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**THE EFFECT OF IMPORTS OF GEARS AND GEARING PRODUCTS ON THE NATIONAL SECURITY**



**For information or comments concerning this report, please contact Brad Botwin, Director, Strategic Analysis Division (202) 482-4060. Copies are available for sale from the National Technical Information Service (NTIS) by calling (703) 487-4650 and requesting PB 93-192466.**

## EXECUTIVE SUMMARY

On October 17, 1991, the American Gear Manufacturers Association (AGMA) petitioned the Department of Commerce (DOC) to conduct an investigation under Section 232 of the Trade Expansion Act of 1962, as amended, to determine the effect of imports of gears and gearing products on the national security. Under the terms of Section 232, the President has authority to "adjust imports," should he concur with a DOC finding that a national security threat is present.

In its petition, the AGMA asserted that "the U.S. gear industry has filed (its) petition to illustrate the importance of our industry to the nation as a whole and promote action to ensure its continued viability." AGMA requested that "the entire range of remedies available under (Section 232) be examined and appropriate measures implemented," and further stated that "the U.S. gear industry seeks to avoid further deterioration by establishing a partnership with government to gain an equal footing with foreign competitors."

Section 232 (d) of the Act directs us to review the "domestic production needed for projected national defense requirements" and "the capacity of domestic industries to meet such requirements," among other factors. To meet these criteria, we focused our investigation on the Department of Defense's (DOD) statement that it requires an internationally competitive technically advanced gear production base able to participate in the development and production of state-of-the-art weapon systems.

BXA organized an interagency team of experts for this study effort, and conducted a comprehensive survey of all identifiable gear producers and importers. Due to the indefinite lapse of the Defense Production Act, we conducted this survey without mandatory data collection authority. As a result, some of the most important gear producers and importer/end-users chose not to provide the requested information.

As basic components of most industrial machinery and equipment, construction and agricultural equipment, motor vehicles, ships, and aircraft of all types, gears are critical to the industrial base. From a military perspective, gears are critical to both the construction and performance of nearly all weapon systems, either as components of the many different machines required to produce a particular weapons system, or as components of the weapon systems themselves.

The gear industry is customarily divided into four sectors: motor vehicle, general industrial, aerospace, and marine. The latter two sectors represent only about 10 percent of gear industry shipments, but about 85 percent of defense gear shipments. Captive producers represent about 75 percent of gear industry shipments, but only about 25 percent of marine gear and 40 percent of aerospace gear shipments.

Competitive Factors

U.S. gear industry performance has declined markedly since the early 1980s. This decline can be explained based on a combination of factors including: the relative competitiveness of the U.S. gear industry; the decline of U.S. gear end-users (i.e. increased gear 'imports' embedded in foreign-built finished products); technological advances that have led to the decreasing use of gears in end-products; lagging investment in R&D and foreign government activities in support of their domestic gear industries. Recent exchange rate movements have, however, worked in a countervailing direction to increase the relative competitiveness of U.S. gear producers.

Gear producers responding to our industry survey are notably optimistic about their future competitiveness. Sixty-five percent of companies responding believe their competitive prospects will improve over the next five years, 18 percent believe competitiveness will "stay the same," and only an additional 18 percent believe that competitive prospects will decline. Further, about half of U.S. companies responding to our gear producers survey reported that their companies possessed technology equal to or better than their major foreign competitors.

Commerce gear industry experts believe that it is unlikely that alternative technologies will replace gears in the most critical defense applications any time in the foreseeable future. For the larger market, it is likely that worldwide gear consumption will continue modest growth, despite the development of alternative technologies, as new markets replace the old.

Gear research and development (R&D) is critical to maintaining both the technical superiority and cost-effectiveness of U.S. weapon systems. Joint DOD/industry funding of a very active aerospace gear R&D program, for example, has allowed us to maintain technical leadership for gear systems used in helicopters and other aerospace systems. U.S. gear R&D has, however, trailed significantly behind the industry's international competitors, and also behind the average for all U.S. manufacturers.

Our foreign trading partners also maintain a series of trade barriers that can potentially pose impediments to U.S. gear exports. Although most foreign governments claim that they offer no support targeted to their domestic gear industries, other broad-based industry supports and/or support to major gear-consuming industries may be detrimental to the viability of the U.S. gear industry.

Economic and Trade Data

Overall gear industry shipments followed a downward trend over the 1988 to 1991 period. In contrast, the marine sector showed strong growth in 1991 over very low 1988 levels, and the aerospace sector showed only a modest decline.

Industry-wide imports accounted for a growing percentage of new gear supply (domestic shipments plus imports), rising from 13.5 percent to 18.0 percent over the four year period. In the aerospace and marine sectors, however, imports were flat over this period.

Defense shipment data were reported by companies responding to our producer and importer/end-user surveys. Due to the intermediate nature of gear products - i.e., they are incorporated into finished goods, it is likely that many producers are unaware of the ultimate end-use of their products. It is, therefore, probable that the reported defense share of gear shipments and imports is understated.

Reported defense shipments represented a substantial majority of gear shipments by the aerospace and marine gear sectors, but only around two percent of shipments by the automotive and industrial sectors. The reported import share of defense new supply was less than five percent, and stable over the survey period.

Although the gear industry has shown a steady decline in production worker employment, there has been a continuous increase in total output and productivity (measured as output per employee hour) as reported for the more aggregate Standard Industrial Classification code 35 (machinery, except electrical).

The Department of Labor cautions that continued declining employment in the gear industry will accelerate the loss of skills. While the supply of unskilled workers available to the gear industry is adequate to meet current and anticipated needs, the availability of skilled workers in a national security emergency is problematic.

Government Programs

The United States government has several programs and regulations in place that affect the gear industry. DOD, in particular, operates several grant programs through which it has provided significant support for gear industry R&D required to support the DOD's national security objectives.

A variety of other government programs available to assist the gear industry's revitalization efforts include: DOC/International Trade Administration export promotion, DOC/Economic Development Administration efforts to assist communities in adjusting to decreased defense procurements, and Small Business Administration business loans, among others.

The majority of gear producers responding to our survey stated that their competitiveness had been affected by the need to adjust their firm's business practices in response to U.S. government policies. Company concerns focused on procurement-specific problems, as well as on broader issues.

When producers were asked what adjustments should be made in U.S. government policies, the largest number of companies suggested the reinstatement of tax incentives for capital investment. A large number of companies also asked for the institution of "Buy American" preferences on government gear procurements, and for tougher enforcement of the unfair trade laws.

National Security Analysis

Due to recent substantial changes in the national security challenges facing the United States, it was not possible to develop a quantitative estimate of national security requirements for gears and gearing products to be incorporated into this investigation.

In lieu of such requirements, DOD was able to inform us that it anticipates that gear requirements will be substantially decreased in the near future as procurement is cut back by as much as half. Defense officials emphasized that the most likely contingencies would be for 'come as you are' regional conflicts such as Desert Storm, which would require that DOD be able to rely on a 'warm' industrial base prepared to meet unpredictable increases in short-term defense requirements.

Surge production capacity for a given year is defined as the maximum realistic level of production that a manufacturing establishment can achieve during a twelve month period. In the more defense-intensive aerospace and marine sectors, estimated surge production capacity increased only 54 percent and 53 percent respectively during the twelve month period. In the less defense-intensive gear sectors, industrial and automotive gear producing establishments reported an ability to increase capacity 135 percent and 132 percent respectively over twelve months.

Gear products and processes are, however, generally not fungible between the various gear sectors. This is particularly relevant for the defense-intensive marine and aerospace sectors which require greater precision and a great commitment of capital, labor and time than the industrial and automotive sectors.

Total reported lead times (from initial receipt of a customer's gear order to delivery) ranged from just seven weeks to more than three years. Generally, the higher the precision, the longer the lead time. The average lead time for defense gear orders was nearly 28 weeks, with marine gears having the longest lead times.

Companies responding to our producer survey were asked to identify and rank in order the top five bottlenecks affecting their ability to ramp-up to production capacity. Heat treatment was the bottleneck mentioned most often, followed closely by gear grinding and gear blank production. In a period of long-term declining demand for defense gears, it becomes increasingly difficult to justify maintaining excess capacity able to meet highly-demanding, and more costly defense specifications.

For the automotive and industrial gear sectors, defense gear usage is small, and it is likely that ample gear capacity would be available to meet needs during a national security emergency. In the more defense-intensive aerospace and marine gear sectors, however, it is possible that sufficient capacity may not be available to meet national security gear requirements.

However, it is unlikely that imports have significantly impacted the gear industry's ability to meet national security gear requirements. Imports as a percentage of new supply have been stable over the 1988-91 period in the aerospace gear sector, and have actually declined over this period in the marine gear sector. Imports as a share of defense new supply for these sectors have been even lower and have also been stable over this period.

The decline of the commercial gear sector, combined with the prospect of significant decreases in defense procurement, increases the economic pressure on U.S. gear producers. If these trends continue, the United States may become dependent on foreign countries for defense-critical gears in some industry sectors. There are both benefits and costs to relying on foreign suppliers for gears and other defense-critical components.

Allegations were made by U.S. gear producers that U.S. bidders had been disqualified from European gear procurements based upon their nationality. Details of these allegations have been provided to the appropriate DOD official who intends to seek resolution from his European counterparts.

Several independent gear producers further alleged that particular U.S. prime contractors have informed them that they will stop sourcing gears from independent U.S. producers by the end of 1994. U.S. primes denied that they intend to change their gear supplier mix, but emphasized that they must be certain of the long-term viability of gear suppliers.

U.S. primes further noted that some foreign gear suppliers have both sufficient financial resources to provide the necessary financing (i.e. to become risk/revenue sharing partners), and the production capability to reliably produce other low-compression aircraft engine components. Primes caution that it would take an average of two years to qualify new gear sources at Federal Aviation Administration and DOD standards if forced to abandon joint venture relationships with offshore producers.

We conclude that the substantial cost of system development leaves U.S. prime contractors with little alternative to seeking offshore risk/revenue sharing partners. In attempting to alleviate the national security concerns raised by the declining gear production base, we should ensure that we do not weaken prime contractors and thereby impose a substantial national security cost. However, it is at the same time important for the U.S. to maintain a competitive and technologically viable domestic gear production base.

Findings and Recommendations

The Department of Commerce does not find that gears and gearing products are being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security.

The Department reached this finding based on: 1) anticipated substantial decreases in defense procurements which will likely lead to significantly decreased defense gear requirements; 2) the low and relatively stable level of imports in the defense-intensive aerospace and marine gear markets; 3) the U.S. industry's continuing technological competitiveness and its optimism about its future competitiveness; and 4) the Department of Defense's proven record and continuing commitment to address sector-specific national security gear supply concerns when they may occur.

In light of the negative finding above, we do not include any recommendations to "adjust imports." We recommend the following, however, to address ancillary issues that arose during this investigation:

1. In fulfillment of President Bush's April 1990 Policy on Offsets in Military Exports, we recommend that consultations be initiated with foreign governments to examine the extent to which offset and/or coproduction commitments have led U.S. prime contractors to source gear products from foreign suppliers to the extent of raising national security concerns about the future viability of U.S. defense gear suppliers.

2. We encourage the Department of Defense to carefully consider the national security issues raised within this report, and recommend that it continue its significant effort to support defense-critical gear industry research.

3. We recommend that the Department of Defense continue to encourage its contractors and their independent gear suppliers to develop a cooperative sustainable partnership. This is particularly significant in light of assertions that important U.S. prime contractors intend to cease purchasing gears from independent U.S. gear producers by the end of 1994. These assertions could not conclusively be either confirmed or denied during the Section 232 investigation.

4. We urge the DOD-led Defense Conversion Commission to study the impact of declining military budgets and major weapons system terminations on domestic gear producers and other key subcontractor industries. In addition, the Commission should examine the potential to convert excess defense-dedicated production lines and employees to commercial products.

5. We recommend that the DOC's Economic Development Administration continue its contacts with the U.S. gear industry to provide technical assistance to the industry in its defense conversion efforts.

6. We reiterate the recommendation in our January, 1991 National Security Assessment of the U.S. Gear Industry that the industry take the initiative to consolidate into larger more technologically efficient firms that can both afford and justify investment in the latest technologies.

7. We further reiterate our recommendation that U.S. government and AGMA statistical representatives continue to work to rectify current data shortcomings and to explore the need for better government monitoring of the U.S. gear industry's performance.

## I. INTRODUCTION

On October 17, 1991, the American Gear Manufacturers Association (AGMA) of Alexandria, Virginia petitioned the Department of Commerce to conduct an investigation under Section 232 of the Trade Expansion Act of 1962, as amended, to determine the effect of imports of gears and gearing products on the national security. The Act states that:

> (T)he Secretary shall submit to the President a report on the findings of (the Department's) investigation with respect to the effect of the importation of such article in such quantities or under such circumstances upon the national security and, based on such findings, the recommendation of the Secretary for action or inaction ... (I)f the President concurs (with a Commerce finding that imports threaten to impair the national security, he shall) determine the nature and duration of the action that, in the judgement of the President, must be taken to adjust the imports of the article and its derivatives so that such imports will not threaten to impair the national security.

In its petition, the AGMA asserted that "the U.S. gear industry has filed (its) petition to illustrate the importance of our industry to the nation as a whole and promote action to ensure its continued viability." AGMA requested that "the entire range of remedies available under (Section 232) be examined and appropriate measures implemented," and further stated that "the U.S. gear industry seeks to avoid further deterioration by establishing a partnership with government to gain an equal footing with foreign competitors." A comprehensive summary of the allegations set forth in the petition is attached at Tab A.

On October 31, 1991, the Department of Commerce (DOC) determined that the AGMA petition met the appropriate regulatory criteria and formally initiated its investigation. The DOC announced its action in the Federal Register on November 6, 1991 (copy attached at Tab B). By law, the Secretary of Commerce has 270 days from the date of initiation of this case in which to conduct an investigation and forward her findings and recommendations to the President.

The Department conducted this investigation with assistance from the interagency community including the Departments of Defense (DOD), Labor, Treasury, State, and Justice; the International Trade Commission and the Federal Emergency Management Agency. In order to supplement data available from earlier government studies and other published sources, the Department conducted separate surveys of gear producers and gear importer/end-users (copies attached at Tab C). Additional information was gathered from public comments received in response to our Federal Register notice (summary of comments attached at Tab D), and from additional independent research.

Based on the information contained in the petition and on further analysis of trade and industry statistics, it was decided to analyze the gear industry by four end-use market sectors: automotive, industrial, aerospace and marine gears. (At the petitioner's request, automotive gears were from the outset excluded from consideration for any import-adjusting action which might result from this investigation. Information on automotive gears was collected primarily to evaluate the extent to which automotive gear production capacity might be available to satisfy national security requirements in other gear sectors.)

Regarding methodology, Section 232 (d) of the Act directs us to review the "domestic production needed for projected national defense requirements" and "the capacity of domestic industries to meet such requirements." To meet these criteria, we focused our investigation on DOD's statement that it requires an internationally competitive technically advanced gear production base able to participate in the development and production of state-of-the-art weapon systems.

Importance of the Industry to National Security

As Defense Secretary Dick Cheney has said, "(i)f the United States proves unable to compete effectively in areas of advanced technologies, it would incur the most severe economic and security consequences; markets would be lost, the U.S. industrial base would erode, and the United States would become increasingly dependent upon offshore technologies for its defense at the same time as its economic health weakens." The gear industry is clearly one such area of advanced technology, being a key component supplier to the majority of the 20 technologies identified by DOD as being most essential for maintaining the qualitative superiority of U.S. weapon systems; both in its own right where more precise gears are being developed to be stronger, smaller and quieter, and as a component of nearly every advanced weapon system. Helicopters are often referred to, for example, as "flying gearboxes," while tanks are known as "rolling gearboxes." Department of Commerce gear industry experts estimate that direct and indirect military consumption of gears account for approximately 20 percent of U.S. apparent consumption of non-automotive gears.

As noted in the Department of Commerce's January 1991 National Security Assessment of the U.S. Gear Industry:

> As basic components of most industrial machinery and equipment, construction and agricultural equipment, motor vehicles, ships and aircraft of all types, gears are critical to the industrial base. From a military perspective, gears are critical to both the construction and performance of nearly all weapon systems, either as

components of the many different machines required to produce a particular weapons system, or as components of the weapon systems themselves. Gears are produced in endless sizes and geometries, and can be found in virtually any factory or major weapon system in the world.

Commerce's National Security Assessment concluded that the continued viability of the domestic gear industry is critical to U.S. national security and economic competitiveness. As the Assessment further noted:

> A domestic gear industry provides a secure source of supply and maintains a U.S. presence in the continuing development of gear technology. As a highly specialized intermediate product, gear customers benefit strategically from a domestic source by having greater control over product quality and delivery schedules, and lower transaction, transportation and inventory costs.

Report Outline

This report begins with a description of the gear products under review, and the manufacturing process by which these products are built. This is followed by a description of the gear industry, and an assessment of the industry's international competitiveness. We next present analyses of industry economic and trade data, and of the impact of existing government programs on the industry's ability to meet emergency requirements. A national security assessment follows, focusing on both capacity and technology issues. The investigation concludes with our findings and recommendations.

## II. PRODUCT AND MANUFACTURING PROCESS DESCRIPTION

### Gear Products

Gears are compact toothed wheels used as positive-engagement, power transmission elements to determine the speed, torque, and direction of rotation of driven machine elements. The tooth form is usually based on the "involute" curve. This design is tolerant of small variations in center-to-center distance of mating gears, such as may arise during the manufacture of gearboxes, or which may be due to flexing of gear shafts during operation. A further advantage of involute gears is manufacturing economy. A single cutter can be used to cut a range of gears. Involute gears have been shown through practice to accommodate rolling and to minimize sliding contact of the tooth surfaces. Rolling contact produces less heat and increases the mechanical efficiency with which gears operate. Gear types may be grouped into four main categories: spur, helical, bevel, and worm gears; as well as into several important subcategories such as herringbone and rack-and-pinion.

### Spur Gears

Spur gears have straight teeth cut parallel to the rotational axis. Spur gears are the least expensive to manufacture and the most commonly used, especially for drives with parallel shafts. Spur gear teeth have an external, internal, or rack-and-pinion arrangement. The most common type is external teeth on the perimeter of mating cylindrical wheels, with the larger wheel called the "gear" and the smaller wheel the "pinion." The pinion and its mating gear rotate in opposite directions.

Internal gears, as the name implies, have teeth cut on the inside surface of a cylindrical ring, and their rotation is in the same direction as the input pinion. An internal gear is often set up with an internal "planetary" system in which a set of three or four smaller external toothed spur gears called planets mesh with the teeth of the internal gear, while also meshing with and surrounding a smaller central pinion (sun).

A rack-and-pinion gear has a straight bar with teeth cut across it which is driven by a pinion. This converts rotary motion into linear motion (or the reverse). The rack-and-pinion is used extensively in machine tools, lift trucks, power shovels and other heavy machinery.

### Helical Gears

Helical gears have teeth cut at an angle to the axis of rotation, rather than straight like spur gears. Thus, the contact line of the meshing teeth progresses across the face from the tip of one end to the root of the other, reducing noise and vibration characteristic of spur gears. Also, several teeth are in contact at any one time, producing a more gradual loading of the teeth

that reduces wear substantially. The increased amount of sliding action between helical gear teeth places greater demands on lubricants to prevent metal-to-metal contact. Further, since the teeth mesh at an angle, a side thrust load is produced along each gear shaft. Thus, thrust bearings must be used to absorb this load and maintain proper alignment.

A double helical gear, with tooth angles opposed can be used to cancel out the thrust. Double helical gears are usually manufactured with a small space between the opposing angles. An arrangement with no space between the opposed angles is called a "herringbone" gear. However, a herringbone gear is more difficult to produce, and it must be precisely aligned with its mating pinion to avoid interference.

## SPUR AND HELICAL GEARS

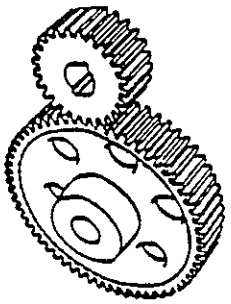


Figure 1. Spur gears.

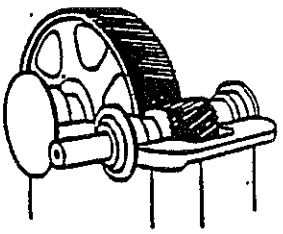


Figure 2. Helical gears.

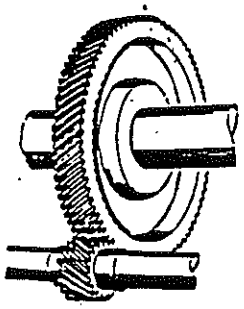


Figure 3. Single helical gears.

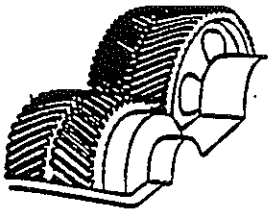


Figure 4. Double helical gears.

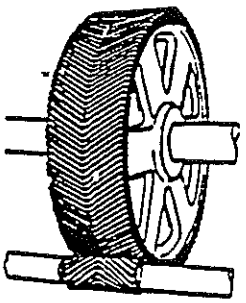


Figure 5. Herringbone gears.

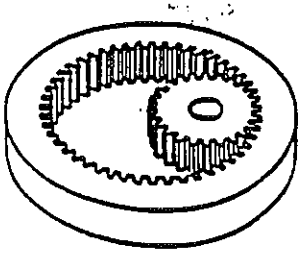


Figure 6. Internal gears.

Bevel Gears

Unlike spur or helical gears with teeth cut from a cylindrical blank, bevel gears have teeth cut on a tapered or conical blank. Bevel gears are used where the center lines of the input and output shafts intersect. Teeth are usually cut at an angle so the shafts (if extended) would intersect at a 90 degree angle.

It is often difficult to support bevel gears at both ends because the shafts intersect. As a result, one or both gears overhang their supporting shafts. This may cause the shaft to deflect, misaligning gears and accelerating wear. Shaft deflection may be overcome by straddle mounting the gear (not the pinion) with a bearing placed on each side where space permits.

Bevel gears may be straight toothed or spiral toothed. Straight toothed bevels have teeth cut straight across. They are subject to much of the same operating conditions as spur gears in that straight tooth bevels are efficient but somewhat noisy. They produce thrust loads in a direction that tends to separate the gears. Spiral bevels have curved teeth that make an action somewhat like a helical gear. This produces smoother, quieter operation. Thrust loading depends on the direction of rotation and whether the spiral angle at which the teeth are cut is positive or negative.

Hypoid gears resemble spiral bevels, but the shaft axes of the pinion and driven gear do not intersect. This configuration allows both shafts to be supported at both ends. Although hypoid gears are stronger and more rigid than most other types, they are also one of the most difficult to lubricate because of high tooth contact pressures.

High levels of sliding between the tooth surfaces of hypoid gears reduces efficiency. In fact, the hypoid combines the sliding action of the worm gear with the rolling movement and high tooth pressure often associated with the spiral bevel. In addition, both the driven and driving gears in the hypoid set are made of steel, which further increases the demands on the lubricant. Special lubricants with both oiliness and anti-weld properties are required to withstand the high contact pressures and rubbing speeds in hypoids. Despite these demands for special lubrication, hypoid gears are used extensively in rear axles of automobiles with rear wheel drives, and are being used increasingly in industrial machinery.

# BEVEL GEARS

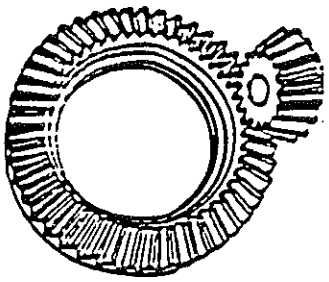


*Figure 7. Straight bevel gears.*

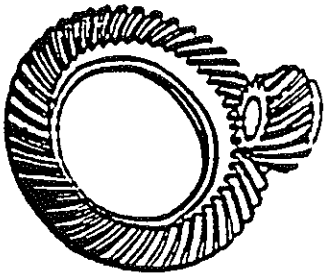


*Figure 8. Spiral bevel gears.*

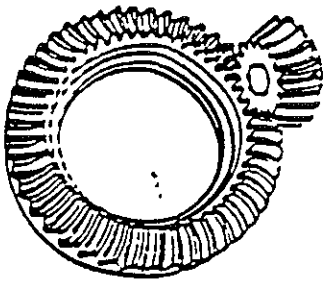


*Figure 9. Zerol bevel gears.*

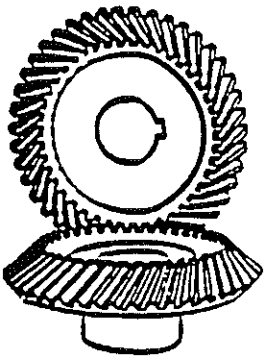


*Figure 10. Skew bevel gears.*

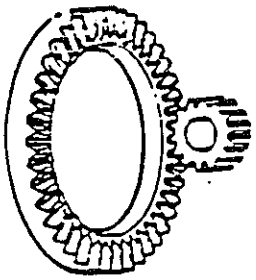


*Figure 11. Face gears.*

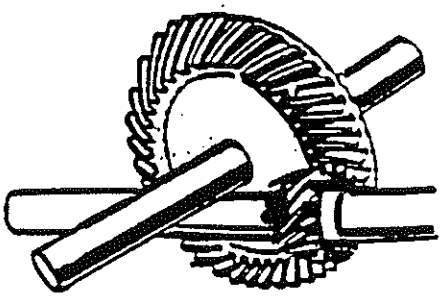


*Figure 12. Hypoid gears.*

Worm Gears

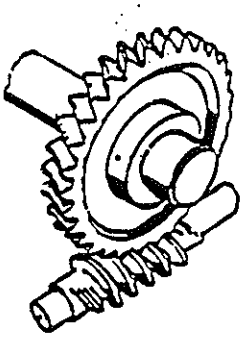
Worm gears consist of a screw-like worm or pinion that meshes with a larger gear, usually called a "wheel." The worm acts as a screw, and may make many revolutions to pull the wheel through a single revolution. In this way, a wide range of speed ratios as high as 70 to one can be obtained in a single reduction.

Most worms are cylindrical in shape with a uniform pitch diameter. However, a double-enveloping worm has a variable pitch diameter that is narrowest in the middle and greatest at the ends. This configuration allows the worm to engage more teeth on the wheel, increasing load capacity. In most worm gears, the wheel has teeth similar to those of a helical gear, but the tops of the teeth curve inward to envelop the worm. As a result, the worm slides rather than rolls as it drives the wheel. Because of this high level of rubbing between the worm and wheel teeth, the efficiency of worm gearing is lower than other major gear types.

WORM AND OTHER GEARS

Figure 13. Cylindrical worm.

Figure 14. Hour glass worm.



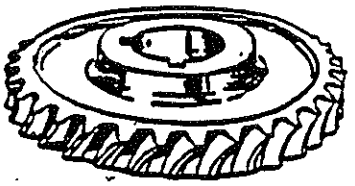


Figure 15. Double enveloping worm gear.

Figure 13. Single enveloping worm gears.

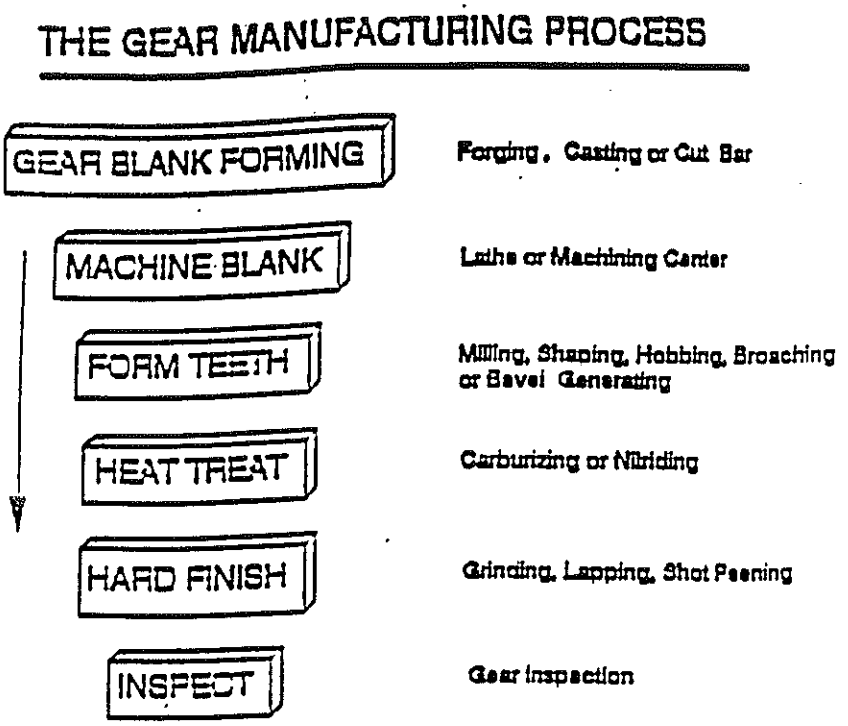
Gear Manufacturing Process

The manufacture of high precision gears is one of the most difficult of modern manufacturing processes; and can involve over 200 steps if all inspections and tests, finishing and plating operations are counted. The process begins with a gear blank either forged, cast or cut from bar stock roughly in the size and shape of the finished gear. The blank is normally made of steel alloy or bronze depending on its application. Nickel, chromium, vanadium, and molybdenum are important alloying agents. Various considerations in the selection of materials include toughness, wear and fatigue resistance, responsiveness to heat treatment, machinability and corrosion resistance. Bronzes are frequently used with worm gears because of the metal's self-lubrication qualities, and the problems associated with sliding contact in worm gears.

First, the gear blank is machined, normally on a lathe or machining center, to establish perpendicularity between the bore and the face of the gear, and between the outside diameter and the bore. This operation establishes reference surfaces which are used to register the part during the remainder of the manufacturing process. Machining may also create oil channels, splines, and other features in the blank as needed. After this initial machining, teeth are generated by any of several methods depending on the type of gear being manufactured.

Teeth generators are known as shapers, hobbers, bevel generators, and broaching machines.. Shapers have a cutting tool that reciprocates up and down to cut a tooth profile into the gear blank. The gear blank is indexed to rotate synchronously with the motion of the cutting tool. Shapers are used to cut spur gears and straight internal gears.

Hobbers have a cutting tool (a "hob") that rotates synchronously with the gear blank, and which may be used to cut spur type or helical gear teeth. A cylindrical hob has numerous flat cutting teeth jutting up from its surface that profile and cut the teeth on the gear blank as they rotate. Bevel generators operate similarly, except that the relative position of the cutting tool to the gear blank is set at an angle. The angle of the bevel generator can be adjusted to the required position.




Broaching machines use hydraulic pressure to push a tapered pole up to eight feet in length (the 'broach') through a cylindrical ring (the 'gear blank') to cut internal gears, and may be designed to cut straight or helical teeth. The broach contains columns of serrated cutting edges along its length that gradually build up to the profile of the teeth it is cutting. A broach is very expensive, and requires high production volumes for efficient use. Broaching machines are commonly used in the auto industry, where a machine may be dedicated to making a single gear. In one auto plant, for example, a broaching machine was being used to produce a six inch internal "annulus" gear every 32 seconds, or about 112 copies an hour. A machine called a shaver is often used to remove additional "shavings" from teeth already generated, to get teeth closer to final profile before heat treatment. The shaver has serrated teeth that rotate with the tooth blank.

After the teeth are generated, most workpieces are heat treated. Heat treatment is necessary to harden the gear and give it longer life and better performance, and to relieve stresses built up in the gear during previous operations. Heat treatment may be used to through-harden or surface-harden the gears depending on the application. Through hardening hardens the gear throughout its interior to Rockwell 30-50 by heating the blank to about 1500-

1600 degrees Fahrenheit, and then "quenching" (quick freezing). Hardness will vary with the molecular composition of the material. When through hardening, the surface is at temperature longer than the interior of the workpiece, and will be somewhat harder than the interior.

With surface hardening, only the surfaces of the gear teeth are hardened (to about Rockwell 60). Surface hardened gears can achieve significantly greater power densities, and thus be made smaller and lighter, and still transmit more torque than through-hardened gears. Most aerospace gears and (increasingly) large marine gears are surface hardened while automotive and most industrial gears are generally through hardened.

For surface hardening, two methods of heat treatment are commonly used in the gear industry, carburizing and nitriding. Carburizing is done in a carbon rich atmosphere at temperatures of 1600-1800 degrees Fahrenheit, and can take anywhere from an hour to more than a day depending on surface area, desired depth of hardening, temperature, and furnace capability. Carbon is gradually fused into the surface of the teeth. When the desired depth is reached, the gear is quenched to stabilize its molecular structure. Quenching invariably causes distortions that will later require grinding. Sometimes a "quench press" or mold of the gear is inserted over the gear to minimize this distortion. This is the most difficult operation in gear making, and one of the most difficult in metal working because of the large number of teeth, all of which must be within specified limits.

Nitriding is done at lower temperatures, but takes longer than carburizing. Instead of carbon, nitrogen is fused into the tooth surfaces. Temperatures of 1000 degrees Fahrenheit are commonly used. Special alloys containing such elements as nickel or aluminum are required to optimize the treatment. As a result of the lower temperatures used, nitriding causes less distortion to the gear teeth during the quenching operation.

Post heat treatment operations take several forms. For many applications, lapping with abrasive compounds is used to remove minor distortions and burrs, and polish the gear tooth surfaces. A lapping tool with the same teeth and the same size as the gear may be run in place with the gear for several hours. This is common for through hardened gears.

Grinding is necessary to remove dimensional distortions caused by heat treatment and quenching processes when tolerances must be held below .001 of an inch. If too much surface is removed, the effects of heat treatment can be negated. Generally, grinding involves using a wheel contoured or "dressed" to the desired tooth form. Cubic boron nitride (CBN), nearly as hard as diamond, is rapidly gaining acceptance as an abrasive for higher volume applications. CBN grinding requires specialized machine

tools, and establishes a beneficial compressive stress in the gears. Using CBN grinding, Honda, for example, is able to use smaller gears than would be possible using conventional processes.

Grinding to precise tolerances requires special environmental conditions. In some instances, rooms have floors physically detached from the rest of the factory to prevent vibrations from interfering with the grinding process. Measures must also be taken to control the temperature of the gear and surrounding area to prevent thermal distortion and to reduce levels of suspended dust in the air. Production costs rise rapidly with greater precision as dimensional measurements and inspections are conducted throughout the production process. The finished gear will be tested for vibration, noise, load, fatigue and wear resistance.

## III. INDUSTRY DESCRIPTION

Gears are essential components used in industrial machinery and equipment, construction and agricultural equipment, appliances, motor vehicles, ships and aircraft of all types. For purposes of this investigation (and in general industrial practice), the gear industry is divided into four sectors distinguishable by end-use orientation, manufacturing requirements, and differences in the gears themselves.

The motor vehicle sector is the largest sector, accounting for about 75 percent of gear shipments. The industrial gear sector represents a further 16 percent of shipments and is the most diverse in selling gear products to a wide range of machinery and equipment makers. The aerospace gear sector produces among the highest precision gears, with about five percent of industry shipments; and along with the smaller marine sector (three percent of shipments) are the most important to defense.

### Sector Descriptions

The motor vehicle gear industry is concentrated in Michigan, Indiana, New York and Ohio. General Motors (GM) has the largest gear operation in the world with plants scattered around the Eastern Great Lakes states. GM operates seven plants which produce and assemble transmissions under the name Hydramatic, and two axle facilities under its Saginaw Division. GM's Ypsilanti (MI) gear facility is a major gear cutting plant and feeds loose gears and other parts to other GM gear facilities.

Ford also maintains a large gear and axle operation with ten facilities in the Midwest. Ford's major gear cutting plant is in Livonia, MI. Chrysler's Acustar Division has major gear plants in Kokomo, IN; Syracuse, NY; and Detroit, MI. Mack Trucks has its own transmission operation in Hagerstown, MD. Several other companies, including Eaton, Dana, Rockwell and Borg-Warner, manufacture truck transmissions and axles.

The industrial and marine gear sectors are more geographically dispersed, although about half of the workers in these sectors are located in Wisconsin, Illinois, Indiana and Pennsylvania. A large cluster of firms lie within a 150 mile radius of Chicago. Some of the major companies include Falk and Milwaukee Gear in Milwaukee, WI; Caterpillar in East Peoria, IL; Fairfield in Lafayette, IN; and Philadelphia Gear in King of Prussia, PA.

The aerospace sector is composed of several major operations that both cut gears and assemble gearboxes, and a group of smaller operations that builds loose gears to order. The smaller firms operate primarily as subcontractors to larger companies, but also on occasion provide replacement parts for the DOD and others. Major players include Litton and Aircraft Gear in Chicago, Speco in Springfield, OH, and Lucas Aerospace soon to consolidate in Park

City, UT. Captive operations with significant gear production include Allison Gas Turbine in Indianapolis; Garrett in Phoenix; Sikorsky and Textron Lycoming in Stratford, CT; and Textron Bell in Fort Worth. Examples of smaller operations include Arrow Gear in Downers Grove, IL; Riley Gear in Tonawanda, NY; and ACR in Mount Clemens, MI.

