THE U.S. PRIVATE, BUSINESS and LIGHT TRANSPORT AIRCRAFT INDUSTRY

Its Development, World Market and Foreign Competition

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

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The mission of the Aerospace Research Center is to engage in research, analyses and advanced studies designed to bring perspective to the issues, problems and policies which affect the industry and, due to its broad involvement in our society, affect the nation itself. The objectives of the Center's studies are to improve understanding of complex subject matter, to contribute to the search for more effective government-industry relationships and to expand knowledge of aerospace capabilities that contribute to the social, technological and economic well being of the nation.

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INTRODUCTION

This study, a look at the U.S. private, business/corporate and light transport manufacturing industry, is the third in a series of AIA reports on a subject of critical concern to all U.S. aerospace manufacturers: foreign competition.

The two earlier studies looked at the world market and at foreign competition for commercial jet transport and helicopter manufacturers. This study explores general aviation—a segment of U.S. aircraft production that, in mid-1984, had not yet shared in the business recovery underway for the rest of the U.S. economy. General aviation sales, which peaked at 17,811 aircraft in 1978, dropped to 2,691 units in 1983, and sales growth overall is coming slowly.

In any future scenario for U.S. general aviation manufacturers, there are some positives:

- The United States is the largest market for general aviation products;
- General aviation sales will improve as corporate profits and capital spending continue to rise; and
- U.S. companies have invested heavily in exciting, new technology.

Yet, as this study points out, non-U.S. manufacturers have made strong incursions in the U.S. domestic market as well as in foreign markets.

Market opportunities and the level of competition are different for each section of the general aviation market—piston-powered aircraft, turboprops, turbofans/jets, and light transports. In the same way, the situation varies from jet transport to rotorcraft to general aviation manufacture. Nonetheless, the three AIA studies clearly show that while the U.S. aerospace industry still leads as a high-technology manufacturing industry, and as an exporter, there is little cause to assume it will remain so without national attention to fundamental trade and R&D policy issues.

CONCLUSIONS

1. Nowhere in the world is the market for general aviation equipment so highly developed as in the United States. The United States today operates four out of every five aircraft in the world's business, corporate and private fleet, and possesses the world's only mature regional/commuter airline system operating alongside its trunk carriers.

2. U.S. private, business/corporate and light transport aircraft production increased dramatically during the 1970's and peaked in 1978 at sales of 17,811 aircraft. However, by 1983, unit sales had dropped to 2,691. Inflation, high interest rates and the economic recession of 1981-83 were devastating for general aviation manufacturing. While a general business recovery was underway for the U.S. economy as a whole in early 1984, the recession has continued for general aviation.

3. With improvement in the U.S. economy and the expected continuing upturn in corporate profits and capital spending, there should be improvement in general aviation aircraft sales, which typically lag behind recovery in other sectors of the economy. Exports, however, which historically have constituted 25-30 percent of the total market for U.S. general aviation manufacturers, will feel the lingering effects of world recession. Export recovery will be slowed by price disadvantages caused by the strong value of the U.S. dollar, the increasingly strong market position of foreign government-owned airframe and engine manufacturers, and by barriers to market access in numerous countries. The General Aviation Manufacturers Association reports that, in 1984, exports are only 10-15 percent of unit deliveries.

4. General aviation and other aerospace exports play a significant role in the American economy and their failure to rebound could have long-term detrimental effects on recovery. Exports not only create jobs, they help offset the outflow of dollars in payment for imports and reduce the nation's merchandise trade deficit. Healthy export sales contribute to the viability of industries and help underwrite research and development that, in turn, keeps the industries competitive.

5. While all indications are for strong potential sales for general aviation manufacturers, numerous foreign competitors are well positioned for market advances and have already made strong inroads in both the U.S. domestic and foreign markets. U.S. producers have been losing ground in the home market for several years.

   Sales by foreign manufacturers have been assisted by government support in the development of general aviation products. The extent of government subsidy and support for general aviation airframe and engine manufacturing differs from country to country. However, the United States is one of the few countries where government ownership and government direction of the industry are not practiced. In most other countries that have a general aviation manufacturing industry, the government owns all or part of the industry, or it provides direction and encourages industrial consolidation that would be illegal in the United States. Virtually all other nations trying to sell directly into the U.S. domestic market are able to offer their products with favorable export financing arrangements not available to U.S. manufacturers.

6. The recent world recession has led to a decline in trade and prompted protectionist actions that threaten the fair and open trading environment that the United States has worked for and supported for over 30 years.

   Fundamental differences in the orientation of national economic systems stand in the way of any swift resolution of open vs. protectionist trade practices. It is the national policy of Japan, members of the European Economic Community, and other nations to provide direct and indirect support to commercial enterprises which foster growth in employment, national security and technological progress. Each of those nations has an urgency for net export earnings to pay for oil and other imports and to repay loans, and for jobs and tax revenues to reduce unemployment and national deficits. The United States also needs export earnings to offset imports, to create employment and to reduce national deficits through tax revenues, but it lacks a

cohesive national policy which addresses the need to export.

7. Sales opportunities and level of competition for U.S. general aviation manufacturers vary in different segments of the market:

   Private and Business Turboprop — U.S. manufacturers dominate the domestic business turboprop market, which is overwhelmingly concentrated in the United States, and have been able to fend off foreign competition more successfully than in either the business jet or light commuter turboprop market. However, government supported foreign manufacturers could open the U.S. market to a major foreign thrust. Government support could give foreign firms an advantage in the global world market. In the future, major market growth will occur outside the United States—in Latin America, Africa, Asia and Oceania.

   Turbofan/Turbojet - The market for the business jet is largely in the United States (74 percent of world production). Based on sales trends of the last several years, foreign manufacturers could continue to capture an increasing share of both North American and global markets through the late 1980's. In 1983, foreign manufacturers claimed 50 percent of the U.S. market, up from 28 percent just two years earlier.

   Single and Multi-Engine Piston - U.S. manufacturers dominate the home market for piston-powered aircraft and their presence in the global market is equally overwhelming. Only a few foreign nations provide the levels of subsidy, credit and trade protection sufficient to enable their home industries to compete head-on against U.S. products. Nonetheless, foreign manufacturers' share of the total overseas piston aircraft market increased from roughly 17 percent in 1981 to 40.7 percent in 1983. At the same time, the piston market contracted sharply because of concern over reduced profitability, price inflation in the economy, high interest rates, and in the late 1970's, uncertainty over fuel availability and cost. As a result, the relative share of pistons in the total market has declined. It is uncertain if recent market handicaps will continue to restrict this segment of general aviation.

   Light Transport - Further expansion is anticipated in the U.S. regional airline system along with strong growth in demand for this category of aircraft for commuter and military use overseas. There have been determined efforts by several nations to share in this fastest-growing segment of the civil aviation market and foreign governments heavily targeted the industry. Foreign government-supported companies were thus more able to risk resources in a promising but turbulent market. U.S. manufacturers were uncertain about the types and sizes of aircraft which would be permitted to engage in air taxi and commuter operations, and had already committed significant resources to other product ventures. While U.S. manufacturers compete aggressively in the domestic market segment for light transports up to 19 seats in capacity, most have tended to refrain from commitments to larger (30-plus seat) transports because of their very heavy capital costs and the large volume of sales required to break even.

8. Given the competitive characteristics of the world aircraft market today, particularly the increasing role of government support, the United States' historical technology lead has eroded. Nonetheless, U.S. companies have demonstrated a willingness to invest substantial sums in developing new products, even during the recent recession. If the promise of current, new designs is fulfilled, the U.S. general aviation industry should climb out of the deepest recessionary trough ever experienced, well positioned to compete against foreign manufacturers offering price-subsidized products that cannot equal the performance of the new U.S. aircraft. The latest technology will move abroad rapidly, however, and be put into production by government-owned and supported manufacturers. In the long run, foreign firms may have the advantage of greater market staying power. The increasingly high cost and risk of funding new technology to stay steps ahead of competitors able to draw on foreign treasuries will undoubtedly handicap U.S. producers.

9. The increasingly higher cost of developing and producing new aircraft models and engines in general aviation as in transport and helicopter manufacturing is leading to international joint venture arrangements like those pioneered by European aerospace manufacturers in the 1960's. These collaborative efforts offer risk sharing and market opportunities. Recent examples are the Gates Learjet and Piaggio (Italy) combination, and those of Fairchild with SAAB-Scania of Sweden and Cessna with Reims Aviation of France. If U.S. manufacturers find it difficult to compete effectively on their own, joint ventures may become an increasingly attractive alternative.

10. The U.S. trade balance, with a deficit for all but two years since 1971, and in 1983 exceeding $60 billion, would be far worse without the positive contribution of aerospace sales. In fact, a substantial portion of the U.S. high technology product trade surplus which grew from 1962 through 1980—is due to only two industries: aircraft and computers and related products. The U.S. advantage in high technology trade argues for U.S. attention to continuing market share losses in aircraft and other high technology product areas, and for strong emphasis on maintaining U.S. market strength through research and technology.

RECOMMENDATIONS

If U.S. manufacturers of private, business/corporate and light transport aircraft and engines are to remain viable contenders in the marketplace, it is important that ***government and industry***:

- Work together to create a business environment supportive of research and development, technological innovation, and export expansion;
- Establish strong, consistent and long-term goals to promote U.S. exports, and develop the technological base that makes exports possible.
- Repudiate protectionist actions that insulate the domestic market from foreign manufacturers.

Industry must:

- Maintain adequate levels of research investment;
- Increase capital investment to improve productivity, stimulate innovation, enhance product quality and effect lower unit costs.

Government must:

- Work to assure a strong economic recovery and continuing steady economic growth and stability in which business can function and compete effectively. In particular, monetary and fiscal policies must be addressed in an attempt to reduce the high value of the dollar, which currently impedes U.S. exports.
- Maintain an adequate and effective level of civil aeronautical R&T spending;
- Continue and strengthen government incentives for private industry investment in R&D including:
  - —Make the 25 percent R&D tax credit permanent;
  - —Provide a meaningful credit for continued, sustained R&D activity;
  - —Allow all research and experimentation expenditures to qualify for R&D tax credit;
  - —Accelerate amortization of the cost of acquired research;
- Strengthen export incentives:
  - —Study export incentives provided by other developed nations to assure that, even with the new Foreign Sales Corporation (FSC) incentive in place, the export incentives of the United States are comparable;
  - —Provide recommendations on an improved trade incentives policy.
- Provide sufficiently competitive export financing:
  - —Work to neutralize financing as an element in foreign competition, and for interest rates and terms which reflect the market environment;
  - —Support and strengthen U.S. trade representatives in efforts to broaden the Commonline Agreement on aircraft export financing to include general aviation aircraft and rotorcraft;
  - —Make Eximbank more effective as an export credit agency by encouraging adoption of a policy of more aggressive support of general aviation exports.
  - —Strengthen Eximbank's ability to provide for the financing of sales of U.S. aircraft manufacturers and subsystem suppliers to domestic carriers when in competition against unfair financing practices of foreign producers.
- Support and promote a fair and open trading environment:
  - —Take appropriate action upon the infringement of international trade rules, and in extreme cases, penalize foreign companies for persistent or prolonged violation.
  - —Support and implement the Trade Agreements Act and the Agreement on Trade in Civil Aircraft vigorously, particularly with respect to subsidies;
  - —Strengthen the Aircraft Agreement and other General Agreement on Tariffs and Trade (GATT) codes on which enforcement of the Aircraft Agreement depends, seeking market discipline and enforcement through multilateral trade agreements;
- Structure a sound, consistent policy framework with respect to restrictions of technology exports:
  - —Eliminate uncertain and erratic export licensing of general aviation products;

—Work to strengthen COCOM* and improve the consistency and uniformity of interpretation of the rules by all members;

* The coordinating committee of all NATO countries, except Iceland and Spain, plus Japan, which has developed policies and practices for the control of goods having a strategic military value in Communist countries.

—Ensure that export control decisions consider foreign availability and are multilateral within COCOM;
—Respect contract sanctity in foreign policy controls;
—Limit the scope of controls on technology transfer to a managable critical set of technologies to which access by adversaries actually can be denied.

EXECUTIVE SUMMARY

For most people, the civil aircraft industry conjures up visions of a handful of large U.S. and foreign manufacturers building the large jet transports used by the major domestic and international airlines to carry hundreds of passengers at a time between pairs of distant and very busy terminals.

It is true that in 1982, in the United States, transport aircraft accounted for about 75 percent of the dollar value of all civil shipments, but what about the other 25 percent of civil aircraft business? This is the province of the "general aviation" manufacturers who build a wide range of products ranging from small two-, four- and six-passenger single-engine piston aircraft for private and business use to a variety of twin-engine turboprop and turbofan machines designed for corporate, business and small airline use.

Background

While the major commercial airlines can trace their antecedents to the 1920's with venerable equipment like the Ford TriMotor and the Curtis Condor, the general aviation market of today, and particularly its light transport segment, is essentially a postwar baby boomer.

To be sure, business flying began well before World War II. In 1925, the Travelaire Co. marketed the first of a series of cabin biplanes and later high-wing monoplanes. Other cabin biplanes included the Waco and the popular Beech Staggerwing. Stinson and Bellanca offered utility aircraft which could be configured for business use, and by the late 1930s, Luscombe offered the first all-metal light plane. Powered by single radial and in-line piston engines, these precursors typically offered a passenger capacity of 3 to 6. Shortly before World War II, Beech introduced its twin-engine all-metal Model D-18 with a passenger capacity of 7.

The war materially altered the development of the general aviation industry. With the cessation of hostilities, an enormous number and variety of military-surplus aircraft became available at bargain prices, enabling corporate and business users to upgrade the range, passenger capacity, speed and comfort of their aircraft. Surplus Air Force C-45's and C-47's (Beech D-18's and Douglas DC-3's) found eager acceptance. More ambitious corporate flight departments turned to fast, fuel-voracious light bombers, surplus A-26's and B-25's internally and often luxuriously modified to belie their World War II origin. It became evident that there existed a definite market for light, fast, long-range aircraft designed specifically for corporate, executive and general aviation use.

The general aviation industry responded to this lively business interest with new models like the powerful and fast Beech Bonanza. Powered by a single piston engine, this "V-tail" came to be regarded as the Cadillac of the light piston market. There remained, however, an unfulfilled demand at the high end of the market.

In 1957, Grumman Corporation gambled on the proposition that there existed a demand for an aircraft utilizing up-to-date technology and designed specifically for corporate use. Its product was the Gulfstream I (also known as G-1). This pressurized, twin-turboprop aircraft proved a great success, and it has been succeeded by several later generations of higher-performance machines.

Shortly after Grumman's initiative, the Air Force announced a competition for an "off-the shelf" pair of jet aircraft for executive transport, navigation training and other mission-related tasks. Winners were North American (now Rockwell International) with the Sabreliner and Lockheed with the JetStar. About the same time, the late, highly-gifted aircraft designer, William Lear, independently designed, manufactured and marketed the small LearJet for executive use. Civil versions of the Sabreliner, JetStar and Learjet found an eager market, and the "high end" of general aviation was off and running.

Industry Growth

In the past 20 years, general aviation has burgeoned in the United States. True, the post war dream of "an airplane in every garage" never materialized, nevertheless, small two-, four- and six-passenger single-engine piston (and now turboprop) aircraft continue to account for the bulk of general aviation unit shipments. More dramatic has been the increase in the variety of two-engine turboprops and two- and four-engine turbofan aircraft, some with intercontinental range, which have come into the market.* These larger and more sophisticated aircraft account for most of general aviation's billings; the turbofans alone accounted for about half the dollar value of general aviation aircraft sales in 1982 and 1983. Taken together, the turboprops and the turbofans at the high end of the industry's

* One four-engine turboprop, the de Havilland Dash 7, is also available.

spectrum have accounted for most of its growth over the past two decades.

In 1962, the industry shipped almost 6,700 piston aircraft but no turboprops or jets. In 1983, it delivered 2,691 aircraft, but this included 321 turboprops and 142 turbofans. The larger, more sophisticated turbine aircraft, some with intercontinental range, accounted for the bulk of the industry's 1982 billings against zero for 1962. In fact, the billings of the entire industry amounted to $137 million in 1962 against $1.47 billion in 1983.

Airline Deregulation

In 1978, Congress gave the air carriers the freedom to compete on fares, routes and frequencies. This has worked a radical transformation in the operating patterns of the major carriers. The points they served reached a peak of 567 in 1960 but shrank to 372 by the time the Deregulation Act became law. Since then, the number of points served by the major carriers has declined to 231.

For general aviation, the consequences of deregulation have been two-fold: first, corporate and business users with widely-scattered plants, mines, mills, construction sites and other activities have found it essential to establish flight departments equipped with high-performance aircraft to minimize executive trip time, thereby increasing employee productivity, and to maintain a high level of cohesion and control of farflung operations.

The second development has been the blossoming of a new pattern of "hub and spoke" operation for commercial traffic. Today, full-fledged regional scheduled systems feed about 70 percent of their passengers from widely-scattered, low-density airports into large, high-density terminals where they may continue their trips on the major carriers. The regional/commuter airlines serve 578 communities in the continental United States, providing air links to communities that might otherwise be cut off from fast, efficient air transportation.

The proliferation and expansion of the new regional carriers does not meet all business and corporate requirements for efficient, non-scheduled air transportation, however. The current hub-and-spoke pattern may be economically more efficient than the elaborate multi-point network it replaced, but some passengers must pay for this in layovers and other time-consuming necessities during their trips. For business and executive travelers, time is the pearl of great value, a commodity companies have shown themselves willing to pay for through the purchase of business aircraft.

Recession

Inflation, high interest rates, and a sharp business contraction in 1981-82 proved devastating for general aviation sales. After peaking in 1978 at 17,811, the unit sales of the industry tobogganed downward to 2,691 in 1983. Total factory billings continued to climb, to a 1981 peak of $2.9 billion. A year later, they had fallen to just under $2 billion, and in 1983 fell further to just under $1.5 billion. (*Figure 1*).

While general business recovery for the U.S. economy as a whole began in 1982 and gained strength in 1983, the recession has continued for general aviation. The principal reason for this delayed impact both in feeling the effects of the recession and in enjoying the recovery is the fact that the high end of the industry's product spectrum, turbine equipment as well as twin-engine piston models, is regarded by almost all buyers as an investment and is thus subject to all the rigors of capital allocation. Prior commitments remain intact for many quarters after the recession hits the general economy, but once the latter enters an expansionary phase, many more quarters must elapse before new orders materialize for high value products.

