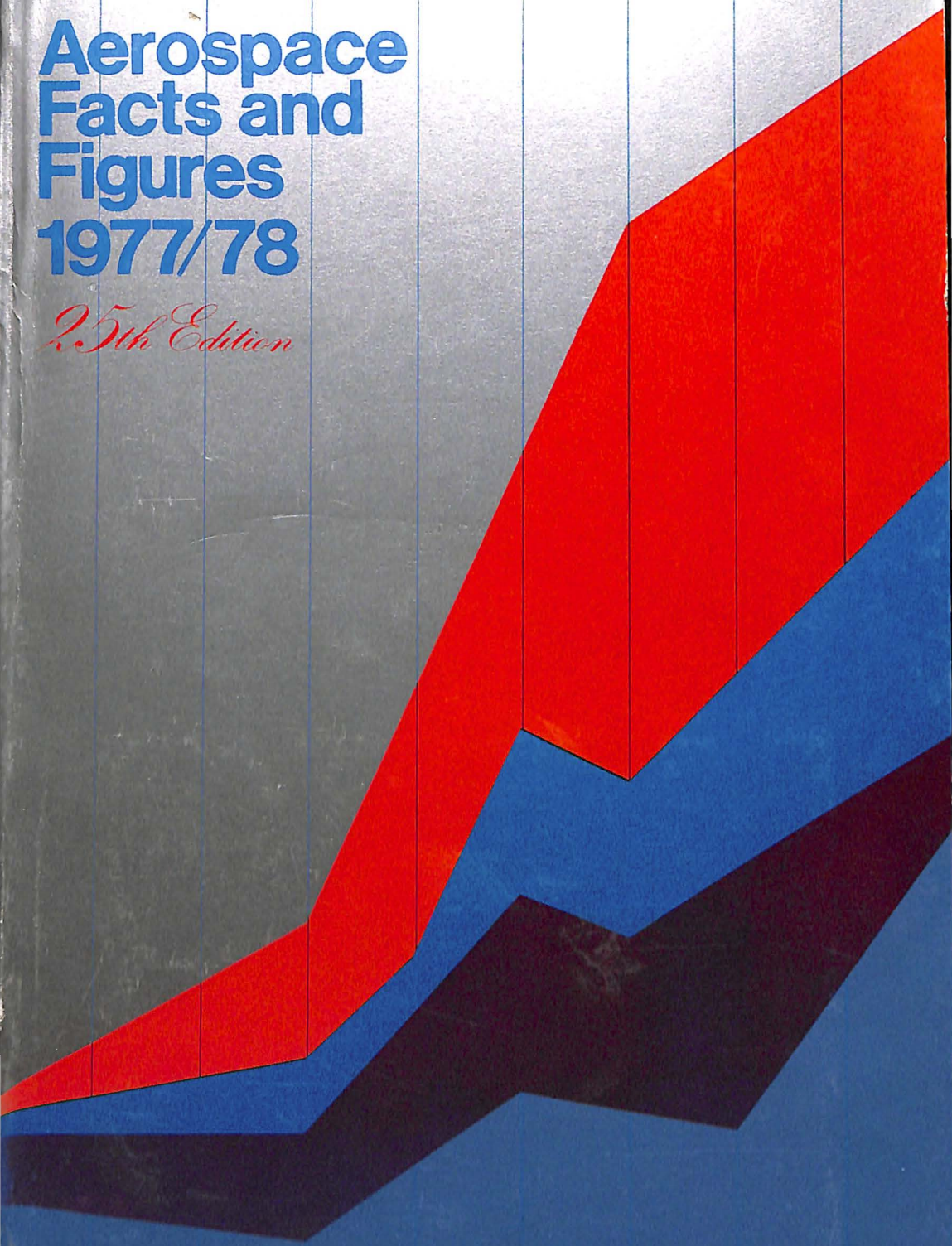


Aerospace Facts and Figures 1977/78

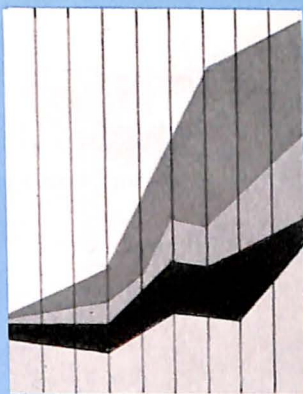
25th Edition



AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

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AVIATION WEEK & SPACE TECHNOLOGY
Book Department
1221 Avenue of the Americas
New York, N. Y. 10020



Aerospace Facts and Figures 1977/78

Compiled by

Economic Data Service

Aerospace Research Center

Aerospace Industries Association of America, Inc.

1725 DeSales Street, N.W., Washington, D.C. 20036

Published by

***Aviation Week
& Space Technology***

A MCGRAW-HILL PUBLICATION

1221 Avenue of the Americas

New York, N. Y. 10020

\$5.95 Per Copy

1977/78 **Aerospace Facts and Figures**

Library of Congress Catalog No. 46-25007
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Aerospace Research Center

Director **Allen H. Skaggs**
Chief
Statistician **Sally H. Bath**

*This 25th edition of **Aerospace Facts and Figures** is dedicated to Dr. Rudolf Modley who passed away September 27, 1976. He was editor of the first **Facts and Figures** in 1945 and was substantially involved in the preparation of all following editions. An economist whose consultant services made him well known throughout the aerospace industry, he contributed importantly to the economic understanding of the industry through the development of improved methods of analysis and statistical presentation.*

Acknowledgments

Air Transport Association
Civil Aeronautics Board
Energy, Research and Development Administration
Export-Import Bank of the United States
Federal Trade Commission
General Aviation Manufacturers Association
International Air Transport Association
International Civil Aviation Organization
National Aeronautics and Space Administration
National Science Foundation
U. S. Departments of
 Commerce (Bureau of the Census)
 Defense (Comptroller, Public Affairs,
 Army, Navy, Air Force)
 Labor (Bureau of Labor Statistics)
 Transportation (Federal Aviation
 Administration)

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Foreword

The terms "record" and "peak" crop up with increasing frequency in financial summaries. The Gross National Product sets a new record every year, as do revenues from sporting events and theatrical performances, costs of medical treatment and sales of consumer goods. But in most instances they are records only in the statistical sense. When the effects of inflation are taken into consideration, it is not unusual to find that a "record" high is actually a decline from the previous level.

Such is the case as regards the aerospace industry's financial summary for 1976. The industry reached an all-time peak in overall sales and broke records—statistically speaking—in several categories. Yet in terms of real productivity the industry's output dipped below the previous year's. Translated into constant dollars, sales were below those of 1975. Aerospace sales fell off as a percentage of the Gross National Product, as a percentage of durable goods sales, and as a percentage of all manufacturing sales.

Reflecting a general upturn in the U.S. economy, the aerospace industry's profit ratio increased. Any increase in earnings is encouraging to an industry whose capital requirements are necessarily intensive, but here again qualification is in order. The aerospace profit ratio improved, but not to the degree of the durable goods manufacturing industry as a whole or the average for all U.S. manufacturing industries.

A continuing source of gratification is the industry's performance in the international market. Aerospace exports and trade surplus set new "records," but the gains over the previous year were not sufficient to match the inflation rate. Nonetheless, exports and trade balance remained at high levels and



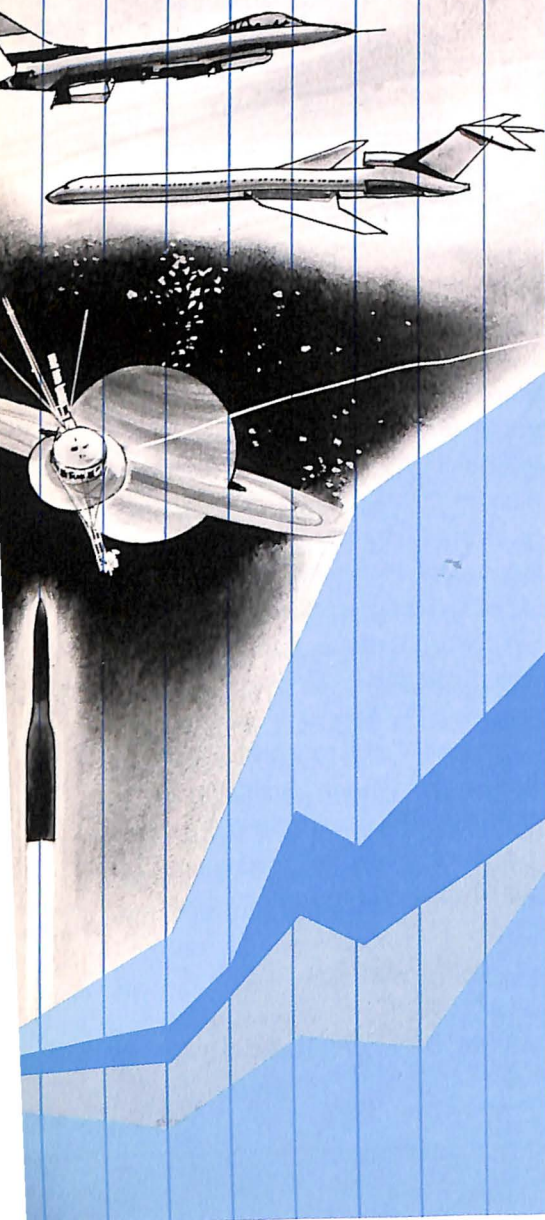
represented significant contributions to the U.S. economy. In view of ever-strengthening competition from foreign nations, sales abroad constitute a testimonial to the continuing excellence of American aerospace products.

As for the industry's near-future outlook, there appears cause for optimism. Continuing debate on the merits of certain major military programs clouds the picture as regards defense workload, but budget estimates for the current and upcoming fiscal years are indicators of potentially greater industry activity. Advancing development on NASA's Space Shuttle and projected increases in overall NASA outlays augur heightened industry effort in fabrication of space equipment. The improving financial posture of the air transportation industry is an indicator of business growth for manufacturers of commercial transports. Sales of non-aerospace products produced in aerospace facilities continue to increase annually, in real rather than inflated terms. These signposts point to an upward swing in the industry's long-declining activity curve.

Moderately reduced workload notwithstanding, 1976 was a year of solid accomplishment for the aerospace industry—spearhead of free world technological advance. The accomplishments are detailed in statistical and highlight fashion in this 25th edition of *Aerospace Facts and Figures*. We trust that this volume, like its predecessors, will prove useful and enlightening to government and industry officials, legislators, news writers and editors, analysts and students.

Karl G. Harr, Jr.
President
Aerospace Industries Association

Aerospace Summary



In 1976, sales of the aerospace industry reached what might be termed an illusory peak. As the following pages show, there were statistical gains in most major categories of industry effort. For the most part, however, the rate of gain was below the national rate of inflation. Thus, what appears to be an all-time sales record translates into another year of decline when the data is adjusted to reflect the erosive effect of a continuing high inflation.

Despite the decline in real output, there are encouraging indicators of brighter near-future prospects for the aerospace industry. Estimates of Department of Defense outlays for the fiscal years 1977 and 1978 show substantial increases in aerospace aspects of the budget, including both procurement and research and development. A general improvement in the U.S. economy is bringing about a corollary improvement in the financial posture of the U.S. airlines, indicating a resumption of long-deferred orders for commercial transports. A third factor is the 1976 increase in the aerospace industry's profit ratio, again a reflection of a strengthening national economy. The industry's profit after taxes remained well below the average for all U.S. manufacturing industries, but it reached its highest level in recent years, a heartening signpost for an industry that needs very large amounts of capital to finance its high-technology programs.

Here is a breakdown of 1976 industry performance by major category:

OVERALL SALES. Total sales amounted to \$29.3 billion, an increase

over the previous year of almost \$1 billion. Statistically, this is the highest figure ever recorded by the industry; it compares with the previous peak, in 1968, of just under \$29 billion. For measurement of *real* activity, however, the data must be adjusted to take into consideration the impact of inflation. Converted to constant dollar terms, using 1972 as the base year, the 1976 sales volume was more than \$13 billion below that of 1968. It was also some \$400 million below 1975 sales, marking the third consecutive year of adjusted-value decline. Aerospace sales also declined slightly as a percent of the Gross National Product, to 1.7 percent, which compares with 3.3 percent in 1968 and with an average of 2 percent for the preceding years of the 1970s.

CIVIL AIRCRAFT PRODUCTION. As had been anticipated, sales of commercial jetliners declined in both numbers delivered and value. This reflects sharply reduced orders for new commercial transports in 1974 and 1975, the major impact of which was felt in 1976 due to the long lead-time involved in production. The industry delivered 238 airline transports worth approximately \$3.2 billion, which compares with 315 planes valued at \$3.7 billion in 1975—and the latter year represented a drop below the 1974 sales level of \$4 billion.

Reduced jetliner sales were partially offset by another record performance in sales of general aviation aircraft. General aviation sales climbed to \$1.2 billion, more than \$200 million above the 1975 level, which was the previous all-time high. A similar peak was re-

corded in the number of units delivered, 15,447 in 1976, 1,390 more than in the previous year.

Helicopter production failed to match the 1975 record, but remained at a high level with sales of \$242 million, down only \$32 million from 1975. There was a greater drop in the number of units produced, 589 in 1976 compared with 864 in 1975.

MILITARY AIRCRAFT PRODUCTION. After a temporary reversal in 1975 of the declining trend in military aircraft production evidenced from 1968 to 1974, deliveries fell off again in 1976. Including planes for Security Assistance Programs, the industry delivered 1,192 military aircraft, down 177 units from 1975 but about 80 more than in 1974, the bottom year. Fighter/attack aircraft deliveries—numbering 682—accounted for over half of the unit production. The high dollar value of these aircraft boosted overall flyaway value substantially; despite the decline in numbers, dollar value increased from \$2.9 billion in 1975 to \$4.8 billion in 1976.

MISSILE PROGRAMS. Industry sales of missile systems and parts took a new dip in 1976. Sales amounted to \$4.9 billion, down from \$5.1 billion in the previous year. Major missile programs, in terms of fiscal year 1976 funding levels, were the Air Force's Minuteman III, the Navy's Trident I and Harpoon, and the Army's Dragon and TOW weapons.

SPACE PROGRAMS. Space systems, civil and military, accounted for \$3.4 billion of the industry's total sales. This represented an increase of

about \$160 million. NASA's principal development program is the Space Shuttle. The Shuttle Orbiter, manned segment of the system, was rolled out in 1976 preparatory to ground and flight testing in 1977. Heightened industry activity was indicated as the Shuttle advanced in development toward operational service in 1980. The major military astronautics program is the NavStar Global Positioning System, to be operational in the mid-1980s.

NON-AEROSPACE SALES. As in previous years, industry activity in non-aerospace products manufacture increased in 1976. This activity, which embraces the industry's effort to transfer to the non-aerospace sector the high technology acquired in aerospace work, topped the \$5 billion level for the first time. Sales of \$5.3 billion represented an increase of more than \$400 million above 1975, which was the previous peak year.

RESEARCH AND DEVELOPMENT. Following a sharp drop in 1975, industry activity in research and development declined again in 1976. The reduction of effort was due primarily to low funding levels for defense research and development (R&D), traditionally the prime source of industry R&D contracts. Department of Defense outlays for aerospace

R&D in FY 1976 actually edged upward slightly, to \$4.5 billion, an increase of \$90 million over 1975. The 2 percent funding increase, however, was well below the inflation rate, indicating a further depression of industry R&D activity.

EXPORTS. For the fifth straight year, aerospace exports set a new record and there was a corresponding all-time high in the aerospace balance of trade. Exports amounted to \$7.8 billion, an increase of \$67 million over 1975. The aerospace positive trade balance of \$7.3 billion compares with a \$7.0 billion surplus in 1975. Principal component of the export volume was sales of commercial transports. Although dollar value of all transport deliveries—U.S. and foreign—was down substantially from the previous year, the export dollar value actually increased. Jetliner sales abroad, at \$2.5 billion, accounted for almost one-third of all aerospace exports.

EMPLOYMENT. Aerospace employment dropped to a new low of 899,000, some 43,000 below the 1975 figure. A 1977 survey, however, indicated that the employment decline of the latter 1960s and the 1970s had bottomed and that an upward swing was indicated.

AEROSPACE INDUSTRY SALES BY CUSTOMER

Calendar Years 1950 to Date
(Millions of Dollars)

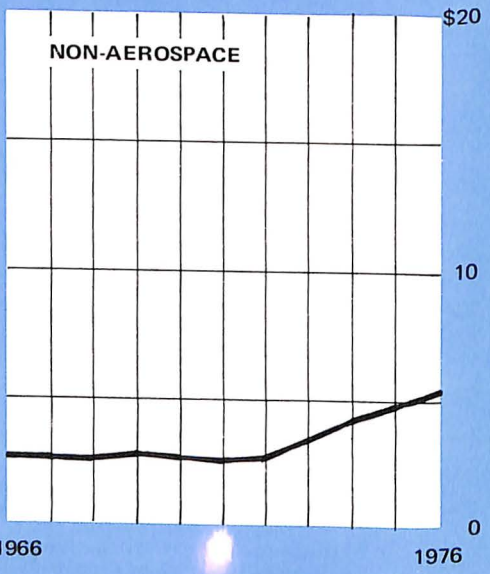
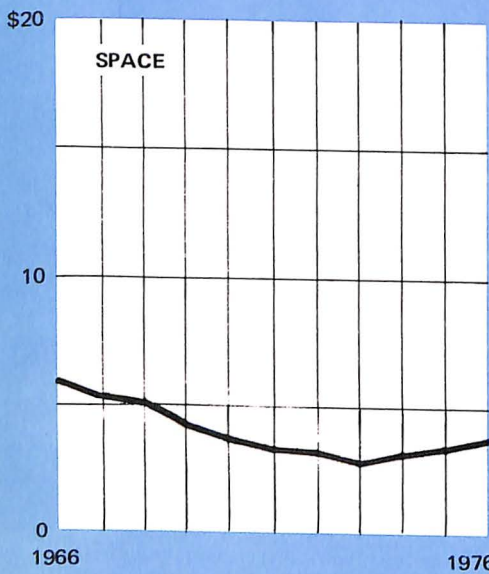
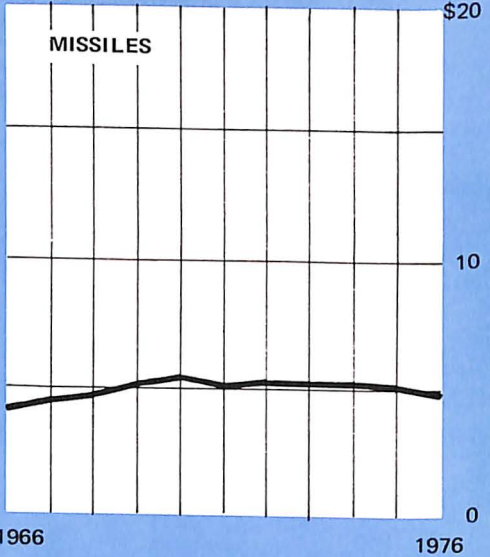
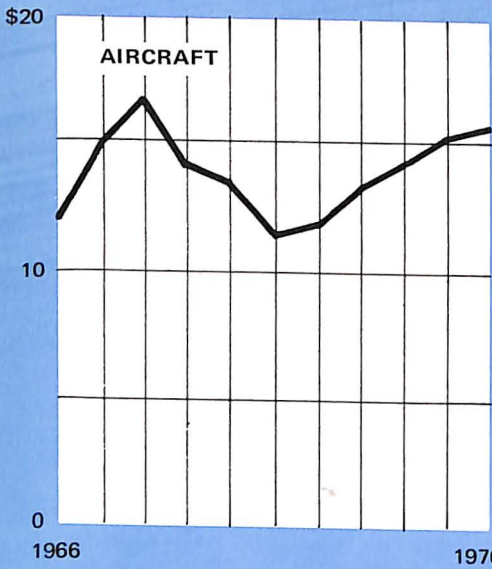
Year	TOTAL Sales	Aerospace Products and Services			Non- Aerospace Products and Services
		U.S. Government		Other Customers	
		Department of Defense	NASA and Other Agencies		
1950	\$ 3,116	\$ 2,598	\$ -	\$ 238	\$ 280
1951	6,264	5,353	-	347	564
1952	10,130	8,568	-	650	912
1953	12,459	10,604	-	734	1,121
1954	12,807	10,832	-	822	1,153
1955	12,411	10,508	-	786	1,117
1956	13,946	11,525	-	1,166	1,255
1957	15,858	12,833	-	1,598	1,427
1958	16,065	13,246	1	1,372	1,446
1959	16,640	13,171	130	1,841	1,498
1960	17,326	13,196	363	2,208	1,559
1961	17,997	13,871	630	1,876	1,620
1962	19,162	14,331	1,334	1,772	1,725
1963	20,134	14,191	2,628	1,485	1,830
1964	20,594	13,218	3,635	2,020	1,721
1965	20,670	11,396	4,490	2,816	1,968
1966	24,610	13,284	5,026	3,663	2,637
1967	27,267	15,855	4,201	4,632	2,579
1968 ^r	28,977	16,573	3,938	5,917	2,549
1969 ^r	26,149	15,771	3,337	4,342	2,699
1970 ^r	24,904	14,643	2,974	4,643	2,644
1971 ^r	22,154	12,584	2,745	4,302	2,523
1972 ^r	22,818	13,295	2,608	4,269	2,646
1973 ^r	24,809	12,886	2,394	6,186	3,343
1974 ^r	26,400	12,650	2,527	7,156	4,067
1975 ^r	28,373	13,127	2,727	7,727	4,792
1976	29,279	13,402	2,815	7,808	5,254

Source: Aerospace Industries Association estimates, based on latest available information.
 NOTE: The AIA estimate of Aerospace Industry Sales is arrived at by adding (1) DOD expenditures for "procurement" of aircraft and missiles; (2) DOD expenditures for research, development, test and evaluation for aircraft, missiles, and astronautics; (3) NASA expenditures for research and development; (4) ERDA expenditures for space propulsion systems and space electric power development; (5) Net sales to customers other than the U.S. government by approximately 70 aerospace companies (adjusted to eliminate duplication by subcontracting) and (6) Non-aerospace sales reported by the approximately 70 aerospace companies reporting to the Bureau of the Census.

r Revised.

AEROSPACE INDUSTRY SALES BY PRODUCT GROUP

(Billions of Dollars)



Source: Aerospace Industries Association

**AEROSPACE INDUSTRY SALES
BY PRODUCT GROUP**

Calendar Years 1950 to Date
(Millions of Dollars)

Year	TOTAL Sales	Product Group			
		Aircraft	Missiles	Space	Non- Aerospace
1950	\$ 3,116	\$ 2,731	\$ 105	\$ -	\$ 280
1951	6,264	5,067	633	-	564
1952	10,130	8,442	776	-	912
1953	12,459	10,420	918	-	1,121
1954	12,807	10,460	1,194	-	1,153
1955	12,411	9,781	1,513	-	1,117
1956	13,946	10,485	2,206	-	1,255
1957	15,858	11,398	3,033	-	1,427
1958	16,065	10,582	4,036	1	1,446
1959	16,640	9,714	5,042	386	1,498
1960	17,326	9,127	5,762	878	1,559
1961	17,997	8,847	6,266	1,264	1,620
1962	19,162	8,944	6,311	2,182	1,725
1963	20,134	8,527	6,003	3,774	1,830
1964	20,594	8,911	5,242	4,720	1,721
1965	20,670	9,747	3,626	5,329	1,968
1966	24,610	11,951	4,053	5,969	2,637
1967	27,267	14,981	4,417	5,290	2,579
1968 ^r	28,977	16,578	4,719	5,131	2,549
1969 ^r	26,149	14,097	5,058	4,295	2,699
1970 ^r	24,904	13,293	5,379	3,588	2,644
1971 ^r	22,154	11,442	5,018	3,171	2,523
1972 ^r	22,818	11,866	5,217	3,089	2,646
1973 ^r	24,809	13,338	5,177	2,951	3,343
1974 ^r	26,400	14,050	5,187	3,096	4,067
1975 ^r	28,373	15,227	5,126	3,228	4,792
1976	29,279	15,708	4,931	3,386	5,254

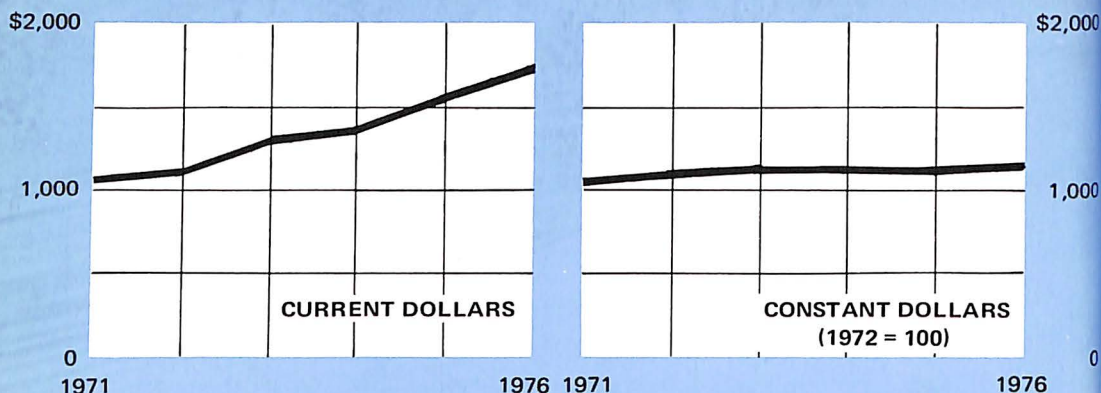
Source: Aerospace Industries Association estimates, based on latest available information.

NOTE: For explanation of "Aerospace Sales" see "NOTE" page 9.

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GROSS NATIONAL PRODUCT

(Billions of Dollars)



AEROSPACE SALES AND THE NATIONAL ECONOMY

Calendar Years 1960 to Date
(Billions of Dollars)

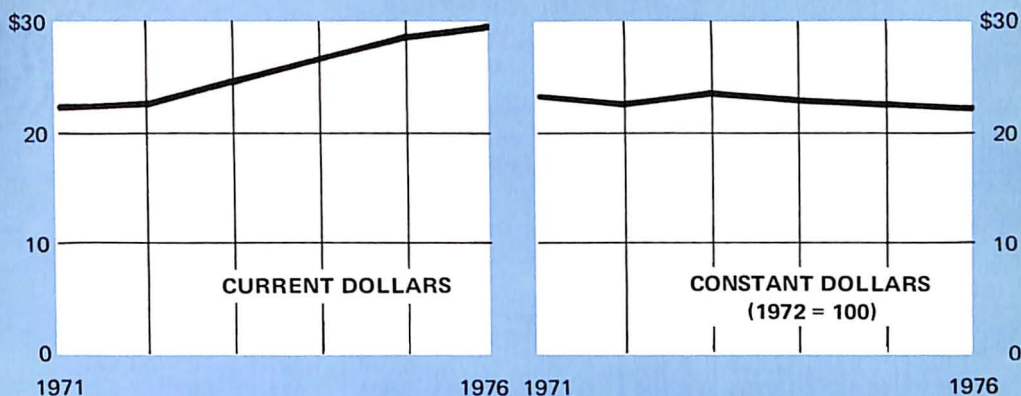
Year	TOTAL Gross National Product ^r	Sales			Aerospace Sales as Percent of		
		Manufacturing Industries ^r	Durable Goods Industry ^r	Aerospace Industry	GNP	Manufacturing Industries	Durable Goods Industry
1960	\$ 506.0	\$ 345.7	\$ 173.9	\$ 17.3	3.4%	5.0%	9.9%
1961	523.3	356.4	175.2	18.0	3.4	5.1	10.3
1962	563.8	389.9	195.5	19.2	3.4	4.9	9.8
1963	594.7	412.7	209.0	20.1	3.4	4.9	9.6
1964	635.7	443.1	226.3	20.6	3.2	4.6	9.1
1965	688.1	492.2	257.0	20.7	3.0	4.2	8.1
1966	753.0	554.2	291.7	24.6	3.3	4.4	8.4
1967	796.3	575.4	300.6	27.3	3.4	4.7	9.1
1968	868.5	631.9	335.5	29.0	3.3	4.6	8.6
1969	935.5	694.6	366.5	26.1	2.8	3.8	7.1
1970	982.4	708.8	363.1	24.9	2.5	3.5	6.9
1971	1,063.4	751.4	382.5	22.2	2.1	3.0	5.8
1972	1,171.1	849.5	435.8	22.8	1.9	2.7	5.2
1973	1,306.3	1,017.2	527.3	24.8	1.9	2.4	4.7
1974 ^r	1,413.2	1,060.7	529.0	26.4	1.9	2.5	5.0
1975 ^r	1,516.3	1,046.9	526.9	28.4	1.9	2.7	5.4
1976	1,691.6	1,182.5	604.7	29.3	1.7	2.5	4.8

Source: Gross National Product, Manufacturing and Durable Goods Industries: Department of Commerce, "Survey of Current Business," (Monthly). Aerospace: Aerospace Industries Association estimates, based on latest available information.

NOTE: For explanation of "Aerospace Sales" see "NOTE" on page 9.
r Revised.

AEROSPACE INDUSTRY SALES

(Billions of Dollars)



AEROSPACE SALES AND THE NATIONAL ECONOMY IN CONSTANT DOLLARS

Calendar Years 1960 to Date
(Billions of 1972 Dollars)

Year	TOTAL Gross National Product	Sales			GNP Implicit Price Deflator 1972=100
		Manu- facturing Industries	Durable Goods Industry	Aerospace Industry	
1960	\$ 736.9	\$ 503.4	\$ 253.2	\$ 25.2	68.67
1961	755.3	514.4	252.9	26.0	69.28
1962	799.1	522.6	277.1	27.2	70.55
1963	830.7	576.5	291.9	28.1	71.59
1964	874.3	609.4	311.2	28.3	72.71
1965	925.9	662.3	345.8	27.9	74.32
1966	981.0	722.0	380.0	32.0	76.76
1967	1,007.7	728.2	380.4	34.5	79.02
1968	1,051.8	765.3	406.3	35.1	82.57
1969	1,078.8	801.0	422.6	30.1	86.72
1970	1,075.3	775.8	397.4	27.3	91.36
1971	1,107.5	782.5	398.4	23.1	96.02
1972	1,171.1	849.5	435.8	22.8	100.00
1973 ^r	1,234.6	961.4	498.4	23.4	105.80
1974 ^r	1,214.0	911.2	454.4	22.7	116.41
1975 ^r	1,191.6	822.7	414.1	22.3	127.25
1976	1,264.4	883.8	452.0	21.9	133.79

Source: Deflator Series: "Economic Report of the President," January 1977.
r Revised.

SALES AND BACKLOG OF MAJOR AEROSPACE COMPANIES BY PRODUCT GROUP

Calendar Years 1961 to Date
(Millions of Dollars)

Year	GRAND TOTAL	TOTAL		Aircraft, Engines, and Parts		Missiles & Space Incl. Pro-pulsion	Other Aerospace		Non-Aero-space
		U.S. Gov't	Other	U.S. Gov't	Other		U.S. Gov't	Other	

SALES

1961	\$14,948	\$11,766	\$ 3,182	\$ 3,967	\$ 1,888	\$5,187	\$1,824	\$ 852	\$1,230
1962	15,972	12,552	3,420	4,128	1,772	6,078	1,791	762	1,441
1963	16,407	13,203	3,204	4,158	1,459	6,904	1,611	682	1,593
1964	16,686	12,815	3,871	4,568	1,863	6,381	1,418	735	1,721
1965	17,016	12,535	4,481	4,525	2,532	5,819	1,413	759	1,968
1966	20,227	14,530	5,697	5,458	3,267	6,241	1,755	869	2,637
1967	23,444	16,334	7,110	7,141	4,753	6,054	1,914	1,002	2,580
1968	25,592	16,635	8,957	7,411	6,439	6,076	2,077	1,040	2,549
1969	24,648	16,560	8,088	7,161	5,603	5,660	2,539	986	2,699
1970	24,752	16,407	8,345	7,586	5,880	5,422	2,324	896	2,644
1971	21,679	14,114	7,565	6,313	5,079	4,971	1,909	884	2,523
1972	21,499	13,492	8,007	4,954	5,199	5,598	2,067	1,035	2,646
1973	24,305	14,431	9,874	5,539	6,739	5,580	2,103	1,001	3,343
1974	26,849	15,196	11,653	5,982	7,560	5,854	2,101	1,285	4,067
1975 ^r	29,473	17,314	12,159	6,859	7,797	6,310	2,070	1,645	4,792
1976	31,445	19,059	12,386	8,325	7,770	5,925	2,356	1,815	5,254

BACKLOG - AS OF DECEMBER 31

1961	\$13,922	\$11,018	\$ 2,904	\$ 5,056	\$ 2,136	\$3,836	\$1,391	\$ 390	\$1,113
1962	13,138	10,572	2,566	4,900	1,672	4,056	992	488	1,030
1963	13,904	10,950	2,954	4,924	1,887	4,646	837	458	1,152
1964	15,188	11,651	3,537	5,282	2,515	4,556	913	492	1,430
1965	20,385	13,731	6,654	6,107	5,281	5,480	1,294	562	1,661
1966	27,547	15,711	11,836	8,761	9,718	4,510	1,588	904	2,066
1967	29,339	16,397	12,972	20,628 ^a		5,704	1,712	917	1,761
1968	30,749	16,343	14,406	8,150	12,409	5,083	1,851	983	2,273
1969	28,297	14,298	13,999	7,089	12,099	4,338	2,001	880	1,890
1970	24,705	12,882	11,823	5,913	9,800	4,522	1,986	805	1,679
1971	24,579	13,997	10,582	6,221	8,059	4,780	2,232	1,042	2,245
1972	26,922	15,322	11,600	7,027	8,605	5,272	2,018	972	3,028
1973	29,661	16,695	12,966	7,815	8,550	5,670	1,819	1,078	4,729
1974	35,516	20,889	14,627	9,789	9,602	6,643	1,926	1,665	5,891
1975 ^r	35,038	22,168	12,870	10,751	8,141	6,415	1,983	2,088	5,660
1976	38,867	23,383	15,484	11,069	9,009	6,230	2,236	3,345	6,978

Source: Bureau of the Census, "Current Industrial Reports," Series AQ37D (Quarterly).

NOTE: Based on reports from about 70 aerospace companies.

a Of this amount, orders of aircraft by the U.S. Government were \$7,071 million; by other customers were \$9,306 million. Total engine sales were \$4,251 million.

r Revised.

