NATIONAL SECURITY ASSESSMENT OF THE ANTIFRICTION BEARINGS INDUSTRY

U.S. DEPARTMENT OF COMMERCE
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EXECUTIVE SUMMARY

In August 1988, the Office of the Secretary of Defense issued a Defense Federal Acquisition Regulation (DFAR) that required that all Department of Defense (DOD) purchases of antifriction bearings (except ball bearings under 30 mm outside diameter) be limited to U.S. or Canadian sources. The DFAR was established to address DOD concerns regarding the erosion of this defense-critical industry.

The DFAR was established for a three-year period, with provision for a two-year extension if necessary. In September 1991, Deputy Defense Secretary Atwood announced an extension for 15 months to the end of 1992, during which time the industry's competitive viability and the impact of the DFAR could be assessed. (In the FY 93 National Defense Authorization Act, Congress subsequently directed that the DFAR be extended for a three-year period.)

In January 1992, DOD requested the U.S. Department of Commerce, Bureau of Export Administration, Office of Industrial Resource Administration (OIRA) to assist in its study effort. To gather information for this assessment, in May 1992, OIRA distributed a survey questionnaire on a voluntary basis to all known bearing producers in the United States. Survey respondents represent about 90 percent of 1991 industry shipments and employment.

Most bearing companies reported that the DFAR had a positive impact on their production capacity, employment, investment, R&D and profitability. In addition, the companies commented that the DFAR improved entree to defense prime contractors, increased awareness of U.S. bearing producers' capabilities, and supported U.S. maintenance of technological proficiency in superprecision bearing production. Some companies replied, however, that the effects of the DFAR were at times overshadowed by the negative impacts of defense cutbacks and the current economic downturn.

Eliminating the DFAR at this time would have a very detrimental impact on the defense superprecision bearings sector. The impact would be less pronounced on firms producing lower precision bearings, although it could severely impact their defense divisions by expanding competition in a shrinking market.

DOD is the major market for superprecision bearings, accounting for over 36 percent of superprecision shipments in 1991. Direct and indirect defense requirements for all antifriction bearings, however, currently account for about 10 percent of the value of bearings produced in the United States, down from close to 15 percent in the mid-1980s.

U.S. Capacity

From 1979 to 1987, more than $1 billion (over 20 percent) of U.S. bearing production capacity was retired, leaving U.S. capacity at a 30-year low. Since 1987, the antifriction bearing industry has undertaken a major expansion in capacity as firms invested large sums of capital into new plant and machinery. The expansion is projected to continue for several more years, although future investment plans may be modified in light of changing business conditions. Bearing production capacity in units increased 18 percent from 1987 to 1991, and is projected to increase another seven percent by 1995.

Much of the expansion was undertaken by foreign-owned bearing companies who are expected to account for two-thirds of capacity added in the 1987-95 period. In terms of value, foreign-owned bearing firms account for about half the expansion because of lower unit values of ball bearings - their area of highest concentration.

Superprecision bearing capacity rose 16 percent from 1987 to 1991, and is projected to increase another 12 percent by 1995. However, almost all of the reported gain in superprecision capacity is dedicated to lower-value non-aerospace/military applications, such as bearings for machine tool spindles, or small high-precision ball bearings used in computer disk drives.

Regular precision ball bearing production capacity increased from 191 million bearings in 1987 to 285 million bearings in 1991. Most new investment was undertaken by foreign-owned firms. Capacity is projected to reach 337 million by 1995, for a total increase of 77 percent. In dollar value, the increase between 1987-1991 is estimated to be $238 million, up 29 percent. Another $170 million in new capacity is anticipated by 1995. About 70 percent of ball bearing capacity is foreign-owned.

Roller bearing production capacity is projected to expand 11 percent by 1995. While the total unit expansion is 66 million bearings, the total value increase is $685 million - a 25 percent increase. Tapered roller bearings, up 24 percent in units, show an estimated $133 million increase (1987-1995). The highest degree of foreign ownership (over 70 percent) is in spherical roller bearings.

U.S. Bearing Market and Trade Trends

Overall bearing shipments peaked in 1990 at $4.1 billion, before falling to $3.8 billion in 1991. Radial ball bearing shipments in 1991 ($703.9 million) are nearly 20 percent above their 1987 level, reflecting newly installed production capacity and displacement of imports. Angular contact ball bearings also experienced strong growth over the period as several major firms installed relatively high-valued wheel hub unit capacity. In the roller bearing segment, tapered roller bearings also displaced imports, and showed growth over the period, peaking at $977 million in 1990. Needle roller bearing shipments (used extensively in motor vehicles) have been flat since 1987.

Bearing import penetration was 22 percent in 1991. This percentage changed little over the 1987-1991 period, ranging from a 1987 low of 19 percent to a 1989 high of 23 percent. Bearing imports increased over the period from $758 million in 1987 to $893 million in 1991, with a peak exceeding $1 billion in 1989. Roller bearing imports dropped over the period from a peak of $358 million in 1989 to $254 million, while ball bearing imports fell from a peak of $574 million in 1987 to $494 million in 1991.

The United States continues to run a significant trade deficit in antifriction bearings. The trade deficit peaked in 1988 reaching almost $590 million. The gap narrowed for the next three years to $425.1 million in 1991. However, preliminary data for the first six months of 1992 indicate that the deficit may be widening again, as the deficit increased by $47 million over the first six months of 1991. This is due primarily to the relatively stronger economic growth in the United States compared to Japan and Europe. The still relatively small volume of exports and a large increase in imports from Japan were the major factors in this rising deficit.

Japan continued to have the largest bearing trade deficit ($299 million) in 1991 with the United States. The United States also runs substantial trade deficits with Germany ($102 million), China ($30 million), Singapore ($27 million), and France ($24 million). The United States had bearing trade surpluses with Mexico ($48 million), Australia ($14 million), and Canada ($14 million). The surpluses with Canada and Mexico primarily represent exports to U.S.-owned auto assembly operations in these countries.

Competitiveness

The global bearing industry is dominated by five giant bearing companies, all headquartered outside the United States. These companies control over 50 percent of the $19.5 billion global bearing business. The next five largest companies, including two headquartered in this country, control another 19 percent. The top four U.S. producers account for about 60 percent of the $4 billion U.S. market.

The competitive environment in the U.S. bearing sector has never been more intense. During the last decade, mostly undercapitalized mid-sized U.S.-owned companies and much larger foreign-owned companies competed fiercely for U.S. market share. In the past decade, U.S. bearing sales by foreign-owned firms (including bearings produced here and abroad) rose from about 25 percent of the market to nearly 60 percent today.

The competitive standing of the U.S. bearing industry has improved in the last five years as many companies took steps to modernize facilities, adopt modern management techniques, and enhance labor training. However, less than half of domestic-owned companies expect their competitiveness to improve over the next five years. In contrast, nearly two-thirds of foreign-owned companies expect their competitiveness to improve.

Despite huge investments during the last five years, the U.S. bearing industry's major competitive problem remains its difficulty in accessing capital. The most commonly reported competitive disadvantage was a lack of sufficient funds for product development and capital equipment purchases. Related concerns were outdated equipment, limited product offerings, and a limited skilled labor pool.

Capital equipment in foreign-owned bearing plants is more modern and technically advanced than in U.S.-owned plants. Machines in domestically-owned bearing facilities have an average age of 19 years, compared to a 12 year average in foreign-owned facilities.

Problems in the defense superprecision bearing sector are mounting. Defense suppliers of superprecision bearings are working down defense order backlogs, and competition for the few new orders has intensified. At the same time, U.S. aircraft engine producers positively evaluate the progress made by U.S. superprecision bearing companies in upgrading facilities, improving quality, and meeting delivery schedules. U.S. superprecision capacity utilization

(excluding ball bearings under 30 mm) was only 60 percent. Firms will not maintain expensive surplus capacity, unless they see prospects improving, so capacity retirements can be expected as defense spending declines further.

Superprecision firms are having difficulty exporting. The globalization of the aerospace industry is fragmenting the superprecision bearing market. Firms recognize the importance of exports, but have experienced difficulties in gaining access to foreign markets. Industry officials report that the Japanese market is closed, and that the Airbus consortium favors its own nationals. In addition, superprecision capacity is in surplus worldwide. Several industry officials state that removal of the DFAR procurement restriction at this time would further intensify the competition and put remaining American suppliers in greater jeopardy.

Industry Performance

Investment in the U.S. bearing industry soared during the last five years to its highest levels since the industry mobilized for World War II. From 1987 to 1991, investment totalled $1.31 billion. In 1990 alone, investment reached $352 million, and the industry invested another $309 million in 1991. Five major companies, three foreign-owned, were responsible for about 60 percent of these investments. In total, foreign-owned manufacturers accounted for $665 million, slightly more than half of the five-year total.

From 1987 to 1991, annual R&D spending by the U.S. bearing industry increased from $40 to $50 million. Over two-thirds of R&D expenditures were allocated to bearing production processes, as firms focused on ways to increase efficiency and reduce production costs.

Foreign-owned firms account for a small and declining share of total U.S. R&D spending; 9.5 percent in 1987 falling to less than 7 percent in 1991. This is in sharp contrast to foreign-owned firms' 37 percent share of U.S. shipments in 1991.

However, foreign bearing firms outspent U.S. bearing firms by a 5-to-1 ratio in worldwide R&D. At least $250 million in bearing-related R&D was expended outside the United States by foreign-owned bearing firms that have production operations here, versus only $3.1 million in R&D spending within this country by these same companies.

U.S.-owned companies reported much higher profitability than their foreign-owned counterparts. U.S.-owned manufacturers' profits (before taxes) averaged 6.8 percent on sales, and 9.0 percent on assets. In contrast, foreign-owned firms reported profits averaging

2.3 percent for both sales and assets. Fifty-eight percent of foreign-owned firms yearly observations were losses, contrasted with losses for only 28 percent of U.S.-owned firms' yearly observations.

Several foreign-owned bearing firms reported cost of goods sold averaging over 90 percent for this period, substantially above the all-industry and all-foreign firm average. Several possible explanations exist for this phenomenon. First, since these firms import components, they may be transferring profits to their home countries by increasing the intracompany transfer price of imported components. Second, they may be lowering prices to barely cover costs (or taking losses) within the United States to gain market share and achieve higher rates of capacity utilization. Third, it is possible, but unlikely, that these firms are less efficient since they are subsidiaries of some of the leading international bearing producers.

Many foreign-owned bearing firms are not financially solvent. The current ratio (current assets over current liabilities - the most widely used measure of short-term solvency) for foreign-owned firms fell from 1.31 in 1987 to only .94 in 1991. In contrast, the current ratio for U.S.-owned firms fell from 2.65 to 1.65. (All U.S. manufacturing's five-year average was 1.48). The quick ratio of very short-term solvency (current ratio excluding inventories) for foreign-owned firms averaged only .44. (The quick ratio for U.S.-owned firms averaged .93, more than twice the foreign-owned figure.) By these measures, foreign-owned firms in the aggregate are not solvent, and apparently remain in business with the sponsorship or subsidy of their parent firms. Again, this appears to be a tactic for increasing market share.

An increase in foreign ownership of U.S. bearing facilities has led to declining purchases of U.S. machine tools and other key elements of the supporting infrastructure. Foreign-owned bearing firms, for example, imported 80 percent of their machine tool purchases in the last five years, while U.S.-owned firms imported only 29 percent of machine tools they purchased during the same period.

There were major differences in sourcing patterns between U.S.-owned and foreign-owned bearing manufacturers. Domestically-owned firms report using very low levels of imported components. The highest level of foreign sourcing of any component by U.S.-owned companies occurred in 1988 when 1.5 percent of unfinished races were imported. In contrast, foreign-sourcing of unfinished races by foreign-owned companies rose from 24 percent of consumption in 1987 to 43 percent last year. Further, U.S.-owned bearing

manufacturers imported 46.6 percent of their steel requirements in 1987, declining steadily since then to 36.4 percent in 1991. In contrast, foreign-owned bearing manufacturers increased their steel imports from 52 percent of consumption in 1987 to 61 percent in 1991.

As demonstrated above, the viability of the defense-critical superprecision bearing sector is threatened. The Department of Defense must pay careful attention to this sector to ensure that further decline does not increase U.S. national security vulnerability.

I. BACKGROUND

The Department of Defense (DOD) has had a Defense Federal Acquisition Regulation (DFAR) "Buy America" restriction in place for miniature and instrument bearings (ball bearings under 30 mm) since 1971. DOD's subsequent decision to impose a procurement restriction on the purchase of all other antifriction bearing sizes and types came about in response to a 1986 study of the bearing industry led by DOD's Joint Logistics Commanders. That study concluded that the American antifriction bearing industry is critical to U.S. national security, and expressed concern that foreign competition was damaging domestic production capability, especially in the superprecision sector most important to the military.

In August 1988, the Office of the Secretary of Defense issued an interim rule that decreed that DOD contracting activities may only purchase U.S.- or Canadian-origin antifriction bearings and bearing components, and that DOD-purchased end-items must only contain U.S. or Canadian bearings. Contractors were required to furnish written certification that bearings supplied to DOD and bearings embedded in end-items were of U.S. or Canadian origin. The rule was established for a three-year period, with provision for a two-year extension if necessary.

The interim rule was revised[1] and adopted as a final rule effective July 11, 1989, and was originally scheduled to be in force through September 30, 1991, with provision for a two-year extension if necessary. In September 1991, however, Deputy Defense Secretary Atwood announced an extension of the DFAR restriction for 15 months to the end of 1992, during which time the industry's competitive viability and the impact of the restriction could be assessed (see Appendix A for the Federal Register notices announcing these actions).[2]

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[1]The interim rule contained a provision allowing foreign firms headquartered in NATO countries with U.S.-located bearing manufacturing facilities to continue supplying bearings for U.S. military use from their foreign operations. This provision applied to only three companies, all incorporated in Germany - FAG Kugelfischer, INA and Rothe Erde. SKF, the largest worldwide bearing firm, was left out because of its Swedish headquarters, despite the fact that much of its major production was located in Germany and other NATO countries. This provision was deleted from the final rule.

[2] A Congressional hearing was held September 24, 1991 to evaluate DOD's implementation of the bearing DFAR and the competitive status of the bearing industry. Deputy Defense Secretary Atwood announced a 15-month extension of the DFAR that day to provide time for a more complete assessment of the industry's condition.

Mr. Atwood took this action to better assess the appropriate course of action in view of rapidly changing national security challenges, and in response to continuing concerns regarding the erosion of the U.S. bearing industry (direct and indirect defense uses currently account for about 10 percent of the value of U.S. bearing production). In addition, Congress enacted legislation to require that DOD continue its existing bearing procurement restriction through FY 1992, and later passed similar legislation extending the DFAR for FY 1993-96.

Current Study

In January 1992, the Office of Industrial Resource Administration (OIRA) was requested by the Office of the Assistant Secretary of Defense (Production Resources) to assist DOD in determining if the DFAR restriction was still necessary (letter at Appendix B). DOD's letter requested a review of business trends, production capacity, and defense-critical bearings, and an assessment of the impact of a termination of the procurement restriction.

OIRA initiated this national security assessment of the U.S. bearing industry to answer the above questions. Our study was conducted under authority of the Defense Production Act of 1950, as amended, and Executive Order 12656, which delegates responsibility for defense industry assessments to the Department of Commerce. OIRA's Strategic Analysis Division is the Commerce organization responsible for conducting assessments of this nature.

As part of this effort, we identify critical defense industries, assess their capabilities to meet national security needs, evaluate current and potential production constraints, and propose remedial action when necessary. In the course of an industry assessment, particular consideration is given to such factors as industry capacity, foreign ownership, industry structure, raw material availability, investment, research and development, competitiveness, foreign sourcing, labor and material costs, productivity, technology and market trends. OIRA's most recent national security assessments include studies of ferrous and nonferrous forgings, semiconductor manufacturing equipment, robotics and gears; and a major review with the Department of the Navy of foreign-sourcing and dependencies for three Naval weapon systems.

Methodology and Scope

To gather information for this assessment, in May 1992, OIRA distributed a survey questionnaire (copy at Appendix C) on a voluntary basis to all known antifriction bearing producers and parts suppliers in the United States. A total of 40 responses from 34 bearing

companies (some companies reported from multiple divisions) were received by the Department. In 1991, companies responding accounted for 89 percent of industry shipments and 91 percent of industry employment.[3]

OIRA supplemented the industry survey with its extensive base of existing information on the bearing industry gathered through participation in the DOD Joint Logistics Commanders 1986 bearing study, the 1988 investigation of the impact of bearing imports on the national security under Section 232 of the Trade Expansion Act of 1962, and continuing analysis of the bearing industry. The survey was also supplemented with a review of the available literature and reports, and from conversations with industry experts at DOD, members of the Antifriction Bearing Manufacturers Association, other bearing firms and bearing end-users.

World Overview

Dominant Firms - The global bearing industry is dominated by five giant bearing companies, all headquartered outside the United States, which control over 50 percent of the global business. The next five largest companies, including two headquartered in the United States, control another 19 percent. These companies and their 1991 world sales are presented in the table below.

[3]Bureau of the Census reports were used as benchmarks for industry totals: the Current Industrial Report, Antifriction Bearings, 1991 (MA35Q-91) for bearing shipment data, and the Annual Survey of Manufactures (AS-1), Statistics by Manufacturing Industry, (SIC 3562) for employment data.

THE WORLD'S TOP 10 BEARING COMPANIES, 1991 SALES

COMPANY NAME	1991 WORLD BEARING SALES ($ millions)	PERCENT SHARE OF WORLD
AB SKF (Sweden)	3,488	17.9%
NSK Ltd (Japan)	1,960	10.1
FAG (Germany)	1,784	9.1
NTN Toyo (Japan)	1,719	8.8
Koyo Seiko (Japan)	1,311	6.7
Total (1st five)	$10,262	52.6%
Timken (USA)	1,129	5.8
Torrington (USA)	(e)850	4.4
INA (Germany)	(e)800	4.1
Nachi-Fujikoshi (Japan)	(e)450	2.3
SNR (France)	(e)400	2.1
Total (2nd five)	$3,629	18.6%
Total World Production	(e)$19,500	100%

(e) - estimated

Source: Company annual reports and financial statements

Three companies control about 75 percent of the $5.0 billion European market. AB SKF (Svenska Kugellager Fabbriken) alone accounts for about 40 percent, FAG Kugelfischer has another 25 percent, and INA holds an additional 10 percent. In Japan, NSK Ltd, NTN Toyo and Koyo Seiko together account for about 80 percent of the $3.1 billion (production) Japanese market. The major Japanese firms are structured in a 'keiretsu' network, making outside penetration of the Japanese market very difficult.[4] The top four U.S. producers, which include New Departure (owned by General Motors), SKF, Timken, and Torrington, account for less than 60 percent of the ($4.0 billion) U.S. market.

[4]NSK is connected with the Fuyo-Kai (Fuji Bank) group ('keiretsu'); NTN with the Sanwa Group; Koyo with Toyota Motor; and Nachi with the Tokai Group.

Swedish-based SKF makes every kind of bearing in more than 60 manufacturing facilities (including 13 in the United States) around the world. Home market bearing sales represent only about four percent of the firm's turnover. SKF is a major bearing producer in Sweden, Germany, Italy, France, the United Kingdom and the United States. The firm also has production facilities in Austria, Yugoslavia, India, Mexico, Brazil, Argentina, and several other countries. In the last 15-20 years, SKF has rationalized and modernized its global bearing operations. Through greater production efficiencies and acquisitions, SKF increased its share of the global market in the last decade, and further solidified its world leadership position.

Unlike SKF, the other leading bearing firms rely on home markets for the majority of their sales. These firms are only beginning to emerge as true multinationals, as they build or acquire bearing production capacity in the United States and other locations outside their home countries. NSK, operating from a solid sales base in Japan, has expanded production capacity in the United States; manufactures in Brazil, and has recently expanded into South Korea and England. In early 1990, NSK acquired British-based UPI (formerly RHP) which makes superprecision and other specialty bearings for the European market. NTN Toyo, also with a large sales base in Japan, became a major producer in the United States by purchasing Federal-Mogul's Bower Division (roller bearings) in 1987, and expanding its ball bearing facilities near Chicago. NTN also produces in Canada and Europe. Koyo Seiko, with over 50 percent of its sales to Toyota (a 20 percent owner of Koyo), is following a similar strategy. The firm is expanding capacity in the United States, and has additional facilities in Brazil and Europe. FAG operates the largest bearing production plant in the world in Schweinfurt, Germany; and has additional production capacity in Switzerland, Austria, Italy and Portugal. The company is expanding its U.S. and Canadian operations, and also has capacity in Brazil, India and South Korea. Each of these "big five" firms views the United States as a growth market.

During 1991 and 1992 economic conditions in Europe and Japan were declining. SKF's 1991 sales were five percent below the previous year, while profits slipped from $229 million (6.2 percent of sales) to only $8.9 million (0.25 percent). FAG lost nearly $50 million and laid-off more than 1,500 people. At the same time, the Japanese car market (responsible for half of that country's bearing consumption) is experiencing its worst slump since World War II. A worldwide surplus of bearing capacity has put downward pressure on prices. With the recent build-up of capacity in the United States, some retirement of worldwide excess capacity can be expected in the near future.

II. PRODUCTION CAPACITY

Thirty-eight responses were received to the capacity section of OIRA's bearing industry survey. These responses represented 84 percent of 1991 bearing shipments reported by the Bureau of the Census.. We estimate, however, that these responses represent over 95 percent of capacity expansion expected to occur over the 1987-1995 period.

Capacity was reported in complete bearing units (i.e., a minimum of an inner and outer ring and rolling elements). An estimated value of new capacity was calculated using 1991 unit shipment values reported by Census in its Current Industrial Report on bearings.[5] For purposes of this study, the industry was divided into three major subsectors - superprecision bearings, (regular precision) ball bearings and (regular precision) roller bearings. Bearing production capacity was defined as the highest practical number of bearings a firm could produce with raceways (inner and outer rings) heat-treated, ground and finished in the United States. These operations - heat treatment, grinding and finishing - constitute the major value-added of the bearing production operation, and would in wartime be most likely to present bottlenecks to expanding production. Capacity was further divided by type bearing, and for certain bearings, by level of precision.

Superprecision bearings are shown separately for several categories of ball bearings and cylindrical roller bearings because of their particular importance in aerospace and military applications, and the added complexity of their manufacture. It should be noted that other types of bearings, such as tapered roller, spherical roller and thrust bearings have superprecision equivalents just as important. They are omitted because their numbers are statistically small and the information unavailable.

Bearing unit production capacity is difficult to calculate, and in the aggregate may be somewhat meaningless because of the great variety of bearings produced. Bearings differ in a number of characteristics (size, type, features, materials, and complexity), with tens of thousands of part numbers in circulation. In the extreme, calculating unit production capacity would mean equating a $5,000 cylindrical roller bearing used on the main shaft of a gas turbine engine and a $2.50 ball bearing used on the shaft of an electric motor.

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[5]While nine of the 38 respondents were bearing parts producers, these respondents accounted for less than a third of 1991 parts shipments reported by the Bureau of the Census. Since this information is incomplete, it was not used in the capacity section.

Companies reported difficulty estimating capacity even though most bearing production plants tend to specialize by bearing type, precision and size ranges. A common practice is to estimate capacity on the recent year's production, and assume next year's will be the same. Dividing bearings into subgroups by type and size may partially offset some of these problems, but even within narrower groups, capacity measures can be misleading. For example, one firm might be set up to produce high volumes, while the next is producing low volumes of a very similar bearing. In adding these together, an average of uncertain worth results. Furthermore, the capacity numbers reported here should not be viewed as immediately available for defense applications.

Capacity Changes 1987-1995

Since 1987, the U.S. antifriction bearing industry significantly increased production capacity through large investments in new plant and machinery. Survey respondents anticipate that the expansion will continue for several more years, although future investment plans may be modified in light of changing business conditions. Bearing production capacity increased 18 percent from 1987 to 1991 (or $659 million), and is projected to increase another seven percent by 1995. The total capacity increase by 1995, if realized, will be about 27 percent, or an estimated $1.08 billion. Capacity expressed in units expanded from 771 million to 914 million bearings from 1987 to 1991, and is expected to reach 982 million bearings by 1995.

Two-thirds of the capacity expansion from 1987 to 1995 (142 million of 211 million bearings) is expected to be undertaken by foreign-owned bearing companies. By value, foreign-owned bearing firms should account for about half the expansion because of lower unit values of ball bearings, their area of highest concentration. In units, foreign ownership of U.S. capacity rose from 27 percent in 1987 to 33 percent in 1991, and is projected to reach 36 percent by 1995. The increase in foreign ownership from 1987 to 1991 included both expansions and acquisitions of existing capacity previously under U.S. ownership.[6] Anticipated activity between 1991 and 1995, however, only includes projected expansions.

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[6]Foreign acquisitions of in-place capacity included: 1) SKF's (Swedish) purchase of the Marlan Rockwell Company (MRC) from TRW Corporation in July, 1987; 2) NTN Toyo's (Japanese) purchase of the Bower Company from Federal-Mogul in December, 1987; 3) SKF-Ovako's purchase of Ajax (forges unfinished rings) in 1988; 4) FAG's (German) purchase of Barden Company in August, 1990; and 5) Tsubakimoto's (Japanese) purchase of the Hoover Ball Company in 1990.

SUMMARY OF BEARING PRODUCTION CAPACITY CHANGES 1987-1995

Major Bearing Type	Bearing Production Capacity, 1987, 1991				Percent Changes in		
	1987	1991	%	1995	87-91	87-95	91-95
Industry Total	770.5	914.1	65.0%	981.8	18	27	7
foreign owned	208.9	298.0	76.3%	350.6	43	67	17
% foreign	27	33	-	36	-	-	-
Superprecision (in 000s)	10,337	12,027	85.1%	13,495	16	31	12
foreign owned	5,851	6,855	84.3%	7,048	17	20	3
% foreign	57	57	-	52	-	-	-
Ball Bearings (reg.	190.7	285.4	70.8%	336.7	50	77	18
foreign owned	123.8	197.4	80.1%	237.3	59	92	20
% foreign	65	69	-	70	-	-	-
Roller Bearings	580.5	629.4	60.7%	646.0	8	11	3
foreign owned	27.0	32.6	67.2%	35.7	21	32	10
% foreign	14	15	-	16	-	-	-

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

Capacity utilization in 1991 for the industry was reported to be 65 percent. This low rate was heavily weighted by the very high unit numbers (but low value) of needle bearings (56 percent utilization). Without needle bearings included, the capacity utilization rate for the remainder of the industry was 74 percent.

Reasons for Capacity Build-Up

U.S. bearing capacity expansion since the 1987 low point can be attributed to shifts in the exchange rate in the mid-1980s that weakened the dollar against major foreign currencies, and to the growing U.S. customer base of the major international bearing companies. Exchange rate fluctuation made U.S. bearing production more price competitive (as rising

exports attest), and (as detailed below) the major international bearing companies were found to "dump"[7] bearings in the United States to meet existing contractual arrangements and maintain market share.

In March 1988, the Torrington Company filed a petition with the Department of Commerce alleging dumping by bearing firms from nine countries and unfair subsidization of bearing imports from two countries.[8] This caused price rises almost immediately. Commerce ruled in Torrington's favor (i.e. found dumping) in all six product categories under review, however, the International Trade Commission determined in May 1989, that injury to the U.S. bearing industry occurred in only three categories - ball bearings, cylindrical roller bearings and spherical plain. Therefore, although dumping was identified in the other three product categories (needle bearings, slew rings and spherical roller bearings), antidumping duties were not imposed in light of the negative injury determination. Countervailing duty charges alleging export subsidies by the Governments of Thailand and Singapore were also verified. In addition, antidumping duties were instituted against tapered roller bearings from Hungary, Italy, Japan, the PRC and Romania.

The antidumping margins were large, and provided an immediate impetus for the major foreign companies to accelerate investment in their U.S. operations. In addition, a worldwide demand surge that began in the second half of 1987 and held through 1989 helped sustain the higher prices that the dumping margins generated.[9] This surge further increased the cash flow for both U.S. bearing manufacturers and foreign bearing companies exporting to the United States. The retirement of over a billion dollars in capacity in the United States

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[7]Dumping refers to the business practice of selling a product in a foreign market at prices below those offered in the home market. Home market prices are taken to be an indication of the manufactured item's competitive return, and therefore, are used to determine a 'fair' price for the product in question.

[8]Torrington's petition covered all antifriction bearings (except tapered roller bearings covered under an earlier petition submitted by Timken) and a type of plain bearing called spherical plain bearings (rod ends). The antidumping petition named West Germany, France, Italy, Japan, Romania, Singapore, Sweden, Thailand and the United Kingdom. The countervailing duty (unfair subsidy) petition named Thailand and Singapore.

[9]Between 1987-1989, imported ball bearing prices (which were most affected by dumping duties) rose by one-third, while overall imported bearing prices rose 18 percent. Since then, prices have eased downward as global demand subsided and world bearing capacity moved from deficit to surplus.

from 1979 to 1987 left a capacity deficit, and shortages were experienced in several bearing end-markets. This deficit was aggravated by some firms double ordering. Timken put its customers on allocation to prevent panic buying, and to ensure an adequate supply for customers with priority requirements.

Two other factors also influenced the expansion of U.S. bearing production capacity. First, as auto companies and other major bearing end-users (including those under foreign ownership) adopted just-in-time inventory policies, it became increasingly important to have a geographically closer source for bearings. One Japanese-owned firm reported in its survey that customers desired local content, although this circumstance could also be related to the perception that lower production costs and prices are now attainable in the United States. Second, the DFAR bearing procurement was directly responsible for FAG moving aerospace/defense capacity from Schweinfurt, Germany to Stratford, Ontario, and influenced FAG's decision to purchase the Barden Company. The DFAR restriction also encouraged MPB Company (now owned by Timken) to continue expanding capacity at its two superprecision facilities in New Hampshire. The DFAR restriction also reinforced SKF's prior decision to upgrade its MRC facility in Jamestown, New York.

Production Capacity by Bearing Type

Superprecision Bearings - Superprecision bearing capacity rose 16 percent from 1987 to 1991, and is projected to increase another 12 percent by 1995. However, almost all of the reported gain in superprecision capacity is dedicated to non-aerospace/military applications, such as bearings for machine tool spindles, or small high precision ball bearings used in computer disc drives, both of which are generally lower in value. Measured in value terms, capacity rose $138 million from 1987 to 1991, and is expected to rise another $22 million by 1995.

Superprecision ball bearings under 30 mm are often made on the same equipment as lower precision bearings because tolerances are (much) easier to control for bearings of smaller size. The highest precision bearings, however, are generally made on specialized equipment in dust-free environments, and require special test equipment. The military may pay up to $400 (perhaps $200 of which is paperwork) for a single gyro bearing manufactured in this manner for use in a missile's guidance system.

SUPERPRECISION BEARING CAPACITY
1987-1995

Bearing Type	Bearing Production Capacity, 1987, 1991 and 1995 (in thousands of units)				Percent Changes in Capacity from....		
	1987	1991	% Util.	1995	87-91	87-95	91-95
Total Superprecision	10,337	12,026	85.1%	13,496	16	31	12
Foreign Owned	5,851	6,855	84.3%	7,048	17	20	3
% foreign	57	57	-	52	-	-	-
Ball bearings, < 30 mm	8,267	9,230	91.8%	10,213	12	24	11
Ball bearings, 30-100 mm	1,514	2,129	64.6%	2,184	41	44	3
Ball bearings, > 100 mm	231	299	55.4%	649	29	181	117
Cylindrical Roller Bearings	325	368	62.1%	450	13	39	22

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

Defense and commercial aerospace are the major markets for superprecision ball bearings under 30 mm, although they are also incorporated in ships, submarines, tanks and space vehicles. Much cheaper varieties are used in computer disc drives and dental drills. Capacity for superprecision ball bearings under 30 mm is projected to increase 11 percent by 1995, from 9.2 to 10.2 million units. Foreign firms own about 60 percent of the capacity.

Capacity to produce superprecision ball bearings in the 30-100 mm range increased 41 percent between 1987-1991 in unit terms, and is expected to increase another three percent by 1995. In value terms, capacity increased $57 million during the last five years, and is expected to increase another $4.7 million by 1995. Production capacity for superprecision ball bearings over 100 mm is expected to increase 181 percent from 1987 to 1995. However, almost 90 percent of the sector's entire capacity is for lower valued product of little utility in military/aerospace applications. In value terms, capacity is expected to increase $61 million (42 percent).

Key defense applications include quiet running bearings for submarines, aircraft engine bearings, gear boxes in helicopters, fighter aircraft and tanks, and tank and gun turrets. Commercial aircraft require similar, and sometimes identical bearings. Other commercial applications include machine tool spindles, high speed motors, racing cars, and moving parts of precision machinery such as semiconductor manufacturing equipment, optical grinders, and printing presses. Prices range from $30 to over $20,000 for one bearing.