Foreign Competition

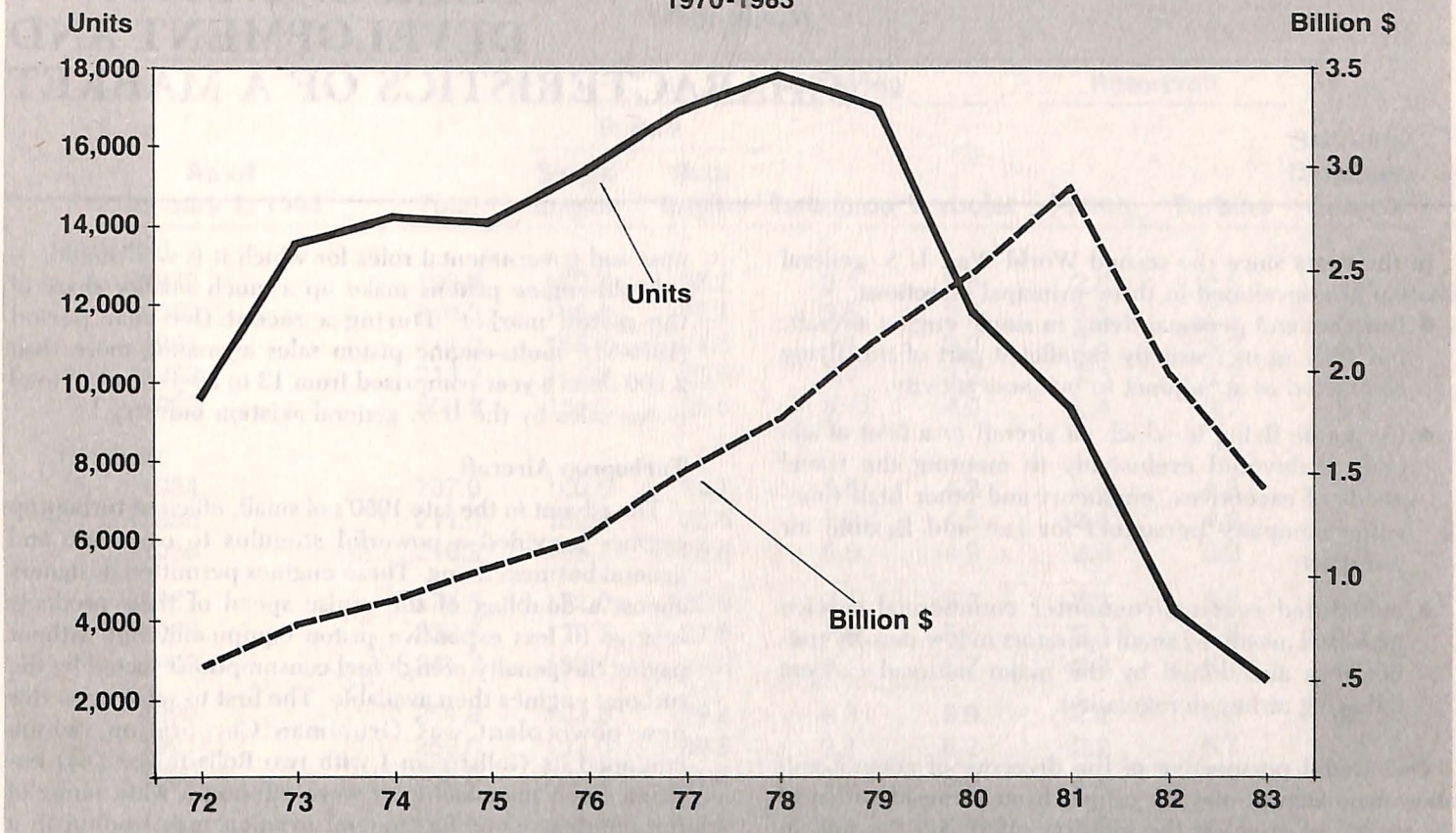
Because of its affluence, its geographical expanse, the tendency of corporations to locate new operations well away from established urban centers, and most recently, because of the impact of airline deregulation and the upheaval in commercial air service, the United States today is unique among nations in its demand for a high level of general aviation service. In fact, the United States operates four of every five aircraft in the world's business, corporate and private fleet, and it possesses the world's only fully-developed third tier airline system operating alongside its trunk and regional carriers.

The U.S. market has attracted keen attention from foreign manufacturers and their governments. They see in the high end of the U.S. general aviation shopping list a splendid opportunity to go head-to-head with U.S. manufacturers of these products, and in fact U.S. manufacturers have been losing ground in the home market to more numerous foreign competitors for several years.

- Aviation exerts a strong attraction for foreign governments and their manufacturers anxious to participate in the most up-to-date and viable commercial technologies. While foreign nations have found it necessary to band together to build large, costly commercial transports like the A-300 and A-310 Airbus and the Concorde supersonic transport, they can often go it alone in the general aviation market. They can mobilize the resources and most of the skills required for the development, production and marketing of the smaller, lower-cost turbine equipment for general aviation use. As a consequence, they recently appear to have dominated the market for light transport aircraft used by the regional/commuter carriers. Corporate and executive aircraft of foreign manufacture, many profiting from NASA's pioneering windtunnel studies available in the public domain, are also making deep inroads into the corporate and business sector; in fact, there are more foreign than domestic manufacturers of

FIGURE 1

GENERAL AVIATION UNIT SHIPMENTS/BILLINGS
1970-1983



products aimed at meeting the market, which is primarily in the United States.

- Many foreign manufacturers benefit from direct subsidies in the development of new general aviation products, and some are able to offer their products in the U.S. domestic market with favorable export financing arrangements not available to their U.S. competitors.

- With the dollar at an all-time high against many foreign currencies and stronger than at any time in half a dozen years, aircraft whose price is denominated in a foreign currency are now a bargain for many business and commuter operators.

Technology

Aviation design remains a fast-moving, highly-competitive area of competition. Harsh as it was, the prolonged recession for general aviation allowed U.S. manufacturers to devote considerable effort to improving their technology. They are developing new generations of aircraft with supercritical (low drag) wings and winglets built largely of strong, ultra-light composite materials. In addition to all-digital electronic displays (as many as five computer-like screens on a cockpit panel), these aircraft offer significantly lower weight and drag, and higher speed and payloads than their predecessors and most of the latest offerings of foreign competitors.

But even with the latest technology to achieve safe, reliable high-performance business and regional/commuter air transportation, U.S. manufacturers may not be able to get themselves onto a "level playing field" with foreign manufacturers who are abetted by their governments. In the long term, the latest technology will move abroad and foreign firms with generous support from their governments may have the advantage of greater market staying power. The increasingly high cost and risk of funding new technology to stay steps ahead of competitors—competitors able to draw on foreign government treasuries—will undoubtedly handicap U.S. producers.

GENERAL AVIATION—DEVELOPMENT AND CHARACTERISTICS OF A MARKET

In the years since the second World War, U.S. general aviation has developed in three principal directions:

- Business and personal flying in single-engine aircraft, but with an increasingly significant part of this flying conducted as an adjunct to business activity.
- Corporate flying in which an aircraft or a fleet of aircraft is devoted exclusively to meeting the travel needs of executives, engineers and other high time-value company personnel for fast and flexible air transport.
- Scheduled regional/commuter commercial service provided mostly by small operators in low-density traffic areas abandoned by the major national carriers following airline deregulation.

One useful perspective of the diversity of general aviation manufacture may be gained from a consideration of the variety of products the industry offers and the uses to which they are put.

Piston Aircraft

In 1983, the U.S. general aviation fleet totaled about 209,000 aircraft, 98 percent of the nation's total civil air fleet. The single-engine piston aircraft, from two to six seats in capacity, accounted for about 78 percent of the total general aviation fleet registry (*Table 1*).

The single-engine piston-powered aircraft is the "oldest" component of the very young general aviation industry. The earliest versions of these—Taylorcraft, Piper, Aeronca and the like—were first sold commercially in the 1930's. With feeble, hand-cranked engines of 40 to 65 hp and possessing only the most rudimentary of instruments and controls, these "kites" were mainly limited to daytime operation in reasonably calm, fair weather. The early fabric-covered machines enabled thousands of Americans to master the art of flying in the years before the second World War, when military requirements for aviators soared.

While the single-engine piston is a universal favorite for personal flying, it fulfills an important function as well for proprietors of small companies whose volume depends upon maximizing individual contact with customers over a geographical area of several hundred miles. The single-engine piston is also used for such tasks as pipeline patrol, spotting of forest fires, fish spotting and a variety of business and governmental roles for which it is well suited.

Multi-engine pistons make up a much smaller share of the piston market. During a recent five-year period (1976-81), multi-engine piston sales averaging more than 2,000 units a year comprised from 13 to 20 percent of total piston sales by the U.S. general aviation industry.[1]

Turboprop Aircraft

The advent in the late 1950's of small, efficient turboprop engines provided a powerful stimulus to corporate and general business flying. These engines permitted designers almost a doubling of the cruise speed of their products relative to less expensive piston equipment, but without paying the penalty of high fuel consumption exacted by the turbojet engines then available. The first to seize upon this new powerplant was Grumman Corporation, which equipped its Gulfstream I with two Rolls-Royce Dart engines. Soon manufacturers were offering a wide range of turboprop engines for general aviation use, leading to a proliferation of intermediate-range products suitable for corporate and business use as well as the widest imaginable application in developing countries lacking roads, railroads, and other transportation infrastructure.

Of all major types of general aviation equipment—pistons, turboprops, turbojets, turbofans and helicopters—the business turboprop has experienced the highest rate of demand growth. Between 1975 and 1981, for example, deliveries of turboprops tripled from 305 to 918 a year (*Figure 1 and Table 2*).

Heavier, faster and longer-range, and more comfortable than most multi-engine pistons, almost all the turboprops aimed at the business market were sized to accommodate seven to 11 passengers (including crew) and confined take-off weight to less than 12,500 pounds. Virtually all are twin-engine designs.

In 1982, FORTUNE's 1000 largest companies operated 1,829 fixed-wing aircraft, 27 percent of which were turboprops, down from 34 percent in 1981.[2] Through 1979, the corporate/business turboprop category constituted four of every five light turboprops employed in U.S. general aviation, averaging 267 hours of operation a year.

[1]General Aviation Manufacturers Association (GAMA), *General Aviation Statistics Handbook*, 1984 Edition, p. 6.
[2]Aviation Data Service, Wichita, Kansas, and National Business Aircraft Association, Inc.

TABLE 1

ESTIMATED ACTIVE U.S. GENERAL AVIATION AIRCRAFT BY TYPE OF AIRCRAFT 1979-1994 (Thousands)

As of January 1, 1984	Total	Fixed Wing				Rotorcraft		Balloons/ Dirigibles/ Gliders
		Piston						
		Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	
Historical								
1979	198.8	160.7	23.2	3.1	2.5	2.8	2.5	4.0
1980	210.3	168.4	25.1	3.5	2.7	3.1	2.7	4.8
1981	211.0	168.4	24.6	4.1	3.0	2.8	3.2	4.9
1982	213.2	167.9	25.5	4.7	3.2	3.3	3.7	5.0
1983	209.8	164.2	25.0	5.2	4.0	2.4	3.7	5.2
Forecast								
1984	207.0	160.6	24.7	5.5	4.2	2.4	4.3	5.3
1985	211.0	162.9	25.0	6.0	4.5	2.4	4.8	5.4
1986	216.9	166.7	25.6	6.6	4.9	2.3	5.2	5.6
1987	224.5	172.0	26.5	7.1	5.2	2.3	5.5	5.9
1988	233.6	178.7	27.5	7.6	5.5	2.3	5.8	6.2
1989	244.7	187.1	28.8	8.1	5.7	2.3	6.1	6.6
1990	251.8	192.2	29.6	8.6	5.9	2.2	6.5	6.8
1991	259.0	197.0	30.5	9.1	6.2	2.2	6.7	7.1
1992	266.6	202.4	31.4	9.6	6.5	2.2	7.2	7.3
1993	274.0	207.7	32.2	10.1	6.7	2.2	7.5	7.6
1994	281.0	212.6	33.0	10.5	6.9	2.1	8.1	7.8
1995	287.0	216.8	33.7	10.9	7.1	2.1	8.4	8.0

Source: Federal Aviation Administration

The turboprop has also become the mainstay of regional/commuter carriers. It is flown almost six times more intensively, 1,427 hours a year, in this role than in the business/corporate role, placing great demands upon manufacturers to produce reliable and durable equipment with long life spans.

A more recent phenomenon, in part a consequence of airline deregulation and in part the result of the considerable dispersal of business operations to suburban, exurban and rural sites in the past two decades, has been the appearance of corporate "airlines" providing scheduled, non-common carrier turboprop as well as turbofan and helicopter service for their employees between widely-separated plants or sites.

Turbofan/Turbojets

The appearance in the early 1960's of small twin-jet executive aircraft like the Sabreliner and Learjet and the larger, four-jet JetStar provided air transportation offering the comfort and speed of contemporary airline jet equipment. Their strongest attraction was their flexibility and their responsiveness to management needs, relieving exec-

TABLE 2

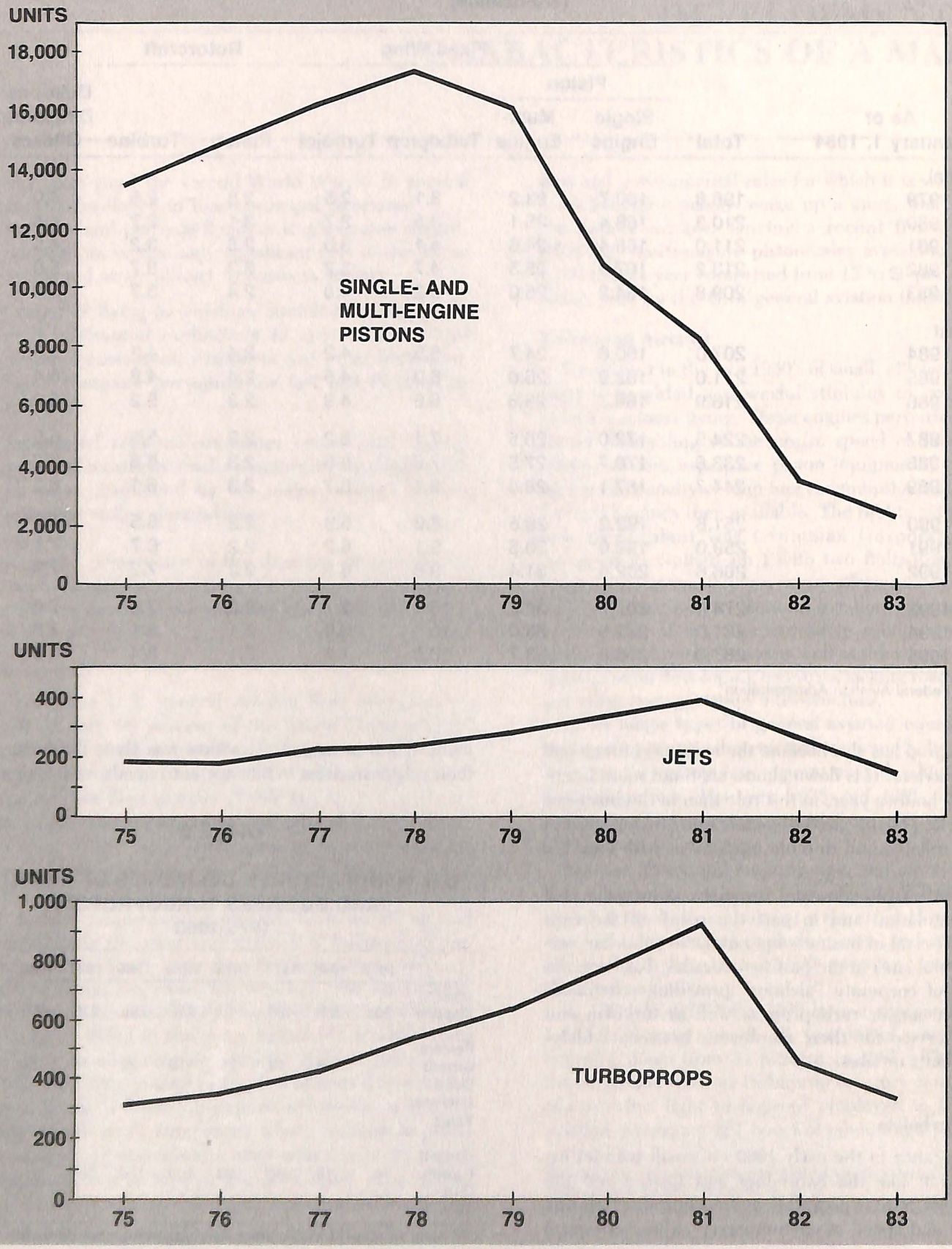
U.S. MANUFACTURER DELIVERIES OF PRIVATE AND BUSINESS TURBOPROPS[a] 1975-1983

	1975	1976	1977	1978	1979	1980	1981	1982	1983
Units Shipped	305	359	428	548	637	795	918	458	321
Percent Growth Over Previous Years	—	18	19	28	16	25	15	−50	−29.9
Percent Growth Over 1975	—	18	40	80	109	160	201	50	5

[a]General Aviation Manufacturers Association member deliveries

FIGURE 1

GENERAL AVIATION UNIT AIRCRAFT DELIVERIES
OF U.S. MANUFACTURERS
1972-1983



Source: General Aviation Manufacturers Association

utives of the necessity of coping with the traffic-optimizing practices of the commercial carriers.

With the advent of small, more fuel-efficient turbofan engines in the 1970's, a new breed of small turbofan aircraft appeared which offered trans-continental and intercontinental range and this enhanced their importance to large corporations.

The U.S. corporate/business jet fleet experienced moderate growth in the 1960's and early 1970's. This was a period of steady growth in revenue passenger miles for the commercial carriers, however, and it was marked by growing lines at ticket and baggage counters and an increasing overload of existing terminal and ground transportation facilities. Complicating the problem was a growing discontent on the part of professional air traffic controllers, who threatened "sick-outs" and employed "work-to-rule" tactics to bring pressure on the Federal Aviation Administration for higher pay and benefits.