AEROSPACE INDUSTRY AND ALL MANUFACTURING INDUSTRIES

Annual Average Employment and Payroll
Calendar Years 1961 to Date

Year	All Manufacturing Industries TOTAL ^r	Aerospace			Aerospace as Percent of All Manufacturing
		TOTAL	Production Workers	Other ^b	
EMPLOYMENT – Thousands of Employees					
1961	16,326	1,178	612	566	7.2%
1962	16,853	1,270	635	635	7.5
1963	16,995	1,267	625	642	7.5
1964	17,274	1,209	600	609	7.0
1965	18,062	1,175	597	578	6.5
1966	19,214	1,375	731	644	7.2
1967	19,447	1,484	804	680	7.6
1968	19,781	1,502	807	695	7.6
1969	20,167	1,402	746	656	7.0
1970	19,349	1,166	604	562	6.0
1971	18,529	951	480	471	5.1
1972	18,933	922	453	469	4.9
1973	19,820	948	475	473	4.8
1974	20,016	965	478	487	4.8
1975	18,347	942	455	487	5.1
1976	18,956	899	422	477	4.7
PAYROLL – Millions of Dollars^a					
1961	\$ 89,800	\$ 9,140	\$ 4,342	\$ 4,798	10.2%
1962	96,700	10,232	4,871	5,361	10.6
1963	100,600	10,173	4,588	5,585	10.1
1964	107,100	10,067	4,563	5,504	9.4
1965	115,500	10,188	4,504	5,684	8.8
1966	128,000	12,139	5,641	6,498	9.5
1967	134,100	13,727	6,382	7,345	10.2
1968	145,800	14,397	6,582	7,815	9.9
1969	157,500	14,649	6,401	8,248	9.3
1970	158,200	12,275	5,322	6,953	7.8
1971	160,300	10,480	4,409	6,071	6.5
1972	175,400	11,197	4,565	6,632	6.4
1973	196,200	12,257	5,114	7,143	6.2
1974	211,400	13,250	5,454	7,796	6.3
1975	211,700	14,561	5,822	8,739	6.9
1976	237,000	14,908	5,766	9,142	6.3

Sources: Aerospace Employment and Payroll: Aerospace Industries Association estimates, based on latest available information; Manufacturing Employment: Bureau of Labor Statistics, "Employment and Earnings" (Monthly); Manufacturing Payroll: Bureau of Economic Analysis.

a Aerospace Payroll is estimated by a method similar to that used to estimate Aerospace Employment. See "NOTE," page 16.

b "Other" employment includes salaried, clerical and maintenance employees, among others.

r Revised.

**ANNUAL AVERAGE EMPLOYMENT IN ALL MANUFACTURING,
DURABLE GOODS AND AEROSPACE INDUSTRIES**

Calendar Years 1961 to Date
(Thousands of Employees)

Year	All Manu- facturing Industries	Durable Goods Industries	Aerospace Industry		
			TOTAL	As Percent of	
				All Manufac- turing	Durable Goods
1961	16,326	9,070	1,178	7.2%	13.0%
1962	16,853	9,480	1,270	7.5	13.4
1963	16,995	9,616	1,267	7.5	13.2
1964	17,274	9,816	1,209	7.0	12.3
1965	18,062	10,406	1,175	6.5	11.3
1966	19,214	11,284	1,375	7.2	12.2
1967	19,447	11,439	1,484	7.6	13.0
1968	19,781	11,626	1,502	7.6	12.9
1969	20,167	11,895	1,402	7.0	11.8
1970	19,349	11,195	1,166	6.0	10.4
1971	18,529	10,565	951	5.1	9.0
1972	18,933	10,884	922	4.9	8.5
1973	19,820	11,633	948	4.8	8.1
1974	20,016	11,837	965	4.8	8.2
1975	18,347	10,679	942	5.1	8.8
1976	18,956	11,026	899	4.7	8.4

Sources: Manufacturing and Durable Goods: Bureau of Labor Statistics, "Employment and Earnings" (Monthly); Aerospace: Aerospace Industries Association estimates based on latest available information.

NOTE: Aerospace employment as shown is the sum of the estimated monthly average employment in the aircraft and missile and space industries (SIC 372 and 1925) plus estimated aerospace employment in the communications equipment (SIC 3662) and instruments (SIC 3811 and 3821) industries and in certain other industries (SIC 28, 35, 73, 89, etc.).

**NET PROFIT AFTER TAXES
AS A PERCENT OF SALES
FOR MANUFACTURING CORPORATIONS**
Calendar Years 1960 to Date

Year	All Manufacturing Corporations ^a	Non-Durable Goods	Durable Goods	Aerospace
1960	4.4%	4.8%	4.0%	1.4%
1961	4.3	4.7	3.9	1.8
1962	4.5	4.7	4.4	2.4
1963	4.7	4.9	4.5	2.3
1964	5.2	5.4	5.1	2.6
1965	5.6	5.5	5.7	3.2
1966	5.6	5.5	5.6	3.0
1967	5.0	5.3	4.9	2.7
1968	5.1	5.3	4.9	3.2
1969	4.8	5.0	4.6	3.0
1970	4.0	4.5	3.6	2.0
1971	4.1	4.5	3.8	1.8
1972	4.4	4.6	4.3	2.4
1973	4.7	5.0	4.5	2.9
1974	5.5	6.4	4.7	2.9
1975 ^r	4.6	5.1	4.1	3.0
1976	5.3	5.5	5.1	3.5

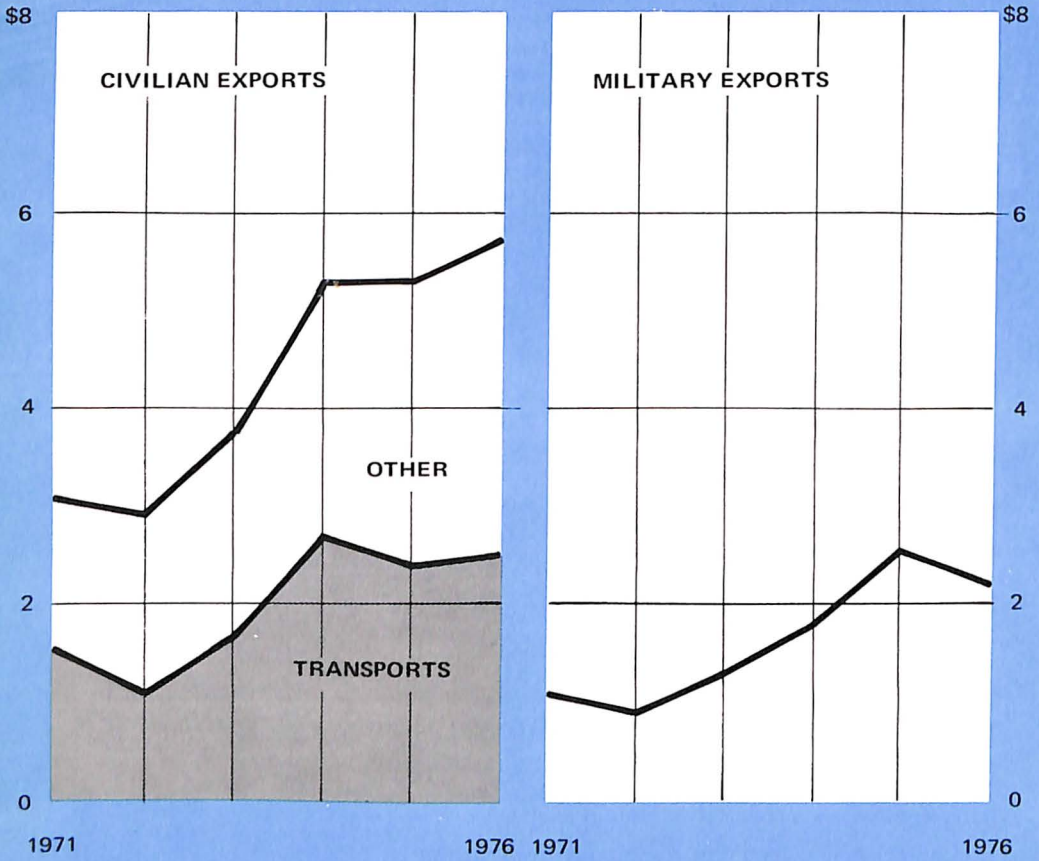
Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

^a Does not include newspapers.

^r Revised.

EXPORTS OF AEROSPACE PRODUCTS

(Billions of Dollars)



U. S. EXPORTS AND EXPORTS OF AEROSPACE PRODUCTS

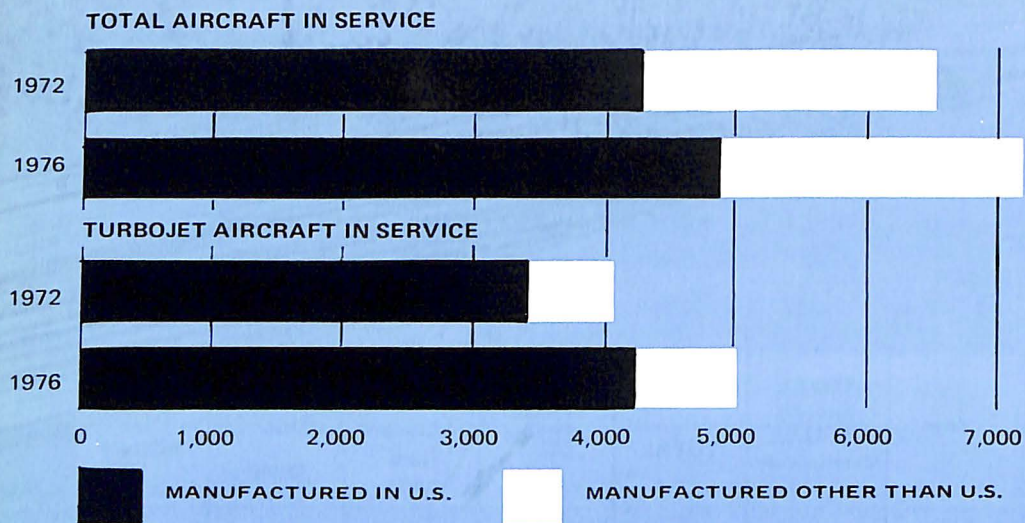
Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL Exports of U.S. Merchandise	Exports of Aerospace Products				
		TOTAL	Percent of Total U.S. Exports	Civil		Military
				Trans- ports	Other	
1960	\$ 20,375	\$ 1,726	8.5%	\$ 480	\$ 609	\$ 637
1961	20,754	1,653	8.0	263	615	773
1962	20,431	1,923	9.4	259	651	1,013
1963	23,062	1,627	7.1	191	541	895
1964	26,156	1,608	6.1	211	553	844
1965	27,127	1,618	6.0	353	501	764
1966	29,884	1,673	5.6	421	614	638
1967	31,142	2,248	7.2	611	769	868
1968	34,199	2,994	8.8	1,200	1,089	705
1969	37,462	3,138	8.4	947	1,080	1,111
1970	42,590	3,405	8.0	1,283	1,233	889
1971	43,492	4,203	9.7	1,567	1,513	1,123
1972	48,959	3,795	7.8	1,119	1,835	841
1973	70,246	5,142	7.3	1,664	2,124	1,354
1974	97,144	7,095	7.3	2,655	2,618	1,822
1975 ^r	106,102	7,792	7.3	2,397	2,926	2,469
1976	113,323	7,859	6.9	2,476	3,208	2,175

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly); Bureau of the Census, "Highlights of U.S. Export and Import Trade," Report FT 990 (Monthly).

r Revised.

WORLD AIRLINE FLEET



U. S. TURBINE-ENGINED AIRCRAFT IN THE WORLD AIRLINE FLEET

Calendar Years 1972 to Date

	1972	1973	1974	1975	1976 ^a
TOTAL AIRCRAFT IN SERVICE	6,519	6,744	6,870	7,153	7,195
Number Manufactured in U.S.	4,276	4,452	4,561	4,866	4,891
Percent Manufactured in U.S.	65.6%	66.0%	66.4%	68.0%	68.0%
Turbojet Aircraft in Service	4,080	4,291	4,628	4,919	5,012
Number Manufactured in U.S.	3,412	3,575	3,842	4,129	4,237
Percent Manufactured in U.S.	83.6%	83.3%	83.0%	83.9%	84.5%
Turboprop Aircraft in Service	1,866	1,843	1,972	1,916	1,914
Number Manufactured in U.S.	476	485	525	497	455
Percent Manufactured in U.S.	25.5%	26.3%	26.6%	25.9%	23.8%
Turbine-Powered Helicopters					
in Service.	573	610	270^b	318	269
Number Manufactured in U.S.	388	392	194	240	199
Percent Manufactured in U.S.	67.7%	64.3%	71.9%	75.5%	74.0%

Source: "Air World Survey," Exxon International Company, (Annually).

NOTE: In order to provide the most complete coverage possible, the Exxon "Air World Survey" has been used as a source effective with this edition of "Aerospace Facts and Figures." The "Air World Survey" covers the world's airlines with the exception of Aeroflot, the USSR national airline, and covers aircraft in service on June 30.

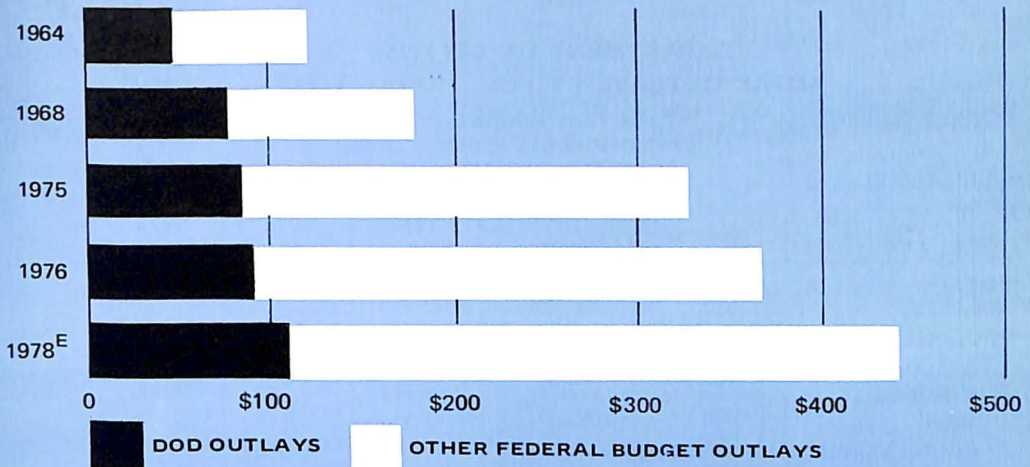
^a Air taxi operators no longer included.

^b Scheduled helicopter services only, starting in 1974.

FEDERAL BUDGET AND DOD OUTLAYS

SELECTED FISCAL YEARS

(Billions of Dollars)



E Estimate

GNP, FEDERAL BUDGET AND DEFENSE BUDGET

Selected Fiscal Years
(Billions of Dollars)

Year	GNP	Federal Budget Outlays			DOD Outlays as Percent of	
		NET TOTAL ^a	DOD	Others	GNP	Federal Budget
1950 - Lowest defense budget since World War II peak	\$ 263.3	\$ 43.1	\$ 12.0	\$ 32.8	4.5%	26.8%
1953 - Korea peak	358.9	76.8	47.5	31.3	13.3	60.3
1964 - Last prewar year	612.2	118.6	50.8	70.7	8.3	41.8
1968 - South East Asia peak	826.1	178.8	78.0	105.3	9.4	42.5
1973 - Actual	1,220.0	246.5	73.8	181.1	6.0	29.0
1974 - Actual	1,348.9	268.4	78.4	199.9	5.8	28.2
1975 - Actual	1,440.0	324.6	86.0	238.6	6.0	26.5
1976 - Actual	1,609.5	366.5	88.5	278.0	5.5	24.1
1977 - Budget Estimate	1,827.6	411.2	98.3	312.9	5.4	23.9
1978 - Budget Estimate	2,038.4	440.2	110.1	329.9	5.4	25.0

Source: Department of Defense, Budget Press Release, OASD (Comptroller) January 17, 1977.

NOTE: For an explanation of the change in Fiscal Years, see page 22.

^a "Net Total" is government-wide total less intragovernmental transactions.

**DEPARTMENT OF DEFENSE
TOTAL OUTLAYS BY FUNCTIONAL TITLE**

Fiscal Years 1970 to Date
(Millions of Dollars)

	1970	1971	1972
TOTAL	\$ 77,880	\$ 75,545	\$ 75,957
PROCUREMENT – TOTAL	<u>21,585</u>	<u>18,858</u>	<u>17,131</u>
AIRCRAFT	7,948	6,631	5,927
MISSILES	2,912	3,140	3,009
Ships	2,066	2,114	1,978
Combat Vehicles, Weapons & Torpedoes	647	545	491
Ordnance, Vehicles & Related Equipment	4,973	3,586	3,040
Electronics & Communications	1,182	1,163	946
Other Procurement	1,857	1,679	1,740
RESEARCH, DEVELOPMENT, TEST & EVALUATION – TOTAL	<u>7,166</u>	<u>7,303</u>	<u>7,881</u>
AIRCRAFT	1,239	1,699	2,066
MISSILES	2,196	2,008	2,157
ASTRONAUTICS	753	519	468
Other	2,978	3,077	3,190
Military Personnel – TOTAL	<u>25,880</u>	<u>26,018</u>	<u>26,921</u>
Active Forces	21,977	21,428	21,629
Reserve Forces	1,054	1,204	1,407
Retired Pay	2,849	3,386	3,885
Military Assistance	609	999	806
Military Construction	1,168	1,095	1,108
Family Housing	614	598	688
Civil Defense	80	75	75
Operations and Maintenance	21,609	20,941	21,675
Other	(831)	(342)	(328)

Source: Department of Defense, Budget Press Briefing, January 17, 1977.

NOTE: Data in parentheses are credit items. The categories printed in capital letters are primarily aerospace, but others contain substantial parts attributable to aerospace activities.

Tr. Qtr. Transition Quarter: Until June 30, 1976, the fiscal years ran from July 1 to June 30. Beginning October 1, 1976, the fiscal years run from October 1 through September 30. A three-month "Transition Quarter" from July 1 through September 30, 1976 belongs to neither fiscal year.

E Estimate.

N.A. Not available.

**DEPARTMENT OF DEFENSE
TOTAL OUTLAYS BY FUNCTIONAL TITLE (Continued)**
Fiscal Years 1970 to Date
(Millions of Dollars)

1973	1974	1975	1976	Transition Quarter	1977 ^E	1978 ^E
\$ 73,828	\$ 78,445	\$ 86,019	\$ 88,537	\$ 22,110	\$ 98,300	\$ 110,100
<u>15,654</u>	<u>15,241</u>	<u>16,042</u>	<u>15,964</u>	<u>3,766</u>	<u>18,710</u>	<u>23,786</u>
5,066	5,006	5,484	6,520	1,557	} N.A.	} N.A.
3,023	2,981	2,889	2,296	402		
1,982	2,104	2,627	2,606	661		
354	446	395	240	134		
2,508	2,044	1,492	856	150		
675	854	897	1,031	271		
2,046	1,806	2,258	2,415	591		
<u>8,157</u>	<u>8,582</u>	<u>8,866</u>	<u>8,923</u>	<u>2,206</u>		
2,036	1,893	1,698	1,603	410	} N.A.	} N.A.
2,038	2,160	2,176	2,295	520		
512	561	515	581	129		
3,571	3,968	4,477	4,444	1,147		
<u>27,635</u>	<u>28,856</u>	<u>31,210</u>	<u>32,359</u>	<u>8,305</u>		
21,722	22,150	23,235	23,259	5,846	24,304	23,984
1,523	1,579	1,733	1,804	512	1,908	2,021
4,390	5,127	6,242	7,296	1,947	8,234	9,035
531	819	999	501	183	250	577
1,119	1,407	1,462	2,019	376	2,087	2,046
729	884	1,124	1,192	296	1,442	1,518
74	75	86	80	18	79	92
21,069	22,478	26,330	27,902	7,261	31,146	33,539
(1,140)	103	(100)	(403)	(301)	147	2,152

**FEDERAL OUTLAYS
SELECTED FUNCTIONS AND AEROSPACE PRODUCTS & SERVICES**
Fiscal Years^a 1960 to Date
(Millions of Dollars)

Year	TOTAL National Defense	TOTAL NASA	Federal Outlays for AEROSPACE Products & Services			AERO- SPACE as Percent of Total National Defense and NASA
			TOTAL	DOD	NASA	
1960	\$45,691	\$ 401	\$12,849	\$12,502	\$ 347	27.9%
1961	47,494	744	13,606	12,960	646	28.2
1962	51,103	1,257	15,135	13,992	1,143	28.9
1963	52,755	2,552	16,186	13,857	2,327	29.3
1964	53,591	4,171	17,938	14,205	3,733	31.1
1965	49,578	5,093	15,697	11,135	4,561	28.7
1966	56,785	5,933	17,771	12,411	5,360	28.3
1967	70,081	5,426	20,011	14,874	5,137	26.5
1968	80,517	4,724	21,355	16,757	4,598	25.1
1969	81,232	4,251	20,472	16,286	4,185	23.9
1970	80,295	3,753	18,747	15,048	3,699	22.3
1971	77,661	3,382	17,335	13,997	3,338	21.4
1972	78,336	3,422	16,999	13,627	3,372	20.8
1973	76,021	3,315	15,945	12,675	3,270	20.1
1974	78,569	3,256	15,782	12,601	3,181	19.3
1975	86,585	3,266	15,943	12,762	3,181	17.7
1976	89,996	3,669	16,843	13,295	3,548	18.0
Tr. Qtr.	22,518	952	3,944	3,018	926	16.8
1977 ^E	100,075	3,706	N.A.	N.A.	3,581	N.A.
1978 ^E	111,900	3,903	N.A.	N.A.	3,770	N.A.

Source: "The Budget of the United States Government" (Annually).

NOTE: "National Defense" includes the military budget of the Department of Defense and atomic energy defense activities. "Total NASA" includes research and development activities, administrative operations and construction of facilities. NASA construction is not included in "Total Aerospace Products and Services."

^a For an explanation of the change in the Federal Government's Fiscal Year and the Transition Quarter (Tr. Qtr.), see page 22.

^E Estimate.

N.A. Not available.

**FEDERAL OUTLAYS FOR
AEROSPACE PRODUCTS AND SERVICES**

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	Department of Defense				NASA
		TOTAL	Aircraft	Missiles	Astro- navitics	
1960	\$ 12,849	\$ 12,502	\$ 6,904	\$ 5,086	\$ 512	\$ 347
1961	13,606	12,960	6,445	5,997	518	646
1962	15,135	13,992	7,024	6,219	749	1,143
1963	16,186	13,857	6,853	6,058	946	2,327
1964	17,938	14,205	6,992	5,929	1,284	3,733
1965	15,697	11,135	6,217	3,997	921	4,562
1966	17,771	12,411	7,611	3,870	930	5,360
1967	20,011	14,874	9,459	4,432	983	5,137
1968	21,355	16,757	10,829	4,707	1,221	4,598
1969	20,472	16,286	10,208	4,919	1,159	4,185
1970	18,747	15,048	9,187	5,108	753	3,699
1971	17,335	13,997	8,330	5,148	519	3,338
1972	16,999	13,627	7,993	5,166	468	3,372
1973	15,945	12,675	7,102	5,061	512	3,270
1974	15,782	12,601	6,899	5,141	561	3,181
1975	15,943	12,762	7,182	5,065	515	3,181
1976	16,843	13,295	8,123	4,591	581	3,548
Tr. Qtr.	3,749	3,018	1,967	922	129	731

Source: Department of Defense, Budget Press Briefing, January 17, 1977. NASA, Budget Briefing, January 17, 1977.

NOTE: Fiscal Years ending June 30.

Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 22.

**DEPARTMENT OF DEFENSE
AEROSPACE OUTLAYS**

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	DOD Aerospace Outlays ^a		
	TOTAL	Procurement	Research, Development, Test and Evaluation
1960	\$ 12,502	\$ 9,299	\$ 3,203
1961	12,960	8,870	4,090
1962	13,992	9,842	4,150
1963	13,857	10,126	3,731
1964	14,205	9,630	4,575
1965	11,135	7,296	3,839
1966	12,411	8,704	3,707
1967	14,875	10,341	4,534
1968	16,757	11,681	5,076
1969	16,286	11,686	4,600
1970	15,048	10,860	4,188
1971	13,997	9,771	4,226
1972	13,627	8,936	4,691
1973	12,675	8,089	4,586
1974	12,601	7,987	4,614
1975	12,762	8,373	4,389
1976	13,295	8,816	4,479
Tr. Qtr.	3,018	1,959	1,059

Source: Department of Defense, OASD (Comptroller), FAD 748/76, June 30, 1976, and earlier reports.

NOTE: Fiscal Years ending June 30.

a Excludes Military Assistance.

Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 22.

Aircraft Production

Aircraft manufacture continued in 1976 to be the principal element of the aerospace industry's workload and sales volume reached a new peak.

Sales—including complete aircraft, engines, parts and related equipment—amounted to \$16.1 billion, up from \$14.6 billion in the preceding year. The increase of more than 10 percent was well above the year's inflation rate. A sharp gain in sales to the U.S. government accounted for the overall increase; non-government sales remained at approximately the 1975 level. This represented a distinct turnaround in sales volume composition; for the four prior years, non-government sales had outstripped government sales by a wide margin.

In terms of numbers, 1976 aircraft deliveries totaled 17,466, up from 16,605 in 1975. Civil aircraft production increased by more than 1,000 units, offsetting a moderate decline in military aircraft deliveries. The civil aircraft increase, however, was entirely in the general aviation category.

As anticipated, sales of commercial jetliners declined in both numbers and dollar value. The industry delivered 238 transport aircraft valued at approximately \$3.2 billion, which compares with 1975 deliveries of 315 planes worth \$3.8 billion. The drop reflected deferrals in orders for transports caused by airline financial problems originating in the oil crisis of 1973. Although jetliner deliveries had decreased slightly in 1975, the impact of the deferrals was more pronounced in 1976 because of the lead-time factor. Reduced backlog—down to \$5.1 billion

at the end of 1976, compared with \$6.4 billion a year earlier—indicated the possibility of a further decline in transport sales for 1977.

Sales of general aviation aircraft in 1976 reached a new dollar value high of \$1.2 billion, up \$200 million from 1975, which was a record year. General aviation shipments totaled 15,447 planes, an increase of 1,390 units over the previous year. Unit production was the second highest in history, topped only by the 15,747 general aviation planes produced in 1966.

Helicopter production declined from the 1975 all-time peak, yet remained strong in dollar value, due to the increasing sophistication of the current helicopter fleet. The industry turned out 589 helicopters, compared with the record 864 of the previous year. Dollar value was down only \$32 million and the 1976 sales volume of \$242 million was second only to \$274 million in 1975.

In military aircraft production, the 1976 total of 1,192 aircraft, including planes for Security Assistance Programs, was off 177 units from 1975 but higher than the 1974 figure. The principal 1976/77 production programs, in dollar value terms, were the two advanced air superiority fighters, the USAF's F-15 Eagle and the Navy's F-14 Tomcat; the Navy's S-3A antisubmarine patrol plane; and the USAF's A-10 close air support aircraft.

Other major programs included:

Air Force. The E-3A AWACS

(Airborne Warning and Control System), first production model of which was delivered early in 1977, and the F-16 air combat fighter. The latter was in pre-production status, with initial production scheduled for 1978.

Navy/Marine Corps. The A-4M Skyhawk, A-6E Intruder and A-7E Corsair II attack aircraft, the EA-6B Prowler electronic countermeasure aircraft, the P-3C Orion patrol plane, the E-2C Hawkeye early warning aircraft, the AH-1J Sea Cobra fire support helicopter and the UH-1N Iroquois utility helicopter.

Army. The UH-1H utility helicopter, the AH-1S anti-armor helicopter and the UH-60A Utility Tactical Transport Aircraft System, a combat assault squad carrier, which will also be used by aeromedical evacuation units. First deliveries of the AH-1S Cobra, equipped with the TOW missile, were made early in 1977; the Army planned procurement of 305 helicopters. The UH-60A was in initial production status in 1977; the total program, calls for eventual production of more than 1,100 UH-60As. In development, and planned for future production of 536 aircraft, is the YAH-64 Advanced Attack Helicopter. Other production included 1976 acceptances by the Army of 219 helicopters slated for shipment to foreign governments, among them the AH-1J, the UH-1H, the OH-58A observation helicopter and the 214-A 16-place utility helicopter.

U.S. AIRCRAFT PRODUCTION

Calendar Years 1961 to Date
(Number of Aircraft)

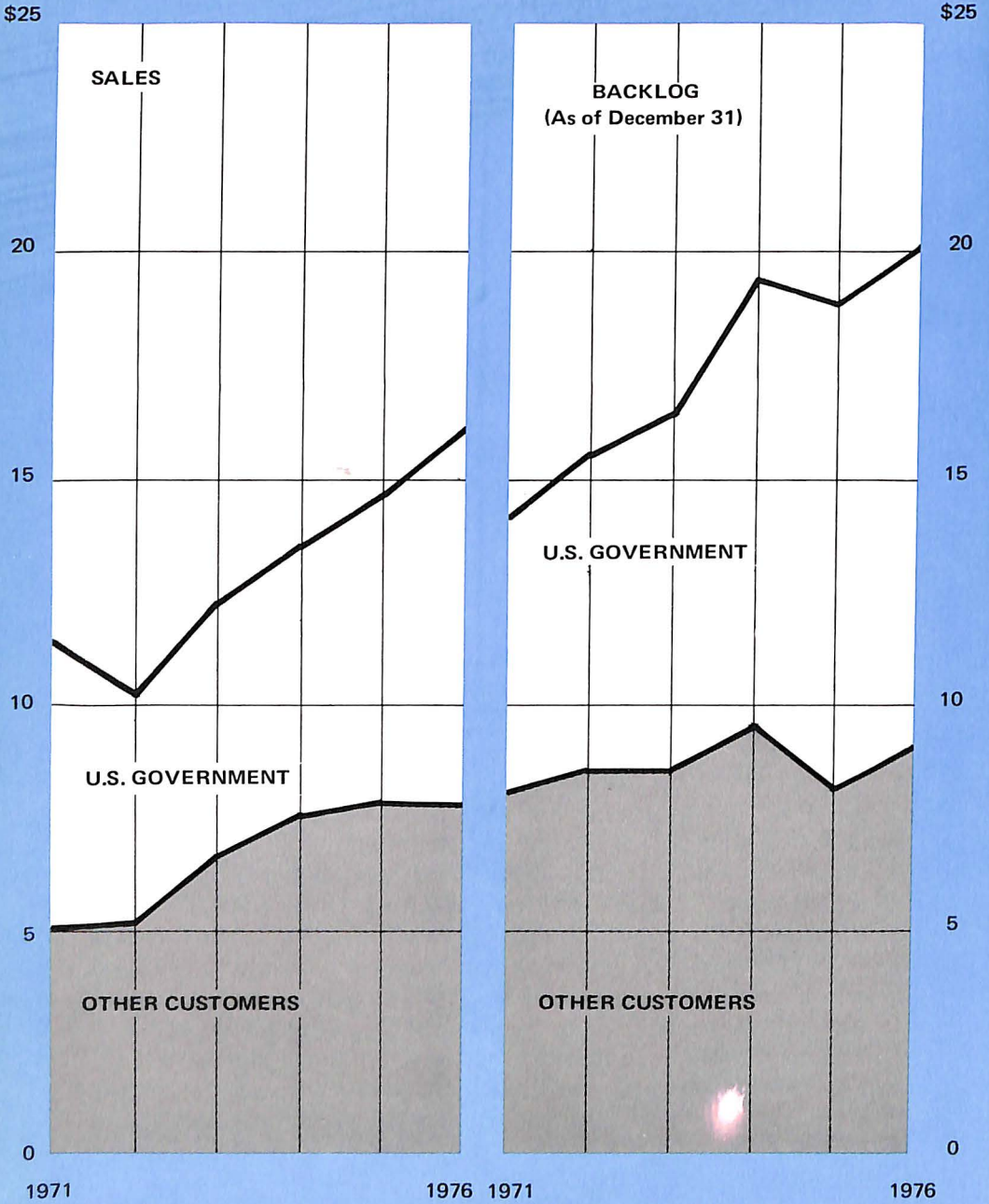
Year	TOTAL	Military	Civil
1961	8,936	1,582	7,354
1962	9,213	1,975	7,238
1963	10,143	1,970	8,173
1964	12,517	2,439	10,078
1965	15,489	2,806	12,683
1966	20,283	3,609	16,674
1967	18,993	4,481	14,512
1968	19,362	4,440	14,922
1969	17,249	3,644	13,505
1970	11,161	3,085	8,076
1971	10,390	2,232	8,158
1972	12,693	2,117	10,576
1973	16,081	1,372	14,709
1974	16,345	1,110	15,325
1975	16,605 ^r	1,369 ^r	15,236
1976	17,466	1,192	16,274

Source: Aerospace Industries Association, company reports; General Aviation Manufacturers' Association, company reports; Department of Defense.

NOTE: As of 1972, aircraft produced for Security Assistance Programs are included.
r Revised.