The capacity to produce superprecision cylindrical roller bearings rose 13 percent between 1987-1991, and is projected to rise another 22 percent by 1995. However, in terms of value, capacity is only expected to increase a cumulative seven percent over the 1987-1995 period, and in fact, a drop of six percent is forecast for the 1991-1995 period. Superprecision cylindrical roller bearings are used on the main shaft of gas turbine engines to allow for axial movement caused by thermal expansion and contraction of the shaft, and to support the load. They are extremely expensive and difficult to manufacture. Cylindricals are used for similar purposes in gear boxes and larger machine tools and other precision machinery, where the shafts and loads are larger, or subject to axial variances. The capacity to produce cylindrical roller bearings for defense applications is projected to decline about 10 percent by 1995.

Ball Bearings - Regular precision ball bearing production capacity increased from 191 million in 1987, to 285 million in 1991 (see table below). Capacity is projected to reach 337 million by 1995, for a total increase of 77 percent. In dollar terms, the increase from 1987 to 1991 is estimated to be $238 million (29 percent). Another $170 million in new capacity is anticipated by 1995, for a total increase of $408 million (50 percent) for the period. Most of the capacity is foreign-owned. Foreign-owned concerns increased capacity from 124 million bearings in 1987, to 197 million in 1991, accounting for 87 percent of the total increase. Foreign-owned firms are projected to add another 40 million units to capacity by 1995.

Capacity for ball bearings under 30 mm is projected to increase 77 percent by 1995, or by 35 million bearings. Over 33 million units, or almost 94 percent of the increase is attributable to foreign-owned concerns. Foreign-owned firms hold about 90 percent of the capacity. Due to the generally low value of these bearings, the expansion in dollar terms is estimated at only about $40 million, only 3.5 percent of the industry total. These bearings are commonly used on smaller electric motors, windshield wipers, small fans for computer and electronic equipment, and fuel pumps. Many of these bearings would qualify as superprecision, but are manufactured to the minimum precision level the customer requires and are so labeled.

BALL BEARING PRODUCTION CAPACITY
1987-1995

Bearing Type	Ball Bearing Production Capacity 1987, 1991 and 1995 (in millions of units)				Percent Changes in Capacity from....		
	1987	1991	% Cap. Util.	1995	87-91	87-95	91-95
Total Ball Bearings	190.6	285.4	70.78	336.7	50	77	18
Foreign Owned	123.9	197.4	80.08	237.3	59	92	20
% foreign	65	69	-	70	-	-	-
Ball bearings, < 30 mm	46.2	64.0	88.6%	81.6	38	77	28
Ball bearings, 30-100 mm	95.0	164.9	69.1%	187.4	74	97	14
Ball bearings, > 100 mm	2.25	2.16	79.2%	2.75	(4)	22	27
Angular Contact Ball Bearings	9.9	10.6	57.5%	11.4	8	15	7
Other Ball Bearings	37.3	43.7	41.5%	53.6	17	25	17

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

The biggest gain in capacity occurred in ball bearings ranging in size from 30-100 mm in outside diameter. The capacity for these bearings grew 74 percent from 1987-1991, and is projected to grow another 14 percent by 1995. Most of the gains are in high volume commodity grade bearings used in motor vehicle applications, and other equipment such as conveyors, pumps, escalators, electric motors, and appliances. Foreign ownership of this capacity is expected to increase from 76 percent in 1987 to 81 percent by 1995. This sector was among those most severely impacted by imports, and much of the recent expansion was prompted by the antidumping duties. For example, SKF actually crated and shipped some of its production lines from Italy to Gainesville, Georgia.

Capacity to produce ball bearings from 30-100 mm is projected to increase by 92 million units, 44 percent of the total unit increase for the entire industry. Foreign-owned concerns have or plan to install 80 million units (86 percent) of this new capacity. These are mostly low-value bearings, however, and the capacity value increase is projected to be $222 million, 21 percent of the industry total.

Capacity to produce ball bearings over 100 mm declined slightly between 1987-1991, but is expected to expand 27 percent between 1991-1995. The unit increase in capacity is only 500,000 bearings, at an estimated value of $19 million. Foreign ownership of this capacity rose from 71 percent in 1987 to 79 percent in 1991, and is projected to reach 83 percent by 1995.

Angular contact ball bearing capacity grew from 9.9 million units in 1987 to 10.6 million units in 1991, and is expected to reach 11.3 million units by 1995, an increase of 14 percent. The estimated value of new capacity is $50 million. Three new lines, all foreign-owned, have been installed to make high-volume high-value double row angular contact wheel hub units. Capacity to produce high precision angular contact bearings commonly used in machine tool spindles has also been expanded. Other applications, such as the clutch release bearing used in standard transmissions, are declining in use.

Other ball bearing capacity includes double row radials, maximum capacity type (bearings with the maximum number of balls), integral shaft, linear, and thrust ball bearings. Double row bearings and maximum capacity ball bearings provide added load carrying ability, but retain the simpler manufacturing and lower-friction characteristics of a ball bearing. They may by used in larger transmissions, conveyors or pulleys. Integral shaft bearings are used extensively as water pump bearings in motor vehicles, while linear bearings are most often used in photocopying machines and for positioning reciprocating shafts on a variety of machines. Superprecision thrust bearings are used in aircraft engines to counter back thrust when landing.

Overall capacity for 'other' ball bearings grew from 37 million units in 1987 to 44 million units in 1991, and is expected to increase to 54 million units by 1995, an overall growth of nearly 44 percent. The estimated value of new capacity is about $90 million dollars. Foreign ownership of other ball bearing capacity is expected to rise from 38 percent in 1987 to 48 percent by 1995.

Roller Bearings - Regular precision roller bearing production capacity increased from 581 million units in 1987 to 629 million units in 1991. Capacity is projected to expand to 646 million by 1995, for an overall increase of 11 percent. The value of this capacity increase is expected to be $685 million, a 25 percent increase. The value number is heavily weighted by increases in spherical roller bearings (up $189 million) and mounted ball bearings (up $170 million) which both show almost a 90 percent unit increase. Tapered roller bearings, up 24 percent in units, show an estimated $133 million increase (1987-1995).

III. SHIPMENTS AND TRADE PATTERNS (1987-1991)

This section provides statistical information on antifriction bearing shipments, imports, exports, apparent consumption, and trade balances for the period 1987-1991, and, where available, for the first six months of 1992. Information is presented in a summary form only; the reader is directed to Appendix D for complete statistical information on all bearing categories for which data are collected by the Bureau of the Census.[10]

Shipments

Shipments of antifriction bearings and parts grew from $3.6 billion in 1987 to $4.1 billion in 1990, before declining seven percent in 1991 to $3.8 billion. In constant 1987 dollars, shipments peaked in 1988 at $3.8 billion, and then fell almost eight percent to $3.5 billion by 1991.

SHIPMENTS OF ANTIFRICTION BEARINGS
(comparing nominal and constant dollar values)
(in $millions)

	1987	1988	1989	1990	1991
Reported Values	3,551	3,899	3,944	4,064	3,762
BLS deflator	3,551	3,665	3,379	3,323	2,762
OIRA calculations	3,551	3,748	3,525	3,641	3,464

Source: Bureau of Labor Statistics[11] and OIRA calculations

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[10]The United States adopted the Harmonized System of Tariffs (HS) on January 1, 1989, replacing both the Tariff Schedule of the United States (import classification) and Schedule "B" (export classification) numbers. The switch to the HS system expanded coverage of bearing imports and exports, making comparability with the old systems somewhat difficult. The HS system also made the unit of quantity "number of units" for complete bearings, and "kilograms" for bearing parts.

[11]Bureau of Labor Statistics price deflators for bearings are based on list prices rather than actual transaction prices. A review of total bearing industry unit shipments and actual average prices indicate that the BLS index may be overstated. Furthermore, employment was increasing over this period while constant values (computed from the BLS deflators) declined. OIRA calculations of constant dollar shipments were developed by holding the 1987 detailed average

The table below presents shipment statistics broken down by major bearing product categories for the 1987 to 1991 period:

U.S. BEARING SHIPMENTS BY SELECTED PRODUCT CATEGORIES

(Millions of Dollars)

BEARING CATEGORY	1987	1988	1989	1990	1991
BALL BEARINGS	1,312.2	1,497.6	1,420.9	1,469.0	1,399.0
RADIAL BALL BEARINGS (Single Row)	592.0	640.1	672.4	752.4	703.9
<30 mm OD	110.4	120.3	130.2	125.2	112.4
30-100 mm OD	267.0	289.8	309.3	347.2	340.0
>100 mm OD	149.1	133.6	153.7	175.3	147.4
INTEGRAL SHAFTS	362.5	421.9	282.7	241.9	250.4
ANGULAR CONTACT	58.7	68.8	97.1	118.0	131.6
OTHER BALL BEARINGS	299.0	366.8	368.7	356.7	313.1
ROLLER BEARINGS	1,492.5	1,580.0	1,813.3	1,849.8	1,672.2
TAPERED ROLLER BEARINGS	754.6	745.7	963.9	977.3	876.3
CYLINDRICAL ROLLER BEARINGS	218.1	233.1	232.0	242.5	222.8
NEEDLE ROLLER BEARINGS	316.3	378.8	361.2	351.0	311.6
SPHERICAL ROLLER BEARINGS	139.7	155.5	194.4	208.6	185.7
OTHER ROLLER BEARINGS	63.8	67.4	61.8	70.4	75.8
MOUNTED BALL & ROLLER BEARINGS	305.6	358.1	345.0	362.9	323.0
BALL & ROLLER BEARING PARTS*	440.1	463.4	365.1	382.6	367.6
TOTAL, ALL TYPES AND PARTS	3,550.9	3,899.2	3,944.4	4,064.2	3,762.2

* Parts classification modified for tapered roller bearings in 1989. Earlier number not comparable.

Source: U.S. Dept. of Commerce, Bureau of the Census

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product prices calculated from the Antifriction Bearing Current Industrial Report constant over the 1987-1991 period. No adjustment was made for improvements in product quality or innovation, which would further lower the index and move shipments even closer to their nominal values.

ROLLER BEARING PRODUCTION CAPACITY
1987-1995

Bearing Type	Bearing Production Capacity 1987, 1991 and 1995 (in millions of units)				Percent Changes in Capacity from....		
	1987	1991	% Cap. Util.	1995	87-91	87-95	91-95
Total Roller Bearings	580.5	629.4	60.7%	646.0	8	11	3
Foreign Owned	79.2	93.7	67.2%	106.2	21	32	10
% foreign	14	15	-	16	-	-	-
Cylindrical Roller Bearings	19.0	19.4	72.9%	20.4	2	7	5
Tapered Roller Bearings	109.2	128.2	78.9%	135.5	17	24	6
Needle Roller Bearings	417.8	441.7	56.0%	441.7	6	6	-
Spherical Roller Bearings	1.36	2.20	67.2%	2.58	62	90	17
Mounted Bearings	5.78	7.65	60.3%	11.03	32	91	44
Other Bearings	16.4	17.4	76.3%	20.4	6	25	17

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

Roller bearing production is dominated by American-owned firms. Timken is the world's leading producer of tapered roller bearings; and Torrington is vying for world leadership in needle bearings with INA (Germany), the European leader. Foreign ownership is dominated by European firms, namely SKF, FAG and INA, although Japanese firms Koyo Seiko and NTN-Bower have a significant presence in tapered roller bearings. The highest degree of foreign ownership (over 70 percent) is in spherical roller bearings. SKF is very strong in this area, as is FAG.

U.S. producers are stronger in roller bearings than in ball bearings for various reasons. First of all, ball bearings are used with greater frequency in Europe and Japan. The United States, in contrast, has more diversity in its manufacturing sector (such as farm equipment, oil and gas field equipment, construction and road building equipment, and heavy machinery of all kinds) and produces things on a larger scale (larger load carrying demands), which encourages the greater use of roller bearings. Further, Timken and Torrington have greatly influenced the development and use of tapered roller and needle roller bearings respectively,

especially in America's historically large auto industry which dominated world production until the mid-1970s. Timken has improved bearing steel quality to a degree that enabled the firm to make tapered bearings at a fraction of the size of past models with the same load carrying capacity.

The effect on capacity of new automated equipment being installed in many U.S. manufacturing facilities will be significant, and should not be overlooked. The newest equipment is frequently designed to operate on a continuous basis, a major change from past practice. The new equipment also has quicker change-over cycles, and produces fewer defects with faster cutting speeds. As one industry spokesman explained, fewer than 50 new machines utilized 70 percent of the time do as much as 100 older machines utilized 35 percent of the time used to do, and only require half the floor space. The wave of plant modernization and capacity expansion and the corollary adoption of modern manufacturing techniques is re-shaping the bearing industry. The new Timken facility in Altavista, Virginia, for example, has only 30 people backed-up by nearly $25 million dollars of state-of-the-art plant and equipment. The per person output (productivity) is over five times the (old) industry standard. The plant makes wheel hub units for trucks and sells to customers around the world.

In conclusion, bearing factories of the future may be even more specialized, with higher productivity. Fixed costs will be higher and variable costs lower, making downswings in the business cycle riskier. However, while the market scope may narrow, it will also stretch further, in many cases around the globe. Open access to foreign markets will be very important to the domestic industry's health.

U.S. shipments of roller bearings averaged almost 20 percent more than shipments of ball bearings over the period. Tapered roller bearings accounted for 26 percent ($877 million) of total shipments (excluding parts), and were the largest bearing category. The next highest shipments were of radial ball bearings in the 30-100 mm range with $340 million in shipments in 1991. Needle bearings slipped to third place in 1991, with shipments of $312 million, down 11 percent from the previous year.

Overall and in most of the individual product categories, bearing shipments peaked in 1990, before falling significantly in 1991. Some product categories fared better than others, however. For example, radial ball bearing shipments in 1991 were nearly 20 percent above their 1987 level, reflecting new production capacity and displacement of imports. Angular contact bearings also experienced strong growth over the period attaining their highest level in 1991 as several major firms installed relatively high-valued wheel hub unit capacity. At the other extreme, shipments of ball bearings with integral shafts were only 70 percent of their 1987 level in 1991. (Some product was reclassified in 1990, partly to other ball bearings, and partly to angular contact bearings as wheel hub units).

In the roller bearing segment, tapered roller bearings displaced imports and showed general growth over the period. A decline in tapered shipments in 1991 from 1990 levels was due to depressed market conditions. Needle roller bearing shipments, on the other hand, are at essentially the same level as in 1987, after peaking in 1988.

Defense Shipments

Superprecision Bearings - As can be seen from the following table, superprecision bearing shipments (shipments of bearings rated ABEC/RBEC 5 and higher) increased 19 percent over the 1987-91 survey period, from $270 million to $323 million. Concurrently, defense superprecision shipments decreased 19 percent, as defense shipments fell from 53 percent to 36 percent of total superprecision shipments. The relative and actual decrease in defense shipments took place as a result of declining defense budgets and the simultaneous recovery of other bearing end-markets. The foreign-owned share of U.S. superprecision bearing shipments more than doubled over this period (going from $111 million to $230 million) largely as a reflection of FAG's purchase of Barden and capacity expansions by NHBB (Minebea). The increase would have been even more pronounced had we considered as "domestic" FAG's increase in superprecision capacity at its Stratford, Ontario factory.

The increase in the foreign-owned percentage of U.S. superprecision shipments was encouraged by the existence of the DFAR procurement restrictions. As a result, several foreign-owned firms are now supplying DOD with U.S. or Canadian bearings where these bearings had earlier been sourced overseas.

SUPERPRECISION BEARINGS: DEFENSE SHIPMENTS
1987-1991

Bearing Type		Superprecision Shipments, 1987-1991 (in $000s) millions				
		1987	1988	1989	1990	1991
Superprecision Radial Ball bearings <30 mm	Total Shipments	46,368	60,045	58,110	69,173	61,568
	Defense Shipments	17,023	18,709	16,917	20,510	15,445
	% Defense	36.7	31.2	29.1	29.7	25.0
Ball bearings 30-100mm	Total Shipments	79,074	80,338	86,614	95,932	93,752
	Defense Shipments	37,236	35,090	32,549	33,392	30,805
	% Defense	47.1	43.7	37.6	34.8	32.8
Ball bearings >100mm	Total Shipments	54,856	57,323	75,768	77,786	75,594
	Defense Shipments	28,365	26,225	31,828	32,873	27,667
	% Defense	51.7	45.7	42.0	42.3	36.6
Cylindrical Roller Bearings	Total Shipments	89,928	89,021	86,370	92,029	91,845
	Defense Shipments	59,817	54,714	47,728	46,155	41,881
	% Defense	66.5	61.5	55.3	50.2	45.5
Total Superprecision	Total Shipments	270,226	286,727	306,862	334,920	322,759
	Foreign-Owned	111,352	121,943	133,508	204,643	230,267
	% Foreign Owned	41.2	42.5	43.5	61.1	71.3
	Defense Shipments	142,441	134,738	129,022	132,930	115,798
	% Defense	52.7	47.0	42.0	39.7	35.9

Source: U.S. Dept. of Commerce, BXA/OIRA industry survey

Among the four superprecision bearing categories under review, total shipments increased most sharply in ball bearings over 100 mm (38 percent), followed by increases of 33 percent for ball bearings under 30 mm, 19 percent for ball bearings 30-100 mm, and two percent for cylindrical roller bearings. Superprecision defense shipments declined in all four categories with the largest declines in defense shipments taking place in the categories with the lowest overall shipment growth. Superprecision defense shipments declined 30 percent for cylindrical roller bearings, 17 percent for ball bearings 30-100 mm, nine percent for ball bearings under 30 mm, and by only two percent for ball bearings greater than 100 mm.

The defense share of each category's superprecision shipments declined. Defense superprecision shipments continued, however, to represent the largest relative share of cylindrical roller bearing shipments (46 percent), and the lowest share of ball bearing shipments under 30 mm (25 percent).

Ball Bearings - Regular precision ball bearing shipments in 1991 were up seven percent over 1987 levels, but were seven percent lower than 1988 levels and five percent lower than 1990 totals. Defense shipments of regular precision ball bearings were nine percent higher in 1991 than in 1987, but two percent below peak defense shipments experienced in 1989. The percentage of total shipments which went to defense ranged from a low of 3.1 percent in 1988 to a high of 3.9 percent in both 1991 and 1989.[12]

Among the five regular precision ball bearing categories under review, total shipments increased most sharply in angular contact ball bearings (up 124 percent over the period). This was followed by increases of 27 percent for ball bearings 30-100 mm, five percent for other ball bearings, two percent for ball bearings less than 30 mm, and a one percent decrease in shipments of balls greater than 100 mm. Regular precision defense shipments increased nine percent overall during the survey period and also increased for four of the five categories: up 14 percent for those greater than 100 mm, ten percent each for angular contact and other ball bearings, and up eight percent for ball bearings between 30 and 100 mm.

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[12]This excludes military shipments by distributors, or from Canadian suppliers, and any that may have been imported prior to the restriction's implementation or grandfathered-in. Further, many bearing firms have difficulty accurately estimating defense shipments, which in some cases may be three or four transactions down the supply chain. In addition, many firms made no effort to estimate defense shipments, and others did not respond to the survey. For these reasons we believe defense shipments presented above are understated.

Defense shipments were down 11 percent for ball bearings under 30 mm. While the overall defense share of regular precision ball bearing shipments was flat, defense shares decreased for four of five categories.

BALL BEARINGS: TOTAL AND DEFENSE SHIPMENTS
1987-1991

Bearing Type		Ball Bearing Shipments, 1987-1991 (in $000s)				
		1987	1988	1989	1990	1991
Ball bearings < 30 mm	Total Shipments	110.4	120.3	130.2	125.2	112.4
	Defense Shipments	1.8	1.3	1.7	1.6	1.6
	% Defense	1.6	1.1	1.3	1.3	1.4
Ball bearings 30-100mm	Total Shipments	267.0	289.8	309.3	347.2	340.0
	Defense Shipments	7.5	6.3	7.4	7.2	8.1
	% Defense	2.8	3.5	3.2	2.7	3.3
Ball bearings >100mm	Total Shipments	149.1	133.6	153.7	175.3	147.4
	Defense Shipments	4.3	4.7	4.9	4.8	4.9
	% Defense	3.6	3.5	3.2	2.7	3.3
Ball bearings angular contact	Total Shipments	58.7	68.8	97.1	118.0	131.6
	Defense Shipments	12.3	11.0	15.1	12.1	13.5
	% Defense	20.9	16.0	16.2	10.3	9.9
Other ball bearings	Total Shipments	299.0	366.8	368.7	356.7	313.1
	Defense Shipments	23.9	22.9	26.6	23.3	26.2
	% Defense	8.0	6.2	7.2	6.5	8.4
Total Ball Bearings	Total Shipments	1,312.2	1,497.6	1,420.9	1,469.0	1,399.0
	% Foreign Owned	65	na	na	na	69
	Defense Shipments	49.9	46.1	55.6	49.1	54.4
	% Defense	3.8	3.1	3.9	3.3	3.9

* % foreign-owned is based on capacity, not shipments.

Source: U.S. Dept. of Commerce, Bureau of the Census and BXA/OIRA Industry Survey

Roller bearings - Total regular precision roller bearing shipments were up 14 percent in 1991 over 1987, but were ten percent below the 1990 peak. Defense shipments in 1991 were four percent below the 1987 peak, but were flat over the entire five-year period. The percentage of total roller bearing shipments which went to defense ranged from 1.9 percent in 1989 and 1990 up to 2.4 percent in 1987. (See footnote 3, p. III-5)

ROLLER BEARINGS: DEFENSE SHIPMENTS
1987-1991

Bearing Type		Roller Bearing Shipments, 1987-1991 (in millions of dollars)				
		1987	1988	1989	1990	1991
Tapered roller bearings	Total Shipments	754.6	745.7	963.9	977.3	876.3
	Defense Shipments	12.3	11.2	11.5	13.3	15.0
	% Defense	1.6	1.5	1.2	1.4	1.7
Cylindrical roller bearings	Total Shipments	113.6	148.5	139.7	140.5	129.8
	Defense Shipments	3.5	4.1	4.9	4.1	4.9
	% Defense	3.1	2.8	3.5	2.9	3.8
Spherical roller bearings	Total Shipments	139.7	145.0	194.4	205.6	185.7
	Defense Shipments	7.9	6.7	7.4	5.8	4.5
	% Defense	5.7	4.6	3.8	2.8	2.4
Needle roller bearings	Total Shipments	316.3	378.8	361.2	351.0	311.6
	Defense Shipments	8.5	8.6	8.1	8.3	6.6
	% Defense	2.7	2.3	2.2	2.4	2.1
Total Roller Bearings	Total Shipments	1324.2	1418.0	1659.2	1674.4	1503.4
	% Foreign Owned*	14	na	na	na	15
	Defense Shipments	32.2	30.6	31.9	31.5	31.0
	% Defense	2.4	2.2	1.9	1.9	2.1

* % foreign owned based on capacity, not shipments
Source: U.S. Dept. of Commerce, Bureau of the Census and BXA/OIRA Industry Survey

Among the four precision roller bearing categories under review, total shipments increased most sharply in the spherical category (up 33 percent over the five-year period); and were up 16 percent for tapered rollers, 14 percent for cylindrical rollers, and down 1.5 percent for needle rollers. Defense shipments increased 40 percent for cylindricals and 22 percent for tapered rollers, but were down 22 percent for needles and down 43 percent for sphericals. While the overall defense share of shipments was down, the defense share was down for sphericals and needles, but up for tapereds and cylindrical rollers.

Mounted and Other Bearings - Mounted bearing shipments were up six percent in 1991 over 1987 levels, but were down 11 percent from the five-year peak in 1990. Defense shipments of mounted bearings varied in a narrow band from a high of $6.9 million in 1990 to a low of $6.3 million in 1987. The defense share of mounted bearing shipments also stayed within a narrow band, going from a high of 2.1 percent in 1987 to a low of 1.8 percent in 1988.

MOUNTED AND OTHER BEARINGS: DEFENSE SHIPMENTS
1987-1991

Bearing Type		Mounted and Other Bearing Shipments, 1987-1991 (in millions of dollars)				
		1987	1988	1989	1990	1991
Mounted bearings	Total Shipments	305.6	358.1	345.0	362.9	323.0
	Defense Shipments	6.3	6.5	6.5	6.9	6.6
	% Defense	2.1	1.8	1.9	1.9	2.0
Other bearings and parts	Total Shipments	63.8	67.4	61.8	70.4	75.8
	Defense Shipments	5.5	5.6	5.8	5.6	5.4
	% Defense	8.6	8.3	9.4	8.0	7.1
Total Mounted, Other and Parts	Total Shipments	369.4	425.5	406.8	433.3	398.8
	% Foreign-Owned	<1	na	na	na	<1
	Defense Shipments	11.8	12.1	12.3	12.5	12.0
	% Defense	3.2	2.8	3.0	2.9	3.0

Source: U.S. Dept. of Commerce, Bureau of the Census and BXA/OIRA Industry Survey

Total shipments of other bearings and parts were up 19 percent in 1991 over 1987 levels, and up 23 percent over 1989 - the five-year low. Defense shipments remained in a fairly narrow range experiencing a five-year low of $5.4 million in 1991 and a high of $5.8 million in 1989. The defense share of shipments of other bearings and parts was at a five-year low of 7.1 percent in 1991 and a five-year high of 9.4 percent in 1989.

Imports

Total bearing imports (all types) increased over the five-year period, from $758 million in 1987 to $893 million in 1991, with a peak exceeding a billion dollars in 1989.[13] Data for the first six months of 1992 show imports at a level of $429 million, an increase over the $395 million of imports in January-June 1991. However, a 12-month estimate of $858 million for 1992 total imports (doubling $429 million) would indicate a continuation of the downward trend in overall imports from their 1989 high.

Roller bearing imports decreased over the survey period (from a peak of $358 million in 1988 to $254 million in 1991), while ball bearing imports show an overall increase from $360 million in 1987 to $494 million in 1991 (although ball bearing imports have fallen from the peak of $574 million in 1989). The increase in ball bearing categories is consistent across the various sizes and types. The roller bearing import decline, however, is due mainly to decreases in imports of tapered roller bearings.

One of the explanations for the peak in the value of imported bearings in 1988-1989 is the antidumping duties imposed by the U.S. Government on bearings from nine major producing countries in the ball and cylindrical roller bearing (and spherical plain) segments of the industry. Dumping duties, retroactive to late 1987, ranged as high as 212 percent in one case, but in general were between 20 and 80 percent. These antidumping duty rates were lowered for specific firms following the first annual review in November 1989, and are no longer as much a determinative factor. The DFAR also contributed to the decrease in imports.

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[13] General Imports trade statistics were used (adjusted for re-exports) to account for imports into foreign trade zones (usually auto assembly plants) which have been significant in recent years. These imports are not captured in the Imports for Consumption trade statistics. In 1989, the disparity between the two sets of data approached $70 million, the highest on record. Since then the disparity has decreased.

ANTIFRICTION BEARING IMPORTS BY MAJOR PRODUCT CATEGORY
(Millions of Dollars)

BEARING CATEGORY	1987	1988	1989	1990	1991
BALL BEARINGS	$360.0	$508.1	$574.3	$522.7	$494.1
RADIAL	307.9	425.7	478.9	423.7	398.5
O.D. <= 30 mm	97.7	131.5	124.7	136.0	118.2
O.D. 30-100 mm	139.4	207.5	245.3	196.2	157.9
O.D. 100 +	36.1	47.3	77.5	53.6	49.2
Other Radial	11.4	15.0	0	0	21.9
INTEGRAL SHAFTS	23.3	24.4	31.5	37.9	51.3
NON-RADIAL	52.0	82.4	95.4	98.9	95.6
ROLLER BEARINGS*	303.3	357.6	288.5	270.6	253.5
TAPERED	147.3	164.3	177.8	141.3	114.9
SPHERICAL	24.0	31.5	39.0	44.3	51.5
CYLINDRICAL	NA	NA	50.2	58.4	58.6
NEEDLE	NA	NA	21.5	26.6	28.5
OTHER	132.0	161.8	NA	NA	NA
OTHER BALL & ROLLER BEARINGS, INCLUDING MOUNTED & COMBINATION*	11.8	15.3	46.1	36.7	31.6
BALL BEARING PARTS	55.7	68.2	53.3	64.8	55.1
ROLLER BEARING PARTS	27.6	34.6	66.0	59.5	58.6
TOTAL, ALL ANTIFRICTION BEARINGS AND PARTS	$758.4	$983.8	$1,028.2	$954.3	$892.9

* Not comparable between 1987-1988 and 1989-1991 due to changes in classification systems.
NA - not available

Source: U.S. Dept. of Commerce, Bureau of the Census

Examining imports on a unit basis would eliminate many of the distortions caused purely by fluctuations in price. This can be demonstrated using radial ball bearings, which provide a five year time series. The table below presents unit import figures and average prices (calculated as value of total imports/quantity of total imports) for several radial ball bearing categories. Here, unit imports are up over 1987 levels in two of the three size categories (less than 30 mm and over 100 mm). The 30-100 mm range, on the other hand, shows a steep decrease in imports, since the peak level of 1988. Average prices show significant increases in 1988 and 1989, the years of the highest antidumping duties.

RADIAL BALL BEARING IMPORTS:
MILLIONS OF UNITS AND UNIT PRICES

BEARING CATEGORY	1987	1988	1989	1990	1991
RADIAL BALL BEARINGS	283.6	365.7	332.4	318.2	300.0
Average Price	$ 1.04	$ 1.12	$ 1.39	$ 1.27	$ 1.26
O.D. <= 30 mm	161.8	211.8	184.6	200.7	189.0
Average Price	$ .60	$ .62	$ .68	$ .68	$ .63
O.D. 30-100 mm	110.0	139.4	137.6	112.6	89.6
Average Price	$ 1.27	$ 1.49	$ 1.78	$ 1.74	$ 1.76
O.D. > 100 mm	2.7	3.3	10.2	4.9	3.0
Average Price	$40.33	$44.57	$19.46	$31.36	$42.86

Source: U.S. Dept. of Commerce, Bureau of the Census

The next table breaks down U.S. bearing imports by country of origin. Eighty-nine countries supplied bearings to the U.S. market over the 1987-1991 period. The top ten supplier countries, however, accounted for over 90 percent of total imports. Japan was the number one supplier by far, accounting for a relatively steady 40 percent of total imports. Japan was the number one or number two supplier for virtually all of the individual bearing categories. The Japanese percentage of total imports is greatest, however, for ball bearing parts (inner and outer races), cup and cone assemblies for tapered roller bearings, and needle roller bearings.

BEARING IMPORTS BY COUNTRY OF ORIGIN

(Millions of Dollars)

SUPPLIER COUNTRY	1987	1988	1989	1990	1991	1991 %
Japan	$319.8	$395.8	$417.0	$356.2	$331.5	37.1%
Germany	140.3	181.8	155.1	162.7	149.8	16.8
Canada	58.7	80.0	82.5	74.7	81.0	9.1
Singapore	32.4	26.0	48.9	64.4	66.2	7.4
France	31.0	38.3	37.1	31.8	38.3	4.3
China	3.1	11.5	26.6	31.0	32.5	3.6
United Kingdom	32.9	50.4	43.9	30.5	31.1	3.5
Italy	35.4	54.0	49.4	40.4	27.0	3.0
Sweden	22.1	25.5	19.0	19.2	25.1	2.8
Taiwan	8.4	14.3	23.1	28.7	22.3	2.5
Total, Top 10	684.1	877.6	902.6	839.6	804.8	90.1
World Total	$758.4	$983.8	$1,028.2	$954.3	$892.9	100.0

Source: U.S. Dept. of Commerce, Bureau of the Census

Germany follows Japan as the second largest supplier of imported bearings, with 17 percent of all imports in 1991, down slightly from 19 percent in 1987. German firms are particularly competitive in the tapered and cylindrical roller bearing categories, where they control up to half the import market. The third largest supplier nation is Canada, source of nine percent of U.S. imports. Canadian firms are particularly strong in markets for smaller ball bearings with integral shafts (used mostly in automotive water pumps), where they control nearly three-fourths of the import market; and tapered roller bearing cones/cone assemblies, where they control 20 percent of the import market.

In addition to these three top supplier nations, several "newly industrializing" countries (e.g., Singapore, China, Taiwan) account for a smaller, but growing, share of bearing imports. In most cases, exports from these countries come from production facilities owned by the major Japanese, European, or American bearing firms; some (apparently) established to avoid antidumping or countervailing duties. Singapore, for example, doubled its share of imports to nearly eight percent in 1991 as Japanese-owned Minebea transferred production/assembly

of large amounts of small ball bearings from Thailand. Singapore is a particularly strong player in the radial ball bearing market, accounting for nearly 60 percent of imports in the 9-30 mm category. China is also beginning to play a significant role in the U.S. market, increasing its share of imports from an insignificant .4 percent in 1987 to over four percent for the first six months of 1992. One reason for this increase has been U.S.-based General Bearing Co.'s recent investment in production facilities in China, primarily for automotive tapered roller bearings. Other minor players in the U.S. market that have increased their presence include Taiwan, South Korea and Mexico. Their gains have been offset by losses from European countries such as Italy and Sweden. Imports are likely to decline further in the future as capacity expansions and enforcement of the dumping laws continue.