Growing delays and frustration for airline passengers provided a catalyst for a decade-long boom in turbojet/turbofan sales to corporate and business users. Worldwide sales of this equipment, averaging about 185 a year between 1965 and 1972, more than doubled in the following decade, 1973-82. U.S. and foreign manufacturer shipments of business and corporate jets reached 552 in 1981, but subsequently receded because of the severe economic recession.

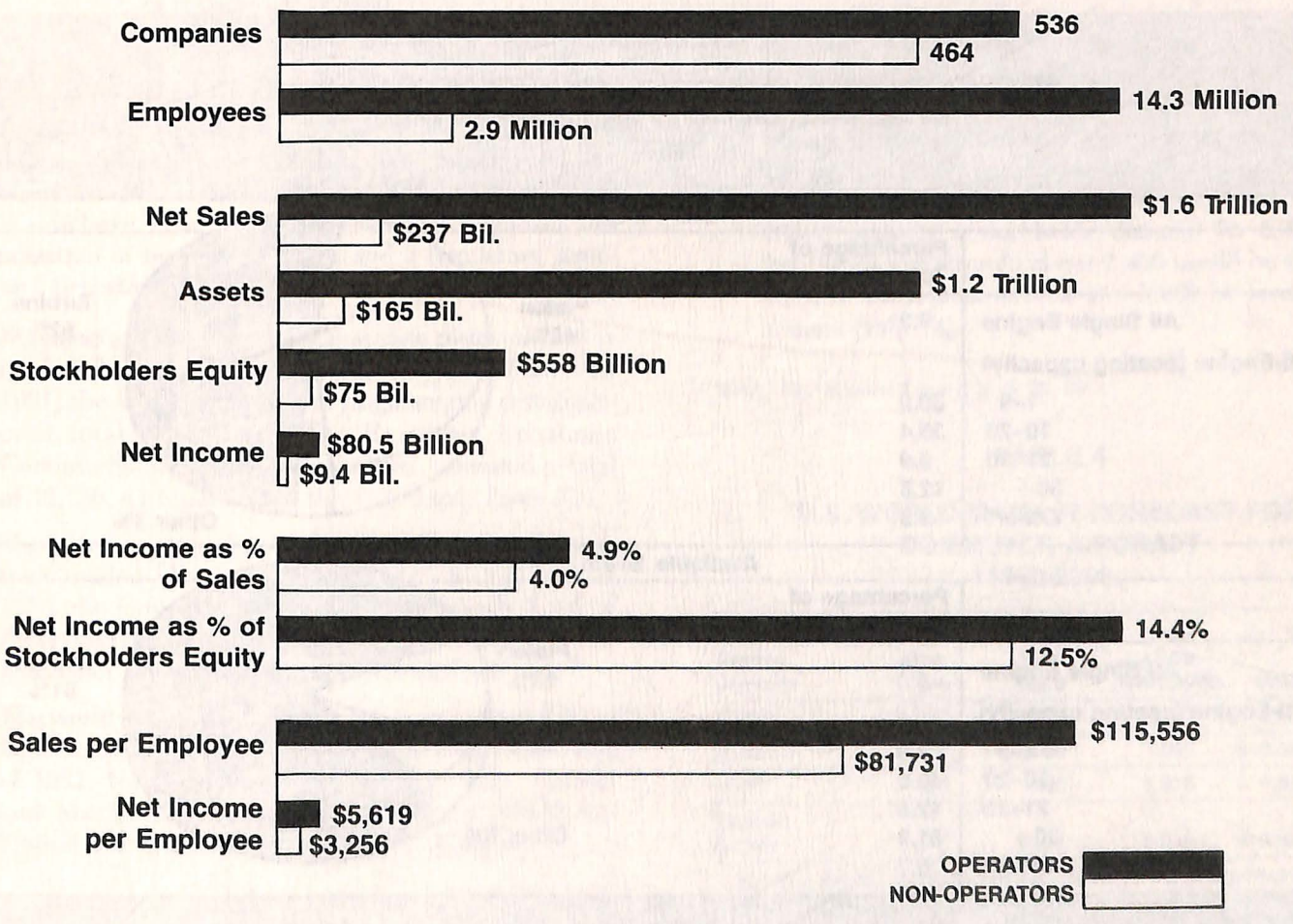
Figure 2 illustrates the important role of corporate aircraft to major U.S. companies.

Light Transports

One of the great national legacies of World War II was the construction of many first-class paved airdromes in remote parts of the country for the training of military aviators. With the end of the war, many of these became surplus to military needs and local communities eagerly

FIGURE 2

OPERATORS VS. NON-OPERATORS OF CORPORATE AIRCRAFT
1000 TOP INDUSTRIAL COMPANIES RANKED BY SALES[a]
1981



Source: Aviation Data Service, Wichita, Kansas and National Business Aircraft Association, Inc.
[a]As listed each year by *Fortune* magazine.

took them over. In response to public demand, the Civil Aeronautics Board (CAB) moved to increase local air service, issuing temporary operating certificates to 17 new or existing interstate carriers to serve as a second category of local airlines "feeding" passengers to the major trunks. Shortly after the creation of the local service carriers, the CAB in 1952 created a third category of "noncertified irregular route" carriers. While exempt from CAB economic regulations, the third tier (air taxi) carriers were prohibited from offering scheduled services or operating a commercial basis aircraft exceeding 12,500 pounds gross take-off weight.

The third tier carriers later came to be known as "commuter airlines," but today the term "regional" would be more appropriate. Between 1970 and 1979, this group of carriers enjoyed passenger growth of 13 percent annually, compared to 7 percent for the major trunk and local service carriers, and a 3 percent average growth rate for the gross national product.[1] Between 1970 and 1978, regional/commuter traffic grew from 4.3 to 11 million passengers, an average annual increase of 840,000. From 1978 to 1983, growth was far more dramatic. In 1983, regional commuter lines served 21.8 million passengers, an average annual increase since 1978 of 2.1 million travelers.[2]

Several factors stimulated the rapid growth of the third tier carriers during the 1970's: rising incomes, the dispersal of business to smaller communities, the withdrawal of local service carriers from smaller areas, and a variety of regulatory changes (to be discussed below) permitting them easier entry into the market and allowing them to offer a wider range of services.

The small twin-turboprop with a seating capacity of 10-20 is presently the aircraft most often used by regional/commuter carriers, accounting for 40 percent of available seating capacity. There is a clear "upscale" drift, however, with growing interest in aircraft with capacities of 30, 40, 60 or more passengers. In fact, many of the regional/commuter carriers operating today increasingly resemble the local service carriers operating 25 years ago, and their routes and traffic have expanded along with increasing equipment size. Figure 3 shows the composition of the regional aircraft fleet in 1983.

[1]Congress of the United States, Office of Technology Assessment, *Impact of Advanced Air Transport Technology*, Part III - *Air Service to Small Communities*, February 1982, p. 17.

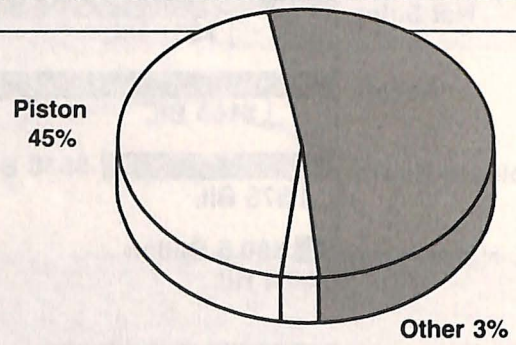
[2]Regional Airline Association (RAA), *1983 Annual Report*, p. 19.

FIGURE 3

COMPOSITION OF U.S. REGIONAL/COMMUTER AIRCRAFT FLEET BY SEATING CAPACITY AND ENGINE TYPE 1983

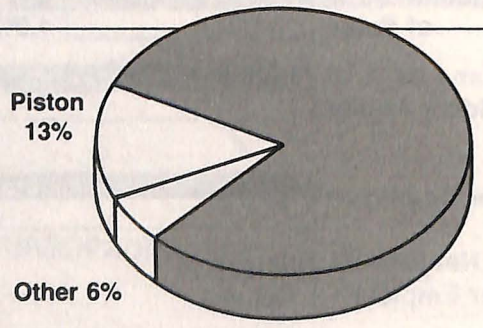
Total Fleet

	Percentage of Total Fleet
All Single Engine	9.9
Multi-Engine (seating capacity)	
1–9	30.9
10–20	35.4
21–30	8.9
30+	12.6
Other*	3.3



Available Seats

	Percentage of Available Seats
All Single Engine	1.1
Multi-Engine (seating capacity)	
1–9	7.9
10–20	40.0
21–30	12.9
30+	31.9
Other*	6.2



*Other includes Helicopters and Jets

Source: Regional Airline Association

TABLE 3

SINGLE-ENGINE AIRCRAFT FLEET IN WESTERN EUROPE AS OF DECEMBER 31, 1981

	Fleet		Fleet Breakdown by Design Origin							
			USA		EEC		Canada		Others	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Belgium	734	3.8	464	63.2	262	35.7	1	0.1	7	1.0
Denmark	748	3.8	532	71.1	196	26.2	15	2.0	5	0.7
F. R. Germany	6,584	33.8	3,886	59.0	2,482	37.7	2	0.0	214	3.3
France	5,143	26.4	1,590	30.9	3,518	68.4	1	0.0	34	0.7
Greece	116	0.6	94	81.0	21	18.1	—	—	1	0.9
Ireland	204	1.1	104	51.0	98	48.0	—	—	2	1.0
Italy	1,157	6.0	475	41.1	661	57.1	5	0.4	16	1.4
Luxembourg	47	0.2	31	66.0	15	31.9	—	—	1	2.1
Netherlands	443	2.3	374	84.4	50	11.3	1	0.2	18	4.1
United Kingdom	4,284	22.0	2,471	57.7	1,698	39.6	8	0.2	107	2.5
European Community	19,460	100.0	10,021	51.5	9,001	46.2	33	0.2	405	2.1

Source: Commission of the European Communities, *The European Aerospace Industry Trading Position and Figures* (Brussels: January 11, 1984).

West Germany—Luftfahrt Bundesamt; Belgium—Ministere des Communications, Administration de l'Aeronautique; Denmark, France, Greece, Ireland, Luxembourg, Netherlands—Bureau Veritas; Italy—Registro Aeronautico Italiano; and United Kingdom—Civil Aviation Authority.

* As of December 31, 1980.

Characteristics of the General Aviation Market

Although the market for general aviation equipment is worldwide, nowhere is it so highly-developed as in the United States. This is the result of a combination of factors found nowhere else: large geographical expanse, decentralization of business activity, and a regulatory structure and airport/airway system that have enhanced growth.

- Manufacture and use of single-engine piston aircraft is overwhelmingly concentrated in the United States. In 1981, the U.S. active fleet of single-engine piston aircraft totaled 168,000.[3] The European Economic Community, comprising ten nations, operated a total of 19,460, 11.6 percent of the U.S. total (*Table 3*).
- The active private, business and corporate turboprop fleet totaled about 7,200 worldwide by the end of 1983; the United States accounted for nearly 5,300 of these aircraft, or 74 percent. Next largest user was the European Economic Community with 7 percent.[4]
- The world business, corporate and government fleet of light turbojet/turbofan aircraft totaled 5,400 at the end of 1983; North America (the United States, Canada and Mexico) accounted for 81 percent, while the United States alone accounted for 74 percent.[5]
- By 1983, the U.S. light transport fleet totaled 1,808 aircraft including 868 modern turboprops. The United States today operates the world's most mature third tier commercial airline system.[6] Between 1980 and 2000, however, the Federal Aviation Administration (FAA) projects a worldwide demand for 5,400 new light transport aircraft; about 2,400 would be acquired by U.S. commuter airlines and 3,000 by foreign customers (Table 4).

[3]Aerospace Industries Association (AIA), *Aerospace Facts and Figures*, 1983/84, p. 96.
[4]Gates Learjet Corporation.
[5]Ibid.
[6]RAA, *1983 Annual Report*, p. 6, 27, 28.

TABLE 4

U.S./WORLD MARKET FORECAST FOR COMMUTER AIRCRAFT 1980-2000

Passenger Seating Capacity	U.S. Unit Sales	International Unit Sales	Total Units Worldwide	Value of Shipments[1]
15-19	1,050	1,137	2,187	$ 3,065,000,000
20-40	898	1,098	1,996	$ 6,895,000,000
41-60	425	790	1,215	$ 6,685,000,000
Total All Aircraft	2,373	3,025	5,398	$16,645,000,000

Source: *Light Transport Market Forecast.* Report prepared for the Office of Aviation Policy, Federal Aviation Administration, Washington, D.C. by The Aerospace Corporation, July 1979.

1 Regional Airline Association estimated value in constant 1980 U.S. dollars.

Reducing the Regulatory Burden

Two separate regulatory developments have exerted a powerful stimulative effect on the growth of business and light regional transport aircraft in the United States in the past decade.

The Airline Deregulation Act of 1978: By far the most important development in the government's commercial aviation policy since the 1938 Civil Aeronautics Act was the airline deregulation law enacted by Congress in 1978. This represented a critical turn away from a nationally-regulated fare, route and frequency pattern mandated for the major trunk and local service airlines established during the previous 40 years. The new freedom to abandon old routes, establish new routes, and charge competitive fares produced an upheaval in commercial traffic patterns.

One widely-anticipated consequence of the new law quickly materialized. The large carriers promptly reduced service at some points, abandoned it entirely at others, and increased it at still others. The increasing capacity of their new jet equipment was ideal for high-frequency service between distant, heavily-traveled city pairs, but this equipment became increasingly less economic when applied to shorter stage lengths generating less traffic.

In 1955, carrier service touched 539 points in the contiguous United States and peaked at 567 points in 1960, according to Civil Aeronautics Board (CAB) figures. By 1983, the number of points served by the major carriers had declined to 231.[7]

Another consequence of airline deregulation had not been anticipated. This was the replacement of point-to-point air service with a "hub-and-spoke" arrangement compelling air travelers to fly two or more times the straight-line distance between their origin and destination, often with a layover of an hour or two and a change of planes. While this new type of route structure made economic sense for large local service carriers, it also provided individuals as well as businesses and corporations further incentive to acquire aircraft tailored to their own requirements.

An Easier Regulatory Climate for Third-Level Carriers: Following its wartime decision to inaugurate a new class of local service carriers on an experimental basis, the CAB launched a second experiment in 1952. This was the creation of "noncertified irregular route" carriers, i.e., air taxies. Air taxi operations would be exempt from CAB economic regulation, but they could not operate aircraft with a gross take-off weight of more than 12,500 pounds, nor could they engage in scheduled air service.

It was not until 1969 that the CAB recognized the need to establish a class of small, non-certificated scheduled airlines which came to be known as commuter airlines. The CAB accomplished this by amending Part 298 of its Economic Regulations to define a commuter air carrier as a Part 298 operator.

A commuter airline, according to the amended regulations, was a carrier which performed at least five round trips per week between two or more points and published flight schedules which specified the time, days of the week, and airports between which such flights operated, or a carrier which transported mail under contract with the U.S. Postal Service. The other scheduled carriers—established as trunks in 1938—came under Section 401 of the Board's regulations and, thus, were sometimes referred to as 401 carriers.

To be exempt from the 401 certification, a commuter could not exceed the take-off weight of 12,500 pounds which effectively limited the aircraft to 19 passengers.

These passenger and load limitations have been eased over the years—the aircraft seating limit was moved up to 30 passengers in 1972. With the enactment of airline deregulation in 1978, the seating limit was increased to 60 passengers and the limit for all-cargo payload was raised to 18,000 pounds.

Together with market demand, regulatory relief has made the 1973-83 decade a memorable one for the regional/commuter carriers. Today, more than 50 of the 196 operating commuter airlines board 100,000 passengers annually, compared with only a handful a decade earlier. For the industry as a whole, passenger boardings have increased 283 percent to 21.8 million, revenue passenger miles have climbed 440 percent to 3.2 billion, average trip length has increased from 100 to 149 miles, points served have increased 33 percent, from 643 to 854, and the commuter aircraft fleet has increased by 12 percent, from 791 to 1,808 aircraft.[8]

Approximately 70 percent of all regional/commuter passengers connect with another airline prior to the conclusion of their trip.[9]

In 1982, the "commuters" provided the only scheduled commercial air service available at 566 of the 817 terminals served in North America.

[7]Ibid., p.10.

[8]RAA, *1982 Annual Report*, p. 10; *1983 Annual Report*, p. 6.
[9]RAA, *1982 Annual Report*, p. 15.

GENERAL AVIATION MANUFACTURING —ITS ECONOMIC AND NATIONAL SECURITY ROLES

General aviation manufacturing in 1982 constituted almost one-fourth total U.S. shipments of new fixed-wing civil aircraft and helicopters—a $2 billion share of aggregate sales of $8.6 billion. The latter number, in turn, represented just over one-eighth of total U.S. aerospace sales of $67 billion in 1982. Civil and military transports, fighters, bombers, missiles, space boosters, spacecraft and other high technology hardware as well as R&D programs constituted the great bulk of total 1982 aerospace sales, which in total amounted to 2.2 percent of the nation's GNP and 3.6 percent of its sales of manufactured goods.[1]

The overall U.S. merchandise trade account began to erode steadily in the latter half of the 1960's. It last registered a surplus in 1975 and has been negative since that time. In the last several years, largely as a result of the deep global recession, high U.S. interest rates and an extremely strong dollar on foreign exchange markets, the U.S. trade balance registered an increasingly large deficit, amounting to $35 billion in 1982 and $61 billion in 1983, partly as a result of a strong U.S. economic recovery while recession persisted abroad. It is estimated that the U.S. trade deficit could reach $100 billion in 1984.

Dismal as this trend may seem for a nation long accustomed to registering a strong and steady surplus of exports over imports, it would be far worse without the positive contribution of aerospace sales, and commercial transports in particular. In 1983, the United States exported aerospace products with an aggregate value of $16.1 billion, yielding a net surplus of $12.6 billion in the overall aerospace trade account. Civil products accounted for $10.6 billion or 66 percent of total industry exports, with transports the largest single component at $4.7 billion, an increase of almost $850 million over 1982.[2]

Unfortunately, general aviation manufacturing did not share in this improvement. The Department of Commerce reports that, in 1983, exports which typically account for 25-30 percent of the market, totaled only 519 aircraft, or 19 percent of total shipments, compared with 940 in 1982 and 2,617 in 1981. The drop in dollar value of general aviation exports was equally sharp, to $356 million in 1983 against $517 million the year before. Again, as in the previous two years, the industry experienced a trade deficit. Until 1981, general aviation had consistently registered positive trade balances (*Figure 1*). The General Aviation Manufacturers Association (GAMA) reports that in mid-1984, exports were only 10-15 per cent of unit deliveries.