AIRCRAFT SALES AND BACKLOG

(Billions of Dollars)



Source: Department of Commerce

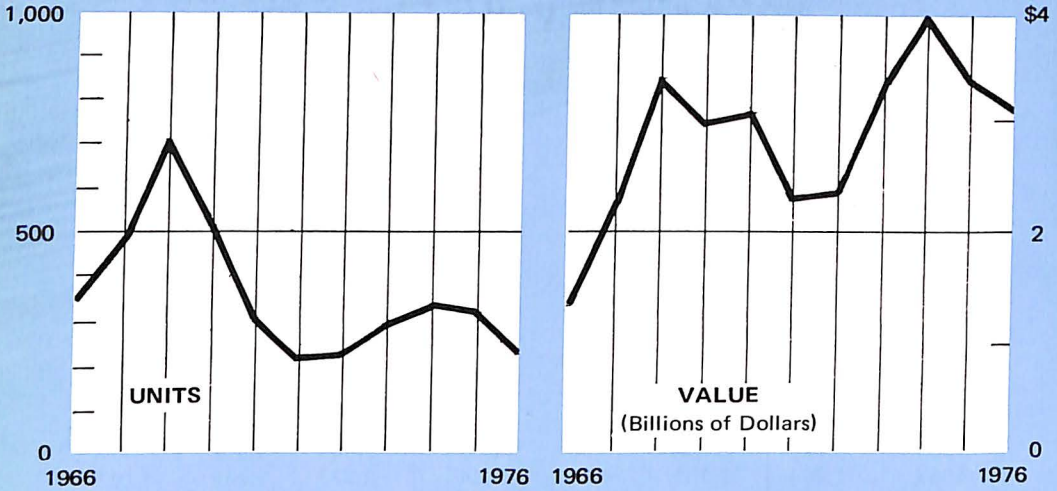
**AIRCRAFT SALES AND BACKLOG
COMPLETE AIRCRAFT, AIRCRAFT ENGINES, AND PARTS**

Calendar Years 1961 to Date
(Millions of Dollars)

Year	TOTAL			Aircraft & Parts ^a		Aircraft Engines & Parts	
	TOTAL	U.S. Gov't	Other	U.S. Gov't	Other	U.S. Gov't	Other
SALES							
1961	\$ 5,855	\$ 3,967	\$ 1,888	\$ 2,946	\$ 1,455	\$ 1,021	\$ 433
1962	5,900	4,128	1,772	2,998	1,389	1,130	383
1963	5,617	4,158	1,459	2,986	1,055	1,172	404
1964	6,431	4,568	1,863	3,502	1,409	1,066	454
1965	7,057	4,525	2,532	3,393	1,950	1,132	582
1966	8,725	5,458	3,267	4,086	2,544	1,372	723
1967	11,894	7,141	4,753	5,345	3,737	1,796	1,016
1968	13,850	7,411	6,439	5,697	5,188	1,714	1,251
1969	12,764	7,161	5,603	5,382	4,517	1,779	1,086
1970	13,466	7,586	5,880	5,674	4,683	1,912	1,197
1971	11,392	6,313	5,079	4,953	4,093	1,360	986
1972	10,153	4,954	5,199	3,666	4,085	1,288	1,114
1973	12,278	5,539	6,739	4,231	5,322	1,308	1,417
1974	13,542	5,982	7,560	4,562	5,846	1,420	1,714
1975 ^r	14,656	6,859	7,797	5,269	6,001	1,590	1,796
1976	16,095	8,325	7,770	6,338	5,902	1,987	1,868
BACKLOG—AS OF DECEMBER 31							
1961	\$ 7,192	\$ 5,056	\$ 2,136	\$ 3,968	\$ 1,678	\$ 1,088	\$ 458
1962	6,572	4,900	1,672	3,736	1,309	1,164	363
1963	6,811	4,924	1,887	3,844	1,457	1,080	430
1964	7,797	5,282	2,515	4,290	1,987	992	528
1965	11,388	6,072	5,316	4,425	4,460	1,647	856
1966	18,479	8,761	9,718	6,515	8,140	2,246	1,578
1967	20,628	20,628	7,071	9,306	4,251		
1968	20,559	8,150	12,409	5,999	10,609	2,151	1,800
1969	19,188	7,089	12,099	5,270	10,340	1,819	1,759
1970	15,713	5,913	9,800	4,663	8,601	1,250	1,199
1971	14,280	6,221	8,059	4,876	7,123	1,345	936
1972	15,632	7,027	8,605	5,705	7,355	1,322	1,250
1973	16,373	7,815	8,550	6,312	7,232	1,503	1,318
1974	19,391	9,789	9,602	7,698	7,791	2,091	1,811
1975 ^r	18,892	10,751	8,141	8,743	6,646	2,008	1,495
1976	20,078	11,069	9,009	8,790	7,415	2,279	1,594

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
 NOTE: Based on reports from about 70 aerospace companies.
 a Including Aircraft Propellers and Parts.
 r Revised.

TRANSPORT AIRCRAFT PRODUCTION



TRANSPORT AIRCRAFT PRODUCTION

Calendar Years 1972 to Date

Company and Model	1972	1973	1974	1975	1976
TOTAL					
Number of Aircraft Shipped	227	294	332	315	238
Value — Millions of Dollars	\$ 2,660	\$ 3,718	\$ 3,993	\$ 3,779	\$ 3,192
Boeing — TOTAL	<u>96</u>	<u>148</u>	<u>174</u>	<u>169</u>	<u>132</u>
B-707	3	11	21	7	3
B-727	41	92	91	91	61
B-737	22	17	41	51	41
B-747	30	28	21	20	27
Lockheed — TOTAL	<u>51</u>	<u>68</u>	<u>64</u>	<u>68</u>	<u>43</u>
L-1011	17	39	41	25	16
L-100-30 (Hercules)	} 34	} 29	} 23	} 43	11
C-130 (Hercules)					16
McDonnell Douglas — TOTAL	<u>80</u>	<u>78</u>	<u>94</u>	<u>78</u>	<u>63</u>
DC-8	4	—	—	—	—
DC-9	24	21	48	35	44
DC-10	52	57	46	43	19

Source: Aerospace Industries Association, company reports.

NOTE: Differs from FAA totals which include executive type aircraft.

TRANSPORT AIRCRAFT ORDERS

Calendar Years 1972 to Date

Company and Model	Orders as of December 31				
	1972	1973	1974	1975	1976
TOTAL AIRCRAFT ON ORDER (Domestic and Foreign Orders) . . .	534	573	564	381	326
VALUE (Millions of Dollars) ^a . . .	\$ 7,090	\$ 7,252	\$ 7,587	\$ 6,369	\$ 5,070
Boeing, TOTAL	<u>162</u>	<u>180</u>	<u>210</u>	<u>130</u>	<u>155</u>
B-707	16	21	14	9	5
B-727	108	104	121	60	106
B-737	13	36	46	29	22
B-747	25	19	29	32	22
Lockheed^b, TOTAL	<u>199</u>	<u>179</u>	<u>178</u>	<u>134</u>	<u>97</u>
L-1011	159	142	112	81	70
L-100-30	—	—	15	12	1
C-130	40	37	51	41	26
McDonnell Douglas^b, TOTAL	<u>173</u>	<u>214</u>	<u>176</u>	<u>117</u>	<u>74</u>
DC-9	19	83	91	65	47
DC-10	154	131	85	52	27
TOTAL FOREIGN ORDERS	267	378	356	258	163
VALUE (Millions of Dollars) ^a	\$ 3,452	\$ 4,634	\$ 5,293	\$ 4,622	\$ 3,113
Boeing, TOTAL	<u>85</u>	<u>122</u>	<u>112</u>	<u>82</u>	<u>50</u>
B-707	16	21	14	9	5
B-727	40	50	41	20	13
B-737	13	34	32	28	12
B-747	16	17	25	25	20
Lockheed^b, TOTAL	<u>82</u>	<u>86</u>	<u>117</u>	<u>87</u>	<u>59</u>
L-1011	42	54	55	36	32
L-100-30	—	—	11	10	1
C-130	40	32	51	41	26
McDonnell Douglas^b, TOTAL	<u>100</u>	<u>170</u>	<u>127</u>	<u>89</u>	<u>54</u>
DC-9	10	78	58	40	30
DC-10	90	92	69	49	24

Source: Aerospace Industries Association, company reports.

a Dollar value excludes the cost of spare parts.

b Includes options.

AEROSPACE FACTS AND FIGURES 1977/78

**HELICOPTER
COMMERCIAL PRODUCTION**

Calendar Years 1972 to Date

Company and Model	1972	1973	1974	1975	1976
Number of Helicopters Shipped . . .	575	770	828	864	589
VALUE (Millions of Dollars) . . .	\$ 90	\$ 121	\$ 189	\$ 274	\$ 242
Bell, Total	<u>329</u>	<u>477</u>	<u>467</u>	<u>495</u>	<u>238^a</u>
47 Series	97	92	3	3	1
204 Series	—	4	—	1	3
205 Series	17	29	26	40	26
206 Series	193	304	368	325	137
212 Series	22	48	70	126	63
214 Series	—	—	—	—	7
AH-1J	—	—	—	—	1
Boeing-Vertol, Total	<u>6</u>	<u>2</u>	<u>11</u>	<u>10</u>	<u>11</u>
CH-47C	6	2	11	10	11
Brantly-Hynes, Total	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>2</u>
B-2B	—	—	—	—	2
Enstrom, Total	<u>38</u>	<u>64</u>	<u>87</u>	<u>77</u>	<u>87</u>
F-28A	38	64	86	59	4
F-28C	—	—	—	—	40
280	—	—	1	18	3
280C	—	—	—	—	40
Fairchild, Total	<u>28</u>	<u>10</u>	<u>—</u>	<u>—</u>	<u>—</u>
FH-1100	28	10	—	—	—
Hiller, Total	<u>—</u>	<u>—</u>	<u>3</u>	<u>35</u>	<u>34</u>
12-E	—	—	3	35	29
12-E4	—	—	—	—	2
12-E (Turbine)	—	—	—	—	3
Hughes, Total	<u>155</u>	<u>211</u>	<u>248</u>	<u>214</u>	<u>204</u>
300's	71	96	105	92	94
500's	84	115	143	122	110
Sikorsky (UTC), Total	<u>19</u>	<u>6</u>	<u>12</u>	<u>33</u>	<u>13</u>
S-61	13	6	12	13	13
S-64	—	—	—	3	—
S-65	6	—	—	17	—

Source: Aerospace Industries Association, company reports.

NOTE: All figures exclude the production by foreign licensees.

a Includes 6-206B and 1-AH-1J exported in a military configuration.

GENERAL AVIATION AIRCRAFT SHIPMENTS

By Selected Manufacturers
Calendar Years 1965 to Date

Year	TOTAL	Beech	Cessna	Gates Learjet	Grumman American	Piper	Rockwell Intl.	Other
NUMBER OF AIRCRAFT SHIPPED								
1965	11,852	1,192	5,629	80	—	3,776	110	1,065
1966	15,747	1,535	7,888	51	70	4,437	265	1,501
1967	13,577	1,260	6,233	34	52	4,490	386	1,122
1968	13,698	1,347	6,578	41	N.A.	4,228	471	1,033
1969	12,457	1,061	5,887	61	306	3,951	344	847
1970	7,283	793	3,730	35	217	1,675	211	622
1971	7,466	519	3,859	23	435	2,055	202	373
1972	9,774	802	4,964	39	620	2,461	242	646
1973	13,645	1,110	7,262	66	663	3,233	418	893
1974	14,165	1,303	7,187	66	628	3,415	545	1,021
1975	14,057	1,212	7,564	79	758	3,070	433	941
1976	15,447	1,220	7,888	84	762	4,042	595	856
VALUE^a (Millions of Dollars)								
1965	\$ 318.3	\$ 72.2	\$ 97.2	\$ 45.1	\$ —	\$ 61.7	\$ 27.7	\$ 14.4
1966	444.2	97.3	128.2	28.6	N.A.	80.1	51.5	58.5
1967	359.6	92.0	116.6	20.2	N.A.	79.4	31.8	19.6
1968	421.5	115.7	138.8	28.7	N.A.	85.5	22.3	30.5
1969	584.5	113.1	145.6	46.5	129.0	98.2	25.4	26.7
1970	339.4	80.7	97.2	26.9	42.2	48.5	20.1	23.8
1971	321.5	52.1	102.4	18.1	45.6	56.7	24.7	21.9
1972	557.6	113.3	183.2	35.1	58.4	72.3	60.9	34.4
1973	826.4	140.4	298.0	61.5	75.0	126.8	80.4	44.3
1974	907.7	170.2	313.9	66.0	67.6	131.7	125.2	33.1
1975	1,032.9	187.1	336.3	99.7	89.9	160.6	114.4	44.9
1976	1,228.8	236.1	382.7	120.0	112.1	209.6	119.2	49.1

Sources: 1965—1969: Aerospace Industries Association, company reports.
1970—1976: General Aviation Manufacturers' Association.

NOTE: "Other" includes Bellanca, Lake, Lockheed Jetstar, Maule, Mooney and Swearingen.

^a Manufacturers' Net Billing Price.

N.A. Not Available.

AEROSPACE FACTS AND FIGURES 1977/78

CIVIL AIRCRAFT SHIPMENTS

Number and Value
Calendar Years 1961 to Date

Year	TOTAL	Transport Aircraft	Helicopters	General Aviation
NUMBER OF AIRCRAFT SHIPPED				
1961	7,354	198	378	6,778
1962	7,238	134	407	6,697
1963	8,173	100	504	7,569
1964	10,078	163	579	9,336
1965	12,683	233	598	11,852
1966	16,674	344	583	15,747
1967	14,512	480	455	13,577
1968	14,922	702	522	13,698
1969	13,505	514	534	12,457
1970	8,076	311	482	7,283
1971	8,158	223	469	7,466
1972	10,576	227	575	9,774
1973	14,709	294	770	13,645
1974	15,325	332	828	14,165
1975	15,236	315	864	14,057
1976	16,274	238	589	15,447

VALUE—Millions of Dollars

1961	\$ 849	\$ 725	\$ N.A.	\$ 124
1962	742	605	N.A.	137
1963	559	406	N.A.	153
1964	986	787	N.A.	199
1965	1,554	1,197	39	318
1966	2,183	1,699	40	444
1967	2,861	2,458	43	360
1968	4,267	3,789	57	421
1969	3,598	2,939	75	584
1970	3,546	3,158	49	339
1971	2,984	2,594	69	321
1972	3,308	2,660	90	558
1973	4,665	3,718	121	826
1974	5,090	3,993	187	908
1975	5,086	3,779	274	1,033
1976	4,663	3,192	242	1,229

Source: Transport aircraft and helicopters: Aerospace Industries Association.
General Aviation: General Aviation Manufacturers' Association.

**MILITARY AIRCRAFT PRODUCED
NUMBER AND FLYAWAY VALUE**

Calendar Years 1961 to 1973

Year	Type of Aircraft						
	TOTAL	Bomber	Fighter/ Attack	Trans- port	Trainer	Heli- copter	Other
NUMBER							
1961	1,582	397	376	148	203	366	92
1962	1,975	398	437	256	211	554	119
1963	1,970	310	423	282	204	672	79
1964	2,439	362	586	254	191	1,007	39
1965	2,806	283	496	136	396	1,470	25
1966	3,609	214	627	142	442	2,164	20
1967	4,481	404	811	135	331	2,448	352
1968	4,440	34	1,007	18	292	2,800	289
1969	3,644	31	792	44	295	2,165	317
1970	3,085	66	734	37	173	1,944	131
1971	2,232	48	386	42	135	1,587	34
1972	2,117	13	563	29	148	1,312	52
1973	1,372	30	422	22	90	808	—
1974	1,110	50	478	27	49	506	—
1975	1,369 ^r	62	624 ^r	34	40	601 ^r	8 ^r
1976	1,192	55	682	64	13	362	16

FLYAWAY VALUE — Millions of Dollars

1961	\$ 4,497	\$ 2,575	\$ 1,054	\$ 385	\$ 200	\$ 228	\$ 55
1962	3,816	1,629	1,005	674	194	250	64
1963	2,876	798	931	587	182	337	41
1964	3,080	802	1,155	624	122	356	21
1965	2,875	639	960	655	108	490	23
1966	3,554	612	1,289	701	190	749	13
1967	4,476	822	1,721	759	144	962	68
1968	3,871	117	2,451	81	167	905	150
1969	3,693	248	2,204	101	164	845	131
1970	3,920	545	1,940	555	111	694	75
1971	2,996	397	1,322	688	112	469	8
1972 ^a	3,247	129	2,068	536	100	396	18
1973 ^a	2,571	325	1,490	348	140	268	—
1974 ^a	2,224	584	1,222	101	111	206	—
1975 ^a	2,913 ^r	599 ^r	2,054 ^r	128	27	100 ^r	5 ^r
1976	4,788	562	3,437	338	31	410	10

Source: Department of Defense.

NOTE: Data excludes gliders and targets, and includes spares, spare parts, and support equipment that are procured with the aircraft.

1961—1967, Navy attack planes included with bombers; 1968—1973, Navy attack planes included under fighter/attack.

a 1972—1975, Flyaway value does not include the value of planes produced for the security assistance programs and accepted by the USAF.

r Revised.

**MILITARY AIRCRAFT PRODUCTION
AIR FORCE ACCEPTANCES BY TYPE AND MODEL**

Calendar Years 1975 and 1976
(Millions of Dollars)

Type and Model	Number		Flyaway Cost ^a		Weapon System Cost ^b	
	1975	1976	1975	1976	1975	1976
AIR FORCE, TOTAL . . .	377	328	\$ 925	\$1,727	\$1,072	\$1,903
Fighters/Attack, TOTAL. .	152	269	718	1,573	854	1,742
A-7D	24	24	69	78	76	99
A-10A	3	17	16	107	26	119
A-37B	39	16	21	8	21	9
F-4E	34	37	113	139	117	143
F-5E/F	11	64	17	61	20	64
F-111F	8	9	92	136	99	1,172
F/TF-15A	33	102	390	1,044	495	136
Transports/Command & Control, TOTAL	34	45	128	128	136	135
C-9A	3	—	18	—	19	—
C-12A	9	21	6	15	6	15
C-130H	22	24	104	113	111	120
Helicopters, Other, TOTAL.	191	14	79	26	82	26
UH-1H	181	—	58	—	61	—
CH-47C	10	14	21	26	21	26

Source: Department of the Air Force.

NOTE: Costs shown are approximate. Calendar Year acceptances may derive from procurement quantities funded in more than one Fiscal Year.

- a Flyaway Cost includes airframe, engines, electronics, communications, armament and other installed equipment.
- b Weapon System Cost includes flyaway costs, initial spares, ground equipment, training equipment and technical data.

MILITARY AIRCRAFT PRODUCTION

Reimbursable Programs^a by Type and Model
 Calendar Years 1975 and 1976
 (Millions of Dollars)

Type and Model	Number of Aircraft Accepted		Flyaway Cost	Weapon System Cost
	1975	1976	1976	1976
Security Assistance, TOTAL.	338	305	1,150	1,233
Fighter/Attack, Total.	<u>317</u>	<u>282</u>	<u>940</u>	<u>1,011</u>
AU-23	—	15	17	16
A-37B	44	32	27	28
F-4E/F	119	118	543	594
RF-4F	—	12	89	98
F/RF-5A/B	11	14	25	25
F-5E	143	66	158	161
F-5F	—	25	81	89
Transports/Tankers, Total	<u>—</u>	<u>19</u>	<u>210</u>	<u>222</u>
C-13H	—	10	66	66
KC-130H	—	2	16	16
KC-707-3J9C	—	7	128	140
Trainers, Total.	<u>14</u>	<u>4</u>	<u>(b)</u>	<u>(b)</u>
T-37C	14	—	—	—
T-41D	—	4	(b)	(b)
Helicopters/Others, Total	<u>7</u>	<u>—</u>	<u>—</u>	<u>—</u>
UH-1N	2	—	—	—
AU-23	5	—	—	—

Source: Department of the Air Force.

NOTE: Costs shown are approximate. Aircraft Configuration and Equipage under Security Assistance Programs may vary greatly from country to country causing substantial differences in average unit cost.

a Grant Aid, Foreign Military Sales, other Agencies, accepted by the USAF for delivery to foreign governments.

b Less than \$500,000.

MILITARY AIRCRAFT PRODUCTION NAVY ACCEPTANCES BY TYPE AND MODEL

Calendar Years 1975 and 1976
(Millions of Dollars)

Type and Model	Number		Flyaway Cost ^a		Weapon System Cost ^b	
	1975	1976	1975	1976	1975	1976
NAVY, TOTAL	271^r	219	\$1,724^r	\$1,542	\$2,175^r	\$1,978
Patrol, Total	<u>62</u>	<u>55</u>	<u>599^r</u>	<u>562</u>	<u>772^r</u>	<u>711</u>
P-3C	12	11	134 ^r	148	152 ^r	173
S-3A	50	44	465	414	620 ^r	538
Attack, Total	<u>84^r</u>	<u>83</u>	<u>348^r</u>	<u>353</u>	<u>477^r</u>	<u>482</u>
A-4M	30	25	58	58	76	70
A-6E	13 ^r	12	86 ^r	83	127 ^r	125
EA-6B	6	6	90	88	124 ^r	116
A-7E	24	36	80	112	106	155
AV-8A	11	4	34	12	44	16
Fighters, Total.	<u>71</u>	<u>48</u>	<u>729</u>	<u>571</u>	<u>867</u>	<u>721</u>
F-14A	71	48	729	571	867	721
Trainers, Total.	<u>26</u>	<u>9</u>	<u>27</u>	<u>31</u>	<u>35</u>	<u>36</u>
T-2C	24	—	24	—	32	—
TA-4J	2	2	3	3	3	3
TAV-8A	—	7	—	28	—	33
Helicopters, Total. . .	<u>28</u>	<u>24</u>	<u>21</u>	<u>25</u>	<u>24</u>	<u>28</u>
UH-1N	28	24	21	25	24	28

Source: Department of the Navy.

a Flyaway Cost includes airframe, engines, electronics, communications, armament and other installed equipment.

b Weapon System Cost includes flyaway items, initial spares, ground equipment, training equipment and other support items.

r Revised.

**MILITARY AIRCRAFT PRODUCTION
ARMY ACCEPTANCES BY TYPE AND MODEL**

Calendar Years 1975 and 1976
(Millions of Dollars)

Type and Model	Number		Flyaway Cost ^a	
	1975	1976	1975	1976
ARMY, TOTAL	383	340	\$ 264	\$ 369
Helicopters, Total	<u>375</u>	<u>324</u>	<u>259</u>	<u>359</u>
AH-1J	67	73	74	80
UH-1H	211	107	73	66
OH-58A	29	16	4	3
CH-47C	13	17	42	55
214-A	55	111	66	155
Other, Total	<u>8</u>	<u>16</u>	<u>5</u>	<u>10</u>
C-12A	8	14	5	8
UV-18A	—	2	—	2
Accepted for Shipment to a Foreign Government, Total^a	187	219	\$ 168	\$ 249
Helicopters, Total	<u>187</u>	<u>219</u>	<u>168</u>	<u>249</u>
AH-1J	67	73	74	80
UH-1H	32	19	11	12
OH-58A	29	16	4	2
CH-47C	4	—	13	—
214-A	55	111	66	155

Source: Department of the Army, Materiel Development and Readiness Command.
a Included in ARMY, TOTAL.

**DEPARTMENT OF DEFENSE
OUTLAYS FOR AIRCRAFT PROCUREMENT**

**By Agency
Fiscal Years 1960 to Date
(Millions of Dollars)**

Year	TOTAL DOD	Air Force	Navy	Army
1960	\$ 6,272	\$ 4,414	\$ 1,765	\$ 93
1961	5,898	3,926	1,832	140
1962	6,659	4,387	2,102	170
1963	6,309	3,747	2,328	234
1964	6,053	3,894	1,859	300
1965	5,200	3,115	1,739	346
1966	6,635	4,074	2,021	540
1967	8,411	4,842	2,607	962
1968	9,462	5,079	3,244	1,139
1969	9,177	5,230	2,821	1,126
1970	7,948	4,623	2,488	837
1971	6,631	3,960	2,125	546
1972	5,927	3,191	2,347	389
1973	5,066	2,396	2,557	113
1974	5,006	2,078	2,806	122
1975	5,484	2,211	3,137	136
1976	6,520	3,323	3,061	136
Tr. Qtr.	1,557	859	672	26

Source: Department of Defense, OASD (Comptroller), FAD 748/76, June 30, 1976, and earlier reports.

NOTE: Fiscal Years ending June 30.

Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 22.

**MILITARY AIRCRAFT PROGRAM PROCUREMENT
INCLUDING INITIAL SPARES^a**

By Agency, Type and Model
Fiscal Years 1976, 1977 and 1978
(Millions of Dollars)

Agency, Type and Model	1976 ^b		1977 ^E		1978 ^E	
	No.	Cost	No.	Cost	No.	Cost
AIR FORCE						
B-1 Bomber	—	\$ 87.0	3	\$1,073.0	5	\$1,431.4
A-10	73	485.2	100	600.4	144	825.2
F-15 Eagle	132	1,685.4	108	1,465.2	78	1,378.2
F-16 Air Combat Fighter	—	—	—	240.2	105	1,502.7
E-3A AWACS	4	327.0	6	460.0	3	261.3
HH-53C	—	—	4	18.8	—	—
EF-111A	—	—	—	—	—	31.6
NAVY						
A-4M Skyhawk	3	\$ 17.4	21	\$ 89.7	—	\$ 7.2
A-6E Intruder	11	170.4	6	78.3	12	181.8
EA-6B Prowler	7	137.6	6	135.5	6	143.2
A-7E Corsair II	36	202.8	30	220.2	—	34.0
F-14A Tomcat.	45	760.5	36	700.9	44	940.7
F-18	—	—	—	—	—	29.3
CH-53E Sea Stallion.	—	—	6	93.5	—	20.4
UH-1N Iroquois	30	34.7	12	18.8	—	—
AH-1J Sea Cobra	14	40.6	23	64.3	8	31.2
P-3C Orion.	14	222.5	12	239.3	14	321.6
S-3A Viking	41	513.7	—	—	—	54.7
E-2C Hawkeye.	7	186.1	6	156.5	6	196.6
CTX	—	—	—	—	22	28.2
T-34C Mentor	98	38.8	33	13.7	34	28.7
F-5F	—	—	3	14.0	—	—
T-44A	18	14.4	20	15.3	23	17.7
EC-130Q TACAMO IV	1	24.2	—	—	—	—
KC-130R Hercules	4	39.6	—	—	—	—
ARMY						
C-12A	20	\$ 13.8	20	\$ 16.6	—	\$ —
AH-1S Cobra/Tow	60	83.4	82	121.1	83	128.4
UTTAS.	—	—	15	137.5	56	34.8

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1978.

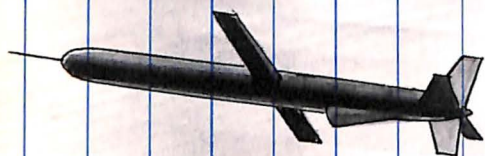
NOTE: For an explanation of the change in the Fiscal Year, see page 22.

a Total Obligational Authority.

b Includes the Transition Quarter, see page 22.

E Estimate.

Missile Programs



Aerospace industry sales of missile systems and parts, excluding missile propulsion units, amounted to \$3.2 billion in 1976. In terms of current dollars, this represents a decline of \$320 million from the previous year and the lowest level of missile sales since 1971.

Missile backlog also declined, from \$4.6 billion at the end of 1975 to \$4.4 billion at year-end 1976.

U.S. strategic missile strength remained at the level of previous years—1,710 launchers. The USAF's land-based ICBM force consisted of 1,000 Minuteman missiles and 54 Titan IIs. The Navy's 656 sea-launched ballistic missiles included a mix of Polaris and Poseidon weapons aboard 41 nuclear submarines.

Initial production is under way on the Navy's Trident I, newest of the Submarine Launched Ballistic Missile (SLBM) family. To be used in conjunction with a new Trident submarine and also "backfitted" into Polaris/Poseidon subs, Trident I has a range of 4,000 miles, compared with Poseidon's 2,500. The other long-range strategic missiles in production in 1976/77 are Poseidon and Minuteman III. With the change of Administration in 1977, Minuteman III production plans were altered. The number of missiles to be produced under FY 1978 funding was reduced from 60 to 10 and there were indications that the Department of Defense would discontinue production of new Minuteman III's in favor of upgrading the existing ICBM force.

Aside from Minuteman III, the Air Force's major 1976/77 production

program is the Maverick air-to-air weapon. Navy production programs include the Phoenix air-to-air missile and the air-to-surface Harpoon. Production continues on several joint-use weapons. Being produced for the Army and the Marine Corps are the Hawk air defense weapon, and the Dragon and TOW antitank missiles. Joint USAF/Navy programs include the Sparrow and Sidewinder air-to-air weapons, the Shrike air-to-surface countermeasure weapon, and the Standard ARM air-to-surface missile.

A considerable portion of the industry's missile workload involves a variety of research and development programs aimed at increasing future capability of the missile force. Department of Defense outlays for research, development, test and evaluation in FY 1976 amounted to \$2.3 billion, an increase of approximately \$120 million over FY 1975.

Although entering production status, Trident I continues as the principle development program of the Department of Defense; initial operational capability of the new system was targeted for late 1979. In concept formulation status is Trident II, which would have greater range and accuracy than its predecessor. Another strategic missile in development is the Air Force's M-X, a planned successor to Minuteman which would offer more throw-weight, increased accuracy and

greater survivability. M-X had been scheduled for full-scale development with FY 1978 funding, but an amended Administration budget deferred this step for a year.

Among other important missile development projects were DoD's cruise missiles, jet-powered pilotless aircraft designed for high accuracy and penetrability. Active programs include the Navy's Tomahawk, which can be launched from either a submarine or a surface vessel, and the Air Force's Air-Launched Cruise Missile (ALCM). Both were in flight test status during 1976/77 and scheduled for progression to full-scale engineering development, with operational capability targeted for 1980.

Other DoD research and development programs include the USAF/USN Brazo air-to-air missile; the Navy's HARM (High-Speed Anti-Radiation) air-to-surface weapon; the USAF's Hornet air-to-surface system; the Army's Patriot (formerly known as SAM-D) battlefield air defense system; the Army's Roland short-range air defense weapon; the Army/Marine Corps Stinger, a shoulder-launched, infrared-guided anti-aircraft weapon; the Army's Hellfire antiarmor missile; and the Army's Viper battlefield support weapon. Additional development effort was directed toward improved versions of several missiles already in production or operational status.

**SALES AND BACKLOG
MISSILE SYSTEMS AND PARTS**
Calendar Years 1961 to Date
(Millions of Dollars)

Year	Missile Systems and Parts	
	Net Sales	Backlog December 31
1961	\$ 3,628	\$ 2,873
1962	3,699	2,143
1963	3,318	2,146
1964	2,580	1,921
1965	2,082	2,394
1966	2,260	2,157
1967	2,877	3,121
1968	2,812	3,218
1969	2,676	2,511
1970	2,826	2,721
1971	2,641	3,344
1972	3,335	3,642
1973	3,391	3,868
1974	3,454	4,473
1975	3,548 ^r	4,580 ^r
1976	3,228	4,363

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
 NOTE: Based on data from about 70 companies engaged in the manufacture of aerospace products. Data exclude sales of military engines and propulsion units. See page 47.
 r Revised.

**SALES AND BACKLOG
ENGINES AND PROPULSION UNITS FOR
MISSILES AND SPACE VEHICLES**

Calendar Years 1961 to Date
(Millions of Dollars)

Year	Net Sales			Backlog, December 31		
	TOTAL	Military	Non-Military	TOTAL	Military	Non-Military
1961	\$ N.A.	\$ 784	\$ (a)	\$ N.A.	\$ 367	\$ (a)
1962	N.A.	1,060	(a)	N.A.	498	(a)
1963	1,675	1,153	522	888	699	189
1964	1,579	851	728	1,024	557	467
1965	1,288	560	728	883	513	370
1966	1,211	511	700	859	534	325
1967	978	441	537	609	405	204
1968	907	676	231	535	406	129
1969	702	667	35	497	485	12
1970	640	618	222	617	610	7
1971	605	596	9	520	513	7
1972	607	596	11	671	659	12
1973	627	607	20	615	615	10
1974	649	633	16	678	662	16
1975 ^r	643	626	17	531	517	14
1976	635	614	21	647	637	10

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).

NOTE: Based on data from about 70 companies engaged in the manufacture of aerospace products. The figures are inflated by the inclusion of subcontracts.

a Data included in totals for space vehicle systems. See page 65.

r Revised.

N.A. Not available.

**MAJOR MISSILES
DEVELOPMENT, PRODUCTION AND OPERATION**

Project	Agency	Status ^a	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR-TO-AIR					
BDM	USAF	R	Raytheon	—	Raytheon
Brazo	USAF/USN	D	Hughes	—	USAF/ADTC
Falcon	USAF	O	Hughes	Thiokol	Hughes
Super Falcon	USAF	O	Hughes	Thiokol	Hughes
Genie	USAF	O	McDonnell Douglas	Thiokol	Hughes
Phoenix	USN	P	Hughes	RI/Rocket- dyne	Hughes
Sidewinder- 9G	USN	O	Raytheon	RI/Rocket- dyne	Raytheon
Sidewinder- 9J	USAF	P	Ford Aero- space	—	Ford Aero- space
Sidewinder- 9H	USN	P	NWC/Ford Aerospace	Bermite/ Rocketdyne	Ford Aero- space
Sidewinder- 9L	USAF/USN	P	NWC/ Raytheon/ Ford Aero- space	Bermite/ Rocketdyne	Raytheon/ Ford Aero- space
Sparrow	USN	O	Raytheon	Hercules	Raytheon
AIR-TO-SURFACE					
ALCM	USAF	D	Boeing	Williams	McDonnell Douglas
ASALM	USAF	R	Martin Marietta	Marquardt	—
Bullpup (12B)	USN	O	Numax	Thiokol	Numax
HARM	USN	D	NWC	Thiokol	Texas Instruments
Harpoon	USN	P	McDonnell Douglas	Teledyne CAE	Texas Instru- ments/IBM
Hornet	USAF	D	RI/Autonetics	Thiokol	RI/Autonetics
Hound Dog	USAF	O	RI	P&W	RI/Autonetics
Maverick	USAF	P	Hughes	Thiokol	—
Quail	USAF	O	McDonnell Douglas	General Electric	McDonnell Douglas
Shrike	USAF/USN	O	NASC/NWC	Aerojet	Texas Instruments
SRAM	USAF	O	Boeing	Thiokol	Singer
Standard ARM	USAF/USN	O	General Dynamics	NOTS	General Dynamics
Walleye	USN	O	Martin Marietta/ Hughes	—	Martin Marietta/ Hughes

(Continued on next page)

**MAJOR MISSILES
DEVELOPMENT, PRODUCTION AND OPERATION (Continued)**

Project	Agency	Status ^a	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
ANTI-SUBMARINE					
Subroc	USN	O	Goodyear Aerospace	Thiokol	Singer
SURFACE-TO-AIR					
Chaparral	Army	O	Ford Aerospace	RI/Rocket-dyne	GE/Raytheon
Hawk	Army	O	Raytheon	Aerojet	Raytheon
Nike-Hercules	Army	O	Western Electric	Thiokol/Hercules	BTL/Western Electric
Redeye	Army	O	General Dynamics	Atlantic Research	Norden
Patriot	Army	D	Raytheon	Thiokol	Raytheon
Roland	Army	D	Hughes/Boeing	Hercules	Hughes/Boeing
Sea Sparrow	USN	O	Raytheon	Aerojet	Raytheon
Safeguard/Spartan	Army	P	BTL/Western Electric	Thiokol	BTL/Western Electric
Safeguard/Sprint	Army	X	BTL/Western Electric	Hercules	BTL/Western Electric
Standard (MR)	USN	O	General Dynamics	Aerojet/Hercules	General Dynamics
Standard (ER)	USN	O	General Dynamics	Atlantic Research	General Dynamics
Stinger	Army/USMC	D	General Dynamics	Atlantic Research	General Dynamics
Talos	USN	O	Bendix	Bendix	Bendix
Tartar	USN	O	General Dynamics	Aerojet	General Dynamics
Terrier	USN	O	General Dynamics	Atlantic Research	General Dynamics
SURFACE-TO-SURFACE					
Minuteman 2	USAF	O	AFLC Hill AFB	Thiokol/Aerojet/Hercules	RI/Autonetics
Minuteman 3	USAF	O	Boeing	Thiokol/Aerojet	RI/Autonetics
Missile MX	USAF	D	AFRPL	Hercules	—
Polaris A2	USN	O	Lockheed MSC	Aerojet/Hercules	GE/MIT/Hughes/Raytheon

(Continued on next page)

NOTE: See page 50 for footnotes.