Exports

U.S. antifriction bearing exports totalled $468 million in 1991, up 40 percent over 1987 exports of $334 million. The value of exports in 1991, however, was lower than the 1990 peak of $490 million as major customer nations in Europe slid into recession. In the first six months of 1992, exports are running slightly behind their 1991 level.

Roller bearings account for nearly 60 percent of U.S. bearing exports in 1991. Tapered roller bearings, in particular, are a strong export item. Within the ball bearing categories, exports have followed an upward trend over the period. Exports in the less than 30 mm and greater than 100 mm ball bearing categories were at their five-year highs in 1991.

Canada[14] and Mexico are the leading destinations for U.S. bearing exports, and taken together account for about one third of U.S. exports (primarily to assembly operations of U.S. auto makers). Exports to Mexico are on the rise, both in terms of value and by percentage, as a result of increasing manufacturing by U.S. auto companies and other end-users. The North American Free Trade Agreement, if approved, could accelerate the growth of bearing exports to Mexico.

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[14]Beginning in 1989, official Canadian import statistics were used to count U.S. exports. However, Canadian bearing classification numbers do not correspond with U.S. export categories, and if taken at face value result in almost a three-fold overstatement of bearing exports to Canada. Canadian bearing exports are therefore extrapolated from 1988 numbers for which both series of data were available.

U.S. EXPORTS OF ANTIFRICTION BEARINGS
BY MAJOR PRODUCT CATEGORY
(Millions of Dollars)

BEARING CATEGORY	1987	1988	1989	1990	1991
BALL BEARINGS	$69.6	$ 84.0	$ 105.4	$ 113.2	$ 125.4
RADIAL	34.1	48.2	61.4	67.7	64.4
O.D. <30mm	5.6	7.7	16.3	18.9	26.7
O.D. 30-100mm	13.4	20.9	26.4	28.1	13.1
O.D. 100mm +	15.1	19.6	18.6	20.6	22.0
WITH INTEGRAL SHAFTS	3.5	6.2	13.6	13.7	11.2
NON-RADIAL	32.1	29.6	30.5	31.2	49.8
TAPERED ROLLER BEARINGS & PARTS	141.2	164.1	170.8	172.1	161.1
CYLINDRICAL ROLLER BEARINGS	NA	NA	24.4	25.9	21.7
NEEDLE ROLLER BEARINGS	NA	NA	31.3	30.1	23.4
SPHERICAL ROLLER BEARINGS	16.7	15.6	24.3	39.0	32.9
MOUNTED BALL AND ROLLER BEARINGS	20.8	20.4	18.8	18.2	17.5
OTHER BEARINGS AND PARTS*	90.5	109.7	87.8	91.0	85.8
TOTAL, ALL ANTIFRICTION BEARINGS & PARTS	$ 338.8	$393.8	$462.8	$489.5	$467.8

NA - not available

* - Includes categories not available in 1987 and 1988.

Source: U.S. Dept. of Commerce, Bureau of the Census

U.S. BEARING EXPORTS BY COUNTRY
(Millions of Dollars)

RECIPIENT COUNTRY	1987	1988	1989	1990	1991	1991 %
Canada	$ 96.3	$105.4	$105.7	$101.4	$ 94.8	20.2%
Mexico	29.3	38.6	51.1	50.7	57.4	12.3
Germany	30.2	38.3	55.5	61.3	48.3	10.3
Japan	9.0	13.0	23.2	26.1	32.3	6.9
United Kingdom	25.5	36.1	29.1	32.4	30.0	6.4
Australia	11.7	15.5	20.7	18.6	17.8	3.8
Brazil	18.2	15.7	17.6	17.6	16.8	3.6
France	9.6	14.1	19.0	16.8	14.3	3.1
South Africa	6.8	10.3	11.4	16.2	13.1	2.8
Singapore	3.6	5.2	7.5	9.8	12.7	2.7
Total, Top 10	$240.2	$292.2	$340.8	$350.9	$337.5	72.1
World Total	$338.9	$393.8	$462.8	$489.5	$467.8	100 %

Source: U.S. Dept. of Commerce, Bureau of the Census

Germany ranks as the third largest market for U.S. bearings, at about $50 million, and a relatively stable ten percent share of total exports in 1991. Japan is next, with about seven percent of U.S. bearing exports in 1991. Exports to Japan have increased continually over the 1987-1991 period (from 2.7 percent in 1987), largely due to extended efforts by Timken that began in the mid-1970's. Japan is followed closely by the United Kingdom, with just over 6 percent of U.S. exports. The next top five destinations, in order, are Australia, Brazil, France, South Africa, and Singapore. These top ten countries accounted for over 70 percent of all U.S. bearing exports; the remaining 25-30 percent were sold to 129 other countries over the five year period.

Trade Balance

The United States runs a significant trade deficit in antifriction bearings. The trade deficit was at its highest in 1988, reaching almost $590 million. The gap narrowed for the next three years, but preliminary data for the first six months of 1992 indicate that the deficit may

be widening again ($217 million versus $170 million for the same period last year). This is due primarily to the relatively stronger economic growth in the United States compared to Japan and Europe. The major factor in the increase was the still relatively small exports and large increase in imports (up $16.4 million) from Japan. Exports to Germany fell $7.5 million. With the U.S. economy continuing to outpace the others we expect the deficit to enlarge further in the second half of 1992.

Japan continued to have the largest bearing trade deficit ($299) in 1991, with the United States. The United States also ran a deficit of $102 million with Germany, $30 million with China, $27 million with Singapore, and $24 million with France. The United States had a $48 million surplus with Mexico, and $14 million surpluses with both Australia and Canada.

By specific product category, the largest deficits were in radial ball bearings. The highest deficit in 1991 ($96 million) was in the 9-30 mm ball bearing category. Surprisingly, however, the United States ran a trade surplus in the smallest radial ball bearing category (under 9 mm) in 1991, after years of trade deficits. This apparent anomaly may be explained by unusually large exports of bearings in this category to the United Kingdom and Singapore in 1991. It is uncertain whether this is a one-time occurrence, a statistical error, or if it constitutes the beginning of a trend.

TRADE BALANCES WITH SELECTED COUNTRIES, 1991
(Millions of Dollars)

COUNTRY	U.S. EXPORTS	-	U.S. IMPORTS	=	TRADE BALANCE
JAPAN	$ 32.3	-	$ 331.4	=	$ -299.1
GERMANY	48.3	-	149.8	=	-101.5
CANADA	94.8	-	81.0	=	+ 13.8
SINGAPORE	2.9	-	29.6	=	- 26.7
FRANCE	14.3	-	38.3	=	- 24.0
CHINA	3.0	-	32.6	=	- 29.6
MEXICO	57.4	-	9.3	=	+ 48.1
AUSTRALIA	17.8	-	3.8	=	+ 14.0
WORLD	**$ 467.8**	-	**$ 893.0**	=	**$ -425.1**

Source: U.S. Dept. of Commerce, Bureau of the Census

The United States also runs substantial trade deficits in cylindrical and needle roller bearings (although small in proportion to shipments), inner and outer races for ball bearings, and ball bearings with integral shafts. On the surplus side are balls for ball bearings ($10.5 million surplus) and tapered roller bearings and parts ($40.1 million surplus).

TRADE BALANCES IN SELECTED BEARING PRODUCT CATEGORIES, 1991

U.S. Trade Deficit

Radial Ball Bearings 9-30mm (-$96.3 million)
Radial Ball Bearings 30-52mm (-$76.1 million)
Radial Ball Bearings 52-100 mm (-$68.1 million)
Ball Bearings with Integral Shafts (-$40.1 million)
Inner and Outer Races for Ball Bearings (-$37.3 million)
Cylindrical Roller Bearings (-$36.9 million)
Needle Roller Bearings (-$5.0 million)

U.S. Trade Surplus

Radial Ball Bearings <9mm (+$4.8 million)
Balls for Bearings (+$10.5 million)
Tapered Roller Bearings & Parts (+$40.1 million)

Source: U.S. Dept. of Commerce, Bureau of the Census

Apparent Consumption and Import Penetration

Apparent U.S. consumption of bearings of all types, defined as shipments from U.S. manufacturing facilities, plus imports, less exports for 1991 was calculated and is presented below. Import penetration levels were calculated by dividing the value of imports by total apparent consumption.

APPARENT CONSUMPTION & IMPORT PENETRATION SELECTED BEARING CATEGORIES: 1991

BEARING CATEGORY	U.S. Shipments	Imports	Exports	Re-Exports	Apparent Consump.	Import Penet.
BALL BEARINGS	$1,399.0	$ 494.1	$ 125.4	$ 17.4	$1,750.4	28.2%
RADIAL	703.9	347.2	64.4	8.5	978.2	35.5%
< 30 mm O.D.	112.4	118.2	26.7	3.2	200.7	58.9%
30-100mm O.D.	340.0	157.9	13.1	2.8	482.0	32.8%
>100 mm O.D.	147.4	49.2	22.0	2.4	172.2	28.5
WITH INTEGRAL SHAFTS	250.4	51.3	11.2	0.6	289.9	17.7%
ROLLER BEARINGS	1,672.2	253.5	281.8	30.8	1,613.1	15.7%
TAPERED ROLLER	876.8	121.0	161.1	8.1	828.6	14.6%
SPHERICAL ROLLER	185.7	51.5	32.9	2.2	202.1	25.5%
CYLINDRICAL ROLLER	222.8	58.6	21.7	3.8	255.9	22.9%
NEEDLE ROLLER	311.6	28.5	23.4	0.4	316.3	9.0%
PARTS OF BEARINGS	376.6	113.7	78.8	18.1	384.5	29.6%
ANTIFRICTION BEARINGS & PARTS, ALL TYPES	$3,762.2	$892.9	$ 467.8	$ 50.6	$4,136.7	21.6%

Source: U.S. Dept. of Commerce, Bureau of the Census

The overall import penetration level in the U.S. antifriction bearing market was 21.6 percent in 1991. Import penetration was little changed over the 1987-1991 period, ranging from a low of 19 percent in 1987 to a high of 23 percent in 1989. Individual bearing categories, however, were quite volatile. The greatest level of import penetration was experienced in the radial ball bearing segment, especially in the smallest size category (under 30 mm). Here, import penetration reached 59 percent in 1991. Import penetration for this category has increased each year since 1987, when it was 48 percent. On a unit basis, imports account for an even larger percentage of apparent consumption, over 75 percent of the less than 30 mm category, and 45 percent of the 30-100 mm category.

Roller bearing product categories (especially needle and tapered) have relatively low levels of import penetration (from 15 to 18 percent). In the ball bearings with integral shafts market, import penetration was relatively low (18 percent in 1991), but had increased markedly over the review period from about six percent in 1987.

IV. OTHER PERFORMANCE MEASURES

This section assesses the bearing industry's performance from 1987 to 1991 as measured by employment, investment, research and development, profitability, age of equipment, and foreign sourcing of bearing components.

Employment

The BXA/OIRA industry survey provides incomplete employment data for the years prior to 1991. In 1991, however, the 34 firms responding to the survey represented 91 percent of industry employment (per Bureau of the Census data). This section also reports employment information published by the Bureau of Labor Statistics (BLS) and the Bureau of the Census for comparison purposes and to show trends. Census and BLS data differ because of differences in the composition of the firms they sample; in the classification of firms (especially small firms) as bearing producers, and in estimation procedures. Census numbers may overrepresent larger firms, while BLS data may overrepresent smaller firms.

Census and BLS data both show an increase in employment from 1987 to peak levels in 1989 or 1990, and a drop in 1991. This tracks very closely with shipment trends. Production worker data followed the same trend. Census reports that employment rose from 36.9 thousand to 39.1 thousand in 1989, and then fell back to 36.6 thousand in 1991 as shipments fell eight percent. Production workers began the period at 29.2 thousand, peaked in 1989 and 1990 at 32.1 thousand, and then fell eight percent to 29.8 thousand in 1991.

Production workers average about 80 percent of the total workforce according to Census figures, and a few percent less according to the BLS and OIRA industry survey data. Scientists and engineers represent about four percent of industry employment. Over the business cycle, production workers are the last hired and first fired, although veteran workers, with more training and know-how (and seniority), are less likely to be laid-off during a downturn.

Hourly wage rates in the bearing industry averaged $12.50 in 1991 (according to BLS), an increase of about 15 percent from 1987. Hourly rates reported by Census were somewhat higher at $13.69, 14 percent above 1987. Generally, firms located around the Great Lakes are unionized and pay higher wages, while firms in the South are non-union and pay lower wages.

EMPLOYMENT IN THE U.S. BEARING INDUSTRY
1987-1991

Occupation Title	OIRA Industry Survey Employment Information				
	1987	1988	1989	1990	1991
Scientists and Engineers	1,219	1,245	1,365	1,248	1,437
Production Workers	20,482	23,046	24,434	24,942	26,351
Administrative and Other	4,822	4,881	5,823	5,808	5,667
Total	26,756	29,417	31,883	32,236	33,707
Persons Engaged in Research and Development	724	719	687	702	704
	Bureau of Labor Statistics (in 000s)				
	1987	1988	1989	1990	1991
All Employees	41.3	42.2	43.0	43.2	41.4
Production Workers	31.7	32.8	33.5	33.5	32.2
Average Hourly Wage	$10.90	$11.10	$11.50	$12.00	$12.50
	Bureau of the Census (in 000s)				
	1987	1988	1989	1990	1991
All Employees	36.9	38.8	39.1	39.0	36.6
Production Workers	29.2	31.4	32.1	32.1	29.8
Average Hourly Wage	$11.99	$12.18	$12.70	$13.14	$13.69

Source: Bureau of Labor Statistics; Bureau of the Census and BXA/OIRA industry survey

Strikes have plagued the industry for years, and in some cases economically injured end-users and stopped certain DOD production lines. In one case, Fafnir's New Britain (CT) plant was struck in 1979, closing down F-16 production.[15] The plant was struck again in 1985, extending lead times to two years. Uncertainty of supply was one of the reasons which encouraged the aircraft engine companies to qualify foreign sources. FAG's Schweinfurt (Germany) factory, for example, has experienced only one two-hour sit-down strike in 100 years of operation. Further, NTN built a new aerospace bearing plant in Kuwana (Japan) in the mid-1980s, in part, to take advantage of labor problems in the American market.

As companies adopt newer management techniques, and substitute capital for labor, the production worker's skill requirements expand in scope and complexity. Successful workers generally have a high mechanical aptitude, and experience with computers and computer programming is increasingly important. The most complex skills are associated with manufacturing aircraft engine bearings.

Manufacturing a typical main shaft engine bearing typically requires about 50 manufacturing operations and 100 inspections, all of which are closely monitored and documented. Mastery of the operation and capabilities of a number of machine tools and inspection machines is essential. Additional skills include a knowledge of statistical variation and process controls, monitor reading, preventive maintenance, and record keeping. A skillful worker can also anticipate problems, quickly analyze and repair work flow interruptions, recognize ways to increase productivity, and work well with others.

A more complicated engine bearing with special flanges and oil channels, and other unusual features may require 100 operations and as many as 150 inspections. These are very expensive bearings that require special care. An official from one of the main shaft bearing producers estimated it takes about five years for a person with the necessary talents to gain this expertise and know-how.

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[15]Coincident with the Fafnir strike was a strike at Wyman-Gordon's aerospace forging plant in Massachusetts which made blades for the F-100 engine used on the F-16. Either strike would have interrupted production of the F-100. After these strikes, gas turbine engine producers adopted a policy of dual sourcing.

Designers and engineers also rank high in skills and knowledge. They must work closely with the end-user to understand the application and customer requirements. This may involve building and testing prototypes to determine the best solution for the customer at a reasonable cost, while ensuring a profit for the bearing company.

Bearing workforce productivity will increase in the future as companies continue to automate and further train and empower their people. For example, Federal-Mogul's new plant in Lititz (PA) has 300 people doing what 500 did previously, and only six job classifications instead of over 60 that existed before. In addition, the new Georg Meuller/Torrington plant in Rockford (IL) is a high volume operation with only a handful of people trained in all aspects of the operation. Also, as previously mentioned, the Timken plant in Altavista, Virginia, with only 30 people is redefining productivity in the bearing industry.

Capital Investment

Thirty-one surveyed firms (11 foreign-owned) reported capital expenditures in their U.S. bearing facilities. This is believed to represent over 95 percent of total investment for the bearing industry. For comparison, Bureau of the Census investment data is reported from 1987-1990 (1991 data not yet available). There are slight differences in composition between the two sets of numbers since Census statistics are establishment based and include non-bearing products that may be produced at the same establishment as bearings. The OIRA survey posed the question on a company-wide basis, and asked that only bearing-related investments be included.

Investment in the U.S. bearing industry soared during the last five years to the highest levels since the industry mobilized for World War II. From 1987 to 1991, investment totalled $1.31 billion. In 1990 alone, investment reached $352 million, more than double the five-year low of $152 million in 1987. In 1991, the industry invested an additional $309 million, down slightly from the 1990 five-year peak. About $1.1 billion (84.5 percent of the 5-year total) was allocated to new machinery and equipment, while $203 million went to new plant expenditures. Five major companies, three foreign-owned, were responsible for $776 million (60 percent) of the outlays, as each invested well over $100 million. Four other firms, three foreign-owned, each invested over $50 million for the period.

Foreign-owned manufacturers accounted for $665 million, slightly more than half of the five year investment. Three foreign-owned firms constructed new plants in the United States for the first time, and another built a new plant to complement existing operations. Two

additional foreign-owned concerns each plan to construct plants in the near future. Foreign-owned bearing companies accounted for about 65 percent of the plant investment outlays between 1987 and 1991. During the same period, U.S.-owned bearing firms have completed three new plants, and another is planned for 1993. There were also numerous expansions, with more planned by both domestic and foreign-owned firms.

BEARING INDUSTRY CAPITAL EXPENDITURES, 1987-1991

Category	Capital Expenditures, 1987-1991 (in $000s)				
	1987	1988	1989	1990	1991
Industry Totals: New Plant	30,786	34,426	41,337	48,546	47,420
New Machinery and Equipment	120,778	201,023	217,347	303,409	261,522
Total New Investment	151,564	235,449	258,684	351,955	308,942
% of Shipments	5.37%	7.51%	7.64%	9.86%	9.37%
By Foreign-Owned Firms: New Plant	19,641	19,722	31,168	35,094	25,750
New Machinery and Equipment	36,110	81,955	99,385	184,417	131,962
Total New Investment	55,751	101,677	130,553	219,511	157,712
% of Shipments	7.48%	12.81%	14.50%	21.08%	16.50%
% of Total Investment by Foreign-Owned Firms	36.8%	43.2%	50.5%	62.4%	51.0%
Bureau of the Census Number	154,700	196,100	271,200	363,900	305,700

Source: U.S Dept. of Commerce, Bureau of the Census, and BXA/OIRA Industry Survey

Investment as a percent of shipments averaged 8.0 percent from 1987 to 1991.[16] By contrast, the all manufacturing average was only 3.3 percent. In 1990, investment to sales soared to 9.86 percent, and then settled to 9.37 percent in 1991. In the prior five-year period, Census reported that the bearing industry invested $718 million, 4.2 percent of the value of shipments. Foreign-owned manufacturers reported investment equal to 15 percent of their U.S. shipments over the survey period. This number would be much lower and perhaps more meaningful if compared to these foreign companies total U.S. sales (i.e., U.S. production plus imports). By this standard, U.S. investment to total sales would drop to 7.5 percent, while U.S.-owned firms averaged 5.2 percent. Two U.S. companies accounted for well over half of the domestic group's investment.

PROJECTED CAPITAL EXPENDITURES, 1992-1995

Category	Projected Capital Expenditures, 1992-1995 (in $000s)			
	1992	1993	1994	1995
Industry Totals:				
New Plant	44,031	20,973	14,740	20,049
New Machinery and Equipment	202,379	243,182	156,446	166,391
Total New Investment	246,410	264,155	171,186	186,440
By Foreign-Owned Firms:				
New Plant	32,484	2,957	1,760	6,010
New Machinery and Equipment	83,619	96,307	73,840	93,640
Total New Investment	116,103	99,264	75,600	99,650
% Foreign	47.1%	37.6%	44.2%	53.4%

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

[16]This average was calculated from the shipment totals of the companies reporting investment. For the five years, the shipment total was $16.211 billion, or 84.2 percent of the $19.2 billion reported in the Bureau of the Census Current Industrial Report for the same period.

Survey respondents project that capital expenditures will continue at a high rate through 1993, although not all provided complete information. Nineteen firms reported for all years, two others reported for three years, another two reported for the first two years, and four reported for just 1992. Another four did not report beyond 1991. Therefore, the significant declines shown for 1994 and 1995 are based on incomplete information. However, it is possible that bearing capacity expansion may be ending, and a slowdown should be expected. Moreover, if the U.S. economy remains sluggish, a number of projects could be delayed or canceled.

From 1992 to 1995, total capital outlays are projected to be $868 million. Over 88 percent will be used to purchase new machinery and equipment as the industry continues to modernize. Outlays by foreign-owned concerns are expected to total $391 million (45 percent) of the industry total.

Research and Development

Fourteen companies reported research and development (R&D) expenditures, including five foreign-owned firms. Many other firms reported they do not have a formal R&D program, or that they do not collect cost information. Several foreign-owned firms indicated that research is done by their parent firm overseas.

Between 1987 and 1991, R&D spending by surveyed firms increased from $40 to $50 million, up 25 percent. (Firms were asked to break out R&D expenditures for bearing materials, production processes or new product development.) Over two-thirds of the R&D expenditures were allocated to bearing production processes, as firms focused on ways to increase efficiency and reduce production costs. Research in this area grew by 31 percent during the period from $27 million to $35 million, and increased its relative share of total expenditures from 67 to 70 percent.

Expenditures on new product development rose 13 percent between 1987 to 1991, only about half the growth rate for total R&D. This category's share of the total dropped from 20 percent in 1987 to 18 percent in 1991. New product development generally involves building and testing bearing prototypes to improve existing applications, or to develop new ones.

Research spending on bearing materials also fell as a share of the total, dropping from 13 percent in 1987 to 12 percent in 1991. Materials R&D expenditures rose, however, from $5 million in 1987 to $6 million in 1991. Some material research is directed into exotic materials such as ceramics and composites, which have importance in defense applications. In both these areas the Japanese are the technology leaders, although their focus has not been on military applications. Ceramic bearings can be very useful in no-oil conditions in helicopters and missiles saving weight and space. They are also finding utility in machine tool spindles because of their thermal stability, wear-resistance and greater accuracy. Ceramic bearings are particularly valuable in high-speed spindles used by defense/aerospace firms for cutting aluminum and other nonferrous metals.

RESEARCH & DEVELOPMENT EXPENDITURES BY THE BEARING INDUSTRY 1987-1991

Category	Research and Development Expenditures (in $000s)				
	1987	1988	1989	1990	1991
Bearing Materials	5,275	5,785	5,869	6,130	6,125
Production Processes	26,690	29,951	31,252	33,463	35,037
New Product Development	8,081	8,993	8,992	9,171	9,093
Total	40,046	44,729	46,113	48,764	50,255
R&D by Foreign Owned Firms	3,791	3,713	3,119	3,311	3,060
% by Foreign Owned Firms	9.5%	8.3%	6.8%	6.8%	6.1%
Sources of Funding: Bearing Firms	39,033	43,238	45,037	46,567	48,828
Department of Defense	394	590	644	494	671
All Other	619	901	732	1702	756

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

Nearly all bearing industry R&D is funded by the companies. The percentage funded by firms is typically over 95 percent, and in one year was as high as 98 percent.[17] The Department of Defense funded small amounts, ranging from less than one percent in 1987, to 1.4 percent in 1991. The dollar value of DOD funding ranged from $394 thousand in 1987 to $671 thousand in 1991.

The majority of R&D spending in the United States is undertaken by Timken and Torrington, the only two U.S.-owned companies with the critical mass to support substantial R&D programs and the sales base over which to reap the benefits. Most of the remaining U.S.-based companies are too small to support broad based R&D programs and tend to focus on a narrower range of problems associated with product development where payoffs are normally quicker.

The share of total R&D spending by foreign-owned manufacturers dwindled over the period from 9.5 percent in 1987, to 6.1 percent in 1991. The dollar value of foreign firms' R&D spending ranged from a high of $3.8 million in 1987 to a low of $3.1 million in 1991. This is not surprising since the major foreign firms have significant R&D programs in their home countries, or in the case of SKF, a dedicated research and training facility in the Netherlands.

Japanese firms (with U.S. manufacturing facilities) publicly reported spending slightly more than $100 million dollars on R&D last year in Japan. The three largest European bearing firms alone spent around $150 million on R&D. SKF alone funded about $90 million in 1991, of which an estimated $70 million was allocated to bearings-related R&D. FAG spent an estimated $50 million (equalling the entire U.S. industry), and INA spent an estimated $30 million. Thus, at least $250 million in bearing related R&D is expended outside the United States by foreign-owned firms that have manufacturing operations here, or five times the amount spent by U.S.-owned firms.

Investment in the latest technologies by foreign-owned firms in the United States allows us to benefit from these firms' large R&D programs. SKF, for instance, has its own machine tool company subsidiary (Lidkoping Machine Tools, AB in Sweden) that developed and makes

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[17]About 80 percent of foreign-owned firm's R&D was self-funded, the remainder coming from Defense and other outside sources. If the foreign-owned R&D component were removed, the self-funding of the remaining firms for the five years would rise to 98.28 percent of their total R&D expenditures.

some of the finest raceway grinding equipment in the world. This equipment has found its way into SKF/MRC's aerospace plant in Jamestown (NY). NTN Toyo, FAG and Koyo also make bearing production equipment, primarily for internal consumption, although Koyo is a leading seller of centerless grinders.

However, key advances in bearing technology are very tightly held and not often made available for licensing, giving the owners an advantage on the competition. As most of the technology is now being developed abroad, it is almost certain the foreign-owned share of the American bearing manufacturing base will continue growing in the years ahead.

Dual Use of R&D - Survey respondents were asked to comment on the overlap between defense- and commercial-related R&D. Eighteen responses were received, of which 12 reported that little or no interrelationship existed. Few of these firms, however, do significant defense-related research, and, therefore, most were not in a position to properly answer the question. Defense-intensive superprecision bearing producers, however, reported substantial interrelationships exist primarily because the end-markets and applications in both civilian and military markets are similar. In learning to create quiet running bearings for defense applications, for example, one firm was able to develop vibration-free bearings for machine tools. Two firms noted that defense-related R&D stimulates leading edge technology and advances fundamental bearing knowledge. Another firm reported, however, that most defense R&D is application-specific, and that less than ten percent could be applied to commercial projects.

Several companies noted that commercial R&D is more easily transferred to military applications, especially to more common applications. Much of defense R&D is actually for exotic applications, with little attention given to manufacturability or impact on the commercial applications of the firms involved. For example, projects involving ceramics, M50 nil alloy steel, or coatings such as thin dense chrome are useful for developing high performance weapon systems, but their application in the general bearing industry has been minimal.

Where Should U.S. Government R&D be Directed? - Fifteen responses were received to the survey question about areas where U.S. Government R&D might benefit the bearing industry. Some of the firms provided multiple recommendations. Most of the responses were from defense suppliers.

One firm suggested that the government consider making R&D funds available to bearing companies working on prototype bearings for new defense applications. The firm commented that this work is expensive and increasingly risky, with the cost borne by the firm competing for a defense contract. Full production often lags initial prototype stages by seven or more years. At any time during its development, the project could lose its funding. Given the current state of defense funding, a firm faces not only the risk of being beaten out by a competitor, but also the risk of investing in a program that may not be funded during the Congressional budget process.

Comments relating to materials research were mostly directed toward improving material quality and lowering costs. A total of nine comments were received regarding materials research. One firm suggested that the government consider funding basic research into corrosion resistant steels and ceramics. Another recommendation was that materials should be developed to improve and expand bearing capabilities and applications. Two companies commented that high speed, high temperature, and no or low oil materials would benefit both defense and commercial applications.

Thirteen comments were received regarding bearing production processes. Six of these mentioned grinding technology specifically, and several others alluded to it. Aspects of grinding technology included achieving better geometries and surface finishes, metrology and cutting oils. Two firms commented on ceramic technology development such as ceramic processing. Another firm recommended that government dollars be directed into biotechnology research for coolant and waste management. Other companies suggested that funds be spent on production engineering, machine tools, and process and machine capabilities to produce high quality bearings at a lower cost. One firm expressed its concern, however, that improved manufacturing capabilities would have to be shared with competitors, including some foreign firms, if funded by the government.

Another 13 comments were directed toward product development, testing, and other issues. Three firms mentioned new designs for aerospace applications, public transport applications, and bearings better suited to extreme environments such as outer space. Two other firms suggested testing: one relating to materials and greases, and the other toward non-destructive testing. Two respondents believe that further coatings research could have a high payback. One firm also listed failure prevention/detection research as worthwhile. Another company recommended that more support be provided for National Science Foundation-sponsored

research centers. Others recommended that greater efforts be undertaken in the commercial area; policy research into ways to enhance industrial modernization to increase the demand for bearings; and development of a national industrial plan.

Financial Results and Profitability

Twenty-four financial reports (eight from foreign-owned operations) were received from survey respondents representing about 73 percent of bearing industry shipments. This included almost 77 percent of the domestically-owned sector, and over 67 percent of the foreign-owned sector.

Net income before taxes (profits) for the bearing industry peaked in 1989 at $210 million (7.3 percent of sales), more than doubling 1987 profits of $90 million (4.1 percent of sales). Given a boost by the antidumping duties, profits rose in 1988 and again in 1989, but then fell to $112 million in 1991 (4.1 percent of sales). Net sales fell in 1991 by 7.7 percent, after four straight years of growth. For the five-year period profitability averaged 5.5 percent of sales, and 6.7 percent of assets. By comparison, the broader industry (SIC 35 - Machinery, Except Electrical) averaged 5.0 percent before tax return on sales, and 5.1 percent on assets during the same five years. For all manufacturing these two measures were 6.4 percent and 8.5 percent.[18]

U.S.-owned bearing companies reported much higher profitability than their foreign-owned counterparts. U.S.-owned manufacturers posted profits of 8.3 percent in 1989, and 8.0 percent in 1990, and averaged 6.8 percent on sales, and 9.0 percent on assets. In contrast, foreign-owned firms reported profits of 4.6 percent in 1989, decreasing to only 0.5 percent in 1991. For the five years, foreign-owned firms profitability averaged just 2.3 percent on both sales and assets.

A surprising number of firms reported losses for at least one of the five years. Seven U.S.-owned firms reported profits all five years, while only one foreign-owned firm did so. By contrast, two U.S.- and two foreign-owned firms reported losses each year, and another foreign-owned firm reported losses four of the five years. In summary, out of a total of 87 (U.S.-owned) yearly observations, 24 were losses (28 percent), while out of 33 (foreign-

[18]U.S. Dept. of Commerce, Economics and Statistics Administration, Office of Business Analysis: "Financial Ratios for Manufacturing Corporations," Fourth Quarter 1991

owned) yearly observations, 19 were losses (58 percent). In view of reported losses, it is possible that some foreign-owned firms may close or reduce their U.S. operations should the DFAR restriction be removed.

NUMBER OF U.S. AND FOREIGN-OWNED FIRMS REPORTING LOSSES

		Number of Firms Reporting Losses				
		1987	1988	1989	1990	1991
U.S. Owned	# with losses	6	5	4	5	4
	# reporting	18	18	18	17	16
Foreign Owned	# with losses	4	4	3	3	5
	# reporting	6	6	6	7	8

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

The average cost of goods sold (composed primarily of materials and labor) began the period at 82 percent of sales, fell to 78 percent in 1989 as profits peaked, and returned to 80 percent in 1991, moving inversely to profit margins.

However, several foreign-owned bearing firms reported cost of goods sold averaging over 90 percent for this period, substantially above the all-industry and all-foreign firm average. Several possible explanations exist for this phenomenon. First, since these firms import components, they may be transferring profits to their home countries by increasing the intracompany transfer price of imported components. Second, they may be lowering prices to barely cover costs (or taking losses) within the United States to gain market share and achieve higher rates of capacity utilization. Third, it is possible, but unlikely, that these firms are less efficient since they are subsidiaries of some of the leading international bearing producers.

Total assets for the group increased from $1.8 to $2.6 billion over the period, an increase of 44 percent. Growth in property, plant and equipment (i.e., fixed assets) accounted for almost 90 percent of the increase. Fixed assets grew from $1 billion in 1987 to $1.7 billion in 1991, up about 70 percent. Most of this gain resulted from capacity expansions undertaken by foreign-owned firms. Foreign-owned firms more than tripled their assets over

the period increasing from $200 million to $724 million. The increases in net fixed assets (new capital less depreciation) by foreign-owned firms accounted for about three-fourths of the total increase.