General aviation generates many more jobs than simply those involved in the development and production of new aircraft. For example, GAMA reported that, in 1979, 60,000 production workers, engineers and other personnel were engaged in direct production of general aviation products. They generated about 240,000 additional jobs:

- 80,000 in sales and service support for air commuter operations, flight commuter operations, flight training, maintenance and other systems support;
- 65,000 to make the brakes, wheels, tires, aluminum sheet and other components and materials of general aviation products;
- 45,000 in corporate and business flying departments;
- 20,000 in agricultural flying, i.e., crop seeding and spraying;
- 15,000 in specialized industrial pipeline patrol and logistics support by helicopter of off-shore oil platforms; and
- 15,000 as self-employed flight instructors, mechanics and other specialists.

Today, employment in the general aviation manufacturing sector is down 50 percent from the 1979 level, GAMA reports.

General aviation exports not only create jobs, they help offset the outflow of dollars in payment for imports and reduce the trade deficit. The increased markets that exports provide contribute to the viability of industries, keeping costs down and helping to underwrite research and development that, in turn, keep the industries competitive.

The Economic Environment

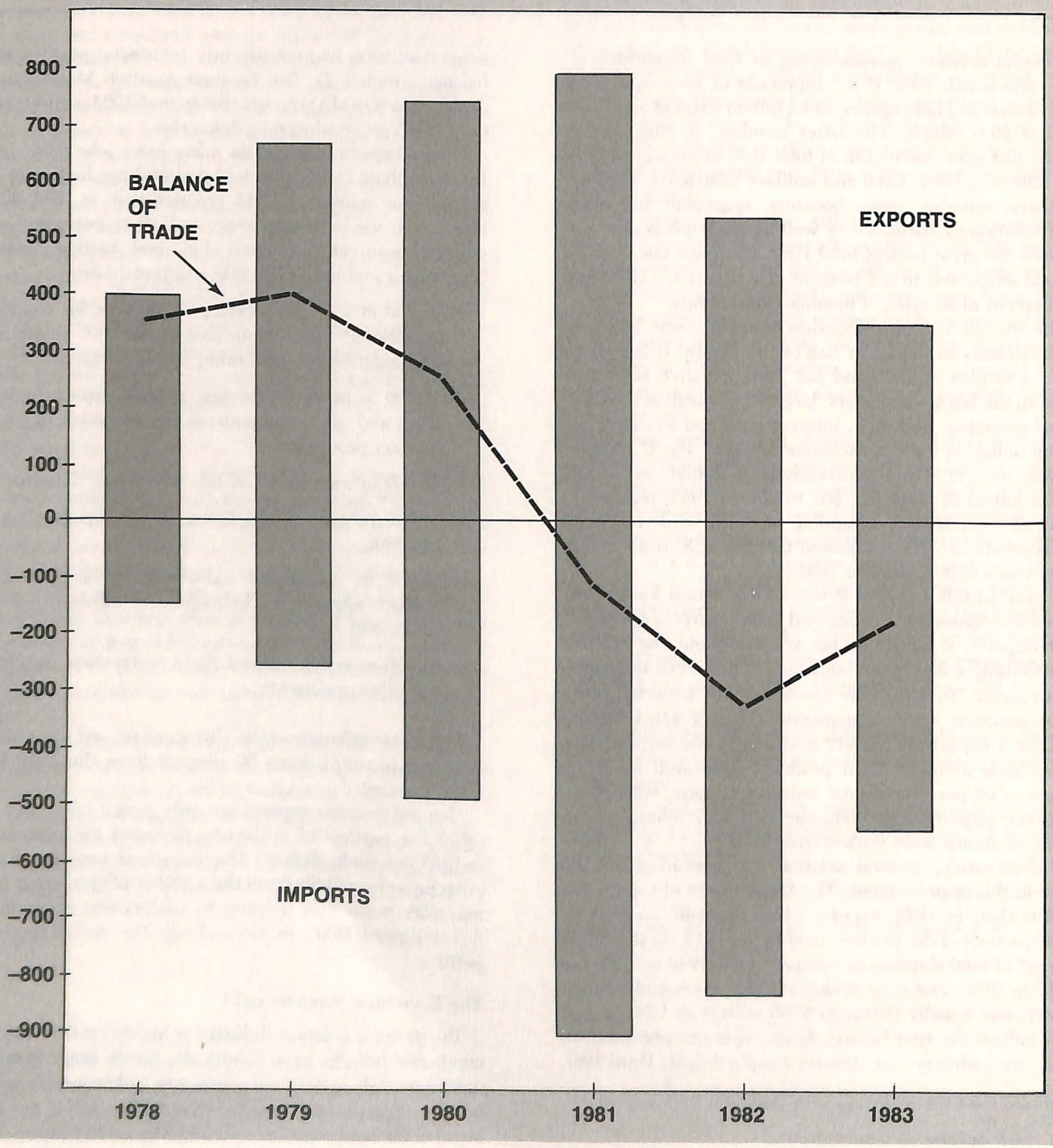
The general aviation industry is highly cyclical. Its shipments and billings have historically grown faster than GNP during periods of national prosperity and economic growth, but they also plunge far more steeply than GNP, per capita income, corporate profits and other broad indicators during

[1]Aerospace Industries Association (AIA) *Aerospace Facts and Figures*, 1983/84, p. 19.
[2]Ibid., *Facts and Figures, 1984/85* (draft).

FIGURE 1

GENERAL AVIATION EXPORTS, IMPORTS AND TRADE BALANCE
1975-1983

(Millions of Dollars)



times of economic contraction. General aviation activity also lags major turns in the economy by several quarters, mainly because equipment purchasing by the business community is treated as a capital investment rather than an operating expense.

The industry's performance during the 198l-82 recession provides a dramatic illustration of its response to major economic trends. Unit deliveries peaked at 17,811 in 1978, declined slightly in the following year, and plunged every year since then. Piston-engine shipments accounted for the great surge in total deliveries in the late 1970's, reflecting the national prosperity of the period, the availability of new aircraft and flight training programs. Even though the U.S. economy was still in a growth phase when world oil prices soared, the prospects of scarcer supplies of fuel at steeply-rising costs, general price inflation in the economy and rising interest rates proved daunting for many potential private and recreational buyers and piston sales spiraled downward after 1979.

Despite the downturn in shipments, particularly for piston aircraft, the factory net billings of the general aviation industry continued to rise, peaking at $2.9 billion in 198l. The impetus was provided by the high-value products—the turboprop and turbofan models with price tags ranging from five to 20 times those of multi-engine piston aircraft. After 198l, however, the dollar value of the industry's billings contracted sharply, dropping to the neighborhood of $l.5 billion in 1983. This was a clear consequence of the economic recession, which persuaded many potential corporate buyers to defer major investments.

Although the National Bureau of Economic Research has declared that the U.S. general economic recovery began in November 1982, the general aviation industry continued on a downward slope through 1983. In 1984, sales growth overall is coming slowly.

Import/Export Trends

One impediment to the U.S. general aviation industry should be faced squarely: the targeting of major segments of the U.S. general aviation market by foreign manufacturers, in many cases either government-owned or heavily subsidized by their governments.

While the U.S. market is risky and uncertain, with demand fluctuating sharply in response to turns in the national economy, it presents an inviting target to foreign manufacturers and governments eager to supply it with products.

The investment cost of launching most new, competitive products lies within the means of all developed countries and many developing countries. This is no longer true for large commercial airline transports. The successful European Airbus required a multilateral consortium of seven nations for its development and production, and now the two remaining U.S. builders of large commercial transports find it increasingly necessary to mobilize international teams of contractors to launch new products. In the general aviation market, a single country can undertake a project on its own and avoid the complexity entailed by a multinational venture.

Uneconomic though it may be, it is a fact of international life that all nations are anxious to master the latest technologies and develop their industrial base. General aviation manufacture presents an opportunity to stay abreast of the latest in aviation technology at a reasonable cost, meet domestic requirements (often in highly-protected home markets) and create jobs while defraying the cost of a project by sales into the U.S. market. The U.S. market, in fact, provides the vast majority of foreign manufacturers sales. For foreign manufacturers, the United States is *the* market.

Because they perceive national benefits in keeping abreast of aviation technology, foreign governments provide subsidies to support state-owned companies competing for a share of the U.S. general aviation market. For example, in early 1984, the Canadian government absorbed substantial losses incurred by de Havilland of Canada and Canadair, two state-owned corporations that have succeeded in marketing products in the United States, and committed itself to further funding and support ($310 million in 1984).[3]

Even when trade is conducted in full compliance with the rules of the General Agreement on Tariffs and Trade (GATT), foreign governments can finance export sales on favorable credit terms and rebate value-added taxes on export goods. In some cases—Brazil, for example—governments seal off their markets to protect their home industries against American competition.

Since October 1979, when the Federal Reserve Board shifted from trying to control interest rates to curbing the expansion of money supply, U.S. interest rates have soared into double digits. Although they have since receded from their peak levels, they remain high relative to the real return on money, historical rates, and the rates set by foreign central banks. Under these circumstances, and because the United States is experiencing a strong economic recovery from the recent recession, money from abroad has poured into American capital markets. The dollar's rate of exchange with other currencies has climbed on a trade-weighted basis to unreasonable levels. In early 1984, some economists placed the dollar's over-valuation at 20-30 percent. The strong dollar has exacted a severe penalty on American exports of practically all products and commodities, while throwing virtually all U.S. markets wide open to foreign imports.

As an example of what this means for U.S. general aviation manufacturers, consider the case of Brazil. Some $90 billion in debt to foreign (mainly U.S.) banks, Brazil has a desperate need to earn dollars through exports. Its state-controlled aircraft company, Embraer, has established a powerful hold on the U.S. commuter airline market with its Bandeirante. With the cruzeiro's exchange value faltering almost daily because of Brazil's severe inflation rate, Em-

[3]*Business Aviation*, March 19, 1984, p. 89 and April 16, 1984, p. 122.

braer can offer value-added in its sales to U.S. customers which is too good to be refused and which no U.S. manufacturer can match. In addition, though partly as a result of its severe foreign exchange problem, Brazil bans imports of foreign general aviation products which might compete against Embraer in the home market.

General Aviation in National Security

It was Air Force interest in small, high performance aircraft more than 20 years ago that stimulated the "high end" of the general aviation market—the business jet. Following Air Force selection of the Lockheed JetStar and the North American Sabreliner, an eager civil market adapted these and other aircraft for corporate use.

Since that pioneering move, many other federal agencies —FAA, NASA, the Coast Guard, and others—have discovered a requirement for small twin turboprop and turbofan aircraft. Executive airlift, logistics, maritime surveillance, and airways calibration are just a few of the uses these aircraft are finding with government agencies. It has been estimated that the military services and other federal agencies will lease or buy 400 of these high-end general aviation products during the 1980's. Development of the aircraft the military are now purchasing has been privately financed over the years by U.S. general aviation manufacturers.

Foreign governments increasingly discern similar uses for general aviation products. Some have even resorted to them in combat situations. During the Falklands Campaign of 1981, Argentina pressed into service privately-operated executive aircraft in a combat role.

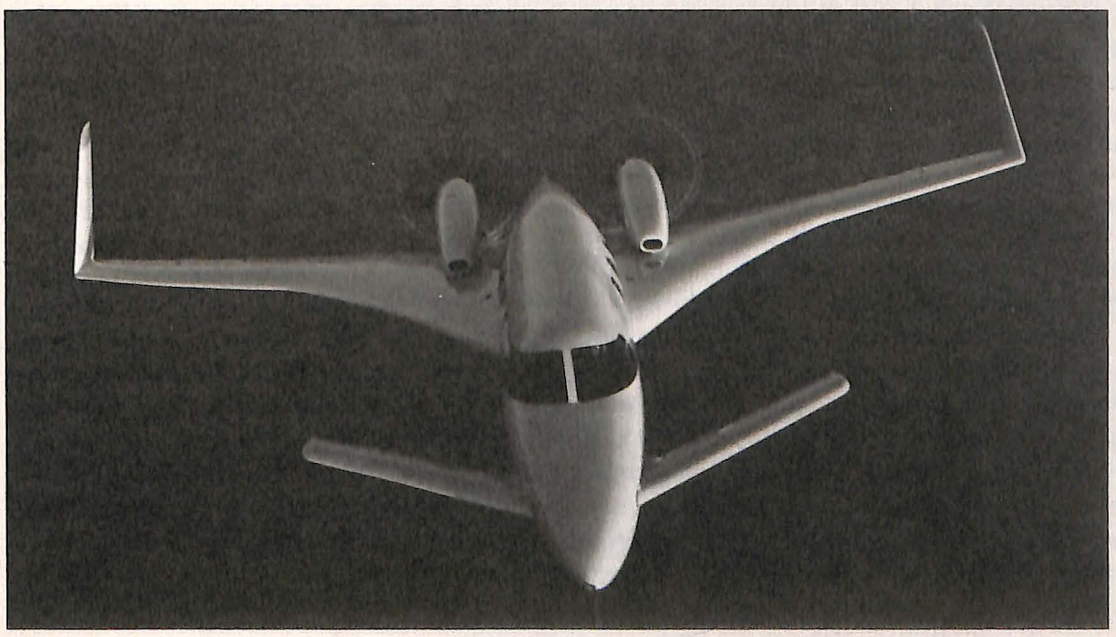
While it is unlikely such extreme measures would have to be employed by the United States in any realistic wartime scenario, the general aviation industry does represent a potential wartime capacity to produce large numbers of high performance aircraft. Since the 1950's, U.S. airframe and engine production capacity for front-line combat aircraft has become concentrated in fewer and fewer companies, sustained by declining production rates at relentlessly increasing costs per unit. In a wartime situation, the government would move as rapidly as possible to a three-shift operation for its prime contractors, but then it would have to look to the general aviation industry to provide the additional mobilization base required.

THE FUTURE OF GENERAL AVIATION

It is difficult to over-emphasize the highly cyclical nature of general aviation manufacturing. The U.S. industry's deep trough during the recession has been exacerbated by high U.S. interest rates and the high value of the dollar relative to other currencies. But this does not mean the industry is structurally unsound. While the present trough is much deeper than anything it has experienced before, most segments of the industry retain the ability to climb out as fast as they declined.

There are barriers, both existing and potential, to a strong market demand or to the market share maintenance and growth of U.S. manufacturers. A much-discussed potential barrier to market development is the possible impact on the transportation industry of electronic communications. The late, visionary writer Marshall McLuhan forecast that the world was becoming a "global village" as a result of broadcast television, cable, satellite relay, and other forms of electronic interconnectedness like the computer-modem-telephone link to move data. Some have proposed this would lead to greater reclusiveness among corporate executives; teleconferencing and other forms of communications would erode the need to travel and conduct face-to-face negotiations.

According to the National Business Aircraft Association, this has not happened. Although intermediate levels of management now resort to electronic links for transmission of purchase orders, invoices and other routine operating matters, when it comes to major corporate decisions about acquisitions, investments and disposal of assets, top executives seem invariably to prefer face-to-face negotiations and they maximize opportunities for such meetings by resorting to high-performance business aircraft for their travel needs. There may come a time when electronic communications can match the immediacy of site visits, one-on-one negotiations and top-level reviews of the performance of major divisions and their managers, but what is available today seems too rigid and limited to accommodate that need. An August 3, 1984 article in the *Wall Street Journal* reports that video conferences, which have not been very popular, are expected to become more so in 1984 with the introduction of new equipment and new marketing approaches. However, AT&T, a telecommunications industry leader, is "no longer selling the video conferences as a replacement for travel." An AT&T spokesman said the video conference displaces travel—as does the telephone—but that is not its major purpose, which is the faster distribution of information.



Beech Starship I—one of the new generation of U.S. general aviation aircraft

The high cost of developing and producing new aircraft models which embody substantial advances over the present generation of general aviation products is a very real barrier to market share maintenance and, combined with the need to expand market opportunities, has led a number of American manufacturers to enter into joint projects with foreign companies: for example, Gates Learjet with Rinaldo Piaggio of Italy; Fairchild with SAAB-Scania of Sweden; and Cessna with Reims Aviation of France. If U.S. manufacturers find it difficult to compete effectively on their own, joint ventures may become an increasingly attractive alternative.

Technology will play a critical role in the industry's future and, given the competitive characteristics of the world aircraft market today, particularly the increasing role of government support, the United States' historical technology lead has eroded. Nonetheless, U.S. companies have been investing substantial sums in developing new products during the steep recession which has plagued the industry for the past few years. At the National Business Aircraft Association annual meeting in Dallas in October 1983, for example, U.S. companies disclosed several new turboprop business aircraft representing a radical departure from conventional designs, e.g., the Beech Starship, Gates/Piaggio G.P. 180, and the Lear Fan 2100. Ranging from remarkable to startling, the new models feature aft-located main wings with controllable tipsails on the wingtips, small forward wings (sometimes called canard stabilizers), and aft-mounted engines turning pusher propellers. Several incorporate composite materials like graphite-epoxy on a large scale, and also make large use of titanium.

In addition to roomier, quieter and more comfortable cabins than current business turboprops in the same size class, the new models offer digital cockpit displays in which information is presented on an array of four to six separate screens like those used in personal computers. The new displays can be read far more swiftly and easily than the collection of analog gauges and dials now crowded on aircraft control panels.

Radical as the new designs may appear, in a sense they are a throwback to the first successful airplane, the Wright Flyer, which struggled into the air under its own power 80 years ago. That, too, had a pusher propeller as well as a forward stabilizer.

The new turboprops, as well as new generation corporate jets and piston aircraft, will be 40 to 50 percent more fuel efficient and will fly faster and higher than most planes now in service.

If the promise of these new aircraft designs is realized, the potential for attracting keen interest from medium-sized business and corporate customers seems strong indeed, and the U.S. general aviation industry should climb out of the deepest recessionary trough it has ever experienced. Nonetheless, the latest technology will move abroad rapidly and be put into production by government-owned and supported manufacturers. In the long run, subsidized foreign firms may have the advantage of greater market staying power.

Following is a look at specific general aviation market segments, and industry prospects.