**MAJOR MISSILES
DEVELOPMENT, PRODUCTION AND OPERATION (Continued)**

Project	Agency	Status ^a	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
SURFACE-TO-SURFACE (Cont.)					
Polaris A3	USN	O	Lockheed MSC	Aerojet/Hercules	GE/MIT/Hughes/Raytheon
Poseidon	USN	O	Lockheed MSC	Thiokol/Hercules	GE/MIT/Hughes/Raytheon
Tomahawk	USN	D	General Dynamics	Williams	McDonnell Douglas
Titan 2	USAF	O	AFLC Hill AFB	Aerojet	GM/Delco Electronics
Trident	USN	D	Lockheed MSC	Hercules/Thiokol	C.S. Draper Lab

BATTLEFIELD SUPPORT AND ANTIARMOR

Dragon	Army	O	Kollsman/Raytheon	McDonnell Douglas/Hercules	Raytheon
Hellfire	Army	D	RI	Thiokol	RI/Autonetics
Lance	Army	O	Vought	RI/Rocket-dyne	Arma/E-Systems
Pershing 1-A	Army	O	Martin Marietta	Thiokol	Bendix
Pershing 2	Army	D	Martin Marietta	Thiokol	Goodyear Aerospace
Sergeant Shillelagh	Army	O	SR/Univac	Thiokol	SR/Univac
	Army	O	Ford Aerospace	Hercules	Ford Aerospace
TOW	Army	O	Hughes	Hercules	Emerson Electric
Viper	Army	D	General Dynamics	Atlantic Research	-

Source: Aerospace Industries Association, based on latest available information.

Status:
 R — Research.
 D — Development.
 O — Operational.
 P — Production.
 X — Deactivated.

MISSILE PROGRAM PROCUREMENT INCLUDING INITIAL SPARES^a

By Agency, Type and Model
Fiscal Years 1976, 1977 and 1978
(Millions of Dollars)

Agency, Type and Model	1976 ^b		1977 ^E		1978 ^E	
	Units	Cost	Units	Cost	Units	Cost
AIR FORCE						
LGM-30F/G						
Minuteman II/III . . .	50	\$ 753.6	—	\$ 663.8	—	\$ 267.4
AGM-69A/B SRAM.	—	—	—	25.3	—	58.4
AGM-86, ALCM. . .	—	—	—	—	—	40.6
AGM-65 A/B, E/O Maverick . . .	6,000	111.8	—	4.9	—	8.3
AGM-65C, Laser Maverick . .	—	—	—	28.9	100	38.1
AGM-65D, IIR Maverick. . . .	—	—	—	—	—	29.2
Aerial Targets & Drones ^c	—	93.8	—	112.0	—	115.4
NAVSTAR GPS. . .	—	—	—	—	—	43.4
SPACE SHUTTLE .	—	—	—	—	—	37.4
NAVY						
Poseidon	—	\$ 30.9	—	\$ 20.9	—	\$ 21.8
Trident I	—	387.4	48	967.3	96	1,132.7
Sparrow	980	147.7	1,320	152.9	1,725	180.0
Sidewinder.	1,510	98.6	1,420	93.1	2,900	145.9
Phoenix	340	125.3	240	81.6	210	87.1
Shrike ^d	1,350	58.9	1,275	51.3	900	41.6
Condor	—	34.5	—	—	—	—
Standard ARM . . .	—	5.0	—	0.2	—	3.0
Harpoon	231	169.6	245	144.5	315	152.8
Standard MR	250	35.1	500	74.3	480	102.1
Standard ER.	22	53.5	36	45.8	40	47.7
ARMY						
Chaparral.	—	\$ 38.3	2,000	\$ 61.4	—	\$ 49.9
Hawk ^e	660	86.1	526	87.7	559	98.7
U.S. Roland	—	—	—	—	—	67.1
Stinger ^e	—	—	—	—	890	87.9
Dragon ^e	34,443	156.4	16,080	86.0	20,671	90.9
TOW ^f	26,926	152.1	13,051	105.9	14,866	102.1
Lance.	—	—	360	74.6	—	—
Pershing	—	17.3	—	—	6	18.7
AN/TSQ-73	—	4.7	12	41.9	12	48.0

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1978.

NOTE: For an explanation of the change in the Fiscal Year, see page 22.

^E Estimate.

^a Total Obligation Authority.

^b Includes the Transition Quarter, see page 22.

^c Includes Army and Navy procurement.

^d Includes Air Force procurement.

^e Includes Marine Corps procurement.

^f Includes Navy and Marine Corps procurement.

**DEPARTMENT OF DEFENSE
OUTLAYS FOR MISSILES**
Fiscal Years^a 1960 to Date
(Millions of Dollars)

Year	TOTAL DOD	Procurement	Research, Development, Test and Evaluation
1960	\$ 5,086	\$ 3,027	\$ 2,059
1961	5,997	2,972	3,025
1962	6,219	3,442	2,777
1963	6,058	3,817	2,241
1964	5,929	3,577	2,352
1965	3,997	2,096	1,901
1966	3,870	2,069	1,801
1967	4,432	1,930	2,502
1968	4,741	2,219	2,522
1969	4,919	2,509	2,410
1970	5,108	2,912	2,196
1971	5,148	3,140	2,008
1972	5,166	3,009	2,157
1973	5,061	3,023	2,038
1974	5,141	2,981	2,160
1975	5,065	2,889	2,176
1976	4,591	2,296	2,295
Tr. Qtr.	922	402	520

Source: Department of Defense, OASD (Comptroller), FAD 748/76, June 30, 1976, and earlier reports.

NOTE: Does not include Military Assistance.

^a Excludes Military Assistance.

Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 22.

**DEPARTMENT OF DEFENSE
OUTLAYS FOR MISSILE PROCUREMENT**

By Agency
Fiscal Years^a 1960 to Date
(Millions of Dollars)

Year	TOTAL DOD	Air Force	Navy	Army
1960	\$ 3,027	\$ 2,021	\$ 423	\$ 583
1961	2,972	1,922	493	557
1962	3,442	2,385	593	464
1963	3,817	2,676	718	423
1964	3,577	2,100	981	496
1965	2,096	1,320	522	254
1966	2,069	1,313	512	244
1967	1,930	1,278	432	220
1968	2,219	1,388	436	395
1969	2,509	1,382	534	593
1970	2,912	1,467	702	743
1971	3,140	1,497	791	852
1972	3,009	1,334	831	844
1973	3,023	1,454	628	941
1974	2,981	1,537	541	903
1975	2,889	1,602	615	672
1976	2,296	1,549	584	163
Tr. Qtr.	402	347	148	(93)

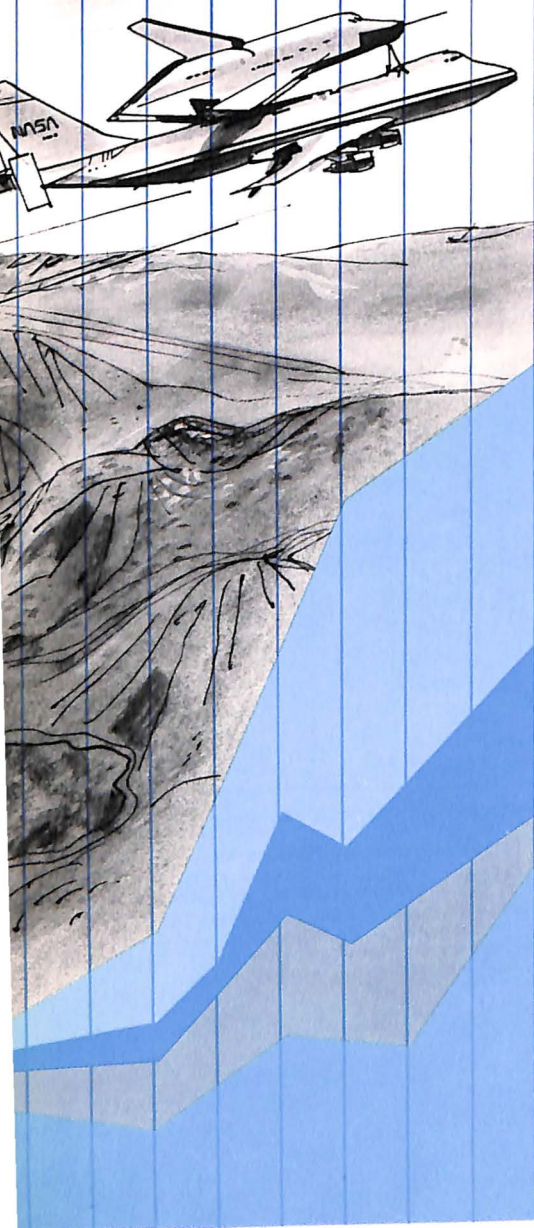
Source: Department of Defense, OASD (Comptroller), FAD 748/76, June 30, 1976, and earlier reports.

NOTE: For data on research and development outlays for missiles, see page 99.

^a Fiscal Years ending June 30.

Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 22.

Space Programs



The U.S. space program, in decline for several years, experienced an activity upturn in 1976 as government outlays for space research and operations increased by \$430 million.

Total space outlays in FY 1976 amounted to \$5.3 billion, the highest level since 1970. NASA outlays totaled \$3.2 billion, which compares with \$2.9 billion in the previous year. Department of Defense outlays were just under \$2 billion; in unadjusted dollars the figure was the second highest since DoD began exploring the military use of space in the latter 1950s.

Principal reason for NASA's increased funding in FY 1976 and planned increases in later years of the decade is expanding effort on the Space Shuttle, the transportation system designed for high-frequency earth orbital flights involving a wide variety of earth-benefit applications and scientific payloads. The Space Shuttle reached a major milestone in 1976 when the Shuttle Orbiter, the manned segment of the system, was rolled out preparatory to 1977 ground and flight tests.

Captive flight tests, in which the unmanned Orbiter was carried aloft by a modified 747 jetliner, were successfully conducted early in 1977. The schedule calls for manned free-flight tests of the Orbiter, beginning in July 1977 and continuing into early 1978. Later in 1978, the Shuttle will be ground-tested as a complete system, including the Orbiter, the recoverable solid boosters used for launch propulsion, and the huge external tank which

supplies fuel to the Orbiter's three main rocket engines during the boost phase. First manned orbital test flight is targeted for 1979 and initial operational flights for 1980.

NASA's operational highlight of 1976 was the highly successful Viking mission to Mars. Two spacecraft landed on Mars at widely separated points while two others were directed into orbital paths around the Red Planet. Collectively, the four spacecraft provided a wealth of photos and scientific data, including new information on Mars' atmosphere, magnetism, radiation, seismic activity and soil composition. The Viking Landers scooped up and analyzed a series of soil samples, looking for evidence of microbial life, but the question of Mars life remained inconclusive at year-end 1976. The four spacecraft continued their investigations in 1977.

During 1976, NASA launched 16 spacecraft, all of them officially rated as successful. Among the major programs were Lageos 1, an earth-orbiting satellite designed to study continental drift and the processes that create earthquakes; Helios II, jointly developed with the Federal Republic of Germany, the second of two probes investigating space close to the sun; and Communications Technology Satellite, a U.S./Canada program for further development of the direct broadcast type of communication satellite.

In development status during 1976 and slated for 1977 launch were two of NASA's most important space sci-

ence projects. NASA's heaviest unmanned spacecraft, the two-ton High Energy Astronomical Observatory (HEAO), will return information on some of the most intriguing mysteries of the universe—pulsars, quasars and "black holes" in space.

The other major project involves launch, in August and September, of two 1,600-pound Mariner interplanetary spacecraft on multi-year flights past Jupiter and Saturn. The Mariners will conduct extensive investigations of the two planets and the interplanetary medium between them, with emphasis on comparative studies of the two planetary systems, including their satellites and the rings of Saturn. They will encounter Jupiter in 1979 and Saturn in 1981.

The principle space program of the Department of Defense is the NavStar Global Positioning System, to be operational in the mid-1980s. NavStar will provide positioning data of unprecedented precision for great enhancement of such military capabilities as missile delivery, bombing, navigation, artillery fire, troop movement and rendezvous. DoD also continues to operate unmanned satellite systems for communications, meteorology and early warning and to develop improved spacecraft for these purposes. Additionally, DoD plans "to increase significantly the U.S. space defense effort over a broad range of space-related activities which include space surveillance, satellite system survivability and the related space operations control function."

U. S. SPACE FLIGHT TIME LOG

Calendar Years 1961 to Date

Launch Date	Mission	Man-Hours in Mission		Total Cumulative Time	
		Hrs.	Min.	Hrs.	Min.
1961					
May 5	MR-3 (Shepard)	—	15	—	15
July 21	MR-4 (Grissom)	—	16	—	31
1962					
Feb 20	MR-6 (Glenn)	4	55	5	26
May 24	MA-7 (Carpenter)	4	56	10	22
Oct 3	MA-8 (Schirra)	9	13	19	35
1963					
May 15	MA-9 (Cooper)	34	20	53	55
1965					
Mar 23	Gemini 3 (Grissom, Young)	9	46	63	41
June 3	Gemini 4 (McDivitt, White)	195	52	259	33
Aug 21	Gemini 5 (Cooper, Conrad)	381	50	641	23
Dec 15	Gemini 6 (Schirra, Stafford)	51	42	693	05
Dec 4	Gemini 7 (Borman, Lovell)	661	10	1,354	15
1966					
Mar 16	Gemini 8 (Armstrong, Scott)	21	21	1,375	36
June 3	Gemini 9 (Stafford, Cernan)	144	42	1,520	32
July 18	Gemini 10 (Young, Collins)	141	34	1,662	06
Sept 12	Gemini 11 (Conrad, Gordon)	142	34	1,804	40
Nov 11	Gemini 12 (Lovell, Aldrin)	189	10	1,993	50
1968					
Oct 11	Apollo 7 (Schirra, Eisele, Cunningham)	780	27	2,774	17
Dec 21	Apollo 8 (Borman, Lovell, Anders)	441	03	3,215	20

(Continued on next page)

U. S. SPACE FLIGHT TIME LOG (Continued)

Calendar Years 1961 to Date

Launch Date	Mission	Man-Hours in Mission		Total Cumulative Time	
		Hrs.	Min.	Hrs.	Min.
<u>1969</u>					
Mar 3	Apollo 9 (McDivitt, Scott, Schweikart)	723	03	3,938	23
May 18	Apollo 10 (Stafford, Young, Cernan)	576	09	4,514	32
July 16	Apollo 11 (Armstrong, Collins, Aldrin)	585	57	5,100	29
Nov 14	Apollo 12 (Conrad, Gordon, Bean)	733	48	5,834	17
<u>1970</u>					
Apr 11	Apollo 13 (Lovell, Haise, Swigert)	428	45	6,623	02
<u>1971</u>					
Jan 31	Apollo 14 (Shepard, Roosa, Mitchell)	650	06	6,913	08
July 26	Apollo 15 (Scott, Worden, Irwin)	885	36	7,808	44
<u>1972</u>					
Apr 16	Apollo 16 (Young, Duke, Mattingly)	797	33	8,606	17
Dec 7	Apollo 17 (Cernan, Schmitt, Evans)	905	36	9,511	53
<u>1973</u>					
May 25	Skylab 2 (Conrad, Kerwin, Weitz)	2,018	30	11,530	29
July 28	Skylab 3 (Bean, Lousma, Garriott)	4,287	27	15,817	56
Nov 16	Skylab 4 (Carr, Gibson, Pogue)	6,051	48	21,869	44
<u>1975</u>					
July 15	Apollo (Stafford, Slayton, Brand)	652	24	22,522	08

Source: "Aeronautics and Space Report of the President" (Annually).

NASA MAJOR LAUNCH RECORD, 1976

Date	Designation	Objective
Jan. 15	Helios 2	To investigate the fundamental solar processes and solar terrestrial relationships by the study of phenomena such as solar wind, magnetic and electric fields, cosmic rays, and cosmic dust.
Jan. 17	CTS-1	To advance the technology of spacecraft-mounted and related ground-based components and systems applicable to high-radiated-RF-power satellites. Specific objectives of two-way television and voice communication; wide-band data transmission and data relay to small, low-cost ground stations; maintain antenna pointing accuracy; and obtain 1-kw of useful power to the spacecraft from the unfurled solar-cell array.
Jan. 29	Intelsat IV-a F-2	To provide 6250 two-way voice circuits plus two television channels simultaneously or a combination of telephone, TV, and other forms of communications traffic.
Feb. 19	Marisat 1	To launch satellite into synchronous transfer orbit. Satellite to provide 24-hour real-time communications between ships and shore.
Mar. 15	LES-8/9	To evaluate advanced satellite communications techniques.
Mar. 26	RCA-Satcom-2	To provide television, voice channels, and high-speed data transmission to Hawaii, Alaska, and contiguous United States to operate all 24 transponder channels at specified power throughout the minimum 8-year satellite lifetime.
May 4	Lageos	To provide permanent reference point in orbit for precision Earth-dynamics measurements; demonstrate capability of laser satellite tracking techniques; and make accurate measurements of Earth's rotation and movement of the crust.
May 13	Comstar 1	To launch satellite into synchronous transfer orbit. Satellite to provide contiguous U.S., Hawaii, Alaska, and Puerto Rico with 14,400 two-way high quality voice circuits.
June 10	Marisat 2	To launch satellite into synchronous transfer orbit. Satellite to provide 24-hour real-time communications between ships and shore.

(Continued on next page)

NASA MAJOR LAUNCH RECORD, 1976 (Continued)

Date	Designation	Objective
June 18	Gravity Probe A (Red Shift Experiment)	To test Einstein's "equivalence principle," which is the foundation of relativity theory.
July 8	SESP 74-2	To measure the intensity, distribution, and effects of protons, electrons, and alpha particles in space.
July 29	NOAA 5 (ITOS H)	To place spacecraft in a Sun-synchronous orbit having a local equator crossing time of approximately 8:30 a.m., descending to permit regular and dependable daytime and nighttime meteorological observations in both direct read-out and stored modes of operation.
Oct. 14	Marisat 3	To launch satellite into synchronous transfer orbit. Satellite to provide 24-hour real-time communications between ships and shore.

Source: National Aeronautics and Space Administration, "Historical Pocket Statistics," January 1977.

NOTE: For data for earlier years, see previous editions of "Aerospace Facts and Figures."

CHRONOLOGY OF MANNED SPACE FLIGHTS

Calendar Years 1973 - 1976

Launch Date	Project	Pilots	Nation	Duration
1973				
May 25	Skylab 2	Charles Conrad, Jr. Joseph P. Kerwin Paul J. Weitz	USA	672 hr. 50 min.
July 28	Skylab 3	Alan L. Bean Jack R. Lousma Owen K. Garriott	USA	1,427 hr. 09 min.
Sept 27	Soyuz 12	Vasiliy Lazarev Oleg Makarov	USSR	47 hr. 16 min.
Nov 16	Skylab 4	Gerald P. Carr Edward G. Gibson William R. Pogue	USA	2,017 hr. 16 min.
Dec 18	Soyuz 13	Petr Klimuk Valentin Lebedev	USSR	188 hr. 55 min.
1974				
July 3	Soyuz 14	Pavel Popovich Yuriy Artyukhin	USSR	377 hr. 30 min.
Aug 26	Soyuz 15	Gennadiy Sarafanov Lev Demin	USSR	48 hr. 12 min.
Dec 2	Soyuz 16	Anatoliv Filipchenko Nikolai Rukavishnikov	USSR	142 hr. 24 min.
1975				
Jan 10	Soyuz 17	Aleksey Gubarev Georgiy Grechko	USSR	709 hr. 20 min.
Apr 5	Anomaly	Vasiley Lazarev Oleg Makarov	USSR	— 20 min.
May 24	Soyuz 18	Petr Klimak Viraliy Sevastyanov	USSR	1,511 hr. 20 min.
July 15	Soyuz 19	Aleksey Leonov Valeriy Kubasov	USSR	142 hr. 31 min.
July 15	Apollo	Thomas P. Stafford Donald K. Slayton Vance D. Brand	USA	217 hr. 28 min.
1976				
July 6	Soyuz 21	Boris Volynov Vitaliv Zholobov	USSR	1,182 hr. 24 min.
Sept 15	Soyuz 22	Valeriv Bykovskiy Vladimir Aksenov	USSR	189 hr. 54 min.
Oct 14	Soyuz 23	Vyacheslav Zudov Valeriy Rozhdestvenskiy	USS	48 hr. 06 min.

Source: "Aeronautics and Space Report of the President" (Annually).

NOTE: For data for earlier years, see previous editions of "Aerospace Facts and Figures."

U. S.-LAUNCHED SPACE PROBES

1972 to Date

Launch Date	Name and Launch Vehicle	Remarks
<u>1971</u> May 30	<u>Mariner 9</u> Atlas-Centaur	Mars orbital photographic mission. Entered Mars orbit Nov. 13, 1971. Returned 6876 pictures and data on temperatures, elevations and water vapor.
<u>1972</u> Mar. 3	<u>Pioneer 10</u> Atlas-Centaur	Jupiter flyby mission. Passed Jupiter Dec. 3, 1973, returned color pictures and data on radiation, temperatures, and magnetic fields. Accelerated toward solar system escape.
<u>1973</u> Apr. 6	<u>Pioneer 11</u> Atlas-Centaur	Jupiter flyby mission. Passed Jupiter on Dec. 2, 1974, returning pictures and data, and headed for a similar pass by Saturn before accelerating out of the solar system.
Nov. 3	<u>Mariner 10</u> Atlas-Centaur	Venus and Mercury flyby mission. Passed Venus on Feb. 5, 1974, returning good quality pictures. Passed Mercury again on Sept. 21, 1974, returning 500-600 pictures. Passed Mercury again on Mar. 16, 1975.
<u>1974</u> Dec. 10	<u>Helios 1</u> Titan III E-Centaur	Investigate properties of interstellar space close to Sun. West German payload.
<u>1975</u> Aug. 20	<u>Viking 1</u> Titan III E-Centaur	Mars lander and orbiter mission, arrived in mid-1976, orbited, landed.
Sept. 9	<u>Viking 2</u> Titan III E-Centaur	Mars lander and orbiter mission, arrived in mid-1976, orbited, landed.
<u>1976</u> Jan. 15	<u>Helios 2</u> Titan III E-Centaur	Investigate properties of space close to Sun. West German payload.

Source: "Aeronautics and Space Report of the President" (Annually).

AEROSPACE FACTS AND FIGURES 1977/78

U. S. APPLICATIONS SATELLITES

1976

Launch Date	Name and Launch Vehicle	Remarks
COMMUNICATIONS SATELLITES		
Jan 17	<u>CTS-1</u> Thor-Delta (TAT)	Canadian-U.S., most powerful experimental satellite.
Jan 30	<u>Intelsat IV-A (F-2)</u> Thor-Delta (TAT)	Positioned over Atlantic.
Feb 19	<u>Marisat 1</u> Thor-Delta (TAT)	For maritime use by Comsat, over the Atlantic.
Mar 15	<u>LES 8/9</u> Titan IIIC	Experimental satellites with radio-isotope power sources.
Mar 26	<u>RCA-Satcom 2</u> Thor-Delta (TAT)	Second of three RCA communications satellites.
Apr 22	<u>NATO IIIA</u> Thor-Delta (TAT)	First of a new series.
May 13	<u>Comstar 1</u> Atlas-Centaur	Placed over Pacific for AT&T by Comsat.
June 10	<u>Marisat 2</u> Thor-Delta (TAT)	For maritime use by Comsat, over the Pacific.
July 8	<u>Palapa 1</u> Thor-Delta (TAT)	Indonesian domestic communications.
July 22	<u>Comstar 2</u> Thor-Delta (TAT)	Placed south of the U.S. for AT&T by Comsat.
Oct 14	<u>Marisat 3</u> Thor-Delta (TAT)	Placed over Indian Ocean.
WEATHER OBSERVATION		
July 29	<u>NOAA-5 (ITOS H)</u> Thor-Delta	Second generation operational satellite.
GEODESY		
May 4	<u>Lageos</u> Thor-Delta	Laser geodynamic satellite.
NAVIGATION		
Sept 1	<u>Tip-3</u> Scout	Transit Navigation Satellite Improvement Program.

Source: "Aeronautic and Space Report of the President" (Annually).

SPACECRAFT LAUNCHINGS

As of April 17, 1977

Country	TOTAL	Payloads In Earth Orbit	Payloads Decayed	Space Probes
TOTAL	2,081	871	1,156	54
U.S.S.R.	1,139	411	703	25
United States	840	382	431	27
France	14	13	1	—
United Kingdom	11	7	4	—
West Germany	6	2	2	2
Canada	8	8	—	—
Japan	10	10	—	—
Italy	4	—	4	—
N.A.T.O.	4	4	—	—
Netherlands	1	1	—	—
E.S.R.O.	7	1	6	—
Australia	2	1	1	—
People's Republic of China	7	3	4	—
France/Germany	2	2	—	—
Spain	1	1	—	—
Indonesia	2	2	—	—
India	1	1	—	—
E.S.A.	1	1	—	—
I.T.S.O.	21	21	—	—

Source: National Aeronautics and Space Administration.

UNITED STATES SPACE LAUNCH VEHICLES

Vehicle	Stages	Thrust (in Thousands of Pounds)	Payload (Pounds)	
			300 Nautical Miles Orbit	Escape
Scout	1. Algol IIIA* 2. Castor IIA* 3. Antares IIB* 4. Altair III*	108.3 63.2 28.5 5.9	410	85
Thor-Delta 2900 Series	1. Thor plus nine TX354-5* 2. Delta (DSV-3) 3. TE 364-4*	205 plus 99 10.3 15	3,900	1,050
Atlas F/TE 364-4	1. Atlas Booster and Sustainer (Atlas F) 2. TE 364-4*	443 15	3,300	—
Atlas-Agena	1. Atlas Booster and Sustainer (SLV-3A) 2. Agena	503 16	6,000	1,000
Titan IIIB-Agena	1. LR-87 2. LR-91 3. Agena	520 100 16	7,100	1,500
Titan IIIC	1. Two 5-segment 120" diameter* 2. LR-87 3. LR-91 4. Transtage	2,600 520 100 16	26,500	7,000
Titan IIID	1. Two 5-segment 120" diameter* 2. LR-87 3. LR-91	2,600 520 102	6,500	—
Titan IIIE - Centaur	1. Two 5-segment 120" diameter* 2. LR-87 3. LR-91 4. Centaur (Two RL-10)	2,600 520 102 30	—	11,300
Atlas-Centaur	1. Atlas Booster and Sustainer 2. Centaur (Two RL-10)	503 30	10,300	2,500
Saturn IB	1. S-IB (8H-1) 2. S-IVB (1J-2)	1,640 230	34,000	—

Source: "Aeronautics and Space Report of the President" (Annually).

* Solid propellant, all others are liquid.

**SALES AND BACKLOG
SPACE VEHICLE SYSTEMS**
(Excluding Engines and Propulsion Units)
Calendar Years 1961 to Date
(Millions of Dollars)

Year	Net Sales			Backlog, December 31		
	TOTAL	Military	Non-Military	TOTAL	Military	Non-Military
1961	\$ 775	\$ 551	\$ 224 ^a	\$ 586	\$ 350	\$ 236 ^a
1962	1,319	712	607 ^a	1,435	852	583 ^a
1963	1,911	1,061	850	1,612	856	756
1964	2,222	732	1,490	1,611	391	1,220
1965	2,449	602	1,847	2,203	503	1,700
1966	2,710	734	1,976	1,494	428	1,066
1967	2,199	789	1,410	1,974	1,096	878
1968	2,357	899	1,458	1,329	834	495
1969	2,282	1,187	1,095	1,330	869	461
1970	1,956	1,025	931	1,184	786	398
1971	1,725	860	865	916	603	313
1972	1,656	905	751	959	646	313
1973	1,562	902	660	1,177	923	254
1974	1,751	944	807	1,492	1,131	361
1975 ^r	2,119	1,096	1,023	1,304	1,019	285
1976	2,062	981	1,081	1,220	894	326

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
NOTE: Based on data from about 70 companies engaged in the manufacture of aerospace products.

a Includes engines and propulsion units.
r Revised.

OUTLAYS FOR SPACE ACTIVITIES

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	NASA ^a	DOD ^b	AEC	Other
1960	\$ 960	\$ 401	\$ 518	\$ -	\$ 41
1961	1,518	744	710	-	64
1962	2,418	1,257	1,029	130	2
1963	4,114	2,552	1,368	181	13
1964	5,970	4,171	1,564	220	15
1965	6,886	5,035	1,592	232	27
1966	7,719	5,858	1,638	188	35
1967	7,237	5,337	1,673	184	43
1968	6,667	4,595	1,890	146	36
1969	6,330	4,083	2,095	116	36
1970	5,453	3,565	1,756	103	29
1971	4,999	3,171	1,693	97	38
1972	4,772	3,195	1,470	60	47
1973	4,719	3,069	1,557	51	42
1974	4,854	2,960	1,777	39	78
Year	TOTAL	NASA ^a	DOD ^b	ERDA ^c	Other
1975	4,891	2,951	1,831	34	75
1976	5,321	3,227	1,983	23	88
Tr.Qtr.	1,341	850	460	5	26

Source: 1960-1969: "The Budget of the United States" (Annually).

1970-Date: "Aeronautics and Space Report of the President" (Annually).

NOTE: Tr. Qtr. - Transition Quarter. For an explanation of the change in the Federal Government's Fiscal Year and the Transition Quarter, see page 22.

a Excludes amount for aircraft technology beginning with 1965.

b Includes the aeronautics budget activity and other activities which contribute to the space effort.

c AEC research and development programs transferred to ERDA with 1974 reorganization.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OUTLAYS**

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	Research and Development	Construction of Facilities	Research & Program Management
1960	\$ 401	\$ 256	\$ 54	\$ 91
1961	744	487	98	159
1962	1,257	936	114	207
1963	2,552	1,912	225	416
1964	4,171	3,317	438	416
1965	5,093	3,984	531	578
1966	5,933	4,741	573	619
1967	5,426	4,487	289	650
1968	4,724	3,946	126	652
1969	4,251	3,530	65	656
1970	3,753	2,992	54	707
1971	3,382	2,630	44	708
1972	3,422	2,623	50	749
1973	3,315	2,541	45	729
1974	3,256	2,421	75	760
1975	3,266	2,420	85	761
1976	3,669	2,749	121	799
Tr. Qtr.	952	731	26	195
1977 ^E	3,706	2,737	125	844
1978 ^E	3,903	2,923	133	847

Source: "The Budget of the United States" (Annually).

NOTE: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 22.

^E Estimate.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
BUDGET AUTHORITY**

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	Research and Development	Construction of Facilities	Research & Program Management
1960	\$ 614	\$ 333	\$ 190	\$ 91
1961	964	672	125	167
1962	1,825	1,285	326	214
1963	3,673	2,929	744	(a)
1964	5,099	3,890	713	496
1965	5,250	4,360	267	623
1966	5,175	4,502	61	612
1967	4,968	4,235	85	648
1968	4,589	3,912	38	639
1969	3,995	3,314	33	648
1970	3,749	2,993	53	703
1971	3,312	2,556	26	730
1972	3,308	2,523	53	732
1973	3,408	2,599	79	730
1974	3,040	2,194	101	745
1975	3,231	2,323	143	765
1976	3,552	2,678	82	792
Tr. Qtr.	932	700	11	221
1977 ^E	3,724	2,761	118	845
1978 ^E	4,020	3,011	162	847

Source: "The Budget of the United States" (Annually).

NOTE: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 22.

a Included in Research & Development for one year.

E Estimate.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND DEVELOPMENT PROGRAMS**

BUDGET PLAN

Fiscal Years 1975 to Date
(Millions of Dollars)

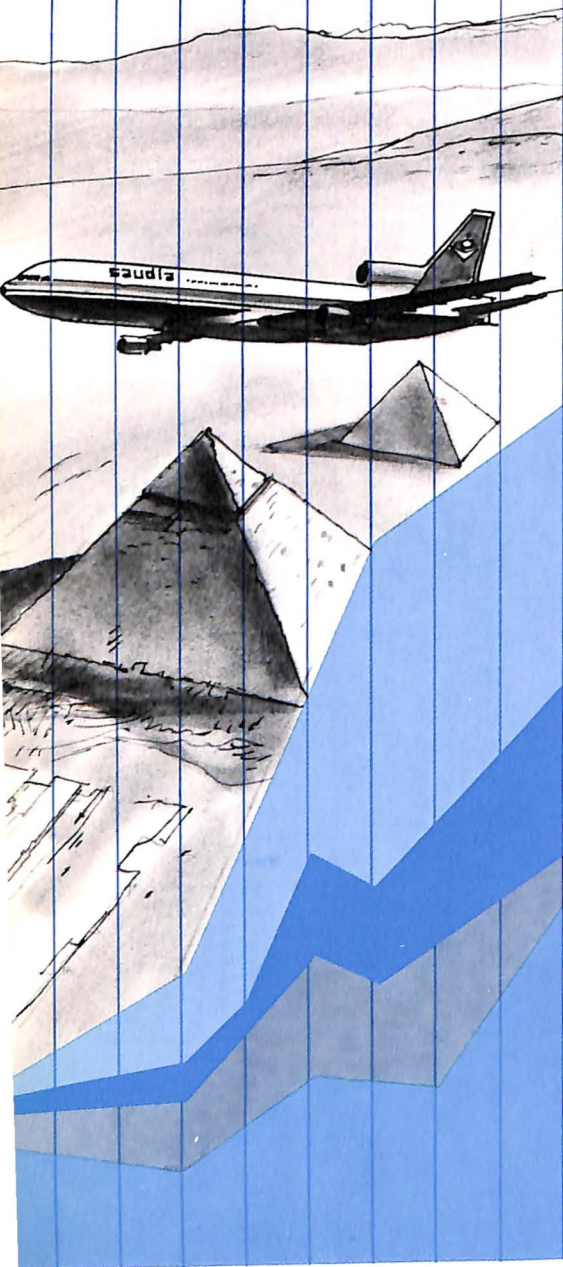
	1975	1976	Tr. Qtr.	1977 ^E	1978 ^E
TOTAL	\$ 2,324	\$ 2,677	\$ 701	\$ 2,761	\$ 3,011
Manned Space Flight, TOTAL . . .	<u>1,236</u>	<u>1,561</u>	<u>407</u>	<u>1,642</u>	<u>1,754</u>
Space Shuttle	797	1,206	321	1,288	1,349
Space Flight Operations	299	189	49	202	268
Expendable Launch Vehicles . .	140	166	37	152	137
Space Science and Applications, TOTAL	<u>592</u>	<u>612</u>	<u>164</u>	<u>578</u>	<u>634</u>
Physics and Astronomy	136	159	44	166	224
Lunar and Planetary Explorations	261	254	67	192	148
Life Sciences	20	21	5	22	33
Space Applications	175	178	48	198	229
Aeronautics and Space Technology, TOTAL	<u>238</u>	<u>250</u>	<u>63</u>	<u>272</u>	<u>329</u>
Aeronautical Research and Technology	167	175	44	190	231
Space and Nuclear Research and Technology	71	75	19	82	98
Energy Programs, TOTAL	<u>4</u>	<u>6</u>	<u>2</u>	<u>6</u>	<u>4</u>
Tracking and Data Acquisition, TOTAL	<u>248</u>	<u>241</u>	<u>63</u>	<u>255</u>	<u>282</u>
Technology Utilization, TOTAL . .	<u>6</u>	<u>7</u>	<u>2</u>	<u>8</u>	<u>8</u>

Source: NASA, Briefing on the Budget of the United States, January 17, 1977.

Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter and the change in the Fiscal Year, see page 22.

E Estimate.

Air Transportation



For the U.S. scheduled airline industry, 1976 was a year of substantial financial improvement. The gains resulted from a combination of several factors, chief among them stringent cost control measures by the airlines, a resurgence of traffic growth stemming from an improving national economy, and an increase in yield, or the revenue per passenger mile and cargo ton mile.

Operating profit of the U.S. airlines totaled \$572 million, a sharp increase from the \$117 million operating profit experienced in the previous year.

Despite the substantial improvement, the U.S. airlines' financial performance relative to other industries remained low and capital formation continued to pose a major problem for the industry. The Air Transport Association estimated that acquisition of new airliners between 1977-80 will require a capital investment on the order of \$65 billion. To meet capital needs of that magnitude, the airlines must realize an average annual return of 5½ cents on each dollar of revenue. But the 1976 profit margin amounted to only 2.2 cents on the dollar. Stated another way, the capital required for re-equipping airline fleets demands annual earnings approximating \$800 million, twice the 1976 figure.

In worldwide airline traffic, 1976 saw gains in all categories over the previous year. World airlines, including the Soviet Union, flew 475 billion passenger miles, which compares with 433 billion in 1975. The number of passengers carried increased from 534 million to 578 million. Cargo ton miles were up from 13.3 billion to 14.5

billion and mail ton miles increased by 50 million to a 1976 level of more than 2 billion.

The U.S. airlines, including both domestic and international operations, recorded similar traffic gains. Overall passenger miles flown amounted to 179 billion, up from 1975's 163 billion. Cargo ton miles, which had declined sharply in the previous year, rebounded to a record high of 5.4 billion, an increase of more than 300 million ton miles over the 1975 level. There was also a slight—16 million— increase in mail ton miles.

Record traffic levels were recorded in domestic service by certificated carriers. Passenger miles flown in 1976 totaled more than 145 billion, a gain over 1975 of about 13.5 billion, or an increase of 10 percent. By comparison, passenger mile gains in 1974 and 1975 were about 2.7 and 1.5 percent respectively. Domestic passenger boardings in 1976 topped 206 million, an increase of more than 17 million.

A particularly encouraging factor was the turnaround in traffic volume moved by U.S. international carriers. In the two previous years—1974 and

1975—passenger miles on international routes had declined, due largely to world recession. In 1976, the traffic curve took a new upward swing. U.S. international carriers flew 33.7 billion passenger miles, up from 31 billion in 1975, and carried 17 million passengers, up from 16.3 million. In both cases, however, the figures remained below those of the peak year of 1973.

In another area of air transportation, U.S. general aviation continued its steady growth. General aviation planes flew 4.2 billion miles in 1975, compared with 4.0 billion in 1974. They flew a total of more than 34,000 hours, an increase of approximately 1,700 hours.

As in previous years, business flying constituted the major element of general aviation in terms of miles flown. Business aircraft flew nearly 1.5 billion miles, or 35 percent of the general aviation total. Personal flying accounted for 1.1 billion miles, or 26 percent. In terms of hours flown, personal flying topped business flight. Personal aircraft flew almost 10,000 hours, 29 percent of the total, while business aircraft accounted for 9,545 hours or 28 percent.

U. S. AIRLINE FLEET
TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL
 As of December 31, 1972 to Date

Type of Aircraft, Number of Engines and Models	1972	1973	1974	1975 ^a	1976 ^{aP}
TOTAL	2,583	2,599	2,472	2,672	2,707
Four-Engine, TOTAL	917	866	730	710	692
Turbojets	<u>811</u>	<u>750</u>	<u>632</u>	<u>602</u>	<u>583</u>
Boeing 707	342	316	281	264	240
Boeing 720	57	45	35	29	25
Boeing 747	106	111	104	98	105
Convair 880	41	37	—	—	—
Convair 990	8	8	5	—	—
Lockheed L-1329	1	—	1	1	2
McDonnell Douglas DC-8	256	233	206	210	211
Turboprops	<u>79</u>	<u>74</u>	<u>67</u>	<u>68</u>	<u>69</u>
Boeing 377S	1	1	—	—	—
Lockheed 188	57	53	48	48	49
Lockheed 382	21	20	19	20	20
Piston-Engine	<u>27</u>	<u>42</u>	<u>31</u>	<u>40</u>	<u>40</u>
Boeing 377	1	1	—	—	—
Douglas DC-4	3	4	1	1	1
Douglas DC-6	21	31	28	36	36
Douglas DC-7	—	5	1	2	2
Lockheed 749	1	—	—	—	—
Lockheed 1049/1649	1	1	1	1	1
Three-Engine, Turbojets, TOTAL	759	872	923	994	1,022
Boeing 727	683	733	747	792	820
Lockheed L-1011	17	48	68	77	77
McDonnell Douglas DC-10	59	91	108	125	125
Twin-Engine, TOTAL	880	833	797	953	975
Turbojets	<u>548</u>	<u>523</u>	<u>523</u>	<u>575</u>	<u>600</u>
Boeing 737	153	152	150	147	152
British Aircraft Corp., BAC-111	58	31	36	30	31
Dassault MD-20	2	—	—	44	43
DeHavilland DH-125	—	—	—	1	3
Grumman G-1159	—	—	—	2	4
Lear Jet LR-23	—	—	3	—	1
Lear Jet LR-25	—	—	—	7	8
Lear Jet LR-35	—	—	—	1	4
McDonnell Douglas DC-9	335	340	334	341	352
Hamburger Flugzeugbau HF-320	—	—	—	1	1
Rockwell International NA-265	—	—	—	1	1

(Continued on next page)

U. S. AIRLINE FLEET
TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL (Continued)

Type of Aircraft, Number of Engines and Models	1972	1973	1974	1975 ^a	1976 ^{aP}
Twin-Engine, continued					
Turboprops	<u>239</u>	<u>230</u>	<u>199</u>	<u>205</u>	<u>191</u>
Aero Commander AC-680-V.	1	1	—	—	—
Beech 99	1	—	—	4	3
Convair 580	104	105	89	71	73
Convair 600, 640	34	32	29	32	25
DeHavilland DHC-6	13	9	8	21	18
Fairchild F-27	29	25	15	10	7
Fairchild FH-227	32	31	33	29	27
Grumman G-159	1	1	1	2	1
Hawker Siddeley HS748	—	1	1	1	1
Nihon YS-11	22	23	21	23	23
Nord ND-262	—	—	—	10	12
Short SC-7	2	2	2	2	—
Short SD-330	—	—	—	—	1
Piston-Engine	<u>93</u>	<u>80</u>	<u>75</u>	<u>173</u>	<u>184</u>
Aero Commander 500	1	1	1	3	—
Aero Commander 680E	1	—	1	—	3
Beech BE-18	—	—	1	3	4
Beech BE-50	1	—	—	—	—
Britten-Norman BN2	—	—	—	—	2
Cessna CE-310	—	1	1	—	—
Cessna 402	3	2	1	—	—
Cessna CE-421	—	—	—	1	—
Convair 240	1	—	—	—	—
Convair 340/440	7	6	6	14	15
Curtis CW-46	22	30	25	23	21
Dornier DO-28	—	—	—	—	1
Douglas DC-3	20	12	14	104	112
Fairchild FC-82	2	2	2	2	2
Grumman G-21	11	6	6	5	4
Grumman G-44	1	1	1	3	1
Grumman G-73	1	1	1	—	—
Martin 202	1	—	—	—	—
Martin 404	21	18	15	15	19
Single-Engine, TOTAL	13	15	12	8	11
Piston-engine	13	15	12	8	11
Helicopters, TOTAL	14	13	10	7	7
Turbine-Engine	<u>11</u>	<u>10</u>	<u>10</u>	<u>7</u>	<u>6</u>
Sikorsky S-61	7	7	7	7	6
Bell BL-206	4	3	3	—	—
Piston-Engine	<u>3</u>	<u>3</u>	—	—	<u>1</u>
Sikorsky S-58C	3	3	—	—	—
Hiller UH-12E	—	—	—	—	1

Source: Department of Transportation, Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).

a Includes large air taxi aircraft (gross takeoff weight 12,500 pounds and over).

p Preliminary.

**WORLD AIRLINE FLEET
TURBINE-ENGINEED AIRCRAFT**

By Model
1972 to Date

	1972	1973	1974	1975	1976 ^a
TOTAL AIRCRAFT IN SERVICE . . .	6,519	6,744	6,870	7,153	7,195
Number Manufactured in U.S.	4,276	4,452	4,561	4,866	4,891
Percent Manufactured in U.S.	65.6%	66.0%	66.4%	68.0%	68.0%
Turbojets, TOTAL	4,080	4,291	4,628	4,919	5,012
Aerospatiale Caravelle	245	253	232	215	187
Aerospatiale Corvette.	—	—	—	8	15
Airbus A300B.	—	—	3	8	24
BAC 1-11	159	166	168	163	163
BAC VC10.	36	34	33	25	26
BAC/Aerospatiale Concorde.	—	—	—	—	6
Boeing 707/720.	766	718	741	733	719
Boeing 727.	868	935	1,032	1,140	1,185
Boeing 737.	292	305	333	399	436
Boeing 747.	185	208	232	253	268
Cessna Citation	—	—	6	15	5
Convair 880/990	73	72	27	26	18
Dassault Mystere	8	22	59	57	35
Dassault Mercure	—	—	—	9	10
Douglas DC-8	534	514	514	494	482
Douglas DC-9	628	650	678	706	758
Fokker—VFW F28	39	44	52	73	81
Gates Learjet	30	38	43	60	17
Grumman Gulfstream 2	1	3	3	7	4
Hawker Siddeley HS125	11	15	31	35	7
Hawker Siddeley Comet	33	25	19	15	17
Hawker Siddeley Trident.	73	75	81	71	86
Ilyushin IL-62.	16	19	24	25	26
Lockheed Jetstar	—	1	1	1	1
Lockheed L-1011	4	34	75	109	126
McDonnell Douglas DC-10.	31	97	157	186	218
Tupolev TU-134.	27	33	38	51	59
Tupolev TU-154.	—	3	16	9	13
VFW-Fokker 614	—	—	1	2	6
Yakovlev 40	6	11	16	15	14
Other	15	16	13	9	—

(Continued on next page)

WORLD AIRLINE FLEET
TURBINE-ENGINEED AIRCRAFT (Continued)

By Model
 1972 to Date

	1972	1973	1974	1975	1976 ^a
Turboprops, TOTAL	1,866	1,843	1,972	1,916	1,914
Aero Spacelines Guppy	—	—	—	2	2
Aerospatiale 262	40	31	25	28	28
Antonov 10/12	1	—	—	1	2
Antonov 24	49	45	55	45	54
BAC Britannia	18	15	10	10	23
BAC Vanguard	37	27	28	23	25
BAC Viscount	156	155	138	115	104
Beechcraft 99	127	102	113	129	136
Beech King Air	5	13	19	22	12
Beech Westwind	5	1	9	7	8
Canadair CL-44	30	27	30	26	27
Convair 580	116	114	116	81	81
Convair 600/660	25	52	57	48	48
DHC Turbo Beaver	6	3	4	8	6
DHC Twin Otter	232	224	282	297	307
Embraer EMB 110	—	2	14	10	14
F-27/FH27	374	361	379	376	394
Grumman Goose	—	—	2	—	2
Grumman Gulfstream 1	1	2	1	2	2
Grumman Mallard	1	1	1	2	1
Handley Page Herald	37	31	31	26	29
Handley Page Jetstream	4	—	3	5	6
Hawker Siddeley Argosy	11	6	9	9	8
Hawker Siddeley 748	122	135	136	126	128
Ilyushin IL-18	78	73	74	80	88
Let 410	4	5	12	12	12
Lockheed Electra	108	114	112	102	102
Lockheed Hercules	31	32	30	29	32
Mitsubishi MU-2	5	6	4	6	15
NAMC YS-11	129	129	133	136	123
N.A. Commander	8	8	8	8	3
Pilatus Turbo-Porter	48	41	47	48	11
Piper Cheyenne	—	—	—	1	2
Saunders ST-27 Heron	2	2	4	5	7
Short Skyvan/Skyliner	24	29	41	39	35
Swearingen Merlin	1	2	—	2	1
Swearingen Metro	—	3	10	16	14
Other	31	52	35	34	22

(Continued on next page)

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT (Continued)

By Model
 1972 to Date

	1972	1973	1974	1975	1976 ^a
Turbine-Powered Helicopters, TOTAL	573	610	270 ^b	318	269
Aerospatiale Alouette	120	129	56	37	27
Aerospatiale SA-315B-LAMA	6	11	8	2	10
Aerospatiale Super Frelon	—	—	—	—	1
Aerospatiale/Westland SA 330	—	10	9	26	17
Aerospatiale/Westland SA 341	7	5	1	1	1
Agusta Bell 204/206	5	16	—	—	—
Bell 204	45	59	6	16	5
Bell 205	24	50	19	37	26
Bell 206	197	67	65	58	53
Bell 212	4	23	11	13	8
Bölkow B-105	—	6	1	4	6
Fairchild-Hiller F-1100	14	22	1	4	1
Hughes 500	34	86	43	55	50
Kawasaki KV-107	3	3	—	—	—
Sikorsky S-58T	17	23	13	14	17
Sikorsky S-55T	—	5	2	1	—
Sikorsky S-61	43	44	31	37	34
Sikorsky S-62	10	12	2	2	2
Sikorsky S-64	—	1	1	3	3
Westland WS-55/Wesser	38	36	—	4	—
Other	6	2	1	4	8

Source: "Air World Survey," Exxon International Company, (Annually).

NOTE: In order to provide the most complete coverage possible, the Exxon "Air World Survey" has been used as a source effective with this edition of "Aerospace Facts and Figures." The "Air World Survey" covers the world's airlines with the exception of Aeroflot, the USSR national airline and covers aircraft in Service on June 30.

a Air taxi operators no longer included.

b Scheduled helicopter services only, starting in 1974.

**WORLD AIRLINE TRAFFIC
SCHEDULED SERVICES**
Calendar Years 1960 to Date
(Millions)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles	Mail Ton-Miles
	Excludes U.S.S.R.				
1960	1,930	106	67,500	1,400	415
1961	1,940	111	72,500	1,615	490
1962	2,015	121	80,500	1,900	555
1963	2,130	135	91,500	2,130	590
1964	2,300	155	106,000	2,575	625
1965	2,550	177	123,000	3,290	755
1966	2,780	200	142,000	3,905	1,050
1967	3,280	233	169,500	4,470	1,295
1968	3,730	261	192,500	5,425	1,610
1969	4,170	293	218,000	6,685	1,720
1970	4,360	311	237,000	7,165	1,885
1971	4,390	333	252,000	7,870	1,750
1972	4,490	368	289,000	9,060	1,660
1973	4,680	405	323,000	10,680	1,700
1974 ^r	4,580	423	341,000	11,625	1,680
1975 ^r	4,670	436	357,000	11,810	1,660
1976 ^E	4,800	473	393,000	13,000	1,700
	Includes U.S.S.R.				
1970	N.A.	382	286,000	8,230	2,110
1971	N.A.	411	307,000	9,060	1,970
1972	N.A.	450	348,000	10,290	1,900
1973	N.A.	489	385,000	12,015	1,970
1974 ^r	N.A.	515	407,000	13,030	1,970
1975 ^r	N.A.	534	433,000	13,260	1,990
1976 ^E	N.A.	578	475,000	14,550	2,040

Source: International Civil Aviation Organization, "Development of World Scheduled Revenue Traffic" (Annually).

NOTE: Excludes states which were not members of ICAO on December 31, 1976. Figures represent revenue traffic on international and domestic scheduled services.

r Revised.

E Estimate.

N.A. Not available.

AIRLINE TRAFFIC
UNITED STATES SCHEDULED AIRLINES

Calendar Years 1960 to Date
(Millions)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles ^a	Mail Ton-Miles ^b
1960	998	58	38,863	880	250
1961	970	58	39,831	1,023	308
1962	1,010	63	43,760	1,388	350
1963	1,095	71	50,365	1,346	368
1964	1,189	82	58,494	1,634	383
1965	1,354	95	68,676	2,270	494
1966	1,482	109	79,889	3,048	762
1967	1,834	132	98,484	3,537	985
1968	2,146	150	113,958	3,872	1,268
1969	2,385	159	125,414	4,443	1,345
1970	2,418	170	131,710	3,862	1,484
1971	2,379	174	135,652	4,637	1,327
1972	2,376	191	152,406	5,198	1,205
1973	2,448	202	161,957	5,283	1,209
1974	2,258	207	162,919	5,332	1,163
1975	2,241	205	162,810	5,090	1,110
1976	2,320	223	178,988	5,399	1,126

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.

NOTE: Figures represent total scheduled service excluding nonrevenue operations of U.S. International and domestic certificated route air carriers.

a Includes freight plus express revenue ton-miles in scheduled and nonscheduled operations.

b U.S. mail ton-miles plus foreign mail ton-miles in scheduled and nonscheduled operations.

PASSENGER SERVICE
U. S. SCHEDULED AIRLINES
 Calendar Years 1960 to Date

Year	Domestic		International	
	Passenger Miles Flown (Millions)	Passengers Carried (Thousands)	Passenger-Miles Flown (Millions)	Passengers Carried (Thousands)
1960	30,556.6	52,377	8,306.2	5,499
1961	31,062.3	52,712	8,768.5	5,699
1962	33,623.0	55,950	10,138.0	6,598
1963	38,456.6	63,925	11,905.4	7,513
1964	44,141.3	72,988	14,352.4	8,775
1965	51,887.4	84,460	16,789.0	10,195
1966	60,590.8	97,746	19,298.4	11,646
1967	75,487.3	118,669	23,259.3	13,424
1968	87,507.6	134,423	26,450.6	15,728
1969	95,945.8	142,340	29,468.3	16,848
1970	104,146.8	153,662	27,563.2	16,260
1971	106,293.9	156,098	29,357.9	17,569
1972	118,138.0	172,452	34,268.3	18,897
1973	126,317.3	183,272	35,640.0	18,936
1974	129,732.4	189,733	33,186.2	17,725
1975	131,728.4	188,746	31,081.7	16,316
1976	145,270.8	206,274	33,716.7	17,039

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.

NOTE: Figures represent total scheduled passenger services excluding nonrevenue operations of certificated route air carriers.

REVENUES AND EXPENSES
TOTAL DOMESTIC OPERATIONS^a, ALL AIR CARRIER SERVICES
 Calendar Years 1960 to Date
 (Millions of Dollars)

Year	TOTAL Operating Revenues	TOTAL Operating Expenses	Operating Profit
1960	\$ 2,129	\$ 2,091	\$ 38
1961	2,245	2,244	1
1962	2,498	2,408	90
1963	2,722	2,580	142
1964	3,094	2,778	316
1965	3,608	3,165	443
1966	4,070	3,589	481
1967	4,887	4,476	411
1968	5,606	5,298	308
1969	6,438	6,156	282
1970	7,131	7,128	3
1971	7,753	7,496	257
1972	8,652	8,158	493
1973	9,694	9,200	494
1974	11,545	10,760	785
1975	12,020	11,902	117
1976 ^E	13,897	13,325	572

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.

a Includes domestics trunks, local service, Intra-Alaska, Intra-Hawaii, helicopters, other carriers, all-cargo, and regional carriers.

E Estimate.

SOURCES OF OPERATING REVENUE
TOTAL DOMESTIC OPERATIONS^a, ALL AIR CARRIER SERVICES
 Calendar Years 1960 to Date
 (Millions of Dollars)

Year	TOTAL Operating Revenues	Passenger	Mail (including subsidy)	Express and Freight	Excess Baggage	Other
1960	\$ 2,129	\$ 1,860	\$ 113	\$ 103	\$ 21	\$ 32
1961	2,245	1,951	130	115	20	29
1962	2,498	2,168	139	136	20	35
1963	2,722	2,375	143	152	17	35
1964	3,095	2,701	149	182	17	46
1965	3,608	3,142	157	220	12	77
1966	4,070	3,534	162	251	6	117
1967	4,887	4,260	170	287	7	163
1968	5,606	4,913	182	343	9	159
1969	6,438	5,662	186	401	10	179
1970	7,131	6,246	205	461	12	207
1971	7,753	6,736	227	527	13	250
1972	8,652	7,565	230	596	13	248
1973	9,694	8,379	263	694	14	344
1974	11,545	9,758	264	759	17	747
1975	12,020	10,123	253	782	19	843
1976 ^E	12,537	10,600	255	850	19	813

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.

a Includes domestic trunks, local service, Intra-Alaska, Intra-Hawaii, helicopter, other carriers, all-cargo, and regional carriers.

E Estimate.

**U. S. DOMESTIC AIRLINES
TOTAL ASSETS AND INVESTMENT IN FLIGHT EQUIPMENT**

Fiscal Years^a 1960 to Date

(Millions of Dollars)

Year	TOTAL NET ASSETS ^b	Value of Flight Equipment				Investment in Flight Equipment as a Percent of Total Assets
		TOTAL Gross Value	Less: Depreciation	Plus: Construction Work in Process	Equals: Net Value of Flight Equipment	
1960	\$ 1,760	\$ 2,174	\$ 890	\$ 90	\$ 1,374	78.1%
1961	2,099	2,719	1,062	77	1,734	82.6
1962	2,273	3,006	1,183	52	1,875	82.4
1963	2,211	3,132	1,341	27	1,818	82.2
1964	2,415	3,383	1,402	48	2,029	84.0
1965	2,816	3,844	1,505	52	2,391	84.9
1966	3,747	4,520	1,646	107	2,981	79.6
1967	5,003	5,485	1,805	153	3,833	76.6
1968	6,294	6,936	2,044	204	5,096	76.6
1969	7,107	8,003	2,334	195	5,864	82.5
1970	7,417	8,546	2,814	298	6,030	81.3
1971	7,664	9,375	3,231	203	6,347	82.8
1972	8,017	9,813	3,484	200	6,529	81.4
1973 ^r	13,967	12,377	4,495	350	8,232	58.9
1974 ^r	14,979	13,288	4,846	194	8,636	57.7
1975	15,098	13,668	5,278	192	8,582	56.8
1976	15,218	14,166	5,892	191	8,465	55.6

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics. (Air Carrier Financial Statistics.)

NOTE: 1960 through 1972: Includes data for trunk and local service carriers only; international carriers, helicopter service and air taxi operators excluded.

1973 to date: Pan American Airlines is reclassified as a trunk carrier. Data includes trunk, local service, helicopters, Alaskan, Hawaiian, regional, All-cargo, and "Other" carrier groups.

a Fiscal Years ending June 30.

b Comprises net investment in buildings and ground equipment, flight equipment, working capital, etc.

r Revised.

ACTIVE CIVIL AIRCRAFT

as of December 31
Years 1960 to Date

Year	Active Civil Aircraft								
	TOTAL	TOTAL Air Carrier ^a	General Aviation Aircraft					Rotorcraft ^b	Other ^c
			TOTAL	Fixed-Wing Aircraft		Other ^c			
				Multi-Engine	Single-Engine				
4-place & over	3-place & less								
1960	78,760	2,211	76,549	7,243	34,829	33,472	634	371	
1961	82,853	2,221	80,632	8,401	38,206	32,800	798	427	
1962	86,287	2,166	84,121	9,186	41,120	32,341	967	507	
1963	87,267	2,179	85,088	9,695	42,657	30,977	1,171	588	
1964	90,935	2,193	88,742	10,644	45,777	30,367	1,306	648	
1965	97,741	2,299	95,442	11,977	49,789	31,364	1,503	809	
1966	107,085	2,379	104,706	13,548	52,972	35,687	1,622	877	
1967	116,781	2,595	114,186	14,651	56,865	39,675	1,899	1,096	
1968	127,164	2,927	124,237	16,760	60,977	42,830	2,350	1,320	
1969	133,814	3,008	130,806	18,111	63,703	45,001	2,557	1,434	
1970	134,539	2,796	131,743	18,291	64,759	44,884	2,255	1,554	
1971	133,869	2,721	131,148	17,855	64,464	44,792	2,352	1,685	
1972	147,695	2,685	145,010	19,849	70,998	49,448	2,787	1,928	
1973	156,207	2,667	153,540	21,929	74,831	51,386	3,143	2,251	
1974	164,160	2,658	161,502	23,418	78,924	53,008	3,610	2,542	
1975	171,156	2,681	168,475	24,559	82,261	54,390	4,073	2,832	

Source: Federal Aviation Administration.

NOTE: Before 1971, an "active aircraft" was one certificated as eligible to fly. Now an "active aircraft" must have a current registration and have been flown during the previous calendar year.

a Registered, not necessarily in operation. Includes helicopters.

b Includes autogiros; excludes air carrier helicopters.

c Includes gliders, dirigibles and balloons.

ACTIVE AIRMAN CERTIFICATES HELD

as of December 31
1972-1976

	1972	1973 ^a	1974	1975	1976
<u>Pilots, TOTAL</u>	<u>750,869</u>	<u>714,607</u>	<u>733,728</u>	<u>728,187</u>	<u>744,246</u>
Students	181,477	181,905	180,795	176,978	188,801
Private	321,413	298,921	305,848	305,863	309,005
Commercial	196,228	182,444	192,425	189,342	187,801
Airline	37,714	38,139	41,002	42,592	45,072
Helicopter (only)	7,987	5,968	5,647	4,932	4,804
Glider (only) ^{b,c}	4,080	4,288	4,824	5,348	5,789
Other Pilot ^{b,c}	1,970	2,942	3,187	3,132	2,974
<u>Non-Pilots, TOTAL</u>	<u>315,348</u>	<u>304,747</u>	<u>314,394</u>	<u>323,934</u>	<u>334,681</u>
Mechanics ^b	201,700	193,337	198,863	205,436	212,303
Parachute Rigger ^b	7,287	6,941	7,800	8,327	8,718
Ground Instructor ^b	48,450	46,827	49,249	51,365	53,464
Dispatcher ^b	5,637	5,527	5,576	5,741	5,838
Control Tower Operator	23,353	23,250	23,342	23,956	24,584
Flight Navigator	2,957	2,636	2,509	2,321	2,214
Flight Engineer	25,964	26,229	26,955	26,788	27,560
<u>Flight Instructor Certificates^d</u>	<u>37,858</u>	<u>36,795</u>	<u>42,418</u>	<u>44,777</u>	<u>46,236</u>
<u>Instruments Ratings^d</u>	<u>187,909</u>	<u>185,969</u>	<u>199,323</u>	<u>203,954</u>	<u>211,364</u>

Source: Federal Aviation Administration, Office of Management Systems.

- a The decrease in the number of airmen resulted from a purging of the airmen certification files. During this process approximately 26 thousand duplicates or faulty records were eliminated.
- b No periodic medical examination required, therefore, no determination as to current activity can be made.
- c Gliders and lighter-than-air pilots are not required to have a medical examination, however, the totals above are the pilots who received a medical.
- d Special ratings shown on pilot certificates represented above, not additional certificates.

**GENERAL AVIATION
MILES AND HOURS FLOWN**

By Type of Flying
Calendar Years 1965 to Date

Year	TOTAL	Business		Commercial		Instructional		Personal & Other	
		Units	Per-cent	Units	Per-cent	Units	Per-cent	Units	Per-cent

MILES FLOWN BY TYPE OF FLYING—Millions of Miles

1965	2,562	1,204	47	461	18	359	14	538	21
1966	3,336	1,536	46	516	16	646	19	638	19
1967	3,440	1,431	42	569	16	713	21	727	21
1968	3,701	1,406	38	666	18	814	22	815	22
1969	3,926	1,426	36	723	19	910	23	867	22
1970	3,207	1,134	35	555	17	686	22	832	26
1971	3,143	1,129	36	506	16	651	21	857	27
1972	3,317	1,144	34	581	18	692	21	900	27
1973	3,729	1,344	36	688	18	778	21	919	25
1974	4,043	1,433	35	790	20	816	20	1,004	25
1975	4,238	1,487	35	818	19	829	20	1,104	26

HOURS FLOWN BY TYPE OF FLYING—Thousands of Hours

1965	16,733	5,857	35	3,348	20	3,346	20	4,182	25
1966	21,023	7,057	33	3,555	17	5,674	27	4,737	23
1967	22,153	6,578	30	3,918	18	6,262	28	5,395	24
1968	24,053	6,976	29	4,810	20	6,494	27	5,773	24
1969	25,351	7,064	28	4,928	19	7,023	28	6,336	25
1970	26,030	7,204	28	4,582	18	6,791	26	7,453	28
1971	25,512	7,141	28	4,264	17	6,416	25	7,691	30
1972	26,974	7,239	27	4,831	18	6,814	25	8,090	30
1973	30,048	8,558	28	5,608	19	7,646	25	8,236	28
1974	32,475	9,140	28	6,294	19	7,972	25	9,069	28
1975	34,165	9,545	28	6,480	19	8,174	24	9,966	29

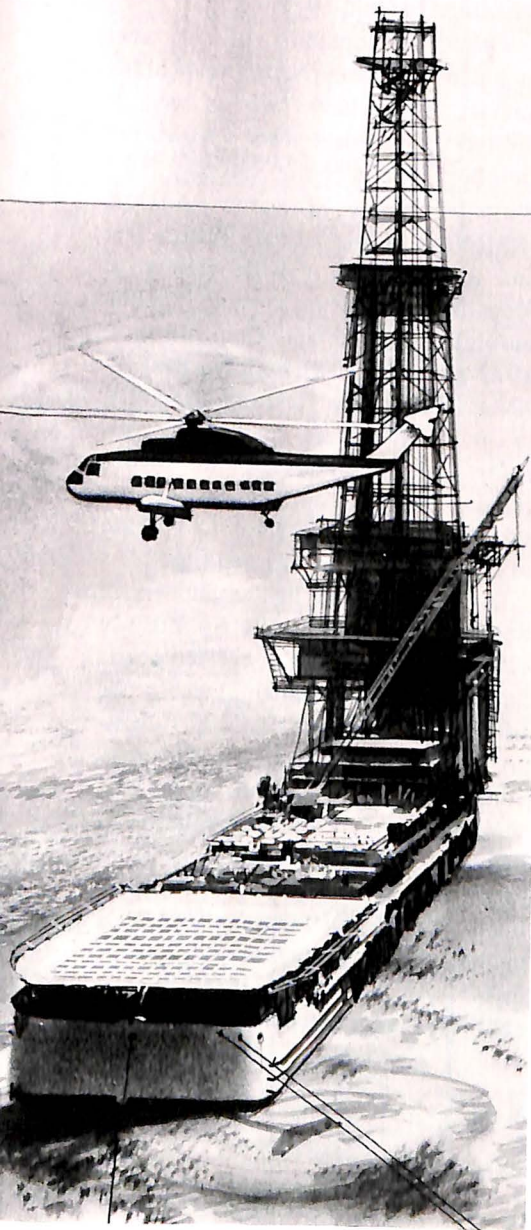
Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).

U. S. CIVIL AIRPORTS^a
By Length of Runway and Region
December 31, 1976

FAA Region	TOTAL	Airports by Length of Runway (in feet)		
		Under 5,000	5,000- 9,999	10,000 & Over
TOTAL	13,770	12,139	1,372	259
New England	547	461	66	20
Eastern	1,860	1,714	119	27
Great Lakes	2,772	2,560	177	35
Central	1,243	1,165	69	9
Southern ^b	1,555	1,333	206	16
Southwest	2,087	1,842	223	22
Rocky Mountain	947	799	141	7
Western	1,124	945	159	20
Northwest	807	723	71	13
Alaska	762	548	126	88
Pacific	51	44	6	1
South Pacific ^c	15	5	9	1

Source: Department of Transportation, Federal Aviation Administration.
a Includes seaplane bases, heliports, stolports and military fields having joint civil-military use.
b Includes Puerto Rico (23 airports) and the Virgin Islands (4 airports).
c American Samoa, Guam, Saipan, and Trust Territory.

Helicopters



The commercial helicopter industry marked a major milestone in 1976. It was the 30th anniversary of the industry's genesis on March 8, 1946, when a Bell Model 47 was granted the world's first commercial helicopter license. In that same year, Bell Helicopter Co. opened the first flight training school. The growth of the industry over three decades is indicated by the fact that, in 1976, there were 218 helicopter flight schools in the U.S. and Canada.

In 1976, civil helicopter operations in the United States, Canada and Puerto Rico reached record highs in practically all categories. The *AIA Directory of Helicopter Operators* showed large increases over the previous year in the number of civil helicopter operators and the number of helicopters they operate. The number of helicopters in service topped the 6,000 level for the first time; the 1976 figure of 6,181 represents a dramatic increase of 18.4 percent over the previous year. The number of operators rose by an even greater margin of more than 23 percent; civil operators totaled 2,330 in 1976, compared with 1,891 in 1975.

After reaching an all-time high in 1975, business use of helicopters set another record in 1976, with 1,082 corporations and executives operating 1,392 helicopters. The figures represent increases over 1975 of 29.9 percent in the number of users and 31.8 percent in helicopters owned, renewed evidence of growing business acceptance of the helicopter as a cost-effective tool, particularly in mining, construction, banking, logging and off-

shore and overland oil exploration.

There were also substantial gains in commercial and governmental use of helicopters. In the commercial category, the number of operators increased by 16.9 percent to a 1976 total of 911; helicopters in use climbed to 3,702 from the previous year's 3,342.

Government users totaled 337 in 1976, up from 279 in 1975, and the number of helicopters in federal, state and local government operations rose above the 1,000 mark for the first time, to 1,087. This compares with 824 in the previous year. The substantial increases in civil government users and helicopters in service reflects the 1976 availability of military surplus helicopters for purchase by state and local governments. For many small agencies, these surplus machines are a "foot in the door," serving to introduce communities to the helicopter's life-saving, crime-combatting and rescue capabilities as prelude to future operation of larger, more modern equipment.

A major step in civil helicopter development occurred in 1976 with the introduction of the first company-funded twin-turbine helicopters designed to meet civilian rather than military requirements. The Bell 222 mid-size commercial helicopter made its first flight in August 1976 and

entered production status. The prototype of the Sikorsky S-76 was completed in 1976 and was in flight test status in 1977. Initial deliveries are scheduled for mid-1978.

Other developments of the year included two Army/NASA vertical lift aircraft which have civil as well as military potential. First flown in October 1976 was the Sikorsky S-72 Rotor Systems Research Aircraft (RSRA), a flying laboratory for test and evaluation of a wide variety of rotor and propulsion systems. Rolled out late in 1976 and first flown in 1977 was the Bell Helicopter Textron XV-15 Tilt-Rotor Research Aircraft, designed to explore further the tilt-rotor concept in which the blades provide helicopter-like vertical lift for take-off, then tilt forward to operate as propellers in conventional flight.

