "Cooperation Essential But Difficult When Tapping Defense Market," *Aviation Week and Space Technology* 132 (12 February 1990): 95.

30. US Congress, Office of Technology Assessment, The Defense Technology Base: Introduction and Overview—A Special Report (Washington, DC: US Government Printing Office, March 1988, Serial No. OTA-ISC-374): 41.

31. Martyn Bittleston, "Cooperation or Competition? Defence Procurement Options for the 1990s." *Adelphi Paper No. 250* (Oxford, Great Britain: International Institute for Strategic Studies, Nuffield Press Ltd., Spring 1990): 61.

32. William P. Coughlin, "Snafus, Successes Described in Call-up of Reserve Fleet," *Boston Globe*, 15 April 1991: 9. Another newspaper reported that the US had even decided to purchase some of the roll-on, roll-off ships it had been chartering from foreign owners. Bruce Vail "Military Learned Big Lessons in Persian Gulf Sealift," *Journal of Commerce* (22 February 1991): 12B.

33. Casey Anderson, "Iraq Counterstrike May Use B-52s, Officials Say," *Air Force Times* (1 October 1990): 25; and "US B-52Gs Could Get Have Nap Missiles Soon," *Air Force Times* (15 October 1990): 12.

34. David Marsh, "Germany Supplies US with 1,000 Vehicles," *London Financial Times*, 21 January 1991: 3.

35. Associated Press report, *Champaign-Urbana News Gazette*, 28 February 1991: A9.

Vulnerability: Cause for Concern

Though beneficial in many respects, procuring from foreign sources has its detrimental aspects too. There is cause for concern that foreign procurement entails significant risk. Every time the United States uses a foreign component in one of its weapon systems, it exposes itself to potential vulnerability—supply cutoff, delay of delivery, and foreign interference in its affairs.

Vulnerability is undeniably a consequence of procuring foreign components for use in DOD weapon systems. In simple terms, vulnerability is the inability of a nation to obtain what is needed for its military forces on a timely basis.[36] Whenever DOD procures components, even from domestic sources, there is risk that a supplier will default on its obligations. The risk, however, increases when the supplier is based in a foreign nation, not subject to US laws, and moreover, subject to the laws of another government.[37]

One potential vulnerability is cutoff of components by a supplying nation or manufacturer, especially during contingency situations. If the United States cannot obtain components needed to produce a weapon system, then it either must do without, come up with alternative suppliers, or find suitable substitutes for the component. Without preplanning for such a situation, there is potential for a crisis in force capabilities. For instance, in the event of complete foreign cutoff, it would take more than one year for domestic sources to produce the silicon or gallium arsenide field-effect transistors used in high frequency radars common to most PGMs.[38] If the cutoff occurred during war, the United States would quite possibly lack sufficient quantities of PGMs after initial stockpiles were depleted (somewhere between three and six months after war is initiated, according to news accounts prior to the Gulf War) until domestic production was enabled. A cutoff would force greater utilization of "dumb bombs" and other less-capable military hardware as a substitute for lost capabilities; under such circumstances the likelihood that US and noncombatant casualties could be kept to a minimum diminishes greatly.[39]

To date, the United States has never suffered the consequences of foreign supplier cutoff, either in peacetime or war, but plausible cutoff scenarios have been speculated. One potential scenario simply posits disagreement by the foreign supplier with US policy. When testifying before a House of Representatives subcommittee, American Gear Manufacturers' Association Executive Director Richard B. Norment related the story of the USS Iowa heading for its battle station in preparation for the US bombing raid on Libya in 1986. A gear used in the steering mechanism of the ship, he said, broke on the way to the battle station, causing it to turn "about four degrees to port out in the middle of the Atlantic, constantly." While a replacement gear was found within the United States, enabling correction in seventy-two hours, Norment speculated that the outcome would have been different had it been necessary to procure the gear from France, one of the few world suppliers of gears left as the United States is losing its manufacturing capabilities in this area. One might recall that France, in opposing

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36. More detailed and technical definitions have been offered by other authors. Libicki, Nunn, and Taylor, for instance, define vulnerability as "Any source of supply, manufacture, or technology outside the United States or Canada for which there is no immediately available alternative source within the United States or Canada, and whose lack of reliability and substitutability jeopardizes national security by precluding the production, or significantly reducing the capability of a critical weapon system." *US Industrial Base Dependence/Vulnerability, Phase II—Analysis*, p. 4. A related term, "dependency" is defined in a 1986 Joint Logistics Command report as "an immediate serious logistics support problem that affects the combat capability of the United States because of the unavailability of a foreign sourced item." The report is classified, however, this definition was cited in US Congress, *House Defense Production Act Amendments of 1990: Report of the Committee on Banking, Finance and Urban Affairs to Accompany HR 486*, 101st Congress, second session, 19 September 1990 (Washington, DC: US Government Printing Office, 1990, Serial No. 101-724): 24.

37. Traditionally domestic suppliers have been subject to the rules of the Defense Production Act of 1950. Among this act's many provisions is authority for DOD to force suppliers to prioritize production for military contracts, especially in time of crisis. Congress failed to renew this act in 1990 due to the lack of ideological consensus on other new provisions; however, the Bush Administration still enforced its authority over domestic suppliers during the Gulf War through an Executive Order.

38. Libicki, *Industrial Strength Defense,* 82, 83, and 94.

39. A recent report by the Joint Chiefs of Staff depicted other potential impacts of cutoff. If foreign sources were unavailable in crises, it reported, the M-1 tank, AIM-7 missile, sonobuoys, and the F/A-18 Hornet could continue production for only two months, while it would take six to fourteen months for US sources to supply industries with components necessary to resume production. Automated and multifunction machine tools, precision ball bearings, computer chips, and precision optics procured from foreign sources were labeled as potential "show stoppers." "New JCS Document Warns of Serious Erosion in Aircraft Subcontractor Base," *Inside the Air Force* (5 April 1991): 1.

US action against Libya, did not allow over flight for US bombers during the raid, and thus there was a possibility that France also would have denied needed components for US weapon systems.[40]

Several other potential cutoff scenarios have been offered. Problems such as strikes, political unrest, or natural disasters within the supplier's country are all plausible. Cutoffs might also be created by the supplying nation giving priority to ventures more profitable than DOD contracts, or giving priority to the supplier's home country needs over the United States, especially in times of crisis. Countries external to the supplying country could also create cutoffs—by threatening the supplier, by an overt blockade, or by war. One US study done prior to the end of the Cold War, reminded readers that Japan was within easy bombing distance of the Soviet Union, and thus the USSR could easily cut off critical components for US weapon systems.[41] Although the political climate for the near term makes this specific scenario unlikely, recent Soviet military activity demonstrates that the possibility remains. The USSR test fired two sea-launched ballistic missiles into the Sea of Japan at a time coinciding with Mikhail Gorbachev's April 1991 visit to Japan. Some analysts described the test firings as a "muscle flex" and a "political message for Tokyo."[42] The message, however, has ramifications for the United States also—sources of certain critical supplies are vulnerable to hostility, a situation that creates a possible domino effect on US weapon systems.

Another potential risk is delay in delivery of needed components. One defense supplier, in fact, claims that we have already been harmed by this vulnerability to a minor extent. Cray Research Inc., a Minneapolis-based firm, leads the world in supercomputer technology, but it is dependent on Japanese suppliers for many high-speed logic and memory chips. Jerry Brost, Cray's vice president for engineering says, "We have seen cases where we haven't received the parts [from the overseas suppliers] when we needed them."[43] Although a problem, the damage to national security was negligible in this peacetime case; it merely hampered Cray's ability to deliver its end products in accordance with its contracts. Such delays, however, could have had security implications if they had occurred during the Gulf War.

Despite the successes of US military weapon systems that used foreign high technology components during the Gulf War, there were moments of uncertainty as to whether the United States would be able to get requested "rush" orders filled for needed components on a timely basis. Reporter Stuart Auerbach recently reported in the *Washington Post* that "on nearly thirty occasions, the Bush administration had to call upon foreign governments for help to get delivery of crucial parts for the war effort." Auerbach continued, "foreign manufacturers often were reluctant to put the Pentagon's purchase orders ahead of their regular customers' without prompting from their governments, according to officials at embassies here and at the Commerce Department."[44]

Of special concern were Japanese suppliers. According to John Eckhouse, an investigative reporter for the *San Francisco Chronicle*, "The Japanese electronics companies—whose identities have not been publicly disclosed—reportedly said they could not curtail existing commercial contracts, such as orders from VCR, television, and automobile manufacturers, to meet the needs of the US forces in the Gulf." Experts on Japan, according to Mr. Eckhouse, also speculated that Japanese suppliers, in a society geared toward avoiding any military involvement beyond national borders in the post-World War II era, "may have been afraid of domestic political ramifications of favoring military over commercial customers." Mr. Eckhouse's interview with an unnamed Commerce Department official revealed that the US government "had to 'jump through the hoops' and

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40. Testimony, US Congress, House Committee on Banking, Finance, and Urban Affairs, *Defense Production Act Amendments of 1989, HR 486: Hearings before the Subcommittee on Economic Stabilization,* 101st Congress, first session, 17, 18, 24 May and 20 June 1989 (Washington, DC: US Government Printing Office, 1989 , Serial No. 101-27): 16, 17.

