# INDUSTRIAL DIAMOND

By Ronald F. Balazik

In addition to its value as a gemstone, diamond has unique properties that make it ideal for many industrial and research applications. In fact, as the hardest substance known, diamond has been used for many centuries as a grinding, drilling, cutting, and polishing tool (Spear and Dismuks, 1994). Today, industrial-grade diamond (defined as diamond that does not meet gem-quality standards) continues to be used principally as an abrasive. Moreover, diamond has exceptional optical properties and superior electrical/thermal characteristics that make it the best material for special lenses, heat sinks in electrical circuits, wire drawing, and many advanced technologies.

Although both synthetic and natural diamonds are used by industry, synthetic industrial diamond is superior to its natural diamond counterpart in many cases because its properties can be tailored for specific applications. Thus, manufactured diamond accounts for at least 90% of the industrial diamond used in the United States.

**Legislation and Government Programs**

The National Defense Stockpile (NDS), operated by the Department of Defense (DOD), contained the following categories of industrial diamond in 1996: industrial stones, crushing bort, and diamond dies. At yearend, the NDS had an inventory of 4.65 million carats of industrial stones (valued at $78.3 million), 816,000 carats of crushing bort ($4.5 million), and 25,500 pieces of diamond dies ($917,000). Additional information on the value of NDS diamond is in the "Price" section that follows.

Congress has authorized the DOD to dispose of all NDS industrial diamond. For fiscal year 1997 (October 1, 1996, to September 30, 1997), the DOD has been authorized to sell up to 2 million carats of industrial stone and all stockpiled industrial bort and diamond dies.

**Production**

The U.S. Geological Survey (USGS) conducts an annual survey of domestic industrial diamond producers and U.S. firms that recover diamond wastes. Although most of these companies responded to the 1996 survey, a few significant firms withheld certain data that they deemed proprietary. Thus, only estimates of U.S. primary and secondary output are provided below.

As one of the world's leading producers of synthetic industrial diamond in 1996, the United States accounted for an estimated output of 114 million carats. Only two U.S. companies produced synthetic industrial diamond during the year: Du Pont Industrial Diamond Division, Gibbstown, NJ; and GE Superabrasives, Worthington, OH. In addition, GE Superabrasives and five other firms (Dennis Tool Co., Houston, TX; Phoenix Crystal, Ann Arbor, MI; SII Megadiamond Industries Inc., Provo, UT; Tempo Technology Corp., Somerset, NJ; and U.S. Synthetic Corp., Orem, UT) manufactured polycrystalline diamond (PCD) from synthetic diamond grit.

More than 20 million carats of industrial diamond were estimated to have been recycled in the United States during 1996. Most of this material was recovered from residues generated in the manufacture of PCD (Wilson Born, National Research Company, written commun., 1997). Four U.S. companies recovered and sold industrial diamond as their principal product in 1996. These firms were: Industrial Diamond Laboratory Inc., Bronx, NY; Industrial Diamond Powders Co., Pittsburgh, PA; International Diamond Services Inc., Houston, TX; and National Research Company, Fraser, MI. These firms reclaimed industrial diamond from used drill bits, diamond tools, and diamond-containing wastes as well as from the residues of PCD manufacturing. In addition to these companies, other domestic firms reportedly recovered industrial diamond in smaller secondary operations.

A new diamond mine under development near Fort Collins, Colorado, may prove to be the first significant domestic source of natural industrial diamond in the United States. The mine would be the first commercial diamond mine in North America in almost a century (U.S. Geological Survey, 1997). A diamond processing plant at the mine began operating in May 1996. By yearend, about 65% of the recovered diamonds were gem quality; presumably, the remainder can be used for industrial purposes.

**Consumption**

The United States remained the world's largest market for industrial diamond in 1996. Domestic consumption of industrial diamond during the year was estimated to be 224 million carats. This consumption reflects growth in the U.S. economy and the many domestic industries where diamond is used. Domestic consumption in the 1990's was accounted for primarily by the following U.S. industry sectors: construction, machinery manufacturing, mineral services, stone and ceramics production, and transportation equipment fabrication.