BEARING INDUSTRY FINANCIAL RESULTS, 1987-1991

Category	Financial Results, Antifriction Bearings Industry (in $millions)				
	1987	1988	1989	1990	1991
Net Sales	2,197.0	2,548.2	2,875.6	2,986.1	2,757.4
Cost of Goods Sold	1,794.7	2,047.8	2,248.4	2,345.9	2,196.4
Operating Income	360.5	445.0	553.2	564.3	485.5
Net Income, Before Taxes	90.1	146.1	209.8	175.3	111.6
Ratios: Net Sales(=100 %)	100	100	100	100	100
Cost of Goods Sold	82	80	78	79	80
Operating Income	16	17	19	19	18
Net Income, Before Taxes	4.10	5.73	7.29	5.87	4.05
Current Assets	785.5	906.7	942.9	952.1	872.9
Current Liabilities	394.1	441.3	531.6	725.5	719.0
Inventories	471.9	530.0	580.0	591.9	530.0
Total Assets	1,788.2	1,969.5	2,143.6	2,492.3	2,574.2
Short Term Debt	74.8	84.3	96.2	244.7	295.9
Long Term Debt	163.5	136.7	144.9	290.8	336.7
Current Ratio	1.99	2.05	1.77	1.31	1.21
Quick Ratio	.80	.85	.68	.50	.48
Inventory Turnover	4.66	4.81	4.96	5.05	5.20
Debt to Total Assets	.13	.11	.11	.22	.25

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

U.S.-OWNED COMPANY FINANCIAL RESULTS, 1987-1991

Category	Financial Results, Antifriction Bearings Industry U.S. Owned Manufacturers (in $millions)				
	1987	1988	1989	1990	1991
Net Sales	1,612.0	1,898.2	2,086.8	1,987.8	1,821.0
Cost of Goods Sold	1,307.0	1,520.4	1,624.0	1,561.0	1,439.5
Operating Income	264.7	324.4	393.6	354.4	308.0
Net Income, Before Taxes	80.9	122.9	173.4	159.2	107.2
Ratios: Net Sales(=100)	100	100	100	100	100
Cost of Goods Sold	81	80	78	79	79
Operating Income	16	17	19	18	17
Net Income, Before Taxes	5.02	6.47	8.31	8.01	5.89
Current Assets	531.6	610.6	623.5	526.7	461.2
Current Liabilities	200.8	214.1	220.9	292.1	279.1
Inventories	319.8	350.0	382.9	332.8	285.7
Total Assets	1,334.1	1,429.3	1,480.4	1,469.8	1,439.0
Short Term Debt	24.6	20.4	28.1	118.9	93.8
Long Term Debt	121.4	93.7	92.7	108.0	126.4
Current Ratio	2.65	2.85	2.82	1.80	1.65
Quick Ratio	1.06	1.22	1.09	.66	.63
Inventory Turnover	5.04	5.42	5.45	5.97	6.37
Debt to Total Assets	.11	.08	.08	.15	.15
Total Assets to Net Sales	1.158	1.279	1.356	1.342	1.265

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

U.S.-owned firms expanded total assets by $105 million, or only 7.9 percent, although this was from a larger initial base. Fixed assets, on the other hand, increased 22 percent, rising from $803 million to $978 million over the period. If we assume depreciation charges of about one-twelfth of average fixed assets, it would add somewhat more than $70 million in new property, plant and equipment a year, or more than $350 million in new fixed assets added to the $175.3 million in fixed asset expansion. Thus, it is evident U.S. firms invested the bulk of their new investment dollars $644 million in capacity modernization, while foreign-owned firms invested much more in new capacity.

Total asset turnover (total assets to net sales) measures the relative efficiency or productiveness of the use of all assets. Fixed asset turnover measures the productiveness of property, plant and equipment. Total assets turned over 1.23 times in 1987, rose to 1.34 in 1989, and then fell to only 1.07 in 1991, as sales and capacity utilization plummeted. Fixed asset turnover began the period at 2.19 and ended at 1.62, after rising to 2.39 in 1989.

Total asset turnover by foreign-owned firms began the period at 1.29, which was higher than the entire industry measure. However, in subsequent years the measure fell steadily, finishing at only .83 times in 1991. Fixed asset turnover followed a similar trend, falling from 2.92 in 1987, to 1.29 in 1991. U.S.-owned firms turned total assets over 1.16 times in 1987, 1.36 in 1989, and fell back to 1.27 times in 1991. Fixed asset turnover began at 2.01 and finished at 1.86 times.

Care must be taken in interpreting asset turnover measures. Fixed costs in the industry are replacing and driving down variable costs, especially for foreign-owned firms. This is a very significant trend that confirms the general undercapitalization of many American companies. The leading international bearing companies upgraded their Japanese and European operations some years ago, while the U.S. industry lagged behind.[19]

To help finance these expansions, both short and long-term debt increased between 1987-1991. Short-term debt rose from only $75 million in 1987 to $296 million in 1991, almost a three-fold increase; while long-term debt rose from $164 million to $337 million over the

[19]U.S. bearing industry investment lagged as a result of declining U.S. end-markets and rising imports (including dumping) which put enormous downward pressure on prices and cash flow. Bearing production technology had advanced rapidly in the previous 20 years making facility modernization a competitive imperative.

same period, more than doubling. Total net debt rose $394 million (165 percent), starting the period at $238 million and ending at $633 million. In 1990, debt rose $294 million, or about three-fourths of the increase for the entire period due to the great surge in investment that year. Foreign-owned firms increased debt from $92 million in 1987 to $413 million in 1991, more than a four-fold increase, accounting for more than 80 percent of total net new debt incurred.

Inventory turnover (net sales/inventories) improved each year for the industry, rising from 4.7 in 1987, to 5.2 times in 1991, indicating greater efficiency in the use of inventories and possibly shorter production cycles. The increase can be attributed to American-owned firms, whose turnover rate rose from 5.0 to 6.4 times over the period. All manufacturing's five-year (1987-1991) average inventory turnover rate was 7.4, while all durables manufacturing was 5.9 times.

Foreign-owned bearing firms showed no improvement in their inventory turnover rate, losing ground to U.S.-owned firms. For the period, foreign-owned firms averaged 3.83 inventory turnovers, which was about two-thirds the rate of U.S.-owned firms. The high level of inventories held by foreign-owned firms may be related to higher incidence of stocking catalog type bearings and imports.

The current ratio (current assets over current liabilities) is the most often-used measure of a firm's short term solvency. The bearing industry's current ratio fell from 1.99 to 1.21, as inventories (assets) declined and current liabilities increased. The ratio for foreign-owned firms is much lower than for U.S.-owned firms. The ratio for foreign-owned firms fell from 1.31 to only .94, while U.S.-owned firms saw their ratio drop from 2.65 to 1.65. All manufacturing's five year average (1987-1991) was 1.48. Foreign-owned firms current liabilities rose from $193 million to $440 million between 1987 and 1991, up 128 percent; while current assets, largely increased inventories, rose only 62 percent. Their quick ratio (current ratio excluding inventories) averaged only .44, and finished the period at only .38. The quick ratio measures very short term solvency. By these measures the foreign-owned firms in the aggregate are not solvent (should their short-term liabilities be called), but remain in business with the sponsorship or subsidy of their parent firms. The quick ratio for U.S.-owned firms averaged .93, more than twice the foreign-owned figure, and finished the period at .63.

FOREIGN-OWNED COMPANY FINANCIAL RESULTS, 1987-1991

Category	Financial Results, Antifriction Bearing Industry Foreign-Owned Bearing Manufacturers (in $millions)				
	1987	1988	1989	1990	1991
Net Sales	585.1	649.9	788.8	998.3	936.4
Cost of Goods Sold	487.7	527.4	624.4	784.9	757.0
Operating Income	95.8	120.6	159.6	209.9	177.5
Net Income, Before Taxes	9.1	23.2	36.4	16.1	4.4
Ratios: Net Sales(=100)	100	100	100	100	100
Cost of Goods Sold	83	81	79	79	81
Operating Income	16	19	20	21	19
Net Income, Before Taxes	1.56	3.58	4.61	1.61	.47
Current Assets	253.9	296.1	319.4	425.4	411.7
Current Liabilities	193.3	227.2	310.8	433.5	439.9
Inventories	152.1	180.0	197.2	259.1	244.3
Total Assets	454.1	540.3	663.2	1,022.5	1,135.2
Short Term Debt	50.2	63.9	68.0	125.9	202.2
Long Term Debt	42.1	43.0	52.2	182.8	210.3
Current Ratio	1.31	1.30	1.03	.98	.94
Quick Ratio	.53	.51	.39	.38	.38
Inventory Turnover	3.85	3.61	4.00	3.85	3.83
Debt to Total Assets	.20	.20	.18	.30	.36
Total Assets to Net Sales	1.288	1.203	1.189	.976	.825

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

Age of Equipment

About two-thirds of both domestic and foreign-owned firms reported on the number, vintage and origin of certain varieties of machine tools held in their capital equipment assets. The machines were identified in four age groups: 1-5 years, 5-10 years, 10-20 years, and over 20 years. An average age was calculated using the mid-point of the first three groups, and assuming an average of 30 years for machines over 20 years old. Some of the older machines have been upgraded, in some cases to as good as new, although this is not reflected in the data. Given this method, machines in domestically-owned bearing facilities have an average age of 18.65 years, compared to those in foreign-owned facilities with a 12.28 year average.

The average age, however, does not account for machine utilization, which tends to be highest for younger machines. In some cases, older machines are held in "frozen" production lines for older defense weapon systems that were qualified under mil-specs years ago. It is also important to recognize that foreign-owned plants are newer and expanding, while many U.S.-owned plants have existed for many years. New and expanding operations (almost) always have younger vintage equipment. For the most part, newer machines are more productive than older. One industry official estimated that machine productivity was growing at a rate of about three percent a year (doubling about every 25 years).

The important trend of the decade has been the shift toward computer controlled ("NC") machines, which have grown rapidly in number, while purchases of non-NC have decreased (but not disappeared). NC machines have quicker set-up times, and faster cutting speeds, as well as more accuracy and repeatability than non-NC machines. Newer machines are also designed to be in operation a larger percentage of time, often on an unmanned basis.

A rough indication of their greater productiveness is demonstrated by the larger numbers of non-NC machines in the oldest age group compared with the high percentage of NC models under 10 years old. The higher utilization of these machines, which in special cases may be five or six times the rate of older models, reduces the number of machines needed, the floor space required, and the number of people needed to operate a new factory. Some older machines, particularly larger machines, may remain in use for a long time. Most of the over 20-year models, however, will probably be retired soon for competitive reasons as the industry finishes the capacity build-up, and continues consolidating operations.

MACHINE TOOL INVENTORY BY AGE, TYPE AND ORIGIN
U.S.-OWNED FACILITIES

Machine Type	Machine Tool Inventory by Age, Type and Origin for U.S. Owned Manufacturers			
U.S. OWNED	1-5 years	5-10 years	10-20 years	over 20 years
All Machines (Ave. Age = 18.65)	508	352	580	1,232
NC Turning Machines	178	88	106	9
Non-NC Turning	20	30	345	465
NC Grinding Machines	102	86	27	15
Non-NC Grinding Machines	160	97	70	662
Hone/Finishing Machines	48	51	32	81
	Percent Foreign Sourced			
All Machines	29%	29%	3%	-
NC Turning Machines	36%	62%	1%	-
Non-NC Turning	0	0	1%	1%
NC Grinding Machines	30%	12%	4%	-
Non-NC Grinding Machines	5%	21%	2%	-
Hone/Finishing Machines	98%	39%	31%	-

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

An increase in foreign ownership of U.S. bearing facilities has led to declining purchases of U.S. machine tools and other key elements of the supporting infrastructure. However, American-owned bearing companies rely mostly on domestic machine tool builders, although the use of foreign machines has increased. For the over 20 years category, for example, only four non-NC lathes were purchased offshore out of 465 remaining in inventory. Foreign purchases increased to three percent in the 10-20 year group, and 29 percent for both 5-10 and 1-5 age groups. The use of foreign-produced NC grinding equipment continues to rise, and reached 30 percent in the last five years. Almost 98 percent of honing and finishing machines were imported, mostly from Teilenhaus in Germany.

MACHINE TOOL INVENTORY BY AGE, TYPE AND ORIGIN
FOREIGN-OWNED FACILITIES

Machine Type	Machine Tool Inventory by Age, Type and Origin for Foreign Owned Bearing Manufacturers			
FOREIGN OWNED	1-5 years	5-10 years	10-20 years	over 20 years
All Machines (Ave. Age = 12.18)	727	333	519	400
NC Turning Machines	173	69	19	-
Non-NC Turning	0	3	49	100
NC Grinding Machines	200	41	96	10
Non-NC Grinding Machines	158	131	218	244
Hone/Finishing Machines	196	89	137	46
	Percent Foreign Sourced			
All Machines	80%	71%	45%	10%
NC Turning Machines	86%	96%	11%	-
Non-NC Turning	-	-	47%	12%
NC Grinding Machines	68%	85%	79%	-
Non-NC Grinding Machines	78%	34%	6%	7%
Hone/Finishing Machines	88%	100%	92%	26%

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

An increase in foreign ownership of U.S. bearing facilities has led to declining purchases of U.S. machine tools and other key elements of the supporting infrastructure as foreign-owned companies show a much greater propensity to purchase foreign-made machines and other items. In the most recent five years, 80 percent of their machinery purchases were offshore. In the older categories the number is much less, although these include machines bought by an American bearing company that was later acquired by a foreign firm. The foreign origin of NC turning machines dropped from 96 percent in the 5-10 year slot to 86 percent in the most recent five years due to purchases from the newly established Yamazaki and Okuma facilities in the United States. Honing and finishing machines were 100 percent foreign for the 5-10 age group, decreasing to 88 percent in the 1-5 bracket.

The combined total of machine tool imports by U.S.- and foreign-owned machine tool imports is 60 percent in the 1-5 year bracket. For competitive reasons, bearing companies generally purchase the best machine on the market utilizing the latest technology and providing the best return on investment. Reliability and performance are key considerations, as is servicing and parts replacement. Price is an important consideration after considering these other factors.

Foreign Sourcing of Bearing Components

Major differences in the use of foreign-produced bearing components were found in comparing U.S.-owned and foreign-owned bearing manufacturers. Domestically-owned firms report a very low incidence of foreign-sourced components. The highest level of foreign sourcing of any component by domestic firms was for unfinished races (unground and unhardened). In 1988, 9.5 million unfinished races (equivalent sets of two rings) were imported equal to 1.5 percent of U.S. owned firms' consumption. The U.S.-owned sector imported very small numbers of finished races, which were statistically insignificant. Foreign sourcing of other unfinished parts peaked in 1990, at 8.9 million, or 1.4 percent of total requirements.

The established practice of bearing firms is to cut their own races from purchased steel tubing or bar stock. Larger sized races are forged, and sometimes these are out-sourced. Parts (mainly cages, seals, and shields) are relatively easy to make, and may be purchased or made in-house. Balls are almost always outsourced, and rollers are both. Steel is almost always outsourced, although Timken and SKF each own steel companies. With the return of higher-volume ball bearing production to the United States, a rising demand for unfinished races has developed. A new U.S. firm established in 1989, makes unfinished races ("green rings") for ball bearings by a process called warm-forming. The Europeans and Japanese have utilized this process for many years. This is a forging process, that makes large volumes economically and with very little scrap. Another new domestic entrant also began making unfinished races for sale in very large volumes.

FOREIGN SOURCING OF BEARING COMPONENTS, 1987-1991 BY U.S.-OWNED FIRMS

Type Component	Foreign Sourcing of Bearing Components, 1987-1991 (in millions of units and percentage of total used)				
	1987	1988	1989	1990	1991
Complete Bearing Shipments	606.1	639.3	656.5	620.5	615.3
Unfinished Races	8.2	9.5	8.4	7.5	2.6
% of Total Used	1.4%	1.5%	1.3%	1.2%	.4%
Finished Races	.04	.01	.11	.10	.04
% of Total Used	-	-	-	-	-
Unfinished Parts, Other	7.4	6.7	7.9	8.9	8.6
% of Total Used	1.2%	1.0%	1.2%	1.4%	1.4%
Finished Parts, Other	.5	.5	.4	.4	.4
% of Total Used	.1%	.1%	.1%	.1%	.1%
Finished Rolling Elements	.2	-	.7	-	-
% of Total Used	-	-	.1%	-	-
Imported Steel (AISI 52100)	282.5	280.7	291.6	259.6	224.1
% of Total Used	46.6%	43.9%	44.4%	41.8%	36.4%

Source: U.S Department of Commerce, BXA/OIRA Industry Survey

Domestically-owned bearing manufacturers imported 47 percent of their steel requirements in 1987, declining to 36 percent in 1991. Steel is purchased from several European and Japanese producers, as well as from American producers based mainly on price and quality. In addition, bearing quality wire rod for making needle rollers is not produced in the United States.

Foreign-owned bearing manufacturers remain very dependent of foreign sourced bearing components, although in most cases these are imported from their own operations overseas. A clear trend toward greater integration into finishing operations is indicated by the up-trend in unfinished race imports and the down-trend for finished races. Most of the foreign-owned firms are now heat-treating, grinding and polishing the majority of their bearing production, as more and more value is added in the United States. Foreign-owned firms are also expanding the scope of their operations in terms of greater variety and part numbers. Imports of finished races dropped from 21 million in 1987, to only 3 million in 1991, while the production of finished bearings rose from 164 to 217 million. Unfinished races rose from 39 million to 93 million (from 24 percent of requirements to 43 percent).

The same trend occurred in other finished and unfinished bearing parts, but to a lesser extent. In 1987, 30 percent of the finished parts used were imported compared to 18 percent unfinished. By 1991, the foreign-sourced finished parts shrank to 27 percent, while unfinished rose to 23 percent. The foreign-owned companies also reduced their foreign sourcing of rolling elements from 37 to only seven percent.

While U.S. owned companies reduced imports of steel, foreign-owned firms increased steel imports from 52 percent in 1987 to 61 percent in 1991. The reasons for the rise in imported steel may be related to the conversion of assembly operations to integrated bearing factories that process and require more steel. One firm mentioned that they prefer not to buy steel from a bearing competitor such as Timken. In the case of NSK and NTN, both firms are connected to steel companies through their keiretsu groups, NSK to Nippon Kokan and NTN to Kobe Steel. These relationships probably influence their purchasing decisions.

In addition, SKF owns 100 percent of Ovako Steel in Sweden. Ovako lost a great deal of money in 1991 due to poor bearing and specialty steel market conditions in Europe. SKF held a 50 percent share in Ovako, and a Finnish company, Metra Oy, owned the other half. SKF purchased Metra Oy's share of the bearing related portion of Ovako (mostly in Sweden) in December 1991, and made the company a full subsidiary.

FOREIGN SOURCING OF BEARING COMPONENTS, 1987-1991 BY FOREIGN-OWNED FIRMS

Type Component	Foreign Sourcing of Bearing Components, 1987-1991 (in millions of units and percentage of total used)				
	1987	1988	1989	1990	1991
Complete Bearing Shipments	163.5	187.4	200.4	199.4	217.4
Unfinished Races	39.5	50.4	83.7	87.4	92.8
% of Total Used	24.2%	26.9%	41.8%	43.9%	42.7%
Finished Races	21.0	16.6	2.6	2.1	3.3
% of Total Used	12.9%	8.9%	1.3%	1.1%	1.5%
Unfinished Parts, Other	29.0	34.1	40.8	42.5	48.9
% of Total Used	17.7%	18.2%	20.3%	21.3%	22.5%
Finished Parts, Other	48.3	53.3	60.0	55.0	58.0
% of Total Used	29.6%	28.4%	29.9%	27.6%	26.7%
Finished Rolling Elements	60.7	47.3	17.9	16.0	15.1
% of Total Used	37.1%	25.3%	8.9%	8.0%	6.9%
Imported Steel (AISI 52100)	84.6	98.0	111.4	122.5	133.0
% of Total Used	51.7%	52.3%	55.6%	61.4%	61.2%

Source: U.S Department of Commerce, BXA/OIRA Industry Survey

V. COMPETITIVE ASSESSMENT

Overview

Competitive pressures in the U.S. bearing market have never been more intense. During the last decade, the United States was a major battleground for market share between mostly undercapitalized mid-size American bearing companies and much larger foreign bearing companies. In the past decade, foreign-owned firms have more than doubled their share of the U.S. market, increasing from about 25 percent of the market to nearly 60 percent today.

The gains by foreign firms were made by exploiting their strategic advantages - better capitalization, full product lines; and economies of scale in production, R&D, and distribution. Further, excepting Timken and a few others, most of the major U.S. bearing firms were part of much larger corporations less focused on success in the bearing sector. U.S. bearing industry growth slowed in the 70s and 80s and capital was withheld from the bearing firms by their corporate parents and put into more profitable divisions. This became a serious limitation as bearing production technology advanced, and global trade expanded.

In the last five years, however, several factors (including exchange rate fluctuation and the antidumping duties) encouraged a reinvestment in the U.S. bearing sector by both domestic- and foreign-owned firms. Investment in new plant and equipment by the surveyed companies soared to $1.3 billion between 1987-1991, adding over $650 million to net capacity. (Surveyed companies projected investing another $865 million through 1995.) Exports increased 73 percent between 1986-1990, rising from $283 to $490 million.

A major force behind this competitive drive has been bearing customers' demand for higher quality, lower prices, and more reliable delivery schedules. General Motors, as one important example, recently announced it will renegotiate many component contracts, including bearings, to force prices down and quality up, and is emphasizing single long-term supplier relationships ("vertical partnerships"). A preference for local content has increased among major bearing users, partly as a result of "Just-in-Time" inventory management, difficult to accomplish when using more distant offshore bearing suppliers.

Concentration Levels- The U.S. bearing industry remains much less concentrated than its European and Japanese counterparts. Concentration levels in the U.S. bearing industry were at a low point in 1982 when the top four firms accounted for only 47 percent of total

shipments. Since then, larger firms have consolidated operations and increased concentration back to historic levels of 53 to 62 percent.

A major implication for defense and the national security is that U.S. bearing companies as a group continue to fall behind in many aspects of bearing technology. U.S. firms, for example, are already outspent more than five to one in R&D. These effects are direct consequences of large firm size and economies of scale which put American firms at a major disadvantage, even in their home market.

Bearing industry concentration levels are influenced by automotive business cycles and international trade. The volatile motor vehicle industry is the largest domestic bearing customer, representing 30 percent of U.S. consumption. Motor vehicle users also account for as much as half of bearing imports. Bearing concentration ratios will, therefore, be disproportionately affected by the variation in motor vehicle demand. The motor vehicle industry represents even higher shares of the European (35-40 percent) and Japanese bearing markets (50 percent).

INDUSTRY CONCENTRATION LEVELS, 1972-1990

Year	Total Shipments (in millions of constant 1987 $)	Percent of Shipments Accounted for by			
		4 largest companies	8 largest companies	20 largest companies	50 largest companies
1990	$3,315.1	59	73	NA	NA
1987	$3,723.7	58	68	88	98
1982	$3,382.9	47	65	85	98
1977	$4,771.9	56	71	88	99
1972	$4,623.9	53	73	89	99

Average Shipments	1972	1977	1982	1987	1990
Per Firm: Top 4	$612.7	668.1	397.5	539.9	490.5
Per Firm: Next 4	$231.2	179.0	152.2	93.1	120.5

Source: U.S. Dept. of Commerce, OIRA Industry Survey and Bureau of the Census

Lower concentration levels in the United States were not inevitable, but were shaped by a unique set of circumstances in the U.S. market. Historically, the huge American market encouraged the emergence of a series of U.S. specialists producing for particular market niches. However, both the international competitive situation and technological advances are pushing firms toward both wider scope and market coverage. As one official of a large foreign company stated, his firm is in the "motion control" business (i.e., ball screws, magnetic bearings, spindles, hub units, and linear motion devices), while he said many American companies still think of themselves as specialists making only ball or roller bearings.

Market Developments - Shrinkage of the U.S. manufacturing base led to a 20 percent decrease in U.S. demand for bearings during the 1970s and 1980s, while the Japanese and European markets continued growing. The decline was broad based, with major contraction in the motor vehicle, construction, oil field and agricultural equipment markets, among others. From 1979 to 1987, more than a billion dollars (over 20 percent) of

ANTIFRICTION BEARING PLANTS, 20 AND MORE EMPLOYEES (1978-1989)

Year	# of Plants	Total Employ. (000s)	Average Plant Size	Number of Plants by Employment Range					
				20-49	50-99	100-249	250-499	500-999	1000+
1978	114	52.7	462	17	20	23	22	22	10
1979	117	53.3	456	20	18	23	21	24	11
1980	120	52.6	438	23	17	21	24	27	8
1981	118	53.3	452	19	18	26	21	25	9
1982	116	43.8	378	18	21	23	22	23	9
1983	129	37.7	292	25	25	35	23	15	6
1984	113	42.4	375	16	18	27	25	21	6
1985	115	39.6	344	14	21	27	28	19	6
1986	118	38.4	325	19	15	35	26	18	5
1987	120	36.9	308	18	19	37	27	14	5
1988	121	38.8	321	21	18	31	30	16	5
1989	120	39.1	326	18	20	28	32	15	7

Source: U.S. Department of Commerce, Bureau of the Census, County Business Patterns, U.S. Summaries, 1978-1989

U.S. bearing production capacity was retired, leaving capacity at a 30-year low. Bearing exports also declined, falling from 11 percent of sales in 1981 to eight percent in 1986. Employment in the industry fell from 53 thousand in 1979 to only 37 thousand in 1987. A big drop occurred in plants with over 500 employees, at one time the mainstay of the industry, which fell from 35 in 1980 to a low of 19 in 1987, before returning to 22 by 1989.

Many industry observers believe that the era of large bearing plants has passed to be replaced by smaller plants focusing on a narrower range of product for delivery into an integrated company's global supply network. Smaller plants with a narrower focus have proved to be easier to automate and control in terms of quality, efficiency and cost.

Superprecision Bearing Sector - U.S. aircraft engine producers give the major superprecision bearing companies very high marks for upgrading their facilities, improving quality, and meeting delivery schedules. However, defense production capabilities have declined as several key defense suppliers retired portions of their capacity. Defense suppliers

PRINCIPLE GAS TURBINE ENGINE MAIN SHAFT BEARING PRODUCERS

Company	Location	Capabilities (2.5-25")
Torrington/Fafnir	Newington, CT	full
SKF/MRC	Jamestown/Falconer, NY	full
Timken/MPB - Split Ball Division	Lebanon, NH	up to 16 inches
FAG/Canada	Stratford, Ontario	up to 12 inches
FAG Kugelfischer	Schweinfurt, Germany	full
SKF/RIV	Turin, Italy	up to 16 inches
SNFA	Valenciennes, France	up to 16 inches
SNR	Annecy, France	up to 16 inches
NSK/UPI	Berkshire, England	full
NTN	Kuwana, Japan	full

Source: Dept. of Commerce

of superprecision bearings are working down defense order backlogs, and competition for the few new orders has intensified. Firms will not maintain expensive surplus capacity, unless they see prospects improving, and additional retirements can be expected as defense spending continues to decrease.

The globalization of the aerospace industry has fragmented the market. While firms recognize the importance of exports, they have experienced difficulties in gaining access to foreign markets. Industry officials indicated the Japanese market is closed and the European Airbus consortium favors its own nationals. In addition, superprecision capacity is in surplus worldwide. Removal of the DFAR "Buy America" procurement restriction at this time would further intensify the competition and put the remaining American suppliers in greater jeopardy.

Competitive Prospects

Survey recipients were asked to forecast the competitive prospects for their U.S. production operations over the next five years. Thirty-two responses were received; of these, 19 expect their competitiveness to improve, ten others expect their prospects to remain the same, and only three see their fortunes declining. The following table provides a breakdown of their responses by five possible categories, and by domestic and foreign company ownership.

COMPETITIVE PROSPECTS OVER NEXT FIVE YEARS

	Competitive Prospects					
Bearing Manufacturing Operation is...	(2) improve greatly	(1) improve somewhat	(0) stay the same	(-1) decline somewhat	(-2) decline greatly	Average Points*
Domestic-Owned	2	6	7	3	-	.39
Foreign-Owned	4	7	3	-	-	1.07
Total	6	13	10	3	-	.69

*Average points are calculated by multiplying the number above each prospect times the number of entries below each prospect and dividing their sum by the total entries.

Source: U.S. Dept. of Commerce BXA/OIRA Industry Survey

Foreign-owned companies have a more overall positive outlook for the next five years. Eleven of the 14 foreign-owned firms expect their competitiveness to improve, while only eight of 18 U.S.-owned companies expect an improvement. No foreign-owned company reported an anticipated decline in their competitive prospects, versus three U.S.-based firms.

Further consolidation of capacity within the industry is also anticipated, again because demand is expected to continue at current low levels. To succeed, companies reported a wide range of streamlining efforts to improve the competitiveness of their operations. These include improved process control, continuous improvement for cost containment, preventive maintenance, reduced capital depreciation costs, increased sales and engineering efforts, technical development of new products, and enhanced efficiencies gained by investing in new processes. Several firms indicated that the U.S. industry's global competitiveness is improving, and hope to enhance their operations by exporting.

Of the ten companies that indicated that they expected their competitive prospects to remain the same, most cited unfair trade practices, such as dumping by firms in both industrialized and developing countries. Japan was mentioned most often, but other references were made to the Pacific Rim and Eastern European regions, Third World countries, and China. Overcapacity within the industry was cited by these companies as well, with negative effects on their profitability. Concern was also raised over Federal tax policy which allegedly discourages reinvestment in new equipment and R&D; and inadequate attention to declines in the U.S. industrial base.

Three domestically-owned companies reported that they expect their competitive prospects to decline somewhat over the next five years. Reasons cited were the limited nature of investment in the 1980s in capital equipment and research and development. The continued consolidation of the industry will also result in smaller manufacturers finding it more difficult to maintain competitiveness.

Competitive Advantages & Disadvantages

Survey recipients were asked to describe their major competitive advantages and disadvantages over the next five years.

Advantages - Many firms cited the high quality of their products and workers as being their primary advantage. In addition, they considered their customer and engineering services to be superior, as well as their ability to deliver a wide variety of products within a short time

frame, either through in-stock supply or short manufacturing times. Various cost advantages were also cited by a number of firms, such as low labor rates, low utility rates, and low overhead.

Many firms mentioned improvements and better coordination between the design and manufacturing processes as an important competitive advantage as a result of investment in new equipment that is more productive, reliable, and flexible. In addition, firms cited the high quality of their research and development and in-house "know-how."

One larger firm cited high volume (hence low cost) production runs of commodity-type bearings to be its major advantage. In contrast, several small firms thought their size and "niche" production capabilities were their advantage; in accepting small and specialty orders that larger firms would not. In addition, these firms believe their small size allows for more personalized, responsive customer service.

Several foreign-owned firms mentioned the advantages of ownership by large, multinational organizations with access to worldwide marketing networks. In addition, one foreign-owned firm indicated that its parent company's strong financial position allowed for generous and timely capital investments.

Some U.S.-owned firms, on the other hand, mentioned the antidumping duties and the DFAR as trade advantages. A few firms also mentioned their dedication to continuous improvement in quality through management techniques such as TQM as a source of their competitive advantage.

Disadvantages - Descriptions of competitive disadvantages fell into three basic categories. First, many firms cited internal constraints to their competitiveness. Most commonly mentioned was a lack of sufficient funds to dedicate to product development and capital equipment purchases. Related concerns were old equipment, limited product offerings, and a limited labor pool. Moreover, the small size and scope of some firms was reported as a disadvantage, both financially as well as through limited bargaining power with larger suppliers and customers. Long lead times in procuring needed materials and components, as well as reliance on competitors for materials such as steel, was perceived as yet another disadvantage by some firms.

Another group of competitive disadvantages relates to the nature of the global marketplace. Many firms, both domestic and foreign-owned, cited the increased role that low-cost

suppliers from developing countries are playing in the market, due allegedly in part to unfair trade practices. Some indicated that foreign firms enjoy tax advantages (such as investment credits, and lower taxation of savings and capital gains), and other government support lacking in the United States. One firm mentioned apathy on the part of the Department of Defense/U.S. Government as being a major competitive disadvantage. In addition, a number of firms mentioned the loss of their customer base (such as the auto market) to imports, as well as declines in the overall U.S.industrial base.

A third type of disadvantage relates to declining defense budgets. As a result, defense-intensive bearing firms are experiencing excess capacity resulting in downward price pressures. These firms are facing the challenge of developing commercial markets, which is expensive in terms of writing off defense dedicated equipment, and difficult because of existing worldwide overcapacity in commercial markets.

Actions to Improve Competitiveness

BEARING INDUSTRY USE AND INTEREST IN SELECTED TECHNOLOGIES

Technology Category	no interest	looking into	began using last three years	have used over three years
CAD/CAM	7	2	9	11
Hard Turning	8	6	2	13
Induction Heat	8	4	4	13
Robotics	7	4	4	14
Non-Contact Gaug.	4	7	3	13
Flexible Cell	6	7	9	7
Powder Metallurgy	13	6	3	7
Just-In-Time	2	9	11	7
Statistical PC	2	5	6	19
Concurrent Eng.	5	8	6	10
TQM	3	8	12	6

Source: U.S. Dept. of Commerce, BXA/OIRA Industry Survey

Firms were also asked to indicate what actions they have already taken or plan to take in the future to increase their competitiveness. Almost every respondent reported making investments that lowered production costs, improved product quality, and/or increased productivity. For example, many invested in CAD/CAM, flexible manufacturing systems, and other modern manufacturing technologies. Many also implemented Just-In-Time inventory management controls and Statistical Process Control systems. Firms also reported implementation of new managerial systems reportedly with philosophies of continuous quality improvement, such as Total Quality Management (TQM). These new managerial systems have reportedly improved product quality, while raising employee morale. Investment in worker training programs was also reported by a number of firms.