41. Demeritt and Renard, "Navy Dependence on Foreign Spares," 16.

42. Bill Gertz, "Soviets Tested Ballistic Missiles in Sea of Japan," *Washington Times*, 1 May 1991: 7.

43. George Leopold, "US Must Avoid Foreign Dependence in Order to Keep Supercomputer Lead," *Defense News* (29 January 1990): 34.

44. Auerbach, "US Relied on Foreign-Made Parts for Weapons," 1.

that the department took the unusual step of asking Japanese government officials at the embassy in Washington for help in prodding Japanese suppliers."[45]

If Auerbach's and Eckhouse's reports are true, then the Gulf War is the first documented case of US vulnerability to foreign suppliers during a wartime situation. It is important to note, however, that while the potential vulnerability was real, the reports also revealed successful resolution of the problems. Government to government intervention successfully shifted suppliers' priorities towards the war effort. The unnamed Commerce Department official interviewed by Eckhouse "insisted that it would be an overstatement to call the incident a crisis. 'While it is the first time that our growing dependence on certain critical components was spotlighted in a war setting, we were able to resolve the challenge successfully,' he said. 'We were lucky we were dealing with allies.'"[46]

The remarks of this unnamed Commerce Department official deserve some critical analysis. This official was correct to emphasize that crisis was averted, since the United States obtained the components needed on a timely basis. The potential for crisis, however, certainly existed and only a common political objective shared by top levels of the US and foreign governments averted more serious problems. The bond between most governments during the war was created by nearly-unanimous outrage over Iraq's aggression; such a bond was both unprecedented and delicate, thus it may be tough to duplicate in the future. Had there not been a common political objective or had the Japanese government, for instance, been more inclined to bow to domestic calls for avoiding contributions to the war effort (and there was considerable pressure within Japan for noninvolvement), it is quite likely the United States would have had to look for other sources to obtain necessary components. Without pre-planning for alternate supply sources, the probability of a favorable resolution would have decreased significantly.

Furthermore, the mere fact that the US government requested assistance from foreign governments to obtain rush orders of critical supplies revealed a "weakness in its defense production to outsiders who may not share our security concerns."[47] The implication here is that foreign governments can use this demonstrated weakness as leverage in future dealings with the United States—linking US foreign and economic policies that they desire with continued supply of military components.

An ominous prediction of foreign interference was succinctly detailed by Japanese politician (and long-time Diet member) Shintaro Ishihara, in *The Japan That Can Say No*. After touting Japan's dominance in semiconductor manufacturing, Ishihara predicted that the accuracy of guidance systems for both US and Soviet intercontinental ballistic missiles (ICBMs) would be totally dependent in the future on these products of Japanese manufacturing prowess. In Ishihara's words:

> In short, without using new-generation computer chips made in Japan, the US Department of Defense cannot guarantee the precision of its nuclear weapons. If Japan told Washington it would no longer sell computer chips to the United States, the Pentagon would be totally helpless. Furthermore, the global military balance could be completely upset if Japan decided to sell its computer chips to the Soviet Union instead of the United States.[48]

Ishihara may be incorrect in the details of the example he cites, but his point is well-taken. In fact, semiconductors for ICBMs are not produced in Japan—they are produced within the United States due to the

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45. John Eckhouse, "Japanese Firms Reportedly Withheld Key Parts of US Gulf War Weapons," *Baltimore Sun,* 30 April 1991: 1. Specific components were not revealed to Eckhouse, but he reported that components were most likely to be semiconductors and batteries. Auerbach related one specific instance: US government officials asking the Japanese embassy for help obtaining parts that were in short supply for producing a video display terminal used in the Gulf.

46. Eckhouse, 1.

47. Stephen B. Bryan, a former deputy undersecretary of defense, quoted by Auerbach, "US Relied on Foreign-Made Parts for Weapons," 1.

48. Shintaro Ishihara, *The Japan That Can Say No: Why Japan Will be First Among Equals*, (New York: Simon and Schuster, 1989), 21.

necessity of guaranteeing shielding against radiation and the electro-magnetic pulse,[49] something Japanese manufacturers do not design into their chips. But because an estimated 90 percent of the semiconductors used within the US military come from the Far East, especially Japan,[50] the United States is becoming quite vulnerable to Japanese leverage, as Mr. Ishihara implies.

By using their leverage as suppliers for critical components of US weapon systems, Japan or other nations could hamper the United States in producing or using weapons it deems necessary. The United States may find itself making decisions about new weapons based on foreign research and development, foreign parts, and knowledge that foreigners are willing to share. Furthermore, the ability of the United States to engage in sustained war would be dependent on continuous support from foreign suppliers. If a supplying nation loses interest in the war, or is convinced that continued supply to the United States is detrimental to its own interests, availability of future components would be threatened. In addition, the decision by a foreign country to provide its best technology might be conditional on a favorable decision by the United States in another area of foreign or economic policy.[51] To date, the United States has yet to encounter such situations, but a recent threat by a high-ranking Japanese official has ominous overtones about such linkage. Japan's minister of finance, Makoto Utsumi, was reported to have threatened to curb credit to the United States if Congress passed a bill imposing restrictions on Japanese banks and security firms. This was the first time that Japan had openly threatened to use its ownership of American debt to influence American policy. It does not take a great leap of logic to infer that Japan could just as easily threaten cutoff of military components in the future. Ultimately, the issue of potential foreign interference boils down to a question often-asked in today's interdependent and competitive world: "who will set the agenda" for the United States—politically, militarily, and economically? For the United States, this is becoming a serious question.

The preceding discussion about crisis and the potential for foreign interference demonstrates that a large part of this concern is not about nations considered to be US enemies, but, instead, about nations that are allies of the United States. Nations that have traditionally been our strongest political allies and sources of interdependence (members of NATO, Japan, and Canada) have also grown to become our biggest economic competitors. Some nations, especially Japan, have shown willingness to use economic clout as leverage against the United States.

In addition, both the United States and its allies have demonstrated diverging political interests on many occasions, and each has used whatever leverage it had available to show the other displeasure or to attempt to persuade the other to change its policy. The Europeans have, on occasion, shown displeasure with US policies by refusing landing or overflight rights for US aircraft. Most European nations refused landing privileges to US planes involved in supply efforts during the Arab-Israeli war of 1973. The refusal by France to allow overflight during the 1986 bombing raid of Libya has already been mentioned. The United States, for its part, has threatened and actually cut off critical supplies from European allies on several occasions. One example is the US threat during the crisis of 1956 to cut off oil supplies to the British and the French if they did not remove their military forces from the Suez Canal region. From 1964 to 1966 the United States denied France computer technology in order to inhibit Charles DeGaulle's "force de frappe" and to force work on France's hydrogen bomb to stop. Finally, to express displeasure with repressive Soviet policies in Poland in the early 1980s, the United States retroactively canceled technology licensing agreements with European nations in an attempt to prevent European help for the construction of the Soviet-European gas pipeline.[52]

These examples remind one of the often-quoted phrase by Henry John Temple, Lord Palmerston (1784-1865): "Nations do not have permanent enemies; nor do they have permanent friends. They have only

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49. Electro-magnetic pulse is emitted for miles during a nuclear explosion. It surges unshielded electronic components beyond capacity and thus destroys the operability of the components.

50. Roderick L. Vawter, *US Industrial Base Dependence/Vulnerability, Phase I—Survey of Literature* (Washington, DC: National Defense University Mobilization Concepts Development Center, Institute for National Strategic Studies, December 1986), 5.

51. John B. Judis, "Burden Shirking," *New Republic* (4 March 1991): 21.

52. Moran, "The Globalization of America's Defense Industries, 60-65; and "International Economics and National Security," *Foreign Affairs* 69 (Winter 1990/91): 80.

permanent interests." After paraphrasing this very thought when he testified about the potential vulnerability of the United States caused by procurement from allies, former Chairman of the Joint Chiefs of Staff, Admiral Thomas H. Moorer, USN, added: "And if we get involved in some kind of altercation or confrontation which is contrary to the national interest of any of these nations, they will stop production."[53] In this respect the previously-mentioned unnamed Commerce Department official was incorrect in assessing the avoidance of crisis during the Gulf War as "lucky we were dealing with allies." In fact, we were lucky that we were dealing with allies that had compatible political objectives. While procurement from allies doesn't entail as much risk as it would from other countries, the fact remains that the risk is considerable.