Industrial diamond stones (usually larger than 800 microns) are used primarily in drilling bits and reaming shells, single- or multiple-point diamond tools, diamond saws, diamond wheels, and diamond wire-drawing dies. Miscellaneous uses include:

engraving points, glass cutters, bearings, and surgical instruments. Diamond drilling bits and shells are used principally for mineral, oil, and gas exploration. Other applications for diamond bits and shells include foundation testing, masonry drilling, and inspecting concrete in various structures. The primary uses of point diamond tools are for dressing and truing grinding wheels and for cutting, machining, boring, and finishing; beveling glass for automobile windows also is an application. Cutting dimension stone and concrete in highway reconditioning are the major uses of diamond saws; another application is the forming of refractory shapes for furnace linings. Diamond wire dies are essential for high-speed drawing of fine wire, especially from hard, high-strength metals and alloys.

Diamond grit, powder, and fragmented bort are used in diamond grinding wheels, saws, impregnated bits and tools, and loose abrasives compounds for lapping and polishing. Three major types of grinding wheels are made: resinoid, metal, and vitrified bonds. These tools are made in many shapes and sizes designed for specific applications. Very large grinding wheels can be as much as 1 meter in diameter. The primary uses of diamond grinding wheels include the sharpening and shaping of carbide machine tool tips, die grinding, plate glass edging, and optical grinding. Saws made with diamond grit are used to cut concrete, stone, ceramics, and composite materials. Very fine saws are used to slice brittle metals and crystals into thin wafers for electronic and electric devices.

Polishing and lapping powder and compounds are used primarily to finish optical surfaces, jewel bearings, gemstones, wiredrawing dies, cutting tools, and metallographic specimens. Hundreds of other important items made from metals, ceramics, plastics, and glass also are finished with diamond compounds.

Changes in technology have resulted in an increased use of synthetic industrial diamond and polycrystalline diamond shapes (PDS) and compacts (PDC) for many of the applications cited above. In particular, the use of PDS, PDC, and matrix set synthetic diamond grit for drilling bits and reaming shells has increased in recent years. Moreover, PDS and PDC are used in the manufacture of single- and multiple-point tools, and PDC is used in a majority of the diamond wire-drawing dies. The manufacturing PCD for PDS and PDC now accounts for most of the diamond powder consumed in the United States (Wilson Born, National Research Company, written commun., 1997).

## Prices

Although the USGS does not collect industrial diamond price data, it monitors the average value of certain industrial diamond imports. In 1996, average per-carat values for U.S. imports of natural grit and powder, synthetic grit and powder, and industrial stones were $0.42, $0.45, and $7.54, respectively. These values are slightly higher than those of 1995.

In addition, at yearend 1996, the DOD appraised the average per-carat market value of crushing bort and industrial stones in the NDS at $5.51 and $16.84, respectively. In certain cases, however, significantly higher assessments of industrial diamond in the stockpile have been made; for example, some bidders at NDS disposal sales have paid almost $100 per carat for stockpiled diamonds that they valued as gem-quality stones.

Events in 1996, such as new diamond mines (for example, see the preceding “Production” section) and more suppliers in the rough diamond market, may dampen prices of natural industrial stone during the next few years.

## Foreign Trade

The United States is the world’s leading importer and exporter of industrial diamond; in 1996, imports came from more than 30 countries, and exports/reexports went to at least 50 countries. Although the United States is a major producer of synthetic diamond, its growing domestic markets have become more reliant on foreign sources of industrial diamond in recent years. Moreover, U.S. markets for natural industrial diamond always have been dependent on imports and secondary recovery operations because domestic production of natural diamond was lacking. The new Colorado diamond mine noted on page 1, however, may help to reduce this reliance on foreign sources.

In 1996, domestic imports of diamond powder, dust, and grit reached a record high of 218 million carats (valued at $99 million). Imports of industrial quality stones were 2.9 million carats (valued at $22 million). China appears to be growing as a major source of synthetic diamond for U.S. markets. *(See tables 1 and 2.)*

During 1996, the United States also exported and reexported 108 million carats of industrial diamond dust, powder, and grit (valued at $94 million). Additionally, the United States exported and reexported about 3.3 million carats of industrial stones (valued at $27 million). *(See tables 3 and 4.)*

## World Review

The global market for industrial diamond was estimated to be more than $650 million in 1996. The United States remained the world’s largest single market for industrial diamond as its economy continued to expand.

More than 35 countries produced industrial diamond in 1996. Almost two-thirds of global output, however, was accounted for by just the top four producers: The United States, Russia, Ireland, and South Africa. Synthetic diamond accounts for about 90% of global production and consumption. Tables 5 and 6 show world production of natural and synthetic industrial diamond by country.