Industry Structure

The gear industry is structured into three types of business organizations. These are: 1) "captive" shops that supply a single customer's (usually a parent firm's) gear requirements; 2) "integrated jobbers" that generally supply anywhere from a few to many customers often specializing in a particular industrial category and offering a range of specialized services; and 3) "job shops" that build-to-order for many customers, but furnish little or no engineering services.

By most measures (e.g. dollar volume, employment, investment), captive organizations dominate the gear industry. In 1988, almost 78 percent of total U.S. production of open and enclosed gears was done by captive firms. However, this large percentage is heavily weighted by the captive auto gear companies. While about 90 percent of the shipments by the motor vehicle sector in 1988 were captive, slightly less than 40 percent of combined shipments of the other three industry sectors were captive.

Table III-1
1988 Percent Captive Shipments
By Major Gear Sector
(in $000s)

| Sector | Total Shipments | Captive Shipments | Percent Captive |
|---|---|---|---|
| Motor Vehicle | $10,202,372 | $9,185,450 | 90.0% |
| Industrial | 2,101,791 | 887,801 | 42.2 |
| Aerospace | 725,097 | 258,418 | 35.6 |
| Marine | 356,295 | 83,013 | 23.3 |
| Total | $13,385,555 | $10,414,682 | 77.8 |

Source: National Security Assessment of the U.S. Gear Industry, U.S. Department of Commerce, 1991.

Captive firms typically produce a limited range of gears in large volumes to meet the specific requirements of a single customer. Given sufficient production volumes, it is cheaper to produce gears in-house on dedicated equipment than purchase them from an outside source. Moreover, gears are integral subsystems that must operate

effectively in larger end-products. Each firm that makes final products (e.g. autos, tractors, helicopters, printing presses, power shovels) must use a customized gear system for each model, and must work closely with its gear supplier to do so.

It is not surprising to find captive gear firms affiliated with some of the largest and best-known U.S. companies. In addition to the auto companies, others such as John Deere, Caterpillar, General Dynamics, Cummins Engine, Mack Trucks, Sikorsky, and Textron Lycoming maintain captive gear shops that provide a significant amount of their gear requirements. While the captives generally do most of their own work, they also at times buy and sell gears to complete their product line.

The integrated jobbers, though smaller than many of the captives, are generally mid-sized or larger gear companies with annual sales often exceeding $50 million. These firms supply mid-sized original equipment manufacturers (OEM) which are too small to economically maintain captive gear operations. Integrated jobbers will also supply the large captives when the opportunity presents itself, and other customers including the military. The integrated jobbers offer design and engineering services, and usually manufacture both loose gears and complete gear systems. However, integrated jobbers also frequently build to customer drawings and specifications, which incidentally reduces their product liability risk. Many of the integrated jobbers specialize in certain market categories usually based on a narrow range of gear sizes and precision, and on the special expertise required for a particular family of end-market applications.

Eaton, Borg-Warner, and Dana, for example, provide gear systems to truck manufacturers. Cincinnati Gear, Westech, General Electric, Westinghouse, Falk and Philadelphia Gear supply marine gears. Speco, Litton, International Gear (Argo-Tech), and Lucas Aerospace furnish gear systems to aircraft and helicopter companies. Others like Fairfield and Regal-Beloit have a broader focus and sell to a variety of OEMs.

Job shops are the most numerous form of business organization within the gear industry. In terms of dollar volume, employment, and investment; however, job shops represent less than five percent of the gear industry. Although few job shops supply any gears to the automotive business, their share of the non-automotive gear sector is closer to 20 percent. Job shops are distinguished from integrated jobbers by their smaller size, lack of engineering staff, and their inability to produce open gears.

Job shops exist because of market demand for a large variety of unique gears in small quantities. Typically, job shops bid on drawings supplied by customers, with many sales also made to integrated jobbers and captive producers. Job shops are mostly privately-owned by a family or by a few engineers, and many were founded by people formerly employed by a captive producer or integrated jobber. Marketing is frequently accomplished through distributors or sales representatives.

Although most gear companies fit into one of the three categories, others are borderline, and may exhibit features of more than one category. For example, some job shops can provide design and engineering services if pressed to do so, and others are in transition with ambitions of moving from job shop to integrated jobber. In addition, some integrated jobbers resemble captive shops in selling the bulk of their production to only one or two customers.

Factors Influencing Industry Structure

The structure of the gear industry is influenced by four fundamental criteria. First, gears are predominantly "customized" products with design and engineering application (i.e. end-user) determined. Once made, a gear system is essentially "dedicated" to its application, and cannot be substituted elsewhere. End-product design is, therefore, very important in defining both the market size and the technical constraints of a gear system.

Second, end-users requiring large production quantities are in a position to spread overhead costs over these larger volumes, and bring gear production in-house. The large volume producer is able to dedicate production lines to produce single systems at lower costs than obtainable in the open market. It would be very risky for an independent gear producer to invest in dedicated production lines, without ironclad customer assurances of future sales. Thus, independent gear manufacturers tend to have more flexibility built into their production lines which expands their market scope. For production of a single product, however, flexible lines cannot most often compete on a cost basis against the dedicated lines of the large captive producers.

Third, gear applications are numerous and diverse with tens of thousands of unique gear part numbers in circulation. Gears are produced in sizes ranging from a fraction of an inch to over 30 feet across. Gears can vary in relative dimensions, size, and pitch diameter, and in gear type, material, and precision. The entire gear market is the sum of hundreds of specialized niches. These niches require production quantities ranging from very large to only one unit; and make varied demands on the size, strength, speed, torque and precision of gear systems.

Fourth, gears are among the most difficult metal products to manufacture due to their geometric complexity and to the demanding precision of their specifications. Many gear dimensions, for example, must be controlled within thousandths of an inch, or tighter dimensions. Machining time is very high relative to workpiece weight, particularly for ground high-precision gears. Further, gear cutting and grinding equipment are among the most expensive machine tools. The accessories and cutting tools used on these machines are also among the most complex and expensive, both to buy and maintain. It is very important for design and process engineers to work closely together to achieve optimum quality, ease of manufacture, and efficient production at acceptable cost.

## Standard Industrial Classification Treatment of Gears

Existing statistical categories make it very difficult to accurately track gear industry shipments, imports and exports. Many analysts have recognized the need for better statistical coverage of gear-related imports and exports, and for a consolidation of domestic data currently reported in several different and unrelated statistical categories.

The Standard Industrial Classification (SIC) system is an establishment-based (i.e. factory or plant level) system used by the government to collect economic and statistical information about the U.S. economy. About 460 SIC Codes are used to define all manufacturing industries, and another 400 cover the rest of the economy. Gear data is reported in three of these SIC categories: 1) SIC 3714 (Motor Vehicle Parts and Accessories); 2) SIC 3728 (Aircraft and Engine Parts); and 3) SIC 3566 (Speed Changers, Industrial High-Speed Drives, and Gears).

Establishments engaged in manufacturing automotive power transmission equipment are classified in industry SIC 3714. Since this SIC category includes a wide variety of other automotive subsystems and parts, gearing data is thereby concealed. In 1982, the Bureau of the Census established a more narrowly defined five-digit Product Class 37146 - Drive Train Components, new, except Wheels and Brakes - that includes motor vehicle transmission systems. This class was further divided into seven-digit Product Codes that include separate codes for transmissions, gear shifters, drive shafts, universal joints, axles and parts, and several other items. Detail at the seven-digit product level is published only once every five years in the Commerce Department's Census of Manufactures. Five-digit product class data, however, is published in intervening years in Commerce's Annual Survey of Manufactures. Commerce gear industry experts estimate that transmissions account for about 60 percent of the value of items within this five-digit SIC class.

Using the 60 percent rule-of-thumb, estimated 1990 shipments of gearing for on-highway vehicles were $9.8 billion, although the value of the actual toothed elements in these transmissions was much lower. Gears represent only about eight percent of the value of a passenger car transmission, with the rest accounted for by shafts, bearings, seals, casings and assembly costs. The toothed element value of truck transmissions can run from under ten percent for minivans to about 20 percent for large semis since such gears are both larger and more numerous than in passenger cars. The toothed element portion of the reported value of the overall automotive transmission market is roughly ten percent (about $980 million in 1990).

Establishments that manufacture aerospace gearing are classified in SIC 3728. As in SIC 3714 above, aerospace gear information is concealed by the many other aerospace related parts that make up this four-digit SIC category. In the five-year Census of Manufactures, aircraft mechanical transmission equipment (AMTE) is

reported in two seven-digit product codes. Product Code 37281-13 is AMTE for military aircraft and all other aircraft built to military specifications, while product Code 37281-15 is AMTE for civilian aircraft. In 1987, Census reported shipments in 37281-13 totalled $690 million, and shipments in 37281-15 totalled $356 million for a combined total of $1,046 million. This represents about six percent of the total for five-digit Product Class 37281.

The five-digit product class includes AMTE and other items such as hydraulics and landing gear whose shipments over time do not change in a predictable or consistent manner relative to each other. It is, therefore, difficult to accurately estimate aerospace gearing from the SIC five-digit level currently available. One aerospace gearbox company estimated that toothed elements comprise about 50 percent of the gearbox value, although this is a very general estimate.

Establishments engaged in manufacturing industrial or marine gears are classified in SIC 3566, the only SIC code established exclusively for the gear industry. Before the 1972 establishment of SIC code 3566, industrial and marine gear data was part of a more broadly defined SIC code called "Mechanical Power Transmission Equipment, Except Ball and Roller Bearings." From this information, it is possible to reconstruct gear shipments for these sectors from the 1950s forward that correspond to the current SIC 3566. There is no way, however, to reliably disaggregate marine sector information from industrial.

With the establishment of SIC 3566, more comprehensive and detailed statistical information for the industrial and marine sectors has been collected on an annual basis. This information includes the number of establishments, production workers, production worker hours and wages, cost of materials, shipments, value added, new investment, and other data. Although the toothed element portion of industrial gears varies over a wide range, industry sources estimate that it is about 30 percent of aggregate shipments. Toothed elements may represent over 80 percent of the value of the main reduction gears of ships, while the value of toothed elements for recreation craft marine gears is much lower.

Users of this information should be aware of several accounting problems which generally apply to all SIC codes. First, as intermediate products, gears may be shipped several times before becoming part of a final product. Gear producers classified within SIC 3566 may, for example, ship products such as open gears to other gear firms who would then assemble the open gears into a gearbox which also would be classified in SIC 3566. Gear-related shipments by both of these firms would be counted in SIC 3566 resulting in some double-counting.

Second, many plants produce open gears and assemble them into gearboxes at the same location. In addition, a few operations assemble gearboxes and mount them on final machinery or vehicles in the same plant. However, Census only captures shipments that leave the factory. Thus, if gear production and its mounting on a

tractor take place in the same factory, Census will count the tractor, but not the gearing. In this instance, the gearing portion is under-counted.

Third, while SIC 3566 is an industry classification made up of establishments whose "primary" production is industrial or marine gearing, most establishments also produce "secondary" products, such as couplings, bushings, or aerospace or motor vehicle gearing. These secondary products are included in industry totals and may distort shipment totals, as well as other data such as employment and new investment. In 1987, 91 percent ($1,343 million) of SIC 3566 shipments of $1,477 million (excluding miscellaneous receipts of $92.4 million) were gearing, while the other nine percent included various secondary products.

In the opposite direction, secondary products produced in other industry sectors (identified under other SIC codes) may include industrial or marine gearing. In 1987, a total of $198.4 million of gearing was identified as secondary product in other industries. Total product shipments of industrial and marine gearing in 1987, reported as either primary or secondary products was $1,541.4 million.

## IV. COMPETITIVE FACTORS

U.S. gear industry performance, measured in shipments, employment, profitability, or by any of a number of other indicators, has declined markedly since the early 1980s. This decline can be explained based on a combination of factors including: the relative competitiveness of the U.S. gear industry; the decline of U.S. gear end-users (i.e. increased gear 'imports' embedded in foreign-built finished products); technological advances which have led to the decreasing use of gears in end-products; lagging investment in R&D and foreign government activities in support of their domestic gear industries. Recent exchange rate movements have, however, worked in a countervailing direction to increase the relative competitiveness of U.S. gear producers.

### Competitiveness Self-Assessment

Gear producers responding to our industry survey are notably optimistic about their future competitiveness. Of the 124 companies responding to this question, 22 (18 percent) expect that their firm's competitive prospects will "improve greatly" over the next five years. Fifty-eight (47 percent) firms believe their competitive prospects will "improve somewhat," and 22 companies (18 percent) believe competitiveness will "stay the same." Only 18 firms (15 percent) believe prospects will "decline somewhat," while only four firms (three percent) believe that competitive prospects will "decline greatly." Defense-intensive gear producers are, however, over-represented among the firms predicting declining competitive prospects, reflecting likely apprehension over anticipated cutbacks in defense procurements.

Among companies expecting improved competitive prospects, a recently-acquired U.S. gear producer notes that it expects improved access to capital through its Japanese parent, and a German-owned company expects that its recent investments will "pay off." Two U.S. aerospace gear producers expect that their recently-installed manufacturing cells will aid competitiveness, and another company cites anticipated success from its new powdered metal gear line. Several companies report that an increased dedication to quality will improve their competitiveness. Other factors cited as competitive advantages include: experienced labor, quick service and delivery, and technological innovation.

Companies expecting decreased competitiveness cite such factors as insufficient capital (primarily industrial gear firms), foreign unfair trade practices (aerospace and industrial gear producers), and co-production agreements entered into by U.S. prime contractors (cited by aerospace gear producers). Other factors cited as competitive disadvantages include: high costs of regulatory compliance and health care, erosion of the industry's U.S. customer base, and decreasing U.S. defense budgets.

About half of U.S. companies responding to our gear producers survey reported that their companies possessed technology equal to or better than their major foreign competitors. U.S. gear producers who responded that foreign competitors did possess unique technologies cited the following: German superiority in grinding and inspection; Japanese expertise in manufacturing process technology; and German, French and Japanese capability in computer modeling of gear meshes. One leading gear machine tool manufacturer stated that foreign gear companies benefit from cooperative product development efforts between gear manufacturers and their suppliers, rather than from access to any particular technology.

When importers were asked to identify their major competitive advantages over the next five years, they identified various factors. One European-based producer notes its long-term risk/revenue sharing involvement in commercial engine programs with both of the leading U.S. aircraft engine producers. Another European-based company cites its stability and worldwide service capability, and a third European company cites its high-technology products. Importers perceived their competitive disadvantages to include: unfavorable exchange rates (cited by two of the European-based companies above and by a leading importer of Japanese gears); and a generally difficult U.S. business climate (cited by a fourth European-based company).

When asked what U.S. gear producers should do to increase their competitiveness, one leading farm equipment manufacturer (and gear importer) stated that U.S. gear companies should do what the U.S. government has already advised them to do: spend more on R&D, combine operations and close economically inefficient factories. A large number of other importers suggested that U.S. gear producers invest more in state-of-the-art production equipment. Both a large U.S. aerospace producer and a leading foreign aerospace gear manufacturer suggested that U.S. gear makers work more closely with their larger customers and take advantage of favorable exchange rates to increase exports.

Only a minority of U.S. gear producers responding answered that they had lost major sales or markets to imported gearing since 1988. Nevertheless, several of the U.S. gear makers answering this question affirmatively reported that imports had significantly affected their firms' market niches.

One company stated that Japanese firms now capture 20 percent of the industrial gear market, up from near zero in 1988. Similarly, another U.S. industrial gear producer stated that Japanese gear firms have come to dominate the machine tool, copier and overhead door markets. Two divisions of a diversified auto parts supplier reported that their sales have been devastated by very low-priced aftermarket imports. A leading U.S. aircraft engine manufacturer, conversely, notes that it has

'lost gear markets' by entering into revenue sharing agreements with a European gear company, but that it may never have been able to proceed with the overall aircraft engine development without financial and technical assistance from its risk and revenue sharing partners.

Gear importers were also asked to rank the importance of various factors to the purchasing decisions of their customers, the original equipment manufacturers (OEM). Forty-four of the companies responding to the importer survey ranked the eleven factors, although not all of them commented on each criterion. The companies designated each of these eleven factors by four categories: extremely important, very important, not very important or not at all important.

Reliability was considered the most crucial criterion. More than half of the companies responding (27 out of 44) rated reliability to be extremely important; the remainder, but one, rated it very important. No company declared it not at all important. Delivery time was the next most important factor, followed very closely by availability, price and service. All of these were considered extremely important by 17 companies, and again, no company declared them not at all important. Engineering/design fared similarly.

Life-cycle cost, while rated very important by 24 out of 43 companies, was identified as either not very important or not at all important by 10 companies and as extremely important by only nine. Warranties were rated overall slightly less important than life-cycle cost.

Training and brand of gears were both rated either not very important or not at all important by more than half of the companies responding. The factor deemed by the importers to be least important to their OEM customers was country of origin of the gears or gearing products.

Decline of U.S. Gear End-Users

As producers of an intermediate product, gear manufacturers' prosperity is often closely tied to the success of their customers. The relative lack of standardization among gear products has generally mandated close cooperation between gear producers and gear end-users, and has historically discouraged sourcing from distant foreign suppliers.

As amply demonstrated in the Department of Commerce, January 1991 National Security Assessment of the U.S. Gear Industry, however, most U.S. gear end-markets experienced their worst contraction of the post-World War II period during the 1980s. From the late 1970s to the late 1980s, for example, constant dollar farm equipment shipments dropped 63 percent, construction equipment

shipments decreased 50 percent, and oil field equipment shipments were down 73 percent. The U.S. gear industry lost sales opportunities as many of its leading customers sold fewer end-products containing fewer gears, and as end-product imports (most often containing foreign-built gears) increased.

Technological Advances

Technological advances have in some cases led to decreased demand for gearing products, both through the development of alternative technologies and through increased efficiency in products continuing to rely on gears. Commerce gear industry experts state that it is impossible to quantify the extent to which alternative technologies (e.g. pneumatic and hydraulic) are displacing gears as a power transmission provider, although it is clear that these alternatives are being used in an increasing number of applications. Commerce experts note, for example, that pneumatic and hydraulic power transmissions are particularly suited for use in material handling and motion control applications. Additionally, improvements in electric motors have eliminated the need for gears in many applications. For certain functions, gear systems remain more effective, while for other systems, alternative technologies have been proven to have an advantage.

The encroachment of alternative technologies into the most defense-intensive gear applications remains largely in the experimental stage. A leading aircraft engine producer, for example, reports that it is conducting research to develop alternative power transmission systems for its engines, but that it has not yet developed a commercially-implementable alternative system. Leading helicopter producers and a leading aerospace gear producer are, however, working together to develop a lighter and quieter Advanced Rotorcraft Transmission which will continue to rely on gears for power transmission.

Mitsubishi Heavy Industries' shipyard in Kobe, Japan made a notable breakthrough this year when its experimental Yamato 1 vessel demonstrated the use of a magnetohydrodynamic (MHD) propulsion system. The MHD system uses a gear-less, propeller-less water-propulsion system based on recent advances in superconducting technology. Although the ship's top speed is currently only about seven miles per hour, Japanese researchers predict that the MHD system could reach 115 miles per hour and become a marketable product within the next decade. Japan's Ship and Ocean Foundation officials have expressed their desire to limit the use of MHD technology to peaceful applications. Until alternative sources of MHD technology are developed, this limitation should significantly delay the day that the technology will be available to power U.S. military applications.

The machine tool industry represents an archetypical example of the move away from gears. Machine tool producers have replaced gears with servo-drives in some applications, and have been building increasingly efficient machinery. In some cases, a single machining center can replace as many as 12 conventional machine tools, and in so doing, can displace many gears.

Commerce gear industry experts believe that it is unlikely that alternative technologies will replace gears in the most critical defense applications any time in the foreseeable future. For the larger market, it is likely that worldwide gear consumption will continue modest growth, despite the development of alternative technologies, as new markets replace the old.

Exchange Rates

Exchange rate movements have worked to increase the competitiveness of U.S. gear makers and other U.S.-based manufacturers. The U.S. dollar has fallen 50 percent against the Japanese yen since February 1985, and 53 percent against the German mark. During the period 1988 to present, however, the dollar's value expressed in yen and marks has been relatively stable.

The lower exchange value of the dollar has made U.S. exports and domestic products which compete with imports more price competitive. Other things equal, the lower value of the dollar should have increased the foreign demand for U.S.-made gears and related products. At this stage, the price effects of exchange rate movements on U.S. exports of gears have probably largely played out, but exchange rate movements which have occurred since 1985 have likely enhanced the gear industry's competitiveness.

Wage Rate Competitiveness

In national currency terms, the annual rate of increase for total compensation for production workers in SIC 35 (machinery except electrical) for the United States for the period 1984-90 was 2.7 percent, the lowest rate of increase for 12 major gear-producing countries in the table below. (Less aggregated data is not available.) Given the exchange rate movement noted above and the relatively modest wage increases in the U.S. machinery industry, it is probable that wage rate trends will continue to enhance U.S. gear industry competitiveness.

Table IV-1
**Rate of Increase of Total Compensation for Twelve Countries (1984-1991)**

| U.S | Can | Jap | Kor | Sin | Tai | Fra | Ger | Spa | Swe | UK | Ital |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.7 | 4.5 | 3.3 | 17.4 | 3.8 | 10.7 | 4.2 | 4.5 | 8.8 | 8.5 | 8.0 | 7.6 |

## Research and Development

Gear research and development (R&D) is critical to maintaining both the technically superiority of U.S. weapon systems and the ability to produce them efficiently at reasonable cost. Joint DOD/industry funding of a very active aerospace gear R&D program, for example, has allowed us to maintain technical leadership for gear systems used in helicopters and other aerospace systems. Much less attention has been given to the actual manufacturing of gears, although this is becoming a growing concern. One response to this problem has been DOD's $17 million commitment in 1989 to fund a manufacturing technology demonstration factory, or 'Instrumented Factory' (INFAC) that has recently produced its first gear. (For more details on INFAC see Chapter VI.)

Internationally, the United States is falling behind in many aspects of gear manufacturing and product technology, and is seeing its lead in the aerospace gear sector erode. Gear-related R&D undertaken in other countries, notably Japan and Germany, has long exceeded the U.S. effort, and firms in these countries, with a strong focus on manufacturing technology now set world quality standards in many gear product areas.

Recent private studies have reported that gear-related research activities in U.S. universities lagged behind efforts in certain other gear-producing countries. Dr. Donald Houser of Ohio State University reported in his 1988 Worldwide Survey of University Research in Gearing that the number of graduate students, researchers, faculty, and support staff involved in gear research totalled 73 in the United States, compared with 155 in West Germany and 222 in Japan. Further, during 1981-1985, a total of 60 masters and doctoral degrees in the gear field were conferred in the United States, compared with 102 degrees in Japan and 259 in Germany. A total of 23 special purpose gear test facilities were located at American universities, compared with 72 in Germany and 81 in Japan. Only one gear manufacturing facility was located on an American campus, while ten were on German campuses and 43 were at Japanese universities.

## U.S. Industry R&D Activity

Information on gear company-financed R&D was collected from gear companies responding to our Section 232 producer survey. Seventy-four firms supplied R&D information for the period 1988 to (projected) 1992 (aggregated results are presented in table IV-2 below).

In 1991, total reported R&D expenditures by the reporting firms were $83.3 million, up 14.4 percent from 1988. Increases were posted by each of the gear industry sectors, with aerospace posting the largest gain of just over 20 percent. R&D

Table IV-2
Research and Development Expenditures
by Gear Sector, 1988-1992

| | Research and Development (in $000s) | | | | |
|---|---|---|---|---|---|
| | 1988 | 1989 | 1990 | 1991 | 1992 (Est.) |
| All Sectors | | | | | |
| Gear Materials | 4324 | 3184 | 3239 | 3414 | 2983 |
| Production Processes | 7970 | 9359 | 94444 | 13234 | 15258 |
| Product Development | 60573 | 63852 | 68908 | 60634 | 66103 |
| Total | 72867 | 76395 | 81591 | 77282 | 83344 |
| % of Shipments | 1.35 | 1.34 | 1.51 | 1.54 | - |
| AEROSPACE | | | | | |
| Gear Materials | 1473 | 613 | 422 | 835 | 793 |
| Production Processes | 539 | 992 | 915 | 3180 | 4200 |
| Product Development | 14908 | 14855 | 18544 | 14450 | 15320 |
| Total | 16920 | 16460 | 19881 | 18465 | 20313 |
| % of Shipments | 2.83 | 2.84 | 3.41 | 3.44 | - |
| INDUSTRIAL | | | | | |
| Materials | 1301 | 1653 | 1830 | 1612 | 1317 |
| Production Processes | 5252 | 6218 | 6383 | 8139 | 7994 |
| Product Development | 20371 | 21328 | 23270 | 21198 | 18962 |
| Total | 26924 | 29199 | 31483 | 30949 | 29273 |
| % of Shipments | 1.45 | 1.48 | 1.53 | 1.68 | - |
| AUTOMOTIVE & MARINE[1] | | | | | |
| Gear Materials | 1550 | 918 | 987 | 967 | 873 |
| Production Processes | 2179 | 2149 | 2146 | 1915 | 2064 |
| Product Development | 25294 | 27669 | 27094 | 1821 | 31821 |
| Total | 29023 | 30736 | 30227 | 27868 | 34758 |
| % of Shipments | .98 | 1.01 | 1.08 | 1.06 | - |

Source: Section 232 Gear Producers Survey

[1] Combined due to minimal marine R&D activity.

expenditures on production process technology saw the greatest increase, rising 91.4 percent from $8 million to $15.3 million. Most of this gain was recorded by the aerospace gear sector, although the industrial sector also reported an increase in production process R&D of over 50 percent.

Almost 80 percent of total R&D expenditures by the gear sector was dedicated to product development activities. This includes the building of prototypes, experimenting with new designs, improving or establishing testing methods, and other activities such as research into lubricants, noise reduction and life testing. As a percentage of total R&D, product development declined from 83.1 percent of the total in 1988 to 78.4 by 1991.

While the overwhelming majority of gear industry R&D supports product development, an additional 18.3 percent ($15.3 million) was reported as process related research in 1991. More than half ($8 million) of process research was reported by the industrial gear sector. As a percentage of total R&D, the industrial sector's process-related expenditures were 27.3 percent, up from 19.5 percent in 1988. Production process R&D expenditures were related to such activities as cubic boron nitride grinding, near net shape forming, co-rotating forging, production scheduling, plant layout, statistical process control and production information retrieval. These expenditures help to enhance firms' efficiency and product quality.

Material-related research totalled only $3.4 million in 1991, down from a reported $4.3 million in 1988. A further decline, to less than $3 million, is projected for 1992. Activities in this area consist of work in powdered metals, composites, plastics and other non-metallic gears, austempered ductile iron, and new alloys. Some material-related R&D is, however, closely related to production processing or product development R&D.

The gear industry spends only about one-third as much on R&D as the average for all U.S. manufacturers. Gear R&D spending, however, rose from 1.35 percent of shipments in 1988 to 1.54 percent in 1991. While technology advancement may be a very critical factor in the competitiveness of some industries, such as electronic components, it is less important in more established sectors such as gears.

U.S. firms are also being outspent in research by their international competitors. German-based Zahnradfabrik Fredrichshafen (ZF), the world's largest independent gear company, reportedly spends about $150 million annually on R&D, and has an 1,100 person research facility in Germany. This firm alone allocates nearly twice the amount to R&D as reported by the 74 surveyed firms combined. One very well-publicized innovation by ZF has been the grinding of automotive gears, which improves quality, extends life and reduces noise. Grinding of automotive gears also appears to be gaining acceptance among American automotive companies.

Lower levels of R&D funding by U.S. gear companies underscores the hidden effects of the fragmentation of the American gear industry. Smaller U.S. firms cannot as readily undertake R&D projects because they lack the sales base on which to capture the benefits, and/or the financial ability to fund the projects.

In the industrial sector, for example, firm size is a very critical factor in R&D spending. In 1991, the top three industrial gear firms reported shipments of $376.2 million, about 20 percent of the industrial gear sector total. However, these three firms accounted for 64 percent ($17.7 million) of industrial gear R&D spending, averaging over five percent of their shipment dollars. The other 37 industrial firms reporting R&D had shipments of $882.9 million, but spent only $10 million (one percent of shipments) on R&D. Similarly, the top three aerospace gear firms (out of 18 that reported) accounted for 66 percent of that sector's R&D.

An important effort has been put forth by the Naperville (IL)-based Gear Research Institute (GRI) to pool the resources of smaller firms so that they too may benefit from R&D. GRI, affiliated with the American Society of Mechanical Engineers (ASME), was founded in 1982 in recognition of increasing international competition and greater R&D efforts in other countries. GRI promotes Cooperative Pre-competitive R&D to encourage firms to pool resources and work cooperatively in the early stages of technology development, without jeopardizing firms' competitive position. GRI seeks to identify a need; initiate a project; and enlist support from industry, government, and other organizations.

A major project completed by GRI was in "austempered ductile iron." This work was funded in part by the Department of Commerce's Trade Adjustment Assistance Office. Other GRI projects have included work in boron alloyed steels, heat treatment distortion, lubricants, surface finishing, and fatigue analysis.

The GRI Board has voted to work more closely with the AGMA, and to relocate to Lisle, IL, and has since been known as GRI of ASME and AGMA. GRI continues to undertake R&D projects and is now examining corrosion of preservative coatings, and high-temperature materials. GRI is also developing a comprehensive stress/life computer evaluation, and is raising funds to begin a study of worm gears.

Another major R&D effort has been undertaken by General Motors. GM established a gear research facility in Romulus, MI, in part to facilitate the introduction of new technologies into its gear-making operations. This 21,000-square foot facility currently employs about 30 people.

Government-funded R&D

The Department of Defense also funds gear industry research efforts, primarily in the aerospace sector. In 1991, DOD funding was up about 15.3 percent from 1988. (Eighty-three percent of 1991 DOD-funded research reported on our surveys was aerospace-related, up from 77 percent in 1988.) Most DOD-funded R&D has been for product development, frequently including experiments with/development of new materials that can reduce weight or enhance reliability. DOD has also expressed interest in research in new geometries, lubricants, or lubricant-free gear operation.

The industrial gear sector received over $2 million in annual defense R&D funding during the survey period, distributed among only four firms. About 20 percent of this was allocated for production process development, while nearly 80 percent went into product development. The marine and automotive sectors reported very little defense funding.

In addition, the Vehicle Propulsion Directorate at NASA's Cleveland-based Lewis Research Center has almost completed a $13 million helicopter, tilt-rotor gearbox project called "Advanced Rotorcraft Transmission" (ART). The project, funded by the U.S. Army, began in 1989, and should be finalized later this year.

The three major goals of the ART project were to: 1) achieve a 25 percent weight reduction in the gearbox, 2) reduce its noise level ten-fold, and 3) double the gearbox's reliability. These goals were achieved, and some of the knowledge gained will be put to practical use by Sikorsky and Boeing in their joint production of the Commanche helicopter. The project was split into four contracts (each about $3.3 million) to Sikorsky, Boeing, Bell Textron and McDonnell Douglas. As part of the ART project, McDonnell Douglas and Lucas Aerospace are developing a prototype helicopter gear system that uses a face gear instead of spiral bevel as a first stage reduction. This is a totally new concept, which is expected to result in major benefits to defense.

University R&D

The United States has developed perhaps the world's finest university system. However, until very recently, there has been little research money available for university professors to investigate manufacturing issues. When manufacturing research is proposed, it often reflects the scientific and analytic orientation of professors, and is perceived by industrialists as impractical and remote from industrial problems. Thus, much R&D is not even undertaken. Also, many funding agencies prefer to underwrite "cutting-edge" research in fast growing fields, such as superconductivity and low temperature fusion, which are more

Table IV-3
Department of Defense Funding of Gear
Research and Development, 1988-1992

| | Research and Development (in $000s) | | | | |
|---|---|---|---|---|---|
| | 1988 | 1989 | 1990 | 1991 | 1992 |
| All Sectors | | | | | |
| Gear Materials | 501 | 694 | 603 | 649 | 715 |
| Production Processes | 805 | 816 | 951 | 1240 | 990 |
| Product Development | 11032 | 11999 | 13786 | 12700 | 12515 |
| Total | 12338 | 13509 | 15340 | 14589 | 14220 |
| AEROSPACE | | | | | |
| Gear Materials | 432 | 621 | 533 | 624 | 715 |
| Production Processes | 225 | 207 | 393 | 770 | 495 |
| Product Development | 8865 | 9199 | 11095 | 10697 | 10455 |
| Total | 9522 | 10027 | 12021 | 12091 | 11665 |
| INDUSTRIAL | | | | | |
| Materials | 24 | 3 | - | - | - |
| Production Processes | 480 | 509 | 508 | 445 | 470 |
| Product Development | 1707 | 2290 | 1841 | 1728 | 1760 |
| Total | 2211 | 2802 | 2349 | 2173 | 2230 |
| AUTOMOTIVE & MARINE | | | | | |
| Gear Materials | 90 | 140 | 140 | 50 | - |
| Production Processes | 100 | 100 | 50 | 25 | 25 |
| Product Development | 460 | 510 | 850 | 275 | 300 |
| Total | 650 | 750 | 1040 | 350 | 325 |

Source: DOC Section 232 Gear Producer Survey

glamorous, provide greater opportunities for recognition, and offer the possibility of a greater payoff. Despite this, there are a few university programs related to the gear industry.

The Ohio State University Department of Mechanical Engineering established a Gear Dynamics and Gear Noise Research Laboratory in 1980 as an industry-funded research consortium. The scope of the Lab's research ranges from the development of computer software to the acquisition of experimental data from sophisticated test stands. Most Lab funds are used to provide financial aid for graduate students working on gearing-related thesis projects. Industry sponsors meet with faculty and students twice yearly to review research progress and to discuss the Lab's research goals. Sponsors have access to all computer codes developed by the Lab, and are also provided reports and theses prior to publication.

The Ohio State Laboratory currently has about 25 members. Benefits to industry members include pooling of funds for financial leverage; computer software for gear design and analysis; access to experimental data in advance of publication; copies of reports and student theses; research reviews, and literature searches.

Penn State University's Applied Research Laboratory has developed a prototype thermo-mechanical gear finisher as a substitute for gear grinding. The project began in 1989 and is scheduled for completion in 1993. The Office of the Assistant Secretary of the Navy for Ships and Logistics sponsored the project, and provided cumulative funding of $4.5 million. The gear finisher is a micro precision forging process which operated at elevated temperatures using induction heat. The workpiece is roll finished while in the meta-stable-austenitic (plastic) state in rolling dies. Class 12 gears have been attained, and class 14 gears could likely be produced by this process using better equipment.

The University of Connecticut's Grinding Technology Center (GTC) at Hartford (sponsored by Pratt and Whitney) began two gear-related grinding projects in early 1991 that should be completed later this year. One project focuses on investigating the softening of gear teeth surfaces related to the use of various cutting oils (lubricants). A critical function of the lubricant in the grinding process is the removal of heat from the active grinding surfaces. If the ambient temperature should reach the boiling point of the lubricant and the lubricant is boiled away, grinding may remove the carburized layer and leave a soft spot on the tooth surface. Another related GTC research project involves investigating different gradients of carburization (the depth of tooth surface hardening). Greater depth of carburization can reduce the incidence of soft spots, but is more costly.

## Foreign Trade Barriers

The following section, organized by country, is drawn from the 1992 National Trade Estimate Report on Foreign Trade Barriers, prepared by the Office of the United States Trade Representative (USTR). The following selections from the USTR report exemplify foreign barriers to U.S. manufactured product exports which can potentially pose impediments to U.S. gear exports. Progress is being made in addressing many of the practices cited, and, therefore, this section is intended to be only illustrative of the variety of barriers potentially faced by U.S. exporters.

### European Community (EC)

The USTR report cites several EC practices which can potentially hinder U.S. gear exports including: differing standards, testing and certification procedures among member states; government procurement practices; and government subsidies for the aerospace (i.e. Airbus Industrie) and shipbuilding industries. The EC has undertaken a major effort as part of the Single Market Program ('EC 92') to minimize technical restrictions hindering the free flow of products throughout its member countries. The U.S. government has urged the EC Commission to ensure access for U.S. exporters to the standards, testing, and certification system in the EC market equal to that accorded domestic EC producers. Additionally, the United States is currently seeking the elimination of all "buy national" policies as part of the GATT Government Procurement Code negotiations.

Government support for Airbus is of particular concern to U.S. industry. The Governments of France, Germany, the United Kingdom, and Spain have together committed at least $13.5 billion in direct supports for Airbus since 1967. (Airbus' share of the large transport aircraft market has gone from 13 percent in 1981 to 41 percent in 1991). German, French and British government support for the Airbus Industrie consortium. Germany provides support to Deutsche Airbus, a partially government-owned subsidiary of Daimler-Benz; France provides support to Aerospatiale and the U.K. provided support to British Aerospace (BAe). Since 1967, Germany has provided approximately $8 billion in subsidies to Deutsche Airbus, and Aerospatiale has received an estimated $3.6 billion from the French government. The UK provided approximately $1 billion to BAe since 1979, but discontinued support after 1987. Additionally, Germany provided compensatory payments to the 1988 Daimler-Benz/MBB merger for any exchange rate losses.