Compounding Vulnerability

It is apparent that the risk of vulnerability is compounded by other factors. One factor is a lack of knowledge about the true extent of foreign sourcing. This factor precludes well-planned responses to existing vulnerabilities. A second factor, the dwindling manufacturing base in the United States, increases the likelihood that the vulnerabilities of foreign procurement will be perpetuated and probably continue to increase. Thus, focusing on reducing existing vulnerabilities is beneficial to some extent, but it is not a long-term solution. Third, an internally-inconsistent collection of uncoordinated government agencies and disjointed policies, fostered by free market ideology in the United States, hampers effective management and reduction of these vulnerabilities. Each of these factors requires detailed analysis.

While this paper has used numerous examples to depict the pervasive use of foreign components in US weapon systems, knowledge of its true extent is lacking. A 1988 Department of Defense (DOD) report stated, "While this issue has been studied extensively on an ad hoc basis, and anecdotal evidence abounds, there are few, even moderately comprehensive studies of foreign-sourced components of key weapon systems."[54] The 1989 CSIS study mentioned previously concluded that although the trend towards foreign procurement of microchips is well-known, "there is reason to be troubled by the lack of adequate data and analysis of other products and sectors, which may conceal significant vulnerabilities lurking beyond view."[55] In an attempt to foster analysis and decision making, DOD has been assembling a broad database since 1985. Named "The Defense Industrial Network" (DINET), it contains information about the components, suppliers, and manufacturers used to produce DOD weapon systems procured from 1986 to the present. DINET has a variety of purposes—among them is to identify specific components procured from foreign sources and provide information about potential alternative suppliers.

This database, however, has been widely criticized as not being comprehensive. Criticism focuses on limits imposed on data collection. Data contained within the system includes only items for which DOD made "direct purchases" (components contracted specifically to DOD), but does not include those purchased by contractors to DOD. Purchases tracked do not include contracts of less than $25,000, nor does the database include purchases "off the shelf"—those purchases made without formal contracting or specification processes.

This means that there is no information within the database about a whole realm of suppliers, either foreign or domestic, that under subcontract provide components to a prime contractor who, in turn, has a direct purchase contract with DOD. In modern weapons systems, prime contractors are merely "system integrators." It is not uncommon for them to subcontract 60 to 70 percent of their overall production work through a network of manufacturers that could be ten to fifteen tiers deep![56] Thus, any picture obtained from examining the existing DINET database is incomplete. Larry Grossman, associate editor of *Military Forum*, probably summed it best

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53. Testimony, US Congress, House Committee on Banking, Finance, and Urban Affairs, *Defense Production Act Amendments of 1989, HR 486: Hearings before the Subcommittee on Economic Stabilization,* 101st Congress, first session, 17, 18, 24 May and 20 June 1989 (Washington, DC: US Government Printing Office, 1989, Serial No. 101-27): 42.

54. Robert Costello, "Bolstering Defense Industrial Competitiveness: Report to the Secretary of Defense by the Under Secretary of Defense for Acquisition" (July 1988) 31.

55. Blackwell, *Deterrence in Decay*, 50.

56. US Congress, Senate, *Defense Production Act Amendments of 1990: Report of the Committee on Banking, Housing, and Urban Affairs, United States Senate to Accompany SR 1379*, 101st Congress, second session, 13 July 1990 (Washington, DC: US Government Printing Office, 1990, Serial No. 101-368): 31.

when he wrote, "DOD knows which companies are building its tanks, fighter aircraft, and submarines, but it has less insight into the origin of what is under the hood. That is because the military does little to monitor the activities of sub-tier contractors."[57]

Without data pertaining to all levels of supply and production of a weapon system, it is likely that many potential or existing vulnerabilities are unknown. If such vulnerabilities are exposed by surprise, especially in time of war, then the potential for crisis exists. A complete database would enable identification of vulnerabilities prior to the crisis stage, as well as allow a proactive response.

A second factor compounding vulnerability is the dwindling US manufacturing base.[58] CSIS reported that the number of firms that provided goods to DOD shrunk between 1982 and 1987 from more than 118,000 to less than 40,000. For some products, it continued, there was no longer more than one domestic supplier. Examples given included certain depth charge components, parachute recovery systems, some specialized marine vessels, tanks, a number of types of machinery, nonmetallic pipe, and piezoelectric crystals. The only domestic source of certain materials for missiles had to be "bailed out" with federal funding according to James Blackwell, project director for the CSIS study.[59]

In its annual assessment of the nation's capabilities, the Joint Chiefs of Staff (JCS) in 1991 reported further dwindling of the manufacturing base. Only one supplier remains for aircraft titanium extrusions, optic coatings, and image converter tubes; and only two or three suppliers exist for sixteen other components. Production capability in essential sub-tier industries such as machine tools, gears, optics, bearings, castings, and forgings has also declined.[60] As a warning of the potential implications of such a dwindling domestic base, the JCS wrote: "The loss of sub-tier suppliers—manufacturers of subsystem components of larger systems—is a threat to our ability to field state-of-the-art weapon systems on a timely basis."[61]

Not stated but implied in the JCS warning is that dwindling manufacturing capabilities increases the likelihood that foreign procurement and its associated vulnerabilities are perpetuated. A hypothetical example by Robert Kurtz illustrates the point. Kurtz, chairman of a National Research Council study group commissioned by the army to study US industrial preparedness in 1990, wrote:

> Suppose, for example, that a modern Rosie [the Riveter] was asked to design a microchip for an aircraft guidance system. She might find it difficult, if not impossible, to locate a domestic company with the equipment to convert her design into an actual product. . . . Many companies lack the sophisticated machinery needed to produce modern weapons.[62]

While US firms may have the "technological know-how," the Japanese "have the mass production and quality control capability" with respect to electronics and semiconductors.[63] Today US firms are often left with little choice but to procure components from overseas sources, rather than invest huge sums of money and many years of research and development to achieve the capabilities that other nation's firms already have. Foreign components are typically inexpensive and of high quality, a combination that offers strong incentives to buy abroad.

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57. Larry Grossman, "Industrial Base: The Supplier Bottleneck," *Military Forum* (May 1989): 41.

58. Actually it is the combination of a dwindling manufacturing and technology base. The dwindling technology base, however, has already been discussed in the text.

59. Blackwell testimony, US Congress, House Committee on Banking, Finance, and Urban Affairs, *Internationalization of the Aerospace Industry: Hearings before the Subcommittee on Economic Stabilization*, 101st Congress, first session, 10 May 1989 (Washington, DC: US Government Printing Office, 1989, Serial No. 101-23): 25, 26.

60. "New JCS Document Warns of Serious Erosion in Aircraft Subcontractor Base," 1.

61. Steven Pearlstein, "As Defense Industry Slows, Contractors Fear Shakeout: 'Build Down' Spurs Debate Over Impact," *Washington Post*, 13 May 1991: 1.

62. Robert Kurtz, "Cutting Defense Threatens US," *Champaign-Urbana News Gazette*, 11 September 1990: A-5.

63. Ishihara, *The Japan That Can Say No*, 21, 22.

A 1988 DOD report expounds upon further consequences of a particularly disconcerting trend, the decline of the machine tool industry:

> The decline of manufacturing equipment industries is of particular concern to the Department of Defense. As long as state-of-the-art production equipment is manufactured in the United States, there is a substantial capability to reconstitute or expand American product industries. However, without the basic tools for manufacturing, this capability virtually disappears, leaving United States security vulnerable to the political and economic processes of other nations.[64]

If the United States not only procures critical components from other nations, but also cannot produce the components even if it wanted to, it is certainly more susceptible to foreign pressure than if it had prospective domestic suppliers. A dwindling manufacturing base therefore increases the likelihood that US vulnerabilities will multiply in the long term. Clearly any successful plan to reduce the vulnerabilities created by foreign procurement requires a long-range, dual approach—focusing upon improvements to US manufacturing capabilities, as well as mitigation of existing vulnerabilities.

The third and final factor that compounds vulnerability is inconsistency within the US government. The industrial base that supplies components to DOD is not an entity separate from the commercial industrial base; indeed, the distinction between military and commercial technologies is steadily diminishing. DOD will therefore not be able to reduce long-term vulnerabilities created by diminished manufacturing without the joint efforts of numerous other federal government agencies and private firms. Unfortunately, the current lack of coordinated efforts, as well as disjointed policies within the US government inhibit the identification of long-term solutions.