Private and Business Turboprops

In physical appearance, turboprop aircraft in service today resemble piston-engine aircraft. The difference lies in the powerplant—a gas turbine whose high RPM is reduced by a gear box to turn three- or four-bladed propellers at a tolerable rate, i.e., a rate avoiding supersonic tip speed.

Multi-engine turboprops like the Viscount and Electra enjoyed a brief vogue with the commercial airlines in the 1950's, but after the spectacular success of the Boeing 707 series of turbojets at the end of the decade, the large commercial carriers universally turned to turbojet aircraft offering significantly higher speed, a wide range of passenger capacities and an equally large range of optimum stage lengths, depending upon the route structure of the individual operator.

While the turboprop lost its niche in the fleet structures of the major national and regional carriers, small twin-engine turboprops have found a welcome in business and corporate fleets as well as with the new regional/commuter airlines.

The typical business turboprop has a gross take-off weight of 12,500 pounds and a passenger capacity, including crew, of seven to 11. Almost all now in service employ two "tractor" (forward-facing) engines and propellers, although an increasing number of single-engine turboprops are becoming available.

The market for private, business and corporate turboprop aircraft is overwhelmingly concentrated in the United States—about 74 percent of the total worldwide fleet of 7,200 at the end of 1983. Western Europe accounted for another 7 percent of the fleet; Latin America, 7 percent; and Africa, Asia and the Pacific region accounted for the rest.[1] It is anticipated that the major growth in the foreign business/corporate turboprop market will occur in Latin America, Africa, Asia and Oceania mainly because short distances, stringent customs restrictions, a paucity of airports and supporting services, and strong competition from ground and highway transportation will restrict market growth in Europe.

Current major U.S. manufacturers of business/corporate turboprops are Beech (B200 Super King Air, and the B100, 300, F90 and C90 versions of the King Air); Cessna (Conquest I and II); Gulfstream American (Commanders 840, 900 and 1000); Piper (Cheyenne I, II, III and IV), and Fairchild (Merlin IVC and IIIC and 300).

At the present time, U.S. manufacturers dominate the domestic business turboprop market and, in general, have been able to fend off foreign competition in the home market for business turboprops more successfully than in either the business turbofan or commuter light transport turboprop market. However, government supported foreign manufacturers could open the U.S. market to a major for-

[1]Gates Learjet Corporation

Piper Cheyenne IV—a turboprop serving the business/corporate market

eign thrust and give foreign producers an advantage in the global world market.

Turbofan/Turbojets

The high end of the business and corporate market belongs to the gas turbine engine, either a straight-through arrangement of compressor stages, burners, turbine disks and a nozzle, or a more elaborate arrangement in which the foregoing apparatus is shrouded by a larger duct containing a large-diameter fan to propel relatively low-speed air through the duct to mix with the high-speed exhaust exiting the nozzle. The latter arrangement offers the advantage of enhanced fuel efficiency together with quieter operation while retaining the power-to-weight characteristics of the straight-through turbojet engine.

The major focus of this market has been on aircraft of 6-15 seats and gross take-off weights of 12,000-30,000 pounds. Some, however, range up to 69,700 pounds in take-off weight and offer a passenger capacity of 19. These aircraft typically cruise at 450-550 mph and the larger versions provide intercontinental nonstop range.

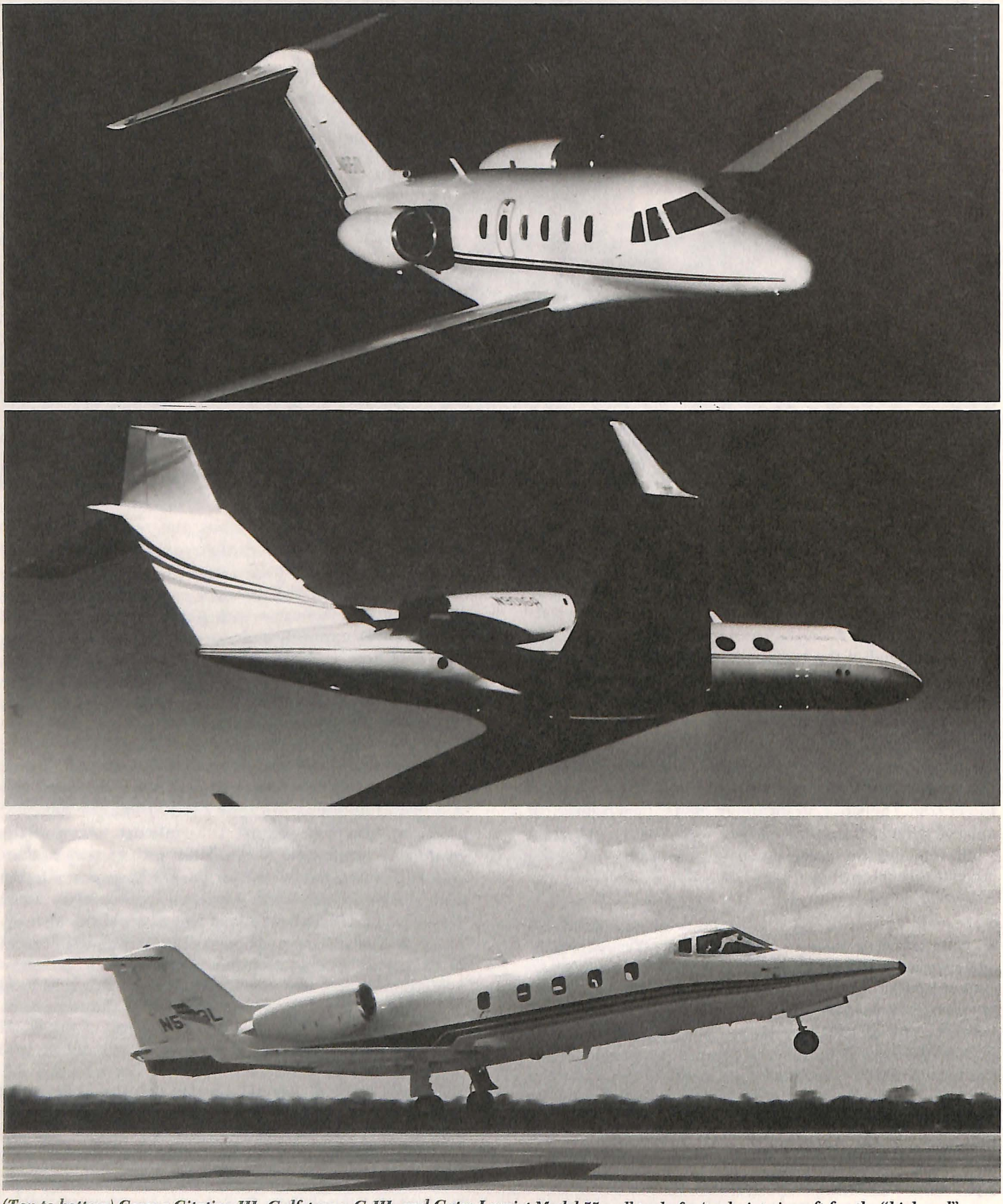
By the end of 1983, the total worldwide active fleet of turbofan/turbojet aircraft used by business amounted to just over 5,400, of which 3,994 or about 74 percent were registered in the United States. (If Canada and Mexico are included in a "North American" market, the share is 81 percent.) Europe accounts for another 9 percent of the market; Asia, 4 percent; South America, 3 percent; Africa, 2 percent, and Oceania, 1 percent.[2]

[2]Ibid.

Major U.S. manufacturers of these aircraft include Gates Learjet Corporation (seven Learjet models), Cessna Aircraft Corporation with Citations I and II, and SII and III, and Gulfstream American with the Gulfstream III plus a Gulfstream IV currently under development. Major foreign manufacturers include the Canadair Challenger series (Canada); Dassault-Breguet Aviation (France) with three models of the Falcon and a fourth, the Falcon 900 trijet, under development; Israel Aircraft Industries, Ltd., two versions of the Westwind and a new model, Astra, in late development; Mitsubishi Heavy Industries, Ltd. (Japan) with Diamond I plus two growth versions in development, and British Aerospace with the 125-700 and 125-800.

Taking advantage of high U.S. interest rates and the inviting exchange ratio of the dollar with respect to their own currencies, foreign manufacturers have prospered in both the world and North American markets since 1981. They accounted for about 29 percent of worldwide deliveries in 1981, advancing to 40 percent in 1982 and 51 percent in 1983. Foreign manufacturers increased their deliveries to North American customers from 28 percent in 1981 to 43 percent in 1982 and 50 percent in 1983. At the same time, foreign deliveries of business jets to the rest of the world increased from 32 percent in 1982 to 55 percent in 1983 (*Figure 1*).

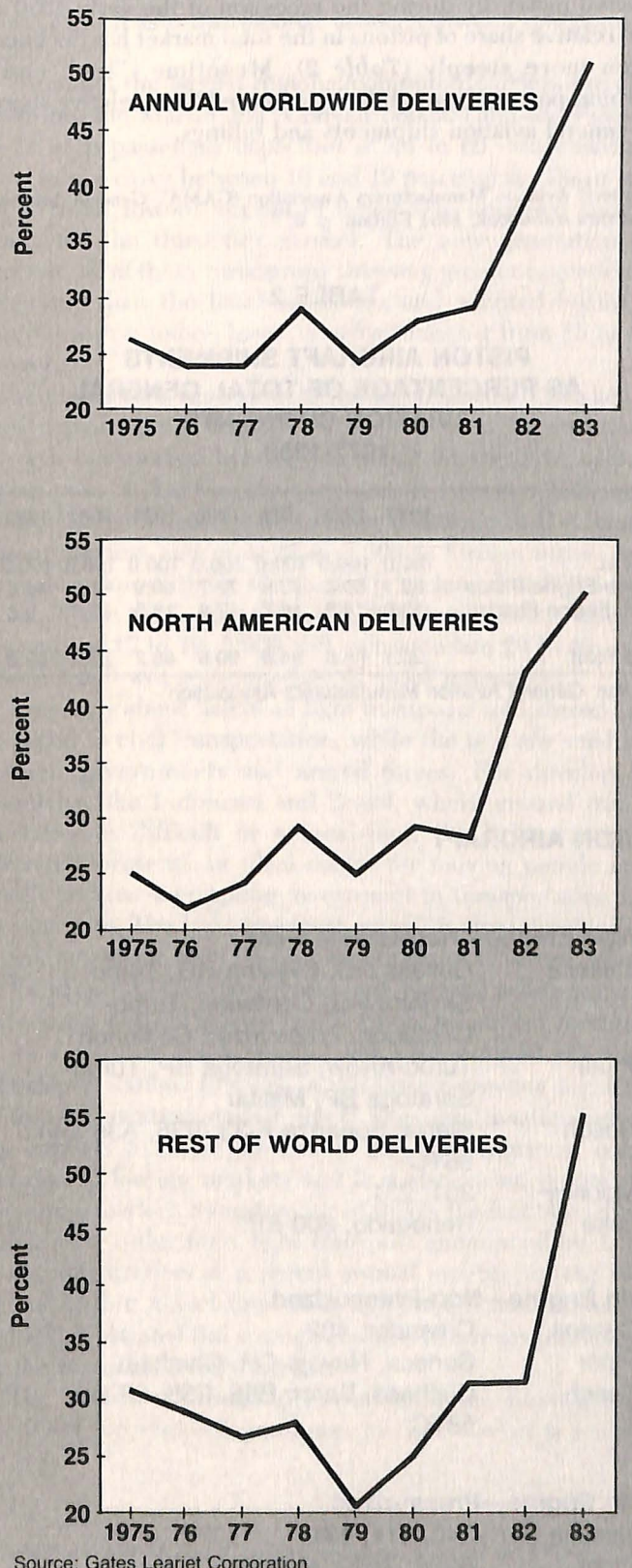
Many in the U.S. general aviation industry believe that sales of jets and turbofans to business users will turn upward in 1984 and grow at moderate annual rates through the rest of the decade. However, based on trends of the last several years, foreign manufacturers could continue to garner an increasing share of both North American and global markets through the late 1980's.



(Top to bottom) Cessna Citation III, Gulfstream G-III, and Gates Learjet Model 55—all turbofan/turbojet aircraft for the "high end" of the business market.

FIGURE 1

FOREIGN MANUFACTURERS' SHARE OF BUSINESS JET MARKET 1975-1983



Source: Gates Learjet Corporation

Single and Multi-Engine Piston Aircraft

Propeller-driven aircraft powered by reciprocating engines were the first types of equipment marketed by the private, business and light transport segments of the general aviation industry, and they were also the only available types to launch commercial airline service in the 1920's and 1930's. Piston aircraft continue to account for the great bulk of the active U.S. aircraft fleet. In 1983, according to an FAA estimate, there were 209,000 active aircraft, of which 90 percent were single- or multi-engine piston types.

The typical piston-engine small aircraft today is technologically more sophisticated and offers tremendously greater performance than its minimally-instrumented, wood-and-fabric predecessors. Aluminum skin and structure, high-lift flaps, VHF communications and navigation equipment and self-starters are commonplace, along with adjustable pitch propellers and retractable landing gear in all but the simplest models. Cabin pressurization has become commonplace for light twins and is beginning to appear in single-engine models. Designers are pressing toward the goal of a 300 mph cruise speed for singles as well as twins.

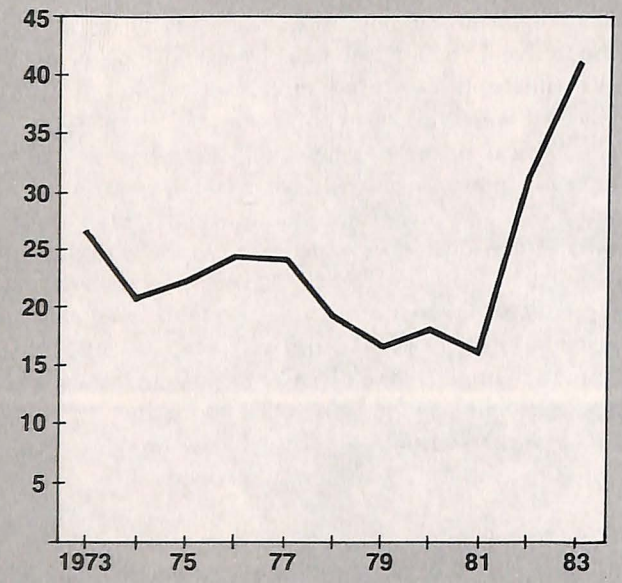
U.S. manufacturers continue to dominate the home market for piston aircraft, and their presence in the global market is equally overwhelming. Only a few foreign nations provide the levels of subsidy, credit and trade protection sufficient to enable their home industries to compete head-to-head against U.S. products. It is noteworthy that almost every piston aircraft sold in a non-Soviet bloc country is powered by an engine of U.S. manufacture. From 1973 through 1981, foreign manufacturers' share of the total overseas piston aircraft market ranged from about 17 percent to 27 percent annually, coming in at the high end of the range during recessionary periods. In 1982, foreign manufacturers accounted for 31.4 percent and, in 1983, 40.7 percent of worldwide sales, the highest share they have ever recorded (*Figure 2*).

Cessna, Piper, and Beech offer 18 different single-engine piston models with non-retractable landing gear. These range from two to eight seats and from $20,000 to $114,000 in price. Cessna, Beech, Piper and Mooney offer 17 different single-engine pistons featuring retractable landing gear, four to seven seats' capacity and price tags from $68,000 to $162,000. Beech, Piper and Cessna also dominate the non-pressurized multi-engine piston category, accounting for 10 of the 11 models available in the U.S. market. (The 11th is built by an Italian manufacturer, Partenavia.) Capacities of these twins range from four to 10 seats and prices from $143,000 to $415,000. Finally, seven pressurized piston models are available from the three major U.S. manufacturers, Beech, Cessna and Piper. These provide four to seven seats and range up to $462,000 in price (*Table 1*).

It should be noted, however, that the piston market has contracted severely since 1978, with singles hurt somewhat more severely than twins. Annual sales by U.S. manufac-

FIGURE 2

FOREIGN MANUFACTURER SHARE OF TOTAL OVERSEAS PISTON AIRCRAFT MARKET 1973-1983



Source: Gates Learjet Corporation

turers of single-engine pistons peaked at 14,398 in 1978 but declined by 87 percent to 1,811 in 1983. The peak for multi-engine pistons, sales of 2,843, came in 1979 but they had slumped by more than 85 percent, to 417 in 1983.[3]

While general aviation shipments and billings have contracted markedly during the recession of the early 1980's, the relative share of pistons in the total market has declined even more steeply (*Table* 2). Meantime, "high end" turbine-powered aircraft have increased their relative share of general aviation shipments and billings.

[3]General Aviation Manufacturers Association (GAMA), *General Aviation Statistics Handbook*, 1984 Edition, p. 6.

TABLE 2

PISTON AIRCRAFT SHIPMENTS AS PERCENTAGE OF TOTAL GENERAL AVIATION SHIPMENTS 1977-1983

	1977	1978	1979	1980	1981	1982	1983
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Single Engine Piston	83.1	80.8	77.9	72.7	69.9	67.3	42.5
Multi Engine Piston	13.0	14.8	16.7	17.8	16.3	15.9	9.8
Sub Total	96.1	95.6	94.6	90.5	86.2	83.2	52.3

Source: General Aviation Manufacturers Association

TABLE 1

CURRENT PRODUCTION PISTON AIRCRAFT

Single Engine—Fixed Gear

Cessna	152, Skyhawk, Cutlass, Skylane, Turbo-Skylane, Stationair 6, Turbo-Stationair 6, Stationair 8, Turbo-Stationair 8, Skywagon
Piper	Tomahawk, Warrior, Archer, Dakota, Saratoga, Turbo-Saratoga
Beech	Skipper, Sundowner
Helio	H-700, H-800
Taylorcraft	F21
Pitts	S-1, S-2
Maule	M-5, M-6, M-7

Agricultural

Cessna	Ag Truck, Ag Husky
Eagle	Eagle 300
Schweizer	Ag Cat

Single Engine—Retractable Gear

Cessna	Cutlass RG, Skylane RG, Turbo-Skylane RG, Centurion, Turbo-Centurion, Pressurized Centurion
Piper	Turbo-Arrow, Saratoga SP, Turbo-Saratoga SP, Malibu
Beech	Sierra, Bonanza F-33, V35, A36 and 36TC
Mooney	201, 231
Lake	Renegade, 200 EP

Twin Engine—Non-Pressurized

Cessna	Crusader, 402
Piper	Seneca, Navajo CR, Chieftain
Beech	Duchess, Baron B55, E55, 58 and 58TC

Twin Engine—Pressurized

Cessna	340, 414, 421
Piper	602P, 700P, Mojave
Beech	Baron 5&P

Light Transports

U.S. regional/commuter airlines feed passengers to "hub" terminals where passengers may continue to their destinations on major long-haul commercial carriers. Hub to hub service is also provided between closely-spaced airports as well as intra-regional service between low-density points.