A new type of helicopter service was introduced during 1976: the use of helicopters to clear congested ports. Saudi Arabia's Jiddah harbor is jammed with upwards of 200 freighters waiting to unload. Normal turnaround time is about 40 days, but ships have waited two, three and even five months. To relieve the congestion, Saudi Arabia is using a U.S. helicopter operator's fleet of Sikorsky S-58Ts to unload priority cargo at the rate of 2,000 tons a day, the first full-scale application of this technique.

**CIVIL HELICOPTER OPERATORS AND HELICOPTERS OPERATED
IN THE UNITED STATES AND CANADA**

1960 to Date

Year	TOTAL	Users		
		Commercial	Companies and Executives	Government Agencies ^a
CIVIL HELICOPTER OPERATORS				
1960	318	193	94	31
1961	406	265	106	35
1962	503	322	145	36
1963	600	405	150	45
1964	710	451	212	47
1965	860	508	299	53
1966	933	519	353	61
1967	1,023	522	427	74
1969	1,379	689	596	94
1971	1,424	672	590	162
1972	1,491	758	566	167
1973	1,532	752	599	181
1974	1,536	725	608	203
1975	1,891	779	833	279
1976	2,330	911	1,082	337
HELICOPTERS OPERATED^b				
1960	936	705	134	97
1961	1,179	882	173	124
1962	1,319	994	213	112
1963	1,497	1,157	218	122
1964	1,767	1,333	311	123
1965	2,053	1,537	401	115
1966	2,318	1,699	475	144
1967	2,438	1,764	487	187
1969	3,433	2,390	770	273
1971	3,874	2,605	802	467
1972	4,185	2,992	745	448
1973	4,601	3,295	780	526
1974	4,819	3,418	778	623
1975	5,222	3,342	1,056	824
1976	6,181	3,702	1,392	1,087

Source: Aerospace Industries Association, Manufacturers' and owner/operators' reports.

^a Federal, state and local governments.

^b Includes helicopters on order.

**HELIPORTS AND HELISTOPS
IN THE UNITED STATES, CANADA, AND PUERTO RICO**

By Region
Selected Years 1970 to Date

Region	1970	1972	1973	1974	1975 ^r
TOTAL	2,310	2,326	2,384	3,014	3,268
(elevated)	(216)	(211)	(241)	(221)	(277)
New England	93	87	78	106	143
Middle Atlantic	514	571	581	741	684
East North Central	293	281	307	359	411
West North Central	107	109	110	111	98
South Atlantic	192	190	204	301	352
East South Central	47	65	64	86	107
West South Central	205	216	217	245	338
Mountain	157	168	176	216	241
Pacific	593	545	551	711	789
Other ^a	109	94	96	138	105

Source: Aerospace Industries Association.
 NOTE: Data for 1971 are not available. Totals include proposed facilities.
 a Includes Canada and Puerto Rico.
 r Revised.

**HOSPITAL HELIPORTS
IN THE UNITED STATES AND CANADA**

By Region
Selected Years 1970 to Date

Region	1970	1972	1973	1974	1975 ^r
TOTAL	285	354	384	489	565
New England	5	5	5	10	16
Middle Atlantic	29	43	42	51	55
East North Central	74	82	99	120	126
West North Central	18	22	21	26	22
South Atlantic	33	39	50	67	76
East South Central	5	18	18	24	29
West South Central	20	26	26	38	59
Mountain	24	29	32	41	56
Pacific	73	87	87	105	119
Canada	4	3	4	7	7

Source: Aerospace Industries Association.
 NOTE: Data for 1971 are not available. Totals include proposed facilities.
 r Revised.

HELICOPTER TRAFFIC
UNITED STATES SCHEDULED AIRLINES
 Calendar Years 1960 to Date
 (Thousands)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Ton-Miles
1960	2,219	430	9,475	1,054
1961	2,157	490	8,604	963
1962	1,518	359	8,192	897
1963	1,462	458	12,510	1,317
1964	1,976	608	16,003	1,668
1965	1,984	718	18,811	1,948
1966	2,241	1,067	25,420	2,562
1967	2,660	1,220	29,670	2,960
1968	2,547	1,042	24,856	2,482
1969	1,909	737	17,074	1,703
1970	1,427	573	11,341	1,167
1971	1,048	551	8,973	917
1972	1,022	587	10,009	1,020
1973	1,085	613	10,936	1,108
1974	1,029	592	10,298	1,055
1975	873	505	8,370	868
1976 ^E	709	444	7,490	755

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.

NOTE: Chicago suspended services indefinitely as of October 13, 1976. Carrier has been granted a waiver from submitting CAB Forms 41 and no reports will be required until such time as Chicago resumes service under its Certificate of Public Convenience and Necessity.

E Estimate.

**REVENUE TON-MILE TRAFFIC CARRIED
SCHEDULED HELICOPTER AIRLINES**
Calendar Years 1960 to Date
(In Thousands)

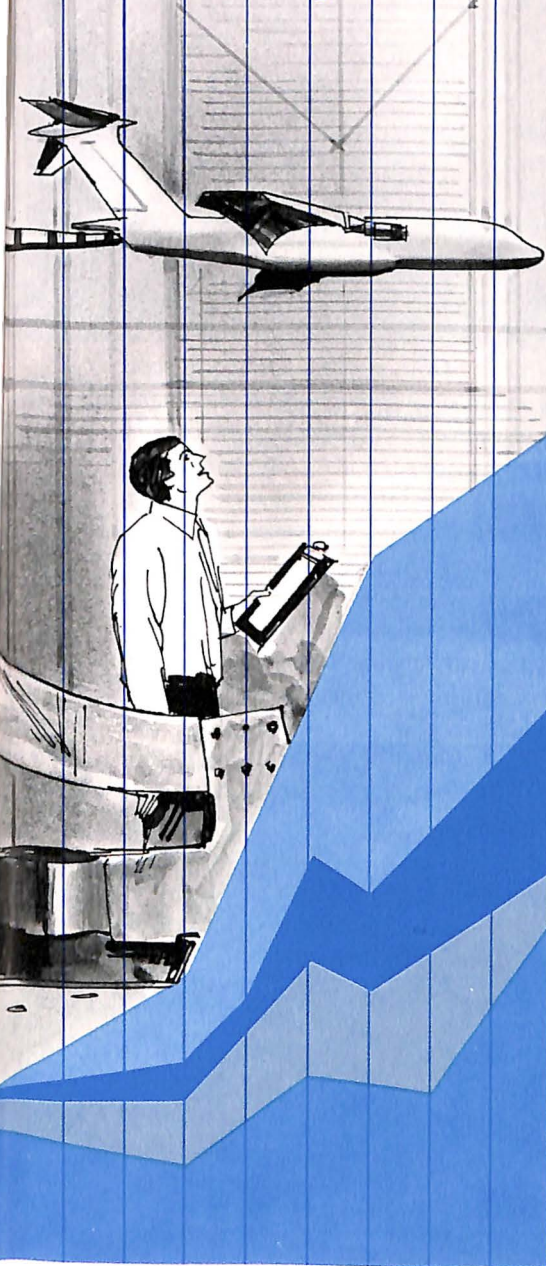
Year	TOTAL TON-MILES	Passenger ^r	U.S. Mail	Express	Freight
1960	1,054	916	91	40	7
1961	963	822	94	40	7
1962	897	780	65	44	6
1963	1,317	1,193	74	44	6
1964	1,668	1,525	92	45	6
1965	1,948	1,794	84	60	10
1966	2,562	2,422	60	70	10
1967	2,960	2,826	61	64	9
1968	2,482	2,367	57	48	8
1969	1,704	1,627	34	37	6
1970	1,167	1,133	5	25	4
1971	917	897	4	13	3
1972	1,020	1,000	5	12	3
1973	1,108	1,094	3	8	3
1974	1,055	1,047	4	2	2
1975	868	860	5	1	2
1976	755	749	3	—	2

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.

NOTE: Chicago suspended services indefinitely as of October 13, 1976. Carrier has been granted a waiver from submitting CAB Forms 41 and no reports will be required until such time as Chicago resumes service under Its Certificate of Public Convenience and Necessity.

r Effective January 1, 1970, the certificated route air carriers no longer report excess baggage separately. Excess baggage is now combined with passenger ton-miles and passenger weight standardized at 200 lbs.

Research and Development



Following a sharp decline in 1975, Department of Defense outlays for research, development, test and evaluation edged slightly upward in FY 1976. The 2 percent increase in funding, however, was well below the national inflation rate, so the apparent gain translates into a reduction when adjusted to constant dollar terms. Since industry contracts with DoD constitute the bulk of all aerospace R&D effort, the funding level represents a further depression of industry R&D activity.

DoD outlays for aerospace R&D totaled \$4.4 billion in FY 1976, up \$90 million from 1975 but well below the levels of the three preceding years. The FY 1976 gain over FY 1975 was compounded of increases in funding for missiles and astronautics research, coupled with another major reduction in aircraft RDT&E. Aircraft outlays dropped for the fifth consecutive year, to a FY 1976 level of \$1.6 billion, down \$95 million from the previous year.

In terms of dollar value, missile programs continue to be the largest area of DoD research and development effort in 1976/77. The principal program is the Navy's Trident I, a new sea-launched ballistic missile planned for operational service beginning in 1979. Another strategic weapon development is the Air Force's M-X advanced land-based ICBM; an option for deployment in the 1980s, M-X offers improvements over the operational Minuteman missiles in warhead weight, accuracy and survivability.

Other major missile programs in-

clude the Air Force AGM-86 Air Launched Cruise Missile and the Navy Tomahawk cruise missile; Aegis, a Navy system for fleet air defense; and the Army's Patriot, a long-range air defense system for field armies. Aside from these specific weapon systems, DoD is allocating a large portion of its R&D funding to a broad program of developing technology for ballistic missile defense.

In the aircraft category, the Air Force B-1 bomber is the major development; a decision as to whether the B-1 would progress to production status was expected in mid-1977. Other aircraft development programs, in order of 1976/77 funding emphasis, include: the Air Force F-16 air combat fighter, a highly maneuverable light-weight aircraft designed to complement the already operational F-15 air superiority fighter; the F-18 carrier-based air combat fighter, slated for operational employment in the 1980s; the Air Force E-3A Airborne Warning and Control System (AWACS), which advanced to production status in 1976 and was planned for first operational use late in 1977; the YAH-64 Advanced Attack Helicopter, slated to be the backbone of the Army's anti-armor helicopter force; and the Army

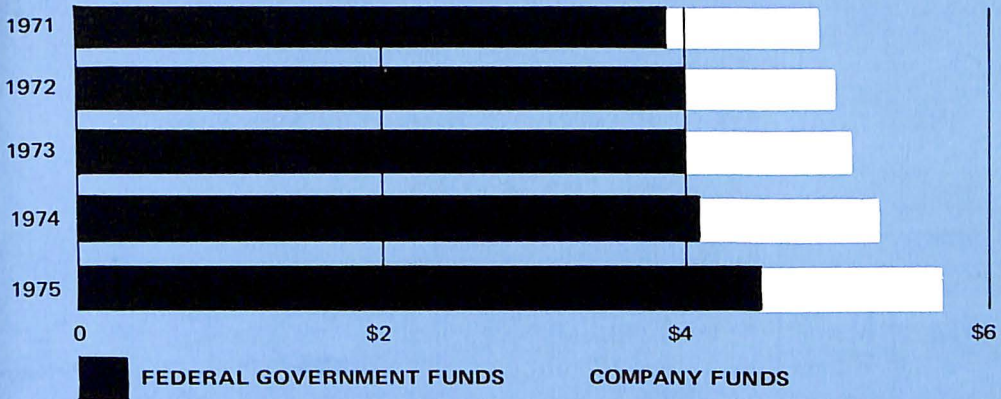
UH-60A Utility Tactical Transport Aircraft System, which continues as a development program although it is in initial production status.

The major DoD astronautics project, under Air Force cognizance, is the NavStar Global Positioning System, a 24-satellite network to be operational in the mid-1980s. Moderately funded in 1976/77, Air Force participation in the Space Shuttle program was slated to become the principal DoD astronautics project under FY 1978 funding plans. In addition to these specific projects, DoD is conducting a general program of space defense research and development, including improvement of the space surveillance system, development of satellite-borne long-wave infrared sensors and increasing survivability of satellite systems.

The aerospace industry is also participating in government R&D programs other than defense effort. Included are a wide range of NASA projects (covered separately in this volume under Space Programs); contracts with the Energy Research and Development Administration involving R&D in both aerospace and non-aerospace areas; and development of equipment and techniques for the Federal Aviation Administration.

AEROSPACE INDUSTRIAL RESEARCH AND DEVELOPMENT

(Billions of Dollars)



INDUSTRIAL RESEARCH AND DEVELOPMENT ALL INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1960 to Date
(Millions of Dollars)

Year	All Industries	Aerospace ^a Industry		
	TOTAL	TOTAL	Federal Government Funds	Company Funds
1960	\$ 10,509	\$ 3,514	\$ 3,150	\$ 364
1961	10,908	3,829	3,438	392
1962	11,464	4,042	3,588	454
1963	12,630	4,712	4,261	452
1964	13,512	5,078	4,621	457
1965	14,185	5,148	4,499	649
1966	15,548	5,526	4,724	802
1967	16,385	5,669	4,531	1,138
1968	17,429	5,776	4,544	1,232
1969	18,308	5,909	4,554	1,355
1970	18,062	5,245	4,032	1,213
1971	18,311	4,912	3,900	1,012
1972	19,383	4,992	4,043	948
1973	20,921	5,084	3,995	1,089
1974 ^r	22,399	5,318	4,140	1,177
1975	23,535	5,724	4,527	1,198

Source: National Science Foundation.

a Includes companies primarily engaged in the manufacture of aircraft and parts, SIC Code 372, and the manufacture of ordnance and accessories, including complete guided missiles and space vehicles, SIC Code 19.

r Revised.

INDUSTRIAL RESEARCH AND DEVELOPMENT IN AEROSPACE

By Type of Research and Fund Source
 Calendar Years 1960 to Date
 (Millions of Dollars)

Year	TOTAL AERO-SPACE	Applied Research and Development Funds			Basic Research Funds		
		TOTAL	Federal Government Contracts	Company	TOTAL	Federal Government Contracts	Company
1960	\$3,514	\$3,452	\$3,118	\$334	\$62	\$32	\$30
1961	3,829	3,789	3,417	372	40	20	20
1962	4,042	3,987	3,558	429	55	30	25
1963	4,712	4,653	4,229	424	59	31	28
1964	5,078	5,010	4,585	424	68	35	33
1965	5,148	5,074	4,457	617	74	42	32
1966	5,526	5,452	4,685	767	74	39	35
1967	5,669	5,596	4,497	1,099	73	34	39
1968	5,776	5,705	4,518	1,187	71	26	45
1969	5,909	5,842	4,529	1,313	67	25	42
1970	5,245	5,182	4,012	1,170	63	20	43
1971	4,912	4,858	3,880	978	54	20	34
1972	4,992	4,931	4,022	908	61	21	40
1973	5,084	5,034	3,975	1,059	50	20	30
1974 ^r	5,318	5,267	4,122	1,145	50	18	32
1975	5,724	5,678	4,510	1,168	47	17	30

Source: National Science Foundation.
 r Revised.

FEDERAL OUTLAYS FOR RESEARCH AND DEVELOPMENT

Fiscal Years^a 1960 to Date
(Millions of Dollars)

Year	TOTAL	DOD	NASA	AEC	Other
1960	\$ 7,738	\$ 5,654	\$ 401	\$ 986	\$ 697
1961	9,278	6,618	744	1,111	805
1962	10,379	6,812	1,257	1,284	1,026
1963	12,000	6,849	2,552	1,335	1,264
1964	14,694	7,517	4,171	1,505	1,501
1965	14,875	6,728	5,093	1,520	1,534
1966	16,002	6,735	5,933	1,462	1,872
1967	16,842	7,680	5,426	1,467	2,269
1968	16,865	8,148	4,724	1,593	2,400
1969	16,207	7,858	4,251	1,654	2,444
1970	15,632	7,568	3,753	1,616	2,695
1971	15,050	7,541	3,382	1,303	2,824
1972	16,629	8,275	3,422	1,552	3,380
1973	17,407	8,574	3,315	1,623	3,895
Year	TOTAL	DOD	NASA	ERDA	Other
1974	18,239	8,956	3,256	1,825	4,202
1975	19,525	9,341	3,266	2,277	4,641
1976	20,233	9,329	3,521	2,225	5,158
1977 ^E	22,574	10,391	3,557	3,168	5,458
1978 ^E	25,251	11,919	3,745	3,735	5,852

Source: "The Budget of the United States Government" (Annually).

NOTE: Includes military personnel, procurement, civil functions and some other items not included in other tables. Includes R&D facilities and administrative operating costs. AEC research and development programs transferred to ERDA with 1974 reorganization.

a For an explanation of the change in the Federal Government's Fiscal Year, see page 22.

E Estimate.

DEPARTMENT OF DEFENSE
OUTLAYS FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION
 By Agency
 Fiscal Years 1960 to Date
 (Millions of Dollars)

Year	TOTAL	Air Force	Navy	Army	Other
1960	\$ 4,710	\$ 2,348	\$ 1,129	\$ 1,021	\$ 212
1961	6,131	3,300	1,435	1,207	189
1962	6,319	3,493	1,364	1,280	180
1963	6,376	3,301	1,429	1,355	291
1964	7,021	3,722	1,578	1,338	383
1965	6,236	3,146	1,294	1,344	452
1966	6,259	2,948	1,407	1,412	492
1967	7,160	3,229	1,791	1,634	506
1968	7,747	3,800	2,003	1,434	510
1969	7,457	3,386	2,045	1,521	505
1970	7,166	2,937	2,084	1,665	480
1971	7,303	2,809	2,405	1,569	520
1972	7,881	3,205	2,427	1,779	470
1973	8,157	3,362	2,404	1,912	479
1974	8,582	3,240	2,623	2,190	529
1975	8,866	3,308	3,021	1,964	573
1976	8,923	3,338	3,215	1,842	528
Tr. Qtr.	2,206	830	778	437	161
1977 ^E	9,993	3,579	3,566	2,213	635
1978 ^E	11,350	4,129	3,992	2,471	758

Source: Department of Defense, Budget, Fiscal Year 1978.

NOTE: For RDT&E for aircraft, missiles and astronautics, see page 99.

Tr. Qtr.: For an explanation of the Transition Quarter, (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 22.

^E Estimate.

**DEPARTMENT OF DEFENSE
OUTLAYS FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION**
By Function
Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL All RDT&E Functions	Aerospace				Other
		TOTAL	Aircraft	Missiles	Astro- nautics	
1960	\$ 4,710	\$ 3,203	\$ 632	\$ 2,059	\$ 512	\$ 1,507
1961	6,131	4,090	547	3,025	518	2,041
1962	6,319	4,150	624	2,777	749	2,169
1963	6,376	3,731	544	2,241	946	2,645
1964	7,021	4,575	939	2,352	1,284	2,446
1965	6,236	3,839	1,017	1,901	921	2,397
1966	6,259	3,707	976	1,801	930	2,552
1967	7,160	4,533	1,048	2,502	983	2,627
1968	7,746	5,076	1,367	2,488	1,221	2,670
1969	7,459	4,600	1,031	2,410	1,159	2,859
1970	7,166	4,188	1,239	2,196	753	2,978
1971	7,303	4,226	1,699	2,008	519	3,077
1972	7,881	4,691	2,066	2,157	468	3,190
1973	8,157	4,586	2,036	2,038	512	3,571
1974	8,582	4,614	1,893	2,160	561	3,968
1975	8,866	4,389	1,698	2,176	515	4,477
1976	8,923	4,479	1,603	2,295	581	4,444
Tr. Qtr.	2,206	1,059	410	520	129	1,147
1977 ^E	9,993	N.A.	N.A.	N.A.	N.A.	N.A.
1978 ^E	11,350	N.A.	N.A.	N.A.	N.A.	N.A.

Source: Department of Defense, Budget Press Briefing, OASD (Comptroller), January 17, 1977.

NOTE: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 22.

^E Estimate.

N.A. Not available.

FEDERAL AERONAUTICS RESEARCH AND DEVELOPMENT

New Obligational Authority
 Fiscal Years 1967 to Date
 (Millions of Dollars)

Year	TOTAL	NASA	DOD	DOT
1967	\$ 1,613	\$ 105	\$ 1,199	\$ 309
1968	1,404	136	1,126	142
1969	1,300	169	1,161	-30 ^a
1970	1,882	199	1,641	42
1971	1,990	210	1,707	73
1972	2,295	236	1,964	95
1973	2,187	313	1,799	75
1974	2,030	278	1,678	74
1975	2,015	314	1,627	74
1976	2,351	325	1,941	85
Tr. Qtr.	584	83	480	22

Source: "Aeronautics and Space Report of the President" (Annually).

NOTE: Tr. Qtr.—Transition Quarter. For an explanation of the change in the Federal Government's Fiscal Year and the Transition Quarter, see page 22.

a Unobligated balances for SST research and development, rescinded in 1969.

RESEARCH AND DEVELOPMENT

**MILITARY PRIME CONTRACT AWARDS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION**

Fiscal Years 1973, 1974, 1975, 1976
(Millions of Dollars)

Program Categories	1973	1974	1975	1976
TOTAL, RDT&E	<u>\$6,284</u>	<u>\$5,815</u>	<u>\$6,303</u>	<u>\$6,871</u>
Research	267	278	234	276
Exploratory Development	662	506	530	593
Other Development	4,950	4,550	5,027	5,364
Management & Support	405	481	512	638
Aircraft, Total	<u>\$1,683</u>	<u>\$1,318</u>	<u>\$1,166</u>	<u>\$1,378</u>
Research	2	3	3	2
Exploratory Development	17	16	13	18
Other Development	1,662	1,297	1,146	1,345
Management & Support	2	2	4	13
Missile and Space Systems, Total	<u>1,901</u>	<u>1,706</u>	<u>1,895</u>	<u>2,305</u>
Research	47	58	23	34
Exploratory Development	73	75	72	107
Other Development	1,710	1,488	1,711	1,991
Management & Support	71	85	89	173
Electronics & Communications				
Equipment, Total	<u>1,270</u>	<u>1,318</u>	<u>1,767</u>	<u>1,491</u>
Research	28	31	26	33
Exploratory Development	126	113	96	144
Other Development	979	1,001	1,496	1,253
Management & Support	137	173	149	61
All Other, Total^a	<u>1,430</u>	<u>1,473</u>	<u>1,475</u>	<u>1,697</u>
Research	190	186	182	207
Exploratory Development	446	302	349	324
Other Development	599	764	674	775
Management & Support	195	221	270	391

Source: Department of Defense, "Military Prime Contract Awards by Service Category and Federal Supply Classification, Fiscal Years 1973, 1974, 1975, 1976."

NOTE: For a description of the Fiscal Year see page 22.

^a "All Other" includes ships, tank-automotive, weapons, ammunition and services.

* Less than \$500,000.

**MILITARY AIRCRAFT PROGRAMS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION^a**

**By Agency, Type and Model
Fiscal Years 1976, 1977 and 1978
(Millions of Dollars)**

Agency, Type and Model	1976 ^b	1977 ^E	1978 ^E
AIR FORCE			
B-1 Bomber	\$ 725.5	\$ 482.7	\$ 442.5
A-10 Close Air Support	52.5	12.9	15.7
F-15 Eagle	40.3	59.6	28.1
F-16 Air Combat Fighter.	285.3	259.1	192.8
E-3A AWACS	223.3	104.6	117.6
Adv. Medium STOL Transport	96.3	29.3	25.0
EF-111A Electronic Warfare Aircraft.	16.1	36.8	17.1
C-5	31.0	22.6	40.6
E-4 AABNCP	49.8	69.0	65.8
KC-135.	6.6	7.5	9.8
NATO AEW&C	—	—	15.7
NAVY			
A-4M Skyhawk	\$ 5.9	\$ 3.0	\$ 0.5
A-6E Intruder	6.1	1.9	4.1
A-7E Corsair II	7.3	0.2	0.4
CH-53E Sea Stallion	33.4	12.0	4.5
S-3A Viking	—	0.4	3.4
V/STOL	27.7	44.0	101.1
LAMPS Helicopter	27.9	73.7	107.3
F-18	131.2	346.9	626.6
ARMY			
AH-1S Cobra Tow	\$ 4.5	\$ 7.5	\$ 14.4
UTTAS.	112.4	75.5	34.8
Interim Scout Helicopter.	—	—	18.3
Adv. Attack Helicopter (AAH)	91.8	130.8	200.0
CH-47	12.1	25.9	32.0

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1978.

- a Total Obligational Authority.
- b Includes the Transition Quarter, see page 22.
- E Estimate.

**MISSILE PROGRAMS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION^a**

By Agency, Type and Model
Fiscal Years 1976, 1977 and 1978
(Millions of Dollars)

Agency, Type and Model	1976 ^b	1977 ^E	1978 ^E
AIR FORCE			
LGM-30F/G Minuteman II/III	\$ 154.7	\$ 102.4	\$ 70.9
AGM-69A/B SRAM.	3.1	15.5	12.2
AGM-65C LASER Maverick	23.2	11.1	9.8
AGM-65D IIR Maverick	4.3	11.2	38.0
Adv. Med. Range Air-to-Air	—	5.0	42.5
Ground Launch Cruise Missile	—	—	3.9
Aerial Targets & Drones	49.6	41.9	60.7
M-X, ICBM.	48.9	69.0	134.4
AGM-86, ALCM.	62.2	79.2	123.9
NAVSTAR Global Positioning System . .	87.7	62.0	69.0
Space Shuttle	26.8	60.1	129.7
NAVY			
Trident I	\$ 890.9	\$ 568.2	\$ 327.7
Sparrow	9.1	16.3	—
Sidewinder	6.5	2.4	5.9
Phoenix	—	9.6	7.1
Harpoon	20.8	—	—
Standard MR	18.0	9.1	22.1
Standard ER	18.0	9.2	22.0
Aegis	75.5	26.3	27.2
Harm	31.0	30.0	29.7
Tomahawk	130.7	119.5	234.3
ARMY			
Chaparral	\$ 6.6	\$ 5.0	\$ 5.2
Hawk	6.6	19.6	12.5
Stinger	25.3	25.8	17.7
Dragon	2.9	4.0	2.8
TOW	10.2	2.9	0.5
Lance	—	1.1	5.2
BMD Adv. Technology Program	122.2	102.7	107.3
Ballistic Missile Defense System	124.9	100.1	107.7
U.S. Roland	66.5	85.0	64.0
Hellfire	4.8	17.8	50.5
Patriot	170.0	180.2	214.6
General Support Rocket System	1.3	5.0	30.1

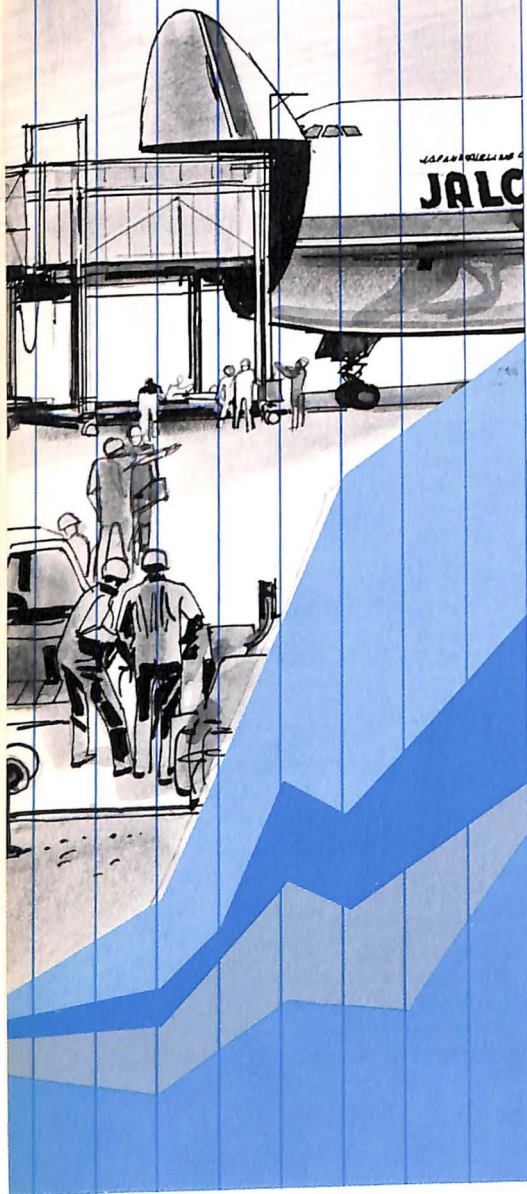
Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1978.

a Total Obligation Authority.

b Includes the Transition Quarter, see page 22.

E Estimate.

Foreign Trade



Exports of aerospace products reached an all-time high in 1976 and the aerospace industry generated a record aerospace trade balance of \$7.3 billion. The industry's performance in foreign trade represented a significant contribution to the U.S. economy, but it was not enough to offset heavy deficits in other trade areas—particularly oil—as the United States experienced its greatest-ever overall trade deficit.

Imports of fuel oil and other petroleum-related products constituted by far the major factor in the U.S. trade imbalance. Because of petroleum imports, U.S. total imports exceeded exports in 11 of the 12 months of 1976, resulting in a negative trade balance of \$7.8 billion. This compares with a 1975 trade surplus of \$9.6 billion.

The startling effect of rising oil prices and increasing U.S. consumption is underlined by the fact that the nation has had trade deficits in only four years since 1888, all of them in the 1970s. The first came in 1971, when a negative trade balance of \$2 billion was recorded; since then there have been deficits in 1972, 1974 and 1976, each larger than the preceding imbalance. The outlook remained bleak as Treasury officials predicted a new record deficit for 1977.

In this perspective, the consistently high aerospace trade surplus assumes greater importance. In contrast to the overall U.S. downturn in foreign trade, aerospace exports have exceeded imports by wide margins and the aerospace trade balance has reached new

peaks in each of the past four years.

The 1976 aerospace surplus of \$7.3 billion compares with a \$7.0 billion surplus in 1975. Exports amounted to \$7.8 billion, an increase of \$67 million over 1975. Imports fell off sharply, from \$747 million in 1975 to \$576 million in 1976.

As in previous years, shipments of civil aviation products accounted for the bulk of sales abroad. Shipments of civilian aircraft, engines, accessories, and other equipment amounted to \$5.7 billion in 1976, or more than 72 percent of all aerospace exports. The figure represented an increase over 1975 of \$361 million.

Once again sales of large commercial transports dominated civil exports. Although the overall dollar value of all transport deliveries—U.S. and foreign—declined substantially from the previous year, export dollar value actually increased. Commercial transport sales, near \$2.5 billion in 1976, accounted for almost one-third of all aerospace exports.

In other areas of civil aviation exports, there were increases in sales dollar value of general aviation aircraft, helicopters and aircraft engines.

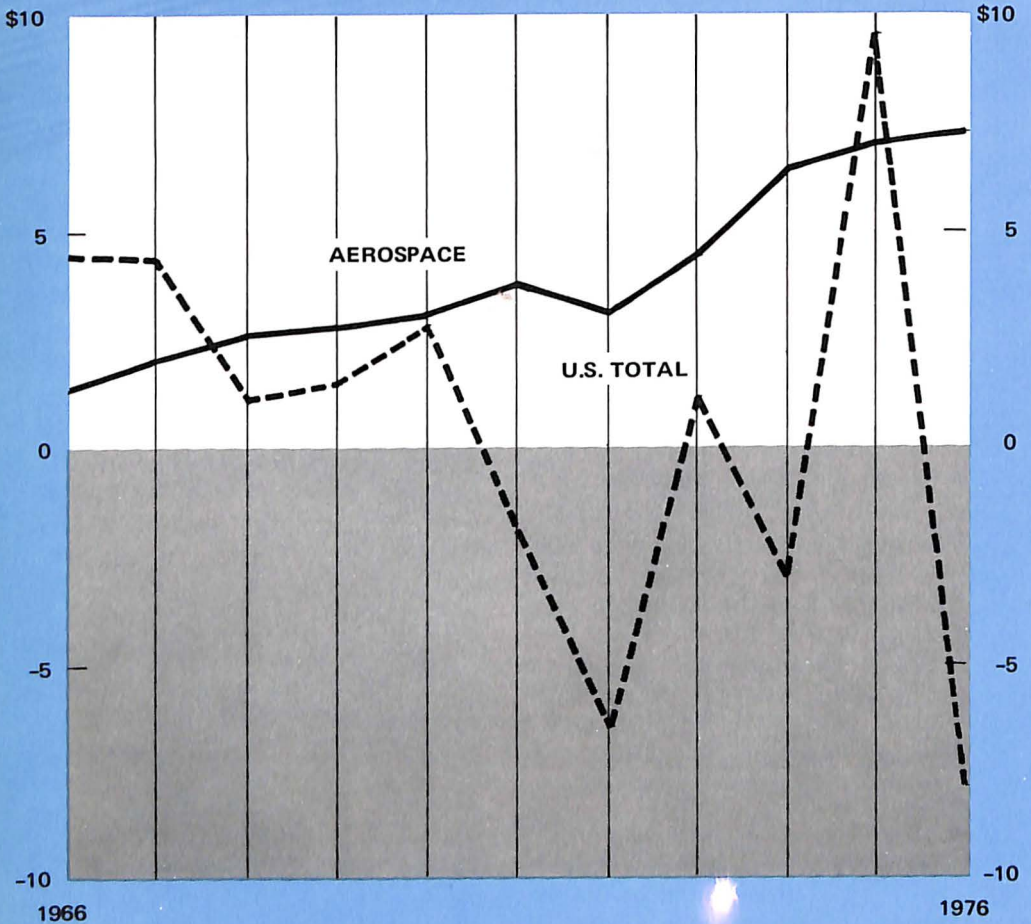
Sales of general aviation aircraft were up by \$50 million, helicopters by almost \$9 million and engines more than \$20 million.

Shipments of military equipment abroad declined considerably, from the 1975 level of \$2.5 billion to less than \$2.2 billion. Aircraft shipments, primarily fighters and bombers, totaled \$971 million and accounted for 45 percent of all military aerospace exports. Other major components of the military export category were deliveries of parts, accessories and equipment totaling \$652 million, and shipments of rockets, guided missiles and parts amounting to \$479 million. The latter figure represented a substantial \$182 million increase over 1975, or more than 60 percent, but it was nonetheless a small portion—about 6 percent—of overall aerospace exports.

Aerospace imports in 1976 dropped in all three reporting categories: aircraft, engines and parts. The greatest drop was in aircraft engines; dollar value fell off from \$229 million in 1975 to \$145 million in 1976, the lowest engine import value since 1971. Imports of aircraft parts declined by \$50 million and complete aircraft by \$37 million.