The term "defense industrial base" is, in many respects, a misnomer. It implies that there is an industry supplying only DOD completely separate from the commercial realm. The fact is, however, that while there are firms for which DOD is the only or biggest customer, there are also many that supply to DOD as one of numerous customers. According to an industrial base study by the General Accounting Office, DOD's suppliers:

> ".□□□manufacture both defense and non-defense products. Activities of the firms range from assembling major weapon systems (such as tanks and missiles) to supplying small parts (such as washers, screws, and clamps), to machining already manufactured parts."[65] Congress' Office of Technology Assessment (OTA) agrees: "DOD is a small and relatively insignificant customer when compared to aggregate consumer demand in most high technology, civilian-based industries."[66]

Department of Commerce official John A. Richards further expounded during 1988 testimony before Congress: "Defense production of most firms within the industrial base comprises less than 10 percent of their business. In order to maintain their ability to continue to produce defense items, most companies must be able to compete in the commercial sector which accounts for the overwhelming majority of orders." He further testified that the Department of Commerce and DOD had cooperated previously to make a list of sixty industries critical to national security. The process of making such a list, however, became extremely difficult because "only a handful of industries .□□don't have a role" in supporting or supplying DOD. "Our industrial base is not a separate defense industrial base and non-defense industrial base," was Mr. Richard's conclusion.[67]

The lack of distinction between military and commercial industries is also applicable to technologies. The task of separating technologies that are uniquely military and civilian, in fact, is extremely difficult. "What the

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64. Costello, "Bolstering Defense Industrial Competitiveness," 31.

65. US General Accounting Office, *Assessing Production Capabilities and Constraints in the Defense Industrial Base: Report to the Subcommittee on International Trade, Finance, and Security Economics of the Joint Economic Committee*, 4 April 1985 (Washington, DC: US Government Printing Office, 1985, Serial No. GAO/PEMD-85-3): 1.

66. US Congress, Office of Technology Assessment, *Holding the Edge; Maintaining the Defense Technology Base*, 179.

67. Testimony, US Congress, House Committee on Banking, Finance and Urban Affairs, *Defense Production Act Amendments of 1988, HR 4037: Hearings before the Subcommittee on Economic Stabilization,* 100th Congress, second session, 30 and 31 March 1988 (Washington, DC: US Government Printing Office, 1988, Serial No. 100-56): 15 and 96.

military calls brilliant guidance is a subspecies of precision navigation, and precision navigation technologies are used in commercial products," according to the OTA.[68] There are "food chain linkages,"[69] meaning that few technologies are developed in isolation. Brilliant guidance, for instance, feeds upon computers, sophisticated microchips, sensors, mapping systems, and inertial guidance technologies. Furthermore, recent listings of critical commercial technologies by the independent Council on Competitiveness as well as the White House Critical Technologies Panel of the Office of Science and Technology Policy, included many items that were on DOD's critical technologies list.[70] Critical technologies in the United States thus have a "dual use" nature, applicable to both military security and commercial prosperity.

These inexorable linkages—between military and commercial technologies, as well as between military and commercial industries—mean that DOD, by itself, is incapable of preventing growing vulnerabilities caused by the dwindling of US industry. Only a coordinated and joint effort between DOD, other government agencies, and commercial industry can do the job. Unfortunately, the current lack of a coordinated effort precludes making progress in reducing vulnerability.

Absent within the US government are "institutions capable of dealing with complex technological [or industrial] issues that have both commercial and military implications and that cut across several industries."[71] Twenty six government agencies are responsible for industrial preparedness planning, but there is no real "champion" within for industrial matters. The Federal Emergency Management Agency (FEMA) coordinates preparedness planning for natural and man-made disasters (war), but it has neither the resources, nor the authority to be effective in this mission—it can convene meetings but not compel attendance, force decisions, or enforce recommendations.[72]

With respect to technology, "the one organization that provides an overview of federal research and other activities related to economic performance, is the White House Office of Science and Technology Policy (OSTP)," according to retired Admiral B. R. Inman and Daniel F. Burton Jr., active participants in various councils that propose recommendations for revitalizing industrial competitiveness. OSTP helps to coordinate federal research and development (R&D), but like FEMA, it has no line functions, and operates on a small budget and staff on loan from other agencies. Civilian R&D is dispersed among twelve agencies in the executive branch and thirteen appropriations subcommittees for science in the legislative branch. In a manner analogous to civilian R&D, military R&D is dispersed among the Defense Advanced Research Projects Agency (DARPA) and numerous service laboratories. And while DARPA is one of the most highly respected research agencies within the US government, it has little coordination with civilian agencies, although half of its budget is invested in dual-use technologies. In effect, there are many agencies responsible for fostering technology within the US government, each going off in its own direction with R&D or policies that affect other agencies, and there is no mechanism for establishing reasonable compromises or setting priorities.[73]

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68. US Congress, Office of Technology Assessment, *The Defense Technology Base: Introduction and Overview—A Special Report*, 30.

69. B. R. Inman and Daniel F. Burton, Jr., "Technology and Competitiveness: The New Policy Frontier," *Foreign Affairs* 69 (Spring 1990): 126.

70. George Leopold, "Congress: 'Critical List Lacks Strategy,'" *Defense News* (29 April 1991): 4, 29. The following list of critical technologies released by the White House can be compared to DOD's listing (contained at the beginning of the section on the "Benefits of Foreign Procurement in this paper) for similarity: materials processing; electronic and photonic materials; ceramics; composites; high-performance metals and alloys; computer-integrated manufacturing; intelligent processing equipment; micro-fabrication; systems management techniques; software; microelectronics and optoelectronics; high performance computing and networking; high definition displays; sensors and signal processing; data storage; computer simulation; applied molecular biology; medical technology; aeronautics; surface transportation; energy; and pollution remediation.

71. Inman and Burton, "Technology and Competitiveness: The New Policy Frontier," 126.

72. Robert B. Kurtz, Chairman, Committee on Industrial Mobilization, Manufacturing Studies Board, Commission on Engineering and Technical Systems, National Research Council, *Industrial Preparedness: National Resource and Deterrent to war* (Washington, DC: National Academy Press, 1990), 44, 45.

73. Inman and Burton, "Technology and Competitiveness: The New Policy Frontier," 29-31.

The lack of coordination that exists between government agencies also exists between government and industry. DOD's relationship with its subcontractor base is an example. The Pentagon fails to "encourage vendor's participation in strategic planning decisions or design processes," despite the fact that "purchased materials and components supplied by subcontractors represent 50 to 85 percent of the total cost." Instead, requirements for "free and open price competition," combined with program stretch outs, and uncertain defense budgets "have the effect of keeping the supplier base in constant turmoil and make it virtually impossible .□□ to build a stable base of reliable, high quality, cost-effective vendors."[74]

Further hampering a coordinated effort in reducing long-term vulnerabilities is a variety of inconsistent policies. Policies affecting the industrial and technology base, as well as procurement from overseas sources have been developed in a case-by-case approach, with no real priorities or strategy applied.[75] Certain existing policies, in fact, were demonstrated by DOD researcher Roderick Vawter to be responsible for the pervasive nature of foreign procurement. Procurement officers, he wrote in 1986, have long been attuned to the necessity of having a prosperous domestic industrial and technology base to ensure delivery of needed components on a timely basis, especially in emergency situations. These same procurement officers, however, have been confronted with competition and NATO standardization policies, which opened up bidding for defense contracts to other nations. In many cases, foreign firms outbid US firms, and thus contracts were awarded overseas, to the detriment of the domestic industrial base.[76]

There are also policy conflicts between the executive and legislative branches of government in the area of foreign procurement. Approximately twenty-three congressional-mandated "buy American" provisions exist in current statutes.[77] DOD complies with each of these laws, but waiver authority granted within certain of these laws still permits foreign procurement. To comply with the broad "Buy American Act of 1933" for instance, DOD adds 50 percent to the price bid by overseas firms, thus fostering advantage for domestic bidders. At the same time, however, for most contract awards, DOD waivers this act in support of reciprocity arrangements in defense procurement established by nineteen memoranda of understanding with US allies.[78]

Other existing government laws and policies discourage production or make it noncompetitive to produce in the United States. An incomplete listing includes:

- Some rocket motor chemicals for example, can't be produced within the United States because of environmental regulations.[79]
- US Occupational Safety and Health Act (OSHA) standards, while important in providing a safe work environment, have nevertheless increased costs of production and ultimately the price of products.
- Anti-trust restrictions within the United States have discouraged cooperative ventures between companies, though such ventures have been successful in fostering industry in other nations.
- Military specifications (MILSPECs) for product content and performance are overstated in the minds of many manufacturers—in the PGM study, suppliers responding to a survey felt MILSPEC increase costs and may even result in lower quality than is available commercially.[80]
- Product liability laws necessitate extensive tests and evaluation to protect manufacturers against costly lawsuits in the United States.
- Current US tax policies provide a lack of incentive for investment in new equipment, plants, and technology.