Although the largest regional/commuter carriers use aircraft like the Martin 404, Convair 580/600 and the Fokker F-27 with passenger capacities of 44 to 60, most aircraft now in use carry between 10 and 19 passengers. There is a clear trend toward aircraft of larger size designed specifically for the third tier market. The new generation of aircraft, all of them turboprops stressing greater operational economy than the hand-me-downs and adapted business aircraft in use today, have capacities ranging from 15 to 44 passengers.

While further expansion of the light transport market is anticipated in the United States, the market's strongest growth is expected overseas. A study for the FAA anticipates sales of 5,400 commuter aircraft between 1980 and 2000. Almost 2,400 of these will be delivered to U.S. commuter carriers and more than 3,000 to foreign users. Aggregate value of these shipments is reckoned at $16.6 billion. Of the total, approximately 2,200 will have a seating capacity of 15 to 19; 2,000 will accommodate 20 to 40, and about 1,200 will accommodate 41 to 60 passengers.[4]

Presently about half of all light transports sold abroad are engaged in civil transportation, while the rest are used by foreign governments and armed forces. For developing countries like Indonesia and Brazil, where ground transportation is difficult or non-existent, the light transport aircraft represents an ideal means for moving people and goods without a crippling investment in transportation infrastructure. The light transport aircraft is also perceived as a product which even developing countries have the means to build and substantial government financial assistance and protection against foreign competition are almost routine.

As a result of these trends, and a determined effort by developed nations to share in this fastest-growing segment of the civil aviation market, the U.S. general aviation industry appears to have lost out in the light transport competition in foreign markets and it is also losing ground in the home market. Symptomatic of this is the fact that every single new order for a light transport announced by U.S. commuter carriers at a recent annual meeting of the Regional Airline Association went to a foreign manufacturer. Table 3 illustrates the strong presence of foreign producers in the regional aircraft market.

The extent of foreign penetration in the heavier segments of the regional/commuter aircraft market is readily apparent in the availability of models in the light, medium and large categories of these aircraft:

Less than 19 passengers—Cessna, 2; Piper, 3; Beech, 2; British Aerospace, 2; Dornier (Germany), 1; DeHavilland of Canada, 1; Embraer (Brazil), 1; Fairchild, 1; Israeli Aircraft Industries, 1, and Shorts (Northern Ireland), 1.

20-40 passengers—CASA of Spain, 2, including one joint venture with P.T. Nurtanio of Indonesia; Shorts, 2; de Havilland, 1; EMBRAER, 1, and a Fairchild-SAAB (Sweden) joint venture.

40 to 65 passengers—The ATR-42, a joint venture by Aerospatiale (France) and Aeritalia (Italy); British Aerospace, 2; DeHavilland of Canada, 1, and Fokker (Netherlands), 1.

The question is often asked: Why should the U.S. general aviation industry dominate world markets in private, business and corporate categories while lagging in the light transport market? There is no question this segment of general aviation airframes and the engines powering them has been heavily targeted by foreign manufacturers backed by generous support from their governments. American manufacturers have produced aircraft for the commuter market; however, a factor that deterred U.S. manufacturers from rushing into this market in great numbers and with aircraft dedicated specifically to commuter use, was uncertainty about the types and sizes of "commercial" (i.e., non-airline) aircraft which would be permitted to engage in air taxi and commuter operations. In 1947, the Civil Aeronautics Board limited air taxis to a weight of 10,000 pounds; in 1969, commuters were limited to 12,500 pounds, effectively limiting commercial aircraft to 19 seats. In 1973, the weight limit for commuters was raised to permit production of aircraft with 30 seats. However, the emerging commuter market has been highly unstable and hard to predict, and U.S. manufacturers were dubious about the ability of the new airlines to finance purchases. U.S. manufacturers already had significant resources committed to other product ventures and government-supported companies have been more able to risk resources in a promising but turbulent market segment. Today, competition in the 20-70 passenger range of commuter aircraft is intense, and the large number of market participants with backing by their governments is a deterrent to participation by U.S. manufacturers.

Foreign manufacturers perceived a fast-growing light transport market outside the United States regardless of this nation's regulatory developments. They forged ahead with new light transport designs promising the high reliability, durability and cycle needs of the small carriers before most U.S. manufacturers were willing to take the risk. As a result, foreign manufacturers have filled a major niche in the domestic and world market for light transports, and the U.S. general aviation industry will have to fight an uphill battle to increase its share of this market should it decide to pursue it.

[4]*Light Transport Market Forecast*, report prepared for the Office of Aviation Policy, Federal Aviation Administration, Washington, D. C., by the Aerospace Corporation, July 1979.

Fairchild Swearingen Metro III—major U.S. contender for the regional/commuter market

TABLE 3

TOP AIRCRAFT IN REGIONAL PASSENGER SERVICE
1983

Model	Percent of Total Industry Aircraft Seat Capacity	Total Aircraft in Industry Operations	Estimated Fleet Utilization (000's of Hours)
Fairchild (Swearingen) Metro	13.5%	157	356.9
Shorts 330-360	9.5%	74	153.0
de Havilland Dash 7	8.2%	37	82.3
Embraer Bandeirante	8.0%	105	221.9
Convair 580/660/640	7.8%	56	88.6
de Havilland Twin Otter	7.6%	105	200.8
Beech Model 99	7.3%	119	243.6
Fokker/Fairchild F27 series	6.7%	37	75.8
Nihon YS 11	4.6%	23	39.8
Cessna 402	3.4%	187	213.2
Piper Navajo (all series)	3.1%	167	191.2
CASA 212	2.0%	21	43.8
Total Top Aircraft	81.7%	1,088 (70%)	1,910.9 (79%)
All Others in Service	18.3%	460 (30%)	504.1 (21%)
Total Industry	100%	1,548 (100%)	2,415.0 (100%)

Source: Regional Airline Association Fleet Analysis, March 1, 1984

COMPETITIVE FACTORS AND INTERNATIONAL AND DOMESTIC POLICIES IMPACTING GENERAL AVIATION MANUFACTURE

The U.S. general aviation industry has been dealt severe blows in the last few years. A root cause of the industry's decline was a world economic recession which severely impacted buying power but, as we have seen, U.S. sales at home and abroad have been dramatically affected by the sales success of foreign aircraft manufacturers.

With improvement in the U.S. economy and the expected continuing upturn in corporate profits, there should be an improvement in domestic light aircraft sales. Nonetheless exports, which historically have constituted one-fourth of the total market for U.S. general aviation manufacturers, will feel the lingering effects of world recession, and export recovery will be slowed by price disadvantages caused by the strong value of the U.S. dollar, the increasingly strong market position of foreign manufacturers, and by barriers to market access in numerous countries.

The strength of foreign competitors, and current tendencies toward market protectionism in most countries of the world, are due in large measure to the increasing interdependence of national economies and the growing role of exports in the economies of most nations. For most of the world's industrial nations (members of the Organization for Economic Cooperation and Development, plus emerging industrial powers such as Korea, Brazil, and Taiwan), the urgency as well as the capability to export has increased dramatically during the last 10-15 years. Exports are more important than ever in the U.S. economy as well. As recently as 1971, exports amounted to only 6.5 percent of Gross National Product; in 1983 exports were 10 percent of U.S. GNP.[1]

Unfortunately, the world recession has led to a decline in trade and prompted protectionist actions that threaten the fair and open trading environment that the United States has worked for and supported for over 30 years.

Fundamental differences in the orientation of national economic systems nations stand in the way of any swift resolution of open vs. protectionist trade practices. It is the national policy of Japan, members of the European Economic Community, and other nations to provide direct and indirect support to commercial enterprises which foster growth in employment, national security and technological progress—particularly advances which will pay off in the world market. Each of those nations has an urgency for net export earnings to pay for oil and other imports and to repay loans, and for jobs and tax revenues to reduce unemployment and national deficits. The United States also needs export earnings to offset imports, to create employment and to reduce national deficits through tax revenues, but it lacks a cohesive national policy which addresses the need to export. In the past, American businesses relied heavily on the size and prosperity of the U.S. market and saw the export market as a bonus. When companies did compete abroad, they were frequently in a dominant position with little competition. Unfortunately, U.S. national policy does not reflect the fact that things have changed significantly and that a sustained economic recovery is more dependent on the competitiveness of exports than ever before.

There are few government incentives for U.S. business to export. In addition, U.S. practices and policies hinder exports, e.g., the government often fails to provide sufficiently competitive export financing, and U.S.-applied trade sanctions in various parts of the world, for foreign policy reasons, contribute to a reputation of unreliability on the part of American suppliers. There is always a possibility that the U.S. government will step in and prevent delivery of American products, or follow-up support sales and services.

It is vital to strengthen the U.S. trade position. Increasingly, businesses need worldwide markets and the government must not adversely constrain American business in this arena, nor neglect to enhance opportunities for its marketplace participation. The difficulty of selling products is compounded when competitors have the encouragement, political skill and financial assistance of their governments behind them. The U.S. government has an obligation, therefore, to support and promote a fair and open trading environment, and to take action upon the infringement of international trade rules.

ROLE OF FOREIGN GOVERNMENTS IN GENERAL AVIATION MANUFACTURING

The extent of government subsidy and support for general aviation manufacturing varies from one country to another. From Table 1, however, it is clear that the United States is one of the few countries where government ownership and government direction of the industry are

[1] *Council of Economic Advisors for the Joint Economic Committee, Economic Indicators* (Washington, D. C. : U.S. Government Printing Office), February 1984, p. 1.

TABLE 1

MAJOR FOREIGN GENERAL AVIATION AIRCRAFT AND ENGINE MANUFACTURERS AND THEIR OWNERSHIP

Country	Corporation	Ownership
Australia	Government Aircraft Factories	Government Owned
Brazil	Embraer	Government share declined to 7.1% in 1981. Government retains majority of voting stock
Canada	Canadair	Government Owned
	deHavilland	Government Owned
	Pratt-Whitney, Canada	Subsidiary U.S. Firm—United Technologies Corp.
France	Aerospatiale	Government Owned
	Dassault-Breguet	46% Government Owned
	Turbomeca	Privately Owned (has received government support for projects)
Germany	Dornier	Privately Owned (received repayable credit of 40% of development costs for DO 228 commuter/utility aircraft)
Indonesia	P. T. Nurtanio	Government Owned
Israel	Israel Aircraft Industries	Government Owned
Italy	Siai Marchetti, Subsidiary of Agusta	51% Government Owned
	Partenavia	Privately Owned but Government Owned Aeritalia has 49% share
	Aeritalia	Government Owned
Japan	Mitsubishi	Privately Owned
Netherlands	Fokker	49-51% Government Owned
Spain	CASA	71% Government Owned
Sweden	Saab-Scania	Privately Owned
United Kingdom	British Aerospace Corporation	48% Government Owned
	Pilatus Britten-Norman	48% Government Owned
	Short Brothers	Government Owned
	Lear Avia	49% Government Owned
	Rolls Royce	Government Owned

not practiced. In most other countries that have a general aviation manufacturing industry, the government owns all or part of the industry, or it provides direction and encourages industrial consolidation that would be illegal in the United States.

Because of this extensive government ownership, and the fact that a foreign general aviation production unit is often a subsidiary of a larger, defense-oriented manufacturing company, it is often difficult to obtain financial data indicating the precise amount of government subsidy given to a specific general aviation aircraft.

One does not need precise accounting, however, to conclude that government subsidy is present when the company is owned or controlled by a government which has announced that establishing or maintaining a general aviation manufacturing industry is in its national interest. By its very nature, government ownership ensures that subsidies are in the national interest.

To place U.S. trade problems in perspective, and to understand the causes of these problems, it is necessary to profile each foreign country and the special government/industry relationship existing in each.

Canada

The Canadian government views the aerospace sector as a fundamental component of the modern sophisticated industrial base it seeks. A Canadian government official stated in June, 1983: "We should recognize aerospace is a growth industry that can strengthen Canada's technological base, serve as an active source of export earnings and provide well-paying and highly-skilled jobs."

In 1974, the Canadian government purchased deHavilland, which specializes in light transport aircraft from the British Siddely group for C$40.5 million. In 1976, the Canadian government acquired Canadair, which specializes in business jets, for C$46.6 million.

The Canadian government plays a key role in the development and success of both companies, as well as other privately owned aerospace companies:[2]

- Canada has assumed loans to Canadair totaling $1.35 billion and has provided direct equity (cash) infusions of $200 million (1982), $240 million (1983), and $310 million (1984).
- Having earlier approved $710 million for DeHavilland including $450 million in loan guarantees and $260 million in direct equity (cash) infusions, the Government is expected to inject $240 million more into de Havilland in 1984.
- Government grants under the Defense Industry Productivity Program are now available for developing civil applications of spin-off technology from military programs. Under DIPP, over C$421 million has been allocated to aerospace firms since 1967. Pratt and Whitney of Canada received a C$71.9 million grant in 1982 to develop civil aircraft engines. Previous government loans to Pratt and Whitney from 1960 to 1982 totaled C$172 million.
- Canadian Export Development Corporation offers export credit financing at subsidized interest rates.

[2]Report by Canadian Senator Jack Austin on Canadair Ltd. to the Standing Committee on Public Accounts, June 7, 1983

Brazil

The government-run Aircraft Department of the Research and Development Institute began work on what was to become the "Bandeirante" in July 1965. After demonstrating the feasibility of the project with a flying prototype, the Government of Brazil founded Embraer in 1969 with the objective of "executing governmentally sponsored aircraft programs in Brazil . . . Brazil believes that governmental control of Embraer is reasonable and beneficial." It has stated: "In its approach to the regulation of competition in the Brazilian market between Embraer and others, Brazil is fortunate to be able to benefit from the experience of other countries, and it is attempting to steer clear of the pitfalls of either U.S.-type laissez-faire system or the European pattern of nationalization. Either can lead to unhealthy combinations of over-capacity, social hardship and inefficiency. The Brazilian objective is to maintain a healthy industry through a sensible regulation of competition and of capacity from the outset. The existence of a close coordination of government and industrial interests in Brazil is of tremendous importance in the field of aeronautics and an asset which most countries do not enjoy to the same degree."

The government share of ownership of Embraer has declined to only 7.1 percent in 1981, but the Brazilian government still retains the majority of voting stock.[3] Through the use of a tax incentive program, Embraer has raised over $34 million selling government owned stock. In addition:

- Brazil supports capitalization of Embraer by granting tax credits to industrial firms which purchase equity positions in Embraer.[4]
- Financial export credits enable Embraer to provide attractive financial packages for their export aircraft (recently 8 percent interest).[5]
- The government has established import tariffs and a licensing procedure for aircraft which might compete with local production—effectively embargoing the import of light aircraft into Brazil.[6]

[3]Embraer, *General Information - Brazilian Aeronautical Industry, 1983.*
[4]W. Stephen Piper, Office of the United States Trade Representative, "Questions and Answers on Aircraft International Competitiveness," prepared for Congressional hearings on the NASA Aeronautical R&T budget and the international competitiveness of the U.S. aircraft manufacturing industry, p. 6
[5]"Embraer Chairman's Report," *Interavia Newsletter*, No. 10,016, June 22, 1982.
[6]*Aviation Daily*, November 14, 1983, p. 65.

- Brazil actively pursues the development of aviation technology through demands for licensing of technology and/or establishment of manufacturing facilities for products not already produced by Brazilian industry.[7]

These protectionist policies have enabled Embraer to penetrate foreign markets, particularly the United States, while closing the door on their home market. This has caused at least one U.S. airframe manufacturer to petition the International Trade Commission (ITC) for the imposition of U.S. countervailing duties on Embraer aircraft imports.

Japan

Japan's aerospace industry is comprised of four major airframe manufacturers: Mitsubishi, Kawasaki, Ishikawajima-Harima and Fuji, with Mitsubishi being the most prominent manufacturer of general aviation aircraft. Mitsubishi's general aviation role expanded even further in 1982 with the takeover of Nihon Aerospace Manufacturing Company, producer of the YS11 turboprop which is no longer in production.

All Japanese aerospace companies are strongly supported and heavily influenced by the Ministry of International Trade and Industry (MITI). MITI sees aerospace as one of the strategic industries for the nation's future. As production of less highly technological products shifts to developing countries, MITI's important funding as well as control position is demonstrated by:

- Formation in 1973 of the Civil Transport Development Corporation (CTDC), a consortium of Fuji, Kawasaki and Mitsubishi, to handle the Japanese share of the Boeing 767 program.
- In 1981, MITI provided $9.9 million, or half of the total required by CTDC to develop subassemblies for the Boeing 767. In 1982, an additional $1.9 million was to be provided.
- MITI provides 50-75 percent of the development costs of certain major aerospace industry projects.[8]
- MITI provides necessary funding to enable Japan's manufacturing sector to compete internationally with special financing packages such as an offering by Mitsubishi for export aircraft called the "10-10-10": 10 percent down payment; 10 percent interest rate for first year; and 10-year amortization.[9]

[7]Ibid.

[8]"Aerospace Japan: Growing Capabilities Despite Constraints," *Interavia*, October 1983, p. 1093; and Department of Commerce, International Trade Administration, "Japanese Industrial Policies and the Development of High-Technology Industries: Computers and Aircraft," February 1983, pp. 33-38.

[9]"Aviation Intelligence," *Business and Commercial Aviation*, September 1982, p. 34.

Italy

The Italian government has embarked on a program to nationalize its aerospace manufacturing sector, which has historically been highly fragmented and shown to be less and less capable of competing with the larger multinational ventures in the United States and the rest of Europe. The former structure, comprised of several small private companies, could not produce the necessary capital to finance future developments and projects. Additionally, the duplication of effort and counterproductive competition among Italian aerospace firms is contrary to the national objective of becoming a major worldwide aerospace participant.