USTR also reports that restrictions on U.S. gear market penetration in Germany, France, the U.K. and Italy may include government procurement "buy national" policies, and that French regulations on foreign direct investment are discriminatory toward non-EC investors.

Separately, a working group of six OECD members (including Japan, the EC, Korea, Finland, Norway and the United States) was established to negotiate an agreement to eliminate subsidies for shipbuilding by OECD member countries.

Japan

There are a variety of restrictive Japanese legal and business practices that have been identified as potential barriers to U.S. gear-related exports: tariffs (although they now average only two percent on industrial products); certain standards, testing, labeling, and certification requirements; government procurement practices; restricted access to the construction, architectural and engineering markets; and legal barriers to direct foreign investment in Japan. Additional barriers include government support for certain targeted industries (e.g. aerospace), exclusive long-term intercorporate relationships; a complex distribution system; and restrictive marketing practices.

Since 1986, the U.S. and Japanese governments have been working to improve market access for foreign suppliers under the Market-Oriented Sector-Selective (MOSS) framework. In 1990, the U.S. and Japan established a Market-Oriented Cooperation Plan to facilitate the development of long-term business relations between Japanese automotive manufacturers and U.S. auto-parts suppliers.

In July 1989, the Strategic Impediments Initiative (SII) was established by President Bush and then-Prime Minister Uno to identify and solve structural problems within both countries that may impede trade and balance of payments adjustments with the long-term goal of reducing Japan's trade surplus. Japan's competitive practices in the gear-related auto and auto parts sectors have been identified for SII review during 1992. U.S. exporters currently hold less than two percent of Japan's $90 billion auto parts market.

Taiwan

Taiwan imposes several potentially serious impediments to gear imports such as foreign investment barriers, discriminatory government procurement practices and import policies that include high tariffs, import licensing requirements and a commodity tax.

Since 1989, Taiwan has implemented a "Trade Action Plan" that has worked significantly to reduce tariff levels on nonagricultural products. For example, average tariff rates have fallen from 10.3 percent in 1989 to 8.1 percent in 1991. Recently, Taiwan passed a tariff bill that reduced the average nominal tariff rate for industrial products to 6.54 percent, and from 40 to 30 percent for small passenger cars. The tariff for large passenger cars, however, remained at 42.5 percent.

Taiwan also maintains an import licensing system. It is unclear, however, if gears are affected by this requirement. Currently, 5,915 (65.6 percent) of the items on Taiwan's tariff schedule can be imported without a license. The remaining 2,865 items require pro-forma import visas from commercial banks, and 691 require licenses from the Board of Foreign Trade. Taiwan is working to reduce the number of items requiring import licenses.

Taiwan's commodity tax is a domestic excise tax applied to 39 domestic and imported products. In January 1990, Taiwan reduced the commodity tax on domestic products, placing imports at a comparative disadvantage. For example, Taiwan imposes a commodity tax on imported cars with small (25 percent), mid-size (35 percent) and large engines (60 percent). Still, car imports captured almost 38.8 percent of Taiwan's auto market in 1990, with the U.S. accounting for 46.5 percent of the total value.

Additionally, Taiwan's government procurement practices and certain foreign investment criteria may impede imports of U.S. gears to Taiwan. For example, Taiwan practices a local procurement policy for all public enterprises and administrative agencies. This policy requires that a product must be procured locally if its price is within five percent of the price of an imported alternative (including tariff and taxes). Regarding foreign investment, Taiwan maintains a "Statute for Upgrading Industries" (effective January, 1991) that provides tax incentives for investment in R&D and high- technology industries. While Taiwan has removed most restrictions to foreign investment, certain export performance and local content requirements exist for portions of the automotive and electronics industries. Taiwan's latest liberalization measures, in May 1989, opened most of its markets to foreign investors, except for certain sectors including defense-related industries.

South Korea

The following legal restrictions may work to impede U.S. gear market access to Korea: tariffs; an import license system; certain standards, testing, labeling, and certification procedures; government procurement practices; investment barriers; government support for shipbuilding industry; and a national anti-import campaign. Since 1989, Korea has been working to reduce its average tariff rate from 12.7 percent to 7.9 percent by 1994. U.S. firms report, however, that the combination of current tariffs and value-added taxes impedes market access and diminishes price competitiveness. The United States continues to encourage Korea to reduce and bind its tariff rates.

Korea maintains quantitative restrictions through its import licensing system and requires all imported goods to obtain a Foreign Exchange Bank-issued import license. Approximately 95

percent of goods entering Korea receive routine automatic approval. Korea has agreed to phase out these quantitative restrictions by July, 1997.

A bilateral agreement was reached in 1989 where Korea consented to eliminate or revise unfair regulations relating to standards, testing and certification procedures. Since then, Korea has made significant progress in this area; however, certain inequalities remain between domestic and imported goods. In 1991, the Korean government expanded the number of products for which retailers must display two retail prices. The first price is the ex-factory price for domestic products or the customs clearance price for imported products, and the second is the retail price. As a result, imported prices may appear higher and therefore less attractive.

The Korean government encourages local procurement and offsets for its government agencies or government majority-controlled enterprises. Offsets (e.g. subcontracting and required licensing) are a condition of sale for major military procurements, and can range from 30 to 50 percent of the total contract value. This can preclude U.S. subcontractor industry participation in Korean government defense projects. In 1990, Korea offered to join the GATT Government Procurement Code, potentially yielding new opportunities for U.S. firms in non-defense contracts.

Certain service and foreign investment barriers may discourage U.S. firms from entering Korean markets. For example, cumbersome and arbitrary regulations discriminate against foreign firms, particularly in the maritime and transportation sectors. Advertising created outside of Korea faces complex screening requirements. Access to wholesale distribution is also restricted due to control of distribution channels by 'chaebols' (large manufacturing combines). Additionally, while 98 percent of Korean industrial areas are now open to foreign investment, all U.S. investment applications filed after 1989 are subject to Korea's "going public" policy, requiring certain local and foreign-invested firms to sell at least 30 percent of their stock to the public. Finally, the Korean government provides support including subsidies to its shipbuilding and repair industry.

Foreign Industrial Capabilities/Foreign Government Support

The next section is a compilation of reporting cables regarding foreign gear capabilities and the support provided to gear firms by foreign governments. Reports were provided from the U.S. Embassies in Bonn, Paris, London, Brussels, Tokyo, and Seoul; the U.S. Consulate in Milan and from the American Institute in Taiwan in Taipei.

Germany

Germany has traditionally been a large producer and major exporter of gears and gearing machinery. The German Machinery Industry Association has supplied the following statistics on German gear production:

Table IV-4
1991 German Gear Production

| Type of Gear | Number of Producers | Tons Produced | Value (US $000) |
|---|---|---|---|
| Spur gearing | 111 | 37,326 | 384,221 |
| Bevel gearing | 40 | 2,613 | 42,548 |
| Worm gearing | 33 | 3,841 | 58,210 |
| Racks, threading mach. | 34 | 5,301 | 114,562 |
| Sprocket wheels | 42 | 12,527 | 62,919 |

Source: German Machinery Industry Association

Table IV-5
Annual German Gear Production
(US $millions)

| | 1989 | 1990 | 1991 |
|---|---|---|---|
| Production | 595 | 687 | 662 |
| Exports | 160 | 176 | 173 |
| Exports to U.S. | 18 | 20 | 18 |

Source: German Machinery Industry Association

Industry and government officials assert that the Western German machinery industry receives no government support in the form of subsidies, research and development support, or export subsidies. The German government provides many German companies of all kinds export credit guarantees for exports to countries where payment is uncertain, although the extent to which the gear industry in particular benefits from such guarantees is unknown. The German Machinery Industry Association reports that the industry receives no subsidies, but the government does have a program (available to all industries) through which it reimburses 50 percent of joint private industry research and development project costs.

The situation in former East Germany is more complex. At the time of unification, all state-owned manufacturing sites were taken over by the Treuhandanstalt, a German government agency. The Treuhand is charged with privatizing these firms, but approximately 70 percent of machinery firms are still Treuhand property today. The number of these which are gear firms is unknown.

The German government offers a variety of benefits (e.g. tax breaks, investment subsidies, and assumption of firms' debts) to companies willing to purchase these firms. Any company, German or foreign, is eligible for these benefits. This support is designed to speed privatization of firms, rather than to provide them a competitive advantage in the world market. The exact level of U.S. investment in German gear firms is unknown, but thought to be small.

France

There are 120 gear manufacturers in France producing gears in 45 separate categories. Of this group, there are several multinational producers, more than 50 exporters, and approximately 30 importers, agents and distributors.

The majority of enterprises produce gears for heavy machinery, and these are mostly steel, bronze, and cast iron straight teeth circular gears. An industry source stated that the French market is $836 million, of which $36 million worth is imported. He indicated that there has been total market growth annually of between 3-4 percent since 1989.

The French industry is separated into roughly three groups: industrial, automotive, and aerospace. The industrial sector is dominated by five major companies: Leroy-Sommer (a subsidy of Emerson), Usine Merger, CMD, Rockwell-SVI (a subsidiary of Rockwell International) and Flender-Graffenstaden.

In the automotive market, Peugeot and Renault manufacture their own gears. Two other enterprises produce gears: SMAM for Peugeot and STA (Societe Transmission Automatique) for Peugeot and Renault. Ford, GM, and Eaton also have production facilities in France, although, according to our source, all of their production is exported to Spain, the United States and Germany. The large gear producers in the aerospace sector are Hispano-Suiza, which produces for the SNECMA Group, Eurocopter (Aerospatiale), and Turbomace (Labinal).

France's largest trading partners for gears are Germany, the U.K., and Italy. France also exports a significant amount to francophone African nations, but apparently only 2.9 percent of production is exported to the United States.

The U.S. Embassy in Paris is unaware of any government subsidies in either the industrial or automotive markets. There have been supports in the aerospace sector, which is still on the French government's list of strategic industries.

Italy

The Association of Italian Manufacturers of Transmissions and Gears (ASSIOT) reports that Italy is currently the fourth largest producer in the world gear industry and, after Germany, the second largest in Europe. The Association believes that Italy's technological ranking also is probably just behind Germany's. Domestic 1991 production (in billions of lira) for various product types were as follows:

Table IV-6
1991 Italian Gear Output by Product

| | Output | Sold Locally | Exported |
|---|---|---|---|
| Gear units/gear motors | 685 | 404 | 281 |
| Speed change units/axles/ differential gear | 521 | 216 | 305 |
| Variable speed drives | 133 | 105 | 28 |
| Toothed elements | 482 | 312 | 170 |
| Couplings/clutches | 218 | 138 | 80 |
| Mechanical control units | 101 | 70 | 31 |
| Brakes/electromagnetic friction clutches | 51 | 46 | 5 |
| Pulleys | 52 | 37 | 15 |
| Belts | 74 | 46 | 28 |
| Industrial transmission chains (non-automotive) | 115 | 74 | 41 |
| Racks/chain pinions | 12 | 8 | 4 |
| Bearings (non-auto) | 107 | 83 | 24 |

Source: Association of Italian Manufacturers of Transmissions and Gears

Market data supplied by the Association for 1990 and 1991 are as follows (all figures are in billions of lira):

Table IV-7
Italian Gear Industry Statistical Summary
(Excludes automotive and industrial vehicle gear components)

| | 1990 | 1991 | % change |
|---|---|---|---|
| 1) Domestic production | 2935 | 2636 | (10.2) |
| 1a) Sold domestically | 1833 | 1590 | (13.3) |
| 1b) Export | 1102 | 1046 | (5.1) |
| 2) Import | 460 | 347 | (24.6) |
| 3) Total Italian market | 2293 | 1937 | (15.5) |

Source: Association of Italian Manufacturers of Transmissions and Gears

The Italian government reports that it does not provide support specifically targeting the gear industry. However, a number of firms make use of programs for regional or sectoral development and R&D support sponsored by the European Investment Bank, the European Coal and Steel Community, and the Italian government. Italian government programs of particular relevance include support for small and mid-sized industry based on 1952 legislation (no. 949); the "Sabatini law" of 1965 providing for low-interest loans for the purchase of capital goods; export credits for capital goods and services (1977. No. 227); and legislation (1986. No. 64) providing for tax relief and concessionary loans for projects aimed at development of the Italian South.

ASSIOT is unaware of any U.S. ownership of Italian gear manufacturers, although they concede that this information was not solicited from the Association membership. ASSIOT believes that Italian ownership of foreign affiliates is also limited by the fact that most Italian producers are relatively small by international standards. They state that there are some small Italian-owned assembly plants in the United States and Canada, but to the best of their knowledge, no manufacturing facilities.

United Kingdom

The United Kingdom has a significant gear industry, capable of competing internationally, including in the U.S. market. A database search turned up 64 gear-making companies with sales in excess of 5 million pounds. Some of these are producing for the automotive industry and some are American-owned (e.g. Borg-Warner). There are many other firms which produce gearing for incorporation in their products that would not be reported as gear producers. British Aerospace almost certainly produces some gears for its aircraft and Rolls-Royce for its aircraft engines, for example.

Twelve years of Conservative party rule have reduced British government financial support for industry. However, government support continues for a research program being coordinated by the British Gear Association. The British Department of Trade and Industry has agreed to pay 40 percent of a 8 million pound program spread over ten years.

Belgium

Trade data on Belgian gear exports and imports to/from the United States for 1989 and 1990 show only a modest trade surplus in favor of Belgium. Apparently a significant amount of internal corporate trading in gears between U.S. companies and their Belgian subsidiaries takes place. Further, part of reported Belgian exports may represent transshipment of German gears through Belgian ports. Belgian trade statistics for Harmonized Tariff Schedule Code 8483 regarding gear trade with the United States are reported below. (Figures are in millions of US$):

Table IV-8
Belgian Gear Statistics

| | 1989 | 1990 |
|---|---|---|
| Exports | 38.115 | 32.778 |
| Imports | 28.601 | 28.513 |

One gear sector contact reported that he thought there were a lot of internal corporate transfers of gearing between the Belgian and U.S. branches of Ford, GM and Caterpillar. Of the 33 members listed in the "gears, transmission devices and elements subsectors" of Fabrimetal, the sectoral organization guide on companies in the metalworking sector, three are U.S.-based companies: Clark-Hurth (marine gearing), Ferguson Machine Company and Twin Disc International. The Fabrimetal list does not include GM, Ford or Caterpillar, whose main line of activity is not gears.

While the U.S. Embassy in Brussels is not aware of any specific industrial support for the gearing industry, there are two important Airbus subcontractors in the Fabrimetal listing. These are Viz. Asco and Watteeuw, two members of Belairbus, the subsidized Belgian subcontractor that works with Airbus Industrie. Inasmuch as these companies have utilized part of the generous Belgian subsidies related to Airbus to finance their overall activities, there may be a subsidy involved in their gear production.

Japan

Japan's global exports of gears and gear-producing equipment have increased steadily since 1983. Although gear imports have grown by 30 percent, the trade surplus in gears has rapidly risen. According to Japanese Ministry of Finance (MOF) statistics, Japanese global exports of gears rose substantially from 16 trillion yen in 1983 to 39.7 trillion yen in 1990. According to the MOF, Japan's gear exports to the U.S. rose from 3.1 trillion yen in 1983 to 4.2 trillion yen in 1990. Over the same period its global imports grew from 6.9 trillion yen to 10.8 trillion yen.

According to the Ministry of International Trade and Industry (MITI) and the Japan Gear Manufacturers Association (JGMA), there are no government programs to support Japan's gear industry. MITI has pointed out that export subsidies for gears would be illegal under the GATT. MITI has also claimed that there is no government support of research and development for gears and gear-producing equipment. The JGMA further claimed that there are no below-market-rate interest loans from Japanese banks.

There are at least two joint ventures between Japanese and foreign gear manufacturers in Japan. The Niigata Converter Company, Ltd. is a joint venture between U.S.-based Twin Disc and Niigata Engineering Co., Ltd. which manufactures marine gears and reduction gears. The Tsubakimoto Emerson Co., Ltd., a joint venture between U.S.-based Emerson Electric Co. and the Tsubakimoto Chain Co. Ltd., manufactures speed reducers and cam shafts.

The JGMA estimates there are over 200 gear manufacturers in Japan including 123 JGMA member companies. The remaining companies are either small manufacturers or larger companies that manufacture gears for their own use.

Taiwan

To the extent that statistics on the Taiwan gear industry exist, they do not follow the Standard Industrial Classification system. Further, there is no trade association devoted entirely to the gear industry nor is there any one trade association to which most gear producers belong. Accordingly, trade association data reflects at best what is true of the association's membership and not the industry as a whole. Apart from Customs statistics, the authorities do not have data on the gear industry beyond what trade associations have provided to them. Export percentages are particularly elusive and vary according to the definition of gear product used.

Taiwan's gear industry consists of about 150 firms. Most of the firms are small, having fewer then ten employees. About 50 of the firms belong to the Taiwan Association of Machinery Industries (TAMI). That association believes that its members account for over 70 percent of Taiwan's gear production. In addition to those firms whose essential business is producing and selling gears, there are a number of automotive and machine tool companies which produce gears for incorporation into their final products. Those firms do not market gears except as replacement parts.

Taiwan's gear industry was once dominated by Japanese products. With incentives and assistance programs provided by the authorities in the early 1980s, Taiwan gradually developed its own gear industry to replace Japanese products. Apart from gear products used in the automotive and precision equipment industries, locally-produced gears can meet 70-80 percent of local market demand. The main products of Taiwan's gear industry include worm gears, gear reducers, and gears used in machine tools and motorcycles.

According to information provided by the statistical department of the Ministry of Economic Affairs (MOEA), Taiwan's gear production in 1991 reached 21,430 metric tons, valued at $89.3 million. (Note: MOEA data probably does not include vehicular gearing products and gearing products produced in-house for assembly into final products.)

According to a research fellow at the Industrial Technology Research Institute (ITRI), perhaps seven or eight of Taiwan's gear firms now have the capability to produce gears meeting the "zero" rating on the Japanese Industrial Standard for machine tools. Taiwan does not appear to have any firms capable of producing aerospace gearing on a commercial basis. The Mechanical Industry Research Laboratories (MIRL), a division of ITRI, is the only organization in Taiwan producing aerospace gears, providing the aerospace gears for Taiwan's Indigenous Defensive Fighter and AT-3 training aircraft.

Taiwan's producers are hobbled by difficulties in obtaining alloy steel, and by weaknesses in design, testing and measurement, heat treatment and tooling. Most of the products produced by Taiwan's gear firms are still low-end products with low added-value. Locally-made products are lower quality than imports of equivalent products, but the quality is reportedly adequate for most uses. The price of local gears is always 10-15 percent lower than that of imports, making them competitive in the market. Output of Taiwan's gear industry goes mainly to meet local demand. Exports appear to account for less than 15 percent of Taiwan's total gear production.

To replace gear imports from Japan, the Taiwan authorities implemented the "Precision Gear Plan" in 1982 in order to encourage the development of a quality domestic gear industry. Under this plan, ITRI assisted gear manufacturers in the use of CAD/CAM equipment. At present, MIRL plans to assist Taiwan's gear firms in setting up a joint tooling company to introduce advanced tooling technology from Japan or Italy so as to lower production costs for precision gears. MIRL has also invited local gear firms to develop the technology for worm gear reducers used in elevators.

Apart from such specific projects, the state-run MIRL conducts research to upgrade Taiwan's gear production technology. Beyond such technical assistance, all Taiwan industries, including the gear industry, are eligible for various incentives. Firms are entitled to a tax credit against business income tax for machinery purchases and duty-free machinery imports if such equipment is not made locally. The authorities provide loans at an interest rate 2 percentage points lower than the prime rate on loans for the purchase of automation equipment.

While several of Taiwan's gear firms are joint ventures with Japanese firms, only Roc-Spicer Ltd. is a U.S.-Taiwan joint venture, with Dana Corporation holding 49 percent of the company's equity. The firm produces rear axle and shaft assemblies for the automotive industry. The gears which go into such assemblies are produced internally by the firm.

Table IV-9
Taiwan Gear Production

| Year | Metric Tons | US $000 |
|---|---|---|
| 1989 | 21,892 | 107,623 |
| 1990 | 17,058 | 70,325 |
| 1991 | 21,430 | 89,328 |

Note: Data provided by the MOEA may not include gearing products made in vertically-integrated firms for internal use or vehicular gearing products.

Source: Taiwan Ministry of Economic Affairs

Table IV-10
Taiwan 1991 Gear Imports and Exports

| | Imports | | Exports | |
|---|---|---|---|---|
| | m.t. | US $000 | m.t. | US $000 |
| Industrial gearing | 2,533 | 38,345 | 2,758 | 10,721 |
| Vehicular non-automotive gearing (a) | 4,208 | 59,639 | 9,409 | 38,033 |
| Aerospace Gearing (b) | n.a. | n.a. | -0- | -0- |
| Marine gearing (b) | n.a. | n.a. | n.a. | n.a. |

Note: m.t. = metric tons
(a) vehicular non-automotive gearing includes motorcycle gearboxes, and bicycle sprocket-wheels.
(b) no such data can be found in Taiwan's HS tariff schedule.

Source: Taiwan Ministry of Economic Affairs

South Korea

Korea's exports of gears and reduction gears amounted to $32 million in 1991, less than 0.1 percent of Korea's machinery exports of $33.8 million. The principal destination for Korean exports of non-automotive gear products in 1991 was Japan, which accounted for $12 million of exports, or 38 percent of Korea's total gear exports. In the same year, Korea's exports of non-automotive gears to the U.S. reached $8 million. The United States was the second largest purchaser of these products.

By value, Korea's imports of gears and reduction gears were over ten times higher than Korea's exports of the items in 1991, amounting to $339 million. The largest supplier was Japan ($196 million), followed by Germany ($54 million) and the United States ($39 million). Thus, Korea had a trade deficit with all three countries for these products. Both the Korean Government and the Korea Association of Machinery Industry (KOAMI) emphasize that the gear and gearing products industry in Korea is very small and accounts for only 0.4 percent of the machinery industry in Korea (based on production value in 1991).

According to an official of the Ministry of Trade and Industry (MTI), there is no government support for gear-related research and development. The Korean gear industry manufactures gear products based only on contracted orders and has no mass

production facilities. The small size and diversity of the industry have made it an impractical target for R&D.

The Korean Government and KOAMI also report that there are no direct government financial supports for the gear industry in Korea. However, the Korean government still maintains some measures to support Korea's export industries in general, including Customs duty rebates for raw material imports used in the production of exports; short-term export loans for small and medium firms; rebates on the value-added tax and a special consumption tax for export products; corporate income tax benefits for costs related to the promotion of overseas markets; unit export financing loans; and special depreciation allowances for small and medium firms. The interest rate for short-term export loans is the same as the government-established commercial interest rate. Export companies have better access to funds than non-exporters, a significant advantage in Korea's extremely tight financial market.

The embassy was informed by the MTI that there are no U.S. ownerships, equity investments, or technology imports from the United States in the Korean gear industry. According to the MTI and KOAMI, there are no tariff and non-tariff barriers which mitigate against Korean gear exports overseas.

The following provides the best available statistical data of production, shipments, inventories and exports/imports on the gear industry in Korea. The primary source of information is KOAMI.

Table IV-11
Korean Machinery Statistics

Value in billion won: US$ = 708 won in 1990 and 732 won in 1991.

| | 1990 | 1991 |
|---|---|---|
| Production: | | |
| All machinery | 19,325 | 21,884 |
| General machinery | 4,629 | 5,403 |
| Gear and reduction gear | 91 | 90 |
| Shipments: | | |
| All machinery | 19,572 | 22,431 |
| General machinery | 4,737 | 5,354 |
| Gear and reduction gear | 89 | 90 |
| Inventory: (year-end) | | |
| All machinery | 491 | 598 |
| General machinery | 250 | 338 |
| Gear and reduction gear | 2 | 1 |

Exports: (in millions of US$)

| | Total To World | To U.S. | To Japan |
|---|---|---|---|
| All Machinery: (incl. electronics and shipbuilding) | | | |
| 1990 | 29,228 | 9,452 | 3,416 |
| 1991 | 33,810 | 10,079 | 2,971 |
| b. General Machinery: | | | |
| 1990 | 5,017 | 2,123 | 445 |
| 1991 | 5,776 | 2,281 | 446 |
| c. Gear and Reduction Gear: | | | |
| 1990 | 33 | 10 | 11 |
| 1991 | 32 | 8 | 12 |

Imports: (in millions of US$)

| | Total From World | From the U.S. | From Japan |
|---|---|---|---|
| All Machinery: (incl. electronics and shipbuilding) | | | |
| 1990 | 27,430 | 7,497 | 11,738 |
| 1991 | 32,460 | 9,481 | 13,459 |
| b. General Machinery: | | | |
| 1990 | 12,273 | 3,322 | 5,076 |
| 1991 | 14,543 | 3,549 | 6,279 |
| c. Gear and Reduction Gear: | | | |
| 1990 | 278 | 37 | 170 |
| 1991 | 339 | 39 | 196 |

# V. ECONOMIC AND TRADE DATA ANALYSIS

The following chapter reviews and analyzes economic and trade data concerning the U.S. gear industry including statistics regarding: shipments and imports, value-added activities, defense shipments, profitability, and labor.

## Shipments and Imports

This section relies primarily upon the surveys of gear producers and importer/end-users conducted for this investigation by the Bureau of Export Administration (see Tab C). As explained in Chapter III, published Census gear statistics are inadequate for our purpose as many gear shipments are captured by Census in broad statistical categories of which gears are just one element. In addition, many gear 'imports' are embedded in larger finished goods, such as construction or mining equipment, and are not captured in Census shipment or import statistics as gear products.

Survey recipients were asked to provide the value of their gear shipments and imports for the years 1988-1991. Their shipments, presented in Table V-1 below, were broken into four end-use categories: aerospace, automotive, industrial, and marine. It is important to note that some key gear-producing companies did not respond to the survey, especially in the automotive sector. As with shipments, not all imports are covered due to the lack of responses from some major gear-importing companies. For the aerospace and marine sectors, which are most important to defense applications, survey data is more comprehensive. Nevertheless, the BXA survey data cover a majority of total gear shipments and imports, and the information can be used to identify trends in the industry over the 1988-1991 period.

The automotive sector alone accounts for nearly half of total gear shipments by surveyed firms (and an estimated three-fourths of actual industry shipments). The industrial gear sector is next, accounting for about 37 percent of survey shipments. The aerospace and marine sectors are much smaller, accounting for 11 percent and five percent of survey shipments, respectively.

Captive production plays an important role in the automotive and aerospace categories. About two-thirds of automotive gear production is done by large automobile companies, while over 40 percent of aerospace gears are produced in captive facilities. Large industrial companies produce about a third of the gears used for their internal consumption. In contrast, captive production accounts for less than 25 percent of marine gear shipments.

Table V-1
SURVEYED FIRMS' SHIPMENTS AND IMPORTS OF GEARS
BY END-USE CATEGORY
(Millions of Dollars)

| END-USE CATEGORY | 1988 | 1989 | 1990 | 1991 | % of Total (1991) |
|---|---|---|---|---|---|
| **AUTOMOTIVE** | | | | | |
| Shipments | $2789.8 | $2294.7 | $2564.1 | $2394.9 | 47.8% |
| Imports | 493.3 | 618.6 | 640.7 | 611.2 | |
| % Imports | 15.0% | 18.2% | 20.0% | 20.3% | |
| **INDUSTRIAL** | | | | | |
| Shipments | $1853.9 | $2083.4 | $2051.1 | $1838.4 | 36.7% |
| Imports | 201.5 | 322.5 | 391.3 | 345.5 | |
| % Imports | 9.8% | 13.4% | 16.0% | 15.8% | |
| **AEROSPACE** | | | | | |
| Shipments | $ 597.3 | $ 578.7 | $ 583.7 | $ 537.2 | 10.7% |
| Imports | 125.2 | 119.7 | 97.0 | 112.9 | |
| % Imports | 17.3% | 17.1% | 14.3% | 17.4% | |
| **MARINE** | | | | | |
| Shipments | $ 164.3 | $ 229.4 | $ 211.9 | $ 237.7 | 4.7% |
| Imports | 25.4 | 31.9 | 24.1 | 32.3 | |
| % Imports | 13.4% | 12.2% | 12.2% | 12.0% | |
| **TOTAL** | | | | | |
| Shipments | $5405.3 | $5686.1 | $5410.8 | $5008.1 | 100.0% |
| Imports | 845.5 | 1092.7 | 1158.4 | 1101.9 | |
| % Imports | 13.5% | 16.1% | 17.6% | 18.0% | |

Source: DOC Section 232 Gear Producer and Importer Surveys

In general, shipments followed a downward trend over the 1988 to 1991 period. In the automotive sector, shipments fell 14 percent in 1991 compared to 1988 levels, from $2.8 billion to $2.4 billion. Smaller losses were experienced by the aerospace and industrial categories, with shipments falling ten percent and one percent, respectively. In contrast, the marine sector showed strong growth in 1991 over very low 1988 levels.

Imports accounted for a growing percentage of new gear supply (domestic shipments plus imports), rising from 13.5 percent to 18.0 percent over the four year period. Imports were highest in the automotive sector, where they increased from 15 percent of new supply to over 20 percent. The aerospace sector also showed high import levels, at about 17 percent; however, there was not a definite pattern of increasing or decreasing import penetration. In the industrial sector, imports consistently rose over the 1988-1991 period, from less than 10 percent to nearly 16 percent of new supply. Marine gear imports, while rising in volume over the period, remained relatively stable as a percentage of new supply (at around 12 percent) due to the volatility of domestic gear shipments.

Despite problems with Census data, it does provide information on the origin of imported gears not available elsewhere. The Census Bureau keeps statistics on the total value of imported gears and gearing products, values of various sectors of gear imports and the countries of origin of these imports. The root of the differences between Census data and survey data lies primarily in the classification criteria. The Census Bureau, for example, adds most aerospace data into the industrial gear category; splits automotive gears into products for on-highway or off-highway vehicles, placing those for off-highway vehicles into the industrial category; omits a marine category; and includes components not subject to this investigation. Data discrepancies are compounded by the incomplete industry response to our surveys.

For 1991, the Census Bureau reported the total value of imports of gear and gear-related products for all purposes as slightly more than $2.07 billion. The largest percentage of these imports, about 27 percent, came from Japan. The Japanese share of U.S. gear imports has changed little over the past five years, with about 28 percent of U.S. gear imports originating in Japan in 1988. Imports from Canada accounted for the next highest share, over 22 percent in 1991. Canada's share has slipped from about 27 percent in 1988.

Census reported that Japan was also the leading source of industrial gear imports, with a 26 percent share in 1991, up considerably from 16 percent in 1988. In 1991, Germany had the second largest share at about 21 percent, approximately the same as West Germany's 1988 share.

Value-Added

Twenty-seven gear importers reported adding value in the United States to imported gearing and/or gearing components. Value added was defined in our importer/end-user survey as any special service normally performed by gear manufacturers, such as assembly, machining, grinding or testing. During 1991, the average percentage of the total dollar value of imported gears subject to these value added services was approximately 68 percent. The average value added that year was about $2.3 million. The total value added by these 27 firms was almost $61.7 million.

Nearly all the companies that added value in the U.S. performed some type of assembly function. In some cases, the companies assembled gearboxes or reducers. In others, they incorporated the gearing components into a final product, such as a machine tool or an automobile. Sometimes, U.S. components were integrated into the final assembly. Testing and servicing were also frequently performed domestically. Reworking or application engineering was done to meet customer specifications. Occasionally, gears were ground, polished or finished in the U.S.

Meeting customer needs was the reason most frequently cited for performing assembly or reworking in the U.S. This broad category includes customizing units, giving the desired ratio or configuration, overall systems integration and assembly to customer specifications. All these functions were described as more efficient and cost effective to perform in close proximity to and coordination with the customer. In an extension of this focus on the customer, such domestic value added operations also enabled the importer to provide timely deliveries and responsive service, enhancing flexibility and quality.

Two-thirds of the companies responding had no plans to increase or decrease value-added service in this country during the next twelve months. The remaining third, however, uniformly expressed the intention to increase value-added services and source more components and materials domestically.

Defense Shipments

Respondents to both the producer and importer/end-user surveys were also asked to identify their defense-related gear shipments. Defense shipments were defined as direct and indirect military shipments, including: 1) weapon systems, support equipment, and all other defense agency related end-use items; 2) the orders of customers who can be identified as producing products for defense purposes; and 3) items tested and certified to military specifications. Due to the intermediate nature of gear products - i.e. they are incorporated into finished goods, it is

likely that many producers were unaware of the ultimate end-use of their products. **It is, therefore, probable that the reported defense share of gear shipments and imports is significantly understated.**

Survey data show that shipments to defense applications in 1991 exceeded $637 million, accounting for about 13 percent of total 1991 shipments. Table V-2 below highlights trends in defense gear shipments over the 1988-1991 period.

Gear companies that predominantly produce for the aerospace industry are the most dependent on defense shipments, with nearly 70 percent of their business going to defense. The aerospace category also accounts for the bulk of total defense shipments, about 59 percent of the total $637 million. Of the 28 gear plants classified as predominantly aerospace-related, all but one participated in the defense market. Many of these firms were "captive" producers, making gears for their own use in larger aerospace systems. Examples of companies in this category are Bell Helicopter, General Electric, Pratt and Whitney, and Sikorsky Aircraft, companies which produce either aircraft itself or engines for aircraft. Despite the larger individual size of some captive producers, shipments by independent aerospace gear producers substantially exceed shipments by captive aerospace producers. Captive gear production accounted for about 40 percent of defense-related aerospace shipments. Defense shipments followed a consistently downward trend over the 1988-1991 period, falling from about $422.5 million in 1988 to $373.4 million in 1991, a 12 percent drop.

The marine gear sector, consisting of 18 plants, was even more reliant on defense sales than aerospace producers, with defense accounting for nearly 75 percent of their 1991 shipments. Fourteen of the 18 plants sold to defense applications that year. Total marine gear shipments to defense applications were smaller however, totalling $175 million in 1991 (27.5 percent of total defense shipments). Unlike the aerospace sector, the vast majority of defense-related marine gears are not produced by captive producers; in fact, captive production accounted for less than one percent of the marine sector total. Defense-related marine gear shipments followed a generally upward trend during the evaluation period, up from only $90 million in 1988, but this trend may end, however, as the impact of defense budget cuts is felt over the next several years.

The automotive and industrial gear sectors were much smaller players in the defense market. Of the 85 industrial gear producers included in the BXA survey, only 35 sold to defense applications in 1991; and only 7 of 28 automotive gear producers participated. The two sectors combined account for less than 15 percent of total defense shipments, with $31 million and $57 million in defense sales respectively. These sectors are

TABLE V-2
DEFENSE USE OF GEARS
(Thousands of Dollars)

| DEFENSE SHIPMENTS BY PRODUCER CATEGORY | 1988 | 1989 | 1990 | 1991 | % (1991) |
|---|---|---|---|---|---|
| AEROSPACE | $422.5 | $418.7 | $401.7 | $373.8 | 58.7% |
| MARINE | $90.4 | $144.2 | $142.5 | $175.4 | 27.5% |
| AUTOMOTIVE | $66.9 | $68.4 | $62.8 | $57.3 | 9.0% |
| INDUSTRIAL | $34.4 | $35.0 | $46.1 | $30.6 | 4.8% |
| **TOTAL** | $614.3 | $666.2 | $653.1 | $637.2 | 100.0% |

| **DEFENSE SHIPMENTS AS % OF TOTAL, BY CATEGORY** | **1988** | **1989** | **1990** | **1991** |
|---|---|---|---|---|
| AEROSPACE | 70.7% | 72.4% | 68.8% | 69.6% |
| MARINE | 55.0% | 62.8% | 67.3% | 73.8% |
| AUTOMOTIVE | 2.4% | 2.4% | 2.4% | 2.4% |
| INDUSTRIAL | 1.9% | 1.7% | 2.2% | 1.7% |
| **AVERAGE** | 11.4% | 11.7% | 12.1% | 12.7% |

| **DEFENSE IMPORTS** | **1988** | **1989** | **1990** | **1991** | **% OF TOTAL DEFENSE** |
|---|---|---|---|---|---|
| AEROSPACE | $23.5 | $19.2 | $15.5 | $22.2 | 5.6% |
| MARINE | $ 0.6 | $ 0.0 | $ 3.6 | $ 8.4 | 4.5% |
| AUTOMOTIVE | $ 1.1 | $ 1.7 | $ 6.8 | $ 0.9 | 1.6% |
| INDUSTRIAL | $ 0.2 | $ 0.1 | $ 0.1 | $ 0.3 | 1.1% |
| **TOTAL** | $25.4 | $21.0 | $26.0 | $31.8 | -- |
| **TOTAL AVERAGE DEFENSE IMPORT PENETRATION** | 3.9% | 3.1% | 3.8% | 4.8% | -- |

Source: DOC Section 232 Producer and Importer/End-User Surveys

obviously also less dependent on defense sales for their business; defense shipments account for only around two percent of their combined sales.