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74. Costello, "Bolstering Defense Industrial Competitiveness," 36.
75. Jacques S. Gansler, "Needed: A US Defense Industrial Strategy," *International Security* 12 (Fall 1987): 47.
76. Vawter, *US Industrial Base Dependence/Vulnerability, Phase I—Survey of Literature*,□10-12.
77. A detailed listing and analysis of "buy American" laws is contained in "The Impact of Buy American Restrictions Affecting Defense Procurement: A Report to the United States Congress by the Secretary of Defense," July 1989.
78. Memorandums of Understanding are discussed in in the earlier section on benefits of foreign procurement.
79. Vawter, *US Industrial Base Dependence/Vulnerability, Phase I—Survey of Literature*,□.
80. Libicki, *Industrial Strength Defense*, 87.

The above are all “nonproductive costs" that increase the price of US products and create burdens on US manufacturers often not encountered by foreign suppliers. Combined, these laws and policies constitute a “de facto industrial policy,” that is “at best, incoherent and, at worst, counterproductive.”[81]

The term “industrial policy” conjures intense debate within the United States. While some defense analysts such as Robert Costello and Jacques Gansler claim such policy already exists,[82] officially there is none. Generally taken to mean that the government provides incentives to enhance strategically-chosen industries—in effect, picking winners and losers—industrial policy is something that advocates of free market economics argue the government is ill-prepared to do. According to free market advocates, the government should interfere with the market and industry as little as possible and only when absolutely necessary. They believe market forces will distribute the right mix of resources both in the United States and around the world. Proponents offer the sustained prosperity of the United States since World War II as evidence of the success of free markets. Free market advocates currently occupy most key policy-making positions within the executive branch of the US government.

Unfortunately, continuing allegiance by the United States to free market ideology may be illogical in today’s world.[83] Other countries, especially Japan, Korea, and Southeast Asian nations such as Taiwan, Hong Kong, and Singapore, and also some European nations including Germany, have forged ahead economically without fostering free markets. Most of these nations, America’s biggest economic competitors, have no qualms about picking winners and losers. Naohiro Amaya, former Japanese vice minister for international affairs in the Ministry of International Trade and Industry (MITI), explained Japan’s philosophy: “When you go hunting, you have to shoot at a target.□□□But your neoclassical school of economics says you can fire in all directions at once and the ‘market’ will ensure you hit the target. Well, we don’t accept that line of reasoning□□□”[84]

Strategic industries in these nations are frequently subsidized by the government in both labor and development costs. Unlike the United States, responsibility for industrial and technology policies are centralized (rather than separated) into a ministry of science and technology or trade and industry.[85] In each of these countries placing broad responsibilities in one agency has fostered coordinated, consistent, and successful efforts to make their industries competitive in world markets. Evidence of their successes are everywhere as they have gained huge market shares of industries once dominated by the United States: semiconductors, machine tools, gears, optics, bearings, castings, forgings, etc. These are precisely the industries where concern exists about the vulnerability introduced by foreign procurement of components for US military weapons systems.

By clinging to simple-minded free market ideology and allowing uncoordinated agencies and inconsistent policies to prevail, the US government has fostered industrial losers rather than enhancing strategic winners. As argued in the CSIS report, plans to let the market “play itself out” could foster further dwindling of the industrial base as the economy shifts toward a service economy. “Without government intervention, the defense market will not produce the right mix of material needed for national security. For this reason, the government cannot simply take a complete hands-off approach.”[86] In testimony before a House subcommittee in 1989, Anthony H. Harrigan, President, US Business and Industrial Council, added “.□□□he market doesn’t have any appreciation of strategic factors. A company has no requirement to consider the national interest in its production; it has to, especially today in terms of profit calculations on the short term, look only at the bottom

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81. Costello, “Bolstering Defense Industrial Competitiveness,” 10, 17, 18.

82. A summary of Costello’s argument was listed immediately above. Gansler’s argument about a de facto industrial policy is contained in the previously-cited essay, “Needed: A US Defense Industrial Strategy.”

83. This theme is developed with painstaking detail in Robert Kuttner’s *The End of Laissez Faire: National Purpose and the Global Economy After the Cold War* (New York: Alfred A. Knopf, 1991).

84. Steven Schlossstein, *The End of the American Century* (New York: Congdon and Weed, Inc., 1989): 34.

85. Inman and Burton, “Technology and Competitiveness: The New Policy Frontier,” 130.

86. Blackwell, *Deterrence in Decay*, 3, 58.

line."[87] As the dwindling of our nation's critical industries has shown, the bottom line all too often has been oblivious to the vulnerabilities created by foreign procurement.

Policy Recommendations

What policy direction should the United States take to respond to the current trends and implications of foreign procurement? Many of the trends and implications described in this paper are negative from a US perspective. Foreign procurement potentially renders the United States vulnerable to exploitation by other governments, and this vulnerability is compounded by lack of knowledge about its extent, the dwindling manufacturing base, uncoordinated agencies, inconsistent policies, and the strategic indifference of a free market economy. Due to these negative implications, policy makers within DOD and the US government cannot allow foreign procurement to proceed unmitigated. One policy option to combat these negative effects would simply be to prohibit foreign procurement (or at least limit it to the maximum extent practical).[88] But such policy would be ignorant of an essential benefit of foreign procurement.

Although a policy prohibiting foreign procurement would eliminate the vulnerabilities created by supply cutoff or delay in delivery from overseas suppliers, such a policy would also eliminate US access to the world's best technologies. As demonstrated previously, technologically superior weapons are an essential element of US military strategy—they enable precise, overwhelming, quick, and effective offensive action, while at the same time minimizing US and noncombatant casualties. To the degree that restrictions on foreign procurement hinder US strategy, such constraints are undesirable policy choices. Restricting DOD contractor procurement of the highest quality, most advanced semiconductors, for instance, hinders the strategic pursuit of precise and effective military capabilities by the United States. In effect, restricting foreign procurement is a self-inflicted vulnerability, potentially rendering the United States incapable of fielding improved and "break-through" weapons that potential adversaries might themselves procure.

For this reason alone, it is essential to consider balanced policy options. Instead of substituting one vulnerability for another, policy makers should focus on reducing or eliminating the vulnerabilities that currently exist and conditions that compound and increase the likelihood of their perpetuation. An optimal policy needs to contain several elements.

On one hand, the United States must obtain greater knowledge about the true extent of the foreign components within DOD weapon systems. The information contained within the DINET database must be expanded. Until DINET reaches, "all the way to the end of the supplier and subcontractor chain, the foreign dependencies involved for critical weapon systems and components .□□the nation is planning in the dark."[89] A complete database would enable specific analysis and determination of the foreign components that create the greatest vulnerabilities. An annual survey of every supplier in the numerous tiers of the subcontractor network should be undertaken to obtain the needed information missing from the database.

To enable specific determination of vulnerabilities, the database should allow analysts to answer three questions. First, what components supplied by foreign producers are common to multiple weapon systems? Cutoff or delay of components that are widely used have potentially greater impact on US force capabilities than those unique to one weapon system. Second, at what point does each overseas supplied component become essential for non-interrupted production of the weapon system—in other words, become part of the "critical path?" If US contractors could continue producing a weapon system without a specific overseas component for an extended time until other sources of supply are established, then the impact of cutoff or delay would be

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87. Testimony, US Congress, House Committee on Banking, Finance, and Urban Affairs, *Defense Production Act Amendments of 1989, HR 486: Hearings before the Subcommittee on Economic Stabilization*," 101st Congress, first session, 17, 18, 24 May and 20 June 1989 (Washington, DC: US Government Printing Office, 1989, Serial No. 101-27): 18.

88. Inclusion of such strict and wide-ranging "buy American" provisions in the Defense Production Act (DPA) has been the focus of intense debate during congressional subcommittee hearings since 1987. It is quite possible that Congressional failure to renew the DPA in 1990 was the result of a lack of consensus on this particular issue.

89. Correll, "Lifeline in Danger," 79.

minimal. On the other hand, the impact of a cutoff could reach crisis proportions if the sudden unavailability of a particular foreign component quickly implied a production work stoppage.