In addition, some firms changed the structure of their business to better compete in the world marketplace. Some indicated that they were expanding production into new product lines to compete in broader market sectors. Several others cited buying or selling another bearing company for the same reason. Some foreign-owned firms reported increasing their U.S. production and local content to better compete in the U.S. market, while U.S. firms nurtured domestic and international strategic partnerships with suppliers, and increased their focus on overseas markets.

VI. REVIEW OF DFAR

Department of Defense, Defense Federal Acquisition Regulation (DFAR) restrictions were imposed on antifriction bearings in two unrelated actions. First, in April 1971, the Office of the Secretary of Defense (OSD) required that DOD purchases of miniature and instrument bearings (ball bearings less than 9 mm and 9-30 mm diameter respectively) be limited to U.S. and Canadian sources. In a second action, in August 1988, DOD issued an interim rule (later made final) that covered all other bearing sizes and types. The latter DFAR is the central focus of this assessment. A copy of the interim and final versions of the August 1988 restriction can be found in Appendix B.

Effects of the DFAR

Implementation - The effectiveness of the 1988 DFAR bearing restriction in meeting its national security objectives clearly depends upon the efficacy with which it is being implemented by DOD and its contracting activities. In separate audits conducted by DOD's Office of the Inspector General (IG) in 1991 and 1992, it was found that the DFAR restriction was being incompletely implemented. These reports found that, in some cases, the procurement restrictive clause was not included in DOD contracts, and in other cases when the clause was included, contractors often did not make the required certification that bearings were domestically manufactured and/or made insufficient effort to verify that contractors actually complied with the DFAR clause. During the course of the DOD IG audits, several Army and Navy contracting units initiated immediate corrective action to include the restrictive clause in appropriate contracts. It is too soon to determine whether these actions have made a significant difference in the effectiveness of DOD's implementation of the DFAR restriction.

Company Comments on Effects of DFAR - Bearing companies responding to the Commerce industry survey were asked to identify the effect of the existing DFAR procurement restriction on their production capacity, employment, investment, and profitability; and to provide an overall assessment of the competitive and other impacts that the DFAR has had on their U.S. bearing operations. Companies were further asked to predict the potential impact on their firm of eliminating the DFAR restrictions, and to appraise the impact of coincident declines in defense expenditures.

In general, surveyed companies reported that the DFAR restriction has had a positive impact on the U.S. bearing industry. Most companies reporting a negative impact were the U.S. subsidiaries of foreign-owned bearing producers. Others noted the DFAR was poorly implemented which detracted from its benefits. Companies cautioned, however, that U.S. bearing industry competitiveness was also significantly affected by helpful actions such as the antidumping duties,[20] and detrimental events such as the recession and the defense build-down. This is not surprising because as noted above, defense end-use now accounts for only 10 percent of U.S. bearing shipments.[21]

Effects on Capacity - Regarding production capacity, several firms reported that the DFAR had led them to either increase or at least retain capacity that would otherwise be unavailable. A superprecision producer estimated that approximately 20 percent of its capacity increase could be attributed to the DFAR restriction. Another producer stated that the "DFAR has contributed to the retention and increased utilization of capacity that might otherwise have been idled." Another large producer indicated that the DFAR enabled it to more economically utilize existing capacity, although it had not yet added additional capacity. An additional superprecision producer noted that while DOD demand for its products has decreased 50 percent over the past four years, the DFAR has enabled them to receive orders for several DOD programs which would earlier have been supplied from offshore sources.

... on Employment - While a superprecision bearing company reported that it hired an additional 50 workers in response to DFAR-related business, most other bearing companies responded that the DFAR had enabled them to maintain current employment, or that it had no effect on their employment level. A leading integrated producer responded that it would have laid-off half of its defense bearing work force had the DFAR not been in place. Two other large producers reported that the DFAR enabled them to stabilize their work force without requiring lay-offs.

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[20]Sales of imported product to the U.S. Department of Defense are exempt from any duty or tariff levied on imports. Thus, the antidumping and countervailing duties placed on "commercial" (ball, cylindrical, and spherical plain) bearings retroactively to October 1987, did not apply to defense. Although delayed in its implementation, the DFAR complimented the antidumping duties at a critical juncture.

[21]These low market shares should not be interpreted as diminished defense importance as bearings remain essential components of most modern weapons systems.

... on Investment - Several leading companies reported that they increased investment in response to the DFAR restriction, while others indicated that the DFAR enabled them to maintain investment at current levels despite the economic downturn. A leading producer of defense-intensive miniature bearings, for example, stated that 20 percent of its capital investment was "fueled" by the DFAR. A leading integrated producer informed us that the DFAR, combined with the coincident imposition of antidumping duties had given them renewed confidence to invest in U.S. bearing production facilities. A leading foreign-owned bearing producer reported that while the DFAR had no effect on its U.S. operations, it had made substantial investment in its Canadian facilities to comply with DFAR sourcing restrictions.

... on Profitability - Regarding profitability, companies responded similarly that the DFAR had either increased profitability or helped offset losses during the economic downturn. Two producers replied that the DFAR enabled them to increase utilization of their equipment and thereby improve profitability by spreading fixed costs over larger production runs. Another producer complained that the impact of the DFAR on profitability has been limited due to the DOD's incomplete implementation of the restriction. Conversely, a leading foreign-owned producer reported that the DFAR had reduced its corporate-wide sales and profitability by removing business from its competitive and cost-efficient offshore facilities.

Following from the above, surveyed companies were overwhelmingly positive about the overall impact of the DFAR citing, in addition to factors noted above, improved entree to defense prime contractors, increased awareness of U.S. bearing producers' capabilities, and support for U.S. maintenance of technological proficiency in superprecision bearing production. One foreign-owned U.S. facility further replied that the DFAR had enabled it to improve its access to U.S. Government contracts and personnel. Another leading foreign-owned producer responded, however, that the DFAR had the effect of supporting the maintenance of excess U.S. defense bearing capacity while limiting U.S. access to state-of-the-art offshore bearing technology.

Impact of DFAR's Elimination - Eliminating the DFAR at this time would have a detrimental impact on the defense superprecision bearing sector. Firms producing regular precision bearings for defense indicated the DFAR's elimination would have a smaller impact on their firm, but could impact their defense divisions quite severely by expanding competition in a shrinking market.

Superprecision bearing producers are already operating at low levels (63%) of capacity, as they work down defense backlogs. Opening the defense market to foreign competition at this time would contribute to the further consolidation and downsizing of capacity, and almost certainly lead to increased DOD reliance on foreign sources for these most critical bearings. From a technology as well as a competitive standpoint, the defense market plays an important and strategic role in the sector. One firm alleged that foreign competitor firms are willing to underprice U.S. Government business for access to the technology.[22] New business is vitally important to this sector's long-term viability and technical capabilities, and retention of the DFAR will, therefore, provide assurance that U.S. superprecision producers will remain viable.

Regular precision bearing producers reported their defense business would probably decline or in a few cases disappear if the DFAR is eliminated. One company predicting a negative impact predicted that elimination of the DFAR could have a ripple effect as displaced U.S. defense bearing producers begin to compete for commercial bearing business held by its competitors. One subsidiary of a diversified U.S. company complained that the DFAR's overall impact was limited by the import of products with embedded foreign-manufactured bearings. Given the formidable nature of foreign competition, elimination of the DFAR would almost certainly result in greater imports, especially in those areas where the technology has a potentially large commercial payoff.

Nearly all of the defense bearing suppliers who were the subject of our survey replied that declining defense expenditures have had a negative impact on their U.S. bearing operations. One small U.S. producer noted that it had stopped replacing retiring workers as government contracts had decreased by 75 percent. A superprecision manufacturer replied that it had been forced to close one of its U.S. facilities. Both a large U.S. manufacturer and a prominent smaller manufacturer responded that they had anticipated the defense downturn, and that they had been emphasizing their efforts to further penetrate commercial bearing markets. Another smaller company replied that it had increased its export efforts.

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[22]For example, largely due to DOD funding, superior metal alloy was developed to extend the life of bearings in the mid-1980s. This enabled superprecision bearings for the main shafts of gas turbine engines to last 3000 hours flying time, compared to only 300 to 500 hours for bearings made in the former Soviet Union. Access to this technology provides an enormous advantage in the commercial aerospace bearings sector.

Additionally, a leading foreign-owned supplier informed us that defense cutbacks will not significantly affect its business as the DFAR had already eliminated its participation in U.S. defense programs.

In summary, most companies responding believe that the DFAR had a positive impact on their capacity, employment, investment, R&D and profitability. Most companies further believe that eliminating the DFAR would have a negative impact on U.S. defense production capability and lead to greater reliance by the military on foreign sources. At the same time, many companies replied that the effects of the DFAR were in some cases overshadowed by the negative coincident impact of defense cutbacks and the recent economic downturn.

VII. FINDINGS

Department of Commerce industry analysts (and most bearing companies) conclude that the bearing DFAR restriction has had a positive impact on U.S. bearing capacity, employment, R&D, investment and profitability. In addition, bearing companies reported that the DFAR improved their entree to defense prime contractors, increased awareness of U.S. bearing producers' capabilities, and supported U.S. maintenance of technological proficiency in superprecision bearing production.

The positive effects of the DFAR were in some cases outweighed by the negative impacts of defense cutbacks and the current economic downturn. Eliminating the DFAR would compound these negative impacts, and have a detrimental impact on U.S. defense production capability.

This study demonstrates that the defense-intensive U.S. superprecision bearing sector is most important to national security. The superprecision sector's viability is threatened, however, by decreasing defense budgets, worldwide overcapacity, and the reported difficulty to access foreign markets, particularly Japan.

The global bearing industry remains dominated by five giant companies, all headquartered outside the United States, who control over half of the $20 billion world bearing market. Depressed economic conditions worldwide and surplus bearing production capacity have led to renewed efforts to export to the relatively open U.S. bearing market.

While the competitive standing of the U.S. bearing industry has improved in the last five years, the competitive pressures it faces have never been more intense. At the same time, U.S. companies report continuing difficulty in obtaining investment capital.

Foreign-owned companies led a dramatic expansion of U.S. bearing capacity since 1987. This phenomenon was spurred by the DFAR, antidumping duties and the low value of the dollar; and helped the U.S. industry recover since 1987 from a 30-year capacity trough.

However, foreign-owned companies with U.S. capacity report dramatically lower U.S. research and development spending, and substantially higher offshore sourcing of bearing components and production machinery. Despite this, foreign-owned companies report

substantially lower profits from their U.S. operations, and several report notably higher cost of goods sold.

The viability of the defense-critical superprecision bearing sector is threatened. The Department of Defense must pay careful attention to this sector to ensure that further decline does not increase U.S. national security vulnerability.

The evidence concerning the DFAR's impact on regular precision bearing producers is less clear. Although competitive pressures have never been higher, U.S. production capacity has increased and defense takes a small and declining share of this production. Questions remain about the long term impact of some of this new foreign capacity - with dramatically lower U.S. research and development spending, and substantially higher offshore sourcing of steel, bearing components, and production machinery.

Congress' decision to include a three-year extension of the DFAR in the FY 1993 National Defense Authorization Act provides us with an opportunity to reexamine this sector at the end of that period to determine if this new capacity represents a substantial long-term addition to U.S. bearing production capability.

APPENDICIES

APPENDIX - A: Department of Defense letter requesting Bearing Industry Study

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, DC 20301-8000

PRODUCTION AND
LOGISTICS

8 JAN 1992

Mr. John A. Richards
Deputy Assistant Secretary for
Industrial Resource Administration
Department of Commerce
Bureau of Export Administration
Washington, DC 20230

Dear ~~Mr. Richards:~~ JOHN :

We are in the process of evaluating the Defense Department's procurement restrictions on imported bearings to determine what actions should be taken when the restriction on imported bearings over 30mm expires on December 31, 1992. Because the Department of Commerce has conducted several studies on the bearing industry, your assistance would be appreciated very much. Areas where your expertise would be especially beneficial are:

- Business trends (shipments, profits, employment, market share, capital investment, research and development)
- Production capacity by type, size and precision
- Identification of bearings most important for national defense
- Impact that termination of the procurement restriction may have on U.S. bearing manufacturers

We are planning to have our evaluation completed by August 31, 1992, so I believe we should start working together right away. Please let me or John Todaro know your thoughts on the best way to proceed.

Sincerely,

Nicholas M. Torelli, Jr.
Deputy Assistant Secretary
(Production Resources)

specification, (b) other DoD prepared specification or (c) purchase description are not considered commercial products.

(3) wholly manufactured was eliminated and net export value was added as an alternate way.

(4) exports to Canada were eliminated as a part of the allowable export baseline.

(5) replaced the 6 month phase-in provision with a 12 month phase-in.

(6) changed to reflect that the Head of the Contracting Activity would grant waivers.

(7) eliminated the waiving of the restriction after contract award and clarified the manner in which the waiver should be considered.

(8) clarified the requirement regarding the plan to convert from foreign to domestic manufactured bearings.

(9) added provision to flow the certification requirement down to the contractor who is purchasing the bearing.

B. Regulatory Flexibility Act

The coverage at Subpart 208.79 is not expected to have a significant impact on small businesses. It will impact only those small businesses that (1) manufacture antifriction° bearings, or (2) use antifriction bearings in a subassembly, assembly, or end item sold to the DoD either directly or through a subcontract with a DoD contractor. Although there is no existing data to quantify the number of small businesses which may be impacted, it is estimated that only a small quantity will be affected. Further, because the restriction will be applied across the board giving the same advantages and disadvantages to all, and because commercial items are exempted from the restriction, any impact is expected to be minimal. Therefore, an Initial Regulatory Act Analysis has not been prepared. Please cite DAR Case 88-35 for any comments regarding this determination. In addition, comments from small entities concerning the affected DFARS Subpart will be considered in accordance with Section 610 of the Act. Such comments must be submitted separately and cite DFARS Case 88-610D.

C. Paperwork Reduction Act

It is expected that this coverage will impose additional burden on contractors. A paperwork burden clearance for OMB Control Number 0704-0205 was submitted to OMB for review and approval. This clearance reflects an increase of 439,383 hours.

D. Determination to Issue an Interim Regulation

A determination has been made under the authority of the Secretary of Defense to issue this coverage as an interim regulation. This action is necessary to protect and strengthen the domestic industrial base for an industry critical to national security.

Charles W. Lloyd
Executive Secretary, Defense Acquisition
Regulatory Council

Therefore, it is proposed to amend 48 CFR Parts 208 and 252 as follows:

1. The authority citation for 48 CFR Parts 208 and 252 continues to read as follows:

Authority: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, and DoD FAR Supplement 201.301.

PART 208--REQUIRED SOURCES OF SUPPLIES AND SERVICES

2. A new Subpart 208.79, consisting of sections 208.7901 through 208.7904, is added to read as follows:

SUBPART 208.79 ANTIFRICTION BEARINGS

Sec. 208.7901 Definitions. 208.7902 Policy. 208.7903 Procedures. 209.7904 Contract clause.

SUBPART 208.79 ANTIFRICTION BEARINGS

208.7901 Definitions.

As used in this subpart:

"Bearing" means antifriction bearing or antifriction bearing assembly.

"Commercial product" means a product, such as an item, material, component, subsystem, or system sold or traded to the general public in the course of normal business

operations at prices based on established catalog or market prices (see FAR 15.804-3(c) for an explanation of terms). It does not include bearings or items described by and developed under (a) a Military Specification, (b) other DoD prepared specification, or (c) purchase description.

"Custom/specialty Bearings" means those bearings having tolerances equivalent to super precision-bearings or greater, and those bearings which contain components or have assembly characteristics that meet or exceed ABEC/RBEC 5;

"Domestic manufacture" means wholly manufactured in the United States or Canada. When a bearing assembly is involved, all components of the assembly must be wholly manufactured in the United States or Canada. For the purposes of this definition, raw materials, such as preformed bar or rod stock and lubricants, need not be domestically mined or produced.

"Net Export Value" means the value of any bearing manufactured in whole or in part in the United States minus the value of any foreign manufactured components used in that bearing. The value of the imported components in any year may not exceed the value for calendar year 1987 for bearings sold to the Department of Defense. Raw materials, such as preformed bar or rod stock and lubricants, imported for use in domestic manufacture are excluded from the value of imported components.

"Other authorized manufacture" means manufacture in whole or in part by a company which has its corporate headquarters in a NATO participating country (see DEARS 25.001) and which has a United States subsidiary. However a manufacturer's bearings are included within this term only to the extent that (a) the total value of such bearings imported for sale to DoD and its contractors in a calendar year, does not exceed the net export value of bearings exported outside the United States by its United States subsidiaries in calendar year 1987; and (b) the total value of super-precision or custom/specialty bearings imported for sale to DoD and its contractors in a calendar year does not exceed the total value of such bearings imported in calendar year 1987. Subject to the sales restrictions in (a) and (b) above, bearings manufactured by the following manufacturers are other-authorized manufactures bearings: FAG Bearings Corporation (additional companies may be added to this list based on a survey of domestic firms)

"Super-precision Bearings" means bearings having a precision classification of ABEC/RBEC 5 or higher;

208.7902 Policy.

(a) It has been determined that the ability of the United States bearing industry to meet industrial surge and mobilization requirements for bearings is in serious jeopardy. In view of the national security significance of bearings, the DoD has determined that except as provided in (b) below, all bearings, components of bearings, or items containing

bearings, whether procured directly or installed in defense end-items and subassemblies shall be of domestic manufacture. This restriction shall remain in effect for contracts awarded through September 30, 1991. The restriction may be extended an additional two years if conditions warrant.

(b) This subpart does not apply to:

(1) Miniature and instrument bearings restricted by Subpart 208.73;

(2) Bearings covered by the following Military Specifications, for contracts entered into prior to December 31, 1989.

MIL B 6039	Bearing, double row, ball, sealed rod end, antifriction, self-aligning
MIL B 7949	Bearing, ball, airframe, antifriction
MIL B 8942	Bearings, plain, TFE lined, self-aligning
MIL B 8943	Bearing, journal plain and flanged, TFE lined
MIL B 8948	Bearing, plain rod end, TFE lined, self-aligning
MIL B 8952	Bearing, roller, rod end, antifriction self-aligning
MIL B 8976	Bearing, plain, self-aligning, all metal
MIL B 81820	Bearing, plain, self-aligning, self-lubricating, low speed oscillation
MIL B 81934	Bearing, sleeve, plain and flanged, self-lubricating
MIL B 81935	Bearing, plain, rod end, self-aligning, self-lubricating
MIL B 81936	Bearing, plain, self-aligning (BeCU, CRES Race)

208.7903 Procedures.

(a) The Head of the Contracting Activity, without delegation, may waive the domestic bearings requirements of this subpart if there is a determination that there is no domestic bearing manufacturer that meets the requirement or if it is not in the best interest of the United States to qualify a domestic bearing to replace a qualified nondomestic bearing. This determination must be based on a finding that the qualification of a domestic manufacture bearing would cause unreasonable costs or delays.

(b) The determination of unreasonableness should be made in consideration of the DoD policy to assist the United States industrial mobilization base by awarding more contracts to domestic bearing manufacturers thereby increasing their capability to reinvest and to become more competitive.

(c) Before a waiver is granted for a multi-year contract or contract that may exceed 12 months, the contracting officer shall require offerors to submit a written plan for transitioning from the use of nondomestic to domestic manufacture bearings. The plan shall be reviewed to determine whether a domestic manufacture bearing can be qualified at a reasonable cost, and used in lieu of the foreign bearing during the course of the contract period. if approved, the plan shall be incorporated in the contract and shall:

(1) Identify the bearings that are not domestic or other authorized manufacture, application, and source of supply;

(2) Describe the transition, including cost and timetable, for providing a domestic manufacture bearing. The timetable for completing the transition should normally not exceed one year from the date of the waiver.

208.7904 Contract clause.

The clause set forth at 252.208-7006, Required Sources for Anti-friction Bearings, shall be inserted in all solicitations and resultant contracts, and before exercising an option, except:

(1) where the contracting officer knows that the item being procured does not contain bearings;

(2) when purchasing commercial products;

(3) when purchasing foreign manufactured bearings, components of bearings, or foreign manufactured products containing bearings overseas for use overseas;

(4) when purchasing for use in a cooperative or co-production project under an international agreement;

(5) when using small purchase procedures, other than in purchases of bearings as the end item.

PART 252–SOLICITATION PROVISIONS AND CONTRACT CLAUSES

3. Section 252.208-7006 is added to read as follows: 252.208-7006 Required Sources for Antifriction Bearings.

As prescribed in 208.7904 insert the following clause:

REQUIRED SOURCES FOR ANTIFRICTION BEARINGS (AUG 1988)

(a) For the purpose of this clause:

"Bearing" means antifriction bearing or antifriction bearing assembly.

"Commercial product" means a product, other than bearings or items described by and developed under a Military Specification or other DoD prepared specification or purchase description, such as an item, material, component, subsystem, or system sold or traded to the general public in the course of normal business operations at prices based on established catalog or market prices (see FAR 15.804-3 (c) for an explanation of terms);

"Custom/specialty Bearings" means those bearings having tolerances equivalent to super precision-bearings or greater, and those bearings which contain components or have assembly characteristics that meet or exceed ABEC/RBEC 5;

"Domestic manufacture" means wholly manufactured in the United States or Canada. When a bearing assembly is involved, all components of the assembly must be wholly manufactured in the United States or Canada. For purposes of this definition, raw materials, such as preformed bar or rod stock and lubricants, need not be domestically mined or produced.

"Net Export Value" means the value of any bearing manufactured in whole or in part in the United States minus the value of any foreign manufactured components used in that bearing. The value of the imported components in any year may not exceed the value for calendar year 1987 for bearings sold to the Department of Defense. Raw materials, such as preformed bar or rod stock and lubricants, imported for use in domestic manufacture are excluded from the value of imported components.

"Other authorized manufacture" means manufacture in whole or in part by a company which has its corporate headquarters in a NATO participating country (see DFARS 25.001) and which has a United States subsidiary. However a manufacturer's bearings are included within this term only to the extent that (a) the total value of such bearings imported for sale to DoD and its contractors in a calendar year, does not exceed the net export value of bearings exported outside the United States by its United States subsidiaries in calendar year 1987; and (b) the total value of super-precision or custom/specialty bearings imported for sale to DoD and its contractors does not exceed the total value of such bearings imported in calendar year 1987. A list of other authorized bearing manufacturers is at DFARS 208.7901;

"Super-precision Bearings" means antifriction bearings having a precision classification of ABEC/RBEC 5 or higher; and

(b) If the Offeror is a bearing manufacturer, the offeror agrees that, if awarded the contract

(1) bearings and components of bearings supplied under this contract will be of domestic or other authorized manufacture; and

(2) for bearings that are of other authorized manufacture, acceptance by the Government of this offer will not cause the manufacturer to exceed the sales levels described in the definition of the term "other-authorized manufacture".

(c) if the Offeror is not the bearing manufacturer, the offeror agrees that, if awarded the contract, the bearings, components of bearings, or bearings installed in defense end-items or subassemblies supplied under this contract will be of domestic or other-authorized manufacture.

(d) The requirements in paragraph (b) and (c) above may be waived, in whole or in part, by the Government. Before a waiver is granted for a multi-year contract or one that may exceed 12 months, the Contracting Officer will require each offeror to submit a written plan for the transition from bearings that are not of domestic or other authorized manufacture, to domestic manufacture bearings. The plan shall identify all bearings that are not of domestic or other authorized manufacture currently used, their application and source of manufacture, a plan for the transition to domestic manufacture bearings, the costs associated with the transition, and a timetable for transition. If approved, the plan will be incorporated into the contract.

(e) The Contractor will provide written certification upon delivery of the bearings, components of bearings, or defense end-items or subassemblies containing bearings, that to the best of its knowledge and belief, such bearings or components of bearings are of domestic or other-authorized manufacture.

(f) Paragraphs (c) and (d) do not apply to end items and components that are commercial products.

(g) Paragraphs (b), (c), and (d) do not apply to:

(1) Miniature and instrument bearings which are restricted by DEARS Subpart 208.73; and

(2) Bearings covered in the following Military Specifications, for contracts entered into prior to December 31, 1989.

MIL B 6039 Bearing, double row, ball, sealed rod end, antifriction, self-aligning

MIL B	7949	Bearing, ball, airframe, antifriction
MIL B	8942	Bearings, plain, TEE lined, self-aligning
MIL B	8943	Bearing, journal plain and flanged, TFE lined
MIL B	8948	Bearing, plain rod end, TFE lined, self-aligning
MIL B	8952	Bearing, roller, rod end, antifriction self-aligning
MIL B	8976	Bearing, plain, self-aligning, all metal
MIL B	81820	Bearing, plain, self-aligning, self-lubricating, low speed oscillation
MIL B	81934	Bearing, sleeve, plain and flanged, self-lubricating
MIL B	81935	Bearing, plain, rod end, self-aligning, self-lubricating
MIL B	81936	Bearing, plain, self aligning (BeCU, CRES Race)

(h) The Contractor agrees to insert this clause, appropriately modified to reflect the identity of the parties, including this paragraph, in every subcontract and purchase order issued in performance of this contract, unless he knows that the item being purchased contains no bearings or components of bearings.

(End of clause)

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

MAY 15 1992

TO: Producers of Antifriction Bearings

The Department of Commerce is conducting a national security assessment of the antifriction bearing industry in coordination with the Department of Defense. The objective of the assessment is to assist the Department of Defense in its evaluation of the effectiveness of the Defense Federal Acquisition Regulation that restricts usage of imported bearings in defense applications. The enclosed questionnaire requests information directly related to this assessment. This information is needed to supplement data available to both Departments from other sources and to carry out Department of Commerce emergency preparedness responsibilities under Executive Order 12656 of November 18, 1988.

The Department of Commerce must receive your questionnaire response no later than June 19, 1992 to ensure the information you provide is incorporated into this assessment. The questionnaire responses will be treated as confidential and will not be published or disclosed in any manner that would reveal the operations, capacity, or other proprietary information of your firm. Please return completed questionnaire to:

Mr. Brad Botwin, Director
Strategic Analysis Division
BXA/OIRA, Rm. 3878
U.S. Department of Commerce
Washington, D.C. 20230

Questions related to the questionnaire should be directed to Mr. John Tucker, Senior Industry Analyst, (202) 377-3984, or to Ms. Margaret Cahill, Trade and Industry Analyst, (202) 377-3795, Strategic Analysis Division, Department of Commerce. Thank you for your cooperation in this important assessment.

Sincerely,

Brad Botwin, Director
Strategic Analysis Division
Office of Industrial Resource
Administration

DEFINITIONS

BEARING - Consists of a minimum of all of the following: inner race, outer race, and associated rolling elements, rated ABEC or RBEC 1 or higher (or equivalent). These are commonly called antifriction or rolling bearings. (See also definitions of Precision and Superprecision Bearings.)

Bearing Subsets:

MINIATURE AND INSTRUMENT BEARINGS - Ball bearings with an outer race diameter (excluding flanges) of 30 mm or less.

OTHER BALL AND ROLLER BEARINGS - All antifriction bearings, mounted or unmounted, except miniature and instrument bearings: includes ball bearings with outer race diameter over 30 mm, tapered roller bearings, needle roller bearings, cylindrical roller bearings, spherical roller bearings, combination rolling bearings, and other antifriction bearings.

DEFENSE RELATED EXPORTS - Report foreign military sales, shipments of spares for weapon systems, shipments to NATO, or to contractors supplying NATO, and other military related sales.

DFAR - Defense Federal Acquisition Regulation - A DFAR requiring domestic (U.S. or Canadian) manufacture of miniature and instrument bearings has been in effect since April 22, 1971 (48 CFR 208.73). For other ball and roller bearings an interim DFAR requiring domestic manufacture was issued on August 4, 1988 for 3-5 years, and made final on April 12, 1989 (48 CFR 208.79).

ESTABLISHMENT - All facilities in which bearings are produced. Includes auxiliary facilities operated in conjunction with (whether or not physically separate from) such production facilities. Does not include wholly owned distribution facilities.

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.

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 providing Government incentives for contractor capital investment.

MANUFACTURING TECHNOLOGY - Information that is, or will be used to define, monitor, or control processes and equipment used to manufacture material for the Department of Defense. Its objective is: 1) the timely establishment or improvement of the manufacturing processes, techniques, or equipment required to support current and projected programs, and 2) assurance of the ability to produce, reduce lead time, ensure economic availiability of end items, reduce costs, increase efficiency, improve reliability, or to enhance safety and anti-pollution measures.

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 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 been characteristic of your operations.

PART I FIRM IDENTIFICATION

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

_____

_____

_____

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.

_____

_____

_____

Ownership:_____%

3. **MERGERS, ACQUISITIONS AND JOINT VENTURES**: Please describe any U.S. mergers, acquisitions or joint ventures your firm was involved in since the end of 1987 with respect to your bearing operations.

_____

_____

_____

_____

_____

_____

PART II BEARING CAPACITY AND PRODUCTION CONSTRAINTS

1. **U.S. BEARING PRODUCTION CAPACITY**: On the table below, please enter your end-of-1991 U.S. practical capacity, and 1991 production (in units) for each bearing type and bearing component hardened (heat treated) and ground in the United States. Also, please estimate your capacity (again in units) as it was at the end of 1987, and that you plan by the end of 1995. (See definition of **Practical Capacity**, **Precision** and **Superprecision**.)

Bearing Type	Practical Capacity (in units) (end of 1991)	1991 Production (in units)	Changes in Capacity Over Time (in units)	
			Capacity end of 1987	Planned Capacity end of 1995
Single Row Radial PRECISION: Ball Bearings, < 30mm				
Ball Bearings, 30-100mm				
Ball Bearings, > 100mm				
SUPERPRECISION: Ball Bearings, < 30mm				
Ball Bearings, 30-100mm				
Ball Bearings, > 100mm				
Angular Contact Ball Bearings				
Other Ball Bearings				
Thrust Bearings, All Types				
Cylindrical Roller Bearings: Precision				
Superprecision				
Tapered Roller Bearings: Precision				
Superprecision				
Needle Roller Bearings				
Spherical Roller Bearings				
Mounted Bearings				
Other Rolling Bearings				
Rings or Races				
Rolling Elements				
Other Bearing Components				

PART II (continued)

5. **FOREIGN SOURCING**: Please complete the following table for foreign sourced bearing components and steel types for 1987-1991. In the space provided under each year, enter the approximate percentage of the part relative to the total components of that type you used in the United States.

	Percent imported to total used in the United States				
DESCRIPTION	1987	1988	1989	1990	1991
Unhardened, Unground Components: Rings or Races					
Rolling Elements					
Other Components					
Hardened and Ground Components: Rings or Races					
Rolling Elements					
Other Components					
Steel Types: AISI 52100					
AISI 440C					
M50					
Other*					

*Specify

6. **REASONS FOR FOREIGN SOURCING**: Please identify the reasons for foreign sourcing below? You may use the coded (a-f) list of reasons provided. If you respond with a, e, or f - please briefly explain the circumstances (i.e., country of origin, why not domestically available, what is the global strategy, etc.).

a. domestic source not available
b. lower price
c. higher quality
d. quicker delivery
e. part of global strategy
f. other (specify:_____)

Reason(s) for foreign sourcing:_____

_____

_____

_____

PART IV INVESTMENT AND FINANCIAL INFORMATION

1. **INVESTMENT**: Enter expenditures for plant, new machinery and equipment, and used or rebuilt machinery and equipment (in $000s) from 1987-1991, and projected amounts from 1992-1995 as requested below. Include only dollar amounts that apply to your bearing manufacturing operations.

	INVESTMENT IN U.S. BEARING OPERATIONS (in thousands of dollars)	
	Plant	New Machinery and Equipment
1987		
1988		
1989		
1990		
1991		
projected 1992		
1993		
1994		
1995		

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

If none, check here____

PART IV (continued)

5. **PROFITABILITY**: Please enter the financial information (in $000s) as specified below for the years 1987-1991 for a) your parent firm, and b) the dollar amounts that apply exclusively to your U.S. bearing manufacturing operations. **Please photocopy this page if both a) and b) apply.**

	PROFITABILITY (in $000s)				
	1987	1988	1989	1990	1991
Net Sales (1)					
Cost of Goods Sold (2)					
Operating Income (3)					
Net Income before taxes (4)					

(1)a) Total Parent Company Sales b) Bearing Sales
(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

6. **FINANCIAL BALANCES**: Please provide end of year balance sheet information (in $000s) as specified below for 1987-1991 for a) your parent firm, and b) the dollar amounts that apply exclusively to your U.S. bearing manufacturing operations. **Please photocopy this page if both a) and b) apply.**

	FINANCIAL BALANCES (in $000s)				
	1987	1988	1989	1990	1991
Current Assets					
Current Liabilities					
Inventories					
Total Assets					
Short Term Debt (1)					
Long Term Debt (2)					

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

7. **DFAR'S EFFECT ON PROFITS AND FINANCIAL BALANCES**: What impact has the bearing DFAR had on your profits and financial balances?