Imports account for a small, but apparently growing, percentage of defense gear usage. Defense-related gear imports totalled $31.8 million in 1991, or about 4.7 percent of reported defense shipments by surveyed firms. Generally, the aerospace sector had the greatest volume and percentage of gear imports, totalling $22 million (5.6 percent) in 1991. Industrial gear imports were a very small portion (one percent) of the defense market, while marine and automotive imports were quite variable over the period, ranging from less than one percent to nearly ten percent in 1990 for the automotive sector. The 1991 figure for defense-related automotive gear imports fell to below two percent.

Profitability

According the BXA survey of gear producers, the reported total net sales for gears fluctuated within a narrow band of $1,919 million to $2,075 million from 1988 to 1991. Using 1988 as the base year, net sales increased by six percent in 1989, while a more modest increase of three percent was experienced in 1990. Sales declined by almost two percent in 1991. The pre-tax return of the gear industry in 1988 was 8.6 percent, increased to 9.2 percent in 1989, and then declined somewhat to 8.5 percent in 1990. Profits then fell sharply in 1991 to only 4.7 percent.

In a further related question, companies were asked whether sales of high volume/lower value gears were essential to their firm's profitability. While the majority of companies responded negatively, one went so far as to say that the companies who could have answered this question went out of business ten years ago. Several other companies, however, reported that their production of high volume/low value gears enabled them to lower average unit costs and keep prices lower for low-volume defense gear production. A leading auto gear producer noted that its recent addition of flexible machining cells has enabled them to largely dismiss economy of scale considerations.

LABOR INDICATORS

The U.S. Department of Labor prepared an in-depth report on "Labor Aspects of the Section 232 Investigation of the Effect of Gear Industry Imports on the National Security" for this investigation. Selected highlights from this report are excerpted here and elsewhere throughout our investigation report.

Employment

Bureau of Labor Statistics (BLS) data show that in 1980, production worker employment in the gear industry was 111 thousand, the peak employment level for the 1980-91 period. Production worker employment in the gear industry in the 1980-91 period decreased an average of 3 percent per annum resulting in a employment level of 78 thousand workers by 1991. Comparable declines occurred for SIC 35 (machinery, except electrical) and 3566 (speed changers, drives, and gears) of 2.8 and 3.7 percent respectively. SIC 37 (transportation equipment) showed only a slight decline in employment of 0.6 percent per annum for the same period.

BLS data show that for SIC 35 and 3566, production workers' share of total employment has not changed significantly since 1980, with a high of 60.4 and 70.8 percent respectively in 1989, and a low of 59.3 percent and 63.7 percent in 1983. The annual average share of production workers for 1980-91 was 61.4 and 68.1 percent respectively.

Productivity and Output

Although the gear industry has shown a steady decline in production worker employment, there has been a continuous increase in total output and productivity (measured as output per employee hour) at the two-digit SIC level. For the period 1980-88, production worker productivity for SIC 35 increased 10.2 percent per annum, while production worker productivity for SIC 37 increased 4.1 percent. The decline in demand for motor vehicles and parts, and ship and boat building repair may explain some of the difference in output growth for SIC 37 (transportation equipment). The highest increases in output in SIC 35 and 37 were during the post recession period of 1983-84 when output increased 26.7 and 14.2 percent respectively.

Large declines in output for SIC 35 and 37 occurred from 1981-82 and in some cases extended into 1983 evidencing the lowest level of employment and productivity growth for the entire 1980-88 period for SIC 35 and 37. This compares to a 3.2 percent increase per annum from 1980 to 1988 in productivity for all manufacturing. The increased use of numerically controlled machine tools, computerized manufacturing systems, industrial robots and improved inspection equipment have all contributed to productivity improvements. These new technologies have also brought a change in the mix and levels of skills required of workers involved in the production process. While electronic engineers and computer professionals are becoming increasingly important, skilled machinists are still the mainstay of metalworking manufacturing operations. Shortages of skilled workers have become a real problem according to the National Tooling and Machining Association and the AGMA.

Unemployment

BLS state unemployment data for the top ten gear manufacturing states cover half of AGMA member facilities. As of 1991, five of these states had unemployment rates above the national average rate of 6.7 percent. The majority of gear facilities are located in areas where the unemployment rates currently are very near or above the national average for total current employment.

Table V-3
**Unemployment Rates in the Top 10 Gear Manufacturing States**

| | IL | OH | NY | PA | MI | CA | TX | NJ | WI | IN |
|---|---|---|---|---|---|---|---|---|---|---|
| # FIRM | 37 | 29 | 21 | 20 | 18 | 13 | 10 | 10 | 10 | 9 |
| 1984 | 9.1 | 9.4 | 9.2 | 9.1 | 11.2 | 7.8 | 5.9 | 5.2 | 7.3 | 8.6 |
| 1985 | 9.0 | 8.9 | 6.5 | 8.0 | 9.9 | 7.2 | 7.0 | 5.7 | 7.2 | 7.9 |
| 1986 | 8.1 | 8.1 | 6.3 | 6.8 | 8.8 | 6.7 | 8.9 | 5.0 | 7.0 | 6.7 |
| 1987 | 7.4 | 7.0 | 4.9 | 5.7 | 8.2 | 5.8 | 8.4 | 4.0 | 6.1 | 6.4 |
| 1988 | 6.8 | 6.0 | 4.2 | 5.1 | 7.6 | 5.3 | 7.3 | 3.8 | 4.3 | 5.3 |
| 1989 | 6.0 | 5.5 | 5.1 | 4.5 | 7.1 | 5.1 | 6.7 | 4.1 | 4.4 | 4.7 |
| 1990 | 6.2 | 5.7 | 5.2 | 5.4 | 7.5 | 5.6 | 6.2 | 5.0 | 4.4 | 5.3 |
| 1991 | 7.1 | 6.4 | 7.2 | 6.9 | 9.2 | 7.5 | 6.6 | 6.6 | 5.4 | 5.90 |

Source: Bureau of Labor Statistics

Table V-4
**Unemployment Rates for Industry Groups**

| Year | Total Civilian | All Mfg | SIC 35 | SIC 35 (in 1000) |
|---|---|---|---|---|
| 1984 | 7.5 | 7.5 | 5.5 | 153 |
| 1985 | 7.2 | 7.7 | 6.2 | 171 |
| 1986 | 7.0 | 7.1 | 6.3 | 166 |
| 1987 | 6.2 | 6.0 | 5.2 | 131 |
| 1988 | 5.5 | 5.3 | 4.1 | 107 |
| 1989 | 5.3 | 5.1 | 4.6 | 95 |
| 1990 | 5.5 | 5.8 | 4.6 | 118 |
| 1991 | 6.7 | 7.2 | 6.0 | 151 |

Source: Bureau of Labor Statistics

Industry unemployment data (i.e. workers currently unemployed actively seeking work) are available only for selected broad industry groupings. For SIC 35 (machinery, except electrical), the average unemployment rate for 1991 was 6.0 percent, a rate lower than the all manufacturing figure which was 7.2 percent.

Earnings, Labor Costs and Hours

Table V-5 presents comparative wages from 1980-1991 for SIC 35, SIC 37, and for all manufacturing.

Table V-5
**Comparative Wages for SIC 35, 37, and All Manufacturing**
1980-91

| Year | SIC 35 | SIC 37 | All Mfgr. |
|---|---|---|---|
| 1980 | $8.00 | $9.35 | $7.27 |
| 1981 | $8.81 | $10.39 | $7.99 |
| 1982 | $9.26 | $11.11 | $8.49 |
| 1983 | $9.56 | $11.67 | $8.83 |
| 1984 | $9.97 | $12.20 | $9.19 |
| 1985 | $10.30 | $12.71 | $9.54 |
| 1986 | $10.58 | $12.81 | $9.73 |
| 1987 | $10.73 | $12.94 | $9.91 |
| 1988 | $11.08 | $13.29 | $10.19 |
| 1989 | $11.40 | $13.67 | $10.48 |
| 1990 | $11.78 | $14.10 | $10.43 |
| 1991 | $12.75 | $14.79 | $11.15 |

Source: Bureau of Labor Statistics

While wage data for the gear industry as a whole are unavailable, BLS does publish annual average hourly earnings for production workers in the broad industry groupings of SIC 35 and SIC 37. In current dollars, wages for SIC 35 have risen from $8.00 in 1980 to $12.75 in 1991, an increase of 4.3 percent per annum. A similar increase occurred in SIC 37 from $9.35 in 1980 to $14.79 in 1991 an annual increase of 4.3 percent for the same period.

For all manufacturing over the same period, production worker earnings went from $7.27 in 1980 to $11.18 in 1991, an annual increase of 4.0 percent. Hours worked by production workers in the gears industry remained stable over the 1980-1991 period. For SIC 35, 37, and 3566, the annual rate of change was 0.2%, 0.3%, and -0.1% respectively.

Labor Turnover/Supply

Current data concerning labor turnover in the gear industry are not available. The collection of such data for manufacturing industries was discontinued by BLS in 1982. However, the gear industry has reported difficulty in attracting and retaining skilled personnel needed for manufacturing operations. The industry's inability to attract and find new personnel could become a problem in the future as the average age of the labor force rises. Forty-eight percent of all gear industry workers are between the ages of 35 and 44. Twenty-six percent are between 45 and 54 and four percent are over 55.

Unemployment is eroding the gear industry as highlighted by the steady decline in employment and the difficulty employers have finding and retaining skilled workers. Even with the pool of unemployed workers, training of one to two years would be required and necessary workers likely could not be mobilized in time to meet a national emergency.

Continued declining employment in the gear industry will accelerate the loss of skills in the industry. Even if rehired, gear workers who have been out of work may require substantial retraining to bring them back to proficient levels of skill. A worker who transfers to another site will have to learn the peculiarities of the new plant's equipment. Loss of skills also occurs as new workers are not hired to fill vacancies and the total number of workers possessing critical skills decreases.

It is important to note that the dislocation of workers in the gear industry is not solely due to the U.S. gear business lost to imports. Some jobs have been lost to productivity improvements brought about by technical change in the industry and to changing demand. Productivity improvements in the future may offset some of the labor shortfalls. However, in the near-term, Labor concludes that the gear industry may be unlikely to meet its need for skilled workers in a national security emergency.

The Department of Labor notes that the Section 232 statute directs us to review the "anticipated availabilities of human resources", any "substantial unemployment," and the "loss of skills" when making our findings and recommendations, and concludes that employment problems in the gear industry are complex. While the supply of unskilled workers available to the gear industry is adequate to meet current and anticipated needs, the availability of skilled workers is problematic.

## VI. EXISTING GOVERNMENT PROGRAMS

The United States government has several programs and regulations in place which affect the gear industry. The following section presents a brief description of these programs, and identifies the impact they are having on the gear industry's competitiveness and its ability to meet national security requirements.

### DEPARTMENT OF DEFENSE

#### Research Support Programs

The Department of Defense (DOD) operates several grant programs through which it provides support for industrial research and development required to support the DOD's national security objectives. The Manufacturing Technology (MANTECH) program, for example, provides research and development (R&D) funding to help develop advanced manufacturing processes, techniques and equipment. MANTECH provides seed money necessary to demonstrate first case, factory floor applications of advanced production technology, and reduces the risk for others who are then able to invest their own funds to implement the MANTECH-developed technology, or some derivative of it.

MANTECH funds are to be used only when private industry has not committed funds on a timely basis in support of defense requirements, or when results are directed at the industrial improvement of government facilities. MANTECH's purpose is to lower manufacturing costs, improve manufacturing processes and improve product quality. DOD also operates the Industrial Modernization Incentives Program, and other research programs under the Defense Advanced Research Projects Agency. Since 1988, DOD has provided at least $18 million in funding for gear industry-related projects under these programs as indicated in the following table:

Table VI-1
DOD-FUNDED GEAR INDUSTRY RESEARCH PROJECTS 1988-94

| Subject | Contractor | Funding ($000) |
|---|---|---|
| Army MANTECH | | |
| CNC Grinding and Spiral Bevel Gears | Bell Helicopter/ Gleason | FY 88/$1970 |
| Enhanced automated spiral bevel gear inspection | Sikorsky | FY 89/$128 |

| | | |
|---|---|---|
| Study precision gear manufacturing | Illinois Inst. of Technology Chicago | FY 89/$90<br>FY 90/$198 |
| Navy MANTECH | | |
| Develop double-die ausrolling net shape finishing to AGMA 13 or better | Penn State Applied Research Lab | FY 88/$300<br>FY 89/$400<br>FY 90/$550<br>FY 91/$920 |
| Power compaction for cutting tool inserts and gears | Metalworking Technology Inst (MTI) Johnstown,PA | FY 91/$214 |
| Generate material standards data to permit production of powdered metal alloy gears | MTI | FY 91/$517<br>FY 92/$1276 |
| Develop software to assist design and production of casting technology for large precision gears | MTI | FY 90/$530<br>FY 91/$1061<br>FY 92/$1194 |
| Defense Logistics Agency MANTECH | | |
| Instrumented Factory (INFAC) - Coordinate R&D, education & industrial extension program for gear makers, users & suppliers (see next page for details) | Illinois Inst. of Technology Research Inst.(IIT) Chicago | FY 88/$122<br>FY 89/$2431<br>FY 90/$1016<br>FY 91/$2575<br>FY 92/$4000 |
| Gear Design and Manufacturing Improvement | Arizona State and Garrett | FY 92/$154 |
| Manufacturing Throughput Time Reduction | Ohio State and Speco | FY 92/$59 |
| Vision & Imaging Processes for Gear Inspection and Production | Centl. St. Univ.-Wilberforce, Ohio | FY 90/$50<br>FY 91/$250<br>FY 92/$134 |
| IMIP | | |
| Modernize Litton Precision Gear's Chicago physical plant | IIT/Litton Precision Gear | FY 91/$272<br>FY 93/$1500<br>FY 94/$700 |

Source: Department of Defense, Production Base Division

## Propulsion Gearing Procurement

The Naval Sea Systems Command (NavSea) limits procurement of large propulsion gearing for Naval combatant ships and major auxiliaries to U.S. suppliers. NavSea explains that this policy has both security and industrial base importance, and that declining shipbuilding programs make it even more essential that the U.S. propulsion gear industry be supported if it is to survive to provide the high-technology gearing that the Navy requires. NavSea has determined that the U.S. propulsion gearing industry has a technical edge on foreign suppliers, and therefore, must be given the opportunity to stay healthy. NavSea has further concluded that current projections for reduced future Navy procurements clearly show that the industry will be hard pressed to stay in business without added support. Similarly, the industry will be unable to survive on only the limited number of contracts which require classified clearance. NavSea has taken action to enhance the industry's engineering base by direct technical support contracts. NavSea believes that the above actions are both necessary and justified to maintain the Navy's superiority in propulsion systems.

## Instrumented Factory for Precision Gears (INFAC)

The Defense Logistics Agency's INFAC program was established to reduce the manufacturing lead time for hardened and ground precision gears, such as those typical of helicopter transmissions and fixed wing aircraft auxiliary gearboxes flown by DOD. INFAC benefitted from over $6.1 million in MANTECH funding from 1988 to 1991, in addition to financial and in-kind support from other DOD elements and corporate participants.

The Defense Logistics Agency (DLA) reports that average current lead times quoted for hardened and ground precision gears are about 450 days, and can stretch to more than 700 days. Preliminary factory analyses by Coopers and Lybrand at Litton Precision Gear and by Ohio State University at Speco Gear indicate that lead times can be cut by one-third to two-thirds through manufacturing process improvements. Anticipated manufacturing process improvements (such as cellular technology, improved factory information and control, better training, and installation of state-of-the-art machinery and systems) which shorten lead time will also yield more cost-effective gears and more consistent processes.

A wide range of gear producers and users are participating in the INFAC program. The first group includes four companies participating in the initial four demonstration cycles. These cycles involved modeling the gear maker's operations (functional, informational and simulation) to understand and improve operations, information flow and material flow. Models are then

developed to make the same gears at the INFAC research facility which will have the latest machinery, software and hardware. The gears will then be manufactured at INFAC using company tooling, materials, and design data; and sometimes by company personnel themselves. Statistical engineering experiments will then be conducted to optimize the manufacturing cycle for efficiency and gear performance. Initial models provide insights regarding duplication of effort and lack of control in the gear makers' operations. Finally, comparison of the company-specific models with INFAC models will provide a systematic basis for improvement efforts.

A second group of three gear makers are involved through a program of industry/university joint research. These companies are working with professors and students from the Industrial Engineering Departments at Arizona State, Ohio State, and Texas A&M to improve production management, factory layout and manufacturing engineering.

A third group of gear makers are involved in the management of the INFAC program. Management functions include six companies' service on INFAC's Board of Directors (overall goals), eight companies work on the Research Review Board (research needs and results), and two companies efforts on INFAC's Education Review Board (curriculum development).

A fourth group of 16 gear companies are involved in the development of a small gear makers training course. These companies are developing the curriculum and donating conventional machine tools to provide a four-week hands-on training program.

A fifth area of involvement is INFAC's 'agile manufacturing' efforts working to improve the linkages between gear makers and other elements in the value-added 'food chain,' such as the steel maker, forging supplier and gear end-user. Agile manufacturing consists of operational integration, joint R&D, product and process co-design, synchronized supplies and self-certification.

A final area of involvement is with DOD's IMIP program which provides funding for factory modernization plans. IMIP contractors must be DOD suppliers.

Most of the INFAC program is on schedule. Machine tool installation at INFAC's demonstration facility has been delayed due to procurement problems, but deliveries are expected to begin in July 1992. Cincinnati Milacron has signed a contract to coordinate delivery of machines from itself, Gleason, National Broach and Fellows.

DEPARTMENT OF COMMERCE

Export Promotion

The Department of Commerce's (DOC) International Trade Administration (ITA) operates a variety of export promotion programs potentially of value to the individual gear company. While exports have historically accounted for a small percentage of U.S. gear company sales, the decline of traditional customers has encouraged many companies to consider export markets. ITA's Office of Capital Goods provides export statistics and guidance on determining potential foreign markets to interested gear companies. ITA Country Desk Officers also have market information for their respective countries. U.S. and Foreign Commercial Service personnel located across the country and in overseas posts also have information on potential export markets. Some DOC export promotion programs that can help U.S. gear manufacturers develop foreign markets include:

- Agent/Distributor Service - can locate foreign representatives who, on the basis of company literature, have expressed interest in marketing a company's products;

- World Traders Data Report - can help companies evaluate potential partners overseas, including creditworthiness, standing in the local business community, and overall reliability;

- Commercial News USA - is a regularly published catalog of new U.S. products and services which is sent to 110,000 potential overseas buyers, agents and distributors;

- Foreign Buyers Program - brings delegations of overseas buyers from around the world to participating trade shows;

- Trade Opportunities Program - identifies timely sales leads overseas and makes them available to U.S. businesses;

- Trade Mission/Trade Shows - planned by the DOC or in conjunction with state, local or private organizers, help companies introduce and market their products in promising overseas markets;

- Matchmaker Delegations - are 'no-frills' missions for new-to-export or new-to-market firms. Matchmaker organizers evaluate a product's potential in the market, find and screen appointments with potential partners, and make initial introductions.

Strategic Partnerships Initiative (SPI)

The DOC's Technology Administration has recently launched this initiative to encourage the formation of multi-industry teams to create and commercialize large-scale technologies. SPI teams are anticipated to include noncompeting firms representing manufacturers, suppliers and users of the technology to be developed. The DOC's role is to increase awareness and facilitate formation of strategic partnerships. It is left to the private sector to select technologies, teams and partners within a specific team.

To overcome the cost, complexity and risk barriers associated with development of large-scale technologies, members of a strategic partnership can pool financial and technical resources in order to integrate innovation activities across a broad range of applications. Involving all parties of the innovation process at the outset eliminates the need for elaborate and time-consuming technology transfer processes. Using a team approach and concurrently developing a range of applications can save time and cost moving to market while more rapidly recouping investment costs for the technology.

In the past, perceptions of antitrust questions have created a potential barrier to vertical cooperation between firms. However, vertical integration generally does not present antitrust problems in U.S. markets that are characterized by effective competition and that are open to new entrants.

Advanced Technology Program

The National Institute of Standards and Technology's (NIST) Advanced Technology Program (ATP) assists businesses in carrying out research on pre-competitive, generic technologies. The ATP emphasizes enabling technologies that underlie a wide range of potential applications which offer significant benefits to the nation's economy.

The ATP provides technology development grants to single businesses or independent research institutes, or to joint ventures involving such organizations. The program also can sponsor cooperative research between private industry and Federal research facilities such as NIST. Any business, independent research organization, or industrial joint venture may apply for an ATP grant. No direct funding will be provided to universities or government organizations, although they may participate as joint venture members or as subcontractors.

Awards to individual firms are limited to $2 million over no more than three years, and can be used only for direct R&D costs. Awards to joint ventures can be for up to five years and are limited only by available funds. NIST funding to joint ventures must represent less than 50 percent of the total R&D cost. Levels of future funding are currently under consideration by Congress. A number of gear-related proposals are actively being considered, although none have yet been funded.

Economic Development Administration (EDA)

EDA administers a variety of grant and loan programs targeted to provide assistance to areas experiencing substantial economic distress. As part of this effort, EDA has been given a role in the Federal effort to assist communities in adjusting to an era of decreased defense procurements. EDA may be contacted through its six regional offices or through its Washington headquarters. EDA assistance programs include:

- Public Works and Development Facilities Program used to finance projects that contribute to the economic development of distressed areas.

- Guaranteed Business Loans Program established to support the purchase of fixed assets or for working capital purposes for projects located in areas eligible for EDA assistance. EDA reports that several gear industry firms have participated in this program.

- Economic Adjustment Assistance Program to assist communities experiencing Long-Term Economic Deterioration (LTED) or Sudden and Severe Economic Dislocation. The most common type of activity funded under the LTED program are Revolving Loan Funds (RLF). In concert with private lenders, RLF grantees make fixed asset and/or working capital loans to area businesses. RLF projects support such activities as small business development, business and job retention, and support for growth industries and high-tech firms.

- Trade Adjustment Assistance Program to assist firms affected by import competition. Three TAA program grants relevant to the gear industry have been made with total funding of $450,000 in FY 84-86. All three grants were in support of the Gear Research Institute's (GRI) program to develop a body of technical and performance data for austempered ductile iron, a material that provides producers with a cost-effective alternative to steel in several gear and other applications. EDA is currently reviewing a further GRI request for TAA program funding for a study of thermal grind damage in gears.

- Technical Assistance (TA) Program - (Local TA Program) to assist in solving specific economic development problems, respond to developmental opportunities, and build and expand local organizational capacity in distressed areas; and (National TA Program) to provide resources to intermediary organizations giving technical assistance to local, district and state economic developments organizations and for national demonstrations of innovative economic development techniques.

- Research and Evaluation Program - provides grants and cooperative agreements to support studies that will increase knowledge about the causes of economic distress and approaches to alleviating such problems.

EDA also administers other Planning and University Center Programs.

Export Controls

There are no existing limitations on the export of commercial or dual-use gearing. Under the most recent export control modernization (the "Core List"), licensing requirements remain in effect on export of some of the most precise gear-making machine tools. The Department of State administers separate export controls on certain gearboxes specifically designed for military applications.

Generalized System of Preferences

The United States Generalized System of Preferences (GSP) provides preferential duty-free entry to products falling under approximately 4284 Harmonized Tariff System (HTS) classifications from 134 designated beneficiary countries and territories. Several of the HTS codes under which gears and gearing products are classified are included amongst those eligible for duty-free entry. However, most of the leading sources of gear exports to the United States are not on the GSP list of countries eligible for duty-free privileges. South Korea, Taiwan, Hong Kong and Singapore were previously GSP-eligible, but were 'graduated' on January 1, 1989. Remaining GSP-eligible countries with gear production capabilities include: Brazil, Czechoslovakia, Israel, Malaysia, Mexico and Thailand.

DEPARTMENT OF LABOR

Trade Adjustment Assistance

Pursuant to the Trade Act of 1974, the Department of Labor provides adjustment assistance to workers adversely affected by imports of like or competing products. Workers are entitled to training, job search, relocation assistance, and extended income

support benefits after investigation and findings by the U.S. Department of Labor that workers have lost their jobs due to foreign imports. From October 1981 through September 1991, the Department of Labor reviewed 100 petitions for Trade Adjustment Assistance in industry SICs 3523, 3566, 3568, 3724, and 3728. Labor certified that workers had been adversely affected by imports and qualified for assistance in 33 cases covering 2,785 workers; denied 61 other petitions covering 12,397 workers; and terminated six additional cases prior to decision. Trade readjustment allowances (cash income payments) of $5.1 million have been paid to 1,271 workers adversely affected by imports, an additional $4,366 has been paid to 12 workers to assist in their job search; $28,124 had been paid to 16 workers for employment relocation expenses; and 285 workers have entered training for new employment.

## DEPARTMENT OF JUSTICE AND FEDERAL TRADE COMMISSION

### Antitrust Regulation

The Department of Justice (DOJ) and the Federal Trade Commission (FTC) share administration of this country's antitrust laws. In April 1992, the two agencies jointly issued updated horizontal (within industry) merger guidelines. The new guidelines are designed to reduce deterrents to efficiency-enhancing business conduct that will promote U.S. competitiveness while protecting free-market competition by preventing anticompetitive transactions.

The DOJ notes that in general, the antitrust laws do not proscribe industrial consolidation, restructuring or mergers designed to capture economies of scale or other efficiencies. Justice cautions, however, that the applicability of the antitrust laws to a specific transaction cannot be answered in the abstract without a review of the specific facts of the case in question. Justice further notes that most mergers and acquisitions are not likely to have proscribed anticompetitive results such as substantially lessening competition or tending to create a monopoly. Therefore, most such transactions will not be hindered by antitrust enforcement.

The DOJ reports that while mergers and other transactions which meet certain dollar threshold levels must be notified to the DOJ or to the FTC in advance, neither agency currently has any antitrust suits pending against gear producers. During the notification period, the antitrust enforcement agency reviewing the case will decide whether the matter merits further investigation. Should such investigation indicate that the transaction is likely to have proscribed anticompetitive effects, the DOJ will take appropriate enforcement action. Neither the DOJ nor the FTC has made an antitrust challenge to any gear industry merger or transaction during the 1982-1992 period.

SMALL BUSINESS ADMINISTRATION (SBA)

The SBA, with offices across the country, is an important source of assistance to small business' efforts to stimulate capital formation, economic growth and job creation. The 7(a) General Loan Program represents 90 percent of the agency's total loan effort, and promotes small business formation and growth by guarantees of up to 90 percent of the amount provided by commercial lenders. SBA also operates the 504/503 Development Company Loan Program to help small business finance fixed assets; an Export Finance Program to offer working capital and longer-term financing to promote exporting; and a variety of other finance, investment and procurement programs.

DEPARTMENT OF THE TREASURY

Tax Reform

The Department of Treasury reports that the Administration supports industrial competitiveness through its policy of supporting a neutral income tax system. This policy includes support of tax rules which represent a workable mechanism for determining depreciation allowances that does not seriously bias the tax code towards or against particular industries or assets. To offer special treatment to any one industry or set of industries would provide incentives for tax motivated investments, resulting in inefficient production and a noncompetitive industrial structure.

Treasury further notes that to some extent, current depreciation rules do offer general depreciation incentives, as measured by the difference between regular depreciation schedules and the Alternative Minimum Tax (AMT) depreciation schedules. These general depreciation preferences are designed to be roughly neutral in their effect, and further, the AMT itself serves as a check on the excessive use of tax preference by any particular taxpayer.

The Administration's FY 1993 Budget proposal contains at least two other tax receipt proposals which, if passed by Congress, could affect firms in the gear industry:

1. An investment tax allowance which proposes to allow an additional first-year depreciation equal to 15 percent of the purchase price of equipment acquired before January 1, 1993, and placed into service before July 1, 1993; and

2. An extended research and experimentation (R&E) tax credit which would make permanent the 20 percent tax credit for incremental R&E expenditures.

## GEAR INDUSTRY ASSESSMENT OF GOVERNMENT PROGRAMS AND POLICIES

### Government Programs

Producer survey respondents were asked whether their firm has been involved in a Government-sponsored MANTECH or IMIP program at any time during the past ten years. Only six companies responded that they had participated in such a program, although four of the companies participating were pleased with the program results. A leading aerospace gear producer, responded, for example, that its participation in a Mantech project was very timely, and that it coincided with shop floor improvements and cellular manufacturing implementation that the company had underway.

A leading diversified aerospace manufacturer complained, however, that the IMIP program was slow to work with, received inconsistent funding, and was hampered by too-frequent changes in program management. A leading foreign-owned gear producer with U.S. production facilities complained that the DOD research programs were not adequately publicized.

### Government Policies

The majority of producers responding to our survey stated that they had to adjust their firm's business practices in response to U.S. government policies in a manner which has influenced their competitiveness. Concerns expressed focused on procurement-specific problems, as well as on broader issues.

A small aerospace gear producer complained that U.S. government procurement policies include extensive micromanagement and are very difficult for small businesses to comply with. Another aerospace gear manufacturer complained that inconsistent defense procurement policies require gear companies to produce in small lot sizes leading to inefficient machine usage and higher costs for both gear producers and the taxpayer. Some companies, in fact, reported that they specifically avoided selling to the government due to the complexity and difficulty to comply with procurement regulations. A diversified gear producer estimated, for example, that compliance with military specification 45208-A adds 25 percent to manufacturing costs and leads their company to choose not to compete for defense business.

Several companies complained of U.S. defense funds being spent for foreign-built gears in cases when the gears could have been built in this country. Broader issues raised include concerns about government environmental, product liability and tax regulations.

When producers were asked what adjustments should be made in U.S. government policies, the largest number of companies asked for the reinstatement of tax incentives for capital investment. A large number of companies also asked for the institution of "Buy American" preferences on government gear procurements, and for tougher enforcement of the unfair trade laws. One foreign-owned gear producer complained of the high antidumping duties it was being assessed on bearings imported for use in its gearing products. This company suggested that imports be assessed similar duties for the bearings and other components embedded in imported finished products.

When asked questions similar to the above, gear importers complained most strongly about unfair trade laws, Buy America restrictions and other barriers which they believe have limited their ability to penetrate the U.S. gear market. One major gear end-user suggested that such restrictions are against this country's best interests in that they limit U.S. end-product manufacturers' access to the best component products. One leading foreign aerospace gear producer stated that there were too many limits on its participation in defense procurements, and that it welcomed greater future participation.

## VII. NATIONAL SECURITY ANALYSIS - CAPACITY

Section 232 (d) of the Trade Expansion Act of 1962, as amended, directs us to give consideration to "domestic production needed for projected national defense requirements, (and) the capacity of domestic industries to meet such requirements," among other factors. Most Section 232 investigations conducted in the last twelve years at the Department of Commerce addressed these factors by performing a two-step analysis to make our national security finding for each product category under review.

First, we compared anticipated supply during a national security emergency (from producers and reliable importers) against expected demand (developed from direct and indirect DOD requirements estimates for the product in question). Next, in categories where an anticipated supply shortfall was identified, we examined whether imports were a significant cause of the identified shortfall. Due to recent substantial changes in the national security challenges facing the United States, however, it was not possible to provide a specific quantitative estimate of national security requirements for gears and gearing products for this investigation.

In lieu of such estimates, the Department of Defense was able to inform us that it anticipates that gear requirements will be substantially decreased in the near future as procurement is cut back by as much as half. DOD further informed us, however, that it will continue to require an internationally competitive technically advanced gear production base able to participate in the development and production of state-of-the-art weapon systems. Defense officials emphasized that the most likely contingencies would be for 'come as you are' regional conflicts such as Desert Storm which would require that DOD be able to rely on a 'warm' industrial base prepared to meet unpredictable increases in short-term defense requirements.

As a proxy for specific defense gear requirements, Commerce's 1991 National Security Assessment of the U.S. Gear Industry evaluated whether gear firms could double defense production within six months (i.e. surge) and whether firms could quadruple defense production within 24 months (i.e. mobilize). It was found that the more defense-intensive aerospace and marine gear sectors would not be able to reach these targets, while the less defense-intensive industrial and motor vehicle sectors could substantially exceed these targets. Specifically, motor vehicle gear producers reported that they could increase their defense production 121 percent in six months (i.e. could exceed the goal of 100 percent increase - doubling), and could increase defense production 512 percent by the end of 24 months - thereby exceeding the goal of a 300 percent increase. Industrial gear producers could also exceed these targets by increasing defense production 492 percent within six months and 822 percent within 24 months.

The more defense-intensive aerospace gear sector reported, however, that it could increase defense production only 83 percent in six months, and 182 percent within 24 months. Marine gear producers reported that they could increase defense production 69 percent in six months, and only 87 percent by the end of 24 months.

Supply Side Considerations

By assuming complete intra-industry production fungibility, such aggregated analysis can conceal product-specific national security concerns, and can at the same time understate inter-industry fungibility. (A more detailed analysis of production fungibility can be found later in this chapter.) Further, analysis of any one industry's surge and mobilization ability in isolation can also understate the bottlenecks an industry might face in increasing production. This is true because other defense-critical industries (such as bearings and aircraft) would at the same time be increasing their demand for some of the same machine tools and skilled labor that the gear industry would be seeking.

As noted earlier, Commerce conducted a survey of all identifiable gear producers and importer/end-users to gather data on maximum production capacity and other factors. While we recognized the intimate relationship between the U.S., Canadian, and other allied defense industrial bases, as in previous Section 232 studies, we did not send industry surveys to such producers. We relied instead on data from U.S. importers and end-users.

Further, when Commerce conducted earlier Section 232 investigations, our data was collected using mandatory data collection authority available under Section 705 of the Defense Production Act (DPA) of 1950, as amended. Due to the indefinite lapse of the DPA, the gear industry survey was conducted on a voluntary, not mandatory, basis. As a result, some of the most important gear producers and importer/end-users chose not to provide the requested information. This included two of the "big three" automotive companies' captive gear producers, at least three aerospace gear producers, and several important defense gear user/importers.

Overall, we sent producer surveys to 371 companies, 126 (34 percent) of whom completed the survey. An additional 129 companies (35 percent) confirmed that they met the criteria for exemption (see copy of surveys at Tab C for details); and an additional 116 companies (31 percent) provided no response at all.

Of the 365 companies who received the importer/end-user survey, 58 (16 percent) completed the survey, an additional 152 companies (42 percent) informed us that they were exempt, and the remaining 155 companies (43 percent) did not provide a response. It should be noted that our series of follow-up calls led us to believe that a significant percentage of the companies who did not respond would, however, have qualified for exemption from the surveys.

Plastic Gears

Questions were raised during the public comment period about the possible availability of plastic gears to meet national security needs. After consulting with government and industry experts, we determined, however, that plastic gears are not yet able to meet the most demanding national security requirements, and therefore decided not to survey plastic gear producers and importers. Plastic gears cannot yet be produced in larger sizes, and cannot yet operate under the harsh conditions required for many military applications.

Surge Capacity by Four End-Use Markets

Surge production capacity for a given year is defined as the maximum realistic level of production that a manufacturing establishment can achieve during a twelve month period. (Our producer survey directed companies to assume that existing production facilities operate at full capacity, new equipment can be purchased to replace existing machinery, labor availability reflects normal market conditions, material requirements are fully met, and that at least 75 percent of production is defense-related).

Given these criteria, 154 gear manufacturing establishments reported surge capacity. In the more defense-intensive aerospace sector, estimated surge production capacity increased only 12 percent within 6 months, and increased 54 percent in twelve months. Marine gear producers forecast similar results with a 32 percent projected increase in surge capacity in six months, and a 53 percent increase in twelve months.

In the less defense-intensive gear sectors, industrial gear producing establishments reported an ability to increase capacity 82 percent within six months, and 135 percent in twelve months. Automotive gear production could increase 93 percent beyond current capacity within six months and 132 percent in twelve months.

Table VII-1
Producer Survey Surge Capacity

Aerospace Gear Surge Capacity

| | Quantity ($000) | Percent Increase |
|---|---|---|
| Current | 423,716 | -- |
| After 6 Months | 473,994 | 11.86 |
| After 12 Months | 651,449 | 53.74 |

Marine Gear Surge Capacity

| | Quantity ($000) | Percent Increase |
|---|---|---|
| Current | 190,386 | -- |
| After 6 Months | 251,271 | 31.97 |
| After 12 Months | 291,777 | 53.25 |

Industrial Gear Surge Capacity

| | Quantity ($000) | Percent Increase |
|---|---|---|
| Current | 831,934 | -- |
| After 6 Months | 1,517,253 | 82.37 |
| After 12 Months | 1,953,070 | 134.76 |

Automotive Gear Surge Capacity

| | Quantity ($000) | Percent Increase |
|---|---|---|
| Current | 1,129,963 | -- |
| After 6 Months | 2,179,142 | 92.88 |
| After 12 Months | 2,621,120 | 131.96 |

Source: Section 232 Gear Producers Survey

Production Capacity Lost

Since January 1982, 78 respondents reported they had closed manufacturing establishments and/or product lines with capacity losses totalling $220.6 million. This total does not include companies that went out of business during the past decade which, therefore, were unavailable to be surveyed. The highest reported capacity losses were in 1989 and 1991, and trended upward over the decade. Of companies identifying lost production, 29

establishments attributed the results to a loss of market share to imports, 19 cited declining demand, 15 reported firm restructuring, 13 identified domestic competition, and only seven blamed low profitability. (Some respondents reported that more than one factor was responsible.) The majority of these establishments were located in Illinois, Ohio, Wisconsin, and Michigan.