Third, and finally, for each particular foreign component, are the suppliers members of a "concentrated" industry? Theodore Moran, Director of the Program in International Business Diplomacy at the School of Foreign Service, Georgetown University, has demonstrated that the threat of foreign manipulation of the United States is greatest when "there is a concentration within a very few nations of external suppliers of technology, products, or inputs." He advocates determining the risk of foreign manipulation by adopting a standard, the "4/50 rule of thumb which has proven useful in economic and anti-trust policy." The proposed rule suggests "that when there are more than four foreign companies or four foreign nations supplying more than 50 percent of the world market, they will lack the ability to collude effectively even if they wish to exploit or manipulate recipients."[90]

How costly would building and analyzing such an extensive database be? One DOD source in 1988 estimated it would take $29 million over five years to accomplish what is needed. Offering a trade-off as comparison, the source equated the cost of the database with that of one F-16. Given limited budgetary resources, and the fact that most decision makers can more readily comprehend the deterrent value of an F-16 over that of a database, this source felt that the database would likely receive inadequate funding.[91] The source was correct—a mere $2 million was allocated to the database through 1990.[92] The lack of comprehension concerning the (deterrent) value of a database is unfortunate, however. Obtaining comprehensive data is the first step in pro-actively combating unintended disruptions of supply and in deterring other governments from exploiting vulnerabilities created by US foreign procurement.

Remedial action is the second necessary step to deter exploitation. Two remedies—establishment of stockpiles and proliferation of suppliers—could offer speedy and proactive deterrence. Long-term deterrence, however, requires enhancement of the US manufacturing base.

One short-term remedy is world-wide proliferation of suppliers. If the analysis made possible by an enhanced database reveals that particular foreign suppliers are part of a non-concentrated industry, then it would be logical for DOD to request its primary contractors to disperse subcontracts among several suppliers for each foreign component. In this manner, DOD would decrease the likelihood that one or even several foreign suppliers could totally disrupt continued US production of a weapon system.

Though supplier proliferation decreases vulnerability, it is not foolproof. Suppliers might not be concentrated with respect to market share or nation, as Moran's description implies, but instead might be concentrated within a particular geographical region of the world. For example, most of the world's semiconductor producers are located in the Far East, making all of them more susceptible to hostile action by another nation than if they were dispersed over several geographical regions. Neither does supplier proliferation ensure that remaining suppliers have the capacity for producing the needed quantity of a particular component if the United States is cut off by one nation. While proliferation of suppliers offers much greater protection from vulnerability than unmitigated, uncoordinated, and unknowing foreign procurement, a second remedy—stockpiles—is also desirable.

The second, admittedly a short-term remedy, is more foolproof. By knowing which components procured from foreign sources are common to several weapon systems or are on the critical path of an especially important system, DOD can require its domestic contractors to stockpile quantities of those foreign components sufficient to enable uninterrupted production until an alternate supply is established. Cutoff or delay in delivery would then have little impact on the continued production of important weapon systems in the short term.

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90. Moran, "The Globalization of America's Defense Industries: Managing the Threat of Foreign Dependence," 82, 83; and "International Economics and National Security," 81.

91. Grossman, "Industrial Base: The Supplier Bottleneck," 42.

92. US Congress, House, *Defense Production Act Amendments of 1990: Report of the Committee on Banking, Finance and Urban Affairs to Accompany HR 486*, 101st Congress, second session, 19 September 1990 (Washington, DC: US Government Printing Office, 1990, Serial No. 101-724): 28.

Researchers of the PGM study cited earlier found that a stockpile consisting of approximately twenty items and costing approximately $15 million would ensure uninterrupted production of the seventeen critical missiles studied "even if all overseas sources were cutoff." These researchers were amazed that such a relatively small investment would preclude successful exploitation of vulnerability for an entire class of weapons.[93] Unfortunately, however, this option has been neglected. Since the 1987 PGM study, in fact, no funding has been allocated for PGM component stockpiles. DOD should immediately discontinue this neglect. As PGMs, so-called "smart bombs," were proven to be essential and successful performers in the Gulf War; funding for component stockpiles of these weapons would be an especially worthwhile and cheap insurance policy.

Beyond stockpiles for PGM components, however, DOD should establish greater funding priority to deter exploitation of vulnerabilities that impact other weapon systems. Establishment of specific stockpiles and/or supplier proliferation policies should be based upon conclusions drawn from extended data collection and analysis, as called for above. Even if the combined costs for such activities approaches $1 billion, the total would be merely three-tenths of one percent of the $291 billion defense budget in Fiscal Year 1992 . Certainly a proportion of the defense budget this small is a worthwhile investment, given its deterrent value.

Deterring exploitation of vulnerabilities through stockpiling and proliferating suppliers, however, does not remedy conditions within the United States that perpetuate the growing dependence on foreign suppliers. Additional measures are required to reverse the nation's dwindling manufacturing base. Such measures are of special importance, because a strong manufacturing base is an important determinant of the nation's ability to produce and sustain a strong military force.

Strategic industrial planning by the US government is an essential function. No longer should survival of US industries critical to defense (or economic prosperity) be left to the strategic indifference of a free market. No longer should an inconsistent set of government policies, regulations, and laws hinder the efficiency of US industry.

A high priority task within the government should be to conduct an extensive review of policies, regulations, and laws that impact the industrial base. Each must be judged on its overall enhancement of the industrial base. Those regulations, policies, and laws that achieve merely a narrow purpose while hampering a great portion of the industrial base, should be discarded, reversed, or revised.[94] While successful for many years in preventing monopolistic practices within US industry, anti-trust laws are now hindering the cooperative ventures proven successful by overseas industries. Current anti-trust laws are thus important candidates for revision. Similar candidates are US tax laws, especially the capital gains tax, as they hinder investment in new manufacturing equipment. A goal should be US policies, regulations, and laws that provide an incentive rather than a burden to industry.[95] Whenever possible, US policy should provide incentive for investment, as investment is an important determinant of productivity. Productivity enhances US industrial competitiveness, and competitiveness is "a key to having healthy, leading-edge companies for DOD to buy from."[96]

More than providing general incentives, however, the United States should target specific strategic industries for enhancement. Only strategic targeting will ensure availability of the "right mix" of industrial capabilities necessary to preclude perpetuating foreign procurement and its associated vulnerabilities; free market economics alone will not do this. Identifying specific industrial targets for enhancement could be based, in part, upon critical technology lists already established within DOD and the White House Office of Science and Technology Policy. As mentioned previously, these lists are similar, though there are some differences. These

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93. Libicki, *Industrial Strength Defense*, 93.

94. Of course, it will not be desirable to discard, reverse, or revise all laws which hamper industrial competitiveness. Despite the possibility that OSHA laws raise the costs of production for many US manufacturers, maintenance of a safe work environment is essential to producers also. For those laws that are inconsistent with enhancing overall competitiveness, but still necessary, there should be rules thatequitably compare foreign bids with those of US manufacturers. Such rules would compare on a case-by-case basis the impact of US and foreign laws on the bids received—in other words, they would ensure that the bottom line price offered by a foreign competitor isn't the primary factor judged, but one of many important items in evaluating a bid.

95. Gansler, "Needed: A US Defense Industrial Strategy," 54, 56, 58.

96. US Congress, Office of Technology Assessment, *Holding the Edge: Maintaining the Defense Technology Base*, 14.

separate lists should be reconciled and merged into a set of joint national industrial technology priorities. The existing critical lists also currently lack companion plans demonstrating how "available resources .□□will be applied to reach the identified milestones and objectives."[97] Lead agencies should be identified within the government to monitor and nurture each technology, and monetary assistance should be provided as needed.

Moran's "4/50 rule of thumb" used in conjunction with an enhanced data base would further enable identification and prioritization of strategic US industries. Using Moran's scheme, dwindling US industries in areas where "the sources of external supply are concentrated" should be of greatest concern for US policy makers due to the potential for foreign manipulation. These industries should be assigned high priority for US government assistance and protection for national security.[98]

Enhancing US industry in order to prevent the perpetuation of foreign procurement vulnerabilities requires government subsidies. While the term "subsidy" generally has negative connotations, money granted to a strategic industry by the government is, in effect, an investment.[99] Subsidies, like private investments, provide the capital to ensure that the technologies and industry the United States needs will remain productive and competitive in the future. The government doesn't need to fund full costs, but it could establish cooperative funding ventures with private industry for those projects it deems strategic. Already, government and industry have cooperatively combined to develop better manufacturing capabilities and techniques through DOD's Manufacturing Technology Program. Another apparently successful venture is Sematech, combining monetary resources from DOD with a consortium of fourteen private firms to enhance semiconductor production techniques. These consortia should be models for other cooperative ventures between government and strategic industries.

Foreign procurement could also be incorporated within strategic planning to enhance the manufacturing base. Rather than depending upon "direct product purchases" from overseas firms, DOD contractors should attempt to license foreign technologies and to procure "industrial techniques" (management practices) through "consulting and service contracts" with foreign firms,[100] then produce needed components within the United States. In this manner, the United States would maintain access to the components and technologies it needs for its weapon systems, but at the same time take steps towards reducing the conditions that foster long-term vulnerabilities. In the long term, such practices might even foster greater quality, price, and technology competitiveness within US industry. Licensing technologies and buying industrial techniques are more expensive than buying only components, but the additional long-term benefits may be worth the costs. Foreign procurement would therefore serve a strategic purpose beyond complementing military strategy.