## Outlook

The United States will continue to be the world’s largest market for industrial diamond well into the 21st century, and will remain a significant exporter of industrial diamond as well. Polycrystalline diamond for abrasive tools and wear parts will continue to replace competing materials in many industrial applications by extending tool life, providing closer tolerances, and yielding lower parts cost (Thomas Corcoran, ANCO

Industrial Diamond Corp., written commun., 1997).

Demand for diamond grit and powder worldwide, particularly in the United States, will exhibit significant growth during the next several years. Demand for synthetic grit and powder is expected to be greater than that for natural diamond stone. Constant-dollar prices of synthetic diamond products probably will continue to decline as production technology becomes more cost-effective and competition from low-cost producers in China and Russia increases. The consolidation of major synthetic diamond producers, however, could stabilize prices in saw-grade sizes.

The most dramatic increase in the use of diamond tools made from synthetic grit and powder will likely be in the construction industry. Large quantities of saw-grade diamond will be required for the repair and replacement of highways and bridges. Additionally, the dimension stone industry will increase its demand for diamond as a cutting and polishing medium. The use of diamond tools for cutting, shaping, and polishing will increase in the glass industry as well. Moreover, PDC and PDS will continue to displace natural diamond stone and tungsten carbide products used in the drilling and tooling industries (Wilson Born, National Research Company, written commun., 1997).

Truing and dressing applications will be the major domestic end-use for industrial stones during the next several years. These stones are natural and cannot be manufactured commercially. No shortage of the stones is anticipated, however, because new mines (in Canada and the United States, for example) and more producers selling in the rough diamond market will maintain ample supplies (Thomas Corcoran, ANCO Industrial Diamond Corp., written commun., 1997). These additional sources will tend to reduce prices as well.

### References Cited

Spear, K. E. and Dismuks, J. P., 1994, Synthetic diamond: New York, John Wiley & Sons, Inc., 663 p.

U.S. Geological Survey, 1997, Colorado (draft): U.S. Geological Survey Mineral Industry Surveys, June, 10 p.

## SOURCES OF INFORMATION

### U.S. Geological Survey Publications

Abrasives. Ch. in United States Mineral Resources, U.S. Geological Survey Professional Paper 820.

Diamond (Industrial). Ch. in Mineral Commodity Summaries, annual.[1]

Gemstones. Ch. in Minerals Yearbook, annual.[1]

Industrial Diamond. Ch. in Minerals Yearbook, annual.[1]

### Other

De Beers Consolidated Mines Limited, 1996, Annual Report: Kimberley, South Africa, 90 p.

Diamond—Industrial. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines, Bulletin 675, 1985.

Diamonds. Ch. in Canadian Minerals Yearbook, Natural Resources Canada (annual).

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[1]Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1
U.S. IMPORTS FOR CONSUMPTION OF INDUSTRIAL DIAMOND STONES, BY COUNTRY 1/

(Thousand carats and thousand dollars)

| | Natural industrial diamond stones (including glazers' and engraver's diamond unset) (7102.21.3000 and .4000) | | | | Miners' diamond, natural and synthetic (7102.21.1010 and .1020) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1995 | | 1996 | | 1995 | | 1996 | |
| Country | Quantity | Value 2/ | Quantity | Value 2/ | Quantity | Value 2/ | Quantity | Value 2/ |
| Belgium | 224 | 798 | 206 | 1,200 | 571 | 3,630 | 276 | 735 |
| China | 91 | 176 | 47 | 80 | 2 | 2 | (3/) | 10 |
| Ghana | 103 | 445 | 181 | 1,000 | 36 | 300 | 87 | 577 |
| India | 5 | 4 | 7 | 119 | -- | -- | (3/) | 2 |
| Ireland | 88 | 168 | 133 | 289 | 1 | 17 | 6 | 20 |
| Japan | 1 | 4 | (3/) | 17 | (3/) | 19 | -- | -- |
| Netherlands | 18 | 956 | 5 | 1,430 | 2 | 67 | (3/) | 9 |
| Sierra Leone | 18 | 116 | 49 | 633 | 18 | 65 | 4 | 16 |
| South Africa | 90 | 150 | (3/) | 16 | 4 | 54 | (3/) | 85 |
| Switzerland | 1 | 3 | 6 | 20 | 140 | 341 | 201 | 417 |
| United Kingdom | 858 | 6,880 | 402 | 3,520 | 654 | 8,810 | 495 | 6,990 |
| Zaire | 663 | 954 | 354 | 796 | 37 | 1,910 | 101 | 1,710 |
| Other | 450 r/ | 1,050 r/ | 288 | 1,200 | 29 r/ | 257 r/ | 10 | 655 |
| Total | 2,610 | 11,700 | 1,680 | 10,300 | 1,490 | 15,500 | 1,180 | 11,200 |