BALANCE OF TRADE

(Billions of Dollars)



Source: Department of Commerce

TOTAL AND AEROSPACE BALANCE OF TRADE

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL U.S. Trade Balance ^a	Aerospace			Aerospace Trade Balance as Percent of U.S. Total
		Trade Balance	Exports	Imports	
1960	\$ 5,369	\$ 1,665	\$ 1,726	\$ 61	31.0%
1961	6,096	1,501	1,653	152	24.6
1962	4,180	1,795	1,923	128	42.9
1963	6,061	1,532	1,627	95	21.7
1964	7,555	1,518	1,608	90	20.1
1965	5,875	1,459	1,618	159	24.8
1966	4,524	1,370	1,673	303	30.3
1967	4,409	1,961	2,248	287	44.4
1968	1,133	2,661	2,994	333	234.9
1969	1,599	2,831	3,138	307	177.0
1970	2,834	3,097	3,405	308	109.3
1971	-2,024 ^b	3,830	4,203	373	(c)
1972	-6,351	3,230	3,795	565	(c)
1973	1,222	4,360	5,142	782	356.8
1974	-2,996	6,350	7,095	745	(c)
1975 ^r	9,625	7,045	7,792	747	73.2
1976	-7,798	7,283	7,859	576	(c)

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410; "U.S. Imports, General and Consumption, Schedule A, Commodity and Country," Report FT 135; "Highlights of U.S. Export and Import Trade," FT 990 (All are monthly publications).

a U.S. Balance of Trade is the difference between exports of domestic merchandise, including Department of Defense shipments, and imports for consumption, (customs value base).

b First negative U.S. Balance of Trade since 1888.

c Not applicable.

r Revised.

EXPORTS OF U. S. AEROSPACE PRODUCTS

Calendar Years 1972 to Date
(Millions of Dollars)

	1972	1973	1974	1975 ^r	1976
GRAND TOTAL	\$3,794.5	\$5,141.9	\$7,094.8	\$7,791.9	\$7,858.7
TOTAL CIVILIAN	2,953.7	3,788.4	5,273.4	5,323.3	5,684.2
Complete Aircraft, TOTAL	<u>1,614.5</u>	<u>2,314.9</u>	<u>3,366.0</u>	<u>3,202.6</u>	<u>3,219.1</u>
Transports	1,119.1	1,663.7	2,654.6	2,396.7	2,475.6
General Aviation ^a	140.3	206.4	296.9	311.8	361.8
Rotary Wing	50.3	83.3	109.6	104.7	113.4
Other, Including Used	304.8	361.5	304.9	389.4	268.3
Engines, TOTAL	<u>184.3</u>	<u>175.7</u>	<u>228.9</u>	<u>231.1</u>	<u>253.7</u>
Jet & Gas Turbine	158.6	144.8	195.1	185.9	212.8
Internal Combustion	25.7	30.9	33.8	45.2	40.9
Parts, Accessories & Equipment for Aircraft and Engines, Including Spares, TOTAL	<u>1,154.9</u>	<u>1,297.8</u>	<u>1,678.5</u>	<u>1,889.6</u>	<u>2,211.4</u>
Engine Spares & Accessories	268.2	367.9	474.1	491.9	512.6
Other Spares & Equipment	886.7	929.9	1,204.4	1,397.7	1,698.8
TOTAL MILITARY	840.8	1,353.5	1,821.4	2,468.6	2,174.5
Complete Aircraft, TOTAL	<u>383.4</u>	<u>790.8</u>	<u>1,101.2</u>	<u>1,306.4</u>	<u>971.3</u>
Transports	124.6	131.2	190.3	235.0	150.5
General Aviation	1.4	1.0	0.8	0.2	0.5
Rotary Wing	53.1	37.6	50.1	123.3	101.8
Fighters & Bombers	186.5	588.4	845.2	905.3	516.2
Trainers	14.4	12.1	6.0	5.1	2.2
Other, Including Used	3.4	20.5	8.8	37.5	200.1
Engines, TOTAL	<u>56.5</u>	<u>45.8</u>	<u>49.5</u>	<u>94.2</u>	<u>71.6</u>
Jet & Gas Turbine	44.6	35.7	36.0	82.7	57.9
Missile Turbine	5.1	2.9	2.1	2.6	5.5
Internal Combustion	6.8	7.2	11.4	8.9	8.2
Parts, Accessories & Equipment, Including Spares, TOTAL	<u>299.8</u>	<u>415.1</u>	<u>514.5</u>	<u>770.6</u>	<u>652.3</u>
Engine Spares & Accessories	78.5	97.4	120.2	205.3	140.0
Other Spares & Equipment	221.3	317.7	394.3	565.3	512.3
Rockets, Guided Missiles & Parts, TOTAL	<u>101.1</u>	<u>101.8</u>	<u>36.2</u>	<u>297.4</u>	<u>479.3</u>
Complete Rockets & Guided Missiles	18.0	31.8	37.4	46.9	92.7
Parts & Accessories for Rockets & Guided Missiles	83.1	70.0	118.8	250.5	386.6

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

a Includes transports under 33,000 pounds.

r Revised.

U. S. AEROSPACE IMPORTS
Calendar Years 1960 to Date
(Thousands of Dollars)

Year	TOTAL	Aircraft ^a	Aircraft Engines	Aircraft Parts ^b
1960	\$ 60,901	\$ 6,841	\$ 7,388	\$ 46,672
1961	151,667	82,821	17,485	51,361
1962	128,204	54,280	9,707	64,217
1963	95,290	26,831	4,675	63,784
1964	90,062	21,505	6,573	61,984
1965	158,837	73,406	20,149	65,282
1966	303,264	162,645	32,774	107,845
1967	286,968	61,136	30,750	195,082
1968	333,469	110,817	37,913	184,739
1969	306,625	104,375	30,540	171,710
1970	308,334	48,297	33,686	226,351
1971	372,698	78,613	35,996	258,089
1972	564,989	101,170	155,127	308,692
1973	781,664	203,038	221,452	357,174
1974	744,538	124,006	235,743	384,789
1975	747,442	192,277	229,491	325,674
1976	576,050	155,451	144,857	275,742

Source: Bureau of the Census, "U.S. Imports, General and Consumption, Schedule A, Commodity and Country," Reports FT 110, 125, 135 (Monthly).

a Aircraft includes new and used airplanes, seaplanes and amphibians.

b Aircraft parts not elsewhere specified.

EXPORT-IMPORT BANK
GROSS AUTHORIZATIONS OF CREDITS AND GUARANTEES

Fiscal Years^a 1966 to Date
(Millions of Dollars)

Year	TOTAL Credits ^b	Credits in Support of Commercial Aircraft Exports			
		TOTAL	Percent of TOTAL Credits	Jets	Other
1966	\$ 1,149	\$ 99.3	8.6%	\$ 94.4	\$ 4.9
1967	2,723	806.3	29.6	789.1	17.2
1968	2,526	336.8	13.3	336.8	—
1969	1,296	204.7	15.8	197.5	7.2
1970	2,209	636.2	28.8	598.2	38.0
1971	2,362	490.4	20.8	484.2	6.2
1972	3,285	479.6	14.6	475.4	4.2
1973	4,053	722.4	17.8	689.7	32.7
1974	4,905	946.2	19.3	894.6	51.6
1975	3,812	732.3	19.3	691.2	41.1
1976	2,285	421.9	18.4	398.4	23.5
Tr. Qtr.	282	98.3	34.7	93.8	4.5

Year	TOTAL Guarantees ^c	Guarantees in Support of Commercial Aircraft Exports			
		TOTAL	Percent of TOTAL Guarantees	Jets	Other
1966	\$ 300	\$ 32.8	10.9%	\$ 27.9	\$ 4.9
1967	193	4.9	2.5	2.2	2.7
1968	290	63.6	21.9	50.0	13.6
1969	397	113.4	28.6	111.2	2.2
1970	612	100.2	16.4	79.2	21.0
1971	1,420	397.3	28.0	363.6	33.7
1972	1,743	202.7	11.6	175.9	26.8
1973	1,988	243.3	12.2	189.6	53.7
1974	1,594	157.7	9.9	133.0	24.7
1975	1,574	96.7	6.1	64.0	32.7
1976	1,661	107.2	6.4	87.2	20.0
Tr. Qtr.	272	62.6	23.2	58.7	3.9

Source: Export-Import Bank of the United States.

Tr. Qtr.: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Fiscal Year, see page 00.

a Fiscal Years ending June 30.

b "Credit" is a commitment of direct financing by the Export-Import Bank.

c "Guarantee" by the Export-Import Bank of principal and interest on a loan made by another institution such as a commercial bank.

EXPORTS OF CIVIL TRANSPORT AIRCRAFT
Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL		Under 33,000 Pounds Airframe Weight		33,000 Pounds and Over Airframe Weight	
	Number	Value	Number	Value	Number	Value
1960	159	\$ 480.1	67	\$ 15.8	92	\$ 464.3
1961	119	262.5	68	11.2	51	251.3
1962	172	259.2	122	13.8	50	245.4
1963	181	190.9	151	18.1	30	172.8
1964	225	211.1	193	29.1	32	182.0
1965	76	351.8	16	4.9	60	346.9
1966	82	420.8	6	0.1	76	420.7
1967	134	611.4	13	4.4	121	607.0
1968	240	1,200.2	19	9.9	221	1,190.1
1969	182	946.9	17	25.5	165	921.4
1970	184	1,283.1	19	6.8	165	1,276.3
1971	173	1,566.5	25	24.5	148	1,542.0
1972	147 ^r	1,129.1	43	10.0	104 ^r	1,119.1
1973	149	1,669.5	21	5.8	128	1,663.7
1974	241	2,664.2	14	9.6	227	2,654.6
1975 ^r	187	2,401.7	6	5.0	181	2,396.7
1976	163	2,476.9	4	1.3	159	2,475.6

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

r Revised.

EXPORTS OF CIVIL HELICOPTERS

Calendar Years 1966 to Date
(Millions of Dollars)

Year	TOTAL		Under 2,000 Pounds		2,000 Pounds and Over	
	Number	Value	Number	Value	Number	Value
1966	161	\$ 11.5	119	\$ 5.1	42	\$ 6.4
1967	223	25.2	166	9.9	57	15.3
1968	242	32.9	169	11.9	73	21.0
1969	252	29.1	212	12.7	40	16.4
1970	332	26.9	284	17.1	48	9.8
1971	298	45.7	230	17.9	68	27.8
1972	256	50.3	184	17.1	72	33.2
1973	428	83.3	317	33.1	111	50.2
1974	395	109.6	267	29.7	128	79.9
1975	336	104.7	210	27.5	126	77.2
1976	315	113.4	201	28.2	114	85.2

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

EXPORTS OF GENERAL AVIATION AIRCRAFT

Calendar Years 1965 to Date
(Millions of Dollars)

Year	TOTAL		Single Engine		Multi-Engine			
	Number	Value	Number	Value	Under 3000 Lbs.		3000 Lbs. & Over	
					Number	Value	Number	Value
1965	2,457	\$68.8	2,031	\$30.6	184	\$8.4	242	\$29.8
1966	2,985	89.1	2,387	35.2	261	13.4	337	40.5
1967	3,125	91.2	2,554	36.9	198	9.5	373	44.8
1968	2,890	101.3	2,295	36.1	163	8.5	432	56.7
1969	2,461	125.6	1,761	35.0	211	11.9	489	78.7
1970	2,037	112.5	1,493	31.5	142	8.7	402	72.3
1971	1,566	89.4	1,199	26.1	80	5.1	287	58.2
1972	2,072	130.3	1,546	34.6	92	5.0	434	90.7
1973	3,163	200.6	2,392	53.2	149	8.4	622	139.0
1974	4,263	287.2	3,367	81.4	116	6.4	780	199.4
1975	3,268	306.8	2,460	70.8	168	11.3	640	224.7
1976	3,214	360.4	2,374	73.9	228	17.3	612	269.2

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

NOTE: Excludes transports under 33,000 lbs., airframe weight.

EXPORTS OF MILITARY AIRCRAFT
Calendar Years 1972 to Date

	1972	1973	1974	1975	1976
NUMBER OF AIRCRAFT					
TOTAL	<u>561</u>	<u>608</u>	<u>736</u>	<u>951</u>	<u>761</u>
Bombers, Land & Carrier Type . . .	4	68	90	3	4
Fighters, Land & Carrier Type	106	208	309	475	334
Trainers	127	62	40	51	13
Utility, Personal & Liaison Aircraft .	42	19	15	2	2
Cargo Transports	48	45	47	51	32
Passenger Transports	27	—	—	—	—
Rotary Wing Aircraft	138	79	73	116	139
New Aircraft, NEC	45	97	140	237	179
Used or Rebuilt Aircraft	21	24	19	16	58
Airships & Balloons	3	6	3	—	—
VALUE—Millions of dollars					
TOTAL	<u>\$ 383.4</u>	<u>\$ 790.8</u>	<u>\$1,101.2</u>	<u>\$1,306.4</u>	<u>\$ 971.3</u>
Bombers, Land & Carrier Type . . .	3.1	69.6	105.4	1.3	1.3
Fighters, Land & Carrier Type	183.4	518.8	739.8	904.0	515.0
Trainers	14.4	12.1	6.0	5.1	2.2
Utility, Personal & Liaison Aircraft .	1.4	1.0	0.8	0.2	0.5
Cargo Transports	122.9	131.2	190.3	235.0	150.5
Passenger Transports	1.7	—	—	—	—
Rotary Wing Aircraft	53.1	37.6	50.1	123.3	101.8
New Aircraft, NEC	0.9	19.4	6.9	33.2	144.6
Used or Rebuilt Aircraft	2.4	1.0	1.8	4.3	55.6
Airships & Balloons	0.1	0.1	0.1	—	—

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

NEC Not elsewhere classified.

EXPORTS OF USED AIRCRAFT

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL		Civil		Military	
	Number	Value	Number	Value	Number	Value
1960	634	\$ 26.2	564	\$ 25.7	70	\$ 0.5
1961	618	35.1	494	33.9	124	1.2
1962	511	37.5	382	36.6	129	0.9
1963	423	16.6	356	16.4	67	0.2
1964	489	30.7	288	27.9	201	2.8
1965	474	39.7	407	39.0	67	0.7
1966	397	45.7	364	30.7	33	15.0
1967	391	85.5	362	60.2	29	25.3
1968	304	75.5	290	68.7	14	6.8
1969	382	137.7	379	137.7	3	(a)
1970	361	106.1	358	104.0	3	2.1
1971	419	205.3	413	205.2	6	0.1
1972	471	301.4	450	299.0	21	2.4
1973	621	358.5	597	357.5	24	1.0
1974	709	301.1	690	299.3	19	1.8
1975	597	391.3	581	387.0	16	4.3
1976	650	319.5	592	263.9	58	55.6

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

a Less than \$0.05 million.

EXPORTS OF NEW AND USED CIVIL AIRCRAFT ENGINES

Calendar Years 1960 to Date

(Millions of Dollars)

Year	TOTAL		Jet and Gas Turbine		Internal Combustion	
	Number	Value	Number	Value	Number	Value
1960	3,725	\$ 70.7	480	\$ 47.5	3,245	\$ 23.2
1961	3,640	75.3	364	53.6	3,276	21.7
1962	3,690	63.0	341	44.8	3,349	18.2
1963	3,143	45.1	253	25.7	2,890	19.4
1964	4,062	46.7	247	25.0	3,815	21.7
1965	3,330	56.2	372	38.8	2,958	17.4
1966	4,006	77.0	564	49.3	3,442	27.7
1967	4,236	101.2	756	69.6	3,480	31.6
1968	3,279	115.6	866	92.4	2,413	23.2
1969	4,178	102.4	759	82.0	3,419	20.4
1970	3,790	117.6	634	98.4	3,156	19.2
1971	3,530	148.5	707	128.6	2,823	19.9
1972	3,823	184.3	592	158.6	3,231	25.7
1973	5,017	175.7	641	144.8	4,376	30.9
1974	4,924	228.8	801	195.0	4,123	33.8
1975	4,678	231.0	876	185.9	3,802	45.1
1976	4,243	253.7	745	212.8	3,498	40.9

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).
r Revised.

EXPORTS OF HELICOPTERS

By Selected U.S. Manufacturers
Calendar Years 1972 to Date

	1972	1973	1974	1975	1976
NUMBER EXPORTED					
TOTAL	<u>259</u>	<u>413</u>	<u>420</u>	<u>437</u>	<u>369</u>
Canada & Greenland	75	68	67	67	45
Latin America	63	82	103	80	78
Europe	58	126	121	103	82
Middle East	—	2	28	58	49
Asia	34	86	61	72	68
Oceania	12	27	31	19	34
Africa	7	22	9	21	13
Countries not identified . .	10	—	—	17	—

VALUE—Millions of Dollars^a

	\$ <u>73.7</u>	\$ <u>84.8</u>	\$ <u>123.7</u>	\$ <u>219.9</u>	\$ <u>181.1</u>
TOTAL					
Canada & Greenland	11.2	11.2	13.1	20.4	12.1
Latin America	14.2	23.8	24.5	35.9	24.2
Europe	23.8	32.0	63.4	58.7	57.7
Middle East	—	0.1	4.9	40.4	46.2
Asia	8.5	12.7	14.2	21.9	30.9
Oceania	0.6	1.7	2.5	3.7	7.8
Africa	0.7	3.3	1.1	2.2	2.2
Countries not identified . .	14.7	—	—	36.7	—

Source: Aerospace Industries Association, company reports from Bell, Boeing-Vertol, Enstrom, Hiller, Hughes and Sikorsky.
a Manufacturers' Net Billing Price.

EXPORTS OF GENERAL AVIATION AIRCRAFT

By Selected U. S. Manufacturers
Calendar Years 1972 to Date

	1972	1973	1974	1975	1976
NUMBER EXPORTED					
TOTAL	<u>2,233</u>	<u>3,531</u>	<u>4,248</u>	<u>3,512</u>	<u>3,539</u>
Canada & Greenland . .	283	429	514	610	637
Latin America	616	1,125	1,583	1,206	1,221
Europe	892	1,268	1,177	925	927
Asia	88	121	153	172	165
Oceania	132	219	450	237	382
Africa	222	269	371	362	207

VALUE (Millions of Dollars)^a

	<u>\$ 129.9</u>	<u>\$ 230.3</u>	<u>\$ 286.4</u>	<u>\$ 318.6</u>	<u>\$ 331.4</u>
TOTAL					
Canada & Greenland . .	11.3	19.7	23.2	26.0	31.9
Latin America	42.9	69.1	99.1	102.4	101.4
Europe	47.6	89.1	92.9	90.4	101.6
Asia	9.2	10.0	21.6	34.5	44.2
Oceania	5.3	17.1	21.0	18.9	20.2
Africa	13.6	25.3	28.6	46.4	32.1

Source: General Aviation Manufacturers' Association.

NOTE: Data are based on exports reported by Beech, Bellanca, Cessna, Gates Learjet, Grumman American Aviation, Lake, Maule, Mooney, Piper, Rockwell and Swearingen of new civil aircraft.

^a Manufacturers' Net Billing Price.

EXPORTS OF COMMERCIAL TRANSPORT AIRCRAFT
33,000 Pounds and Over, Airframe Weight
Calendar Years 1972 to Date

	1972	1973	1974	1975	1976
TOTAL UNITS	104	128	227	181	159
Canada	9	11	15	18	1
Latin America	7	6	31	27	15
Europe	38	65	91	67	50
Middle East	6	3	16	11	31
Asia	32	18	49	32	20
Oceania	2	5	11	9	4
Africa	10	20	14	17	38
TOTAL VALUE (Millions of Dollars) . .	\$ 1,119.1	\$ 1,663.7	\$ 2,654.6	\$ 2,396.7	\$ 2,475.6
Canada	41.7	178.0	187.2	162.4	6.2
Latin America	40.0	35.5	267.8	213.1	146.1
Europe	488.8	908.3	1,043.7	934.9	699.9
Middle East	42.5	42.0	162.5	264.1	649.2
Asia	358.8	255.2	686.4	524.4	411.2
Oceania	31.2	67.6	175.2	146.6	81.9
Africa	116.1	177.1	131.8	151.2	481.1

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).

Employment



Aerospace industry employment in 1976 dipped to a low of 899,000, but a 1977 survey indicated that the declining employment curve of recent years had bottomed and was due to swing upward.

Employment in 1976 was down to less than 60 percent of the industry's labor force in 1968, the peak year in which employment topped 1,500,000. Since then, employment has declined in every year except for temporary fluctuations in 1973 and 1974. There were slight increases in those years, due to a spurt in commercial aircraft production which more than offset continuing reductions in other areas of activity. Jetliner production fell off in 1975, largely accounting for the personnel declines of 1975 and 1976.

Overall employment in 1976 was 43,000 below the 1975 figure and there were decreases of varying degree in all categories of employment. The number of workers engaged in aircraft manufacture—including both civil and military airplanes, engines, parts and related equipment—dropped 29,000 to a total of 485,000. Within the aircraft category, the major reduction—more than 13,000—was in airframe workers. There was a drop of 8,000 in the aircraft engine and parts segment of the industry and a decline of 8,400 in aircraft parts and equipment workers.

The 1976 labor force of 899,000 included 422,000 production workers, down 33,000 from the previous year. This represented a further decrease in the number of production workers as a percentage of total industry employment; the ratio dropped from 50

percent in 1974 to 48 percent in 1975 and to less than 47 percent in 1976. Average hourly earnings of production workers increased about 7.5 percent to \$6.45.

Employment of scientists and engineers in aerospace research and development programs totaled 67,400, approximately the same as the previous year's level but well below other years of the 1970s and the latter 1960s. In the industry's peak year of 1968, aerospace R&D-engaged scientists and engineers numbered more than 101,000 and they represented almost 27 percent of all U.S. scientists and engineers working on R&D projects. The percentage has since dropped to 1976's 18.6 percent, reflecting a continuous decline in *real* aerospace R&D activity despite apparent, inflation-induced gains in R&D sales volume.

A reversal of recent downward trends in aerospace employment was forecast by an AIA employment survey conducted early in 1977. The survey

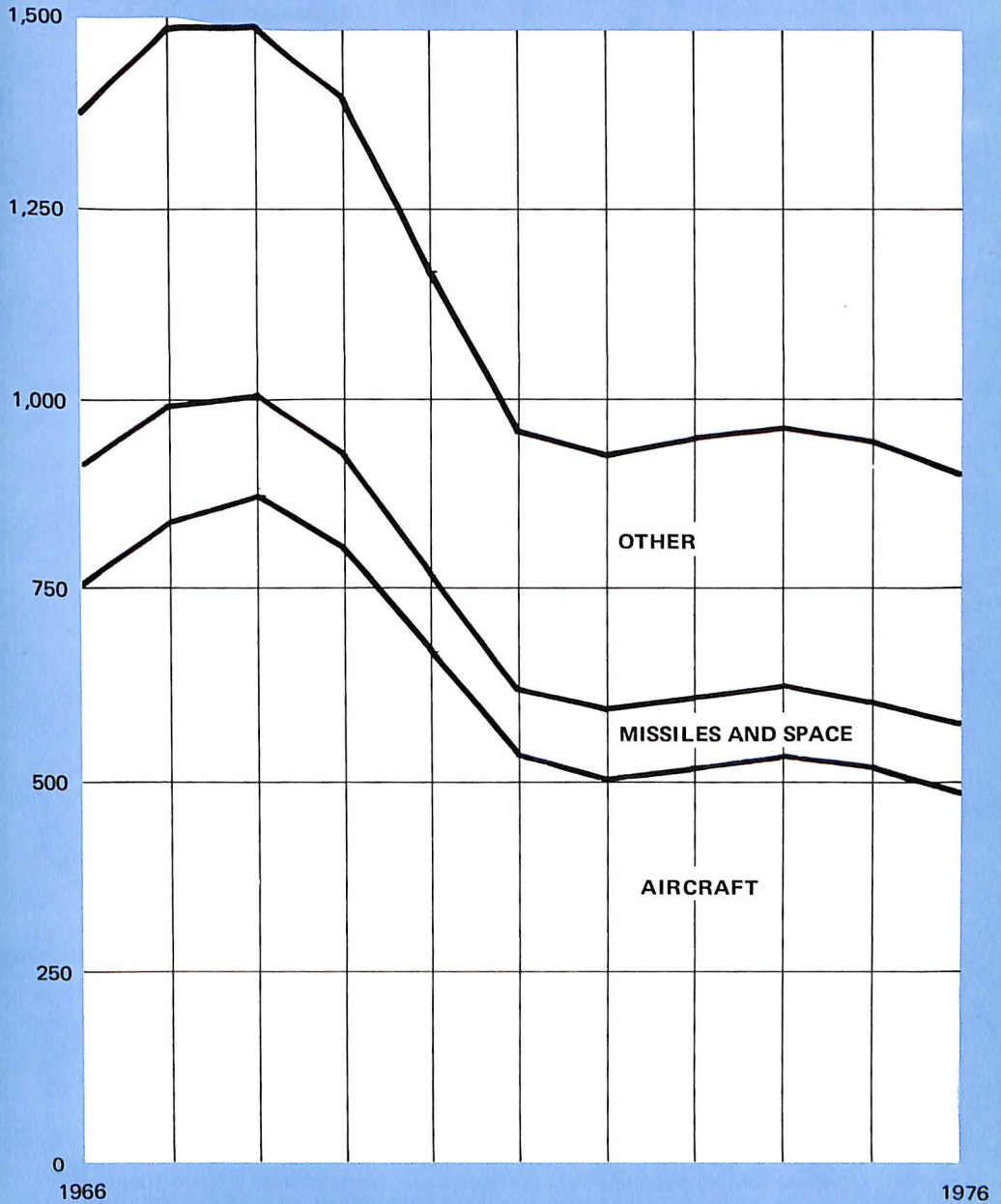
indicated gains in all major occupational groups in 1977 and 1978 and a rise in overall employment levels to 916,000 by year-end 1977 and 935,000 by the end of 1978. These projections represent gains of 2 percent in 1977 and 2.1 percent in 1978.

Principal reason for the predicted increases, the survey concluded, was renewed vigor in the aircraft manufacturing segment of the industry. The expectation of increasing aircraft manufacturing activity is due to improving financial posture of the U.S. scheduled airlines, hence new orders for commercial transports, and to continued growth in helicopter production.

The survey also forecast employment gains in both 1977 and 1978 for the avionics, non-aerospace products and basic research categories of industry effort. Employment in missile and space programs was expected to decline further in 1977 but to swing upward in 1978 due to increasing activity associated with NASA's Space Shuttle.

AEROSPACE INDUSTRY EMPLOYMENT

(Thousands of Employees)



Source: Aerospace Industries Association

AEROSPACE EMPLOYMENT

Calendar Years 1961 to Date
(Thousands of Employees)

Year	TOTAL	Aircraft	Missiles & Space	Communi- cations Equipment	Other
TOTAL EMPLOYMENT					
1961	1,178	610	152	160	256
1962	1,270	638	165	193	274
1963	1,267	639	173	183	272
1964	1,209	605	166	171	267
1965	1,175	624	155	145	251
1966	1,375	753	159	166	297
1967	1,484	834	157	179	314
1968	1,502	852	150	184	316
1969	1,402	804	124	179	295
1970	1,166	669	98	152	247
1971	951	531	88	129	203
1972	922	501	90	132	199
1973	948	514	95	134	205
1974	965	532	91	132	210
1975	942	514	90	136	202
1976	899	485	85	135	194
PRODUCTION WORKERS					
1961	612	348	56	75	133
1962	635	349	58	90	138
1963	625	351	55	82	137
1964	600	339	54	74	133
1965	597	356	51	62	128
1966	731	446	55	73	157
1967	804	502	55	78	169
1968	807	506	52	80	169
1969	746	464	41	86	155
1970	604	369	31	77	127
1971	480	285	26	66	103
1972	453	271	27	57	98
1973	475	281	31	59	104
1974	478	291	24	58	105
1975	455	273	25	58	99
1976	422	250	23	58	91

Source: Bureau of Labor Statistics "Employment and Earnings" (Monthly); Aerospace Industries Association estimates.

NOTE: Aerospace employment as shown is the sum of the estimated monthly average employment in the aircraft and missile and space industries (SIC 372 and 1925) plus estimated aerospace employment in the communications industry (SIC 3662) and estimated aerospace employment in the instruments and certain other industries (SIC 3811, 3821, 28, 35, 73, 89, etc.). Currently published data for the aircraft industry (SIC 372) include substantial missile and spacecraft employment. Thus, aircraft employment is actually lower, missile and space employment higher, than shown.

LABOR TURNOVER RATES IN THE AEROSPACE INDUSTRY

Calendar Years 1961 to Date
(Rates per 100 Employees per Year)

Year	Complete Missiles and Spacecraft	Aircraft			
		TOTAL	Airframes	Engines and Engine Parts	Other Parts & Equipment
ACCESSIONS					
1961	37.0	32.6	31.3	28.9	43.2
1962	37.2	35.2	32.9	30.5	49.3
1963	29.9	28.9	28.6	24.3	39.5
1964	23.5	24.7	23.0	20.2	38.6
1965	32.6	38.7	38.5	32.2	51.9
1966	44.1	48.6	47.3	43.2	61.0
1967	43.5	37.4	36.6	32.5	46.6
1968	40.7	28.1	27.1	22.9	39.8
1969	27.4	23.4	20.8	24.6	31.5
1970	19.3	16.1	13.9	15.1	26.2
1971	21.6	20.4	21.6	13.2	27.6
1972	31.2	24.0	22.8	21.6	33.6
1973	24.0	27.6	24.0	22.8	43.2
1974	24.0	25.2	24.0	19.2	38.4
1975	18.0	16.8	16.8	12.0	20.4
1976	18.0	16.8	16.8	13.2	25.2
SEPARATIONS					
1961	27.2	30.9	29.3	24.8	44.9
1962	31.6	31.3	29.0	23.9	47.9
1963	31.5	29.4	27.9	25.0	42.9
1964	39.1	31.0	28.9	28.0	42.9
1965	28.7	26.9	22.8	28.4	39.6
1966	30.8	31.5	28.1	31.0	46.9
1967	34.0	32.2	27.9	34.1	43.9
1968	45.4	32.3	30.2	31.3	41.1
1969	46.6	33.2	30.8	32.2	42.4
1970	48.7	41.7	43.8	32.1	47.4
1971	37.2	36.0	32.4	34.8	50.4
1972	26.4	25.2	22.8	19.2	38.4
1973	32.4	25.2	24.0	20.4	37.2
1974	30.0	22.8	20.4	20.4	33.6
1975	26.4	26.4	26.4	22.8	32.4
1976	20.4	21.6	20.4	15.6	33.6

Source: Bureau of Labor Statistics, "Employment and Earnings," (Monthly).

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY

Calendar Years 1961 to Date
(Thousands of Employees)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
TOTAL EMPLOYMENT				
1961	609.7	317.1	186.6	106.0
1962	638.4	334.7	198.9	104.9
1963	639.2	335.9	200.7	102.6
1964	605.4	319.2	189.1	97.1
1965	624.2	333.3	187.9	103.1
1966	753.3	417.3	208.1	127.8
1967	833.6	468.2	221.0	144.4
1968	852.0	487.8	216.4	147.8
1969	804.4	456.7	205.0	142.7
1970	668.7	369.6	179.9	119.2
1971	530.8	287.7	150.6	92.6
1972	501.1	272.2	138.5	90.5
1973	514.0	274.6	144.8	94.5
1974	532.0	289.3	146.2	96.5
1975	514.4	275.0	139.6	99.8
1976	484.7	261.7	131.6	91.4
PRODUCTION WORKERS				
1961	347.7	175.9	103.9	67.9
1962	349.1	175.1	108.5	65.6
1963	350.8	176.9	107.2	66.7
1964	338.6	175.7	99.2	63.7
1965	356.3	184.7	102.7	69.0
1966	446.4	239.8	119.4	87.2
1967	501.5	272.9	129.4	99.2
1968	505.5	280.9	123.9	100.7
1969	464.0	255.1	114.1	94.8
1970	369.3	197.0	95.0	77.3
1971	284.5	147.1	79.0	58.4
1972	271.2	139.5	73.5	58.2
1973	280.8	140.6	79.1	61.1
1974	290.5	147.4	80.3	62.8
1975	273.4	133.6	76.8	62.9
1976	250.0	124.5	70.7	54.9

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly).

NOTE: The above figures include substantial missile and spacecraft employment in recent years. They do not, however, represent total aerospace employment, estimates for which appear in preceding tables in this chapter.

EARNINGS IN AIRCRAFT AND PARTS PLANTS

Production Workers Only
(Includes Overtime Premiums)
Calendar Years 1961 to Date

Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
------	-------	-------------------------	----------------------------------	---

AVERAGE HOURLY EARNINGS

1961	\$ 2.77	\$ 2.78	\$ 2.81	\$ 2.70
1962	2.87	2.87	2.91	2.80
1963	2.95	2.95	2.99	2.89
1964	3.02	3.00	3.09	2.98
1965	3.14	2.15	3.17	3.08
1966	3.31	3.34	3.32	3.21
1967	3.45	3.49	3.42	3.35
1968	3.62	3.64	3.65	3.53
1969	3.86	3.90	3.87	3.76
1970	4.11	4.17	4.10	3.99
1971	4.35	4.41	4.38	4.16
1972	4.70	4.78	4.76	4.43
1973	5.01	5.13	5.06	4.66
1974	5.40	5.57	5.43	5.01
1975	5.99	6.20	6.03	5.52
1976	6.45	6.62	6.52	5.96

AVERAGE WEEKLY EARNINGS

1961	\$ 114.68	\$ 114.26	\$ 116.62	\$ 113.40
1962	119.97	119.97	120.77	118.72
1963	122.43	121.84	123.49	122.54
1964	125.03	123.30	127.31	126.35
1965	131.88	131.36	133.46	132.13
1966	143.32	142.95	144.09	142.85
1967	146.97	147.28	145.35	146.73
1968	152.04	152.88	151.11	151.44
1969	161.35	163.41	158.28	159.05
1970	168.51	170.97	166.05	166.78
1971	175.82	178.76	173.53	170.98
1972	193.44	197.66	193.17	183.10
1973	207.50	210.84	211.09	196.19
1974	218.70	219.46	223.72	210.92
1975	246.19	250.48	249.64	231.29
1976	263.16	271.42	262.10	245.55

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly).

NOTE: The production workers surveyed include substantial missile and spacecraft employment. See NOTE page 122.

WORK-INJURY RATES^a AEROSPACE AND ALL MANUFACTURING
Calendar Years 1971 to Date

	1971	1972	1973	1974	1975
ALL MANUFACTURING	16.1	15.6	15.3	14.6	12.5
Aircraft and Parts (SIC 372)	N.A.	8.0	7.4	7.2	5.9
Guided Missiles and Spacecraft (SIC 1925)	N.A.	4.7	4.5	4.2	3.3

Source: Department of Labor, Bureau of Labor Statistics.
 a Defined as the number of injuries per 100 man-years of work.
 N.A. Not available.