Ultimately, however, unprecedented coordination in planning and policy between DOD, civilian government agencies, and commercial firms is necessary to enhance US manufacturing. Several arguments presented earlier in this essay depicted the necessity for unity. For one, DOD cannot effectively enhance the manufacturing base on its own since most US suppliers overwhelmingly depend on commercial contracts for their livelihood. At the same time it is unable to render effective unilateral support, DOD hampers its subcontractor suppliers by failing to include them in its strategic planning. Further hindering effective assistance to the manufacturing base is the lack of a single agency within the government capable of resolving the numerous issues that affect government and industry.

An effective agency within the US government that could "champion" and coordinate industrial affairs would be extremely helpful in reversing the dwindling manufacturing base in the United States. Consisting of representatives from several government agencies as well as liaisons from outside the government, the proposed agency must be inspired by the military concept of "jointness." Jointness is simply the unification of several

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97. Senator Jeff Bingaman, Democrat-New Mexico, quoted by George Leopold, "Improved Third 'Critical' List Still Lacks Long-Term Strategy," *Defense News* (13 May 1991): 43.

98. Moran, "International Economics and National Security," 81, 82.

99. Comment by House of Representatives member Neil Abercrombie, Democrat-Hawaii, during House Armed Services Committee hearings on defense priorities, 26 April 1991. Observed on C-Span broadcast.

100. Ferguson, "America's High Tech Decline," 143.

distinct organizations with a common objective under the leadership of a single powerful individual who has authority to approve fiscally-constrained plans and policy. Application of this concept has been credited with enabling the US military to efficiently and successfully prosecute the war against Iraq.[101]

A specific organizational model for such a joint agency might be an improved version of the Committee on Foreign Investment in the United States (CFIUS). CFIUS consists of eight cabinet-level officials: the Secretary of State, Secretary of Treasury, Secretary of Defense, Secretary of Commerce, the Assistant to the President for Economic Affairs, Executive Director of the Council on International Economic Policy, the Attorney General, and the Director of the Office of Management and Budget. This committee investigates the national security implications of foreign acquisitions of US firms that supply defense materials, then recommends whether presidential approval of each transaction is warranted.[102] Since this committee already analyzes industrial matters with national security implications, it would be a logical candidate for an expanded mission—setting the direction and resolving the issues that could improve the adequacy of the overall US industrial base from both a civilian and military perspective.

Several changes to the committee's existing structure, however, would enhance its "jointness" and its capability to successfully reverse the dwindling industrial base. First, its membership must be expanded. Added to its membership should be the Assistant to the President for Science and Technology Policy, as well as liaisons from industry and the scientific community to ensure key players are not left out of strategic planning. Congressional representatives should also be included for the initial sessions in order to gain consensus between the executive and legislative branches.[103]

Second, the committee should have a permanent support staff—CFIUS currently has none—that would provide detailed policy analysis to the committee's members. Each agency composing the committee would assign personnel to the support staff. These staff members should have knowledge of industrial matters affecting the agencies they represent as well as a "joint perspective"—an attitude that enables them to work together toward a common objective.

Finally, to enforce a joint perspective, the committee should be headed by an individual with clear presidential authority for establishing a broad policy designed to improve the industrial base. Since the top individuals serving on the committee are of cabinet rank, a logical choice for leadership would be the Vice President of the United States. A leader with such broad responsibility would enable the committee to look beyond the focused or tunneled concerns of individual agencies and instead examine proposals and develop policy for achieving the desired common objective.

A single, joint agency structured in this manner would have greater potential for reversing the decline of the manufacturing base than the current uncoordinated approach. By virtue of its cross-cutting membership, it can develop wide-ranging policies for assisting industry, something that neither DOD nor any other government agency can do alone. Some of the turmoil that currently hampers domestic suppliers would be reduced by including industry liaisons in strategic planning. And by virtue of the clear and broad presidential authority of the committee's proposed leader, the entire government would be more responsive to the coordinated policies developed.

Conclusions

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101. Kurt M. Campell, "All Rise for Chairman Powell," *The National Interest* (Spring 1991): 51-60.

102. For further description and analysis of the CFIUS, refer to an essay by John W. Chierichella and Douglas E. Perry, "Foreign Investment in Defense-Related Companies," *Federal Contracts Report* 51 (8 May 1989): 837-845.

103. Unfortunately, Congressional representatives cannot be permanent members of this agency, due to constitutional provisions for separation of powers. One precedent for temporary congressional involvement, however, would be the "budget summit" proceedings in October 1990, where members of the executive and legislative branches joined to resolve another immense problem, the FY91 budget. After obtaining initial consensus about solutions for the industrial base, Congress could then establish a parallel (mirror) organization within its own committee structure as its focal point for industrial affairs. This committee can periodically meet with the proposed executive branch agency to continue hammering out consensus on future major issues.

The policy implications of procuring foreign components for use in US military weapon systems are multifaceted. The United States can reap several benefits from procuring components overseas, and one—access to the world's best technologies for incorporation into technically superior weapon systems—is an essential component of US military strategy. For strategic military reasons then, policy makers should not limit procurement to domestic sources.

Instead, policy making should focus upon taking advantage of this essential benefit while at the same time working to mitigate factors that make the United States vulnerable to delay in delivery, complete cutoff, or foreign manipulation. To preclude "planning in the dark," the United States must gain greater knowledge of the true extent to which foreign components are used in its weapon systems. An expanded database containing information about components procured at all levels of the supplier network is essential in determining where vulnerability risks are greatest. Risks, once identified, can be mitigated by proliferating suppliers and establishing stockpiles of critical components.

To minimize the long-term likelihood that foreign procurement and the vulnerabilities associated with it might someday become unmanageable, policy must also focus upon the task of reversing the decline of the US industrial base. Future US military capabilities are dependent on competitive domestic industries that produce the components DOD needs for its weapon systems. Inconsistent US government policies, uncoordinated agencies, and the strategic indifference of a free market economy currently hinder competitiveness in many industries. To combat these hindrances, the US government needs to engage in strategic industrial planning. This planning should include revision of existing policies that negatively impact industry. In addition, strategic industries should be identified, and government funds should be used for investment in enhanced US productivity in critical US industries.

A viable plan for enhancing the US industrial base and mitigating the vulnerabilities represented by foreign procurement requires more than just DOD. It requires "jointness"—close cooperation and coordination between government and industry. A single, joint organization including representatives from key executive branch agencies, along with liaisons from Congress and the commercial manufacturing sector, could be an effective mechanism for setting industrial priorities and establishing reasonable compromises currently not achievable within the US government. Under the leadership of an individual with clear and broad presidential authority, the committee would give policy concerning industrial affairs and future foreign procurement a clear focus. In this manner, US policy would become more responsive to the trends and needs demonstrated by the current pervasive procurement of foreign components for US weapon systems.

Appendix

A review of the existing literature and studies reveals numerous examples of foreign components in US weapons systems. A sampling follows:

Jacques S. Gansler, *Affording Defense* (Cambridge, MA: MIT Press, 1989).

- The US defense industry is now heavily, if not totally, dependent on foreign sources for computer memory chips, silicon for high-powered electronic switching, gallium arsenide-based semiconductors for high-speed data processing, precision glass for reconnaissance satellites and other military equipment, liquid crystal and luminous displays, and advanced fiber optics (p. 271).

- In 1985 the Congressional Defense Joint Oversight Committee on Foreign Dependency looked into the navy's Sparrow III air-to-air missile and found that the guidance system contained integrated circuits and transistors from Japan, a ferrite phase shifter from West Germany, a memory chip assembled in Thailand, and ball bearings made of raw materials from 'various' sources. In all, sixteen foreign-produced parts were identified (p. 271).

Tim Carrington, "Vital Parts: Military's Dependence on Foreign Suppliers Causes Rising Concern," *The Wall Street Journal*, 24 March 1988, pp. 1, 17.

- Ball bearings in US submarines, aircraft, and tanks come increasingly from Europe and Asia. Some navy ships ride at anchor on Spanish chains (p. 1).

- Gallium arsenide (important because it uses less power and is faster than silicon) is procured from Japan for use in precision guidance systems for missiles and smart bombs, radar apparatus, communications equipment, and electronic countermeasure systems. It is also critical for any space-based anti-missile system (p. 17).

- Extremely powerful magnets used in satellite components also come from Japan. Future sources for these magnets also include Italy, the Netherlands, and Germany (p. 17).

- The Bradley Fighting Vehicle contains imported sophisticated sensors to inform the crew of potential threats and targets (p. 17).