Table VII-2
Production Capacity Lost: 1982-1992
(in thousands of dollars)

| | |
|---|---|
| 1982 | $17,025 |
| 1983 | 10,120 |
| 1984 | 7,770 |
| 1985 | 22,950 |
| 1986 | 25,194 |
| 1987 | 10,315 |
| 1988 | 15,990 |
| 1989 | 36,640 |
| 1990 | 17,500 |
| 1991 | 36,747 |
| 1992 (1st quarter) | 20,360 |
| TOTAL | 220,611 |

Source: Section 232 Gear Producers Survey

Planned Closings and/or Expansions

Eighteen production establishments reported either planned closings or expansions over the next four years. Seven projected a total decrease of $77.8 million in annual capacity from planned closings. Eleven facilities projected a total increase of $10.2 million in annual capacity from planned expansion, for a net anticipated decrease of $67.6 million in annual capacity over the four year period. The projected net loss each year increased from $9.7 million in 1993 to $37.0 million in 1995. All seven expected plant closings were in spur and/or helical manufacturing establishments. Three of the seven plants were industrial gear producers; two were industrial, one automotive and one marine.

Establishments planning expansion reported only marginal increases in existing product lines, with few planning new product expansion. The majority of the establishments planning expansions were located in Georgia and South Carolina.

Inventories

Respondents to the survey were asked to report their 1991 end-of-year inventories to assist in determining the extent to which increased demand could be met from inventory. A total of 154 producers and 62 importers responded. No distinction was made, however, between defense and commercial inventories.

According to producers, aerospace gear inventories represented 19.2 percent of shipments; marine gear inventories, 33.8 percent of shipments; industrial gear inventories, 33.8 percent of shipments; and automotive gear producers, 14.8 percent of shipments. According to importers, aerospace gear inventories represented 40.3 percent of shipments; marine gear inventories, 5.1 percent of shipments; industrial gear inventories, 25.4 percent of shipments; and automotive gear inventories, 3.0 percent of shipments.

Overall, inventories would seem to provide a partial cushion for a sharp increase in gear demand. However, limited fungibility between and within gear sectors may make it difficult to meet varied system by system defense needs.

Table VII-3
Producer and Importer Inventories by End-Use Market

| End-Use Market | Producers ($000) | Importers ($000) | END-USE TOTAL |
|---|---|---|---|
| Aerospace Gears | 102,957 | 45,479 | 148,436 |
| Marine Gears | 149,358 | 1,650 | 151,008 |
| Industrial Gears | 622,099 | 87,818 | 709,917 |
| Automotive Gears | 354,338 | 18,357 | 372,695 |
| PRODUCER/IMPORTER TOTAL INVENTORY | 1,228,752 | 153,304 | 1,382,056 COMBINED INVENTORY |

Source: Section 232 Gear Producers Survey

Available Supply

The following table presents anticipated available supply of gears from survey respondents' domestic production and producer and importer inventories during a national emergency:

Table VII-4
Available Gear Supply

| End-Use Market | Current Surge Capacity ($000) | Inventories ($000) | SECTOR TOTALS |
|---|---|---|---|
| Aerospace Gears | 423,716 | 148,436 | 572,152 |
| Marine Gears | 190,386 | 151,008 | 341,394 |
| Industrial Gears | 831,934 | 709,917 | 1,541,851 |
| Automotive Gears | 1,129,963 | 372,695 | 1,502,658 |
| | | TOTAL SUPPLY | 3,958,055 |

Source: Section 232 Gear Producers Survey

Production Fungibility

As developed above, the potential supply of industrial and motor vehicle gears is likely to exceed the anticipated demand during a national security emergency. Demand in the more defense-intensive aerospace and marine gear sectors may, however, exceed anticipated supply. Gear producers' ability to convert surplus industrial and motor vehicle capacity to meet potential supply shortfalls in the aerospace and marine sectors is an important consideration in determining whether there is a national security shortfall for gears. To fully investigate allegations about the production fungibility of automotive gear producers made during the public comment period, we sought to survey automotive gear producers despite the fact that these producers were outside the scope of the investigation defined by the AGMA's Section 232 petition. As noted earlier, the automotive industry's response to our survey was incomplete. However, information from the surveys we did receive were supplemented by additional independent research allowing us to resolve the fungibility question.

Commerce gear industry experts believe that it would be very difficult for most automotive gear producers to readily shift to producing higher-precision lower-volume aerospace gears. Most gear companies would have neither the necessary precision

production equipment nor the trained production workers. Commerce analysts conclude that acquiring the necessary equipment would require large capital outlays and long lead times, and developing the work force would also be a time-consuming process.

To further evaluate gear producers' production fungibility, companies responding to our producers survey were asked whether they would be able to: 1) convert from producing AGMA 9 (standard automotive) to AGMA 12 (standard aerospace) gears (i.e. their ability to change the precision of the gears they manufactured); 2) change the size range of the gears they produce; and 3) their ability to produce gears for different end-use markets.

Regarding ability to change the precision of gears manufactured, most companies responded that they would be able to make such adjustment if provided sufficient money, time and machinery. Companies estimated that such an upgrading would cost as much as $1 million per company, and that the time required to make such a change would range from six to 36 months. Companies responded that making such a change would require adding gear grinders (only available from foreign sources) at up to a two year wait, upgrading of inspection capability, and purchasing or contracting out for heat treatment. In addition, a number of companies cited the need for substantial retraining of their labor force.

Of the companies responding that they could not convert to producing more precise gears, one aerospace gear company responded that they lacked the capital to purchase new equipment, and expected to go out of business when their machinery becomes unusable. An industrial gear company reported that it could not convert because it produced forged, rather than machined gears. Another aerospace gear company responded that they were already producing the highest precision gears, and could not economically produce lower precision gears with their current equipment and structure. While the above companies largely were answering the question hypothetically, one company reported its actual experience in making such a conversion. This company reported that it took three years to make an actual conversion from producing AGMA 11 to AGMA 12 gears with the substantial needed for upgrading machinery and labor retraining.

Concerning the ability to change the size of gears manufactured, several companies reported that space limitations at their factory would not enable them to bring in larger machinery required. Other companies reported that such a conversion would take from six months to two years to accomplish, and would require worker retraining and new machinery.

Regarding the ability to produce for different end-markets, many companies noted that precision rather than end-market per se would be the most important limiting factor. Several important companies, however, reported that their production equipment is dedicated to a unique gear or class of gears.

In sum, products and processes are generally not fungible between the various gear sectors. This is particularly relevant for the defense-intensive marine and aerospace sectors which require greater precision than the industrial and automotive sectors. Since changing the precision level of the gears produced requires a great commitment of capital, labor and time; the ability of automotive and industrial gear producers to supplement a shortfall of high precision marine and aerospace gears is not likely.

Lead Times

Lead times are a major concern for both military and commercial users of gear systems. Generally, the higher the precision, the longer the lead time. Surveyed firms were asked to estimate their average lead times for filling new gear orders (defense and non-defense combined). Total reported lead times (from initial receipt of the customer's order to delivery) ranged from just seven weeks to more than three years.

The time to design and engineer a first-time gear order was the longest element of the lead time averaging 14 weeks. This phase of production accounted for up to two years for some firms. Obtaining needed materials (e.g. forgings, bearings, steel) accounted for an average of 11 weeks, and as much as one year. Other lengthy phases of the production process included tool preparation (averaging eight weeks), actual in-process manufacturing time (eight weeks) and queue time (six weeks). Shorter periods (three weeks or less) were required for inspection, production scheduling, and packaging/delivery. It is important to note, however, that many of these operations can be performed simultaneously (e.g. tools can be prepared while waiting for needed materials to arrive).

For repeat orders of previously designed and engineered gears for which materials are in stock, the average lead time dropped to 16 weeks, with a range of two weeks to two years. With the design phase complete and materials in inventory, the most time-consuming operations include actual manufacturing (six weeks) and queue time (four weeks).

Defense Lead Times

The BXA survey of gear producers indicates that the average lead time for defense gear orders was nearly 28 weeks, including both new and repeat orders. The table below presents a list of the 20

longest defense lead time items and the defense system they support. It is apparent from this table that marine gears have the longest lead times; the eight longest lead time gears are all for use in Navy submarines or ships. These marine gears, including the main propulsion systems, are critical to the production of these Navy vessels. Aircraft gears, particularly those used in helicopter transmissions, were also subject to extended lead times.

The most frequent reason cited for these long lead times was the time that it takes to get needed materials. The gear industry has little control over the many suppliers it relies on for steel, castings, bearings, forgings, and other parts. Forgings in particular were cited numerous times as the reason for long lead times. Other reasons include the manufacturing process and the need for more equipment. The burdensome paperwork involved in defense orders was also mentioned several times as contributing to long lead times.

Table VII-5
LONGEST LEAD TIME DEFENSE GEARS

| Rank | Lead Time (Wks) | Gear Supplier | Type of Gear | Weapons System |
|---|---|---|---|---|
| 1 ... | | (Proprietary | Information | Withheld) |
| 20 | | | | |

Source: Section 232 Gear Producers Survey

Equipment Requirements

Responding companies were further asked if, in a national security emergency, additional equipment or replacement parts for existing equipment would be required in order to expand the production of gears or gearing products. A total of 74 companies responded affirmatively to this question, with some companies identifying as many as five types of equipment or parts for such equipment.

The most frequently cited machine type was gear grinders mentioned by 46 of the 74 firms. Hobbers were the second most frequently mentioned machine type cited by 37 firms, and lathes were mentioned by 24 firms. Gear shapers were cited by 21 firms, and turning equipment was mentioned by 11. Machining centers and furnaces/heat treaters were each listed by ten companies. Other

(each mentioned six times), inspection equipment (five mentions), milling machinery (four cites), and blanking machinery (three citations). A number of other types of machinery were mentioned once each: boring mill equipment, finishers, lappers, measuring machines, pointers, screw machines, table blasters, tape millers, and testing machinery.

In only three instances did a company report that it would need parts for existing machinery. One firm reported that it would need parts for its current Japanese-made lathe (and would also need additional lathes from its Japanese source). Another company reported needing drills, mills, and broaches from a U.S. supplier. The third company reported needing parts for its Swiss-made grinders.

The total estimated number of machines needed by these 74 firms during an emergency was 631, with grinders ranking as the most needed at 142 additional machines. Hobbers were also frequently reported, with an anticipated increase of 133 machines. Lathes were the third most mentioned machine type with 81 mentions, followed by turning machines with 58, shapers with 43, and cutters with 32 citations. An additional 30 shaving machines were reported needed, as well as 22 generators. Twenty-one additional machining centers were listed, while an additional 18 furnace/heat treaters were needed. Ten milling machines were also reported, as were eight additional blanking machines and eight gear checking equipment. Other reported machinery needs were five inspection centers, four finishers, four pointers, two tape milling machines and screw machines. Finally, companies responded that they would need one each of table blaster, boring mill, measuring machine, testing machine, and lapper.

Estimated leadtimes were also requested for each type of equipment reported. The longest average leadtime by type was for pointers, which require an estimated 60 weeks. This is misleading, however, as only one company reported needing four additional pointers, with the 60 week estimate pertaining to its German equipment supplier. Boring mills and tape mills both required the second longest leadtime, at 52 weeks. One company indicated that it would require one additional boring machine from a U.S. source. Another company reported that it would need two tape milling machines from its Japanese supplier.

The average anticipated leadtime for sourcing various grinding equipment was 45.4 weeks, ranging from two weeks from a foreign-owned U.S. company to 104 weeks from a German producer. There were 29 different companies listed as sources of supply for grinding equipment: ten German; eight American; six Japanese; four Swiss; and one Italian. German suppliers were mentioned most often - 30 times; and one company dominated with eleven mentions. U.S. companies were mentioned 18 times, led by one company with five mentions. Japanese companies were mentioned

16 times spread across several companies. Swiss suppliers were mentioned ten times, seven of which were a single company. Finally, one Italian company was mentioned only once.

Cutters require an average of 43 weeks leadtime, with a range of 20 weeks to 52 weeks. Except in one instance when a German company was cited, a single U.S. company was mentioned as the source of supply for cutters. Shavers require an average leadtime of 40 weeks (ranging from 24 to 56 weeks, in all cases from one of three U.S. sources, with the exception of one mentioned Japanese supplier). The average leadtime for both furnaces/heat treaters and machining centers is 35 weeks, with a range for furnaces from 12 to 52 weeks and for machining centers 16 to 60 weeks. Three sources were reported for furnaces, all U.S. companies. Four companies (three Japanese and one American) were listed as suppliers of machining centers. Japanese firms were reported seven times, while the U.S. company was mentioned four times.

Both hobbing equipment and shapers required an average of 30 weeks. The range for hobbers was between six and 56 weeks; and the range for shapers was six to 104 weeks. Hobbers were reported to be available from 12 companies: five American; three German; two Japanese; one Swiss; and one Chinese. German hobber suppliers led in number of mentions with 18; American companies were mentioned 14 times, Japanese five times, and Swiss and Chinese companies once each. Only five shaping equipment suppliers were identified: three German companies; one American company; and one Japanese company. The American company was cited most often with thirteen mentions, while the German companies were collectively mentioned seven times. The one Japanese company was reported four times.

Generators required an average of 33 weeks, with each company reporting its source as an individual U.S. supplier. The range was between 12 and 52 weeks. One company reported the need for one additional lapper with a leadtime of 32 weeks from its U.S. source. Inspection equipment was determined to have the next longest average leadtime at 31 weeks, with a range between one and 60 weeks. Four inspection equipment suppliers were listed; two American, one German, and one Swiss; with the Americans mentioned most frequently (three times). German and Swiss suppliers were each mentioned by one respondent. Gear checking equipment requires an average leadtime of 30 weeks, ranging from 16 to 52 weeks. Three U.S. producers, one German producer, and one Swiss producer were cited as sources of supply for this type of equipment. One reported measuring machine needed from a U.S. company was reported to require 28 weeks. The average leadtime for turning equipment was 28 weeks, the range being between 12 and 52 weeks.

The reported blanking machinery requires an average of 27.3 weeks, with three companies estimating between 24 and 32 weeks from one U.S. supplier and one Japanese supplier. The leadtime for two needed screw machines is 26 weeks, as reported by one company who sources such equipment from a U.S. producer. One company reported that it would require one additional testing machine from a German company, with a leadtime of 26 weeks.

Lathes require an average 25 week leadtime, with a range of seven to 52 weeks. Eleven lathe producers were identified: six Japanese; four American; and one Taiwanese. By number of mentions, the Japanese dominate with 18 (11 for a single firm), while American firms were mentioned nine times. The Taiwanese company was mentioned once. Four finishers were reported by a single company, which would require 16 weeks from either a single German or single Swiss supplier. Milling machines had the lowest reported average leadtime at 16 weeks. The range was from eight weeks to 16 weeks from either of two different Japanese sources, one U.S. company, or one Taiwanese source.

In response to a related question, the overwhelming majority of gear producers responded that they had not experienced shortages or interruptions of supplies or inputs that adversely affected their U.S. gear manufacturing operations. Component shortages identified included bearings, forgings, steel, and long lead times for gear tooth grinding equipment from Kapp of Germany were cited.

Production Bottlenecks

Companies responding to our producers survey were asked to identify and rank in order the top five bottlenecks affecting their ability to ramp-up to production capacity of loose gears. (For purposes of this investigation, a bottleneck was defined as a "production process, operation, procedure, material or labor requirement ... that would ultimately prevent or delay increased production.") Respondents were provided with a list of 14 potential bottlenecks as well as the opportunity to identify any additional bottlenecks not listed. Of the 152 producer survey responses received (some multiple responses from individual companies); primary bottlenecks were identified by 114 respondents; 112 surveys went on to identify a secondary bottleneck, 99 a third-rank bottleneck, 85 a fourth-rank and 75 identified a fifth-rank potential production bottleneck.

About 25 percent of the 114 companies responding ranked the availability of forgings and castings as their primary bottleneck. Estimates of the time it would take to correct this potential situation ranged from two months to two years, with most falling in the 6 - 11 month range. Very few of these

companies assigned a cost to alleviate this potential bottleneck, primarily because these items are sourced from the outside. Those that did cited costs from $100,000 to $3.8 million.

About 15 percent of the firms responding ranked gear blank production as their primary obstacle to ramping-up. Correction time and cost estimates ranged from six weeks and $50,000 to one year and $2.5 million, averaging about seven months and $865,000.

Another 12 percent identified heat treatment as their most serious potential bottleneck. This obstacle could be overcome at a projected average time and cost of 11 months and $1.5 million. The lowest projection was six months and $300,000; the highest was 18 months and $5.5 million.

Both gear blank production and gear cutting, hobbing and shaping were most often mentioned as a secondary bottleneck. These two procedures together were cited by 30 percent of the companies responding. Gear blank production bottlenecks would require an average of six months and $870,000 to be corrected, while gear cutting, hobbing and shaping concerns would require an average of nine months and $1.3 million to remedy.

Heat treatment was the second most often mentioned secondary bottleneck, cited by about 13 percent of the respondents. Average time and cost to correct this at the secondary level would be 10 months and $1.01 million.

Companies identifying a third-rank bottleneck most often mentioned heat treatment, followed by gear blank production, and followed next by gear cutting, hobbing and shaping. At the fourth level, heat treatment again received the most mentions. Gear cutting and shaving and gear grinding, including gear teeth grinding and general purpose grinding were also frequently mentioned as fourth-rank bottlenecks.

Gear grinding was identified most often among fifth-rank bottlenecks. An average of seven months and $665,000 would be required to rectify this bottleneck. Component testing and inspection, identified second most often at the fifth level, would require an average of nine months and $500,000 to rectify.

Heat treatment was the bottleneck mentioned most often at all levels, being cited in almost 14 percent of the total responses. Gear grinding had slightly less than 13 percent of the total mentions, and gear blank production had slightly less than 12 percent. Forging/casting availability and gear cutting, hobbing and shaping followed closely behind in the rankings.

The coming cutbacks in defense procurement are likely to put increased competitive pressure on defense gear producers. The current challenge is to manage the build-down of the U.S. defense

base without losing the technological edge upon which U.S. national security depends. Lucas-Western's recently-announced plans to close its California facility, and consolidate manufacturing in Park City, Utah is symptomatic of this trend. ... (Proprietary Information Withheld) ...

In a period of long-term declining demand for defense gears, it becomes increasingly difficult to justify maintaining excess capacity able to meet highly-demanding, and more costly defense specifications. With their expensive capital equipment, it is problematic whether defense gear producers can profitably compete in civilian markets in the mid-term, and even more problematic whether such companies would be willing or available to re-convert to defense production in the future. As Sikorsky Helicopter informed us, although its machinery would be capable of producing both civilian and military gears, a company cannot maintain production at two precision levels on the same factory floor.

Labor Occupational Skills Analysis

A critical job was defined for the purposes of this study as one that is essential to maintaining production and that requires a minimum of one year's training before a worker can effectively perform his duties and responsibilities. Based on this definition, the Department of Labor reports that there are 65 critical jobs in the gear industry including 39 production jobs, 18 engineering jobs, and eight technician-drafter-designer jobs.

Virtually all of the production jobs require a basic high school education or some type of technical training. In addition, they require varying periods of on-the-job training and/or experience ranging from a minimum of one year to as many as five years for the job to be carried out at full proficiency. Critical production jobs include such occupations as heat treater, gear hobber, gear-cutting operator, tool grinder, and various types of machine operators.

Critical technical positions include such jobs as gear inspector and machine shop supervisor for production. These jobs require an associate degree from a technical school or completion of a four-year apprenticeship program. In addition, one to four years of relevant work experience is necessary. The engineering jobs require a bachelor of science degree in an engineering field, and two to four years of on-the-job experience to be fully proficient. Most managerial and supervisory jobs, as well as

some support positions can also be considered "critical" to the extent that they require several years of experience and specific product knowledge for effective functioning.

Employment data by occupation are available only for certain broad occupational groupings. In 1990, workers in the broad occupational grouping covering the critical positions identified in the gear industry (SIC 35 and 37) constituted roughly 29.5 percent of total employment in that group. Partial data suggest that the occupational structure of the gear industry is similar to that of the broad grouping.

BLS projections for the structure of employment in SIC 35 and 37 from 1990 to the year 2005 indicate continued decline in industry employment for the occupation structure of the industry. It may be assumed that employment in the critical gear occupations will follow this pattern. Of the eight occupational categories BLS estimates, six show declines in employment levels for the three BLS scenarios of low, medium, and high economic growth. BLS predicts that two-thirds of the occupational categories estimated will continue to decline regardless of the economy.

An analysis of the occupational skills data has been carried out for this study under contract to the Department of Labor by the North Carolina Occupational Analysis Field Center (NCOAFC). This analysis determined that occupations found in the gear industry are also found in other related industries. Several metalworking industries (SIC 3544, 3545 and especially the automotive industry which represents approximately 75 percent of gear production) employ workers with similar skills. The work force in these industries represents in theory, a reservoir of workers who could, under normal circumstances, be retrained to perform tasks in the gear industry. This retraining would require substantially less time than hiring and training of unskilled workers. Nevertheless, the NCOAFC report concludes that knowledge and skills specific to the product and the industry do exist; and that the loss of these skills would make it difficult to reconstruct the industry in any emergency situation.

In a national emergency, it is highly probable that these industries would also experience a strong surge in demand, and as a result, the desired workers would probably not be available to the gear industry. There is a substantial amount of industry-specific knowledge required for effective functioning in the gear industry, and any skilled workers transferring from related industries would need time to master this knowledge before they would be fully proficient.

The capability to maintain mechanical equipment during a national crisis is also an important factor in maintaining a viable gear industry. This capability would depend, in part, on the availability of gears. The production of gearing, in turn,

depends to a large extent on skilled engineering, technical and production workers. Stockpiling equipment or placing entire factories on reserve will not guarantee the necessary levels of production during a national emergency if sufficient numbers of skilled workers are not available.

Import Reliability

The Department of State considers Germany, Japan, France, Italy, the United Kingdom (UK), Belgium and South Korea to be politically stable, reliable allies of the United States. In general, and without reference to a specific military conflict or mobilization scenario, State reports that these countries can be expected to trade with the United States in times of peace as well as in periods in which our country is engaged in military conflict. The United States has longstanding ties with each of these countries that involve very close cooperation on national security matters. As members of the North Atlantic Treaty Organization (NATO); Germany, Italy, the UK and Belgium are committed to the mutual defense of all NATO members including the United States. Our country also has a number of agreements with Japan and South Korea providing for close defense cooperation and the stationing of U.S. troops in those countries.

Foreign-owned Importers

The Importer/End-User questionnaires asked companies if their firms were wholly- or partly-owned by another firm. Of the 62 companies responding to this survey, 31 had foreign ownership, and another 31 were owned by U.S. entities. Total 1991 imports by foreign-owned gear companies were $546 million, accounting for 57 percent of total gear imports.

Thirteen of the foreign-owned companies had German parents, with imports totalling $75.5 million, accounting for 14 percent of total 1991 imports; 11 had Japanese parents, with imports totalling $436.7 million, accounting for 80 percent of total imports; two had Italian parents, with total imports of $22.3 million (4.1 percent of total imports); two were from the United Kingdom, with $2.2 million (.4 percent of total imports); and three were based elsewhere, with $9.3 million and 2.6 percent of total imports. Only one foreign-based importer reported making shipments to defense. These shipments totaled $285,000, less than one percent of the reported $36.3 million of imported defense gears.

Impact of Imports

While the lack of quantifiable gear requirements makes us unable to perform the two-step analysis done in previous Section 232 investigations, we are still able to draw some conclusions about the impact that imports have had on the gear industry's ability

to meet national security requirements. First of all, for the automotive and industrial gear sectors, defense gear usage is small, and it is likely that ample gear capacity would be available to meet needs during a national security emergency.

In the more defense-intensive aerospace and marine gear sectors, however, it is possible that sufficient capacity may not be available to meet national security gear requirements. However, it is unlikely that imports have significantly impacted the gear industry's ability to meet national security gear requirements. Imports as a percentage of new supply (see Table V-1) have been stable over the 1988-91 period in the aerospace gear sector, and have actually declined over this period in the marine gear sector. Imports as a share of defense new supply (i.e. domestic shipments and imports consumed in defense applications) for these sectors have been even lower and have also been stable over this period.

## VIII. NATIONAL SECURITY ANALYSIS - TECHNOLOGY

As noted in the preceding chapter, DOD has informed us that it will continue to require the maintenance of a state-of-the-art gear industry able to support current weapons systems and participate in the development of future weapon systems. In its October 1990 Report to Congress on the Defense Industrial Base: Critical Industries Planning, DOD identifies the leading 20 technologies considered essential for maintaining the qualitative superiority of U.S. weapons systems. Gears are an essential support industry for the majority of these technologies, either as a component of the system itself or as a component of the machines required to produce the system. Gear industry support for these critical industries ranges from the gears contained in robots and semiconductor manufacturing equipment to the precision gears which direct hypervelocity projectiles. For example, although the gears in the engines which power military transports represent less than two percent of the engine's cost, new or replacement engines could not be built nor could the plane fly without these gears.

### Weapon Systems Supported

Each recipient of the producer survey was asked to provide the names of specific weapons systems and value of shipments to its top five defense applications in 1991. To analyze this data, shipments of gears to specified military applications were divided into six broad application categories: marine, land vehicles, fixed wing aircraft, helicopters, missiles/torpedoes, and other/unspecified. The table below breaks out 1991 gear shipments (the top five applications for each responding plant) into these defense categories:

Table VIII-1
DEFENSE GEAR APPLICATIONS

| DEFENSE APPLICATION | 1991 SHIPMENTS ($000's) | Percent |
|---|---|---|
| Ships, Submarines, Marine | $151,094 | 37% |
| Helicopters | $135,776 | 34% |
| Land Vehicles | $ 60,575 | 15% |
| Fixed Wing Aircraft | $ 30,960 | 8% |
| Missiles/Torpedoes | $ 7,685 | 2% |
| Other/Unspecified | $ 17,118 | 4% |
| TOTAL | $403,208 | 100% |

Source: DOC Section 232 Gear Producers Survey

As can be seen from the above table, the bulk of defense gear shipments were destined for use in marine and helicopter applications, with over one-third of the total going to each. Gears play a critical role in each of these applications.

In the marine category, there were relatively few gear suppliers (seven companies) equipping a range of Navy programs, including the DDG-51 destroyer, SSN688, SSN21, Trident, and Seawolf submarines, as well as aircraft carriers, cruisers, amphibious assault ships, and other specialized craft. In fact, three firms were responsible for the vast majority of defense shipments to marine applications in 1991.

In the military helicopter category, 14 gear companies were suppliers, half of which sold gears to multiple helicopter programs. The AH-64 ("Apache"), CH-47 ("Chinook"), and CH-53 ("Blackhawk") helicopter programs were each cited by several companies as utilizing their gears. Other helicopters supported by the survey group include the Huey, Cobra, Sea Knight, and various unspecified utility and observation craft.

The third largest defense category in terms of gear usage (15 percent) was land vehicles; this category was supported by the greatest number of gear companies (21). Included in this category are various types of armored tanks, personnel carriers, earth-moving equipment, trucks, self-propelled howitzers, etc. Surveyed companies most frequently supplied gears for the engines used on these vehicles, as well as their transmission systems. Of the 21 suppliers to the defense land vehicle market in 1991, 11 supplied multiple systems (some as many as four).

The M1A1 "Abrams" tank and the Bradley Fighting Vehicle each were supported by at least eight gear companies. Sales of gears to the M1A1 alone exceeded $21 million in 1991, while sales to the Bradley were over $14 million out of the total $60 million in this category. Other land systems cited by multiple gear firms include the M113 Armored Personnel Carrier, the M9 ACE (an armored bulldozer), the M88 tank vehicle, and the HEMTT (Heavy Expanded Mobility Tactical Truck).

Military fixed-wing aircraft, including the A-6, F-15, F-16, F-18, B1-B, B-2, P-3, and C-130, as well as the F110, J52, CFM56 engines accounted for about eight percent of defense-related gear shipments in 1991. In fixed wing systems, gears are used extensively in the engines well as propellers, environmental controls, and wing actuators. Four gear companies were among the major participants in this market. Many other firms participated, but contracts tended to be small (less than one million dollars).

Missiles and torpedo programs accounted for a small percentage of gear shipments in 1991 (two percent). These programs included the Navy Standard, Harm, Patriot, Cruise, MX, and Hawk missiles, as well as the MK-48 and MK-19 torpedoes. The final category of defense applications for gears was the other/unspecified category, accounting for the remaining four percent of 1991 military gear shipments. Some sales in this category were to undesignated defense applications; others went to systems that did not fit into the other five categories. The latter include satellites, radar systems, guns, pumps, radios, and cranes.

Foreign Sourcing

The decline of the commercial gear sector, combined with the prospect of significant decreases in defense procurement, increases the economic pressure on U.S. gear producers. If these trends continue, the United States may become dependent on foreign countries for defense-critical gears in some industry sectors. U.S. policy objectives could then be compromised in the event of a disagreement with a foreign government whose approval would be necessary before key components could be shipped. There is also some risk that advanced technical data could be transferred from U.S. manufacturers to foreign gear producers in the intimate process of weapon specification and design.

There are both benefits and costs to relying on foreign suppliers for gears and other defense-critical components. Among the benefits can be lower prices, better integration with our allies, and access to a larger, global defense industrial base. Among the costs of foreign sourcing are those noted above, as well as the economic impacts of losing high value-added production and research and development capabilities.

Both our producer and importer/end-user surveys asked companies to identify the positive and negative impact of gear imports. Although the majority of U.S. gear producers state that there is no identifiable benefit from gear imports, several companies from each product sector report that import competition has caused them to increase their competitive quality and lower their production costs. Additionally, one major end-user replied that the alternative to imported gears would be increased in-house gear production, rather than increased purchases from independent gear producers.

Importers tended to emphasize the positive impacts of gear imports, with one importer noting that it purchases half of the loose gears for its imported gearbox from U.S. suppliers. Another importer noted that having had the opportunity to develop a customer base through importing has led it to invest in U.S. gear manufacturing capacity. A leading engine manufacturer

concludes that its competitiveness depends upon the ability to access the best components, and that import competition has kept its domestic suppliers at the leading edge.

Nearly every independent gear company responding to our producers survey stated that imports had had a negative impact on their company. Companies cited dropped product lines, terminated employees, lower profits, and higher costs on remaining defense orders. Further, several AGMA members in their proprietary supplemental submission cited foreign gear sourcing arrangements which have led to a decrease in their business.

An aerospace gear producer cited European subsidies for the Airbus as leading to decreased U.S. aircraft orders, which led the gear producer in turn to lay off 20 percent of its employees in 1991. An importer of Japanese products replied that imports led to the closing of marginal U.S. producers, while another importer of Japanese gears expressed concern that its import source would begin to sell directly in this country, bypassing them entirely.

We conclude that a domestic gear industry provides a secure source of supply and maintains U.S. presence in the continuing development of next generation gear technology. As a highly specialized intermediate product, gear customers benefit strategically from a domestic source by having greater control over product quality and delivery schedules, and lower transaction, transportation, and inventory costs. U.S. national security is enhanced by having a competitive, technologically viable domestic gear manufacturing base.

Offset Agreements

Offset agreements are defined as a range of industrial and commercial compensation practices that are mandated, directly or indirectly, by a purchasing government or company as a condition of purchase. Offsets include co-production, licensed production, subcontractor production, overseas investment, technology transfer and countertrade. Offsets have become particularly prevalent in international defense trade, partially due to the fact that defense trade continues to occur outside the jurisdiction of international commercial trade agreements.

Gear end-users responding to our survey were asked whether their firms imported gearing as a result of entering into or accepting an offset obligation, and further, whether their company was a party to any joint ventures, co-production or other work sharing agreements by which they are committed to purchasing gears or gearing products only from foreign sources.

Only one company reported that it had imported gearing as a result of offset obligations, citing the import of about $750,000 of gears over the last ten years to incorporate into its jet engines. This company commented that almost all aircraft engine production, both military and civil, involves some type of international partnership. On the military side, the most common arrangement is co-production or licensed production. On the civil side, revenue sharing joint ventures are the principal form of international partnering. The company states that when it has purchased gears from a single foreign source for a long period, the usual reason has been that the supplier has proven reliable in quality and delivery schedule and is producing at a reasonable price, or occasionally, that the gearbox itself has been designed by a foreign partner using its own funds.

Another leading U.S. aircraft engine producer emphasized that the quality of aircraft gears is too important to both safety and performance to casually include gears in offset packages. A leading helicopter producer reported that it was committed through a joint venture agreement to purchase gearbox kits from a foreign supplier over the next four to five years.

Risk/Revenue Sharing Arrangements

In their proprietary supplemental submission, several AGMA members alleged that at least three leading U.S. defense prime contractors have informed them that they will stop sourcing gears from independent U.S. producers by the end of 1994. One U.S. aerospace gear producer alleged that one of the primes had told them that they would no longer buy from U.S. gear producers and suggested that the U.S. gear company approach a leading foreign gear supplier for its overflow work.

Further allegations were made by U.S. gear producers that U.S. bidders had been disqualified from European gear procurements based upon their nationality. Details of these allegations have been provided to DOD's Deputy Director for Foreign Contracting who intends to seek resolution from his European counterparts. The DOD official further explained that NATO countries are in the process of negotiating a defense trade code of conduct to require that any such restrictions be published and publicly justified.

A leading aircraft engine producer explains its involvement in risk/revenue sharing arrangements by noting that it has been over twenty years since it last developed a commercial aircraft engine on its own. The company further notes that the military's decision to no longer contribute to the up-front development costs of sub-sonic military engines has increased its need to seek financing assistance from joint venture partners. The aircraft engine company explains that it does not consider joint venture development partners who cannot provide a minimum of six

to ten percent of both the up-front financing and value of the engine project. Leading foreign gear suppliers often have the financial resources to provide the necessary financing, and the production capability to reliably produce other low-compression segments of the engine (i.e. more than the two to four percent of the engine represented by the gearbox).

Another leading aircraft engine producer explains its participation in risk/revenue sharing joint ventures in similar terms, although it reports that it does include partners at the two to four percent participation level. The company has identified a number of critical engine technologies that it believes it must continue to control (such as main drive gear systems), but it is willing to consider joint venture participants in other areas. This company emphasizes that it must be certain of the production capabilities and long-term viability of its partners. The company further asserts that it has no intention of altering its current gear sourcing patterns. Finally, the company cautions that it would take approximately two years to design and build new gear boxes and qualify new sources at FAA and DOD standards if it was forced to abandon its joint venture relationships with offshore producers.

We conclude that the substantial cost of system development leaves U.S. prime contractors with little alternative to seeking offshore risk/revenue sharing partners. In attempting to alleviate the national security concerns raised by the declining gear production base, we should ensure that we do not weaken prime contractors and thereby impose a substantial national security cost. However, it is at the same time important for the U.S. to maintain a competitive and technologically viable domestic gear production base.

Implications for National Security

The absence of the threat of a major conventional war with the Soviet Union has led to a major restructuring of U.S. national security policy with consequent impact on the defense industrial base. The build-down of U.S. armed force structure, and attendant decline in the defense budget will ultimately result in a defense industrial base of considerably reduced size, including some key sectors of the gear industry. Many of the defense programs dependent on gears are either being eliminated or scaled back. The current challenge is to manage the build-down of the U.S. defense industrial base without losing the technological edge upon which national security has depended for over forty years, including the capability to develop and produce current and future sophisticated gear systems.

## IX. FINDINGS AND RECOMMENDATIONS

### Findings

The Department of Commerce does not find that gears and gearing products are being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security.

We reached this finding based on: 1) anticipated substantial decreases in defense procurements which will likely lead to significantly decreased defense gear requirements; 2) the low and relatively stable level of imports in the defense-intensive aerospace and marine gear markets which leads us to determine that it is unlikely that imports have significantly impacted the gear industry's ability to meet national security gear requirements; 3) the U.S. industry's continuing technological competitiveness and its optimism about its future competitiveness; and 4) the Department of Defense's proven record and continuing commitment to address sector-specific national security gear supply concerns when they may occur.