7. **TOTAL SHIPMENTS**: Please report **total shipments** (commercial and military) by bearing type in units and dollar values (in $000s) as specified below for each bearing type from 1987-1991. (See definition of **Shipments**.)

	Report Unit Shipments					Report Dollar Shipments (in $000s)				
Bearing Type	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Single Row Radials PRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
SUPERPRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
Angular Contact Ball Bearings										
Other Ball Bearings										
Thrust Bearings, all types										
Cylindrical Roller Bearings: Precision										
Superprecision										
Tapered Roller Bearings Precision										
Superprecision										
Needle Roller Bearings										
Spherical Roller Bearings										
Mounted Bearings										
Other Rolling Bearings										
Bearing Components	(complete for value only)									

8. **DEFENSE SHIPMENTS**: Please report **defense shipments** (direct to defense and indirect through defense contractors) by bearing type in units and dollar values (in $000s) as specified below for each bearing type from 1987-1991. (See definition of **Shipments**.)

	Report Unit Shipments					Report Dollar Shipments (in $000s)				
Bearing Type	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Single Row Radials PRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
SUPERPRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
Angular Contact Ball Bearings										
Other Ball Bearings										
Thrust Bearings, all types										
Cylindrical Roller Bearings: Precision										
Superprecision										
Tapered Roller Bearings Precision										
Superprecision										
Needle Roller Bearings										
Spherical Roller Bearings										
Mounted Bearings										
Other Rolling Bearings										
Bearing Components	(complete for value only)									

PART V (continued)

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. bearing manufacturing operations at any time since the end of 1987? If so, please identify the following:

i. Beginning/Ending Year: _____

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:_____

_____

_____

_____

c. Has the program(s):

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?

_____

_____

_____

PART VI COMPETITIVE FACTORS

1. **COMPETITIVE PROSPECTS**: How do you view the competitive prospects for your firm's U.S. bearing production operations over the next five years?

They should:
- improve greatly _____
- improve somewhat _____
- stay the same _____
- decline somewhat _____
- decline greatly _____

Please discuss the basis for your answer._____

2. **COMPETITIVE ADVANTAGES/DISADVANTAGES**: What are the major competitive advantages/disadvantages you perceive for your firm over the next five years?

3. **ACTIONS TO IMPROVE COMPETITIVENESS**: What actions have you taken since 1987 to increase your competitiveness? What plans do you have to increase your competitiveness in the future?

PART VI (continued)

8. **BUSINESS GAINS/LOSSES (DFAR RELATED):**

a. Has your firm been qualified for additional defense business as a result of the DFAR? yes___, no___
If yes, has this introduced you to new customers? yes___, no___

b. Please estimate the annual dollar value of foreign sourced bearings (previously used in defense systems) you have displaced with U.S. manufactured product as a result of the DFAR.

1988 $_____
1989 $_____
1990 $_____
1991 $_____

c. Please estimate, if any, the annual dollar value of foreign sourced bearings previously supplied to commercial accounts that you have displaced with U.S. manufactured product since the end of 1987.

$_____

9. **COMPETITIVE AND OTHER EFFECTS OF THE DFAR:** What competitive and other favorable or unfavorable impacts has the DFAR had on your U.S. bearing operations?

_____

_____

_____

_____

APPENDIX - C: DFAR - Federal Register Notices

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, DC 20301-8000

PRODUCTION AND
LOGISTICS

8 JAN 1992

Mr. John A. Richards
Deputy Assistant Secretary for
Industrial Resource Administration
Department of Commerce
Bureau of Export Administration
Washington, DC 20230

Dear ~~Mr. Richards~~ JOHN :

We are in the process of evaluating the Defense Department's procurement restrictions on imported bearings to determine what actions should be taken when the restriction on imported bearings over 30mm expires on December 31, 1992. Because the Department of Commerce has conducted several studies on the bearing industry, your assistance would be appreciated very much. Areas where your expertise would be especially beneficial are:

- Business trends (shipments, profits, employment, market share, capital investment, research and development)
- Production capacity by type, size and precision
- Identification of bearings most important for national defense
- Impact that termination of the procurement restriction may have on U.S. bearing manufacturers

We are planning to have our evaluation completed by August 31, 1992, so I believe we should start working together right away. Please let me or John Todaro know your thoughts on the best way to proceed.

Sincerely,

Nicholas M. Torelli, Jr.
Deputy Assistant Secretary
(Production Resources)

specification, (b) other DoD prepared specification or (c) purchase description are not considered commercial products.

(3) wholly manufactured was eliminated and net export value was added as an alternate way.

(4) exports to Canada were eliminated as a part of the allowable export baseline.

(5) replaced the 6 month phase-in provision with a 12 month phase-in.

(6) changed to reflect that the Head of the Contracting Activity would grant waivers.

(7) eliminated the waiving of the restriction after contract award and clarified the manner in which the waiver should be considered.

(8) clarified the requirement regarding the plan to convert from foreign to domestic manufactured bearings.

(9) added provision to flow the certification requirement down to the contractor who is purchasing the bearing.

B. Regulatory Flexibility Act

The coverage at Subpart 208.79 is not expected to have a significant impact on small businesses. It will impact only those small businesses that (1) manufacture antifriction° bearings, or (2) use antifriction bearings in a subassembly, assembly, or end item sold to the DoD either directly or through a subcontract with a DoD contractor. Although there is no existing data to quantify the number of small businesses which may be impacted, it is estimated that only a small quantity will be affected. Further, because the restriction will be applied across the board giving the same advantages and disadvantages to all, and because commercial items are exempted from the restriction, any impact is expected to be minimal. Therefore, an Initial Regulatory Act Analysis has not been prepared. Please cite DAR Case 88-35 for any comments regarding this determination. In addition, comments from small entities concerning the affected DFARS Subpart will be considered in accordance with Section 610 of the Act. Such comments must be submitted separately and cite DFARS Case 88-610D.

C. Paperwork Reduction Act

It is expected that this coverage will impose additional burden on contractors. A paperwork burden clearance for OMB Control Number 0704-0205 was submitted to OMB for review and approval. This clearance reflects an increase of 439,383 hours.

D. Determination to Issue an Interim Regulation

A determination has been made under the authority of the Secretary of Defense to issue this coverage as an interim regulation. This action is necessary to protect and strengthen the domestic industrial base for an industry critical to national security.

Charles W. Lloyd
Executive Secretary, Defense Acquisition
Regulatory Council

Therefore, it is proposed to amend 48 CFR Parts 208 and 252 as follows:

1. The authority citation for 48 CFR Parts 208 and 252 continues to read as follows:

Authority: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, and DoD FAR Supplement 201.301.

PART 208–REQUIRED SOURCES OF SUPPLIES AND SERVICES

2. A new Subpart 208.79, consisting of sections 208.7901 through 208.7904, is added to read as follows:

SUBPART 208.79 ANTIFRICTION BEARINGS

Sec. 208.7901 Definitions. 208.7902 Policy. 208.7903 Procedures. 209.7904 Contract clause.

SUBPART 208.79 ANTIFRICTION BEARINGS

208.7901 Definitions.

As used in this subpart:

"Bearing" means antifriction bearing or antifriction bearing assembly.

"Commercial product" means a product, such as an item, material, component, subsystem, or system sold or traded to the general public in the course of normal business

operations at prices based on established catalog or market prices (see FAR 15.804-3(c) for an explanation of terms). It does not include bearings or items described by and developed under (a) a Military Specification, (b) other DoD prepared specification, or (c) purchase description.

"Custom/specialty Bearings" means those bearings having tolerances equivalent to super precision-bearings or greater, and those bearings which contain components or have assembly characteristics that meet or exceed ABEC/RBEC 5;

"Domestic manufacture" means wholly manufactured in the United States or Canada. When a bearing assembly is involved, all components of the assembly must be wholly manufactured in the United States or Canada. For the purposes of this definition, raw materials, such as preformed bar or rod stock and lubricants, need not be domestically mined or produced.

"Net Export Value" means the value of any bearing manufactured in whole or in part in the United States minus the value of any foreign manufactured components used in that bearing. The value of the imported components in any year may not exceed the value for calendar year 1987 for bearings sold to the Department of Defense. Raw materials, such as preformed bar or rod stock and lubricants, imported for use in domestic manufacture are excluded from the value of imported components.

"Other authorized manufacture" means manufacture in whole or in part by a company which has its corporate headquarters in a NATO participating country (see DEARS 25.001) and which has a United States subsidiary. However a manufacturer's bearings are included within this term only to the extent that (a) the total value of such bearings imported for sale to DoD and its contractors in a calendar year, does not exceed the net export value of bearings exported outside the United States by its United States subsidiaries in calendar year 1987; and (b) the total value of super-precision or custom/specialty bearings imported for sale to DoD and its contractors in a calendar year does not exceed the total value of such bearings imported in calendar year 1987. Subject to the sales restrictions in (a) and (b) above, bearings manufactured by the following manufacturers are other-authorized manufactures bearings: FAG Bearings Corporation (additional companies may be added to this list based on a survey of domestic firms)

"Super-precision Bearings" means bearings having a precision classification of ABEC/RBEC 5 or higher;

208.7902 Policy.

(a) It has been determined that the ability of the United States bearing industry to meet industrial surge and mobilization requirements for bearings is in serious jeopardy. In view of the national security significance of bearings, the DoD has determined that except as provided in (b) below, all bearings, components of bearings, or items containing

bearings, whether procured directly or installed in defense end-items and subassemblies shall be of domestic manufacture. This restriction shall remain in effect for contracts awarded through September 30, 1991. The restriction may be extended an additional two years if conditions warrant.

(b) This subpart does not apply to:

(1) Miniature and instrument bearings restricted by Subpart 208.73;

(2) Bearings covered by the following Military Specifications, for contracts entered into prior to December 31, 1989.

MIL B 6039	Bearing, double row, ball, sealed rod end, antifriction, self-aligning
MIL B 7949	Bearing, ball, airframe, antifriction
MIL B 8942	Bearings, plain, TFE lined, self-aligning
MIL B 8943	Bearing, journal plain and flanged, TFE lined
MIL B 8948	Bearing, plain rod end, TFE lined, self-aligning
MIL B 8952	Bearing, roller, rod end, antifriction self-aligning
MIL B 8976	Bearing, plain, self-aligning, all metal
MIL B 81820	Bearing, plain, self-aligning, self-lubricating, low speed oscillation
MIL B 81934	Bearing, sleeve, plain and flanged, self-lubricating
MIL B 81935	Bearing, plain, rod end, self-aligning, self-lubricating
MIL B 81936	Bearing, plain, self-aligning (BeCU, CRES Race)

208.7903 Procedures.

(a) The Head of the Contracting Activity, without delegation, may waive the domestic bearings requirements of this subpart if there is a determination that there is no domestic bearing manufacturer that meets the requirement or if it is not in the best interest of the United States to qualify a domestic bearing to replace a qualified nondomestic bearing. This determination must be based on a finding that the qualification of a domestic manufacture bearing would cause unreasonable costs or delays.

(b) The determination of unreasonableness should be made in consideration of the DoD policy to assist the United States industrial mobilization base by awarding more contracts to domestic bearing manufacturers thereby increasing their capability to reinvest and to become more competitive.

(c) Before a waiver is granted for a multi-year contract or contract that may exceed 12 months, the contracting officer shall require offerors to submit a written plan for transitioning from the use of nondomestic to domestic manufacture bearings. The plan shall be reviewed to determine whether a domestic manufacture bearing can be qualified at a reasonable cost, and used in lieu of the foreign bearing during the course of the contract period. if approved, the plan shall be incorporated in the contract and shall:

(1) Identify the bearings that are not domestic or other authorized manufacture, application, and source of supply;

(2) Describe the transition, including cost and timetable, for providing a domestic manufacture bearing. The timetable for completing the transition should normally not exceed one year from the date of the waiver.

208.7904 Contract clause.

The clause set forth at 252.208-7006, Required Sources for Anti-friction Bearings, shall be inserted in all solicitations and resultant contracts, and before exercising an option, except:

(1) where the contracting officer knows that the item being procured does not contain bearings;

(2) when purchasing commercial products;

(3) when purchasing foreign manufactured bearings, components of bearings, or foreign manufactured products containing bearings overseas for use overseas;

(4) when purchasing for use in a cooperative or co-production project under an international agreement;

(5) when using small purchase procedures, other than in purchases of bearings as the end item.

PART 252--SOLICITATION PROVISIONS AND CONTRACT CLAUSES

3. Section 252.208-7006 is added to read as follows: 252.208-7006 Required Sources for Antifriction Bearings.

As prescribed in 208.7904 insert the following clause:

REQUIRED SOURCES FOR ANTIFRICTION BEARINGS (AUG 1988)

(a) For the purpose of this clause:

"Bearing" means antifriction bearing or antifriction bearing assembly.

"Commercial product" means a product, other than bearings or items described by and developed under a Military Specification or other DoD prepared specification or purchase description, such as an item, material, component, subsystem, or system sold or traded to the general public in the course of normal business operations at prices based on established catalog or market prices (see FAR 15.804-3 (c) for an explanation of terms);

"Custom/specialty Bearings" means those bearings having tolerances equivalent to super precision-bearings or greater, and those bearings which contain components or have assembly characteristics that meet or exceed ABEC/RBEC 5;

"Domestic manufacture" means wholly manufactured in the United States or Canada. When a bearing assembly is involved, all components of the assembly must be wholly manufactured in the United States or Canada. For purposes of this definition, raw materials, such as preformed bar or rod stock and lubricants, need not be domestically mined or produced.

"Net Export Value" means the value of any bearing manufactured in whole or in part in the United States minus the value of any foreign manufactured components used in that bearing. The value of the imported components in any year may not exceed the value for calendar year 1987 for bearings sold to the Department of Defense. Raw materials, such as preformed bar or rod stock and lubricants, imported for use in domestic manufacture are excluded from the value of imported components.

"Other authorized manufacture" means manufacture in whole or in part by a company which has its corporate headquarters in a NATO participating country (see DFARS 25.001) and which has a United States subsidiary. However a manufacturer's bearings are included within this term only to the extent that (a) the total value of such bearings imported for sale to DoD and its contractors in a calendar year, does not exceed the net export value of bearings exported outside the United States by its United States subsidiaries in calendar year 1987; and (b) the total value of super-precision or custom/specialty bearings imported for sale to DoD and its contractors does not exceed the total value of such bearings imported in calendar year 1987. A list of other authorized bearing manufacturers is at DFARS 208.7901;

"Super-precision Bearings" means antifriction bearings having a precision classification of ABEC/RBEC 5 or higher; and

(b) If the Offeror is a bearing manufacturer, the offeror agrees that, if awarded the contract

(1) bearings and components of bearings supplied under this contract will be of domestic or other authorized manufacture; and

(2) for bearings that are of other authorized manufacture, acceptance by the Government of this offer will not cause the manufacturer to exceed the sales levels described in the definition of the term "other-authorized manufacture".

(c) if the Offeror is not the bearing manufacturer, the offeror agrees that, if awarded the contract, the bearings, components of bearings, or bearings installed in defense end-items or subassemblies supplied under this contract will be of domestic or other-authorized manufacture.

(d) The requirements in paragraph (b) and (c) above may be waived, in whole or in part, by the Government. Before a waiver is granted for a multi-year contract or one that may exceed 12 months, the Contracting Officer will require each offeror to submit a written plan for the transition from bearings that are not of domestic or other authorized manufacture, to domestic manufacture bearings. The plan shall identify all bearings that are not of domestic or other authorized manufacture currently used, their application and source of manufacture, a plan for the transition to domestic manufacture bearings, the costs associated with the transition, and a timetable for transition. If approved, the plan will be incorporated into the contract.

(e) The Contractor will provide written certification upon delivery of the bearings, components of bearings, or defense end-items or subassemblies containing bearings, that to the best of its knowledge and belief, such bearings or components of bearings are of domestic or other-authorized manufacture.

(f) Paragraphs (c) and (d) do not apply to end items and components that are commercial products.

(g) Paragraphs (b), (c), and (d) do not apply to:

(1) Miniature and instrument bearings which are restricted by DEARS Subpart 208.73; and

(2) Bearings covered in the following Military Specifications, for contracts entered into prior to December 31, 1989.

MIL B 6039 Bearing, double row, ball, sealed rod end, antifriction, self-aligning

MIL B	7949	Bearing, ball, airframe, antifriction
MIL B	8942	Bearings, plain, TEE lined, self-aligning
MIL B	8943	Bearing, journal plain and flanged, TFE lined
MIL B	8948	Bearing, plain rod end, TFE lined, self-aligning
MIL B	8952	Bearing, roller, rod end, antifriction self-aligning
MIL B	8976	Bearing, plain, self-aligning, all metal
MIL B	81820	Bearing, plain, self-aligning, self-lubricating, low speed oscillation
MIL B	81934	Bearing, sleeve, plain and flanged, self-lubricating
MIL B	81935	Bearing, plain, rod end, self-aligning, self-lubricating
MIL B	81936	Bearing, plain, self aligning (BeCU, CRES Race)

(h) The Contractor agrees to insert this clause, appropriately modified to reflect the identity of the parties, including this paragraph, in every subcontract and purchase order issued in performance of this contract, unless he knows that the item being purchased contains no bearings or components of bearings.

(End of clause)

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

MAY 15 1992

TO: Producers of Antifriction Bearings

The Department of Commerce is conducting a national security assessment of the antifriction bearing industry in coordination with the Department of Defense. The objective of the assessment is to assist the Department of Defense in its evaluation of the effectiveness of the Defense Federal Acquisition Regulation that restricts usage of imported bearings in defense applications. The enclosed questionnaire requests information directly related to this assessment. This information is needed to supplement data available to both Departments from other sources and to carry out Department of Commerce emergency preparedness responsibilities under Executive Order 12656 of November 18, 1988.

The Department of Commerce must receive your questionnaire response no later than June 19, 1992 to ensure the information you provide is incorporated into this assessment. The questionnaire responses will be treated as confidential and will not be published or disclosed in any manner that would reveal the operations, capacity, or other proprietary information of your firm. Please return completed questionnaire to:

Mr. Brad Botwin, Director
Strategic Analysis Division
BXA/OIRA, Rm. 3878
U.S. Department of Commerce
Washington, D.C. 20230

Questions related to the questionnaire should be directed to Mr. John Tucker, Senior Industry Analyst, (202) 377-3984, or to Ms. Margaret Cahill, Trade and Industry Analyst, (202) 377-3795, Strategic Analysis Division, Department of Commerce. Thank you for your cooperation in this important assessment.

Sincerely,

Brad Botwin, Director
Strategic Analysis Division
Office of Industrial Resource
Administration

DEFINITIONS

BEARING - Consists of a minimum of all of the following: inner race, outer race, and associated rolling elements, rated ABEC or RBEC 1 or higher (or equivalent). These are commonly called antifriction or rolling bearings. (See also definitions of Precision and Superprecision Bearings.)

Bearing Subsets:

MINIATURE AND INSTRUMENT BEARINGS - Ball bearings with an outer race diameter (excluding flanges) of 30 mm or less.

OTHER BALL AND ROLLER BEARINGS - All antifriction bearings, mounted or unmounted, except miniature and instrument bearings: includes ball bearings with outer race diameter over 30 mm, tapered roller bearings, needle roller bearings, cylindrical roller bearings, spherical roller bearings, combination rolling bearings, and other antifriction bearings.

DEFENSE RELATED EXPORTS - Report foreign military sales, shipments of spares for weapon systems, shipments to NATO, or to contractors supplying NATO, and other military related sales.

DFAR - Defense Federal Acquisition Regulation - A DFAR requiring domestic (U.S. or Canadian) manufacture of miniature and instrument bearings has been in effect since April 22, 1971 (48 CFR 208.73). For other ball and roller bearings an interim DFAR requiring domestic manufacture was issued on August 4, 1988 for 3-5 years, and made final on April 12, 1989 (48 CFR 208.79).

ESTABLISHMENT - All facilities in which bearings are produced. Includes auxiliary facilities operated in conjunction with (whether or not physically separate from) such production facilities. Does not include wholly owned distribution facilities.

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.

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 providing Government incentives for contractor capital investment.

MANUFACTURING TECHNOLOGY - Information that is, or will be used to define, monitor, or control processes and equipment used to manufacture material for the Department of Defense. Its objective is: 1) the timely establishment or improvement of the manufacturing processes, techniques, or equipment required to support current and projected programs, and 2) assurance of the ability to produce, reduce lead time, ensure economic availiability of end items, reduce costs, increase efficiency, improve reliability, or to enhance safety and anti-pollution measures.

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 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 been characteristic of your operations.

PART I FIRM IDENTIFICATION

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

_____

_____

_____

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.

_____

_____

_____

Ownership:_____%

3. **MERGERS, ACQUISITIONS AND JOINT VENTURES**: Please describe any U.S. mergers, acquisitions or joint ventures your firm was involved in since the end of 1987 with respect to your bearing operations.

_____

_____

_____

_____

_____

_____

PART II BEARING CAPACITY AND PRODUCTION CONSTRAINTS

1. **U.S. BEARING PRODUCTION CAPACITY:** On the table below, please enter your end-of-1991 U.S. practical capacity, and 1991 production (in units) for each bearing type and bearing component hardened (heat treated) and ground in the United States. Also, please estimate your capacity (again in units) as it was at the end of 1987, and that you plan by the end of 1995. (See definition of **Practical Capacity**, **Precision** and **Superprecision**.)

Bearing Type	Practical Capacity (in units) (end of 1991)	1991 Production (in units)	Changes in Capacity Over Time (in units)	
			Capacity end of 1987	Planned Capacity end of 1995
Single Row Radial PRECISION: Ball Bearings, < 30mm				
Ball Bearings, 30-100mm				
Ball Bearings, > 100mm				
SUPERPRECISION: Ball Bearings, < 30mm				
Ball Bearings, 30-100mm				
Ball Bearings, > 100mm				
Angular Contact Ball Bearings				
Other Ball Bearings				
Thrust Bearings, All Types				
Cylindrical Roller Bearings: Precision				
Superprecision				
Tapered Roller Bearings: Precision				
Superprecision				
Needle Roller Bearings				
Spherical Roller Bearings				
Mounted Bearings				
Other Rolling Bearings				
Rings or Races				
Rolling Elements				
Other Bearing Components				

PART II (continued)

5. **FOREIGN SOURCING**: Please complete the following table for foreign sourced bearing components and steel types for 1987-1991. In the space provided under each year, enter the approximate percentage of the part relative to the total components of that type you used in the United States.

	Percent imported to total used in the United States				
DESCRIPTION	1987	1988	1989	1990	1991
Unhardened, Unground Components: Rings or Races					
Rolling Elements					
Other Components					
Hardened and Ground Components: Rings or Races					
Rolling Elements					
Other Components					
Steel Types: AISI 52100					
AISI 440C					
M50					
Other*					

*Specify

6. **REASONS FOR FOREIGN SOURCING**: Please identify the reasons for foreign sourcing below? You may use the coded (a-f) list of reasons provided. If you respond with a, e, or f - please briefly explain the circumstances (i.e., country of origin, why not domestically available, what is the global strategy, etc.).

a. domestic source not available
b. lower price
c. higher quality
d. quicker delivery
e. part of global strategy
f. other (specify:_____)

Reason(s) for foreign sourcing:_____

_____

_____

_____

PART IV INVESTMENT AND FINANCIAL INFORMATION

1. **INVESTMENT**: Enter expenditures for plant, new machinery and equipment, and used or rebuilt machinery and equipment (in $000s) from 1987-1991, and projected amounts from 1992-1995 as requested below. Include only dollar amounts that apply to your bearing manufacturing operations.

	INVESTMENT IN U.S. BEARING OPERATIONS (in thousands of dollars)	
	Plant	New Machinery and Equipment
1987		
1988		
1989		
1990		
1991		
projected 1992		
1993		
1994		
1995		

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

If none, check here____

PART IV (continued)

5. **PROFITABILITY**: Please enter the financial information (in $000s) as specified below for the years 1987-1991 for a) your parent firm, and b) the dollar amounts that apply exclusively to your U.S. bearing manufacturing operations. **Please photocopy this page if both a) and b) apply.**

	PROFITABILITY (in $000s)				
	1987	1988	1989	1990	1991
Net Sales (1)					
Cost of Goods Sold (2)					
Operating Income (3)					
Net Income before taxes (4)					

(1)a) Total Parent Company Sales b) Bearing Sales
(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

6. **FINANCIAL BALANCES**: Please provide end of year balance sheet information (in $000s) as specified below for 1987-1991 for a) your parent firm, and b) the dollar amounts that apply exclusively to your U.S. bearing manufacturing operations. **Please photocopy this page if both a) and b) apply.**

	FINANCIAL BALANCES (in $000s)				
	1987	1988	1989	1990	1991
Current Assets					
Current Liabilities					
Inventories					
Total Assets					
Short Term Debt (1)					
Long Term Debt (2)					

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

7. **DFAR'S EFFECT ON PROFITS AND FINANCIAL BALANCES**: What impact has the bearing DFAR had on your profits and financial balances?

7. **TOTAL SHIPMENTS**: Please report **total shipments** (commercial and military) by bearing type in units and dollar values (in $000s) as specified below for each bearing type from 1987-1991. (See definition of **Shipments**.)

	Report Unit Shipments					Report Dollar Shipments (in $000s)				
Bearing Type	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Single Row Radials PRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
SUPERPRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
Angular Contact Ball Bearings										
Other Ball Bearings										
Thrust Bearings, all types										
Cylindrical Roller Bearings: Precision										
Superprecision										
Tapered Roller Bearings Precision										
Superprecision										
Needle Roller Bearings										
Spherical Roller Bearings										
Mounted Bearings										
Other Rolling Bearings										
Bearing Components	(complete for value only)									

8. **DEFENSE SHIPMENTS**: Please report **defense shipments** (direct to defense and indirect through defense contractors) by bearing type in units and dollar values (in $000s) as specified below for each bearing type from 1987-1991. (See definition of **Shipments**.)

	Report Unit Shipments					Report Dollar Shipments (in $000s)				
Bearing Type	1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Single Row Radials PRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
SUPERPRECISION: Ball Bearings, < 30 mm										
Ball Bearings, 30-100 mm										
Ball Bearings, > 100 mm										
Angular Contact Ball Bearings										
Other Ball Bearings										
Thrust Bearings, all types										
Cylindrical Roller Bearings: Precision										
Superprecision										
Tapered Roller Bearings Precision										
Superprecision										
Needle Roller Bearings										
Spherical Roller Bearings										
Mounted Bearings										
Other Rolling Bearings										
Bearing Components	(complete for value only)									

PART V (continued)

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. bearing manufacturing operations at any time since the end of 1987? If so, please identify the following:

i. Beginning/Ending Year: _____

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: _____

_____

_____

_____

c. Has the program(s):

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?

_____

_____

_____

PART VI COMPETITIVE FACTORS

1. **COMPETITIVE PROSPECTS**: How do you view the competitive prospects for your firm's U.S. bearing production operations over the next five years?

They should:
- improve greatly _____
- improve somewhat _____
- stay the same _____
- decline somewhat _____
- decline greatly _____

Please discuss the basis for your answer._____

_____

_____

_____

2. **COMPETITIVE ADVANTAGES/DISADVANTAGES**: What are the major competitive advantages/disadvantages you perceive for your firm over the next five years?

_____

_____

_____

_____

_____

_____

3. **ACTIONS TO IMPROVE COMPETITIVENESS**: What actions have you taken since 1987 to increase your competitiveness? What plans do you have to increase your competitiveness in the future?

_____

_____

_____

_____

_____

PART VI (continued)

8. **BUSINESS GAINS/LOSSES (DFAR RELATED):**

a. Has your firm been qualified for additional defense business as a result of the DFAR? yes___, no___
If yes, has this introduced you to new customers? yes___, no___

b. Please estimate the annual dollar value of foreign sourced bearings (previously used in defense systems) you have displaced with U.S. manufactured product as a result of the DFAR.

1988 $_____
1989 $_____
1990 $_____
1991 $_____

c. Please estimate, if any, the annual dollar value of foreign sourced bearings previously supplied to commercial accounts that you have displaced with U.S. manufactured product since the end of 1987.

$_____

9. **COMPETITIVE AND OTHER EFFECTS OF THE DFAR:** What competitive and other favorable or unfavorable impacts has the DFAR had on your U.S. bearing operations?

_____

_____

_____

_____

APPENDIX - C: DFAR - Federal Register Notices

Ref. # 76

U.S. Department of Commerce
Bureau of Export Administration

OMB Control # 0694-0074
expires 9/30/92

NATIONAL SECURITY ASSESSMENT OF THE DEFENSE FEDERAL ACQUISITION REQULATIONS ON BALL AND ROLLER BEARINGS

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. Sec. 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 (15 C.F.R. 700.91(e)).**

BURDEN ESTIMATE AND REQUEST FOR COMMENT

Public reporting burden for this collection of information is estimated to average 4-12 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, D.C. 20230, and to the Office of Management and Budget, Paperwork Reduction Project (0694-0074), Washington, D.C. 20503.

GENERAL INSTRUCTIONS

1. Please complete this questionnaire in its entirety as it applies to U.S. antifriction bearing manufacturing operations. **Your response is due June 19,1992.** The survey has six parts as follows:

PART I	Firm Identification	PART IV	Investment and Financial Information
PART II	Capacity and Shipments	PART V	Technology
PART III	Employment Information	PART VI	Competitive Factors

2. **SMALL FIRM EXEMPTION:** Firms with 1991 antifriction bearing and/or bearing component shipments of less than $5 million are only required to complete the following: PART I (all); PART II-#1,2,7,8 (for 7,8-'91 data only); PART III-#1,3 (for 1-'91 data only); PART IV-#1,5,6,7 (for 1,5,6- '91 data only); PART VI-#5,6,8. Also see Contents of Ball and Roller Bearing Survey, page i (the 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". If an answer is "none", please indicate. Report calendar year data, unless otherwise specified in a particular question. Please make photocopies of forms if additional copies are needed.

4. Questions related to the questionnaire should be directed to Mr. John Tucker, Senior Industry Analyst, (202) 377-3984, or Ms. Margaret Cahill, Trade and Industry Analyst (202) 377-3795, 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 contact your firm. Return completed questionnaire by June 19, 1992 to:

Mr. Brad Botwin, Director
Strategic Analysis Division
BXA/OIRA, Rm. 3878
U.S. Department of Commerce
Washington, D.C. 20230

DEPARTMENT OF DEFENSE

48 CFR Parts 208 and 252

Department of Defense Federal Acquisition Regulation Supplement; Antifriction Bearings

AGENCY: Department of Defense (DOD)

ACTION: Interim Rule and Request for Comments.

SUMMARY: The Defense Acquisition Regulatory (DAR) Council has approved adding a new Subpart 208.79 to the Defense Federal Acquisition Regulation Supplement to restrict procurement of antifriction bearings and bearing components for use by the DoD to domestic sources. This restriction was deemed necessary to protect and strengthen the domestic industrial base for an industry critical to National security.

DATE: Comments on this proposed addition should be submitted in writing to the Executive Secretary, DAR Council, at the address shown below, on or before (60 days from date of publication), to be considered in the formulation of the final rule. Please cite DAR Case 88-35 in all correspondence relating to this issue.

ADDRESS: Interested parties should submit written comments to: Defense Acquisition Regulatory Council, ATTN: Mr. Charles W. Lloyd, Executive Secretary, DAR Council, ODASD(P)/DARS, c/o OASD(P&L) (MRS), Room 3D139, The Pentagon, Washington, DC 20301-3062.

FOR FURTHER INFORMATION CONTACT: Mr. Gregory E. Saunders, Assistant for Commercial Acquisition, OASD(P6L)PS/SDM, Room 2A318, Pentagon, Washington, DC 20301-8000, telephone (202)695-7915.

EFFECTIVE DATE: August 4, 1988

SUPPLEMENTARY INFORMATION:

A. Background

The DAR Council published a proposed rule at 53 F.R. 10129 dated March 29, 1988. Comments was received from over 30 different respondents, both foreign and domestic. As a result of these comments, the following changes were made to the proposed rule:

(1) definition of domestic manufacture was clarified.

(2) definition of commercial product clarified to indicate bearings or items described by and developed under (a) a military

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GENERAL INSTRUCTIONS

1. Please complete this questionnaire in its entirety as it applies to U.S. antifriction bearing manufacturing operations. **Your response is due June 19,1992.** The survey has six parts as follows:

PART I	Firm Identification	PART IV	Investment and Financial Information
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DEPARTMENT OF DEFENSE

48 CFR Parts 208 and 252

Department of Defense Federal Acquisition Regulation Supplement; Antifriction Bearings

AGENCY: Department of Defense (DOD)

ACTION: Interim Rule and Request for Comments.