Martin C. Libicki, *Industrial Strength Defense: A Disquisition on Manufacturing, Surge, and War* (Washington D.C.: National Defense University Mobilization Concepts Development Center, Institute for National Strategic Studies, 1988).

- Up to half of the components in test equipment modules come from overseas. Test equipment is essential in producing weapons, because they must work right the first time (p. 60).

Martin Libicki, Jack Nunn, and Bill Taylor, *US Industrial Base Dependence/Vulnerability, Phase II-Analysis* (Washington D.C.: National Defense University Mobilization Concepts Development Center, Institute for National Strategic Studies, November 1987).

- Researchers found numerous specific instances of overseas sourcing for US precision guided missiles (PGMs) in 1987. Integrated circuit parts for all PGMs were assembled in East Asia. Radar components in PGMs were found to contain Silicon Field Effect Transistors (FETs) and Gallium Arsenide FETs from Japan, ferrite cores from Germany, and radome chemicals from Mexico. Rocket motor cases for the Skipper, HARM and Harpoon missiles were sourced from the United Kingdom (and Australia in the case of the Harpoon). The United Kingdom also provided copper-based printed-wiring board plating bath, actuator motors, and gear motors for the HARM. It also produced ball screws for the Patriot. Australia provided extrusions for the Harpoon. Switzerland produced copper preform for the Copperhead missile, and sapphire for the Standard, Patriot, Maverick, and Sidewinder missiles. Butan triol (used in making rocket fuel mixtures) for the Standard, Patriot, Maverick, and Sidewinder came from Germany. The HARM, Sidewinder, and Maverick missiles contained precision optics also procured from Germany, as well as Japan. Castings for the Standard missile and the launch tube for the Stinger missile was produced in Israel. Finally, the study found that molybdenum foil for the Patriot came from Austria (See—Benefits of Foreign Procurement).

Testimony by Richard B. Norment, Executive Director, and Thomas H. Lowry, President, American Gear Manufacturers' Association: US Congress, House Committee on Banking, Finance, and Urban Affairs, *Defense Production Act Amendments of 1989 (H.R. 486): Hearings before the Subcommittee on Economic Stabilization*, 101st Congress, 1st session, 17, 18, 24 May and 20 June 1989 (Washington D.C.: US Government Printing Office, 1989, Serial No. 101-27).

- The American Gear Manufacturers' Association estimated 30 percent of the defense contracts for gears are awarded to foreign sources. Over twenty four ships built between 1983 and 1989 were equipped with gear drives from German or British companies. Significant portions of aircraft gearing are provided by Japanese and northern European sources. Vehicular gearing has been coming increasingly from the Asian basin and the Mediterranean states (5, 140).

- High precision bevel gear sets for the Blackhawk and Apache helicopters come from two subcontractors. While a US company is one of the subcontractors, it gets only a minor portion of the business (9).

- The HumVee had $40 million worth of subcontracts for gear drives. They were originally supplied by Japanese and Spanish sources. Problems in delivery led to the approach of US companies, but DOD vacillated between American and foreign sources. The sole source for the gear drives most recently has been Mexico (7).

Christopher D. Demeritt, Commander, USN, and Commander Geoffrey K. Renard, USN, "Navy Dependence on Foreign Spares—A Problem?" (Executive Research Project # S-16, Fort McNair, Washington D.C.: Industrial College of the Armed Forces, 1987).

- With respect to raw materials, the United States and DOD rely on foreign sources for over twenty essential minerals. We are 90 percent dependent on foreign sources for manganese, chromium, cobalt, and platinum, coming mostly from the USSR and South Africa. In addition, we are 50 percent dependent for bauxite, zinc, tungsten, and cadmium (3, 4, 6).

- The navy purchases spare parts from various European sources: engine parts for a search and rescue ship come from Great Britain; Germany supplies diesel engine parts for the PHM (a patrol coastal missile hydrofoil ship); and hull, mechanical, and electrical equipment for the MHC coastal minesweeper are procured from Italy (6, 7).

Roderick L. Vawter, *US Industrial Base Dependence/Vulnerability, Phase I-Survey of Literature* (Washington D.C.: National Defense University Mobilization Concepts Development Center, Institute for National Strategic Studies, December 1986).

- In general, European nations are sources of dependency for complete systems or major subsystems and built-up components and chemical products. Chemical suits, heads-up displays, and electronics assemblies come from Europe. Japan and the Far East are sources of 90 percent of the semiconductors as well as semiconductor assemblies that DOD uses (4-6).

Ronald E. Yates, "Japan Claims Big Role in US Weapons Success," *Chicago Tribune*, 3 February 1991.

- The Japanese, in general, have been successful in penetrating not the "big ticket items" (planes, tanks, ships), but in "providing the critical brain cells," according to Graham McCarty, British defense industry analyst. Up to 80 percent of the components in some of the smart weapons used in the Gulf were produced by two hundred Japanese firms. "A recent report prepared by the American Electronics Association said twenty key components produced by Japanese electronics manufacturers are used in US weapons systems. Japanese firms are the sole suppliers of seven of the twenty vital components, the report said." Japanese-made technologies are in "night viewing equipment, air speed acceleration indicators, infrared missile homing devices, television tubes in aircraft cockpits, microwave weapons control and targeting systems, flat panel displays, advanced radiation communications equipment, submarine sensors, and video display terminals" (7.1 and 7.6).

- The Japanese produce the computer chips in the Patriot missile and the Tomahawk cruise missile (7.1 & 7.6).

Stuart Auerbach, "United States Relied on Foreign-Made Parts for Weapons," *Washington Post*, 25 March 1991.

• During the Gulf War several US defense contractors requested "rush" delivery from foreign companies for components used in military equipment. Japanese producers of semiconductors, video display terminals (for analyzing real-time intelligence data from reconnaissance planes), and battery packs to power command and control computers received such requests. France provided transistors for a Teledyne Corporation transponder for Identification of Friend or Foe uses. In addition, both France and Japan rushed electronic components for measuring and calibrating equipment. Finally, Great Britain surged production of radio gear and avionics for use in US weapon systems (1).

John T. Correll, "Lifeline in Danger," *Air Force Magazine* 71 (November 1988).

• Semiconductors from foreign sources are contained in Global Positioning Satellites, the Integrated Underwater Surveillance System, Defense Satellite Communications System, Fleet Satellite Communications System, AN-53B SSQ Sonobuoy, the F-16 Fighting Falcon, AM-6988 Poet Decoy (an expendable jammer), the Army Helicopter Improvement Program (OH-58 Kiowa), APG-63 Airborne Radar (for the F-15 Eagle), M1 Abrams Tank, and the F/A-18 Hornet (76).

Defense Budget Project, "Media Advisory: The Saudi Arms Sale: Impact on Defense Contractors," 26 October 1990.

• Fokker BV in the Netherlands supplies remote control systems for the Patriot Air Defense System (5).

Larry Grossman, "Industrial Base: The Supplier Bottleneck," *Military Forum* (May 1989).

• A critical optic component in the Bradley Fighting Vehicle is produced by Schott, a German manufacturer (45).

Testimony of Kenneth Bernhardt, consultant and former President, Ordinance Division, General Defense Corporation, US Congress, House Committee on Banking, Finance and Urban Affairs, *Defense Production Act Amendments of 1988 (H.R. 4037): Hearings before the Subcommittee on Economic Stabilization*, 100th Congress, 2nd session, 30 and 31 March 1988 (Washington D.C.: US Government Printing Office, 1988, Serial No. 100-56).

• Design and manufacturing process for all tank-fired anti-tank weapons out of the M-1 tank, 120 millimeter, came from Germany (63).

David W. Baird, "Hyster Gulfbound Foreign Trucks Miff Union," *Champaign-Urbana News Gazette*, 11 January 91, A.1 and A.14.

• Lift trucks with ten thousand pound capacity procured by the air force were built in Scotland, then shipped to the Danville, Illinois Hyster Company where workers installed the uprights and counter weights, then painted the trucks before shipment. Less than one-third of the value of the contract was represented by Danville jobs, according to Terry Payne, President of the Independent Lift Truck Builders Union.

US General Accounting Office, *Assessing Production Capabilities and Constraints in the Defense Industrial Base: Report to the Subcommittee on International Trade, Finance, and Security Economics of the Joint Economic Committee*, 4 April 1985 (Washington D.C.: US Government Printing Office, 1985 Serial No. GAO/PEMD-85-3).

• One TOW2 subcontractor depended wholly on foreign sources for its quartz optics, some M1 tank circuit boards were assembled in Mexico, some tank hybrid circuits came from Taiwan□□□(v.)

Paula J. Pettavino, "Could Our Shipyards Cope? If Not, Then What?" *Naval War College Review* XLI (Autumn 1988).

•Less than one percent of the crucial parts needed for US shipbuilding and procured from foreign sources are shipped on US flagships (53).