### Recommendations

In light of the negative finding above, we do not include any recommendations to "adjust imports." We recommend the following, however, in view of DOD's conclusion that the continued maintenance of a viable technologically advanced gear industry is now and will continue to be important for U.S. national security to address ancillary issues which arose during this investigation:

1. In fulfillment of President Bush's April 1990 Policy on Offsets in Military Exports, we recommend that consultations be initiated with foreign governments to examine the extent to which offset and/or coproduction commitments have led U.S. prime contractors to source gear products from foreign suppliers to the extent of raising national security concerns about the future viability of U.S. defense gear suppliers.

2. We encourage the Department of Defense to carefully consider the national security issues raised within this report, and recommend that it continue its significant effort to support defense-critical gear industry research.

3. We recommend that the Department of Defense continue to encourage its contractors and their independent gear suppliers to develop a cooperative sustainable partnership. This is particularly significant in light of assertions that important U.S. prime contractors intend to cease purchasing gears from independent U.S. gear producers by the end of 1994. These assertions could not conclusively be either confirmed or denied during the Section 232 investigation.

4. We urge the DOD-led Defense Conversion Commission to study the impact of declining military budgets and major weapons system terminations on domestic gear producers and other key subcontractor industries. In addition, the Commission should examine the potential to convert excess defense-dedicated production lines and employees to commercial products.

5. We recommend that the DOC's Economic Development Administration continue its contacts with the U.S. gear industry to provide technical assistance to the industry in its defense conversion efforts.

6. We reiterate the recommendation in our January, 1991 National Security Assessment of the U.S. Gear Industry that the industry take the initiative to consolidate into larger more technologically efficient firms that can both afford and justify investment in the latest technologies.

7. We further reiterate our recommendation that U.S. government and AGMA statistical representatives continue to work to rectify current data shortcomings and to explore the need for better government monitoring of the U.S. gear industry's performance.

TAB A

SUMMARY OF AGMA PETITION

Background:

On October 17, 1991, the American Gear Manufacturers Association (AGMA) petitioned the Department of Commerce's Bureau of Export Administration to initiate an investigation under authority of Section 232 of the Trade Expansion Act of 1962, as amended, of the effect of imports of gears and gearing products on the national security. AGMA stated that "(t)he U.S. gear industry seeks to avoid further deterioration by establishing a partnership with government to gain an equal footing with foreign competitors," and that "the entire range of remedies available under (Section 232) should be examined and appropriate measures implemented."

AGMA is a trade association composed primarily of U.S. and Canadian gear manufacturers, with additional membership representing users of gearing products, offshore gear producers, suppliers to the industry, gear machine tool manufacturers and academicians.

The petition states that there has been a serious decline in the U.S. gear industry over the past decade brought about most significantly by intense price competition. Increased imports have diminished the industry's ability to meet national security needs, and have inhibited the development of new gear technologies within the United States.

Gear Industry Overview

AGMA notes that gears are basic components of most industrial machinery and equipment, motor vehicles, ships and aircraft of all kinds. Gears can be classified as 'open' (i.e shipped as loose machine elements) or 'enclosed' (i.e. assembled with other gears and components to transmit motion or power). Existing Standard Industrial Classification and Harmonized Tariff System (HTS) categories are inconclusive and sometimes contradictory, and make it difficult to accurately track gear industry performance. About 75 percent of gears are built by 'captive' producers (generally higher-volume products), with 25 percent produced by independent gear manufacturers.

Gear manufacturing may consist of as few as a dozen, or as many as 160 distinct steps for the most precise specifications. Gears rated AGMA quality 11 or higher are considered to be precision gearing, a class which includes most defense gearing built for aerospace and marine applications.

As producers of intermediate products, gear manufacturers were seriously affected by the decline of many gear-consuming industries in the 1980s. The gear industry has only been

Over the same period, U.S. gear manufacturers found it increasingly difficult to afford state-of-the-art gear-making machine tools (which are mostly foreign-built). AGMA notes that the U.S. industry was unprofitable in the early 80s when the dollar was strong and gear-making machine tool imports were relatively cheap; and that when profitability returned in the late 80s, imported machine tool were more expensive due to the weak dollar.

In summary, AGMA states that the economic forces of the 1980s reduced U.S. gear industry shipments, cash flow and profits; made it more difficult to acquire financing for capital equipment and growth; made it similarly difficult to attain production economies of scale; led to a shortage of advanced technology operating equipment; and a shortage of skilled labor. AGMA believes that increased imports have reduced U.S. capacity to produce both defense and commercial gears, and that without improved cash flow and profitability, the American gear industry may not be self-sustaining.

Import Problem

AGMA reiterates that any analysis of gear imports would be hampered by inadequate HTS data, with a large number of gears entering embedded in other finished products or as 'parts' in other HTS categories. Nevertheless, measurable imports quadrupled from 1983 to 1990. AGMA states that Germany and Japan account for most of the U.S. gear trade deficit, but that the United States also has a gear trade deficit with all other major foreign competitors.

AGMA believes that foreign government support for competing gear industries (ranging from tax incentives to explicit subsidies) has provided an important competitive advantage to these industries. In the area of U.S. tax policy, AGMA regrets extended equipment depreciation schedules, elimination of the investment tax credit, less favorable treatment of long-term capital gains and institution of the corporate Alternative Minimum Tax. AGMA also cites U.S. antitrust and product liability laws as competitive disadvantages.

AGMA further regards the historically high cost of capital in the United States as an important competitive disadvantage for the U.S. gear industry. AGMA states that Japanese and German gear producers, in particular, have benefitted from their countries' high savings rates, from investors' relatively long investment horizons, and from closer integration between financial institutions and industry. Conversely, without comparable government support, capital investment in the U.S. gear industry has fluctuated with shipment revenues making it more difficult to pursue a long-term strategy.

Finally, AGMA believes that the Department of Defense's willingness to purchase lower cost gears from foreign suppliers has also led to deterioration of the U.S. industry. U.S. gear exports have been limited both by U.S. export controls and restricted foreign markets.

National Security Issues

AGMA reiterates that gears are critical components in almost all defense systems. As subcontractors, however, AGMA believes that U.S. defense gear producers are subject to greater burdens and limitations due to the additional terms and conditions imposed by prime contractors. AGMA applauds, however, the Navy's institution of a Defense Federal Acquisition Regulation mandating domestic sourcing of large marine gears.

AGMA remarks that DOD's policy of lowest cost purchasing has kept the defense supplier base in a state of constant upheaval. Being unable to make long-term investments has sometimes had fatal consequences for U.S. gear manufacturers. AGMA further believes that 'offsets' (i.e industrial compensation practices mandated by many foreign governments when purchasing defense systems) and bilateral defense memoranda of understanding with our Allies have encouraged the purchase of foreign-built defense gears. This has allegedly occurred despite an official Administration policy discouraging the use of offsets in defense transactions.

AGMA further notes that the January 1991 DOC National Security Assessment of the U.S. Gear Industry (NSA) reported that U.S. aerospace and marine gear manufacturers would be unable to meet target defense production levels during a national security emergency. The NSA reported that this was due to anticipated bottlenecks in supplier industries such as forgings, bearings and machine tools and to insufficient heat treatment capacity.

Although the NSA reported that surplus capacity would likely be available in the motor vehicle and industrial gear sectors, AGMA cautions that there would be only limited production fungibility with the aerospace and marine sectors. Such fungibility would be limited by a shortage of sufficiently precise machine tools and inspection equipment, a dearth of skilled labor, and the dedicated nature of certain production equipment.

AGMA notes that there are benefits from foreign sourcing including decreased costs, better integration with our Allies and access to a larger industrial base. However, potential disadvantages of foreign sourcing may include dependence on less reliable foreign suppliers, reduced domestic production capability and questionable access to advanced technology. AGMA believes that DOD is often unaware of the extent of foreign

sourcing/foreign dependency, and that technology developed by U.S. gear producers may be transferred offshore through lowest cost contract awards.

Industry Efforts

AGMA states that the U.S. gear industry has undertaken a number of efforts to increase its international competitiveness including government outreach, support of joint research efforts, standards development, and training programs. AGMA notes that U.S. gear industry R&D investments increased from $53.8 to $77.7 million from 1984 to 1988.

Conclusion

AGMA states that its goal is not to close the U.S. market or to protect American gear producers from more aggressive or efficient foreign gear manufacturers. AGMA believes, however, that defense sourcing of foreign gears is being inadequately monitored, and seeks an informed and detailed overview of the impact of such imports on the national security. AGMA asserts that American gear producers are prepared to work in concert with the U.S. government to preserve the industry and its ability to meet national emergency requirements. AGMA makes no specific request for remedial action, but asks that the Administration review the full range of remedies available under Section 232.

## SUPPLEMENTAL STATEMENT

In a supplemental filing, AGMA reiterated several of the points made in its initial petition and provided reports of proprietary interviews with various AGMA member companies. AGMA notes the difficulty of gathering such information due to a fear of retribution, and states that these company profiles should serve as a roadmap for further U.S. government investigation.

AGMA states that the move to foreign gear suppliers has not taken place randomly, and that on-shore suppliers offer enhanced reliability, compatibility and availability. AGMA recommends that defense procurement decisions should be made on a life-cycle cost, rather than on a single contract basis. The erosion of the gear defense industrial base has led to a sell-off of the most precise equipment and dispersal of the labor force. Such capacity cannot be easily recovered due to the limited fungibility of remaining capacity. AGMA encourages Commerce, Defense and State to thoroughly examine the range of qualified suppliers to determine whether efforts should be made to ensure that adequate ability exists and will continue to exist in the United States to provide critical gearing components for defense production.

11-06-91
Vol. 56 No. 215
Pages 56567-56918

# federal register

Wednesday
November 6, 1991

TAB B

Briefing on How To Use the Federal Register
For information on a briefing in Washington, DC, see announcement on the inside cover of this issue.

convene at 2 p.m. on Wednesday, December 4, 1991, at the Marriott Hotel, 1200 Hampton Street, Columbia, South Carolina, and adjourn at 4 p.m.

The purposes of the meeting are: to orientate SAC; to discuss the follow-up plans to the report on minority political participation in the State; and to adopt program plans for FY 1992.

Persons desiring additional information, or planning a presentation to the Advisory Committees, should contact South Carolina Chairperson Gilbert Zimmerman (803/525-7538), or Southern Regional Division Director Bobby Doctor at (404/730-2476; TDD 404/730-2481). Hearing impaired persons who will attend the meeting and require the services of a sign language interpreter should contact the Southern Regional Division at least five (5) working days before the scheduled date of the meeting.

The meeting will be conducted pursuant to the Rules and Regulations of the Commission.

Dated at Washington, DC, October 29, 1991.

Carol-Lee Hurley,

*Chief, Regional Programs Coordination Unit.*

[FR Doc. 91-25732 Filed 11-5-91; 8:45 am]

BILLING CODE 6335-01-M

## DEPARTMENT OF COMMERCE

### Agency Form Under Review by the Office of Management and Budget (OMB)

DOC has submitted to OMB for clearance the following proposal for collection of information under the provisions of the Paperwork Reduction Act (44 U.S.C. chapter 35).

*Agency:* Bureau of the Census.

*Title:* 1992 Census of Transportation Truck Inventory and Use Survey.

*Form Number(s):* TC-9501, TC-9502.

*Agency Approval Number:* None.

*Type of Request:* New Collection.

*Burden:* 112,130 hours.

*Number of Respondents:* 151,000.

*Avg Hours Per Response:* 45 minutes.

*Needs and Uses:* The Census Bureau will conduct the 1992 Census of Transportation-Truck Inventory and Use Survey (TIUS) as part of the 1992 Economic Censuses. The survey will be mailed to a sample of approximately 151,000 owners of trucks and truck-tractors registered and on file with motor vehicle departments in the 50 States and the District of Columbia. The survey will measure physical and operational characteristics of more than 50 million trucks in the United States. Federal, state, and local transportation agencies use information from the TIUS to analyze various aspects of the Federal-aid highway program. The Federal Government uses TIUS information as part of the framework for the gross national product and input-output tables, as well as for program analysis and evaluation. TIUS information is used by the private sector for market studies, product evaluation, and to assess the effects of deregulation on transportation industries.

*Affected Public:* Individuals or households, farms, businesses or other for-profit institutions, non-profit institutions, and small business or organizations.

*Frequency:* Every 5 years.

*Respondent's Obligation:* Mandatory.

*OMB Desk Officer:* Maria Gonzalez, 395-7313.

Copies of the above information collection proposal can be obtained by calling or writing Edward Michals, DOC Forms Clearance Officer, (202) 377-3271, Department of Commerce, room 5312, 14th and Constitution Avenue, NW., Washington, DC 20230.

Written comments and recommendations for the proposed information collection should be sent to Maria Gonzalez, OMB Desk Officer, room 3208, New Executive Office Building, Washington, DC 20503.

Dated: October 31, 1991.

Edward Michals,

*Departmental Forms Clearance Officer, Office of Management and Organization.*

[FR Doc. 91-26777 Filed 11-5-91; 8:45 am]

BILLING CODE 3510-07-F

## Bureau of Export Administration

### Initiation of National Security Investigation of Imports of Gears and Gearing Products

**AGENCY:** Office of Industrial Resource Administration, Bureau of Export Administration, U.S. Department of Commerce.

**ACTION:** Notice of initiation of an investigation under section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1862), and request for comments.

**SUMMARY:** This notice is to advise the public that an investigation is being initiated under section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1862), to determine the effects on the national security of imports of gears and gearing products. Interested parties are invited to submit written comments, opinions, data, information, or advice relative to the investigation to the Strategic Analysis Division, Office of Industrial Resource Administration, U.S. Department of Commerce.

**EFFECTIVE DATE:** Comments must be received not later than January 8, 1992.

**ADDRESSES:** Send all comments to Brad I. Botwin, Director, Strategic Analysis Division, Office of Industrial Resource Administration, room H-3878, U.S. Department of Commerce, 14th Street and Constitution Avenue, NW., Washington, DC 20230.

**FOR FURTHER INFORMATION CONTACT:** Edward Levy, section 232 Program Manager, Strategic Analysis Division, Office of Industrial Resource Administration, room H-3878, U.S. Department of Commerce, 14th Street and Constitution Avenue, NW., Washington, DC 20230, (202) 377-3795.

**SUPPLEMENTARY INFORMATION:** In an application submitted by the American Gear Manufacturers Association on October 17, 1991, the Department of Commerce was requested to initiate an investigation under section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1862), to determine the effects on the national security of imports of gears and gearing products.

On October 31, 1991 the Department of Commerce formally accepted the application and initiated an investigation. The findings and recommendations of the investigation are to be reported by the Secretary of Commerce to the President no later than July 27, 1992 (*i.e.*, within 270 days).

The items to be investigated are currently described by Standard Industrial Classification (SIC) Codes. They include Vehicular Non-Automotive Gearing SIC Codes 3714, 3566, and 3523; Industrial Gearing, SIC Code 3568; Aerospace Gearing, SIC Codes 3724, 3728, 3764 and 3663; and Marine Gearing, SIC Codes 3566 and 3568.

This investigation is being undertaken in accordance with part 705 of title 15 of the Code of Federal Regulations (15 CFR part 705) ("Regulations"). Interested parties are invited to submit written comments, opinions, data, information, or advice relevant to this investigation to the Office of Industrial Resource Administration, U.S. Department of Commerce, not later than January 8, 1992.

The Department is particularly interested in comments and information directed to the criteria listed in § 705.4 of the regulations (15 CFR 705.4) as they affect national security, including the following:

(a) Quantity of and circumstances related to the importation of the articles subject to the investigation:

(b) Domestic production and productive capacity needed for these articles to meet anticipated national security requirements;

(c) Existing and potential availability of skilled labor, raw materials, production equipment, and facilities to produce these items;

(d) Growth requirements of domestic industries (if any) to meet national security requirements and/or requirements to assure such growth;

(e) The impact of foreign competition on the economic welfare and on the capacity of the domestic industry to meet national security needs; and

(f) The impact of imports on domestic competition, productivity, and the strength of the domestic industry to meet national security requirements.

All materials should be submitted with 10 copies. Public information will be made available at the Department of Commerce for public inspection and copying. Material that is national security classified information or business confidential information will be exempted from public disclosure as provided for by § 705.6 of the regulations (15 CFR 705.6). Anyone submitting business confidential information should clearly identify the business confidential portion of the submission and also provide a non-confidential submission which can be placed in the public file. Communications from agencies of the United States Government will not be made available for public inspection.

The public record concerning this investigation will be maintained in the Bureau of Export Administration's Freedom of Information Records Inspection Facility, Bureau of Export Administration, U.S. Department of Commerce, room H-4525, 14th Street and Constitution Avenue, NW., Washington, DC 20230. The records in this facility may be inspected and copied in accordance with the regulations published in part 4 of title 15 of the Code of Federal Regulations (15 CFR 4.1 *et. seq.*). Information about the inspection and copying of records at the facility may be obtained from Ms. Margaret Cornejo, the Bureau of Export Administration's Freedom of Information Officer, at the above address or by calling (202) 377-5653.

Dated: October 31, 1991.

Michael P. Galvin,

*Assistant Secretary for Export Administration.*

[FR Doc. 91-28706 Filed 11-5-91; 8:45 am]

BILLING CODE 3510-DT-M

## Foreign-Trade Zones Board

[Docket No. 52-91]

### Foreign-Trade Zone 112—Colorado Springs, CO; Application for Subzone; Apple Computer, Fountain, CO; Extension of Public Comment Period

The comment period for the above case, requesting authority for special-purpose subzone status for the electronic data processing and communications equipment manufacturing plant of Apple Computer, Inc., in Fountain, Colorado (56 FR 48156, 9/24/91), is extended to November 15, 1991, to allow interested parties additional time in which to comment on the proposal.

Comments in writing are invited during this period. Submissions should include 5 copies. Material submitted will be available at: Office of the Executive Secretary, Foreign-Trade Zones Board, U.S. Department of Commerce, room 3716, 14th & Pennsylvania Avenue, NW., Washington, DC 20230.

Dated: October 31, 1991.

John J. Da Ponte, Jr.

*Executive Secretary.*

[FR Doc. 91-28778 Filed 11-5-91; 8:45 am]

BILLING CODE 3510-DS-M

[Order No. 540]

### Approval for Expansion of Foreign-Trade Zone 64; Jacksonville, FL

Pursuant to the authority granted in the Foreign-Trade Zones Act of June 18, 1934, as amended (19 U.S.C. 81a-81u), and the Foreign-Trade Zones Board Regulations (15 CFR part 400), the Foreign Trade Zones Board (the Board) adopts the following Resolution and Order:

*Whereas*, the Jacksonville Port Authority, Grantee of Foreign-Trade Zone No. 64, has applied to the Board for authority to expand its general-purpose zone in Jacksonville, Florida, within the Jacksonville Customs port of entry;

*Whereas*, the application was accepted for filing on July 18, 1990, and notice inviting public comment was given in the Federal Register on July 30, 1990 (Docket 29-90, 55 FR 30946);

*Whereas*, an examiners committee has investigated the application in accordance with the Board's regulations and recommends approval;

*Whereas*, the expansion is necessary to improve and expand zone services in the Jacksonville area; and,

*Whereas*, the Board has found that the requirements of the Foreign-Trade Zones Act, as amended, and the Board's regulations are satisfied, and that approval of the application is in the public interest;

*Now, therefore*, the Board hereby orders:

That the Grantee is authorized to expand its zone in accordance with the application filed on July 18, 1990. The grant does not include authority for manufacturing operations, and the Grantee shall notify the Board for approval prior to the commencement of any manufacturing or assembly operations. The authority given in this Order is subject to settlement locally by the District Director of Customs and the Army District Engineer regarding compliance with their respective requirements relating to foreign-trade zones.

Signed at Washington, DC, this 29th day of October, 1991.

Marjorie A. Chorlins,

*Acting Assistant Secretary of Commerce for Import Administration, Chairman, Committee of Alternates; Foreign-Trade Zones Board.*

[FR Doc. 91-28779 Filed 11-5-91; 8:45 am]

BILLING CODE 3510-DS-M

[Order No. 539]

### Resolution and Order Approving the Application of the South Louisiana Port Commission for a Special-Purpose Subzone at the Shipbuilding Facility of North American Shipbuilding, Inc., in LaFourche Parish, LA; Proceedings of the Foreign-Trade Zones Board, Washington, DC

Resolution and Order

Pursuant to the authority granted in the Foreign-Trade Zones Act of June 18, 1934, as amended (19 U.S.C. 81a-81u), the Foreign-Trade Zones Board (the Board) adopts the following Resolution and Order:

The Board, having considered the matter, hereby orders:

After consideration of the application of the South Louisiana Port Commission, grantee of Foreign-Trade Zone 124, filed with the Foreign-Trade Zones Board (the Board) on August 21, 1990, requesting special-purpose subzone status at North American Shipbuilding, Inc.'s, facility in Lafourche Parish, Louisiana, adjacent to the Gramercy Customs port of entry, the Board, finds that the requirements of the Foreign-Trade Zones Act, as amended, and the Board's regulations would be satisfied, and that the proposal would be in the public interest, if approval is subject to certain conditions, approves the application subject to the following conditions: (1) Any steel mill products,

APR 20 1992

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of Export Administration
Washington, D.C. 20230

TAB C - PART I
PART II

TO: Producers of Gears and Gearing Products

The Department of Commerce (DOC) is conducting an investigation, under Section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1862), to determine the effect of gears and gearing products imports on the national security. This investigation is being undertaken in accordance with Part 705 of Title 15 of the Code of Federal Regulations. The information requested is needed to supplement data available from other sources and is being undertaken to carry out DOC emergency preparedness responsibilities under Executive Order 12656 to "perform industry analyses to assess capabilities of the commercial industrial base to support the national defense, and develop policy alternatives to improve the international competitiveness of specific domestic industries and their abilities to meet defense program needs."

You are exempted from completing this survey if:

1. Your firm has not produced gears or gearing products at any time covered by this survey (since January 1, 1988), or

2. Your firm has fewer than 50 employees and your firm's combined sales (F.O.B.-shipment point) in 1991 of domestically produced and imported gears and gear products were valued at less than $3 million.

If you meet either of these conditions, please check the appropriate box on the cover sheet of the questionnaire and return that page to the address below. If you do not meet either condition, the Department of Commerce must receive your completed questionnaire by May 22, 1992 to:

Mr. Brad Botwin, Director
Strategic Analysis Division, Room H3878
U.S. Department of Commerce
Washington, DC 20230

Where appropriate, it is essential that information and material submitted should be designated "BUSINESS CONFIDENTIAL" as provided for in Section 705.6 of the attached Department of Commerce regulations. Submissions not so designated may be subject to release under provisions of the Freedom of Information Act.

If you have any questions concerning this questionnaire, please contact Edward Levy, Section 232 Program Manager, or Jeannette Dykes, Trade and Industry Analyst at (202) 377-3795. Thank you for your cooperation in this important assessment.

Sincerely,

John A. Richards
Deputy Assistant Secretary
for Industrial Resource Administration

Enclosure

AEF # 77

U.S. Department of Commerce
Bureau of Export Administration

OMB Control # 0694-0068
Expires 9/30/92

# INVESTIGATION OF THE IMPACT OF IMPORTS OF GEARS AND GEARING PRODUCTS ON THE NATIONAL SECURITY

## U.S. PRODUCER'S QUESTIONNAIRE

This information is being collected to carry out Department of Commerce emergency preparedness responsibilities under Executive Order 12656 of November 18, 1988. One of these responsibilities is to "perform industry analyses to assess capabilities of the commercial industrial base to support the national defense, and develop policy alternatives to improve the international competitiveness of specific domestic industries and their abilities to meet defense program needs." (Authority: Defense Production Act (50 U.S.C. App. 2155); Department of Commerce Act (15 U.S.C.1516)). Information furnished herewith is deemed confidential and will not be disclosed except in accordance with applicable law. Where appropriate, information and material submitted should be designated "BUSINESS CONFIDENTIAL" as provided for in section 705.6 of the enclosed U.S. Department of Commerce Regulations, 15 C.F.R. 705.

**Burden Estimate and Request for Comment:** Public reporting burden for this collection of information is estimated to average 10 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to BXA Reports Clearance Officer, Room 4513, Bureau of Export Administration, U.S. Department of Commerce, Washington, DC 20230, and/or to the Office of Management and Budget, Paperwork Reduction Project (0694-0068), Washington, DC 20503.

### GENERAL INSTRUCTIONS

1. Please complete this questionnaire in its entirety as it applies to gears and gearing products. Your response is due by May 22, 1992. The survey has 5 parts as follows:

PART I Firm Identification & Shipment Information
PART II Surge Capacity Estimates & Inventories
PART III Gear Capacity and Production Constraints
PART IV Conversion, Research & Development & Technology
PART V International Competitiveness & Markets

2. **If your firm has not produced gears or gearing products at any time covered by this survey (since January 1, 1988), check the appropriate box, and return this page with your signature and title, to the address given below.**

**You are also not required to complete this questionnaire if your firm has fewer than 50 employees and your firm's combined sales (F.O.B.-shipment point) in 1991 of domestically produced and imported gears and gearing products were valued at less than $3 million. If you meet either of these conditions, check the appropriate box and return this page to the address given below with your signature and title.**

Did not produce gears or gearing products since January 1, 1988: ☐

Fewer than 50 employees and combined sales less than $3 million: ☐

| FIRM | SIGNATURE | TITLE | TELEPHONE |
|---|---|---|---|
| | | | |

(INSTRUCTIONS CONTINUED ON NEXT PAGE)

3. It is not our desire to impose an unreasonable burden on any respondent. IF INFORMATION IS NOT READILY AVAILABLE FROM YOUR RECORDS IN EXACTLY THE FORM REQUESTED, FURNISH ESTIMATES AND DESIGNATE BY THE LETTER "E".

4. Report calendar year data, unless otherwise specified in a particular question. Please make photocopies of form if additional copies are needed.

5. Questions related to the questionnaire should be directed to Mr. Edward Levy, Section 232 Program Manager, or Ms. Jeannette Dykes, Trade and Industry Analyst, (202) 377-3795 at the U.S. Department of Commerce.

6. Before returning your completed questionnaire, be sure to sign the certification on the last page and identify the person and phone number to be contacted (if necessary) at your firm.

7. Return completed questionnaire by May 22, 1992 to:

Mr. Brad Botwin
Director, Strategic Analysis Division
Office of Industrial Resource Administration
Room H3878
U.S. Department of Commerce
Washington, D.C. 20230

## DEFINITIONS

**BOTTLENECK** - During a production expansion, the production process, operation, procedure, material or labor requirements within your manufacturing establishment that would ultimately prevent or delay increased production.

**DEFENSE SHIPMENTS** - Direct and indirect military shipments, including: 1) weapon systems, support equipment, and all other defense related end-use items, identified by purchase orders bearing a DO or DX rating and/or a contract number from the Department of Defense, Nuclear Regulatory Commission, Central Intelligence Agency, Federal Aviation Administration, or the National Aeronautics and Space Administration; 2) the orders of your customers which you can identify as producing products for defense purposes; and 3) items tested and certified to military specifications.

**ESTABLISHMENT** - All facilities in which gears and gearing products are produced. Includes auxiliary facilities operated in conjunction with (whether or not physically separate from) such production facilities. Does not include facilities solely involved in distribution.

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

**GEAR BOXES/ENCLOSED GEARS** - An assembled or partially assembled metal product, with gear set(s) shipped from the manufacturer as an assembly or machine for the purpose of power and/or motion transmission between driver(s) and driven equipment.

**INDUSTRIAL MODERNIZATION INCENTIVE PROGRAM (IMIP)** - IMIP is a joint venture between Government and industry to reduce weapon system acquisition cost through the implementation of modern manufacturing processes and increased or accelerated capital investments. IMIP is formalized through a contractual business agreement with Government providing incentives for contractor capital investment.

**LOOSE OR OPEN GEARS** - Consists of unassembled metal toothed components built for the purpose of power and/or motion transmission between driver(s) and driven equipment. At time of shipment, <u>not</u> assembled into a gear drive as a completed unit or machine able to perform power and/or motion transmission duty.

**MANUFACTURING TECHNOLOGY (MANTECH)** - A Department of Defense (DOD) program to develop information that is, or will be used to define, monitor, or control processes and equipment used to manufacture material for the DOD. MANTECH's objectives are: 1) the timely establishment or improvement of the manufacturing processes, techniques, or equipment required to support current and projected defense programs, and 2) assurance of the ability to produce, reduce lead time, ensure economic availability of end items, reduce costs, increase efficiency, improve reliability, or to enhance safety and anti-pollution measures.

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

**PRACTICAL CAPACITY** - Sometimes referred to as engineering or design capacity, this is the greatest level of output achievable within the framework of a realistic work pattern. In estimating practical capacity, please take into account the following considerations:

1. Under most circumstances assume the most recent year's product mix. If no or little production took place during this period of a particular item or group of items which you have, or will have the capability to produce and can anticipate receiving orders for in the future, include a reasonable quantity as part of your product mix.

2. Consider only the machinery and equipment in place and ready to operate. Do not consider facilities which have been inoperative for a long period of time and, therefore, require extensive reconditioning before they can be made operative.

3. Take into account the additional downtime for maintenance, repair, or clean-up which would be required as you move from current operations to full capacity.

4. Do not consider overtime pay, added costs for materials, or other costs to be limiting factors in setting capacity.

5. Although it may be possible to expand output by using productive facilities outside your own, such as by contracting out subassembly work, do not assume the use of such outside facilities in greater proportion than has heretofore been characteristic of your operations.

**RESEARCH AND DEVELOPMENT** - includes basic and applied research and product development in the sciences and in engineering, and design and development of prototype products and processes. For the purposes of this questionnaire, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

3. Apply existing knowledge to problems involved in the improvement of a present product or process.

**SHIPMENTS** - domestically produced gears shipped by your firm during the reporting period. Such shipments should includes inter-plant transfers, but should exclude shipments of products produced by other manufacturers for resale under your brand name. Do not adjust for returned shipments. (See definition of DEFENSE SHIPMENTS above.)

**SURGE PRODUCTION** - The maximum sustainable level of defense production that can be achieved within an existing establishment by the end of the 6 month period immediately following surge day (Defense Priorities and Allocations System in full effect). Procurement actions for additional materials to sustain surge production levels will be initiated on surge day. Existing idle equipment may be activated as is, repaired, or upgraded and brought into service, or new equipment or used equipment may be purchased and installed if possible within the 6 month time frame. Labor may be hired and trained in numbers sufficient to operate around the clock and weekends allowing for necessary equipment maintenance and downtime. Minimum defense target is two times your average monthly defense production in 1991.

**UNITED STATES** - includes the fifty States, Puerto Rico, the District of Columbia, and the Virgin Islands.

## PART I: FIRM IDENTIFICATION & SHIPMENT INFORMATION

1. **COMPANY NAME AND ADDRESS:** Please provide the name and address of your firm or corporate division.

_____
Company Name

_____
Street Address

_____
City, State, Zip Code

2. **OWNERSHIP:** If your firm is wholly or partly owned by another firm, indicate the name and address of the parent firm and extent of ownership.

_____
Company Name

_____
Street Address

_____
City, State, Zip Code (Country)

Extent of Ownership:_____(percent)

3. **ESTABLISHMENTS:** Please identify the location of your gear manufacturing establishment(s) in the United States. Indicate the gear product type produced (spur, helical, bevel, herringbone, worm, or rack and pinion). Please continue on a separate sheet if required.

| | | | Products Manufactured | | |
|---|---|---|---|---|---|
| Establishment Locality | State | Zip Code | Product Type | No. Produced 1991 | Percent for Defense* |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

*Estimate the approximate percent of 1991 shipments ultimately used in defense systems

4. **PRODUCTION LOST: Identify U.S. Manufacturing establishments and/or product lines in which you ceased gear production since January 1, 1982 and the reason production was stopped (use letter codes provided below).**

   **a. Loss of market share to imports**
   **b. Loss of market share to domestic competition**
   **c. Declining demand**
   **d. Low profitability**
   **e. Firm restructuring**
   **f. Other (Specify: _____)**

| | | | | Thousands of Dollars |
|---|---|---|---|---|
| **Date** | **Location (City/State)** | **Gear Products** | **Reasons (Codes)** | **Annual Capacity Lost** |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

5. **PLANNED CLOSINGS AND/OR EXPANSIONS:** Are there any plans for a) plant closings/contractions, or b) plant expansion/new construction over the next three years? If so, explain and what volume of productive capacity and what product lines (i.e. spur, helical, bevel, herringbone, worm, or rack and pinion) will be lost or added.

| | | | Thousands of Dollars |
|---|---|---|---|
| **Date** | **Location (City/State)** | **Gear Products** | **Annual Capacity (Lost)/Added** |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**SHIPMENTS - (please answer separately for each gear-manufacturing establishment)**

6a. **Estimate the dollar value of total shipments and total defense shipments of gear and gear products that were made from this establishment for the years 1988, 1989, 1990, and 1991. (Please refer to the definition of defense shipments at the front of this survey.)**

LOCATION OF ESTABLISHMENT _____

| | SHIPMENT TOTALS ----> ($000'S) | |
|---|---|---|
| YEAR(S) | TOTAL SHIPMENTS | DEFENSE SHIPMENTS |
| 1988-----> | | |
| 1989-----> | | |
| 1990-----> | | |
| 1991-----> | | |

*Please report shipment totals in thousands of dollars

6b. Please break-out shipment totals from the above table by end-use market.

| | SHIPMENT TOTALS ----> ($000'S) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL SHIPMENTS | | | | DEFENSE SHIPMENTS | | | |
| END-USE MARKET | 1988 | 1989 | 1990 | 1991 | 1988 | 1989 | 1990 | 1991 |
| Automotive Gears | | | | | | | | |
| Marine Gears | | | | | | | | |
| Aerospace Gears | | | | | | | | |
| Industrial Gears | | | | | | | | |

6c. Please break-out shipment totals by gear product.

| | SHIPMENT TOTALS —> ($000'S) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL SHIPMENTS | | | | DEFENSE SHIPMENTS | | | |
| GEAR PRODUCT | 1988 | 1989 | 1990 | 1991 | 1988 | 1989 | 1990 | 1991 |
| Spur Gears | | | | | | | | |
| Helical Gears | | | | | | | | |
| Bevel Gears | | | | | | | | |
| Herringbone Gears | | | | | | | | |
| Worm Gears | | | | | | | | |
| Rack and Pinion | | | | | | | | |
| Enclosed Gears | | | | | | | | |

## PART II. SURGE CAPACITY ESTIMATES AND INVENTORIES

### 1. SURGE CAPACITY

(Please answer separately for each gear-manufacturing establishment)

**Directions:** The following tables has been developed to provide the Department of Commerce with an estimate of your firm's production capacity for gears and gearing products by production facility. These capacity estimates will be used in an assessment of the ability of the domestic gear industry to meet national security requirements during a national security emergency. For purposes of completing this survey, assume surge began January 1, 1992. Surge production capacity for a given year is defined as the maximum realistic level of production that a manufacturing establishment can achieve during a twelve month period given the set of assumptions listed below:

**Assumptions**

1. Existing production facilities are to be operated at full productive capacity;
2. New equipment may be purchased to replace existing machinery. Equipment on hand at the time of mobilization may be refurbished or otherwise brought into productive service;
3. Labor availability reflects normal local market conditions;
4. Material requirements are fully met;
5. Facilities operate at the maximum rate possible given technological constraints;
6. Where identifiable, 75 percent of unit production should be targeted to defense end-use items, with the remaining 25 percent devoted to civilian end-use items.

Table 1a

| LOCATION OF ESTABLISHMENT: _____ | | | |
|---|---|---|---|
| SURGE PRODUCTION CAPACITY ——> QUANTITY ($000) | | | |
| End-Use Market | Current | After 6 Mos. | After One Year |
| Automotive Gears | | | |
| Marine Gears | | | |
| Aerospace Gears | | | |
| Industrial Gears | | | |

**SURGE CAPACITY (Continued)**

Table 1b.

| LOCATION OF ESTABLISHMENT: _____ | | | |
|---|---|---|---|
| SURGE PRODUCTION CAPACITY ——> QUANTITY ($000) | | | |
| Product Category | Current | After 6 Mos. | After One Year |
| Spur Gears | | | |
| Helical Gears | | | |
| Bevel Gears | | | |
| Herringbone Gears | | | |
| Worm Gears | | | |
| Rack and Pinion | | | |

2. **INVENTORIES:** Please report your inventory as of December 31, 1991 by product type as set forth in the tables below:

Table 2a.

| LOCATION OF ESTABLISHMENT: _____ | |
|---|---|
| End-Use Market | INVENTORIES ($000) as of 12/31/91 |
| Automotive Gears | |
| Marine Gears | |
| Aerospace Gears | |
| Industrial Gears | |

INVENTORIES (Continued)

| LOCATION OF ESTABLISHMENT: _____ | |
|---|---|
| **Product Category** | **INVENTORIES ($000) as of 12/31/91** |
| Spur Gears | |
| Helical Gears | |
| Bevel Gears | |
| Herringbone Gears | |
| Worm Gears | |
| Rack and Pinion | |
| Enclosed Gears | |

## PART III. GEAR CAPACITY AND PRODUCTION CONSTRAINTS

1. **EQUIPMENT REQUIREMENTS** In a national security emergency, would any additional machinery, equipment or replacement parts for existing machinery or equipment be required at this establishment to expand production of gears or gearing products?