WORK STOPPAGES IN THE AIRCRAFT AND PARTS INDUSTRY
Calendar Years 1961 to Date

Year	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
1961	14	2,440	35,000
1962	19	23,000	555,000
1963	12	7,510	53,700
1964	19	20,300	160,000
1965	22	74,900	946,000
1966	23	38,000	204,000
1967	22	28,800	161,000
1968	46	45,500	594,300
1969	26	76,400	1,564,600
1970	12	6,800	552,500
1971	24	17,200	465,500
1972	18	20,800	148,100
1973	13	4,531	99,145
1974	27	16,800	370,000
1975	20	22,800	1,245,600

Source: Department of Labor, Bureau of Labor Statistics, Division of Wages and Industrial Relations.

NOTE: The "aircraft and parts industry" to which this table applies includes substantial missile and spacecraft employment. It represents approximately 60 per cent of total aerospace employment.

**EMPLOYMENT OF SCIENTISTS AND ENGINEERS
FOR RESEARCH AND DEVELOPMENT**

**Total and Aerospace
1960 to Date**

Year	TOTAL	Aerospace	Aerospace as a Percent of Total
AS OF DECEMBER 31			
1960	292,000	72,400	24.8%
1961	312,100	78,500	25.2
1962	312,000	79,400	25.4
1963	327,300	90,700	27.7
1964	340,200	101,100	29.7
1965	343,600	99,200	28.9
1966	353,200	99,300	28.1
1967	367,200	100,400	27.3
1968	376,700	101,100	26.8
1969	387,100	99,900	25.8
1970	384,100	92,600	24.1
1971	366,800	78,300	21.3
1972	349,900	71,200	20.3
1973	356,600	72,300	20.3
1974	358,200	70,800	19.8
1975 ^r	360,400	67,600	18.8
1976	362,500	67,400	18.6

Source: National Science Foundation.

NOTE: Scientists and engineers working less than full time have been included in terms of their full time equivalent number.

r Revised.

**EMPLOYMENT ON NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION PROGRAMS**

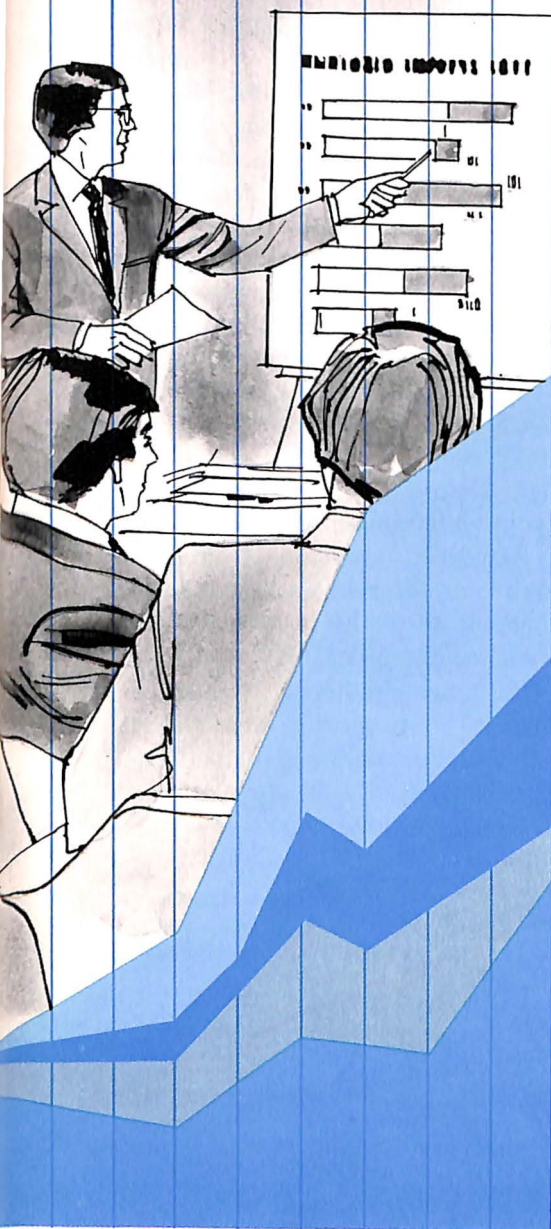
1960 to Date

Year	TOTAL	NASA Employees	Contractor Employees ^E
AS OF JUNE 30			
1960	46,768	10,268	36,500
1961	74,577	17,077	57,500
1962	137,656	22,156	115,500
1963	246,304	27,904	218,400
1964	379,084	31,984	347,100
1965	409,900	33,200	376,700
1966	393,924	33,924	360,000
1967	306,926	33,726	273,200
1968	267,871	32,471	235,400
1969	218,345	31,745	186,600
1970	160,850	31,350	129,500
1971	143,578	29,478	114,100
1972	138,800	27,500	111,300
1973	134,850	26,850	108,000
1974	125,220	25,020	100,200
1975	127,733	24,333	103,400
1976	130,739	24,039	108,000
AS OF SEPTEMBER 30			
1977 ^E	122,400	23,800	98,600
1978 ^E	130,900	23,700	107,200

Source: NASA, Briefing on the Budget of the United States, January 17, 1977.

^E Estimate.

Finance



The profit margin for the aerospace industry in 1976 increased over earlier years of the 1970s, reflecting general improvement in the nation's economy. However, aerospace earnings, expressed as a percentage of sales, remained well below the average for all manufacturing industries.

The aerospace industry recorded a 1976 net profit after taxes of 3.5 percent on sales. The figure compares with a 3.0 percent profit realized in 1975. The aerospace gain was not as large as percentage increases experienced by other segments of the manufacturing community. In the durable goods manufacturing industry, net profit after taxes rose a full percentage point, to 5.1 percent from the previous year's 4.1 percent. The average profit for all manufacturing corporations climbed to 5.3 percent in 1976, up from 4.6 percent in 1975.

In dollar terms, 1976 aerospace profit after taxes amounted to \$1.2 billion, up from \$927 million in 1975. Federal income taxes of \$736 million represented an increase of \$216 million over 1975.

The industry's total net worth at the end of 1976 was \$9.8 billion, which compares with \$8.7 billion for 1975. Net working capital rose from \$5.4 billion to \$5.5 billion.

With minor changes, the geographic distribution of military hardware contracts approximated that of 1975. In all three categories of prime contract awards—aircraft, missile/space systems and electronics/communication equipment—Pacific Coast companies dominated, as they had in earlier years. They

received 27.1 percent of aircraft contracts, 47.1 percent of missile/space contracts and 33.6 percent in electronics/communications.

In the aircraft category, the West North Central region climbed from fourth to second place, with 21.4 percent of 1976 awards. New England (16.3 percent) and the Middle Atlantic states (14.7 percent) placed third and fourth, the latter dropping from second place in 1975.

In missile/space contract awards, the order of rank in geographic distribution remained the same as in 1975; after Pacific Coast, New England was second (12.9 percent), the Mountain states third (9.3 percent) and the South Atlantic area fourth (9.1 percent).

Electronics/communications awards also remained constant, with Middle Atlantic second (17.6 percent), South Atlantic third (16.2 percent) and New England fourth (10.1 percent).

In defense research and development contracts awarded to business firms during FY 1976, Pacific Coast companies led by a wide margin, accounting for approximately half of the

\$6 billion worth of contractual effort. With 11.4 percent of the total R&D dollar value, the Middle Atlantic region supplanted New England as second place area. New England, at 10.9 percent, was third and South Atlantic, 8.6 percent, fourth.

Top ranking among defense contractors, in terms of fiscal year 1976 contract dollar value, was McDonnell Douglas Corp., which had placed fourth in the previous year. Lockheed Aircraft Corp., which had held number one position in 1975, was second in 1976. Northrop Corp. jumped from 12th to third place. Rounding out the FY 1976 top ten were General Electric Co., United Technologies, The Boeing Co., General Dynamics Corp., Grumman Corp., Litton Industries and Rockwell International.

Rockwell International, principal contractor for NASA's Space Shuttle program, led the list in value of NASA prime contracts awarded during FY 1976. Other leading contractors, in order of contract value, were McDonnell Douglas, Martin Marietta Corp., General Dynamics, Bendix Corp. and General Electric Co.

BALANCE SHEET
AEROSPACE COMPANIES

Calendar Years 1972 to Date
(Millions of Dollars)

	1972	1973	1974	1975 ^r	1976
Assets:					
Current Assets					
Cash	\$ 685	\$ 643	\$ 564	\$ 548	\$ 808
U.S. Government Securities	11	80	14	88	85
Other Securities	—	—	197	206	834
Total Cash and U.S. Government Securities	\$ 696	\$ 723	\$ 773	\$ 842	\$ 1,726
Receivables (total)	3,276	3,621	3,225	3,263	3,327
Inventories (gross)	10,918	11,559	12,180	12,285	12,903
Other current assets	608	525	436	527	593
Total Current Assets	\$ 15,498	\$ 16,428	\$ 16,614	\$ 16,917	\$ 18,549
Total Net Plant	4,108	4,376	4,077	4,326	4,600
Other Non-Current Assets	2,998	3,173	3,157	3,752	3,850
Total Assets	\$ 22,604	\$ 23,976	\$ 23,848	\$ 24,994	\$ 27,000
Liabilities:					
Current Liabilities					
Short Term Loans	\$ 649	\$ 934	\$ 1,114	\$ 523	\$ 165
Advances by U.S. Govt.	2,210	2,456	2,821	3,804	4,351
Trade accounts and notes payable	2,048	2,111	2,171	2,029	2,005
Income taxes accrued	638	720	821	788	1,092
Installments due on long term debts	272	359	382	291	443
Other current liabilities	4,048	4,223	4,104	4,080	5,001
Total Current Liabilities	\$ 9,865	\$ 10,803	\$ 11,413	\$ 11,514	\$ 13,057
Long Term Debt	4,351	4,159	3,753	4,322	3,603
Other Non-Current Liabilities	571	540	403	495	515
Total Liabilities	\$ 14,787	\$ 15,502	\$ 15,569	\$ 16,331	\$ 17,175
Stockholders' Equity:					
Capital Stock	\$ 2,763	\$ 2,758	\$ 3,033	\$ 3,083	\$ 3,402
Earned Surplus and Reserves	5,053	5,717	5,246	5,580	6,423
Total Net Worth	\$ 7,816	\$ 8,475	\$ 8,279	\$ 8,663	\$ 9,825
Total Liabilities and Stockholders' Equity	\$ 22,604	\$ 23,976	\$ 23,848	\$ 24,994	\$ 27,000
Net Working Capital	\$ 5,633	\$ 5,625	\$ 5,201	\$ 5,402	\$ 5,492

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

NOTE: Includes 72 companies classified in industry group 372 which filed reports with the Securities and Exchange Commission.

r Revised.

AEROSPACE FACTS AND FIGURES 1977/78

**INCOME ACCOUNTS
AEROSPACE COMPANIES**
Calendar Years 1972 to Date
(Millions of Dollars)

	1972	1973	1974	1975 ^r	1976
Net Sales	\$ 24,838	\$ 29,494	\$ 29,565	\$ 31,373	\$ 34,475
Net Profit from Operations	1,254	1,619	1,678	1,616	2,012
Total Income before Federal Income Taxes	1,103	1,449	1,328	1,348	1,800
Provision for Federal Income Taxes . . .	494	593	537	520	736
As a Percent of Total Income . . .	44.8%	40.9%	40.4%	38.9%	40.9%
Net Profit after Taxes	609	855	866	927	1,208
As a Percent of Net Sales	2.4%	2.9%	2.9%	3.0%	3.5%
Net Profit Retained in Business	340	571	562	623	860

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

NOTE: Does not include data for companies which produce aerospace products but are classified in other than industry group 372.

r Revised.

NEW PLANT AND EQUIPMENT EXPENDITURES
Calendar Years 1960 to Date
(Billions of Dollars)

Year	All Industries	All Manufacturing Industries	Durable Goods	Aerospace
1960	\$ 36.75	\$ 15.09	\$ 7.23	\$ 0.34
1961	35.91	14.33	6.31	0.30
1962	38.39	15.06	6.79	0.40
1963	40.77	16.22	7.53	0.45
1964	46.97	19.34	9.28	0.42
1965	54.42	23.44	11.50	0.46
1966	63.51	28.20	14.96	0.92
1967	65.47	28.51	14.06	0.93
1968	67.76	28.37	14.12	0.86
1969	75.56	31.68	15.96	0.83
1970	79.71	31.95	15.80	0.55
1971	81.21	29.99	14.15	0.38
1972	88.44	31.35	15.64	0.43
1973	99.74	38.01	19.25	0.53
1974	112.40	46.01	22.62	0.80
1975	112.78	47.95	21.84	0.94
1976 ^r	120.49	52.48	23.68	0.94
1977 ^E	134.58	59.16	26.88	1.06

Source: 1960-1967: U.S. Department of Commerce, Survey of Current Business January. 1970; 1968-1971: U.S. Department of Commerce, Securities and Exchange Commission, Joint Statistical Report; 1972-to-date U.S. Department of Commerce, Bureau of Economic Analysis, BEA 75-15, BEA 76-16, BEA 77-17.

E Estimate, based on a BEA survey conducted in January and February 1977.
r Revised.

**MILITARY PRIME CONTRACT AWARDS OF \$10,000 OR MORE
FOR SELECTED MAJOR MILITARY HARD GOODS**

By Geographic Region
Fiscal Years^a 1974, 1975, 1976

Program and Region	Millions of Dollars			Percent of Program Total		
	1974	1975	1976	1974	1975	1976
AIRCRAFT—TOTAL . . .	\$ 7,283	\$ 8,547	\$ 9,622	100.0%	100.0%	100.0%
New England	1,456	1,641	1,568	20.0	19.2	16.3
Middle Atlantic	1,148	1,771	1,410	15.8	20.7	14.7
East North Central . .	594	702	656	8.2	8.2	6.8
West North Central . .	1,289	1,069	2,064	17.7	12.5	21.4
South Atlantic	378	600	397	5.2	7.0	4.1
East South Central . .	74	61	78	1.0	0.7	0.8
West South Central . .	699	698	768	9.6	8.2	8.0
Mountain	71	88	76	1.0	1.0	0.8
Pacific ^b	1,575	1,917	2,605	21.6	22.4	27.1
MISSILE & SPACE SYSTEMS—TOTAL . . .	\$ 4,654	\$ 5,313	\$ 5,653	100.0%	100.0%	100.0%
New England	718	711	727	15.4	13.4	12.9
Middle Atlantic	538	370	414	11.6	7.0	7.3
East North Central . .	219	112	75	4.7	2.1	1.3
West North Central . .	117	389	464	2.5	7.3	8.2
South Atlantic	399	442	516	8.6	8.3	9.1
East South Central . .	72	82	135	1.5	1.5	2.4
West South Central . .	32	80	130	0.7	1.5	2.3
Mountain	425	550	528	9.1	10.4	9.3
Pacific ^b	2,134	2,577	2,664	45.8	48.5	47.1
ELECTRONICS & COMMUNICATIONS EQUIPMENT—TOTAL . .	\$ 4,184	\$ 5,286	\$ 5,003	100.0%	100.0%	100.0%
New England	487	576	507	11.6	10.9	10.1
Middle Atlantic	790	920	882	18.9	17.4	17.6
East North Central . .	280	287	333	6.7	5.4	6.7
West North Central . .	149	252	320	3.6	4.8	6.4
South Atlantic	661	879	808	15.8	16.6	16.2
East South Central . .	28	39	42	0.7	0.7	0.8
West South Central . .	219	240	227	5.2	4.5	4.5
Mountain	142	160	202	3.4	3.0	4.0
Pacific ^b	1,429	1,932	1,682	34.2	36.5	33.6

Source: Department of Defense, Office of the Secretary of Defense, Directorate for Information Operations, "Military Prime Contract Awards by Region and State, Fiscal Years 1974, 1975, 1976."

a Fiscal Years ending June 30.

b Includes Alaska and Hawaii.

**MILITARY PRIME CONTRACT AWARDS OF \$10,000 OR MORE
FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION**

By Region and Type of Contractors
Fiscal Year^a 1976

REGION	TOTAL	Type of Contractor		
		Educational Institutions	Other Non-Profit Institutions ^b	Business Firms
TOTAL—Millions of Dollars . .	\$ 6,770	\$ 388	\$ 325	\$ 6,057
New England	888	117	108	663
Middle Atlantic	735	33	11	691
East North Central	344	22	26	296
West North Central	284	2	2	280
South Atlantic	698	129	46	523
East South Central	110	2	4	104
West South Central	389	11	5	373
Mountain	136	19	1	116
Pacific ^c	3,186	53	122	3,011
PERCENT OF TOTAL	100.0%	100.0%	100.0%	100.0%
New England	13.1	30.1	33.4	10.9
Middle Atlantic	10.8	8.4	3.4	11.4
East North Central	5.1	5.6	8.0	4.9
West North Central	4.2	0.6	0.4	4.6
South Atlantic	10.3	33.3	14.1	8.6
East South Central	1.6	0.6	1.3	1.7
West South Central	5.7	3.0	1.5	6.1
Mountain	2.0	4.8	0.1	1.9
Pacific ^c	47.1	13.6	37.7	49.7

Source: Department of Defense, Office of the Secretary of Defense, Directorate for Information Operations "Military Prime Contract Awards by Region and State, Fiscal Years 1974, 1975, 1976."

^a Fiscal Year ending June 30.

^b Includes contracts with other government agencies.

^c Includes Alaska and Hawaii.

**DEPARTMENT OF DEFENSE
MAJOR CONTRACTORS**

Listed by rank according to net value of military prime
contracts awarded during fiscal year^a 1976
(Millions of Dollars)

	1972	1973	1974	1975	1976
U.S. TOTAL, ALL CONTRACTS. . .	\$33,362	\$31,627	\$34,357	\$39,501	\$41,976
McDonnell Douglas Corp.	1,700	1,143	1,309	1,398	2,465
Lockheed Aircraft Corp.	1,705	1,659	1,464	2,080	1,510
Northrop Corp.	370	446	491	620	1,480
General Electric Co.	1,259	1,416	1,211	1,264	1,347
United Technologies Corp.	996	741	1,212	1,407	1,233
Boeing Company	1,171	1,229	1,076	1,561	1,176
General Dynamics Corp.	1,289	707	1,853	1,289	1,073
Grumman Corp.	1,120	909	687	1,343	982
Litton Industries, Inc.	616	424	926	1,038	978
Rockwell International Corp.	703	704	819	732	966
Hughes Aircraft Co.	688	547	825	1,026	911
Raytheon Co.	507	680	740	681	784
Tenneco, Inc.	505	214	264	242	768
Sperry Rand Corp.	414	447	393	437	506
Westinghouse Electric Corp.	387	505	461	315	482
Chrysler Corp.	94	152	412	283	469
American Telephone and Telegraph Company	1,122	775	691	510	447
FMC Corp.	180	100	351	145	418
Honeywell, Inc.	334	272	281	292	386
Textron, Inc.	242	747	418	546	372
General Motors Corp.	256	249	300	390	345
RCA Corp.	275	254	243	286	330
LTV Corp.	449	347	269	366	316
Todd Shipyards Corp.	b	b	b	b	314
Teledyne, Inc.	180	188	228	236	296
TRW, Inc.	146	177	203	292	292
Ford Motor Co.	197	214	175	260	285
Standard Oil of California	146	132	267	301	281
International Telephone and Telegraph Corp.	258	249	237	233	260
International Business Machines Co.	260	302	252	360	256

Source: Department of Defense, "100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards," (Annually).

^a Fiscal Years ending June 30.

^b Not in top 100 companies for the listed year.

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MAJOR CONTRACTORS**

By rank according to net value of NASA prime
contracts awarded during Fiscal Year 1976
(Millions of Dollars)

Company	1972	1973	1974	1975	1976
TOTAL PROCUREMENTS	\$2,738	\$2,673	\$2,714	\$2,866	\$3,205
TOTAL Awards to Business Firms	2,143	2,064	2,119	2,255	2,536
Percent of TOTAL PROCUREMENTS	78%	77%	78%	79%	79%
Rockwell International Corp.	175	318	487	682	906
McDonnell Douglas Corp.	343	272	156	125	124
Martin Marietta Corp.	208	192	202	130	110
General Dynamics Corp.	67	80	80	85	76
Bendix Corp.	88	79	80	76	75
General Electric Co.	115	87	65	70	61
Lockheed Electronics Co., Inc.	24	29	35	46	56
Boeing Company	94	76	60	44	55
Hughes Aircraft Co.	22	21	18	26	48
RCA Corp.	57	38	35	40	47
Thiokol Corp.	3	4	17	29	47
TRW, Inc.	33	28	21	34	45
IBM Corp.	72	61	48	54	43
Sperry Rand Corp.	34	27	22	22	32
Computer Sciences Corp.	23	25	27	27	29
Planning Research Corp.	2	2	4	14	22
Ford Motor Company	36	38	77	32	20
Blount Bros. Corp.	a	a	a	a	20
United Technologies Corp.	16	25	40	36	18
Northrop Corp.	5	17	16	17	17
LTV Corp.	22	20	17	19	16
American Sciences & Engineering.	7	9	7	11	15
Singer Company.	10	7	4	9	15
Federal Electric Corp.	24	25	21	10	15
Grumman Aerospace Corp.	29	12	11	14	14
Global Associates	8	7	8	9	12
Lockheed Aircraft Corp.	6	7	8	7	11
Raytheon Company	2	1	8	7	11
Computer Sciences/Technicolor (JV).	(a)	2	9	10	11
Teledyne, Inc.	6	10	12	12	11

Source: National Aeronautics and Space Administration, "NASA Annual Procurement Report," (Annually).

a Not in list of major contractors for indicated year.

Glossary

Accessions, the total number of permanent and temporary additions to the employment roll, including both new and rehired employees (see **Labor Turnover**).

Aeronautics, the science that treats of the operation of aircraft; also, the art or science of operating aircraft.

AIA, Aerospace Industries Association of America, Inc., formerly Aircraft Industries Association.

Air Carriers, the commercial system of air transportation. Consists of scheduled domestic and (U.S.) international air carriers, supplemental and other carriers.

Aircraft, all airborne vehicles supported either by buoyancy or by dynamic action. Used in this volume in a restricted sense to mean an airplane—any winged aircraft, including helicopters but excluding gliders and guided missiles.

Aircraft Industry, the industry primarily engaged in the manufacture of aircraft, aircraft engines and parts, aircraft propellers and parts, and aircraft parts and auxiliary equipment. A sector of the aerospace industry.

Airframe, the structural components of an airplane, such as fuselage, empennage, wings, landing gear, and engine mounts, but excluding engines, accessories and other parts that may be replaced from time to time.

Airlines, see **Air Carriers**.

Appropriation (Federal Budget), an act of Congress authorizing an agency to incur obligations and make payments out of funds held by the Department of the Treasury.

Assets, Net, the sum of all recorded assets after reducing such amount by allowance or reserve for bad debts, depreciation and amortiza-

tion, but before deducting any liabilities, mortgages or other indebtedness.

Astronautics, the art and science of designing, building and operating manned or unmanned objects through space.

Average Weekly Hours, average hours for which pay was received; different from standard or scheduled hours.

Backlog, the sales value of orders accepted (supported by legal documents) that have not yet passed through the sales account.

Budget Authority, authority provided by the Congress, mainly in the form of **Appropriations** which allows Federal agencies to incur obligations to spend or lend money.

Constant Dollars, see **Deflators**.

Deflators (Constant Dollars), used to reduce a price level to that comparable with the price level at a given different time. The Gross National Product in constant dollars is arrived at by dividing components of the current dollar figures by appropriate price indexes. Several hundred price indexes are combined to "deflate" the current dollar series. Seasonal variations are eliminated from the price series used.

Depreciation, the general conversion of the depreciable cost of a fixed asset into expense, spread over its remaining life. There are a number of methods, all based on a periodic charge to an expense account and a corresponding credit to a reserve account.

Development, the process or activity of working out a basic design, idea or piece of equipment (see **Research**).

DOD, Department of Defense.

DOT, Department of Transportation.

Durable Goods Industry, comprises major manufacturing industry groups with Standard Industrial Classification Codes 19, 24, 25, and 32 through 39. All other major manufacturing industry groups in SIC Codes 19 through 39 are considered as nondurable goods manufacturing industry groups.

Earnings, the actual return to the worker for a stated period of time while rates are the amounts stipulated for a given unit of work or time. Irregular bonuses, retroactive items, payments of various welfare benefits, payroll taxes paid by employers are excluded.

Average Hourly Earnings, on a "gross" basis, reflecting not only changes in basic hours and incentive wage rates, but also such variable factors as premium pay for overtime and late shift work, and changes in output of workers paid on an incentive plan.

Average Weekly Earnings, derived by multiplying average weekly hours by hourly earnings.

ERDA, Energy, Research and Development Administration. ERDA was formed in 1974 to bring together activities previously scattered among several agencies. The major elements covered are nuclear energy, fossil energy, solar and geothermal energy, conservation through increased efficiency, and environmental controls.

Establishment, the basis for reporting to the Census of Manufactures. It is an operating facility in a single location. Where one facility engages in different lines of activity it is required to submit separate reports if the plant records permit such a

separation and if the activities are substantial in size.

Evaluation (Department of Defense), determination of technical suitability of material, equipment or a system, see **RDT&E**.

Expenditures (Federal Budget), see **Outlays**.

Exports, domestic merchandise including commodities which are grown, produced, or manufactured in the United States, and commodities of foreign origin which have been changed in the United States from the form in which they were imported, or which have been enhanced in value by further manufacture in the United States, and which are traded or sold to other nations.

FAA, Federal Aviation Administration (formerly the Federal Aviation Agency), part of the Department of Transportation.

Facility, a physical plant or installation, including real property, building, structures, improvements and plant equipment.

Fiscal Year (Federal Budget), until June 30, 1976, year beginning July 1 and ending June 30, and designated by the year in which it ends. Beginning October 1, 1976, the fiscal years run from October 1 through September 30. A three month **Transition Quarter** from July 1 through September 30, 1976, belongs to neither fiscal year.

Flyaway Value, includes the cost of the airframe, engines, electronics, communications, armament and other installed equipment.

FY, see **Fiscal Year**.

General Aviation, all civil flying except that of the trunk, regional and supplemental airlines.

GNP (Gross National Product), the

market value of the total output of goods and services produced by the Nation's economy before deduction of depreciation charges and other allowances for business and institutional consumption of durable goods. It includes the purchase of goods and services by consumers and government, gross private domestic investment, and net exports. Beginning with 1960, the estimates include data for Alaska and Hawaii.

Helicopter, a rotary-wing aircraft which depends principally for its support and motion in the air upon the lift generated by one or more power-driven rotors, rotating on substantially vertical axes. A helicopter is a V/STOL—a vertical and/or short take-off and landing aircraft.

Heliport, an area, either at ground level or elevated on a structure, that is used for the landing and take-off of helicopters and includes some or all of the various facilities useful to helicopter operations such as helicopter parking, hangar, waiting room, fueling and maintenance equipment.

Helistop, a minimum facility **Heliport**, either at ground level, or elevated on a structure for the landing and take-off of helicopters but without such auxiliary facilities as waiting room, hangar parking, etc.

Hours, Overtime, that portion of the gross average weekly hours which were in excess of regular hours and for which premium payments were made.

ICBM, Intercontinental Ballistic Missile, with a range of more than 5,000 miles.

Imports, classified as "general imports" or "imports for consumption." This volume refers generally to "imports for consumption,"

which are entries for immediate consumption plus merchandise withdrawn from bonded storage warehouses for consumption. Data are compiled from Import Entries filed with U.S. Customs officials. Import values are in general based on the market value or price in the foreign country at the time of exportation of such merchandise. These values include the cost of containers and coverings, as well as other charges and expenses incidental to placing the merchandise in condition, packed and ready for shipment to the United States, but exclude import duties, insurance, ocean freight and other charges incidental to arrival of the goods in the United States. The foreign values of imported merchandise are converted into U.S. currency at the rate of exchange prevailing on the day the merchandise is shipped to the United States.

Income

Net Operating Income, total net sales (See **Sales**) less total operating costs.

Net Income (Before Income Taxes), Net Operating Income plus or minus "Other Income and Expense."

Other Income and Expense, includes interest income, royalty income, capital gains and losses, interest expense, cash discounts, etc.

Net Income (After Income Taxes), Net Income (Before Income Taxes) less federal income taxes

Labor Turnover, the gross movement of wage and salary workers into and out of employed status with respect to individual establishments. This movement, which relates to a calendar month or year, is divided into two broad types: **Accessions** (new

hires and rehires), **Separations** (terminations of employment initiated by either employer or employee). Each type of action is accumulated for a calendar month or year and expressed as a rate per 100 employees. The data relate to all employees, full- or part-time, permanent or temporary.

Accessions, the total number of permanent and temporary additions to the employment roll, including both new and rehired employees.

New Hires, temporary or permanent additions to the employment roll of persons who have never before been employed in the establishment.

Other Accessions, not published separately, but included in total accessions; all additions to the employment roll which are not classified as new hires.

Separations, terminations of employment during the calendar month or year, classified according to cause: quits, layoffs, and other separations, as defined below:

Quits, terminations of employment initiated by employees, failure to report after being hired, and unauthorized absences.

Layoffs, suspensions without pay lasting or expected to last more than seven consecutive calendar days, initiated by the employer without prejudice to the worker.

Other Separations, terminations of employment because of discharge, permanent disability, death, retirement, etc.

Man-Hours, in measuring labor input, take into account both the number

of production workers and their actual hours of work. The Bureau of Labor Statistics covers all hours paid for, whether worked or not, when the employee was at the plant. One man-hour thus means one hour of a person's time.

Manufacturing Industries, those establishments engaged in the mechanical or chemical transformation of inorganic or organic substances into new products, and usually described as plants, factories, or mills, which characteristically use power driven machines and materials handling equipment; also establishments engaged in assembling component parts of manufactured products if the new product is neither a structure nor other fixed improvement.

Merchandise Trade Balance, the difference between the value of U.S. goods exported to other countries and foreign goods imported into this country. The trade balance is generally regarded as "favorable" when exports exceed imports—a trade surplus—and "unfavorable" when imports exceed exports—a trade deficit.

Missile, a weapon which travels through space, guided along its flight path at the moment of its launching, but thereafter subjected to various external forces that affect the accuracy and speed with which it flies toward the target.

Mutual Security Program, designed by the U.S. Government to maintain the domestic security, promote foreign policy, and provide for the general welfare of the U.S.; based on the Mutual Security Act of 1954.

NASA, National Aeronautics and Space Administration.

N.A.T.O., North Atlantic Treaty Organization.

New Obligational Authority (Federal Budget), see **Budget Authority**.

Net Operating Profit, see **Income**.

Net Profit on Sales, see **Income**.

New Hires, see **Labor Turnover**.

Non-Aerospace Products and Services, includes all non-aircraft, non-space vehicle, and non-missile products and services and all basic research produced or performed by those companies and/or establishments whose principal business is the development and/or production of aircraft, aircraft engines, missile and spacecraft engines, missiles and/or spacecraft.

OASD, Office of the Assistant Secretary of Defense.

Obligations (Federal Budget), commitments made by Federal agencies to pay out money for products, services or other purposes—as distinct from the actual payments. Obligations incurred may not be larger than budget authority.

Other Aerospace Products and Services, all conversions, modifications, site activation, other aerospace products (including drones) and services, and receipts for applied research and development on items such as drones, etc.

Outlays, checks issued, interest accrued on the public debt, or other payments made, net of refunds and reimbursements.

Overtime, see **Hours, Overtime**.

Payroll, includes the gross earnings paid in the calendar year to all employees on the payroll of operating manufacturing establishments. Includes all forms of compensation directly to workers such as salaries, wages, commissions, dismissal pay, all bonuses, vacation and sick leave

pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. Does not include employers' Social Security contributions or other non-payroll labor costs such as employees' pension plans, group insurance premiums, and workmen's compensation.

Passenger-Mile, one passenger moved one mile.

Procurement, the process whereby the executive agencies of the Federal Government acquire goods and services from enterprises other than the Federal Government.

Profit, see **Income**.

Production Workers, includes working foremen and all non-supervisory workers (including leadmen and trainees) engaged in fabricating, processing, assembling, inspection, receiving, storage, handling, janitorial services, product development, auxiliary production for plant's own use and record keeping and services closely associated with the above production operations.

Quits, see **Labor Turnover**.

R&D, Research and Development.

Research, basic, is that portion of the total research and development effort the primary aim of which is extending the fundamental understanding of man and nature. It is systematic, intensive study directed toward the fuller scientific knowledge of the subject studied.

Development, the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, or methods including design and development of prototypes and processes.

- RDT&E** (Department of Defense), research, development, test and evaluation.
- Rotorcraft**, an aircraft which in all its usual flight attitudes is supported in the air wholly or in part by a rotor or rotors, i.e., by airfoils rotating or revolving about an axis (see **Helicopter**).
- Sales**, net of returns, allowances, and discounts; the dollar value of shipments less returns and allowances, including dealer's commission, if any, which have passed through the sales account.
- Satellite**, a body that rotates about another body, such as the moon revolving around the earth, or a man-made object rotating about any body such as the sun, earth, or moon.
- Separation**, see **Labor Turnover**.
- Space Vehicle**, an artificial body operating in outer space (beyond the earth's atmosphere).
- Stockholder's Equity**, assets minus all obligations of the corporation, except those to stockholders. Annual data are average equity for the year (using four end-of-quarter figures). For details, see Federal Trade Commission's "Quarterly Financial Report for Manufacturing Corporations."
- STOL**, short take-off and landing aircraft.
- Test** (Department of Defense), an experiment designed to assess progress in attainment or accomplishment of development objectives (see **RDT&E**).
- Thrust**, the driving force exerted by an engine, particularly an aircraft or missile engine, in propelling the vehicle to which it is attached.
- Ton-Mile**, one ton moved one mile.
- Total Obligational Authority**, the sum of budget authority granted or requested from the Congress in a given year, plus unused budget authority from prior years.
- Trade Balance**, see **Merchandise Trade Balance**.
- Transition Quarter**, the three-month interval from July 1, 1976 to September 30, 1976. Beginning with the 1977 budget, the fiscal year (FY) will run from October 1 through September 30. To facilitate the conversion, this transition period has been provided between FY 1976 and FY 1977 as a separate accounting period belonging to neither year.
- Turbine, Turbo**, a mechanical device or engine that spins in reaction to a fluid flow that passes through or over it. Frequently used in "turbo-prop" or "turbo-jet."
- U.K.**, United Kingdom.
- U.S.**, United States of America.
- USA**, United States Army.
- USAF**, United States Air Force.
- USN**, United States Navy.
- USSR**, Union of Soviet Socialist Republics.
- Utility Aircraft**, an aircraft designed for general purpose work.
- V/STOL**, vertical take-off and landing aircraft.
- Wages**, the payroll (see **Payroll**) of production and related workers.

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