SUMMARY: The Defense Acquisition Regulatory (DAR) Council has approved adding a new Subpart 208.79 to the Defense Federal Acquisition Regulation Supplement to restrict procurement of antifriction bearings and bearing components for use by the DoD to domestic sources. This restriction was deemed necessary to protect and strengthen the domestic industrial base for an industry critical to National security.

DATE: Comments on this proposed addition should be submitted in writing to the Executive Secretary, DAR Council, at the address shown below, on or before (60 days from date of publication), to be considered in the formulation of the final rule. Please cite DAR Case 88-35 in all correspondence relating to this issue.

ADDRESS: Interested parties should submit written comments to: Defense Acquisition Regulatory Council, ATTN: Mr. Charles W. Lloyd, Executive Secretary, DAR Council, ODASD(P)/DARS, c/o OASD(P&L) (MRS), Room 3D139, The Pentagon, Washington, DC 20301-3062.

FOR FURTHER INFORMATION CONTACT: Mr. Gregory E. Saunders, Assistant for Commercial Acquisition, OASD(P6L)PS/SDM, Room 2A318, Pentagon, Washington, DC 20301-8000, telephone (202)695-7915.

EFFECTIVE DATE: August 4, 1988

SUPPLEMENTARY INFORMATION:

A. Background

The DAR Council published a proposed rule at 53 F.R. 10129 dated March 29, 1988. Comments was received from over 30 different respondents, both foreign and domestic. As a result of these comments, the following changes were made to the proposed rule:

(1) definition of domestic manufacture was clarified.

(2) definition of commercial product clarified to indicate bearings or items described by and developed under (a) a military

(b) Miniature and instrument bearings restricted by Subpart 208.73;

(c) Bearings covered by the following Military Specifications, for contracts entered into prior to December 31, 1989.

MIL B 6039 Bearing, double row, ball, sealed rod end, antifriction, self-aligning

MIL B 7949 Bearing, ball, airframe, antifriction

MIL B 8952 Bearing, roller, rod end, antifriction self-aligning

[3] **208.7902 Policy.**

(a) It has been determined that the ability of the United States bearing industry to meet industrial surge and mobilization requirements for bearings is in serious jeopardy. In view of the national security significance of bearings, the DoD has determined that except as provided in (b) below, all bearings, components of bearings, or items containing bearings, whether procured directly or installed in defense end-items and subassemblies shall be of domestic manufacture. This restriction shall remain in effect for contracts awarded through September 30, 1991. The restriction may be extended an additional two years if conditions warrant.

(b) This subpart does not apply to:

(1) Miniature and instrument bearings restricted by Subpart 208.73;

(2) Bearings covered by the following Military Specifications, for contracts entered into prior to December 31, 1989.

MIL B 6039 Bearing, double row, ball, sealed rod end, antifriction, self-aligning

MIL B 7942 Bearing, ball, airframe, antifriction

MIL B 8942 Bearings, plain, TFE lined, self-aligning

MIL B 8943 Bearing, journal plain and flanged, TFE lined

MIL B 8948 Bearing, plain rod end, TFE lined, self-aligning

MIL B 8952 Bearing, roller, rod end, antifriction self-aligning

MIL B 8976 Bearing, plain, self-aligning, all metal

CHAPTER 2–DEPARTMENT OF DEFENSE

SUBCHAPTER B–COMPETITION AND ACQUISITION PLANNING

PART 208–REQUIRED SOURCES OF SUPPLIES AND SERVICES

Subpart 208.79– Antifriction Bearings
(April 12, 1989)

[1] **208.7900 Definitions.**

As used in this subpart:

"Bearing components" means bearing elements, retainers, inner races, or outer races.

"Bearings" means antifriction bearings.

"Commercial product" is as defined in FAR 11.001, except that for purposes of this subpart it does not include (1) items designed or developed under a government contract, or (2) bearings or bearing components.

"Custom/speciality Bearings" means those bearings having tolerances equivalent to super precision-bearings or greater, and those bearings which contain components or have assembly characteristics that meet or exceed ABEC/RBEC 5.

"Domestic manufacture" means wholly manufactured in the United States or Canada. When a bearing assembly is involved, all components of the assembly must be wholly manufactured in the United States or Canada. Unless otherwise specified, raw materials, such as preformed bar, tube or rod stock and lubricants, need not be domestically mined or produced.

"Miniature and instrument ball Bearings" means rolling element ball bearings having a basic outside diameter (exclusive of flange diameters) of 30 millimeters or less, irrespective of material, tolerance, performance, or quality characteristics (see DFARS 208.73).

"Super-precision Bearings" means bearings having a precision classification of ABEC/RBEC 5 or higher.

[2] **208.7901 Applicability.**

This subpart does not apply to:

(a) Commercial products as defined in this subpart;

MIL B 81820 Bearing, plain, self-aligning, self-lubricating, low speed oscillation

MIL B 81934 Bearing, sleeve, plain and flanged, self-lubricating

MIL B 81935 Bearing, plain, rod end, self-aligning, self-lubricating

MIL B 81936 Bearing, plain, self-aligning (BeCU, CRES Race)

[4] **208.7903 Procedures.**

(a) The Head of the Contracting Activity, without delegation, may waive the domestic bearings requirements of this subpart if there is a determination that there is no domestic bearing manufacturer that meets the requirement or if it is not in the best interest of the United States to qualify a domestic bearing to replace a qualified nondomestic bearing. This determination must be based on a finding that the qualification of a domestic manufacture bearing would cause unreasonable costs or delays.

(b) The determination of unreasonableness should be made in consideration of the DoD policy to assist the United States industrial mobilization base by awarding more contracts to domestic bearing manufacturers thereby increasing their capability to reinvest and to become more competitive.

(c) Before a waiver is granted for a multiyear contract or contract that may exceed 12 months, the contracting officer shall require offerors to submit a written plan for transitioning from the use of nondomestic to domestic manufacture bearings. The plan shall be reviewed to determine whether a domestic manufacture bearing can be qualified at a reasonable cost, and used in lieu of the foreign bearing during the course of the contract period. If approved, the plan shall be incorporated in the contract and shall:

(1) Identify the bearings that are not domestic or other authorized manufacture, application, and source of supply;

(2) Describe the transition, including cost and timetable, for providing a domestic manufacture bearing. The timetable for completing the transition should normally not exceed one year from the date of the waiver.

[5] **208.7904 Contract clause.**

The clause set forth at 252.208-7006, Required Sources for Anti-friction Bearings, shall be inserted in all solicitations and resultant contracts, and before exercising an option, except:

(a) Where the contracting officer knows that the item being procured does not contain bearings;

(b) When purchasing commercial products;

(c) When purchasing foreign manufactured bearings, components of bearings, or foreign manufactured products containing bearings overseas for use overseas;

(d) When purchasing for use in a cooperative or co-production project under an international agreement;

(e) When using small purchase procedures, other than in purchases of bearings as the end item.

[6] 208.7905 Solicitation provision and contract clause.

(a) Except as provided in (b) below the clause set forth at 252.208-7006, Required Sources for Antifriction Bearings, shall be inserted in all solicitations and contracts.

(b) The requirements of (a) above shall not apply when:

(1) The contracting officer knows that the item being procured does not contain bearings;

(2) Purchasing foreign manufactured bearings, bearing components, or foreign manufactured products containing bearings overseas for use overseas;

(3) Purchasing bearings, bearing components, or items containing bearings for use in a cooperative or co-production project under an international agreement;

(4) Using small purchase procedures, other than in purchases of bearings as the end item.

[1] SOURCE: 54 FR 14654, Apr. 12, 1989; 54 FR 16438-T, Apr. 24, 1989, as amended at 54 FR 20592, May 12, 1989

AUTHORITY: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, DoD FAR Supplement 201.301.

[2] SOURCE: 54 FR 14654, Apr. 12, 1989; 54 FR 20592, May 12, 1989

AUTHORITY: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, DoD FAR Supplement 201.301.

[3] SOURCE: 53 FR 29333, Aug. 4, 1988

AUTHORITY: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, DoD FAR Supplement 201.301.

[4] SOURCE: 53 FR 29333, Aug. 4, 1988

AUTHORITY: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, DoD FAR Supplement 201.301.

[5] SOURCE: 53 FR 29333, Aug. 4, 1988

AUTHORITY: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, DoD FAR Supplement 201.301.

[6] SOURCE: 54 FR 14654, Apr. 12, 1989

AUTHORITY: 5 U.S.C. 301, 10 U.S.C. 2202, DoD Directive 5000.35, DoD FAR Supplement 201.301.

APPENDIX - D: Trade Statistics

ANTIFRICTION BEARING SHIPMENTS, TOTALS BY BEARING PRODUCT, 1987-1991

(in thousands of dollars)

PRODUCT DESCRIPTION	1987	1988	1989	1990	1991
Ball bearings, radial with od under 9mm, ABEC 1-3	na	na	2630	1923	na
Ball bearings, radial with od under 9mm, ABEC 5 and over	na	na	12963	12492	na
Ball bearings, radial with od over 9mm to 30mm, ABEC 1-3	53191	57010	60800	50441	46478
Ball bearings, radial with od over 9mm to 30mm, ABEC 5 and over	na	na	53796	51628	49628
Ball bearings, radial with od over 30mm to 52mm, ABEC 1-3	95535	103818	110434	121283	132490
Ball bearings, radial with od over 30mm to 52mm, ABEC 5 and over	28082	26870	41857	39555	41544
Ball bearings, radial with od over 52mm to 100mm, ABEC 1-3	101387	110668	120861	149313	132966
Ball bearings, radial with od over 52mm to 100mm, ABEC 5 and over	42021	48469	36179	37335	32962
Ball bearings, radial with od over 100mm, ABEC 1-3	92368	86071	112175	128758	107960
Ball bearings, radial with od over 100mm, ABEC 5 and over	56749	47571	41508	46501	39487
Ball bearings, radial, maximum capacity type, single row	18502	21483	20703	27017	18758
Ball bearings with integral shafts having an od <=30mm	11375	14032	14989	14213	11379
Ball bearings with integral shafts having an od >30mm	na	na	267754	na	na
Ball bearings, double row	47018	74868	58480	80644	85319
Ball bearings, angular contact	58744	68816	97105	104328	131635
Ball bearings, thrust, ground	32709	29391	37300	36488	33986
Ball bearings, thrust, unground	8866	10037	6731	5133	5986
Ball bearings, all other precision, ABEC 1	41714	90119	67200	na	17656
Ball bearings, ground, less than ABEC 1	na	na	58881	62059	na
Ball bearings, unground	73515	86034	91137	82648	76959
Ball bearings, nes (includes linear)	96274	98853	107378	123037	na
Tapered roller bearings, cup and cone assemblies	138108	144521	296300	285992	260872
Tapered roller bearings, cone aseemblies	426006	404225	448247	471253	415685
Tapered roller bearings, cup assemblies or cups	190525	196954	219347	220094	200202
Other cylindrical roller bearings, RBEC 1 and 3	113606	148544	139739	140491	129788
Other cylindrical roller bearings, RBEC 5	104464	84593	92333	102047	93047
Needle roller bearings	316276	378822	361247	350951	311590
Spherical roller bearings, single row	19525	24179	28464	26377	24109
Spherical roller bearings, double row	120185	130779	165963	182179	161619
Other roller bearings, nes	63800	67387	61821	70363	75805
Mounted ball bearings, unit and/or split mounted	171694	197733	186766	197444	170565
Mounted roller bearings, unit mounted	108235	127219	131215	137196	121565
Mounted roller bearings, split mounted	25693	33249	26960	28257	30780
Balls for ball bearings	103119	113645	124914	133177	132122
Parts of ball bearings, nes	22399	29189	39073	41363	na
Parts of tapered roller bearings, nes	na	na	20923	22031	na
Parts of roller bearings, nes	245076	249402	125154	107525	na
Rollers for roller bearings	70029	71181	75994	78323	61281
TOTAL SHIPMENTS	3550905	3899192	3944398	4064231	3762235

(includes estimates)

ANTIFRICTION BEARING SHIPMENTS, TOTALS BY BEARING PRODUCT, 1987-1991

(in thousands of dollars)

PRODUCT DESCRIPTION	1987	1988	1989	1990	1991
Ball bearings, radial with od under 9mm, ABEC 1-3	2598	2614	2630	1923	2552
Ball bearings, radial with od under 9mm, ABEC 5 and over	13804	13383	12963	12492	13759
Ball bearings, radial with od over 9mm to 30mm, ABEC 1-3	53191	57010	60800	49786	46478
Ball bearings, radial with od over 9mm to 30mm, ABEC 5 and over	40757	47276	53796	61027	49628
Ball bearings, radial with od over 30mm to 52mm, ABEC 1-3	95535	103818	110434	121411	132490
Ball bearings, radial with od over 30mm to 52mm, ABEC 5 and over	28082	26870	41857	39729	41544
Ball bearings, radial with od over 52mm to 100mm, ABEC 1-3	101387	110668	120861	148608	132966
Ball bearings, radial with od over 52mm to 100mm, ABEC 5 and over	42021	48469	36179	37486	32962
Ball bearings, radial with od over 100mm, ABEC 1-3	92368	86071	112175	128758	107960
Ball bearings, radial with od over 100mm, ABEC 5 and over	56749	47571	41508	46501	39487
Ball bearings, radial, maximum capacity type, single row	18502	21483	20703	25797	18758
Ball bearings with integral shafts having an od <=30mm	11375	14032	14989	14213	11379
Ball bearings with integral shafts having an od >30mm	351133	407835	267754	227641	239003
Ball bearings, double row	47018	74868	58480	78837	85319
Ball bearings, angular contact	58744	68816	97105	117972	131635
Ball bearings, thrust, ground	32709	29391	37300	36539	33986
Ball bearings, thrust, unground	8866	10037	6731	5133	5986
Ball bearings, all other precision, ABEC 1	41714	90119	67200	56910	17656
Ball bearings, ground, less than ABEC 1	45823	52352	58881	62059	54779
Ball bearings, unground	73515	86034	91137	82648	76959
Ball bearings, nes (includes linear)	96274	98853	107378	113484	123697
Tapered roller bearings, cup and cone assemblies	138108	144521	296300	285992	260872
Tapered roller bearings, cone aseemblies	426006	404225	448247	471253	415685
Tapered roller bearings, cup assemblies or cups	190525	196954	219347	220094	200202
Other cylindrical roller bearings, RBEC 1 and 3	113606	148544	139739	140491	129788
Other cylindrical roller bearings, RBEC 5	104464	84593	92333	102047	93047
Needle roller bearings	316276	378822	361247	350951	311590
Spherical roller bearings, single row	19525	24179	28464	26377	24109
Spherical roller bearings, double row	120185	130779	165963	182179	161619
Other roller bearings, nes	63800	67387	61821	70363	75805
Mounted ball bearings, unit and/or split mounted	171694	197733	186766	197444	170565
Mounted roller bearings, unit mounted	108235	127219	131215	137196	121565
Mounted roller bearings, split mounted	25693	33249	26960	28257	30780
Balls for ball bearings	103119	113645	124914	133177	132122
Parts of ball bearings, nes	22399	29189	39073	61674	73952
Parts of tapered roller bearings, nes	0	0	20923	22031	20000
Parts of roller bearings, nes	245076	249402	125154	109459	100270
Rollers for roller bearings	70029	71181	75994	78323	61281
TOTAL SHIPMENTS	3550905	3899192	3944398	4064231	3762235

ANTIFRICTION BEARING EXPORTS, TOTALS BY BEARING PRODUCT, 1987-JUNE, 1992

(in thousands of dollars)

PRODUCT DESCRIPTION	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Ball bearings, radial with od under 9mm	1558	793	4025	5414	15466	5396	4109
Ball bearings, radial with od over 9mm to 30mm	4054	6900	12321	13518	11214	6938	4434
Ball bearings, radial with od over 30mm to 52mm	5621	7901	10203	12602	1760	1651	1602
Ball bearings, radial with od over 52mm to 100mm	7783	13006	16225	15504	11333	5701	4806
Ball bearings, radial with od over 100mm	15074	19606	18621	20632	22023	13564	11530
Ball bearings, unground	0	0	0	0	126	57	129
Ball bearings, radial, nes	0	0	0	0	1790	0	0
Ball bearings, radial, double row	0	0	0	0	474	175	305
Ball bearings, radial, maximum capacity type	0	0	0	0	239	152	351
Ball bearings with integral shafts	3480	6191	13552	13660	11196	7287	6003
Ball bearings, other than radial	32050	29616	30463	31850	45828	25011	26067
Ball bearings, angular contact, nes	0	0	0	0	2253	0	0
Ball bearings, angular contact, wheel hub, flanged	0	0	0	0	33	26	0
Ball bearings, angular contact, wheel hub, other	0	0	0	0	974	636	349
Ball bearings, thrust	0	0	0	0	467	76	550
Ball bearings, linear	0	0	0	0	197	104	232
Tapered roller bearings and parts	141158	164148	0	0	0	8958	8421
Tapered roller bearings, cup&cone assemblies with cups od <=102mm	0	0	0	0	8815	4435	3971
Tapered roller bearings, cup&cone assemblies with cups od >102mm	0	0	136044	127552	65316	54003	42037
Tapered roller bearings, cup&cone assemblies, wheel hub, other	0	0	0	0	4504	1657	3000
Tapered roller bearings, cup&cone assemblies, wheel hub, flanged	0	0	0	0	1841	1031	429
Tapered roller bearings, cone assemblies for cups with od <=102mm	0	0	0	0	14505	8009	8634
Tapered roller bearings, cone assemblies for cups with od >102mm	0	0	0	0	26707	11689	15753
Tapered roller bearings, cup assemblies or cups	0	0	25225	29567	21683	730	686
Roller bearings and parts, nes	65361	81204	0	0	0	5882	5529
Other cylindrical roller bearings	0	0	24397	25923	21711	9456	9034
Needle roller bearings	0	0	31268	30062	23423	11241	9704
Spherical roller bearings	16732	15594	24304	38982	0	4282	4025
Spherical roller bearings, single row	0	0	0	0	3651	0	0
Spherical roller bearings, nes	0	0	0	0	29250	861	1533
Mounted ball bearings	14382	14153	14572	13460	8824	5851	6722
Mounted roller bearings	6416	6223	4204	4737	8700	4656	2634
Other ball and roller bearings, including combination	0	0	26390	24716	0	2506	2356
Other ball and roller bearings, nes	0	0	0	0	24246	0	0
Combined ball and cylindrical roller bearings	0	0	0	0	173	59	114
Combined ball and needle roller bearing	0	0	0	0	34	6	39
Combined ball and spherical roller bearing	0	0	0	0	245	55	158
Parts of ball bearings, nes	6616	6150	3776	2415	2832	256	241

ANTIFRICTION BEARING EXPORTS, TOTALS BY BEARING PRODUCT, 1987-JUNE, 1992

(in thousands of dollars)

PRODUCT DESCRIPTION	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Balls for ball bearings	6965	9320	13748	15679	0	974	916
Balls for ball bearings, alloy steel	0	0	0	0	15431	5850	9120
Balls for ball bearings, not of alloy steel	0	0	0	0	1598	552	1467
Inner and outer races for ball bearings	0	0	2905	2856	1655	917	1768
Parts of tapered roller bearings, nes	0	0	9507	14948	14274	587	552
Rollers for tapered roller bearings	0	0	0	0	3410	1628	2356
Parts of roller bearings, nes	0	0	10301	8751	11943	533	501
Rollers for roller bearings	2925	3581	0	0	0	401	377
Rollers for roller bearings, except needles	0	0	20342	27979	0	1137	1069
Rollers for roller bearings, nes	0	0	0	0	17066	7747	5272
Rollers for cylindrical roller bearings	0	0	0	0	1790	1102	478
Rollers for needle roller bearings	0	0	3232	2026	1094	697	733
Rollers for spherical roller bearings	0	0	0	0	100	61	17
Parts of cylindrical roller bearings, nes	0	0	0	0	39	32	47
Parts of needle roller bearings, nes	0	0	0	0	430	174	624
Parts of spherical roller bearings	2458	2557	1248	344	0	307	754
Parts of spherical roller bearings, nes	0	0	0	0	186	0	0
Parts of ball and roller mounted bearings	6201	6856	5921	6334	6995	618	581
	0	0	0	0	0	0	0
TOTAL BEARING PRODUCT EXPORTS	338834	393799	462794	489511	467844	225714	212119

ANTIFRICTION BEARING EXPORTS, TOTALS BY COUNTRY OF DESTINATION, 1987-JUNE, 1992
(in thousands of dollars)

Country of Destination	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Algeria	76	138	0	0	111	61	0
Angola	0	0	0	0	15	10	26
Argentina	3375	3490	0	0	3823	565	1150
Aruba	0	5	0	0	18	0	0
Australia	11719	15527	20720	18609	17778	7373	7967
Austria	159	549	1595	2974	2083	621	209
Bahamas	54	103	71	146	171	118	13
Bahrain	11	61	289	110	169	70	115
Bangladesh	10	12	0	0	14	11	0
Barbados	4	33	0	0	6	6	0
Belgium	0	10681	14594	12342	9899	6001	5118
Belgium and Luxembourg	7898	0	0	0	0	0	0
Belize	13	7	10	30	45	45	8
Bermuda	70	35	0	0	5	5	0
Bolivia	212	204	268	331	311	220	99
Botswana	17	0	0	0	0	0	0
Brazil	18248	15697	17624	17633	16791	6023	5041
British Virgin	0	0	0	0	5	5	0
Brunei	2	0	0	0	0	0	0
Cameroon	24	0	0	0	3	0	0
Canada	96264	105394	105694	101421	94806	51099	48035
Cayman Islands	0	0	0	3	4	4	0
Central African Republic	0	0	5	0	0	0	0
Chad	0	3	7	0	0	0	0
Chile	1255	1472	1691	2202	1942	846	1466
China	419	889	4310	3746	3035	1139	2853
Colombia	6742	10178	7688	5371	3543	1589	1957
Costa Rica	420	243	523	601	316	103	251
Cyprus	24	26	47	0	0	0	0
Czechoslovakia	2	0	0	0	0	0	0
Denmark	241	316	469	757	260	157	133
Dominica	0	0	11	26	0	0	0
Dominican Republic	1133	533	928	827	607	235	242
Ecuador	971	729	1080	1036	1228	660	507
Egypt	872	188	300	280	842	1263	156
El Salvador	241	352	284	278	265	111	169
Ethiopia	0	4	3	0	0	0	0
Federated States of Micronesia	0	0	4	0	0	0	0

ANTIFRICTION BEARING EXPORTS, TOTALS BY COUNTRY OF DESTINATION, 1987-JUNE, 1992
(in thousands of dollars)

Country of Destination	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Fiji	0	0	6	30	0	0	0
Finland	347	404	797	831	319	249	240
France	9578	14100	19015	16870	14323	8298	5995
French Polynesia	0	0	0	3	0	0	0
Gabon	7	14	6	0	0	0	0
Germany, East	9	11	5	122	0	0	0
Germany, West	30178	38262	55525	61251	48305	24916	17480
Ghana	115	38	57	140	22	10	5
Gibraltar	0	0	16	113	0	0	0
Greece	230	147	142	158	20	4	19
Guadeloupe	0	6	0	0	0	0	0
Guatemala	570	805	847	490	454	230	312
Guinea	147	238	69	89	235	0	0
Guyana	51	26	13	128	51	27	13
Haiti	9	17	28	25	0	0	0
Honduras	304	354	447	521	622	455	76
Hong Kong	644	764	1690	2622	1621	700	954
Hungary	70	0	6	160	326	224	348
Iceland	9	28	39	20	5	0	0
India	9113	9719	11519	9971	9138	2352	4105
Indonesia	214	158	517	1259	1205	173	25
Iran	0	0	32	88	2676	630	0
Iraq	0	155	42	326	0	0	0
Ireland	396	267	685	613	632	389	382
Israel	1092	1249	2221	1929	3012	1584	1182
Italy	6661	7222	9143	11150	10722	6438	5778
Ivory Coast	0	0	14	63	60	12	10
Jamaica	231	277	309	271	278	81	149
Japan	9017	13027	23187	26062	32256	16453	17421
Jordan	72	106	21	82	247	21	125
Kenya	16	8	21	3	32	11	0
Korea, South	4295	6486	14194	18514	12398	5579	8071
Kuwait	124	21	109	63	109	0	39
Lebanon	45	53	8	14	45	0	83
Liberia	146	10	52	3	11	0	0
Luxembourg	0	19	258	219	473	206	93
Malaysia	183	319	539	959	938	583	550
Mali	2	0	0	0	0	0	0

ANTIFRICTION BEARING EXPORTS, TOTALS BY COUNTRY OF DESTINATION, 1987-JUNE, 1992
(in thousands of dollars)

Country of Destination	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Malta and Gozo	5	0	0	5	18	0	0
Marshall Islands	0	0	0	0	19	11	0
Martinique	0	0	0	5	30	0	0
Mauritania	53	12	21	92	11	22	0
Mauritius	0	3	0	9	0	0	0
Mexico	29270	38640	51164	50711	57366	29621	26510
Morocco	68	190	34	8	33	33	8
Mozambique	0	0	0	38	0	0	0
Neth Antilles	49	10	46	52	164	28	31
Netherlands	5916	6181	7318	8023	7198	3770	3090
New Caledonia	0	0	3	6	3	0	0
New Zealand	365	459	621	673	381	117	87
Nicaragua	2	0	0	94	47	0	5
Nigeria	85	10	88	51	159	56	57
Norfolk Island	0	119	72	0	0	0	0
Norway	182	270	343	560	259	213	380
Oman	4	24	45	0	0	0	0
Other Pacific Islands	3	0	0	0	0	0	0
Pakistan	84	138	277	203	119	80	150
Panama	2093	1695	364	318	689	259	366
Papua New Guinea	49	13	20	12	0	0	0
Paraguay	269	377	138	213	178	46	164
Peru	1498	1252	1717	1542	999	304	225
Philippines	1709	2132	2504	1464	3522	2704	652
Poland	69	97	311	98	81	19	33
Portugal	50	13	154	110	78	39	6
Qatar	0	40	0	0	0	0	0
Republic of South Africa	6871	10327	11405	16195	13118	4483	5878
Reunion	0	0	2	0	0	0	0
Romania	12	23	63	3	4	0	0
Saudi Arabia	838	1279	1450	1501	1731	256	423
Senegal	0	16	0	18	16	0	0
Sierra Leone	9	35	129	39	85	39	46
Singapore	3606	5186	7526	9829	12692	2917	3563
Soviet Union	55	13	12	199	134	53	0
Spain	1518	2005	4869	4437	5439	2403	5020
Sri Lanka (Ceylon)	13	6	6	0	0	0	21
St Christopher and Nevis	0	0	330	0	6	0	0

ANTIFRICTION BEARING EXPORTS, TOTALS BY COUNTRY OF DESTINATION, 1987-JUNE, 1992
(in thousands of dollars)

Country of Destination	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
St Lucia	0	0	3	5	0	0	0
St Vincent and the Grenadines	0	3	2	5	0	0	0
Sudan	29	0	17	104	32	0	0
Suriname	165	285	301	257	181	76	132
Sweden	3383	1820	2978	11330	10487	4376	1103
Switzerland	968	1049	1192	1317	1415	689	362
Syria	29	19	22	22	138	5	0
Taiwan	3662	3506	5783	6252	7108	3177	2575
Tanzania	0	33	82	116	0	0	0
Thailand	938	1327	1688	2722	1847	811	604
Togo	0	0	0	0	18	18	0
Trinidad and Tobago	269	200	292	324	210	95	291
Tunisia	3	20	7	13	17	18	0
Turkey	8348	1386	1452	2312	1995	889	346
Turks and Caicos Islands	0	4	0	21	0	0	0
United Arab Emirates	69	62	91	212	269	179	34
United Kingdom	25454	36112	29120	32423	29952	14766	14342
Uruguay	285	208	207	104	98	70	28
Venezuela	15311	15259	8021	10002	10662	4919	6450
Western Africa,	7	0	0	0	0	0	0
Yemen (Sana)	0	0	0	0	22	19	0
Yugoslavia	496	312	312	1259	107	82	144
Zaire	183	373	52	117	27	9	0
Zambia	60	48	212	60	46	74	10
Zimbabwe (Rhodesia)	79	29	134	141	4	4	13
	0	0	0	0	0	0	0
TOTAL ALL COUNTRIES	338834	393799	462794	489511	467844	225714	212119

ANTIFRICTION BEARING IMPORTS, TOTALS BY BEARING PRODUCT, 1987-JUNE, 1992

(in thousands of dollars)

PRODUCT DESCRIPTION	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Ball bearings, radial with od under 9mm	14906	16562	13151	16216	10672	5441	6807
Ball bearings, radial with od over 9mm to 30mm	82765	114949	111533	119752	107534	48815	60309
Ball bearings, radial with od over 30mm to 52mm	66614	107851	124122	96219	78436	39373	46443
Ball bearings, radial with od over 52mm to 100mm	72819	99684	121147	99967	79432	40916	42663
Ball bearings, radial with od over 100mm	36113	47389	77512	53696	49152	23874	26455
Ball bearings, unground	0	0	0	0	3755	1294	2552
Ball bearings, radial, nes	0	0	0	0	11388	0	0
Ball bearings, radial, double row	0	0	0	0	1976	741	1065
Ball bearings, radial, maximum capacity type	0	0	0	0	4872	719	4165
Ball bearings with integral shafts	16699	16740	31459	37872	0	0	0
Ball bearings with integral shafts having an od <=30mm	0	0	0	0	13241	7791	5795
Ball bearings with integral shafts having an od >30mm	0	0	0	0	38059	18372	13237
Ball bearings with integral shafts, apta	6600	7618	0	0	0	0	0
Ball bearings, original motor vehicle equipment, apta	11379	14899	0	0	0	0	0
Ball bearings, other than radial	52009	82396	95394	98938	58505	46170	51257
Ball bearings, angular contact, nes	0	0	0	0	17928	0	0
Ball bearings, angular contact, wheel hub, flanged	0	0	0	0	3089	1334	783
Ball bearings, angular contact, wheel hub, other	0	0	0	0	1895	944	1472
Ball bearings, thrust	0	0	0	0	4147	1635	1985
Ball bearings, linear	0	0	0	0	10034	6268	6813
Tapered roller bearings, cup and cone assemblies	32076	44291	58993	59342	0	0	0
Tapered roller bearings, cup&cone assemblies with cups od <=102mm	0	0	0	0	21556	11187	11419
Tapered roller bearings, cup&cone assemblies with cups od >102mm	0	0	0	0	19536	9389	11517
Tapered roller bearings, cup&cone assemblies, wheel hub, other	0	0	0	0	4003	1529	2385
Tapered roller bearings, cup&cone assemblies, wheel hub, flanged	0	0	0	0	2198	972	416
Tapered roller bearings, cup and cone assemblies, apta	86	52	0	0	0	0	0
Tapered roller bearings, cone assemblies	59998	62985	76986	53493	0	0	0
Tapered roller bearings, cone assemblies for cups with od <=102mm	0	0	0	0	25068	14264	10962
Tapered roller bearings, cone assemblies for cups with od >102mm	0	0	0	0	19502	10570	9604
Tapered roller bearings, cone assemblies, apta	7982	11109	0	0	0	0	0
Tapered roller bearings, cup assemblies or cups	41020	39498	41845	28504	26012	0	0
Tapered roller bearings, cup assemblies, apta	6134	6316	0	0	0	0	0
Roller bearings and parts, nes	129588	161074	0	0	0	0	0
Roller bearings and parts, nes, apta	2469	723	0	0	0	0	0
Other cylindrical roller bearings	0	0	50233	58388	58583	30434	30716
Needle roller bearings	0	0	21549	26598	28459	14041	13879
Spherical roller bearings	23961	31541	38990	44308	0	0	0
Spherical roller bearings, single row	0	0	0	0	14533	0	0

ANTIFRICTION BEARING IMPORTS, TOTALS BY BEARING PRODUCT, 1987-JUNE, 1992
(in thousands of dollars)