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Customs value.
3/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 2
U.S. IMPORTS FOR CONSUMPTION OF DIAMOND POWDER, DUST AND GRIT, BY COUNTRY 1/

(Thousand carats and thousand dollars)

| | Diamond powder and dust | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Synthetic (7105.10.0020; .0030 and .0050) | | | | Natural (7105.10.0011 and .0015) | | | |
| | 1995 | | 1996 | | 1995 | | 1996 | |
| Country | Quantity | Value 2/ | Quantity | Value 2/ | Quantity | Value 2/ | Quantity | Value 2/ |
| Austria | 1,290 | 1,460 | 288 | 312 | 15 | 3 | 148 | 203 |
| Belgium | 2,050 | 3,040 | 3,100 | 4,210 | 2,180 | 1,930 | 1,790 | 2,130 |
| China | 7,240 | 1,740 | 23,800 | 5,150 | 11,200 | 1,440 | 7,320 | 994 |
| Germany | 11,400 | 4,300 | 7,920 | 1,850 | 69 | 86 | 24 | 19 |
| Hong Kong | 489 | 88 | 4,440 | 797 | 844 | 176 | 1,950 | 401 |
| India | 163 | 160 | 54 | 41 | 48 | 33 | 209 | 100 |
| Ireland | 116,000 | 48,200 | 112,000 | 61,400 | 2,440 | 2,040 | 2,390 | 1,300 |
| Japan | 3,800 | 2,350 | 4,240 | 2,240 | -- | -- | 2 | 6 |
| Korea, Republic of | 6,750 | 6,650 | 25,000 | 9,290 | 1,250 | 899 | 876 | 636 |
| Russia | 9,860 | 1,690 | 9,930 | 2,100 | 35 | 53 | 1,070 | 210 |
| South Africa | 104 | 52 | -- | -- | -- | -- | 1 | 8 |
| Switzerland | 985 | 673 | 1,340 | 946 | 293 | 341 | 332 | 195 |
| Ukraine | 2,710 | 521 | 1,640 | 170 | -- | -- | -- | -- |
| United Kingdom | 3,420 | 1,750 | 5,500 | 1,970 | 1,300 | 674 | 433 | 333 |
| Other | 1,140 r/ | 724 r/ | 2,050 | 1,040 | 803 r/ | 379 r/ | 839 | 846 |
| Total | 167,000 | 73,400 | 201,000 | 91,500 | 20,500 | 8,050 | 17,400 | 7,370 |

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Customs value.

Source: Bureau of the Census.

TABLE 3
U.S. EXPORTS AND REEXPORTS OF INDUSTRIAL DIAMOND STONES, BY COUNTRY 1/

(Thousand carats and thousand dollars)

| | Industrial unworked diamonds (7102.21.0000 ) | | | |
|---|---|---|---|---|
| | 1995 | | 1996 | |
| Country | Quantity | Value 2/ | Quantity | Value 2/ |
| Belgium | 3,440 | 17,000 | 1,650 | 14,500 |
| Brazil | 11 | 27 | 16 | 120 |
| Canada | 512 | 1,410 | 328 | 1,120 |
| Germany | 110 | 899 | 50 | 394 |
| Hong Kong | 194 | 1,370 | 55 | 572 |
| India | 14 | 105 | -- | -- |
| Ireland | 22 | 210 | 73 | 325 |
| Israel | 144 | 1,440 | 53 | 397 |
| Italy | -- | -- | 17 | 39 |
| Japan | 512 | 5,220 | 768 | 6,880 |
| Korea, Republic of | 98 | 946 | 106 | 976 |
| Netherlands | 36 | 364 | 25 | 246 |
| Netherlands Antilles | 12 | 120 | 1 | 7 |
| Switzerland | 15 | 152 | 16 | 163 |
| United Kingdom | 41 | 347 | 43 | 416 |
| Other | 22 | 264 | 57 | 417 |
| Total | 5,180 | 29,900 | 3,260 | 26,600 |

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Customs value.

Source: Bureau of the Census.