In 1981, the Italian government organized the previously highly fragmented aerospace sector into two broad groupings clustered around the state-owned holding companies IRI and EFIM. IRI, which includes Aeritalia, will focus on medium and large aircraft, while EFIM, which now controls Agusta, will concentrate on light aircraft and helicopters. The government hopes the reorganization will change the worldwide role of the Italian aviation industry from that of specialists in marginal small-scale programs to that of a major participant in large multinational projects.

During the past several years, Italy has supplied the new structure with a considerable amount of capital, including a large percentage of the $1.2 billion targeted for research and development activities in 1982. This directly contrasts with other European governments which have been forced to reduce financial support of their aerospace industries because of the current worldwide recession.

France

As with other European countries, a relatively small domestic market for general aviation aircraft and mounting official impediments to the growth of private aircraft ownership (license fees, taxes, etc.) have forced the French to depend heavily upon the export market for continuance of the general aviation industry. The primary manufacturers of general aviation aircraft are Aerospatiale and Dassault-Breguet, both nationalized by the French government and both leaders in the French aviation industry. In 1981, Aerospatiale accounted for 38 percent of France's aerospace industry sales and replaced Renault as its leading profit maker. Avions Marcel Dassault is the world's number two producer of top-line business aircraft with its Falcon series.

As an example of French government support of its industry, production go-ahead was recently given for the Falcon 900, designed to compete for the medium/long-range executive and business transport market, after the government approved a reimbursable loan to help Dassault-Breguet pay the aircraft's development and production costs. These costs are estimated by the company at under $300 million. The government loan is for approximately 30 percent of the development/production charges

and will be paid back by Dassault-Breguet on a percentage basis of Falcon 900 sales. [10]

Other French manufacturers of light aircraft include Socata, Avions Pierre Robin, Avions Mudry and the Cessna associate, Reims. The fact that these companies are not officially nationalized as are Aerospatiale and Dassault is not really important, since the French government has always been in a position to control and coordinate all activities in the aviation sector.

Exports account for 50 percent of France's total aerospace industry sales; the export percentage for general aviation is estimated to be closer to 75 percent. Recognizing that exports are key to industry success, the government provides funding support of aerospace programs and of research and development, including activities critical to general aviation. Following is a breakdown of the 1983 French civil aviation budget:

Activity	Authorized Expenditure U.S.$	Funded U.S.$
Support for Concorde services	$ 7,175,000	$7,175,000
Airbus	137,760,000	126,280,000
Studies of advanced aircraft design	1,865,000	1,865,500
Airbus 320	71,750,000	54,530,000
CFM 56 Engine	115,374,000	119,535,000
TM 333 Engine	6,457,500	7,605,500
Various investments and test programs	5,022,500	5,022,500
Technological development	14,350,000	11,480,000
Aircraft on-board equipment	5,740,000	5,740,000
Light aircraft	574,000	574,000
ATR 42 regional transport	31,570,000	28,700,000
Reserves	4,305,000	3,874,500
	$401,943,500	$372,382,500

Source: *Interavia Air Letter*, September 23, 1982; p. 4.
Conversion factor: French francs x .1435

Additional programs that have been available to the French manufacturing sector include:

- Research and development grants equal to 15-25 percent of investment to businesses that create or expand technical and scientific research activities. This research must tend to assist technological development. [11]
- Tax exemptions and accelerated depreciation (up to 25 percent the first year) to promote investment, employment, and economic development in underdeveloped regions. [12]
- Loans to industries for development and production of joint programs with other countries. These loans are generally repaid over long periods and without interest. [13]

A recessionary economy, high unemployment, a weak franc and escalating prices have seriously inhibited the ability of the French government to offer carte blanche funding support to all programs. These problems resulted in a four-month national price freeze in 1982 and may be reflected further in lower R&D funds available to industry.

West Germany

West Germany's general aviation manufacturing sector is represented exclusively by Dornier, which has concentrated the marketing of its utility aircraft to the Third World. Dornier's strategy has been to maximize use of its project management and technological development skills in areas of the world where this expertise is non-existent. This strategy has resulted in the continued employment of its engineers and designers through licensing arrangements, program management, technical training programs and consultants. Examples include Dornier's contract with Argentina for design and development of the FMA IA63 trainer, and its licensing agreement with India for production of the DO 228 commuter.

The German aerospace manufacturing industry, while comprised of private companies, has historically depended heavily upon financial support and assistance of the government. Messerschmitt-Boelkow-Blohm (MBB), the only German partner in Airbus Industrie, was furnished the bulk of its funding needs by the German government; this is to be repaid from royalties on the sale of Airbus aircraft, and is in keeping with the common practice of the German government to guarantee loans raised to finance new programs.

However, Dornier's current project, the DO 228, represents a departure from the traditional government funding role. Dornier sees its risk in this project as much greater than that of MBB's in the Airbus program. For the DO 228, the German government has provided only a repayable credit of 40 percent of development costs, mandating that Dornier finance the rest.

This may be one of the first examples reflecting a less supportive government attitude toward the aerospace sector. German government policy now calls for:

- Greater use of private company funding instead of reliance on government subsidies. [14]
- Reduction of labor force in the aerospace industry as aircraft programs wind down, with redundant employees to be absorbed in other industries. [15]

[10] *Aviation Week & Space Technology*, June 4, 1984, p. 67.
[11] Aerospace Industries Association, *Research & Development: A Foundation for Innovation and Economic Growth*, September 1980, p. 59.
[12] Ibid.
[13] "Aerospace/France," *Financial Times*, Section XII, August 23, 1982.
[14] "German Industry Faces Funding Cuts," *Aviation Week/Space Technology*, September 6, 1982, p. 22.
[15] Ibid.

- Reduced participation in marginally successful international aerospace and defense programs.[16]
- Restrictive funding for research and development programs.[17]
- The 1979 repeal of the tax exemption on general aviation fuel and oil. This exemption was originally enacted in 1955 to encourage development of general aviation aircraft.[18]

Spain

The Spanish aerospace industry revolves around Construcciones Aeronauticas (CASA), which is 71 percent controlled by the state holding company, National Institute for Industry. Additional CASA partners include Northrop (USA) 13 percent, MBB (West Germany) 11 percent, and Avions Marcel Dassault-Breguet (France) 0.6 percent. In 1982, exports accounted for 77 percent of CASA's sales.[19]

Lacking a broad technical base and possessing limited funds, CASA pursues collaboration with worldwide partners to share risk and funding. Previous partners on the C212 turboprop light transport were India and Indonesia. Most of the Spanish aeronautical expertise has been gained through subcontracting roles in numerous aircraft programs, including the 727, 757, DC-10 and A300.

A certain amount of developmental funds have been furnished by the government on prior programs, with the light, twin-engined CN 235 commuter being the first program ever for CASA that was not funded by the government. This is due to its partnership split with Nurtanio on a 50/50 cost/risk basis.

United Kingdom

Britain possesses the world's second largest aerospace sector (after France) outside the United States. British Aerospace (BAe) is the leading British manufacturer while Short Brothers of Ireland is the leading airframe manufacturer for the general aviation sector. Both companies' contribution to Britain's prominence in general aviation began with the Short Brothers Skyvan and SD 330 and has continued with two new programs, the Short Brothers SD 360 and BAe Jetstream 31. Several years ago, the British government began denationalization of BAe, with the result that BAe is now 48 percent owned by the government. This recent change in policy toward government ownership was prompted by the ever increasing amounts of capital required by the aviation sector, which severely impacted other industry development. In spite of the recent policy change, other aerospace manufacturers, including Short Brothers and Rolls Royce, remain under full government ownership.

[16]Ibid.
[17]Ibid.
[18]"General Aviation in West Germany," *Interavia*, April 1982, p. 365.
[19]Pierre Condom, "The Spanish Aerospace Industry: A Will to Win Through Cooperation," *Interavia*, February 1983, p. 136.

In the following pages, this report takes a closer look at the role of foreign governments in general aviation manufacturing, and discusses major domestic and international policy issues relating to U.S. trade in private, business/corporate and light transport aircraft.

U.S. DOMESTIC POLICY ISSUES

Economy and the World Marketplace: The Importance of Exports

In mid-1984, inflation in the United States has been slowed, production has picked up, capacity utilization increased and corporate profits are on the rise. Nonetheless, a recovery from the most severe U.S. economic reversal since the Depression of the 1930's may not be easily sustainable. U.S. budget deficits, if not controlled, may seriously undermine economic stability. Budget deficits have contributed to high interest rates in the United States; record interest rates and world events, which have created unstable governments abroad and made the United States a relatively more attractive investment market, have kept the dollar high in relation to other world currency values. The strong dollar has in turn hampered U.S. exports. In recent years, exports have encountered tough foreign competition as well as weak demand; a continuing strong dollar will drive the already negative U.S. trade balance more deeply into deficit.

Exports play a significant role in the American economy and their failure to rebound could have long-term detrimental effects on recovery. In 1982 exports accounted for one in eight jobs in manufacturing and one in six jobs in production of non-manufactured goods. In 1980, over six million U.S. workers owed their jobs to U.S. exports. Further, changes in export-related employment have had a far greater than proportionate impact on total U.S. employment. When the volume of manufactured exports was growing between 1977 and 1980, that growth accounted for 30 percent of the increase in U.S. private sector employment. When export volume decreased during 1980-82, that decrease accounted for 40 percent of the rise in U.S. unemployment.[20]

Not only do exports create jobs, they help offset the outflow of dollars in payment for imports and reduce federal budget deficits. An earlier AIA study provides a quantitative assessment of the effects of aircraft exports on employment and revenues.[21] The increased markets that exports provide contribute to the viability of industries, keeping costs down and helping to underwrite research and development that, in turn, keep the industries competitive.

[20]U.S. Department of Commerce, International Trade Administration, *Domestic Employment Generated by U.S. Exports*, May 1983.
[21]Aerospace Industries Association of America, Inc., *National Benefits of Aerospace Exports* (Washington, D. C.), June 1983.

In the case of high technology industries, exports not only increase the viability of the industry but contribute substantially to the national industrial base. High technology industries employ a highly skilled workforce, and pace development in other industry sectors. Aerospace, for example, has prompted developments in information processing and microelectronics.

According to the Department of Commerce, the most technology-intensive U.S. industries provide a significant contribution to overall output growth and productivity increase as well as to trade performance. From 1970-1980, for example, high technology industries as a group had a rate of growth of real output more than twice that of total U.S. industrial output. The rate of price inflation of high technology products during the same period was only one-third that of the country's overall inflation rate. Average labor productivity of high technology industries grew six times faster than that of total U.S. business.[22]

Exports of high technology products are important because they constitute a relative trade advantage for the United States. The U.S. overall trade balance in high technology products grew from 1962 through 1980.[23] A substantial portion of the U.S. high technology product trade surplus, however, is due to only two industries: aircraft and computers and related products. These two product areas have a higher level of technology intensity than other high technology industries.[24]

This advantage in high technology trade argues for U.S. attention to continuing market share losses in aircraft and other high technology product areas, and for strong emphasis on maintaining U.S. strength in research and technology.

Research and Development

Research and development investments, together with a skilled workforce and capital equipment, are factors which affect the long-term competitive position of individual industries and countries. For example, R&D investments of 10-15 years ago are largely responsible for the comparative trading advantage of U.S. capital goods exports like aircraft, computers, and electrical and electronic machinery.

The U.S. spends more in absolute dollars on R&D than any other industrial country. In 1979, the United States spent more on R&D than France, West Germany and Japan combined.[25] The U.S. had been slipping in terms of R&D expenditures per Gross National Product but in recent years this indicator also appears to be turning up and R&D spending should reach 2.7 percent of GNP during 1984.[26] This contrasts with the 1977-78 low of 2.2 percent.

The United States thus draws closer to the level of West Germany and continues ahead of other major industrialized western economies, in R&D spending relative to total economic activities. The exclusion of defense R&D, however, places the United States investment in R&D at 1.9 percent of GNP, below both West Germany (2.6 percent) and Japan (2.3 percent).[27] In fact, the rapid growth of commercial applications of R&D in other countries has narrowed the range of products in which the U.S. retains a commercial competitive advantage. Other nations have compensated for larger R&D expenditures in the United States in part by avoiding commercially unrewarding spending, and by replicating successful innovations developed elsewhere. Estimates of percent of commercially effective R&D as a share of total R&D spending by the United States and other leading industrial nations have shown other nations substantially ahead of the United States.[28]

Government support has played an important role in total U.S. R&D expenditures, but private funding of R&D exceeds government spending. U.S. industry supplies about 95 percent of private funding and the growth rate of industry funding has generally outpaced that of federal expenditures. In 1984, non-federal R&D support is estimated at about $52 billion, 12 percent over the 1983 level. This represents real growth of about 7 percent and most of it will come from industry.[29] Economic recovery and the need to be competitive internationally are driving these expenditures.

Federal R&D spending is still not at the levels of the late sixties in constant dollar terms. However, since 1981, growth of Federal support of industry-performed R&D activities has outpaced growth of company R&D financing, reversing a 17-year trend in which industry's own R&D investment grew annually at a higher rate than that of government's. Defense spending was the primary factor in this expansion in government funding.[30]

Because of the aerospace industry's tie-in to defense, federal spending accounts for the largest share of aerospace R&D. The Federal share, however, had decreased from 78 percent in 1975 to 72 percent in 1980 and has continued at about that level since then.[31]

A high level of R&D spending is largely responsible for the aerospace industry's standing as the leading exporter among U.S. manufacturing industries. Studies, including an earlier one by AIA, have clearly shown the relationship between R&D-intensity and a positive trade balance.[32]

[22]U.S. Department of Commerce, International Trade Administration, *An Assessment of U.S. Competitiveness in High Technology Industries*, February 1983, p. 3.
[23]Ibid., p.10.
[24]Ibid.
[25]National Science Board, National Science Foundation, *Science Indicators 1982*, March 1981, p. 192.
[26]National Science Foundation (NSF), *Science Resources Studies Highlights*, NSF 83-316, July 22, 1983.
[27]Ibid.
[28]Penelope Hartland-Thunberg and Morris H. Crawford, *Government Support for Exports* (Lexington, Massachusetts and Toronto) Lexington Books, 1982, pp. 35-37.
[29]NSF, *Science Resource Studies Highlights*, NSF 83-316, July 22, 1983.
[30]NSF, *Science Resource Studies Highlights*, NSF 84-314, May 14, 1984, and *National Patterns of Science and Technology Resources*, 1982, NSF 82-319, Washington, D.C., March 1982.
[31]AIA, *Aerospace Facts and Figures, 1984/85*, p. 111.
[32]AIA, *Research and Development: A Foundation for Innovation and Economic Growth.*

Among aerospace manufacturers, the largest trade benefit is attributable to products for the civil market, especially aircraft. In 1982, for example, civil aerospace exports totaled $9.6 billion or 62 percent of total exports versus just under $6.0 billion for military exports. In previous years, the percentage of civil to military exports was even higher—as much as 85 percent. Again, aircraft are the largest component of civil exports. [33]

Investment in civil aeronautics R&T is obviously critical to the overall aerospace industry, particularly as military programs have less and less applicability to civil aeronautics problems. The primary source of civil aeronautics funding in the United States is the National Aeronautics and Space Administration (NASA). The funding available is for research and technology development with broad applicability. However, a relatively small share of NASA's budget is set aside for aeronautics—a 7.4 percent share in FY 1978 had dropped to 5.2 percent in FY 1984.[34] In real terms, aeronautics R&T funding increased between 1978 and 1980 and then decreased in FY 1981 and 1982.[35] FY 1983 and 1984 funding and the Administration request for 1985 represents improvement and reflects an awareness on the part of the Reagan Administration that potential gains in aviation warrant federal research investments in aeronautics and that it is consistent with government priorities to support fundamental, high risk research and technology. Nonetheless, few NASA programs have specific applicability to general aviation problems, and where NASA R&D does meet general aviation needs, private company money funds such applications.

The need for further attention to civil aeronautics R&T is being recognized by Congress. Representatives Dan Glickman and William Carney have established a congressional advisory committee to advise on government-sponsored aeronautical research programs. Glickman hopes to see more attention given in the NASA program to all segments of aviation.

In summary, technology-intensive exports—products whose competitiveness is closely tied to R&D expenditures—make a major contribution to the United States position in trade, and at the same time help the U.S. market withstand an invasion of imports. This is a strong point in favor of the continuation and strengthening of government incentives for private industry investment in R&D.

Investments for the Long-Term

Like investments in research and development and in labor, capital investments contribute to higher technology and higher quality products. Productivity, and hence competitiveness, result from capital investments and accrue to the benefit of labor, investors, government and the buyer. During the last two decades, however, U.S. fiscal, monetary and regulatory policies have contributed to a low rate of net investment in plant and equipment, and the U.S. share of gross national product devoted to capital formation was below the levels achieved in most other industrialized nations.

In many European countries and in Japan, long-term investment is encouraged by government participation in industrial development; governments may designate or target particular industries for growth. Assistance can include fiscal and protective trade measures, policies on industry concentration, loans and loan guarantees and marketing incentives. Partnership arrangements between government and industry reduce the risk to private investors and enhance projects with an element of direction and certainty. The converse is characteristic of the U.S. market-oriented system where risk is borne by investors and labor, but not the government. Government participation, when it has occurred, has involved "rescue" of selected distressed industries or companies, and/or the relocation (adjustment) of the unemployed.

In a market system, long-term investment suffers when the risks of uncertainty outweigh the potential gain. It has been pointed out that "Foreign industrial policies . . . can weaken the ability of U.S. firms to realize adequate returns in a variety of ways . . . for U.S. firms engaged in research, the already high risk is amplified once a determined foreign competitor enters the field with government support."[36]

Aerospace Sector Targeting

France, Japan and Canada are countries which have targeted their aerospace industries for development. In Japan, development of high technology sectors is being assisted through support of R&D activities, capital expenditures, and export expansion. Direct government financial assistance to aerospace takes two forms: grants and loans. There are no outright grants for commercial production projects, but rather considerable funding for long-range R&D projects with commercial applicability, such as the Fanjet STOL Transport and FJR 710 Engine Programs. The Ministry of International Trade and Investment (MITI) itself supports selected projects and also recommends projects for funding. Most direct financial assistance to the industry takes the form of loans that reputedly terminate once commercial production is underway, with final "risk" assigned to firms involved once a profit is realized. However, it has been noted that no Japanese aerospace project has ever earned a profit, that loans are technically made to non-profit organizations that disband when commercial production begins, and that the government loans, in

[33]AIA, *Aerospace Facts and Figures, 1983/84*, p. 129.