PRODUCT DESCRIPTION	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Spherical roller bearings, nes	0	0	0	0	36958	7351	7465
Mounted ball and roller bearings, pillow block	7468	10025	0	0	0	0	0
Mounted ball and roller bearings, nes	4404	5279	0	0	0	0	0
Mounted ball bearings, nes	0	0	7050	6361	7639	4044	4364
Mounted ball bearings, flange, take-up, cartridge or hanger	0	0	5436	5304	4923	2374	3256
Mounted roller bearings, nes	0	0	4781	6644	6380	3266	3397
Mounted roller bearings, flange, take-up, cartridge or hanger	0	0	472	135	628	266	140
Other ball and roller bearings, including combination	0	0	28266	18325	0	0	0
Combined ball and cylindrical roller bearings	0	0	0	0	1886	418	931
Combined ball and needle roller bearing	0	0	0	0	324	198	132
Combined ball and spherical roller bearing	0	0	0	0	297	83	108
Other ball and roller bearings, nes	0	0	0	0	6559	3889	2621
Balls for ball bearings, alloy steel	5603	4552	2929	3958	5002	2484	2322
Balls for ball bearings, not of alloy steel	3455	2786	1614	2390	1555	755	797
Balls for ball bearings, apta	1327	2564	0	0	0	0	0
Parts of ball bearings, nes	25499	30387	16194	12693	9614	0	0
Inner and outer races for ball bearings	19813	27333	32561	45726	38942	20364	25123
Parts of ball bearings, apta	50	539	0	0	0	0	0
Parts of tapered roller bearings, nes	3999	7488	10115	6091	2871	0	0
Rollers for tapered roller bearings	0	0	0	0	247	163	104
Parts of tapered roller bearings, nes, apta	292	47	0	0	0	0	0
Parts of roller bearings, nes	0	0	18318	14695	12084	0	0
Rollers for roller bearings	15801	17418	0	0	0	0	0
Rollers for roller bearings, except needles	0	0	14294	11127	0	0	0
Rollers for roller bearings, nes	0	0	0	0	3553	1625	2408
Rollers for cylindrical roller bearings	0	0	0	0	1793	589	1027
Rollers for needle roller bearings	0	0	848	1030	890	320	936
Rollers for spherical roller bearings	0	0	0	0	3229	1420	1355
Parts of cylindrical roller bearings, nes	0	0	0	0	3085	1148	1978
Parts of needle roller bearings, nes	0	0	0	0	3777	1832	1798
Parts of spherical roller bearings	1513	2405	11208	10681	10260	5523	3980
Parts of mounted bearings, nes	1970	3271	7106	13780	13607	0	0
Parts of bearing pillow blocks	4001	3980	0	0	0	0	0
Parts of mounted bearings, flange, take-up, cartridge or hanger	0	0	4141	2101	3230	1255	2293
	0	0	0	0	0	0	0
TOTAL BEARING PRODUCT IMPORTS	758413	983751	1028247	954334	892898	395440	429234

ANTIFRICTION BEARING IMPORTS, TOTALS BY COUNTRY OF ORIGIN, 1987-JUNE, 1992
(in thousands of dollars)

Country of Origin	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Afghanistan	1	0	0	0	0	0	0
Argentina	0	2054	4321	2400	990	928	4
Aruba	1	0	1	0	81	81	0
Australia	1558	1865	2978	2513	3830	1274	1142
Austria	5627	8263	19470	17827	8801	4423	2940
Bahamas	0	0	0	3	0	0	0
Belgium	0	1327	798	505	1174	959	42
Belgium and Luxembourg	922	0	0	0	0	0	0
Brazil	4806	9927	6904	8132	8088	2793	1408
Bulgaria	10	4	0	0	0	0	0
Burkina (Upper Volta)	0	309	0	0	0	0	0
Canada	58695	79999	82532	74671	81046	33349	38247
Chile	41	171	8	39	93	0	6
China	3138	11483	26575	30998	32526	14264	17800
Colombia	14	0	0	0	130	0	12
Cyprus	0	0	0	631	0	0	0
Czechoslovakia	66	176	396	1779	5160	631	1322
Denmark	498	520	470	524	386	173	145
Dominica	5	1	0	8	0	0	0
Dominican Republic	5	0	0	0	0	0	0
Egypt	2	0	0	0	0	0	0
Finland	175	280	370	576	484	240	49
France	31039	38331	37125	31767	38339	15370	20333
French West Indies	1	0	0	0	0	0	0
Gabon	0	0	3	6	0	0	0
Gambia	4	0	0	0	0	0	0
Germany, East	1	7	982	1	0	0	0
Germany, West	140292	181794	155138	162623	149807	63959	62149
Greece	104	0	0	0	0	0	0
Guinea	8	0	0	0	0	0	0
Hong Kong	1647	1406	3279	2139	1119	536	1263
Hungary	2796	5337	7024	8119	3998	2006	1233
Iceland	146	87	0	1	0	0	0
India	252	433	688	872	434	313	420
Indonesia	0	1	367	28	72	66	1
Ireland	94	69	382	878	143	113	30
Israel	160	1064	506	113	22	9	0
Italy	35410	53963	49449	40406	26957	9521	5821

ANTIFRICTION BEARING IMPORTS, TOTALS BY COUNTRY OF ORIGIN, 1987-JUNE, 1992
(in thousands of dollars)

Country of Origin	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Ivory Coast	11	0	0	16	0	0	0
Japan	319792	395781	417035	356244	331474	158966	175310
Jordan	0	219	0	0	0	0	0
Kenya	3	0	0	0	0	0	0
Kiribati (Gilbert Islands)	4	0	0	0	0	0	0
Korea, South	4371	4813	8757	9543	10917	6074	10421
Kuwait	3	0	0	0	0	0	0
Liechtenstein	0	1	0	0	2	2	0
Luxembourg	0	36	23	31	22	0	26
Macao	3	0	0	0	0	0	0
Malaysia	2	140	554	860	123	110	0
Malta and Gozo	0	6	0	0	0	0	0
Mauritius	0	126	3	2	0	0	0
Mexico	2162	5112	12142	12798	9291	3934	6595
Netherlands	899	1219	1516	1162	491	208	309
New Zealand	16	4	5	3	5	0	0
Norway	168	235	174	260	532	26	49
Panama	73	0	56	20	0	0	0
Paraguay	0	0	4	0	0	0	0
Peru	4	6	0	1	0	0	0
Philippines	0	0	1	5	3	0	0
Poland	212	717	3691	5031	4493	1296	2574
Portugal	517	688	1030	876	782	518	365
Republic of South Africa	162	233	1945	958	1057	625	272
Romania	16910	20751	4852	3615	870	419	461
Sao Tome and Principe	0	0	0	10	0	0	0
Saudi Arabia	0	0	3	0	10	0	0
Senegal	3	5	0	0	0	0	0
Singapore	32361	26038	48894	64433	66187	29580	32707
Soviet Union	2	12	76	10	12	12	0
Spain	2075	2619	14396	8099	7629	4613	2766
St Christopher and Nevis	0	0	7	0	0	0	0
Suriname	0	0	0	0	1	1	0
Swaziland	74	70	0	0	0	0	0
Sweden	22124	25494	19033	19241	25072	7375	7970
Switzerland	11241	11818	10463	13448	9297	4111	4354
Taiwan	8354	14323	23092	28715	22275	10228	12556
Thailand	14746	20438	5104	3836	3188	1734	1326

ANTIFRICTION BEARING IMPORTS, TOTALS BY COUNTRY OF ORIGIN, 1987-JUNE, 1992
(in thousands of dollars)

Country of Origin	1987	1988	1989	1990	1991	JAN-JUNE 1991	JAN-JUNE 1992
Turkey	0	782	4648	3035	1074	773	78
United Arab Emirates	0	0	381	0	0	0	0
United Kingdom	32956	50413	43909	30541	31086	12975	16480
Uruguay	1	0	0	0	0	0	0
Venezuela	2	2	27	160	13	2	0
Yugoslavia	1644	2779	6660	3822	3309	850	248
Zambia	0	0	0	0	3	0	0
	0	0	0	0	0	0	0
TOTAL ALL COUNTRIES	758413	983751	1028247	954334	892898	395440	429234

ANTIFRICTION BEARING EMPLOYMENT, BY CALENDAR QUARTER, 1958-JUNE, 1992

YEAR	QUARTER	ALL EMPLOYMENT (000s)	PRODUCTION WORKERS (000s)	AVERAGE WEEKLY HOURS	AVERAGE OVERTIME	AVERAGE WAGES (dollars/hour)
1958	1st	47.3	37.4	38.9	0.7	2.27
1958	2nd	42.4	33.2	38.9	0.8	2.30
1958	3rd	41.1	32.0	39.0	1.5	2.30
1958	4th	44.0	35.1	40.4	2.9	2.41
1959	1st	49.2	40.0	41.4	2.5	2.45
1959	2nd	52.4	42.9	42.6	3.8	2.49
1959	3rd	54.0	44.1	41.1	3.2	2.50
1959	4th	54.2	44.2	41.0	2.8	2.52
1960	1st	55.1	45.0	40.5	2.5	2.55
1960	2nd	52.7	42.6	38.6	1.2	2.52
1960	3rd	50.8	40.6	38.4	1.0	2.54
1960	4th	48.6	38.5	37.3	0.9	2.56
1961	1st	46.8	36.8	38.4	0.7	2.58
1961	2nd	47.1	37.2	39.3	1.3	2.61
1961	3rd	48.1	38.3	39.4	1.8	2.63
1961	4th	49.0	39.1	42.3	3.3	2.70
1962	1st	48.2	38.2	41.2	3.4	2.75
1962	2nd	51.9	41.6	42.2	3.2	2.75
1962	3rd	52.8	42.3	41.3	2.9	2.76
1962	4th	51.8	40.7	41.0	2.2	2.75
1963	1st	52.3	40.6	40.8	2.0	2.74
1963	2nd	52.9	41.1	40.5	2.4	2.78
1963	3rd	53.2	41.4	40.5	3.0	2.81
1963	4th	52.1	40.5	41.4	3.2	2.92
1964	1st	54.5	42.7	41.3	3.0	2.93
1964	2nd	55.1	43.4	41.4	3.1	2.94
1964	3rd	54.7	43.0	41.4	3.4	2.95
1964	4th	54.9	43.3	42.1	3.6	2.96
1965	1st	53.7	42.3	42.8	4.2	3.00
1965	2nd	56.5	44.6	42.7	4.4	3.02
1965	3rd	58.1	45.8	43.3	5.0	3.04
1965	4th	60.1	47.7	43.6	5.4	3.12
1966	1st	62.0	49.3	43.9	5.5	3.14
1966	2nd	63.0	49.7	44.0	5.8	3.17
1966	3rd	62.6	49.0	44.2	6.0	3.17
1966	4th	64.0	50.5	44.0	5.9	3.22
1967	1st	61.3	47.7	43.2	5.5	3.22
1967	2nd	64.7	50.9	42.9	5.0	3.22
1967	3rd	62.5	48.7	42.6	4.5	3.23
1967	4th	62.6	49.0	42.4	4.5	3.30
1968	1st	61.7	48.0	42.1	3.7	3.40
1968	2nd	61.4	47.6	41.3	3.0	3.40
1968	3rd	58.1	44.1	42.8	4.2	3.45
1968	4th	59.9	45.9	43.0	4.7	3.53
1969	1st	63.2	49.0	42.4	4.6	3.63
1969	2nd	63.2	48.9	42.5	4.3	3.65
1969	3rd	63.1	48.7	42.4	4.9	3.68
1969	4th	63.3	49.0	42.6	4.6	3.72
1970	1st	63.4	49.0	41.6	3.8	3.73

ANTIFRICTION BEARING EMPLOYMENT, BY CALENDAR QUARTER, 1958-JUNE, 1992

YEAR	QUARTER	ALL EMPLOYMENT (000s)	PRODUCTION WORKERS (000s)	AVERAGE WEEKLY HOURS	AVERAGE OVERTIME	AVERAGE WAGES (dollars/hour)
1970	2nd	62.3	47.9	38.7	2.5	3.81
1970	3rd	61.1	46.9	38.3	1.6	3.87
1970	4th	54.4	40.9	38.2	0.5	3.86
1971	1st	53.9	40.5	38.6	0.8	4.00
1971	2nd	52.0	39.0	39.4	1.4	4.10
1971	3rd	51.5	38.9	40.5	2.3	4.16
1971	4th	51.5	39.1	41.6	3.6	4.18
1972	1st	51.3	39.2	41.8	3.7	4.28
1972	2nd	52.8	40.8	42.6	4.4	4.38
1972	3rd	52.5	40.5	42.6	4.6	4.46
1972	4th	55.0	42.6	43.7	5.6	4.60
1973	1st	56.8	44.2	43.5	5.5	4.70
1973	2nd	57.6	44.8	44.0	5.9	4.79
1973	3rd	57.0	44.2	43.7	6.0	4.79
1973	4th	58.2	45.3	43.8	5.9	4.89
1974	1st	58.9	45.9	42.4	4.6	4.93
1974	2nd	59.5	46.6	40.3	3.4	4.98
1974	3rd	60.0	47.0	42.7	5.5	5.21
1974	4th	60.6	47.5	42.4	4.8	5.37
1975	1st	57.9	44.9	40.8	3.2	5.42
1975	2nd	54.0	41.1	40.0	2.3	5.49
1975	3rd	51.5	39.1	40.7	2.9	5.62
1975	4th	52.9	40.3	41.2	3.0	5.72
1976	1st	53.0	40.6	41.5	3.6	5.80
1976	2nd	52.1	39.9	41.2	2.4	5.85
1976	3rd	52.7	40.2	41.7	4.3	5.98
1976	4th	53.6	41.4	42.5	4.3	6.01
1977	1st	53.6	41.1	41.7	3.8	5.98
1977	2nd	55.4	42.3	42.2	4.2	6.11
1977	3rd	55.2	41.9	42.2	4.4	6.29
1977	4th	56.1	42.9	41.9	4.5	6.45
1978	1st	56.2	43.3	39.7	4.3	6.47
1978	2nd	55.7	42.9	41.1	4.1	6.64
1978	3rd	55.8	42.7	41.4	4.9	6.82
1978	4th	58.1	45.0	42.3	5.5	7.08
1979	1st	59.3	46.3	42.4	5.1	7.15
1979	2nd	57.8	44.6	41.6	4.1	7.29
1979	3rd	55.9	42.9	41.8	4.4	7.50
1979	4th	59.9	47.8	42.9	5.4	7.68
1980	1st	60.0	47.5	42.2	4.7	7.70
1980	2nd	57.5	44.9	41.8	4.5	7.88
1980	3rd	56.7	43.9	41.2	3.7	8.02
1980	4th	57.2	44.5	42.0	4.3	8.38
1981	1st	58.4	45.5	42.2	4.1	8.44
1981	2nd	58.2	45.2	42.0	3.6	8.60
1981	3rd	56.6	43.3	41.2	3.3	8.75
1981	4th	56.3	43.1	41.8	3.3	8.84
1982	1st	53.9	40.8	39.9	2.4	8.84
1982	2nd	51.5	38.3	39.1	1.7	8.98

ANTIFRICTION BEARING EMPLOYMENT, BY CALENDAR QUARTER, 1958-JUNE, 1992

YEAR	QUARTER	ALL EMPLOYMENT (000s)	PRODUCTION WORKERS (000s)	AVERAGE WEEKLY HOURS	AVERAGE OVERTIME	AVERAGE WAGES (dollars/hour)
1982	3rd	46.0	33.8	39.4	2.0	8.96
1982	4th	41.3	30.1	40.7	2.4	8.91
1983	1st	41.0	30.3	40.6	2.1	9.06
1983	2nd	42.5	31.5	41.5	2.9	9.35
1983	3rd	43.3	31.9	42.3	3.8	9.39
1983	4th	45.3	33.8	43.5	4.6	9.59
1984	1st	46.8	35.2	43.8	4.7	9.77
1984	2nd	48.3	36.5	44.2	4.9	9.96
1984	3rd	48.4	36.1	43.2	4.6	10.01
1984	4th	48.6	36.5	43.5	4.4	10.03
1985	1st	48.3	36.3	43.1	4.2	10.18
1985	2nd	47.3	35.6	42.8	4.2	10.32
1985	3rd	45.6	34.3	42.3	4.2	10.36
1985	4th	43.6	32.1	43.1	4.2	10.44
1986	1st	44.3	32.4	42.9	4.6	10.74
1986	2nd	43.8	32.5	42.9	4.7	10.75
1986	3rd	42.2	31.6	42.4	4.6	10.79
1986	4th	42.2	32.0	43.5	5.0	10.78
1987	1st	41.8	31.6	43.1	4.8	10.93
1987	2nd	41.4	31.7	43.4	4.9	10.96
1987	3rd	40.9	31.5	42.6	4.6	10.90
1987	4th	41.3	32.1	44.0	5.3	10.92
1988	1st	41.8	32.5	44.4	5.4	10.88
1988	2nd	42.3	33.0	44.2	6.1	11.14
1988	3rd	42.0	32.5	43.5	5.8	10.92
1988	4th	42.8	33.4	44.4	6.6	11.28
1989	1st	43.3	33.9	44.5	6.3	11.28
1989	2nd	43.6	34.1	43.6	5.8	11.33
1989	3rd	43.5	33.8	43.1	5.7	11.54
1989	4th	41.8	32.2	43.0	5.1	11.67
1990	1st	43.2	33.6	42.5	4.5	11.61
1990	2nd	42.9	33.4	42.3	4.5	12.00
1990	3rd	42.6	32.9	43.5	6.0	12.11
1990	4th	42.5	33.0	43.6	5.5	12.31
1991	1st	41.8	32.3	41.4	3.7	12.22
1991	2nd	40.8	31.5	41.1	3.4	12.44
1991	3rd	39.5	30.6	41.9	4.4	12.62
1991	4th	39.8	31.2	42.5	4.4	12.80
1992	1st	38.8	30.8	41.9	3.4	12.66
1992	2nd	38.1	30.1	42.0	4.1	13.10

APPENDIX - E: Antidumping and Countervailing Duty Orders

ANTIFRICTION BEARINGS AND PARTS THEREOF: Final Antidumping Duty (AD) Margins and Countervailing Duty (CVD) Rates - (Note 1)
(, 1989

COUNTRIES	COMPANIES	BALL	CYLINDRICAL ROLLER	SPHERICAL PLAIN	NEEDLE ROLLER	SPHERICAL ROLLER
Federal Republic of Germany - AD	FAG	70.41%	52.43%	74.88%	Investigation	Investigation
	GMN	35.43%	--	--	Terminated	Terminated
	INA	31.29%	52.43%	--	(Note 1)	(Note 1)
	SKF	132.25%	76.27%	118.98%		
	All Others	68.89%	55.65%	114.52%		
France - AD	INA	66.18%	11.03%	--	Investigation	Investigation
	SKF	66.42%	--	39.00%	Terminated	Terminated
	SNR	56.50%	18.37%	--	(Note 1)	(Note 1)
	All Others	65.13%	17.31%	39.00%		
Italy - AD	FAG	68.29%	--	--	Investigation	Investigation
	ICSA	--	--	--	Terminated	Terminated
	SKF	155.99%	212.45%	--	(Note 1)	(Note 1)
	All Others	155.57%	212.45%	Negative Det.		
Japan - AD	Koyo	73.55%	51.21%	--	Investigation	Investigation
	Minebea	106.61%	--	84.26%	Terminated	Terminated
	Nachi	48.69%	4.00%	--	(Note 1)	(Note 1)
	NSK	42.99%	12.28%	--		
	NTN	21.36%	9.30%	92.00%		
	All Others	45.83%	25.80%	84.33%		
(- AD	TIE	39.61%	Investigation	Investigation	Investigation	Investigation
	All Others	39.61%	Rescinded	Rescinded	Rescinded	Terminated(1)
Singapore - AD	NMB	25.08%	Investigation	Investigation	Investigation	Investigation
	All Others	25.08%	Rescinded	Rescinded	Rescinded	Rescinded
Singapore - CVD - (Note 2)	Country Wide Rate	2.34%	2.34%	2.34%	2.34%	2.34%
Sweden - AD	SKF	180.00%	13.69%	--	--	Investigation
	All Others	180.00%	13.69%	Negative Det.	Negative Det.	Terminated(1)
Thailand - AD	NMB - (Note 3)	18.77%	Investigation	Investigation	Investigation	Investigation
	All Others	18.77%	Rescinded	Rescinded	Rescinded	Rescinded
Thailand - CVD	Country Wide Rate	21.54%	Negative Det.	Negative Det.	Negative Det.	Negative Det.
United Kingdom - AD	INA	--	--	--	Investigation	Investigation
	RHP - (Note 3)	44.02%	43.36%	--	Terminated	Terminated
	Rose	--	--	Negative Det.	(Note 1)	(Note 1)
	SKF	61.14%	--	--		
	All Others	54.27%	43.36%	Negative Det.		

NOTES:
(1) The ITC has determined that imports of needle roller and spherical roller bearings are not injuring a U.S. industry and that critical circumstances do not exist with respect to imports of ball, cylindrical, and spherical plain bearings.
(2) Singapore is no longer eligible for an ITC injury determination on these products.
(3) The AD margins for NMB (Thailand), RHP, and "All Others" have been corrected to account for post-final clerical errors.
"--" = Not Applicable (No allegation was made. - OR - The company did not produce or export the merchandise to the U.S.)
("Negative Det." = Negative Final AD or CVD Determination

ANTIFRICTION BEARINGS AND PARTS THEREOF: ANTIDUMPING DUTY MARGINS - FINAL RESULTS
FIRST ADMINISTRATIVE REVIEW
NOVEMBER 9, 1988 - APRIL 30, 1990

COUNTRIES	COMPANIES	Ball	Cylindrical Roller	Spherical Plain
Fed. Rep. Ger.	Dowty Rotol	8.11%	*	-------
	FAG	11.93%	3.90%	10.80%
	Fiat	12.86%	10.02%	-------
	GMN	2.84%	*	*
	GRW	0.14%	-------	-------
	Heidelberg	0.00%	0.00%	-------
	INA	10.56%	14.56%	*
	MBB	0.00%	0.00%	0.00%
	NTN-FRG	5.36%	-------	-------
	NWG	51.56%	-------	-------
	Pratt & Whitney	5.25%	3.31%	*
	SKF-FRG	5.25%	6.42%	3.69%
	ZF	42.72%	13.59%	0.00%
	All Others	51.56%	14.56%	10.80%
France	ADH	2.64%	3.15%	4.87%
	Dowty Rotol	0.00%	*	-------
	Fiat	0.00%	*	-------
	INA-France	66.42%	18.37%	39.00%
	Pratt & Whitney Canada	4.33%	2.07%	*
	SNECMA	0.21%	0.24%	-------
	SNFA	66.42%	18.37%	-------
	SNR	2.03%	1.08%	*
	SKF, SARMA, ADR	7.79%	*	26.31%
	Turbomeca	6.85%	10.63%	*
	All Others	7.79%	10.63%	26.31%
Italy	Dowty Rotol	11.67%	*	-------
	FAG Cuscinetti	4.40%	*	-------
	Fiatavio	0.00%	17.36%	-------
	Japanese Aero Engines Corp.	*	*	-------
	Meter S.p.A.	11.67%	17.36%	-------
	Rolls Royce	*	8.76%	-------
	RIV-SKF	4.06%	1.87%	-------
	SNECMA	0.78%	1.23%	-------
	Somecat	155.99%	-------	-------
	All Others	11.67%	17.36%	
Japan	Asahi Seiko	45.83%	*	*
	Fujino	2.67%	-------	-------
	Honda	2.19%	0.06%	0.05%
	IJK	17.58%	5.84%	*
	Isuzu	0.90%	0.07%	3.08%
	Izumoto Seiko	8.50%	-------	-------
	Japanese Aero Engines	106.61%	51.82%	92.00%
	Koyo	9.82%	1.45%	*
	KYK/Tottori	5.70%	-------	-------
	Minebea	106.61%	-------	92.00%
	Nachi Fujikoshi	10.72%	10.50%	*
	Nakai	12.62%	*	*
	Nankai Seiko	15.18%	*	*
	Nippon Pillow Block	45.83%	-------	-------
	NSK	6.33%	51.82%	*
	NTN-Japan	14.23%	15.82%	0.66%
	Osaka Pump	0.59%	-------	-------
	Showa Pillow Block	19.00%	-------	-------
	Takeshita	0.66%	*	*
	Wada Seiko	23.88%	-------	-------
	Yamaha	0.08%	0.03%	0.28%
	All Others	23.88%	51.82%	3.08%

COUNTRIES	COMPANIES	Ball	Cylindrical Roller	Spherical Plain
Romania	Technoimp./exp.	1.85%	-------	-------
	All Others	1.85%		
Singapore	NMB	**4.85%	-------	-------
	All Others	**4.85%		
Sweden	SKF Saverige AB	6.43%	4.12%	-------
	All Others	6.43%	4.12%	
Thailand	NMB/Pelmac	***.054%	-------	-------
	All Others	***.054%		
United Kingdom	Barden	14.73%	-------	-------
	Cooper	-------	0.00%	-------
	Dowty Rotol	10.71%	4.58%	-------
	FAG UK	20.89%	0.00%	-------
	FiatAvio	*	21.91%	-------
	Pratt & Whitney Canada	6.03%	2.55%	-------
	RHP	15.96%	31.07%	-------
	Rolls Royce	2.74%	2.55%	-------
	SKF-UK	4.92%	*	-------
	SNFA	*	-------	-------
	All Others	20.89%	31.07%	

* No Sales to the U.S. during the period
------- Not subject to review
**The cash deposit rate for Singapore is 1.88% due to CVD offset offset.
***The cash deposit rate for Thailand is 0.0% due to CVD offset.

ANTIFRICTION BEARINGS AND PARTS THEREOF: ANTIDUMPING DUTY MARGINS - FINAL RESULTS
SECOND ADMININSTRATIVE REVIEW
May 1, 1990 - April 30, 1991

A-100-001
Admin. Rev. 90-91
Public Document
OADC:MMcP

COUNTRIES	COMPANIES	Ball	Cylindrical Roller	Spherical Plain
Fed. Rep. Ger.	ADH	24.02%	4.57%	(1)
	FAG	18.41%	7.63%	1.90%
	Fiat	4.14%	24.82%	(2)
	GMN	0.29%	(1)	(1)
	INA	12.11%	17.38%	(1)
	MBB	1.32%	0.00%	0.63%
	NTN	0.00%	(1)	(1)
	NWG	6.69%	(2)	(2)
	Pratt & Whitney	13.15%	8.93%	(2)
	SKF	12.40%	10.92%	1.92%
	All Others	24.02%	24.82%	1.92%
France	ADH	7.17%	3.05%	5.06%
	Dassault	11.42%	2.34%	2.33%
	FiatAvio	0.15%	0.00%	(2)
	INA-France	* 66.42%	* 18.37%	* 42.79%
	MBB	0.19%	(1)	42.79%
	Pratt & Whitney Canada	14.13%	6.39%	(2)
	SKF	9.03%	(1)	0.00%
	SNECMA	6.20%	1.89%	(2)
	SNFA	* 66.42%	* 18.37%	(2)
	SNR	11.27%	* 18.37%	(2)
	Turbomeca	6.76%	6.52%	(1)
	All Others	14.13%	6.52%	42.79%
Italy	ADH	0.24%	7.74%	N/A
	FAG Cuscinetti	6.14%	(1)	N/A
	FiatAvio	3.13%	13.52%	N/A
	Meter S.p.A.	8.32%	(1)	N/A
	Rolls Royce	(2)	0.00%	N/A
	RIV-SKF	10.00%	0.00%	N/A
	SNECMA	0.00%	3.53%	N/A
	All Others	10.00%	13.52%	N/A
Japan	Asahi Seiko	0.01%	(2)	(2)
	FiatAvio	2.33%	5.02%	(2)
	Fujino	1.80%	(2)	(2)
	Honda	0.04%	0.00%	0.00%
	IJK	8.26%	0.00%	(2)
	Izumoto Seiko	12.18%	(2)	(2)
	Koyo	8.89%	1.40%	0.00%
	Maehara	(2)	(2)	0.57%
	MBB	(1)	(1)	0.00%
	Minebea	* 106.61%	* 51.82%	* 92.00%
	Nachi Fujikoshi	7.85%	22.73%	(1)
	Nakai	6.36%	(2)	(2)
	Nankai Seiko	9.22%	(2)	(2)
	Nippon Pillow Block	* 45.83%	(1)	(1)
	NSK	7.22%	14.34%	(1)
	NTN-Japan	2.24%	2.63%	0.50%
	Osaka Pump	0.89%	(2)	(2)
	Showa Pillow Block	7.31%	(2)	(2)
	Takeshita	0.84%	(2)	(2)
	Tottori	3.29%	(2)	(2)
	Uchiyama	* 45.83%	(2)	(2)
	Wada Seiko	16.71%	(2)	(2)
	Yamaha	* 45.83%	(2)	(2)
	All Others	16.71%	22.72%	0.57%

COUNTRIES	COMPANIES	Ball	Cylindrical Roller	Spherical Plain
Romania	Technoimp./exp.	0.00%	N/A	N/A
	All Others	0.00%	N/A	N/A
Singapore	NMB	4.49%	N/A	N/A
	All Others	4.49%	N/A	N/A
Sweden	SKF Sverige AB	8.27%	6.20%	N/A
	All Others	8.27%	6.20%	N/A
Thailand	NMB/Pelmac	0.50%	N/A	N/A
	All Others	0.50%	N/A	N/A
United Kingdom	Barden	0.84%	(1)	N/A
	Cooper	(2)	0.00%	N/A
	FAG	46.53%	0.00%	N/A
	FiatAvio	(1)	6.68%	N/A
	INA UK	(1)	0.00%	N/A
	Pratt & Whitney	(1)	5.20%	N/A
	RHP Bearings	16.21%	48.29%	N/A
	SKF	14.24%	(1)	N/A
	All Others	46.53%	48.29%	N/A

N/A - Not Applicable
(1) No U.S. sales during the review period
(2) No review requested
* BIA Rates

Company	BBs		CRBs		SPBs	
ADH	7.17		3.05		5.06	
Dassault	11.42		2.34		2.33	
FiatAvio	0.15		0.00		(2)	
INA	66.42		18.37		42.79	
MBB	0.19		(1)		42.79	
Pratt & Whitney	* 9.37	(14.13)	4.88	(6.39)	(2)	
SKF	* 8.37	(9.03)	(1)		0.00	
SNFA	66.42		18.37		(2)	
SNR	*15.96	(11.27)	18.37		(2)	
SNECMA	6.20		1.89		(2)	
Turbomeca	6.76		6.52		(1)	
All Others	*15.96	(14.13)	6.52		42.79	

Old rates are in parentheses
* Rates requiring the CIT's authorization to amend
[1] No U.S. sales during the review period.
[2] No review requested.

GERMANY

Company	BBs		CRBs		SPBs	
ADH	24.02		4.57		(1)	
FAG	*17.24	(18.41)	7.04	(7.63)	1.10	(1.90)
FiatAvio	4.14		23.52	(24.82)	(2)	
GMN	0.29		(1)		(1)	
INA	12.11		0.45	(17.38)	(1)	
MBB	2.48		0.00		0.95	
NWG	6.69		(2)		(2)	
NTN	0.00		(1)		(1)	
Pratt & Whitney	*11.10	(13.15)	3.34	(8.93)	(2)	
SKF	*11.44	(12.40)	9.76	(10.92)	1.74	(1.92)
All Others	24.02		23.52	(24.82)	1.74	(1.92)

ITALY

Company	BBs		CRBs	
ADH	0.24		7.74	
FAG	* 4.94	(6.14)	(1)	
FiatAvio	3.13		13.26	(13.52)
Meter	8.32		(1)	
Rolls-Royce	(2)		0.00	
SKF	* 9.31	(10.00)	0.00	
SNECMA	0.00		3.53	
All Others	10.00		13.26	(13.52)

JAPAN

Company	BBs		CRBs	SPBs
Asahi	0.01		(2)	(2)
FiatAvio	2.33		5.02	(2)
Fujino	1.80		(2)	(2)
Honda	0.04		0.00	0.00
IJK	* 1.43	(8.26)	0.00	(2)
Izumoto	12.18		(2)	(2)
Koyo	* 6.85	(8.89)	1.40	0.00

Maehara	(2)	(2)	0.57
MBB	(1)	(1)	0.00
Minebea	106.61	51.82	92.00
Nachi	* 7.86 (7.85)	22.73	(1)
Nakai	6.36	(2)	(2)
Nankai	9.22	(2)	(2)
NPBS	45.83	(1)	(1)
NSK	* 4.62 (7.22)	*12.69 (14.34)	(1)
NTN	* 2.26 (2.24)	2.63	0.50
Osaka Pump	0.89	(2)	(2)
Showa	7.31	(2)	(2)
Takeshita	0.84	(2)	(2)
Tottori	3.29	(2)	(2)
Uchiyama	45.83	(2)	(2)
Wada	16.71	(2)	(2)
Yamaha	45.83	(2)	(2)
All Others	16.71	22.73	0.57

ROMANIA

Company	BBs
TIE	0.00
All Others	0.00

SINGAPORE

Company	BBs
NMB/Pelmec	4.51 (4.49)
All Others	4.51 (4.49)

SWEDEN

Company	BBs	CRBs
SKF	*7.81 (8.27)	5.21 (6.20)
All Others	*7.81 (8.27)	5.21 (6.20)

THAILAND

Company	BBs
NMB/Pelmec	0.57 (0.50)
All Others	0.57 (0.50)

UNITED KINGDOM

Company	BBs	CRBs
Barden Corporation	* 0.74 (0.84)	(1)
Cooper Bearings	(2)	0.00
FAG	*41.99 (46.53)	0.00
FiatAvio	(1)	6.68
INA	(1)	0.00
Pratt & Whitney	(1)	4.24 (5.20)
RHP Bearings	16.21	48.29
SKF	* 8.41 (14.24)	(1)
All Others	*41.99 (46.53)	48.29