TABLE 4
U.S. EXPORTS AND REEXPORTS OF INDUSTRIAL DIAMOND POWDER, DUST AND GRIT, BY COUNTRY 1/

(Thousand carats and thousand dollars)

| | Diamond powder and dust | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Synthetic (7105.10.0025) | | | | Natural (7105.10.1010) | | | |
| | 1995 | | 1996 | | 1995 | | 1996 | |
| Country | Quantity | Value 2/ | Quantity | Value 2/ | Quantity | Value 2/ | Quantity | Value 2/ |
| Australia | 725 | 1,950 | 625 | 1,290 | 80 | 122 | 34 | 69 |
| Austria | 1,450 | 869 | 1,260 | 962 | 267 | 201 | 194 | 72 |
| Belgium | 1,420 | 650 | 2,180 | 2,070 | 175 | 208 | 327 | 260 |
| Brazil | 1,570 | 1,090 | 1,480 | 1,010 | 7 | 12 | 96 | 79 |
| Canada | 2,830 | 6,220 | 2,990 | 6,280 | 10 | 10 | 49 | 112 |
| China | 612 | 597 | 1,280 | 497 | -- | -- | -- | -- |
| France | 532 | 299 | 232 | 184 | 24 | 29 | 16 | 25 |
| Germany | 27,800 | 26,600 | 17,300 | 19,300 | 264 | 228 | 279 | 233 |
| Hong Kong | 6,440 | 3,330 | 7,700 | 3,620 | 17 | 58 | 163 | 139 |
| India | 2,180 | 1,700 | 4,130 | 2,310 | 6 | 14 | -- | -- |
| Ireland | 9,030 | 9,890 | 10,800 | 13,200 | 544 | 1,280 | 214 | 412 |
| Israel | 1,260 | 371 | 290 | 130 | 111 | 93 | 219 | 53 |
| Italy | 1,310 | 1,090 | 999 | 607 | 315 | 223 | 84 | 87 |
| Japan | 18,100 | 18,600 | 25,000 | 20,900 | 129 | 135 | 334 | 324 |
| Korea, Republic of | 10,100 | 8,060 | 12,300 | 9,000 | 95 | 130 | 143 | 268 |
| Luxembourg | 290 | 475 | 115 | 73 | 102 | 214 | 170 | 198 |
| Mexico | 127 | 190 | 193 | 131 | 29 | 46 | 169 | 145 |
| Singapore | 525 | 708 | 1,460 | 1,020 | 265 | 663 | 147 | 161 |
| South Africa | -- | -- | 15 | 34 | 110 | 221 | -- | -- |
| Switzerland | 2,220 | 946 | 2,100 | 988 | 203 | 213 | 221 | 197 |
| Taiwan | 2,480 | 1,700 | 3,940 | 2,570 | 173 | 434 | 218 | 108 |
| Thailand | 1,190 | 885 | 450 | 376 | 5 | 11 | 12 | 34 |
| United Kingdom | 3,870 | 4,940 | 3,240 | 1,960 | 989 | 848 | 1,410 | 1,080 |
| Other | 1,350 | 1,300 | 3,160 | 1,670 | 187 | 359 | 91 | 57 |
| Total | 97,300 | 92,400 | 103,000 | 90,200 | 4,110 | 5,750 | 4,590 | 4,110 |

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Customs value.

Source: Bureau of the Census.

TABLE 5
NATURAL DIAMOND: ESTIMATED WORLD PRODUCTION, BY TYPE AND COUNTRY 1/ 2/

(Thousand carats)