No. ☐
Yes. ☐ **If yes, please complete the following table:**

| Machine, Equipment or Part | Number Needed | Lead Time | Supplier | Country of Origin |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

2. **AVAILABILITY OF MACHINE TOOLS AND EQUIPMENT:** If you experienced any problems in the availability of machine tools or other manufacturing equipment that adversely affected, or that continues to adversely affect your U.S. gear manufacturing operations, please describe them below, and the actions you took to resolve them.

If none, check here ☐

If yes, please explain below: ↓

3. **BOTTLENECKS:** Identify the top five bottlenecks to ramping-up to capacity production of loose gears. Please select from the list shown below to identify the bottlenecks, and after the number code specify the bottleneck (e.g., #6. Heat Treatment). (See definition of Bottleneck.)

1. Raw Materials Handling
2. Gear Blank Production
3. Forging/Casting Availability
4. Other Materials Availability
5. Component Testing & Inspection
6. Heat treatment
7. Production Scheduling
8. Assembly & Testing
9. Gear Cutting & Shaving
10. General Purpose Grinding
11. Design & Engineering
12. Packaging & Delivery
13. Gear Cutting, Hobbing & Shaping
14. Other _____

| RANK BOTTLENECKS | BOTTLENECK (Specify) | COST TO CORRECT ($000) | TIME TO CORRECT |
|---|---|---|---|
| Bottleneck No. 1 | | | |
| Bottleneck No. 2 | | | |
| Bottleneck No. 3 | | | |
| Bottleneck No. 4 | | | |
| Bottleneck No. 5 | | | |

4. **MAKE/BUY RATIOS:** What was the average make/buy ratio for your firm's loose gear and gearing product production in 1991? ("Make/buy" is the dollar value measure of components used in the production of gears which are made "in-house" by your firm compared with the total value of components used in production at your firm.)

Make/Buy Ratio: _____%

5. **REPLACEMENT COST:** Please estimate the following information for each manufacturing facility (use separate sheets if necessary). Assume financing is available and normal availability of labor and materials.

Replacement Cost: $ _____

Time required to construct the equipment: _____ months

Time required to become fully operational: _____ months

What factors would effect the time and/or cost of replacement? Please explain below:↓

_____

_____

_____

6. **LEAD TIMES:** Please estimate the normal time each of the operations indicated below contribute to total average lead times for: a) New Orders, and b) Repeat Orders. Beneath the itemized columns enter the time devoted to each operation. Since some of these operations overlap, or may run concurrently, enter the actual elapsed time beneath the cumulative columns. For repeat orders, assume design and engineering was previously accomplished, and materials are inventoried.

| | NEW ORDERS (in weeks) | | REPEAT ORDERS (in weeks) | |
|---|---|---|---|---|
| Operations | Itemized | Cumulative | Itemized | Cumulative |
| Design and Engineering | | | | |
| Materials and Purchasing | | | | |
| Tool Preparation | | | | |
| Production Scheduling | | | | |
| Queue Time | | | | |
| Inspection Time | | | | |
| In-process Time | | | | |
| Packaging and Delivery | | | | |

7. Regarding the longest lead time DEFENSE items, list the type of gear, the defense system supported, the average lead time during 1991, and how that lead time could be shortened. Please provide at least three examples.

| | | In Weeks | |
|---|---|---|---|
| Gear Size, Type, and Rating | Defense System Supported | Average Lead Time | How to Shorten Lead Time |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

8. **AGE OF EQUIPMENT: Please enter the total number, and the number of foreign origin (included in the total) machine tools you have for the categories shown within each age interval on the table below that are used in the manufacture of gears. Count substantially rebuilt machines as new when rebuilt.**

| | # 0-4 Years Old | | # 5-9 Years Old | | #10-19 Years Old | | #20 Years Plus | |
|---|---|---|---|---|---|---|---|---|
| Machine Tool Category | Total | # Foreign | Total | # Foreign | Total | # Foreign | Total | # Foreign |
| NC Turning | | | | | | | | |
| Non NC Turning | | | | | | | | |
| NC Milling | | | | | | | | |
| Non NC Milling | | | | | | | | |
| NC Grinding | | | | | | | | |
| Non NC Grinding | | | | | | | | |
| Gear Shapers | | | | | | | | |
| Gear Hobbers | | | | | | | | |
| Bevel Generators | | | | | | | | |
| Honing and Finishing | | | | | | | | |

9. **MATERIAL AND SUPPLY SHORTAGES: If you experienced any shortages or supply interruptions of gear metals, materials, dies, tooling or other essential supplies in the last five years that adversely affected, or that continue to adversely affect your U.S. gear manufacturing operations, please describe them below, and the actions you took to resolve them.**

If none, check here ☐

If Yes please explain below: ↓

**10. LABOR REQUIREMENTS:**

**A. What is the average age of your work force at present? Is the average age increasing?**

**Average age of work force: _____Yrs. Average Age Increasing? _____ (Yes/No)**

**B. For each manufacturing establishment (use extra sheets if necessary), provide the approximate level of employment at this facility from 1988 to 1992 (forecasted) in each of the following categories:**

| | LOCATION OF ESTABLISHMENT: _____ EMPLOYEES AT THIS FACILITY | | | | |
|---|---|---|---|---|---|
| | 1988 | 1989 | 1990 | 1991 | 1992 |
| Production Workers | | | | | |
| Scientists & Engineers | | | | | |
| Other | | | | | |

**C. What percentage of the total production cost at this facility was accounted for by labor in 1991?**

**Labor Cost _____%**

**D. What is the approximate size of the additional labor force which would be required to support the increase in production projected during the national security emergency given the assumptions provided on page 5 at the beginning of Part II?**

| | Additional Production Workers Needed | Additional Scientists and Engineers Needed |
|---|---|---|
| After 6 Months | | |
| After 1 Year | | |
| After 2 Years | | |

11. **LABOR SHORTAGES: If you experienced any labor shortages or labor supply interruptions in the last five years that adversely affected, or that continue to adversely affect your U.S. gear manufacturing operations, please describe them below, and the actions you took to resolve them.↓**

**If none, check here ☐**

12. **LABOR PROJECTIONS: If in the next five years you foresee experiencing any labor concerns, such as shortages of certain skills, excessive turnover, union activities, etc. that could adversely affect your manufacturing operations, please explain below:↓**

## PART III: INVESTMENT & FINANCIAL

1. **INVESTMENT: Enter expenditures for plant, new machinery and equipment, and used or rebuilt machinery and equipment (in $000) from 1988 to 1991, and projected amounts for 1992. Include only dollar amounts that apply to your manufacturing operations.**

| | INVESTMENT IN GEAR OPERATIONS | | |
|---|---|---|---|
| | Plant | New Mfg. & Inspection Machinery and Equipment | Rebuilt or Used Mfg. & Inspection Machinery and Equipment |
| 1988 | | | |
| 1989 | | | |
| 1990 | | | |
| 1991 | | | |
| Estimated 1992 | | | |

2. **PROFITABILITY: Please enter the financial information (in $000) specified below for the years 1988 to 1991. Include only dollar amounts that apply to your U.S. gear manufacturing operations. Use estimates when necessary.**

| | PROFITABILITY (in $000) | | | |
|---|---|---|---|---|
| | 1988 | 1989 | 1990 | 1991 |
| Net Sales (1) | | | | |
| Cost of Goods Sold (2) | | | | |
| Operating Income (3) | | | | |
| Net Income before taxes (4) | | | | |

(1)Sales, plus intracompany transfers
(2)Includes materials and component purchases, direct labor, and other factory costs such as depreciation and inventory carrying costs.
(3)Difference between Net Sales and Cost of Goods Sold
(4)Operating income less general, selling and administrative expenses, interest expenses and other expenses, plus other income

3. **FINANCIAL BALANCES: Please provide end of year balance sheet information (in $000) as specified below for the years shown. Include only dollar amounts that apply to your U.S. gear manufacturing operations. Use estimates when necessary.**

| | | | | |
|---|---|---|---|---|
| | 1988 | 1989 | 1990 | 1991 |
| Current Assets | | | | |
| Current Liabilities | | | | |
| Short Term Debt (1) | | | | |
| Long Term Debt (2) | | | | |

(1) Principal payable in less than one year
(2) Principal payable in more than one year

## PART IV: CONVERSION, RESEARCH & DEVELOPMENT & TECHNOLOGY

1. **CONVERSION: Please explain the relevant factors (e.g. labor training, new equipment, tooling, set-up, etc.) which can influence the ability of your firm to alter the composition of its current product mix in terms of precision, size and type. Provide an indication of how long it would take to introduce any of these changes.**

   i) Ability to change precision of gear manufactured (e.g. from AGMA 9 to AGMA 13 or 14):

   ii) Ability to change the size range of your gears:

   iii) Ability to produce gears for different end-use markets (e.g. change from producing automotive gears to aerospace gears). Can equipment currently used to produce a particular type and size of gear be converted to production of another type (e.g. spur, helical, bevel, herringbone, worm, rack and pinion), or is equipment dedicated to fixed market segments? Please explain what kinds of product lines are compatible with the same production equipment and labor skills, and what the relevant limits on conversion are in each case.

2. **U.S. CONDUCTED RESEARCH AND DEVELOPMENT: Please enter your firm's gear related research and development (R&D) expenditures from 1988 to 1992 as requested below. Please report your defense related R&D on the bottom half of the following table. Enter separately the dollar amounts (in $000) expended for: 1) gear materials, 2) gear processing, and 3) product development. (See definition of Research and Development.)**

| COMMERCIAL RESEARCH AND DEVELOPMENT EXPENDITURES (in thousands of dollars) | | | | | |
|---|---|---|---|---|---|
| COMMERCIAL | 1988 | 1989 | 1990 | 1992 | Projected 1992 |
| Gear Materials | | | | | |
| Gear Processing | | | | | |
| Product Development | | | | | |
| TOTAL | | | | | |

| DEFENSE RESEARCH AND DEVELOPMENT EXPENDITURES (in thousands of dollars) | | | | | |
|---|---|---|---|---|---|
| DEFENSE | 1988 | 1989 | 1990 | 1991 | Projected 1992 |
| Gear Materials | | | | | |
| Gear Processing | | | | | |
| Product Development | | | | | |
| TOTAL | | | | | |

A. On average between 1988 and 1992, what percentage of revenues was earmarked for research and development?

_____% of revenues earmarked for R&D

B. How important do you view research and development to your firm's competitive viability as it affects a) product development, b) the production process, and c) metallurgy (including factors such as cost, quality control, etc.):

C. Name the principal areas (e.g., heat treatment processes, metallurgy, testing, grinding, etc.) in which your firm has focused its research and development expenditures since 1988:

1.
2.
3.
4.
5.

3. **U.S. GOVERNMENT R&D:** Where (perhaps in areas with longer-term payoffs) could U.S. Government R&D spending be directed to assist the gear industry.

4. **GOVERNMENT SPONSORED PROGRAMS:** (i.e., Industrial Modernization Incentive Program (IMIP) and Manufacturing Technology (MANTECH) - see definitions)

a. Has your firm been involved in a Government sponsored IMIP or Mantech program(s) in your U.S. gear manufacturing operations at any time since the end of 1982? If so, please identify the following (use additional sheets if necessary):

i. Beginning/Ending Years:

ii. Military Sponsor:

iii. Dollar Value:

iv. Manufacturing Operations Involved:

v. Your Opinion of Program:

b. Has this modernization program(s) introduced your firm to new technologies?

Please describe below: ↓

c. Has the program(s):

| | Yes | No |
|---|---|---|
| resulted in reduced lead times? | ☐ | ☐ |
| lowered production costs? | ☐ | ☐ |
| lowered prices to DOD? | ☐ | ☐ |
| made you more competitive? | ☐ | ☐ |

d. What problems still exist that these programs did not address?

5. **DUAL USE OF R&D: To what extent is R&D conducted for defense projects applicable to your commercial operations, and to what extent is commercial R&D of use in your defense operations?**

_____

_____

_____

6. **TECHNOLOGY: For the following listed technologies, please indicate the level of use in your U.S. gear manufacturing operations.**

| | no interest | looking into | began using last 3 yrs | have used over 3 yrs |
|---|---|---|---|---|
| Concurrent Engineering | | | | |
| CAD/CAM | | | | |
| Induction Heat Treat | | | | |
| Robotics | | | | |
| Non-Contact Gauging (including End Process Gauging) | | | | |
| Flexible Cell Manufacturing | | | | |
| Powder Metallurgy | | | | |
| Just-In-Time | | | | |
| Statistical Process Control | | | | |
| Total Quality Management | | | | |
| Near Net Shape Blanking | | | | |
| CBN Grinding | | | | |
| Gaseous Diffusion Heat Treatment | | | | |
| Dual Frequency Contour Hardening | | | | |
| Other* | | | | |

*Specify:_____

7. **TECHNOLOGY STANDING:** What technology(ies) do your major foreign competitors have that you could use, but you cannot or have not been able to access (due to lack of resources, patent protection, or other difficult access)? What is the competitive impact on your firm of not having access to this technology(ies)?

## PART V INTERNATIONAL COMPETITIVENESS AND MARKETS

1. **COMPETITIVENESS:** How do you foresee the competitive prospects for your firm's U.S. gear production operations over the next five years?

Our competitiveness should:

- Improve greatly ☐
- Improve somewhat ☐
- Stay the same ☐
- Decline somewhat ☐
- Decline greatly ☐

Please discuss the basis for your answer. ↓

## 2. GOVERNMENT POLICIES

**A. How have U.S. Government policies (e.g. defense procurement, trade policy, and conflicts between domestic and international business practices) required you to adjust your firm's business practices in a manner which has influenced your competitiveness? Continue on a separate sheet, if necessary.**

**B. What adjustments should be made in U.S. Government policies, laws, and regulations that would moderate any competitive disadvantages that U.S. firms might face as a result of these policies, laws, and regulations?**

## 3. COMPETITIVE ADVANTAGES: What are the major competitive advantages you perceive for your firm over the next five years?

## 4. COMPETITIVE DISADVANTAGES: What are the major competitive disadvantages you perceive your firm faces over the next five years?

5. **EFFECT OF IMPORTS:** How have imports of gears and/or gearing components (including those for your own use) positively and negatively affected your domestic manufacturing operations?

   **a. Positive Effects:** (e.g. lower costs, expanded markets, improved efficiency, access to foreign markets, etc.) Please explain below:↓

   **b. Negative Effects:** (e.g. product lines dropped, customers lost, retired capacity, laid-off work force, etc.). Please explain below.↓

6. Are sales of high volume/lower value gears essential to your firm's profitability? If so, estimate the effect on your firm's operations, investment, and research and development capabilities, of a reduction in sales of these gears. Also, please comment on the effect (if any) the loss of high volume sales has on your ability to produce gears for defense.

7. **MAJOR COMMERCIAL CUSTOMERS: Please list your five largest customers for U.S. manufactured gears, the dollar value of shipments to these customers in 1991, and the primary end-market (e.g., aerospace, automotive, marine, or other industrial).**

| Major Customers | 1991 shipments (in $000s) | End-Market |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

8. **WEAPON SYSTEMS SUPPORTED: In terms of value, please identify the top five (if any) military systems for which you supplied U.S. manufactured gears in 1991.**

| Weapon System | 1991 shipments (in $000s) |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

9. **SHIPMENTS BY MARKET:** Since 1988, has your firm lost major sales or markets (including products whose production has moved offshore) to imported gearing? Please explain.

NO ☐ YES ☐

10. **UNFAIR TRADE PRACTICES:** Please comment on any unfair trade practices (e.g., tariffs or other trade barriers, market access, foreign government subsidies or incentives, dumping, etc.) that you have encountered in the gear marketplace.

11. Please identify your firm's top three competitors in the U.S. market supplying U.S.-produced or -assembled and imported open gearing, enclosed gearing and flexible couplings.

| Product Category/Product Line | Competitors Supplying U.S.-Produced or -Assembled Gears | Competitors Supplying Imported Gears |
|---|---|---|
| Open Gearing: | | |
| 1. | | |
| 2. | | |
| 3. | | |
| Enclosed Gearing: | | |
| 1. | | |
| 2. | | |
| 3. | | |

## CERTIFICATION

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

| | |
|---|---|
| (Date) | (Signature of Authorized Official) |
| (Area Code/Telephone Number) | (Type or Print Name and Title of Authorized Official) |
| (Area Code/Telephone Number) | (Type or Print Name and Title of Person to Contact re this Report) |

## GENERAL COMMENTS

**Is there any other information that we did not request above or that you would like to offer that you believe would be important for this national security assessment of gear and gearing product imports? Please use the space to provide any additional comments or information regarding your operations, or other related issues that impact your firm.**

# PART 705—EFFECT OF IMPORTED ARTICLES ON THE NATIONAL SECURITY

Sec.
705.1 Definitions.
705.2 Purpose.
705.3 Commencing an investigation.
705.4 Criteria for determining effect of imports on the national security.
705.5 Request or application for an investigation.
705.6 Confidential information.
705.7 Conduct of an investigation.
705.8 Public hearings.
705.9 Emergency action.
705.10 Report of an investigation and recommendation.

AUTHORITY: Sec. 232, Trade Expansion Act of 1962 (19 U.S.C. 1862), as amended (Pub. L. 100-418, 102 Stat. 1107), Reorg. Plan No. 3 of 1979 (44 FR 69273, Dec. 3, 1979); E.O. 12188 of Jan. 2, 1980 (45 FR 989, Jan. 4, 1980).

SOURCE: 47 FR 14693, Apr. 6, 1982, unless otherwise noted. Redesignated at 54 FR 601, Jan. 9, 1989.

## § 705.1 Definitions.

As used in this part:

"Department" means the United States Department of Commerce and includes the Secretary of Commerce and the Secretary's designees.

"Secretary" means the Secretary of Commerce or the Secretary's designees.

"Applicant" means the person or entity submitting a request or application for an investigation pursuant to this part.

## § 705.2 Purpose.

These regulations set forth the procedures by which the Department shall commence and conduct an investigation to determine the effect on the national security of the imports of any article. Based on this investigation, the Secretary shall make a report and recommendation to the President for action or inaction regarding an adjustment of the imports of the article.

## § 705.3 Commencing an investigation.

Upon request of the head of any government department or agency, upon application of an interested party, or upon motion of the Secretary, the Department shall immediately conduct an investigation to determine the effect on the national security of the imports of any article.

## § 705.4 Criteria for determining effect of imports on the national security.

(a) To determine the effect on the national security of the imports of the article under investigation, the Department shall consider the quantity of the article in question or other circumstances related to its import. With regard for the requirements of national security, the Department shall also consider the following:

(1) Domestic production needed for projected national defense requirements;

(2) The capacity of domestic industries to meet projected national defense requirements;

(3) The existing and anticipated availabilities of human resources, products, raw materials, production equipment and facilities, and other supplies and services essential to the national defense;

(4) The growth requirements of domestic industries to meet national defense requirements and the supplies and services including the investment, exploration and development necessary to assure such growth; and

(5) Any other relevant factors.

(b) In recognition of the close relation between the strength of our national economy and the capacity of the United States to meet national security requirements, the Department shall also, with regard for the quantity, availability, character and uses of the imported article under investigation, consider the following:

(1) The impact of foreign competition on the economic welfare of any domestic industry essential to our national security;

(2) The displacement of any domestic products causing substantial unemployment, decrease in the revenues of government, loss of investment or specialized skills and productive capacity, or other serious effects; and

(3) Any other relevant factors that are causing or will cause a weakening of our national economy.

## § 705.5 Request or application for an investigation.

(a) A request or application for an investigation shall be in writing. The original and 12 copies shall be filed with the Director, Office of Industrial Resource Administration, Room 3876, U.S. Department of Commerce, Washington, DC 20230.

(b) When a request, application or motion is under investigation, or when an investigation has been completed pursuant to § 705.10 of this part, any subsequently filed request or application concerning imports of the same or related article that does not raise new or different issues may be either consolidated with the investigation in progress as provided in § 705.7(e) of this part, or rejected. In either event, an explanation for taking such action shall be promptly given to the applicant. If the request or application is rejected, it will not be returned unless requested by the applicant.

(c) Requests or applications shall describe how the quantity, availability, character, and uses of a particular imported article, or other circumstances related to its import, affect the national security, and shall contain the following information to the fullest extent possible:

(1) Identification of the applicant;

(2) A precise description of the article;

(3) Description of the domestic industry affected, including pertinent information regarding companies and their plants, locations, capacity and current output of the industry;

(4) Pertinent statistics on imports and domestic production showing the quantities and values of the article;

(5) Nature, sources, and degree of the competition created by imports of the article;

(6) The effect that imports of the article may have upon the restoration of domestic production capacity in the event of national emergency;

(7) Employment and special skills involved in the domestic production of the article;

(8) Extent to which the national economy, employment, investment, specialized skills, and productive capacity is or will be adversely affected;

(9) Revenues of Federal, State, or local Governments which are or may be adversely affected;

(10) National security supporting uses of the article including data on applicable contracts or sub-contracts, both past and current; and

(11) Any other information or advice relevant and material to the subject matter of the investigation.

(d) Statistical material presented should be, if possible, on a calendar-year basis for sufficient periods of time to indicate trends. Monthly or quarterly data for the latest complete years should be included as well as any other breakdowns which may be pertinent to show seasonal or short-term factors.

## § 705.6 Confidential information.

(a) Any information or material which the applicant or any other party desires to submit in confidence at any stage of the investigation that would disclose national security classified information or business confidential information (trade secrets, commercial or financial information, or any other information considered sensitive or privileged), shall be submitted on separate sheets with the clear legend "National Security Classified" or "Business Confidential," as appropriate, marked at the top of each sheet. Any information or material submitted that is identified as national security classified must be accompanied at the time of filing by a statement indicating the degree of classification, the authority for the classification, and the identity of the classifying entity. By submitting information or material identified as business confidential, the applicant or other party represents that the information is exempted from public disclosure, either by the Freedom of Information Act (5 U.S.C. 552 et seq.) or by some other specific statutory exemption. Any request for business confidential treatment must be accompanied at the time of filing by a statement justifying nondisclosure and referring to the specific legal authority claimed.

(b) The Department may refuse to accept as business confidential any information or material it considers not intended to be protected under the legal authority claimed by the applicant, or under other applicable legal authority. Any such information material so refused shall be prompt-

returned to the ...mitter and will not be considered. However, such information or material may be resubmitted as non-confidential in which case it will be made par of the public record.

...? Conduct of an investigation.

(a) If the Department determines that it is appropriate to afford interested parties an opportunity to present information and advice relevant and material to an investigation, a public notice shall be published in the FEDERAL REGISTER soliciting from any interested party written comments, opinions, data, information or advice relative to the investigation. This material shall be submitted as directed within a reasonable time period to be specified in the notice. All material shall be submitted with 6 copies. In addition, public hearings may be held pursuant to § 705.8 of this part.

(b) All requests and applications filed and all material submitted by interested parties, except information on material that is classified or determined to be confidential as provided in § 705.6 of this part, will be available for public inspection and copying in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room H-4886, U.S. Department of Commerce, Washington, DC 20230, in accordance with regulations published in Part 4 of Title 15, Code of Federal Regulations.

(c) Further information may be requested by the Department from other sources through the use of questionnaires, correspondence, or other appropriate means.

(d) The Department shall, as part of an investigation, seek information and advice from, and consult with, the Secretary of Defense and any other appropriate officers of the United States or their designees, as shall be determined. Communications received from agencies of the U.S. Government or foreign governments will not be made available for public inspection. The Department may also seek assistance in the conduct of an investigation from other agencies of the United States, as shall be necessary.

(e) Any request or application that is filed while an investigation is in progress, concerning imports of the same or related article and raising similar issues, may be consolidated with the request, application or motion that initiated the investigation.

[47 FR 14693, Apr. 6, 1982. Redesignated at 54 FR 601, Jan. 9, 1989 and amended at 54 FR 19355, May 5, 1989]

§ 705.8 Public hearings.

(a) If it is deemed appropriate by the Department, public hearings may be held to elicit further information.

(1) A notice of hearing shall be published in the FEDERAL REGISTER describing the date, time, place, the subject matter of each hearing and any other information relevant to the conduct of the hearing. The name of a person to contact for additional information or to request time to speak at the hearing shall also be included. Public hearings may be held in more than one location.

(2) Hearings shall be open to the public unless national security classified information will be presented. In that event the presiding officer at the hearing shall close the hearing, as necessary, to all persons not having appropriate security clearances or not otherwise authorized to have access to such information. If it is known in sufficient time prior to the hearing that national security classified information will be presented the notice of hearing published in the FEDERAL REGISTER shall state that national security classified information will be presented and that the hearing will be open only to those persons having appropriate security clearances or otherwise specifically authorized to have access to such information.

(b) Hearings shall be conducted as follows:

(1) The Department shall appoint the presiding officer;

(2) The presiding officer shall determine all procedural matters during the hearing;

(3) Interested parties may appear, either in person or by representation, and produce oral or written information relevant and material to the subject matter of the investigation;

(4) Hearings will be fact-finding proceedings without formal pleadings or





adverse parties. Formal rules of evidence will not apply;

(5) After a witness has testified, the presiding officer may question the witness. Questions submitted to the presiding officer in writing by any interested party may, at the discretion of the presiding officer, be posed to the witness. No cross examination of any witness by a party shall be allowed.

(6) Each hearing will be stenographically reported. Transcripts of the hearing, excluding any national security classified information, may be purchased from the Department at actual cost of duplication, and will be available for public inspection in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room H-4886, U.S. Department of Commerce, Washington, DC 20230.

[47 FR 14693, Apr. 6, 1982. Redesignated at 54 FR 601, Jan. 9, 1989 and amended at 54 FR 19355, May 5, 1989]

§ 705.9 Emergency action.

In emergency situations, or when in the judgment of the Department, national security interests require it, the Department may vary or dispense with any or all of the procedures set forth in § 705.7 of this part.

§ 705.10 Report of an investigation and recommendation.

(a) When an investigation conducted pursuant to this part is completed, a report of the investigation shall be promptly prepared. The report shall be organized in several sections. If necessary. One section shall contain all information and material that is not classified or confidential as provided in § 705.6 of this part. Another section shall contain all national security classified information and material. A third section shall contain all business confidential information and material.

(b) The Secretary shall report to the President the findings of the investigation and a recommendation for action or inaction within one year after receiving a request or application or otherwise beginning an investigation pursuant to this part.

(c) The Executive Summary of the report, excluding the sections containing national security classified and business confidential information and material, shall be published in the FEDERAL REGISTER upon the disposition of each request, application, or motion made pursuant to this part. Copies of the full report will then be available for public inspection and copying in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room H-4886, U.S. Department of Commerce, Washington, DC 20230.

[47 FR 14693, Apr. 6, 1982. Redesignated at 54 FR 601, Jan. 9, 1989 and amended at 54 FR 19355, May 5, 1989]

## PARTS 706—709 [RESERVED]

# SUBCHAPTER B—[RESERVED]

## PARTS 710—729 [RESERVED]

APR.20 1992

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of Export Administration
Washington, D.C. 20230

PART II

TO: Importers/End-Users of Gears and Gearing Products

The Department of Commerce (DOC) is conducting an investigation, under Section 232 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1862), to determine the effect of gears and gearing products imports on the national security. This investigation is being undertaken in accordance with Part 705 of Title 15 of the Code of Federal Regulations. The information requested is needed to supplement data available to the Department from other sources and is is being undertaken to carry out DOC emergency preparedness responsibilities under Executive Order 12656 to "perform industry analyses to assess capabilities of the commercial industrial base to support the national defense, and develop policy alternatives to improve the international competitiveness of specific domestic industries and their abilities to meet defense program needs."

You are exempted from completing this survey if:

1. Your firm has not imported gears or gearing products at any time covered by this survey (since January 1, 1988), or

2. Your firm sold (F.O.B.-shipment point) or used less than $500,000 of imported gears and gearing products in 1991.

If you meet either of these conditions, please check the appropriate box on the cover sheet of the questionnaire and return that page to the address below. If you do not meet either condition, the Department of Commerce must receive your completed questionnaire by May 22, 1992 after receipt to:

Mr. Brad Botwin, Director
Strategic Analysis Division, Room H3878
U.S. Department of Commerce
Washington, DC 20230

Where appropriate, it is essential that information and material submitted should be designated "BUSINESS CONFIDENTIAL" as provided for in Section 705.6 of the attached Department of Commerce regulations. Submissions not so designated may be subject to release under provisions of the Freedom of Information Act.

If you have any questions concerning this questionnaire, please contact Edward Levy, Section 232 Program Manager, or Jeannette Dykes, Trade and Industry Analyst, at (202) 377-3795. Thank you for your cooperation in this important assessment.

Sincerely,

John A. Richards
Deputy Assistant Secretary
for Industrial Resource Administration

Enclosure

REF. # 77

U.S. Department of Commerce
Bureau of Export Administration

OMB Control # 0694-0068
Expires 9/30/92

# INVESTIGATION OF THE IMPACT OF IMPORTS OF GEARS AND GEARING PRODUCTS ON THE NATIONAL SECURITY

## IMPORTER/END-USER QUESTIONNAIRE

This information is being collected to carry out Department of Commerce emergency preparedness responsibilities under Executive Order 12656 of November 18, 1988. One of these responsibilities is to "perform industry analyses to assess capabilities of the commercial industrial base to support the national defense, and develop policy alternatives to improve the international competitiveness of specific domestic industries and their abilities to meet defense program needs." (Authority: Defense Production Act (50 U.S.C. App. 2155); Department of Commerce Act (15 U.S.C.1516)). Information furnished herewith is deemed confidential and will not be disclosed except in accordance with applicable law. Where appropriate, information and material submitted should be designated "BUSINESS CONFIDENTIAL" as provided for in section 705.6 of the enclosed U.S. Department of Commerce Regulations, 15 C.F.R. 705.

**Burden Estimate and Request for Comment:** Public reporting burden for this collection of information is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden. to BXA Reports Clearance Officer, Room 4513, Bureau of Export Administration, U.S. Department of Commerce, Washington, DC 20230, and to the Office of Management and Budget, Paperwork Reduction Project (0694-0068), Washington, DC 20503.

### GENERAL INSTRUCTIONS

1. Please complete this questionnaire in its entirety as it applies to gears and gearing products. **Your response is due by May 22, 1992.** The survey has 3 parts as follows:

   PART I Firm Identification
   PART II Shipments, Imports & Inventories
   PART III Markets for Imported Gears & Gearing Parts

2. **If your firm has not imported gears or gearing products at any time covered by this survey (since January 1, 1988), check the appropriate box below, and return this page with your signature and title, to the address given below. If your firm is an importer or end-user, you are also not required to complete this questionnaire if your firm sold (F.O.B.-shipment point) or used less than $500,000 of imported gears and gearing products in 1991. If you meet either of these conditions, check the appropriate box and return this page to the address given below with your signature and title.**

Did not import gears or gearing products since January 1, 1988: ☐

Gear sales or use less than $500,000 in 1991: ☐

| FIRM | SIGNATURE | TITLE | TELEPHONE |
|---|---|---|---|
| | | | |

(INSTRUCTIONS CONTINUED ON NEXT PAGE)

3. It is not our desire to impose an unreasonable burden on any respondent. IF INFORMATION IS NOT READILY AVAILABLE FROM YOUR RECORDS IN EXACTLY THE FORM REQUESTED, FURNISH ESTIMATES AND DESIGNATE BY THE LETTER "E".

4. Report calendar year data, unless otherwise specified in a particular question. Please make photocopies of forms if additional copies are needed.

5. Questions related to the questionnaire should be directed to Mr. Edward Levy, Section 232 Program Manager, or Ms. Jeannette Dykes, Trade and Industry Analyst, (202) 377-3795 at the U.S. Department of Commerce.

6. Before returning your completed questionnaire, be sure to sign the certification on the last page and identify the person and phone number to be contacted (if necessary) at your firm.

7. Return completed questionnaire by May 22, 1992 to:

Mr. Brad Botwin, Director
Strategic Analysis Division, Room H3878
Office of Industrial Resource Administration
U.S. Department of Commerce
Washington, D.C. 20230

## DEFINITIONS

**DEFENSE SHIPMENTS** - Direct and indirect military shipments, including: 1) weapon systems, support equipment, and all other defense related end-use items, identified by purchase orders bearing a DO or DX rating and/or a contract number from the Department of Defense, Nuclear Regulatory Commission, Central Intelligence Agency, Federal Aviation Administration, or the National Aeronautics and Space Administration; 2) the orders of your customers which you can identify as producing products for defense purposes; and 3) items tested and certified to military specifications.

**ESTABLISHMENT** - All facilities in which gears and gearing products are produced. Includes auxiliary facilities operated in conjunction with (whether or not physically separate from) such production facilities. Does not include facilities solely involved in distribution.

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

**GEAR BOXES/ENCLOSED GEARS** - An assembled or partially assembled metal product, with gear set(s) shipped from the manufacturer as an assembly or machine for the purpose of power and/or motion transmission between driver(s) and driven equipment.

**IMPORTER**- Any person or firm engaged, either directly, contractually, or through a parent company or subsidiary, in importing gears and/or gearing components from a foreign manufacturer or through his selling agent into the United States. Importers may be one of the following types:

> **Producer/Importer**- A domestic manufacturer of gears and gear components that supplements U.S. production with imports.
>
> **Distributor/Importer**- A person or firm who purchases imported gears and/or gear components on his own account for the purpose of resale. A distributor normally has facilitates for stocking and maintaining inventories.
>
> **End-User/Importer**- A person or firm (or his agent) who purchases imported gears and/or gearing components from a foreign manufacturer or his selling agent in the United States for his own use and not for resale.
>
> **Agent/Importer**- A person or firm who purchases or takes on consignment imports of gears and/or gearing components on behalf of another person or firm through an affiliation, ownership or contractual agreement for the purpose of marketing, delivery to a customer, or inventory building in anticipation of a future sale.

**IMPORTS**- Gears and gearing components identified in the attached Appendix which have entered the Customs territory of the United States under a Consumption Entry (Form 7501). Values reported for imports should be delivered values including the cost of ocean freight and insurance, the applicable U.S. duties and imports brokerage fees, and the cost of delivering the merchandise from the port of entry to your U.S. receiving point. Such values should reflect deductions for all trade discounts, value of returned goods, and any applicable allowances.

**LOOSE OR OPEN GEARS** - Consists of unassembled metal toothed components built for the purpose of power and/or motion transmission between driver(s) and driven equipment. At time of shipment, <u>not</u> assembled into a gear drive as a completed unit or machine able to perform power and/or motion transmission duty.

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

**SHIPMENTS** - gears shipped by your firm during the reporting period. Such shipments should includes inter-plant transfers, but should exclude shipments of products produced by other manufacturers for resale under your brand name. Do not adjust for returned shipments. (See definition of DEFENSE SHIPMENTS above.)

**UNITED STATES** - includes the fifty States, Puerto Rico, the District of Columbia, and the Virgin Islands.

PART I: FIRM IDENTIFICATION

1. **COMPANY NAME AND ADDRESS:** Please provide the name and address of your firm or corporate division.

_____
Company Name

_____
Street Address

_____
City, State, Zip Code

2. **OWNERSHIP:** If your firm is wholly or partly owned by another firm, indicate the name and address of the parent firm and extent of ownership.

_____
Company Name

_____
Street Address

_____
City, State, Zip Code (Country)

Extent of Ownership:_____(percent)

3. **TYPE OF IMPORTER:** Please identify the type of importer your firm is by checking the appropriate box by the importer categories listed below (See definitions of Importer types on preceding page.)

- o Producer/Importer ☐
- o Distributor/Importer ☐
- o End User/Importer ☐
- o Agent/Importer ☐
- o Other ☐ (Specify:_____)

If an Agent/Importer, please identify client(s) and/or parent firm for whom you are an agent.

_____

4. **U.S. LOCATION(S): In the following space indicate all U.S. locations (city and state) in which your firm owns, rents, leases, or otherwise maintains for the purpose of assembly, warehousing or storing imported gears and/or gearing components.**

| Imported Gears Inventory | Normal Value in 1991 | City | State |
|---|---|---|---|
| | $ | | |
| | | | |
| | | | |
| | $ | | |

5. **LEADING IMPORT SOURCES: On the table below identify the 3 foreign manufacturers from whom you imported the largest amount of gears and gearing components and the dollar value imported from each during 1991. (See definition of Imports)**

| Foreign Manufacturer | Country of Origin | Value of ($000) (Delivered Value) |
|---|---|---|
| a. | | |
| b. | | |
| c. | | |

6. **VALUE ADDED IN THE UNITED STATES: Do you provide any special services normally performed by gearing manufactureRs, such as heat treatment. assembly, machining, grinding, or polishing of any kind, repair, testing, etc. (but excluding inventory carrying costs, packaging, marking. inspection and other usual handling and marketing functions) that add value to imported gearing and/or gearing components?**

**YES ☐ or NO ☐**

**If yes, please complete the following: ↓**

a. Describe the nature of the value added service(s) you provide:

_____

_____

_____

b. During 1991, approximately what percentage of the total dollar value of imported gears and/or gearing components were subject to these valued added services?