[34]*Budget of the United States Government - Fiscal Year, 1985*, U.S. Government Printing Office, Washington, D.C. 20402; NASA Budget Summary Press Release, February 1, 1984.

[35]*Budget of the United States Government - Fiscal Year 1984*, U.S. Government Printing Office, Washington, D.C., and National Aeronautics and Space Administration's Budget, various years.

[36]Department of Commerce, *U.S. Competitiveness in High Technology Industries*, p. 26.

effect, remove risk from investment for participating companies.[37]

Design and development inexperience, lack of research and test facilities and limited manufacturing skills, as well as a small domestic market are obstacles for Japan's progress in the commercial aircraft industry. The Japanese also face formidable competition and the same problems as any other nation in raising the enormous amounts of money needed to launch a new aircraft or engine. Nonetheless, Japan is relying on international joint ventures as a means of building up aerospace production capacity, gaining technology expertise and training, creating marketing networks and obtaining some protection through the major partner from the intense competition. This approach, plus generous government support, has facilitated Japan's entry into aerospace production.[38]

French industrial policy has concentrated to a large extent on high technology sectors including aircraft and space. Over the years, emphasis has shifted from direct government guidance of specific industrial sectors and firms to greater reliance on market merchanisms and now, more recently, back to more specific government direction. This is reflected in the nationalization of key high technology firms and a considerable increase in the government R&D budget. (The 1982 government budget for R&D represents approximately three-fourths of the national research effort.) Another means of promoting certain industries has been tax deductions to those who purchase shares on the stock exchange. The government is also heavily supporting the electronic data processing and telecommunications equipment sectors.[39]

The type of support that governments can offer aerospace firms has been demonstrated in Canada where general aviation manufacturers Canadair and de Havilland are both government-owned. The Canadian government recently restructured Canadair (as New Canadair Ltd.) in order to relieve the firm of its huge debt-interest cost which had reportedly deterred some potential buyers from ordering the aircraft. The firm is now expected to show a profit by 1985. The existing Canadair will be left with about $1.35 billion in government-guaranteed debts incurred in developing the Challenger aircraft. The Canadian government is expected to provide additional money for the financially troubled de Havilland Aircraft as well.[40]

As U.S. firms operating under U.S. market system rules compete with companies receiving strong government support, it is important that the U.S. government examine what it can do to assist them, while at the same time preserving our traditional free enterprise system. Fundamentally, the United States must stabilize the economic situation and provide for steady growth. It must provide, where possible, incentives to stimulate lagging capital formation. And it must recognize the difficulties that private enterprise firms face in competing against government supported firms, acting to soften the impact of government support on international markets.

INTERNATIONAL POLICY ISSUES

General Agreement on Tariffs and Trade

There are a number of international marketplace issues that require an active U.S. Government stance on behalf of American companies. One is the need to support and expand the General Agreement on Tariffs and Trade codes and the Agreement on Trade in Civil Aircraft.

The Tokyo Round of Multilateral Trade Negotiations, the most recent international trade talks under the auspices of GATT, resulted in, among other things, major international codes on nontariff barriers, as well as bilateral agreements between the United States and 27 developing countries to reduce tariff and nontariff barriers to trade. One of the six major codes addressed the subsidies issue: the use of grants to benefit production, manufacture or distribution of goods and services. Export subsidies on non-primary products and primary mineral products were prohibited. Domestic subsidies were recognized as having potentially negative effects on international trade and signatories are required to use domestic subsidies in such a manner as to minimize their adverse trade effects. Also concluded was an Agreement on Trade in Civil Aircraft. This Agreement calls for fair and equal opportunities on a commercially competitive basis for all manufacturers and operators, free from the adverse trade effects of governmental support of civil aircraft development, production and marketing. The Agreement eliminated tariffs on all civil aircraft and engines and on most parts. It incorporated many nontariff provisions which indicate that purchase decisions should be based on commercial and technical factors. Specifically, governments should not apply unreasonable pressure on airlines to purchase from particular sources; require offset production; nor attach inducements such as landing rights or economic sanctions, to sales of civil aircraft.[41]

Despite the progress of the Tokyo Round and the Civil Aircraft Agreement, there is much yet to be achieved.

The General Accounting Office has reviewed U.S. government strategies used between January 1980-1983 to reduce the use of trade-related subsidies under the GATT agreement. These were: (1) persuading developing coun-

[37]U.S. Department of Commerce, International Trade Administration, Office of International Trade and Investment Analysis, *Japanese Industrial Policies and the Development of High-Technology Industries: Computers and Aircraft*, February 1983, pp. 32-34.

[38]Ibid.; also, Japan Economic Institute of America, "Japanese Industrial Policy With A Twist: Commercial Aircraft," *Japan Economic Report*, (Washington, D. C.), No. 39A, October 14, 1983.

[39]Department of Commerce, *U.S. Competitiveness in High Technology Industries*, pp. 28-29.

[40]"Canada Plans to Restructure Aircraft Maker," *Wall Street Journal*, March 14, 1984, p.8.

[41]Department of Commerce, *The Tokyo Round Agreements, The Tokyo Round Results - A Descriptive Summary; Agreement on Trade in Civil Aircraft - A Descriptive Summary*, March 1981.

tries to assume increased discipline over the use of subsidies; (2) persuading Agreement signatories to report the subsidies they use; and (3) using the Agreement's dispute settlement procedure to help eliminate the effects of subsidies. GAO concluded that, to date, the United States has had little success with these strategies.[42]

The Government must act to strengthen the General Agreement on Tariffs and Trade codes, as well as the Aircraft Agreement itself. Specifically, the Aircraft Agreement should be revised to: (1) expand duty free treatment of parts of aircraft; (2) list specific actions from which signatory governments agree to refrain while major airline procurement decisions are under consideration (e.g., directed procurements, demands for mandatory subcontracts, and political inducements such as offers of landing rights); (3) eliminate all subsidies in official government direct loan export financing. The Agreement must also be negotiated to reduce or preferably eliminate differing technical requirements and interpretation of requirements on such items as aircraft certification, quality control approvals, and application of standards.

A further U.S. concern is that the Aircraft Agreement be amended to provide that sellers will not subsidize financing of sales into the home markets of other signators. A gentlemen's agreement to this effect with respect to transport aircraft has been in jeopardy for some time as competitive pressures have increased. This issue could be particularly difficult to resolve where general aviation aircraft are concerned.

Until such changes to the Aircraft Agreement can be achieved, the U.S. government must act in a timely manner and at a high political level to counteract foreign government marketing practices that distort trade. The government should make clear that the United States will match to neutralize those practices. Such action can counter unfair practices in the near term, but may also be the only means of leverage to achieve improvements in the government-supported Agreement on Trade in Civil Aircraft and the Commonline financing agreement.

Export Financing

Competition in export credit financing (i.e., direct loans, loan guarantees, risk insurance, mixed credit trade terms and low interest rates, national development loans between countries) began to intensify in 1980. Rising U.S. interest rates and a variety of economic and political problems in other major world areas attracted investment to the United States and resulted in a strong U.S. dollar relative to other currencies, causing European interest rates to rise. Buyers of U.S. and European exports, squeezed by rising service costs on already heavy debt burdens, turned down "business as usual" offers and terms. Export credits offered under terms of a 1976 "Arrangement" among the major exporting (OECD) nations became the source of "cheap" credit, because the Arrangement included interest rates which were below prevailing commercial rates, and a fierce credit competition ensued. The Arrangement specifically excluded aircraft and nuclear power equipment, however, and the Aircraft Agreement did not address the matter of aircraft financing either.

In August 1981, France, Germany, the United Kingdom and the United States (principal producers of large commercial aircraft) agreed to a Commonline on interest rates (certain minimum rates and terms) for credit sales support in other world countries. General aviation and helicopter export credits were not part of the Commonline Agreement nor are they today. Sales terms for these aircraft are governed by trade rules of the 1979 GATT which prohibits subsidies and, as mentioned in the previous section, the United States has had little success in the elimination of subsidy support.

Subsidies, whether from credit terms, production funding or price supports, have been the subject of several recent actions before the International Trade Commission (ITC) by light aircraft manufacturers. In each instance, U.S. manufacturers have been rebuffed in their contention that foreign subsidies have inhibited their potential sales success.

In December 1982, an ITC report entitled "Economic Impact of Foreign Export Credit Subsidies on the U.S. Commuter Industry" was furnished to the U.S. Senate Committee on Finance. This study concluded that financing was a small factor in the procurement decision by operators when selecting their aircraft. According to the study, financing ranked 10th on a list of the 15 most important criteria as reported by U.S. commuter airlines.

The public version of the ITC report does not include a great deal of the data used as the basis for study findings; it is therefore difficult to assess whether financing, which has played a major role in most commercial transport aircraft purchases in recent years, has been accorded proper relative weight in this study of commuter aircraft sales. The report does raise a fundamental question: if financing is so relatively unimportant, why do foreign aircraft producers continue to offer attractive financing in the U.S. market where, during recent years, borrowers have had to pay interest rates ranging from 13.5 to 20.5 percent? Offered rates are certainly below market rates in their own countries as well.

Further contradictory information surfaces from statements made by the presidents of U.S. commuter airlines during an interview with *B/CA Commuter* magazine published in February 1982.

"The big thing was financing," said Provincetown-Boston Airline president Peter Van Arsdale, referring to the interest rate acquired for the purchase of his new fleet of aircraft. "Financing is very important," stated Imperial Airlines president Jim Harmon when referencing his new aircraft purchases.

[42]U.S. General Accounting Office, *Report to the Secretary of Commerce and the United States Trade Representative: Benefits of International Agreement on Trade-Distorting Subsidies Not Yet Realized*, (Washington, D. C.), GAO/NSIAD-83-10, August 15, 1983.

Coleman B. Harding, Vice President, Planning, for Empire Airlines, Inc., discussed his airline's transition from a small aircraft to a jet airline during the Federal Aviation Administration's 1983 Forecast Conference. He acknowledged that, in making the change, Empire required a great deal of help from the manufacturer—in this case, Fokker of the Netherlands. Harding said financing was "very important in the decision to purchase the F-28." He also said that "It certainly did not hurt to find a foreign manufacturer eager to break into the U.S. market."

The potential importance of financial terms in the sale of aircraft is clear from the following payment schedule for a 19-passenger, $2 million commuter aircraft financed at varying rates over 10 years with 10 percent down:

9%—$22,801.64/month
13%—26,875.93/month
15%—29,040.29/month
19%—33,601.02/month

At 19 percent interest, financing would cost the purchaser 47 percent more per month than would financing at 9 percent.

Financing has played a major role in sales in the international marketplace, and certainly in aircraft sales, in recent years. This is evidenced by the range of export financing incentives and subsidies provided through foreign national export credit agencies including: government-supported loans below market level, insurance programs which protect against abnormal cost escalations, and insurance against exchange rate fluctuations.

In the United States, the Export-Import Bank serves to encourage exports with financing assistance. However, in recent years, direct loan and guarantee levels have not always been sufficiently high and the government has not utilized fully the resources of the Eximbank. Only in the last two years (effective September 1982) has the Bank had a medium-term financing program appropriate for small fixed wing aircraft and helicopters; until that time, the Eximbank's medium term financing was basically non-competitive. In the summer of 1983, Eximbank lowered the rates provided for medium-term financing to the OECD Arrangement minimum interest rates negotiated at the close of 1982.

U.S. producers feel that aircraft exports have been hampered not only by loan and guarantee limitations but by restrictive Eximbank policies: an up-front loan fee; stipulations restricting loans where competition is not clearly and actively present, and for follow-on aircraft purchases. The Bank has placed first priority on being self-sustaining rather than competitive as was the intent in the Bank's charter. It appears that this last issue may be satisfactorily resolved by a major provision in the Export-Import Bank Amendments passed by Congress in November of 1983. In re-chartering the Bank, Congress strengthened the competitive mandate of Eximbank by clarifying its intent that the Bank be "fully competitive . . . in all its programs."

Nonetheless, Administration implementation of policy with respect to how aggressively the bank is utilized is key to Eximbank's usefulness in support of American exports. For example, despite legislation providing for Export-Import Bank financing for U.S. firms in competition against foreign producers for sales in the United States (Section 1912, Export-Import Bank Act), the U.S. Treasury not long ago denied Eximbank support to an American firm in just such an instance. Treasury argued that financing was not a *determining* factor in the sale. The Export-Import Bank Amendments of 1983 have broadened the standard for identifying subsidized sales into the U.S. market, emphasizing that if financing is a *significant* factor in a competition, Eximbank financing can be made available. Much rests, however, in the interpretation of the facts of a particular situation. Section 1912 could be particularly useful to producers of private, business and light transport aircraft whose largest market is still the United States, and who face increasing U.S. market penetration by foreign competitors.

The background for all these export sales competitions remains a world economy depressed and restrained from its potential by high interest costs on old and new debt. Until commercial interest rates remain below minimums set in the Commonline and the OECD Arrangement, export credit competition between governments will continue.

Export Tax Incentives

For decades, most developed nations, recognizing that their economic well-being is heavily dependent on exports, have employed an array of export incentives for their businesses and industries. These incentives have often been tax incentives provided directly by law, or indirectly through the administration of national tax systems. The United States has basically had only one export tax incentive, the Domestic International Sales Corporation (DISC). DISC was under attack for years by U.S. trading partners participating in the General Agreement on Tariffs and Trade (GATT) as being illegal under that treaty. The Reagan Administration proposed replacing the DISC provision to resolve the long-standing controversy over GATT consistency. The Administration-supported DISC replacement—the Foreign Sales Corporation (FSC)—was approved by Congress in early summer of 1984 and signed into law by the President. The FSC should be an excellent incentive for exporters and yet be within U.S. international commitments under the GATT.

The United States Government should now undertake a formal study of the export incentives provided by other developed nations, to assure that with the new FSC provisions, U.S. export incentives are comparable to those of other nations.

Export Controls

National security concerns are strongly intertwined with the complexities of the technology transfer issue. The possible transfer of highly critical technology to Eastern bloc nations does necessitate certain technology controls. None-

theless, from the military standpoint, technology must be shared to some degree with key allies. From the commercial viewpoint, the need for national security controls must be balanced by recognition that advanced technology is not the sole province of the United States. Sales that the United States fails to make because of technology controls will likely be made by other countries.

The danger is that trends in the development of controls on technology exports may undermine U.S. economic and technology leadership. If current controls on critical technologies are broadened to include sensitive and significant technologies, such measures could severely impact aerospace exports, and aerospace is one of the few areas of U.S. international trade that consistently shows a large surplus. Technology controls could also limit U.S. companies' opportunities to compete in multinational ventures.

U.S. export control laws contain extraterritorial enforcement provisions which exceed those of any other country. In 1982, foreign policy-based restraints on European government sales of U.S. technology-based products to build the Siberian gas pipeline increased trade friction between the U.S. and its trading partners. In addition to exacerbating trade relations, foreign policy-related controls have increased a perception of U.S. firms as unreliable suppliers. The reliability of U.S. exporters of high technology products has been increasingly in doubt since the Carter Administration when human rights considerations dictated the imposition of export controls. During the subsequent five years, alternative sources of American-made products have increased, including U.S. firms who moved outside of the United States to produce certain items. Yet, experience has shown that foreign policy controls have not, overall, been successful. A recent analysis by Hufbauer and Schott indicates that while in some instances sanctions have helped alter the policies of foreign countries, in many cases they have not contributed very much to the achievement of publicly stated foreign policy goals. Further, "Success has proven more elusive in recent years than in earlier decades." This is attributed to two factors: latter-day target countries are less dependent on trade with sender countries; and there are more nations willing and able to assist target countries. "Growth in global interdependence and the East-West confrontation have made it easier for target countries to find alternate suppliers, markets, and financial backers, to replace goods embargoes or funds withheld by the sender country."[43]

Since trade controls potentially can severely impact the U.S. economy through trade deficits and loss of jobs, efforts should be concentrated on achieving the best balance of security and economic interests. A central element of a more balanced approach is to limit the scope of controls on technology transfer to a manageable and truly critical set of technologies to which access by U.S. adversaries can actually be denied.

Clearly, the United States must inhibit the leakage of advanced technology to the Soviet bloc while at the same time accelerating its use by NATO and other allies, yet these often conflicting restraints make export licensing an erratic and uncertain process. Sometimes permits are denied or even withdrawn after a foreign sale is made, throwing into question the reliability of the United States as a supplier. Accordingly, it is essential that U.S. export regulations be rationalized and simplified in order to achieve a higher degree of predictability in foreign sales.

The economic recession, and associated high unemployment rates, have created a frustration in the United States over foreign import penetration of basic U.S. industries (automobiles, steel, textile, agriculture) and have led to a rise in protectionist sentiment.

The United States has had a large export surplus of capital goods and agricultural products for some years and, excluding petroleum products, actually enjoyed a trade surplus until 1983, when the non-oil trade balance dropped to $21.9 billion.[44] Manufactured goods are the principal components of the rising trade deficit. The very serious threat to those U.S. manufacturing sectors that still reflect a trade surplus would be worsened—and employment in those industries would fall—if foreign markets responded to U.S. protectionism by retaliation. In essence, the protection of some ailing sectors of the U.S. economy can only be bought at the expense of other expanding sectors. Protectionism would also mean higher prices to U.S. consumers, since protected firms would have less incentive to make capital investments, embody new technology in their products, and increase productivity.

While protectionism is not the answer, efforts must be made to counteract unfair trade practices. A preferable alternative to protectionism is to support the GATT, with its commitment to fair and open trade, and to strive to improve the basic agreement and enforce its objectives. Only through full compliance with GATT rules on trade and tariffs can all of the world's nations achieve their trade potential. As it now stands, GATT has no enforcement powers, and many nations refuse to join the agreement. In those cases, it could ultimately prove necessary for the U.S. government to adopt a more aggressive, hands-on policy to deal with uncooperative trading nations and their sheltered manufacturers.

[43]Gary Clyde Hufbauer and Jeffrey J. Schott, *Economic Sanctions in Support of Foreign Policy Goals* (Washington, D. C.: Institute for International Economics, October 1983) distributed by MIT Press/Cambridge, London, Policy Analyses in International Economics 6, pp. 74-76.

[44]U.S. Department of Commerce, "New ITA Report Analyzes U.S. Trade Performance and Outlook," *Business America*, July 9, 1984, p. 22-24.

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