| Country | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|
| Gemstones: 3/ | | | | | |
| Angola 4/ | 1,100 | 130 | 270 | 2,700 r/ | 3,600 |
| Australia | 18,100 | 18,800 | 19,500 | 18,300 | 18,897 5/ |
| Botswana | 11,200 | 10,300 | 10,550 5/ | 11,500 | 11,000 |
| Brazil | 653 | 1,000 r/ | 300 r/ | 700 r/ | 700 |
| Central African Republic | 307 5/ | 370 | 400 | 400 | 350 |
| China | 200 | 230 | 230 | 230 | 230 |
| Gabon | 400 | 400 | 400 | 400 | 400 |
| Ghana | 104 r/ 5/ | 106 r/ 5/ | 118 r/ | 126 r/ | 125 |
| Nambia | 1,520 | 1,120 | 1,312 5/ | 1,382 5/ | 1,300 |
| Russia | 9,000 | 8,000 | 8,500 | 9,000 | 9,250 |
| Sierra Leone | 180 | 90 | 155 | 113 5/ | 162 |
| South Africa | 4,600 | 4,600 | 5,050 r/ | 5,070 r/ | 5,360 |
| Venezuela | 302 | 145 r/ 5/ | 203 | 229 5/ | 230 |
| Zaire | 8,930 | 2,010 | 4,000 | 4,000 | 3,000 |
| Other | 305 | 277 r/ | 463 r/ | 608 r/ | 813 |
| Total | 56,800 r/ | 47,600 r/ | 51,400 | 54,800 r/ | 55,400 |
| Industrial: | | | | | |
| Angola 4/ | 80 | 15 | 30 | 300 r/ | 400 |
| Australia | 22,100 | 23,000 | 23,800 | 22,400 | 23,096 5/ |
| Botswana | 4,790 | 4,420 | 5,000 | 5,300 | 5,000 |
| Brazil | 665 | 600 r/ | 600 r/ | 600 r/ | 600 |
| Central African Republic | 107 5/ | 125 | 131 | 130 | 120 |
| China | 800 | 850 | 850 | 900 | 900 |
| Gabon | 100 | 100 | 100 | 100 | 100 |
| Ghana | 590 r/ 5/ | 484 r/ 5/ | 473 r/ 5/ | 505 r/ | 505 |
| Nambia | 30 | 20 | -- | -- | -- |
| Russia | 9,000 | 8,000 | 8,500 | 9,000 | 9,250 |
| Sierra Leone | 116 | 68 | 100 | 101 r/ | 108 |
| South Africa | 5,600 | 5,700 | 5,800 r/ | 5,880 r/ | 6,000 |
| Venezuela | 176 | 155 5/ | 214 5/ | 64 5/ | 60 |
| Zaire | 4,570 | 13,600 | 13,000 | 13,000 | 15,000 |
| Other | 218 | 210 r/ | 277 r/ | 344 r/ | 464 |
| Total | 48,900 r/ | 57,400 | 58,900 r/ | 58,600 r/ | 61,600 |
| Grand total | 106,000 | 105,000 | 110,000 | 113,000 r/ | 117,000 |

r/ Revised.
1/ World totals and estimated data are rounded to three significant digits; may not add to totals shown.
2/ Table includes data available through May 28, 1997.
3/ Includes near-gem and cheap-gem qualities.
4/ Figures do not include smuggled artisanal production.
5/ Reported figure.

TABLE 6
SYNTHETIC DIAMOND: ESTIMATED WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand carats)

| Country | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|
| Belarus | 30,000 3/ | 30,000 3/ | 25,000 | 25,000 | 25,000 |
| China | 15,000 | 15,500 | 15,500 | 15,500 | 15,500 |
| Czech Republic 4/ | XX | 5,000 | 5,000 | 5,000 | 5,000 |
| Czechoslovakia 5/ | 10,000 | XX | XX | XX | XX |
| France | 3,500 | 3,500 | 3,500 | 3,000 | 3,000 |
| Greece | 750 | 1,000 | 1,000 | 1,000 | 750 |
| Ireland | 60,000 | 65,000 | 65,000 | 60,000 | 60,000 |
| Japan | 30,000 | 32,000 | 32,000 | 32,000 | 32,000 |
| Poland | 320 | 98 | 271 | 256 | 250 |
| Romania | 3,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Russia | 80,000 | 80,000 | 80,000 | 80,000 | 80,000 |
| Serbia and Montenegro | -- r/ | -- r/ | -- r/ | -- r/ | -- |
| Slovakia 4/ | XX | 5,000 | 5,000 | 5,000 | 5,000 |
| South Africa | 60,000 3/ | 60,000 3/ | 60,000 | 60,000 | 60,000 |
| Sweden | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Ukraine | 10,000 3/ | 10,000 3/ | 8,000 | 8,000 | 8,000 |
| United States | 90,000 | 103,000 | 104,000 | 115,000 | 114,000 |
| Total | 418,000 r/ | 440,000 r/ | 434,000 r/ | 440,000 r/ | 439,000 |

r/ Revised. XX Not applicable.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Table includes data available through May 28, 1997.

3/ Reported figure.

4/ Formerly part of Czechoslovakia; data were not reported separately until 1993.

5/ Dissolved Dec. 31, 1992.