_____%

c. In thousands of dollars, what was the total value added applied to imported gears and/or gearing components in 1991?

$ _____

d. Why is this value added service performed in the United States?

_____

_____

_____

_____

_____

e. What plans, if any, do you have to increase or decrease value added service in the United States during the next 12 months?

_____

_____

_____

_____

_____

## PART II: SHIPMENTS, IMPORTS & INVENTORIES

**Please complete the following tables which request statistical information on imports, inventory, shipments, and defense shipments for the period from 1988 through 1991. Read the definitions of Imports and Defense Shipments prior to completing the tables.**

1. **SHIPMENTS & IMPORTS - please estimate the dollar value of your firm's total shipments and total defense shipments of imported gears and gearing products for the years 1988, 1989, 1990, and 1991. Please report shipment totals in thousands of dollars.**

| | | | IMPORTED GEAR SHIPMENT TOTALS -----> ($000'S) | |
|---|---|---|---|---|
| YEAR(S) | TOTAL GEAR IMPORTS | TOTAL SHIPMENTS OF IMPORTED GEARS | TOTAL INTERNAL CONSUMPTION OF IMPORTED GEARS | (IMPORTS DESTINED FOR DEFENSE USE) |
| 1988-----> | | | | |
| 1989-----> | | | | |
| 1990-----> | | | | |
| 1991-----> | | | | |

2a. Please break-out import totals from the above table by end-use market.

| | TOTALS -----> ($000'S) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL SHIPMENTS OF IMPORTED GEARS | | | | TOTAL INTERNAL CONSUMPTION OF IMPORTED GEARS | | | |
| GEAR MARKET | 1988 | 1989 | 1990 | 1991 | 1988 | 1989 | 1990 | 1991 |
| Automotive Gears | | | | | | | | |
| Marine Gears | | | | | | | | |
| Aerospace Gears | | | | | | | | |
| Industrial Gears | | | | | | | | |

2b. Please break-out import totals from Table 1 by gear product.

| | TOTALS —> ($000'S) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL SHIPMENTS OF IMPORTED GEARS | | | | TOTAL INTERNAL CONSUMPTION OF IMPORTED GEARS | | | |
| GEAR PRODUCT | 1988 | 1989 | 1990 | 1991 | 1988 | 1989 | 1990 | 1991 |
| Spur Gears | | | | | | | | |
| Helical Gears | | | | | | | | |
| Bevel Gears | | | | | | | | |
| Herringbone Gears | | | | | | | | |
| Worm Gears | | | | | | | | |
| Rack and Pinion | | | | | | | | |
| Enclosed Gears | | | | | | | | |

3. INVENTORIES: Please report your inventory(ies) as of December 31, 1991 by end-use market and product type as set forth in the following tables:

| DECEMBER 31, 1991 - TOTALS | |
|---|---|
| GEAR PRODUCT | INVENTORIES ($000'S) |
| Spur Gears | |
| Helical Gears | |
| Bevel Gears | |
| Herringbone Gears | |
| Worm Gears | |
| Rack and Pinion | |
| Enclosed Gears | |

**INVENTORIES (Continued)**

| DECEMBER 31, 1991 - TOTALS | |
|---|---|
| **END-USE MARKET** | **INVENTORIES ($000's)** |
| **Automotive Gears** | |
| **Marine Gears** | |
| **Aerospace Gears** | |
| **Industrial Gears** | |

## PART III. MARKETS FOR IMPORTED GEARS AND GEARING PARTS

1. Please identify the U.S. customers to whom you sold the largest dollar amount of imported gears and/or gearing products and the value of shipments of imported gears to each during 1991.

| | Major Customer Firm Name | Shipments ($000's) (FOB Point of Shipment) |
|---|---|---|
| a. | _____ | $_____ |
| b. | _____ | $_____ |
| c. | _____ | $_____ |
| d. | _____ | $_____ |
| e. | _____ | $_____ |

2. Identify the 3 weapon systems for which you provided the largest dollar amount of imported gears and gearing products during 1991.

| | Weapon System | Shipments ($000s) (FOB Point of Shipment) |
|---|---|---|
| a. | _____ | $_____ |
| b. | _____ | $_____ |
| c. | _____ | $_____ |

3. With respect to the gear and gearing products covered in this questionnaire, what adjustments has your firm had to make in its competitive position in order to comply with U.S. Government policies as they relate to defense procurement, trade policy, and conflicts between domestic and international business practices? Continue on a separate sheet, if necessary.

_____

_____

_____

_____

4. What adjustments should be made in U.S. Government policies, laws, and regulations that would moderate any competitive disadvantages that your firm might face as a result of these policies, laws, and regulations?

5. **COMPETITIVE ADVANTAGES:** What are the major competitive advantages you perceive for your firm over the next five years?

. **COMPETITIVE DISADVANTAGES:** What are the major competitive disadvantages you perceive your firm faces over the next five years?

7. How have imports of gears and/or gearing components (including those for your own use) positively and negatively affected domestic gear manufacturing operations?

**a. Positive Effects:** (e.g. lower costs, expanded markets, improved efficiency, access to foreign markets, etc.) Please explain below:↓

b. **Negative Effects:** (e.g. product lines dropped, customers lost, retired capacity, laid-off work force, etc.). **Please Explain below.↓**

8. **MAJOR COMMERCIAL CUSTOMERS:** Please list your five major customers in the United States for imported gears, the dollar value of shipments to these customers in 1991, and the primary end-market (e.g., aerospace, automotive, marine, or industrial) for these products.

| Major Customers | 1991 shipments (in $000s) | End-Market |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

9. **WEAPON SYSTEMS SUPPORTED:** In terms of value, please identify the top five (if any) military systems for which you supplied or used imported gears in 1991. Do not include any weapons system for which you supplied less than $50,000 of gears in 1991.

| Weapon System | 1991 shipments (in $000s) |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

10. **COMPETITORS: Please identify your firm's top three competitors in the U.S. market supplying 1) U.S.-produced or -assembled and 2) imported gears and gearing products.**

| Product Category/ Product Line | Competitors Supplying U.S.-Produced or U.S.-Assembled Product | Competitors Supplying Imported Product |
|---|---|---|
| Open Gearing: | | |
| 1. | | |
| 2. | | |
| 3. | | |
| Enclosed Gearing: | | |
| 1. | | |
| 2. | | |
| 3. | | |

11. **If your company is a gear end-user,** are you a party to any joint ventures, coproduction or other work sharing agreements by which you are committed to purchasing gears or gearing products only from foreign sources? If yes, please explain below:↓

12. **Did your firm import gearing as a result of your firm entering into or accepting an offset obligation? See definition of offset agreements.**

**YES ☐ or NO ☐**

| Date of Offset Agreement | Program Name[1] | Type of Weapon System [2] | Prime Contractor | Type of Gearing Import | Value($000) of Gearing Product Import[3] | Name and Country of Foreign Producer |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

[1]e.g. F/A 18, not simply aircraft, etc.

[2]Specify tank, aircraft, radar, engine, etc.

[3]Value of gear products cited in col. 5 "Type of Gearing Import"

13. If your firm purchases open or enclosed gears, please identify your firm's top 3 suppliers based on dollar value for U.S.-produced or U.S.-assembled or imported gearing from January 1, 1988 to present.

| OPEN GEARING | |
|---|---|
| Imported | U.S. Produced/Assembled |
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| | |
| ENCLOSED GEARING | |
| Imported | U.S.-Produced/Assembled |
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| | |

14. **If your firm imports gears or gearing products for resale, please assess below how important the following factors are in your OEM ('original equipment manufacturer) customers' purchase decisions for gearing. (Check all that apply.)**

| | IMPORTANCE TO CUSTOMER | | | |
|---|---|---|---|---|
| **Factor** | **Extremely** | **Very** | **Not Very** | **Not At All** |
| Price | ☐ | ☐ | ☐ | ☐ |
| Life-cycle Cost | ☐ | ☐ | ☐ | ☐ |
| Delivery Times | ☐ | ☐ | ☐ | ☐ |
| Availability of Product | ☐ | ☐ | ☐ | ☐ |
| Brand | ☐ | ☐ | ☐ | ☐ |
| Country of Origin | ☐ | ☐ | ☐ | ☐ |
| Service | ☐ | ☐ | ☐ | ☐ |
| Reliability | ☐ | ☐ | ☐ | ☐ |
| Engineering/Design | ☐ | ☐ | ☐ | ☐ |
| Training | ☐ | ☐ | ☐ | |
| Warranties | ☐ | ☐ | ☐ | ☐ |
| Other:_____ | ☐ | ☐ | ☐ | ☐ |
| Other:_____ | ☐ | ☐ | ☐ | ☐ |

15. **Please comment on what actions U.S. manufacturers should be taking now to improve their competitive position.**

_____

_____

_____

_____

_____

_____

## CERTIFICATION

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

| | |
|---|---|
| (Date) | (Signature of Authorized Official) |
| (Area Code/Telephone Number) | (Type or Print Name and Title of Authorized Official) |
| (Area Code/Telephone Number) | (Type or Print Name and Title of Person to Contact re this Report) |

## GENERAL COMMENTS

Is there any other information that we did not request above or that you would like to offer that you believe would be important for this national security assessment of gear and gearing product imports? Please use the space to provide any additional comments or information regarding your operations, or other related issues that impact your firm.

# PART 705—EFFECT OF IMPORTED ARTICLES ON THE NATIONAL SECURITY




AUTHORITY: Sec. 232, Trade Expansion Act of 1962 (19 U.S.C. 1862), as amended (Pub. L. 100-418, 102 Stat. 1107), Reorg. Plan No. 3 of 1979 (44 FR 69273, Dec. 3, 1979); E.O. 12188 of Jan. 2, 1980 (45 FR 989, Jan. 4, 1980).

SOURCE: 47 FR 14693, Apr. 6, 1982, unless otherwise noted. Redesignated at 54 FR 601, Jan. 9, 1989.


## § 705.1 Definitions.

As used in this part:

"Department" means the United States Department of Commerce and includes the Secretary of Commerce and the Secretary's designees.

"Secretary" means the Secretary of Commerce or the Secretary's designees.

"Applicant" means the person or entity submitting a request or application for an investigation pursuant to this part.

## § 705.2 Purpose.

These regulations set forth the procedures by which the Department shall commence and conduct an investigation to determine the effect on the national security of the imports of any article. Based on this investigation, the Secretary shall make a report and recommendation to the President for action or inaction regarding an adjustment of the imports of the article.

## § 705.3 Commencing an investigation.

Upon request of the head of any government department or agency, upon application of an interested party, or upon motion of the Secretary, the Department shall immediately conduct an investigation to determine the effect on the national security of the imports of any article.



## § 705.4 Criteria for determining effect of imports on the national security.

(a) To determine the effect on the national security of the imports of the article under investigation, the Department shall consider the quantity of the article in question or other circumstances related to its import. With regard for the requirements of national security, the Department shall also consider the following:

(1) Domestic production needed for projected national defense requirements;

(2) The capacity of domestic industries to meet projected national defense requirements;

(3) The existing and anticipated availabilities of human resources, products, raw materials, production equipment and facilities, and other supplies and services essential to the national defense;

(4) The growth requirements of domestic industries to meet national defense requirements and the supplies and services including the investment, exploration and development necessary to assure such growth; and

(5) Any other relevant factors.

(b) In recognition of the close relation between the strength of our national economy and the capacity of the United States to meet national security requirements, the Department shall also, with regard for the quantity, availability, character and uses of the imported article under investigation, consider the following:

(1) The impact of foreign competition on the economic welfare of any domestic industry essential to our national security;

(2) The displacement of any domestic products causing substantial unemployment, decrease in the revenues of government, loss of investment or specialized skills and productive capacity, or other serious effects; and

(3) Any other relevant factors that are causing or will cause a weakening of our national economy.

## § 705.5 Request or application for an investigation.

(a) A request or application for an investigation shall be in writing. The original and 12 copies shall be filed





with the Director, Office of Industrial Resource Administration, Room 3876, U.S. Department of Commerce, Washington, DC 20230.

(b) When a request, application or motion is under investigation, or when an investigation has been completed pursuant to § 705.10 of this part, any subsequently filed request or application concerning imports of the same or related article that does not raise new or different issues may be either consolidated with the investigation in progress as provided in § 705.7(e) of this part, or rejected. In either event, an explanation for taking such action shall be promptly given to the applicant. If the request or application is rejected, it will not be returned unless requested by the applicant.

(c) Requests or applications shall describe how the quantity, availability, character, and uses of a particular imported article, or other circumstances related to its import, affect the national security, and shall contain the following information to the fullest extent possible:

(1) Identification of the applicant;

(2) A precise description of the article;

(3) Description of the domestic industry affected, including pertinent information regarding companies and their plants, locations, capacity and current output of the industry;

(4) Pertinent statistics on imports and domestic production showing the quantities and values of the article;

(5) Nature, sources, and degree of the competition created by imports of the article;

(6) The effect that imports of the article may have upon the restoration of domestic production capacity in the event of national emergency;

(7) Employment and special skills involved in the domestic production of the article;

(8) Extent to which the national economy, employment, investment, specialized skills, and productive capacity is or will be adversely affected;

(9) Revenues of Federal, State, or local Governments which are or may be adversely affected;

(10) National security supporting uses of the article including data on applicable contracts or sub-contracts, both past and current; and

(11) Any other information or advice relevant and material to the subject matter of the investigation.

(d) Statistical material presented should be, if possible, on a calendar-year basis for sufficient periods of time to indicate trends. Monthly or quarterly data for the latest complete years should be included as well as any other breakdowns which may be pertinent to show seasonal or short-term factors.

## § 705.6 Confidential information.

(a) Any information or material which the applicant or any other party desires to submit in confidence at any stage of the investigation that would disclose national security classified information or business confidential information (trade secrets, commercial or financial information, or any other information considered sensitive or privileged), shall be submitted on separate sheets with the clear legend "National Security Classified" or "Business Confidential," as appropriate, marked at the top of each sheet. Any information or material submitted that is identified as national security classified must be accompanied at the time of filing by a statement indicating the degree of classification, the authority for the classification, and the identity of the classifying entity. By submitting information or material identified as business confidential, the applicant or other party represents that the information is exempted from public disclosure, either by the Freedom of Information Act (5 U.S.C. 552 et seq.) or by some other specific statutory exemption. Any request for business confidential treatment must be accompanied at the time of filing by a statement justifying nondisclosure and referring to the specific legal authority claimed.

(b) The Department may refuse to accept as business confidential any information or material it considers not intended to be protected under the legal authority claimed by the applicant, or under other applicable legal authority. Any such information or material so refused shall be promptly

returned to the submitter and will not be considered. However, such information or material may be resubmitted as non-confidential in which case it will be made part of the public record.

### § 705.7 Conduct of an investigation.

(a) If the Department determines that it is appropriate to afford interested parties an opportunity to present information and advice relevant and material to an investigation, a public notice shall be published in the FEDERAL REGISTER soliciting from any interested party written comments, opinions, data, information or advice relative to the investigation. This material shall be submitted as directed within a reasonable time period to be specified in the notice. All material shall be submitted with 6 copies. In addition, public hearings may be held pursuant to § 705.8 of this part.

(b) All requests and applications filed and all material submitted by interested parties, except information on material that is classified or determined to be confidential as provided in § 705.6 of this part, will be available for public inspection and copying in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room H-4886, U.S. Department of Commerce, Washington, DC 20230, in accordance with regulations published in Part 4 of Title 15, Code of Federal Regulations.

(c) Further information may be requested by the Department from other sources through the use of questionnaires, correspondence, or other appropriate means.

(d) The Department shall, as part of an investigation, seek information and advice from, and consult with, the Secretary of Defense and any other appropriate officers of the United States or their designees, as shall be determined. Communications received from agencies of the U.S. Government or foreign governments will not be made available for public inspection. The Department may also seek assistance in the conduct of an investigation from other agencies of the United States, as shall be necessary.

(e) Any request or application that is filed while an investigation is in progress, concerning imports of the same or related article and raising similar issues, may be consolidated with the request, application or motion that initiated the investigation.

[47 FR 14693, Apr. 6, 1982. Redesignated at 54 FR 601, Jan. 9, 1989 and amended at 54 FR 19355, May 5, 1989]

### § 705.8 Public hearings.

(a) If it is deemed appropriate by the Department, public hearings may be held to elicit further information.

(1) A notice of hearing shall be published in the FEDERAL REGISTER describing the date, time, place, the subject matter of each hearing and any other information relevant to the conduct of the hearing. The name of a person to contact for additional information or to request time to speak at the hearing shall also be included. Public hearings may be held in more than one location.

(2) Hearings shall be open to the public unless national security classified information will be presented. In that event the presiding officer at the hearing shall close the hearing, as necessary, to all persons not having appropriate security clearances or not otherwise authorized to have access to such information. If it is known in sufficient time prior to the hearing that national security classified information will be presented the notice of hearing published in the FEDERAL REGISTER shall state that national security classified information will be presented and that the hearing will be open only to those persons having appropriate security clearances or otherwise specifically authorized to have access to such information.

(b) Hearings shall be conducted as follows:

(1) The Department shall appoint the presiding officer;

(2) The presiding officer shall determine all procedural matters during the hearing;

(3) Interested parties may appear, either in person or by representation, and produce oral or written information relevant and material to the subject matter of the investigation;

(4) Hearings will be fact-finding proceedings without formal pleadings or adverse parties. Formal rules of evidence will not apply;

(5) After a witness has testified, the presiding officer may question the witness. Questions submitted to the presiding officer in writing by any interested party may, at the discretion of the presiding officer, be posed to the witness. No cross examination of any witness by a party shall be allowed.

(6) Each hearing will be stenographically reported. Transcripts of the hearing, excluding any national security classified information, may be purchased from the Department at actual cost of duplication, and will be available for public inspection in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room H-4886, U.S. Department of Commerce, Washington, DC 20230.

[47 FR 14693, Apr. 6, 1982. Redesignated at 54 FR 601, Jan. 9, 1989 and amended at 54 FR 19355, May 5, 1989]

### § 705.9 Emergency action.

In emergency situations, or when in the judgment of the Department, national security interests require it, the Department may vary or dispense with any or all of the procedures set forth in § 705.7 of this part.

### § 705.10 Report of an investigation and recommendation.

(a) When an investigation conducted pursuant to this part is completed, a report of the investigation shall be promptly prepared. The report shall be organized in several sections, if necessary. One section shall contain all information and material that is not classified or confidential as provided in § 705.6 of this part. Another section shall contain all national security classified information and material. A third section shall contain all business confidential information and material.

(b) The Secretary shall report to the President the findings of the investigation and a recommendation for action or inaction within one year after receiving a request or application or otherwise beginning an investigation pursuant to this part.

(c) The Executive Summary of the report, excluding the sections containing national security classified and business confidential information and material, shall be published in the FEDERAL REGISTER upon the disposition of each request, application, or motion made pursuant to this part. Copies of the full report will then be available for public inspection and copying in the Bureau of Export Administration Freedom of Information Records Inspection Facility, Room H-4886, U.S. Department of Commerce, Washington, DC 20230.

[47 FR 14693, Apr. 6, 1982. Redesignated at 54 FR 601, Jan. 9, 1989 and amended at 54 FR 19355, May 5, 1989]

## PARTS 706—709 [RESERVED]

# SUBCHAPTER B—[RESERVED]

## PARTS 710—729 [RESERVED]

TAB D

## SUMMARY OF PUBLIC COMMENTS

On November 6, 1991, the U.S. Department of Commerce, Bureau of Export Administration published a notice in the Federal Register (copy attached at Tab B) to notify interested parties that it was initiating an investigation of the impact of gear and gearing product imports on the national security, under authority of Section 232 of the Trade Expansion Act of 1962, as amended. The Department further notified the public that it was interested in receiving comment by January 8, 1992 on the issues under investigation.

All of the comments received during the public comment period generally opposed the allegations made in the American Gear Manufacturers Association's (AGMA) Section 232 petition. Commenters can generally be characterized as being: U.S. companies which are gear end-users; other U.S.-based entities with foreign ownership or affiliation; foreign-based trade associations and companies; and foreign governments.

### U.S. GEAR END-USERS

**Aerospace Industries Association (AIA)** - AIA members are leading U.S. aerospace gear users, and some are also gear manufacturers. AIA agrees with AGMA's suggestion that government and industry should work more closely together. AIA believes that the 232 study should include a detailed analysis of the kinds of industry/government cooperation which exist in other major gear manufacturing countries.

AIA is pleased that AGMA did not ask for measures to restrict access to foreign gears. Limiting access to overseas markets could raise prices, make the U.S. less competitive and increase the risk of retaliation.

**Caterpillar** - Caterpillar manufactures, exports and imports gears for construction and materials handling. Caterpillar endorses the comments provided by Clark Equipment, and further states that any marine gear shortfalls can best be addressed by the Department of Defense stockpiling products required in a national emergency. Caterpillar also states that since AGMA did not request "adjustment of imports" or any other specific type of relief in its petition, the filing of a section 232 petition is ill-conceived.

**Clark Equipment Company** - Clark is a major manufacturer of forklift trucks and other material handling equipment in the United States and abroad. Clark manufactures, exports and imports transmissions and axles containing gears for use in many types of heavy equipment. Clark believes that the inclusion of motor vehicle and

industrial gears in the petition is unjustifiable protectionism which would result in substantial harm to U.S. gear producers and purchasers of such products without corresponding benefit to U.S. national security.

Clark further notes that the DOC "National Security Assessment of the U.S. Gear Industry" conclusively demonstrates that no national security risk exists in the motor vehicle and industrial gear sectors. While the petitioner notes that industrial gear imports doubled between 1984 and 1988, a mere increase in imports is not a basis for relief under Section 232.

Clark believes that the remedies recommended in the DOC "National Security Assessment" are sufficient, and that maintaining an adequate Department of Defense gear stockpile should meet national emergency needs. Clark notes that J. I. Case Co. and VME America support the concerns raised by Clark in these comments.

**Dana Corporation-** Dana is a worldwide company that principally manufactures automobile and truck components including transmissions, gear boxes and axles. Dana is both a domestic producer and an importer of the gears and gearing products covered by AGMA's petition. Dana opposes AGMA's petition, and believes that the petition fails to establish the need for the drastic measures of a Section 232 investigation. Dana states that the competitive problems faced by the small non-captive producers representing only about 25 percent of the industry is no basis for 232 relief. Dana warns that protection imposes higher costs on consumer industries, which in turn diminishes users' global competitiveness.

AGMA's allegation of a shrinking industrial base seems inconsistent with the allegation of skilled labor shortage, and further that the alleged lack of gear industry production fungibility is undocumented and unlikely. While the petition cites potential disadvantages associated with foreign source procurement, such allegations are inconsistent with the existence of MOUs with NATO allies such as Britain and Belgium.

**Deere & Company -** Deere is the world's leading manufacturer of agricultural equipment; and is also a significant manufacturer of construction, industrial, forestry and lawn care equipment, including the engines that power these products. As a supporter of free trade, Deere opposes the 232 petition. Deere believes that industrial gear imports pose no risk to national security, and further believes that remedies identified in earlier government studies should be sufficient to restore the industry's health.

Deere notes that 80 percent of its gear requirements were satisfied by U.S. suppliers in 1991. Deere protests, however, that offshore producers have often been more willing than U.S. suppliers to meet its low volume gear requirements.

**Rockwell International** - Rockwell is a leading manufacturer of components for on- and off-highway vehicles and passenger cars. Rockwell manufactures, exports and imports gears. Rockwell endorses Clark Equipment's comments, and opposes any limit on motor vehicle or industrial gears because no national security risk for such sectors has been identified. Rockwell believes that limiting gear imports will cause domestic gear prices to increase adversely affecting the export competitiveness of U.S. purchasers and users of gears.

Rockwell opposing any adjustment of aerospace or marine gear imports, and believes that the problems facing these sectors could be solved by the government both working to open export markets overseas and providing funding for R&D and worker training programs, and modernization incentives for efficient facilities.

**Sundstrand Corporation**- Sundstrand is a U.S.-based leader in the design, manufacture and sale of aviation and industrial components. Falk Corporation is an industrial operating unit that makes gearboxes and other power transmission products. Sundstrand supports free trade in the global marketplace, and opposes the AGMA petition. Sundstrand notes that the global gear industry is facing a period of protracted over-capacity, and predicts that not all of the global industry will survive. Sundstrand recommends that this country find ways to bring the gear industry up to world-class standards.

Sundstrand believes that limits on gear imports will lead to a raise in the prices of U.S. end-products, and will risk retaliation from foreign countries which are currently our major customers. Sundstrand further notes that AGMA's petition fails to mention that imported gears pay an average duty of three percent, and cautions that export statistics, as well as import statistics, do not separately report gears embedded in other products.

## OTHER U.S. ENTITIES WITH FOREIGN AFFILIATION

**Flender Corporation** - Flender is a German-owned gear company which manufactures carburized and ground gearing for industrial applications in Illinois. Flender opposes the 232 petition, and believes that foreign competition benefits, rather than jeopardizes U.S. national security. Flender contends, for example, that it invented and brought the technology of carburizing and grinding gearing to the United States from Germany.

Flender suggests that the DOD investigate the extent to which equipment successfully used for Operation Desert Storm was built with U.S.- or foreign-sourced gearing. Flender believes that the superiority of its worm gears became evident when the U.S. Navy was seeking a low- noise propulsion system for its mine sweepers.

Hampton Power Products, Inc. - Hampton is an importer and national distributor for two product lines of Japanese-built enclosed gearing. Hampton argues that unfair trade allegations should be dealt with through other existing statutes, and further that the U.S. marketplace has become extremely competitive since the dollar became weaker against the yen and the mark. Hampton also believes that AGMA failed to prove that foreign sourcing has seriously impacted either commercial gearing, enclosed drives or gearing for stationary equipment.

Hampton believes that leveraged buy-outs, the AGMA's insufficient effort to promote standards, and the fragmented nature of the U.S. industry are the industry's real problems. Hampton further believes that the industry's problems can be addressed through a buy-American provision limited to DOD purchases, and through government support of training efforts.

Italy-America Chamber of Commerce - The Chamber's members include companies that produce gears and gearing products in Italy and import them into the United States, and oppose any action that would limit or restrict U.S. imports of such products.

Sumitomo Machinery Corporation of America (SMCA) - Japanese-owned SMCA manufactures cycloidal speed reducers, gear motors, variable speed drives, and helical gearing in Chesapeake, VA; and exports about half of its speed reducer parts to Japan. SMCA alleges that there is considerable resistance to the 232 petition within AGMA and that the petition represents the beliefs of only a minority of AGMA members.

SMCA believes that AGMA has no case for import relief, and maintains that the AGMA petition failed to provide an accurate and comprehensive description of the U.S. gear industry. SMCA states that the domestic gear industry is profitable, able to produce quality products, and therefore, should be looking forward to future growth. SMCA contends that domestic producers are coping with import competition, and that no significant domestic manufacturers have withdrawn from the market since imports have increased. Further, foreign direct investors will continue to add new capacity to the U.S. market.

SMCA states that the petition should have mentioned the important contribution made by plastic gears. Plastic gear manufacturers have continued to invest in both advanced plastics injection molding machinery for the production of plastic gears.

SMCA argues that there is no basis for imposing Section 232 import restrictions. They believe that erecting protective barriers would only raise U.S. gear prices without benefiting the defense industrial base. SMCA further contends that a wide survey of all metal and plastic gear manufacturers would prove that import relief is neither desired nor needed.

SMCA further contends that the U.S. gear industry has significant excess capacity that can be devoted to military production, and believes that the equipment used to produce plastic gears and traditional metal gears can be converted for military use, and finally, that the U.S. can rely on imports from Canada and Mexico, as well as from our European and Asian allies.

ZF Industries - German-owned ZF Industries manufactures gears, transmissions, and other products for defense and civilian use at its three U.S. subsidiaries. ZF believes that AGMA almost totally neglects the vital importance of our relationships with our NATO allies, and further contends that restricting trade with NATO partners is contrary to both mutual agreements and good management practices.

ZF alleges that AGMA unrealistically finds the presence of any non-U.S. produced component in a U.S. weapon system to be a negative. ZF believes that AGMA ignores the benefits to the United States from foreign military sales, when objecting to the necessity of offering military offsets.

ZF believes that the AGMA is incorrect in alleging that European gear producers benefit from lower tax rates, and states, for example, that the U.S. tax rate is approximately 50 percent less than that which exists in Germany. ZF believes that the U.S. government could, however, do more, including reinstituting the investment tax credit, improving the tax treatment of capital investment, and expanding programs to attract more people into manufacturing careers. ZF urges the Secretary to report to the President that gear imports from Germany pose no threat to U.S. national security.

FOREIGN TRADE ASSOCIATIONS AND COMPANIES

EUROTRANS - The European Committee of Associations of Manufacturers of Gears and Transmission Parts (EUROTRANS) consists of gear associations from Belgium, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden, and the United Kingdom. EUROTRANS emphasizes that several AGMA members oppose the Section 232

petition. EUROTRANS reports that the U.S. gear industry is strong, and that total gear shipments have increased from $12.3 billion in 1984 to $15.6 billion in 1990 showing growth in all four gear industry sectors. At the same time, EUROTRANS notes that the increase in U.S. gear imports in recent years would be significantly lower if measured in companies' home currencies.

EUROTRANS believes that the AGMA petition is misleading when it refers to "lower quality" automotive gears, and that the automotive sector would be able to produce gears for a wide variety of defense purposes. EUROTRANS further believes that AGMA overstates European activity in the aerospace sector, and that the U.S. is virtually self-sufficient in the aerospace and marine sectors. EUROTRANS states that European imports supplement domestic production with high-quality specialty products often not available from U.S. suppliers.

EUROTRANS further denies AGMA's claims of unfair trade practices by European producers, and of easier access to capital by European firms. EUROTRANS states that AGMA understates the extent of government assistance in the United States, and exaggerates the level of foreign government assistance.

EUROTRANS contends that any protectionist measures will have negative consequences on domestic gear end-users and on American gear companies with overseas subsidiaries. In addition, protectionist measures could disrupt European companies transfer of gear technology to the United States. EUROTRANS asserts that its members view themselves as partners with this country and our defense industries for the purpose of defense and security.

EUROTRANS states that the biggest technical difficulty that the U.S. gear industry has to address is to convert to the metric system. This change will enhance competitiveness on the international market. EUROTRANS concludes that the U.S. gear industry is large, strong and capable of meeting the defense needs of the nation under any war scenario.

**Fiat Avio, S.P.A.** - Fiat Avio is the largest Italian exporter of aerospace gear products. Fiat Avio is a member of AGMA and does not support the 232 petition, and believes that other AGMA members oppose or take no position on this investigation. They urge DOC to investigate the extent to which U.S. aerospace gear producers support this investigation.

The commenter believes that the U.S. aerospace gear industry is vibrant, and further, that there is ample domestic and Canadian production capacity available to meet U.S. aerospace gear needs in the event of a national security crisis. Fiat Avio states that imports only accounted for a very small share of the U.S. aerospace gear market during the past decade, and that there is no evidence to suggest that imports will increase enough to justify 232 action. Further, Fiat Avio states that about 90 percent of its exports to the United States consist of lower technology gear products. The company urge the U.S. Government to narrow the scope of its investigation to exclude aerospace gear products.

Fiat Avio states that it does not benefit from offset agreements affecting gear products and is unaware of any Italian manufacturer of aerospace gear products that does. Fiat Avio reports that the only similar activity that it is participating in in the advanced aerospace gear sector, is a joint program for the development of commercial engines, in which Pratt & Whitney is the leading partner. Fiat Avio's risk sharing participation in several programs is instrumental to allowing these programs to progress.

The commenter asserts that restrictions on gearbox imports would harm U.S. importers and exporters of these products, thereby ultimately undermining U.S. readiness. Fiat Avio believes alternative measures are available which would be more consistent with U.S. obligations under the General Agreement on Tariffs and Trade and the Agreement on Trade in Civil Aircraft, and with U.S. bilateral obligations to Italy and other nations under U.S. Treaties of Friendship, Commerce and Navigation.

In place of action to limit imports, Fiat Avio recommends that the U.S. Government could: a) increase support for gear industry R&D; b) provide modernization incentives for productive equipment; and c) offer similar forms of government collaboration that would better assist in the industry's revitalization. The commenter further supports recommendations made by the recent DOC "National Security Assessment of the Gear Industry."

**Japan Gear Manufacturers Association (JGMA)** - JGMA's membership includes a small number of captive producers (especially in the automotive sector) and a large number of small to medium-sized firms. JGMA believes that AGMA is using this investigation to request a lengthy "wish list" of Federal benefits - ranging from Federal R&D support and training programs to relaxation of product liability laws and restoration of the investment tax credit. JGMA cautions that if the petitioners are successful, others may be tempted to use/misuse Section 232 for similar purposes. JGMA asserts that the U.S. government has limited use of Section 232 because of the risks of distorting U.S. trade law and of provoking retaliation under the GATT, and of the threat that 232 action could be counterproductive to broader foreign policy objectives.

JGMA believes that, at the height of the Soviet military threat, domestic gear production capacity was more than adequate to meet national security mobilization and surge targets for automotive and industrial gears, with only moderate projected shortfalls for aerospace and marine gears. National security emergency scenarios should now be sharply revised based on the elimination of the Soviet threat. Further, new data received since the 1988 Commerce/ITC gear industry survey shows that domestic shipments have increased while imports remained stable or declined.

Access to foreign suppliers enables the U.S. defense industries to take advantage of the best technologies available.
U.S. access to foreign markets is impeded by the failure of manufacturers to adopt the metric system of measurement and their failure to manufacture to international standards.

JGMA reports that the Japanese Government has no program to subsidize or support gear manufacturers, nor does it afford them protection from import competition. Japanese tariff rates for gears and gearing products are among the lowest in the developed world and there are no non-tariff barriers to imports. Japan is, in fact, among the largest export markets for U.S. gear manufacturers. JGMA asserts that the small amounts of money that the Japanese government spends in relation to gears are limited to university-based academic research. On the other hand, JGMA notes that the U.S. government invests in the gear industry through DOD-supported programs such as INFAC and IMIP, NASA's Lewis Research Center, and through the National Science Foundation.

JGMA believes that AGMA's petition is somewhat vague about its objectives: it says that its members are supporters of the free trade concept but on the other hand petition claims that imports have "undermined the ability of the domestic industry to respond to national security requirements of surge and mobilization." JGMA believes that successful U.S. firms, like their counterparts abroad, are those that have invested heavily in capital, training and R&D and adopted efficient manufacturing methods.

JGMA believes that there is no justification whatsoever for adjustment of imports under the terms and standards of Section 232. Protecting the U.S. gear industry from international competition would retard its modernization and further undermine its competitiveness. JGMA believes that the domestic industry's problems were not caused by imports and will not be cured by restricting imports.

**SNECMA/Hispano-Suiza** - The Societe Nationale d'Etude et de Construction de Moteurs d'Aviation (SNECMA) is a major French manufacturer of aerospace gas turbine engines and a joint venture

partner with General Electric (GE) in manufacturing the CFM56 jet engine. Hispano-Suiza (HS) is a French manufacturer of aerospace engine gearboxes and thrust reversers.

SNECMA states that it is involved in the U.S. aerospace market due to its joint venture with GE, with one-half of the engines assembled in each country. SNECMA contends that this arrangement is a true joint venture, not an offset arrangement. The gearboxes are manufactured by HS, for example, but the machine tools used to produce the aerospace gears are manufactured in this country.

SNECMA cautions that the broad scope of this investigation could adversely affect the international partnerships critical to the continued health of the U.S. aerospace industry and those companies that produce its component parts. Further, HS contends that it is not in its interest to "target" the U.S. aerospace industry since only a small quantity of HS gearboxes are exported to the US.

**FOREIGN GOVERNMENTS**

**Canadian Embassy** - Canada supplies gears and gearing products that are an integral part of the U.S. defense mobilization base. Restrictions on gear imports from Canada resulting from this investigation would be inconsistent with the Canada-U.S. Free Trade Agreement.

Canadian exports to the U.S. represent less than five percent of total U.S. consumption. If one excludes automotive gears and gearing products, Canadian exports account for less than one percent of U.S. consumption, and less than four percent of U.S. imports. Further, the United States enjoys a gear trade surplus with Canada, with one-half of U.S. gear exports going to Canada.

**Delegation of the Commission of the European Communities (EC)** - Both the EC and the U.S. gear industries can produce to order nearly any gear that the civilian or military sectors may require. The EC predicts that U.S. producers will maintain their capacity to supply any domestic gear requirements and will remain one of the world's leading exporters.

Only a few aerospace gears are used predominantly for defense purposes. Thirty-five percent of U.S. domestic demand of aerospace gears stems from civilian buyers.

Further, surplus automotive and industrial gearing production should be available for conversion to defense-related items in a mobilization. In addition, U.S. mobilization supply should include foreign-owned manufacturers producing in this country, and reliable imports from Allied countries. The EC concludes that there are no sound technical or economic reasons to justify import restrictions on the grounds of national security.