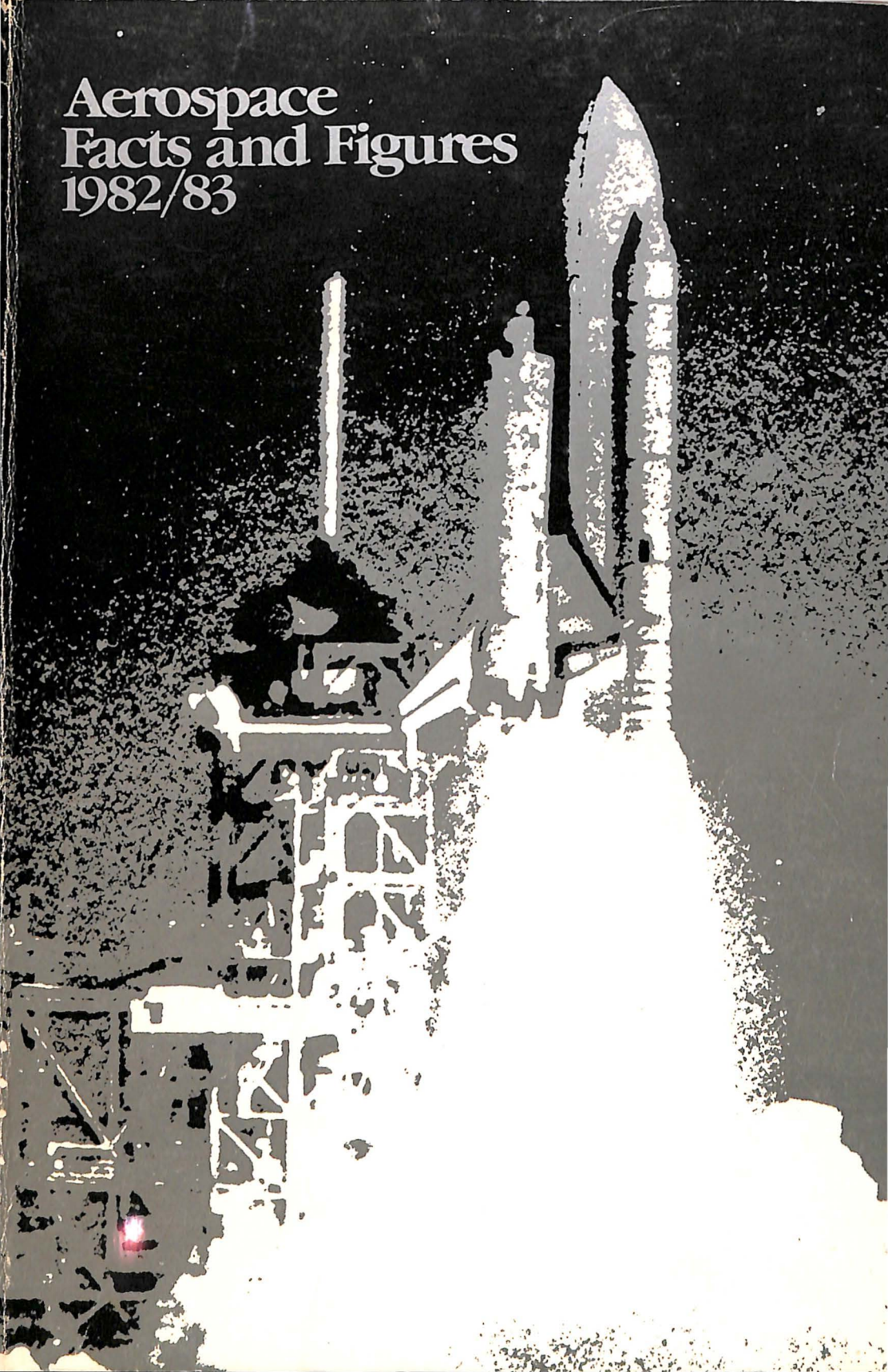
Aerospace Facts and Figures 1982/83



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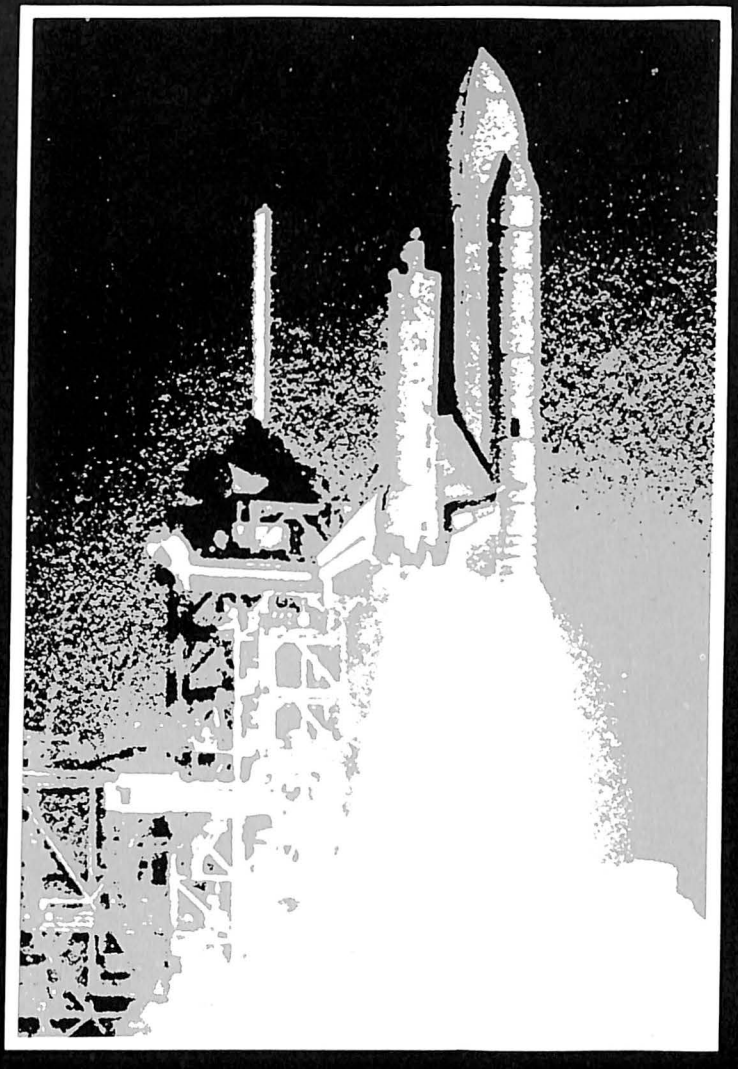

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Contents

6 Foreword

8 Aerospace Summary

29 Aircraft Production

48 Missile Programs

58 Space Programs

77 Air Transportation

95 Helicopter Transportation

104 Research and Development

116 Foreign Trade

130 Employment

142 Finance

153 Glossary

160 Index

Foreword

For the U.S. aerospace industry, 1981 was a curiously paradoxical year. From the standpoint of sales, it was the best year in history—even after inflation is taken into account. But in certain statistical categories, there was evidence of disquieting trends, declines in activity or zero growth patterns one would not expect to see in a record-setting year.

The industry's sales picture is best outlined by removing the distorting inflation factor, i.e., by converting the data to constant dollars. In constant dollar terms, 1981 marked the fifth consecutive year of sales growth and total sales exceeded those of the previous peak year (1968) by more than four percent. For 1981, there was real sales growth in every major product group except one—civil aircraft. The decline in civil aircraft sales growth is paramount among the disquieting trends mentioned earlier.

The industry's profit rate on sales remained at about four percent for the fifth straight year. That compares with an average of well below three percent for the prior decade. Aerospace profit is still below the average for all U.S. manufacturing industries, but the general improvement in earnings is encouraging to an industry having capital investment needs of such a high order.

In 1981, the industry once again made a major contribution to the overall U.S. economy by setting new records for export sales and net trade balance. The importance to the economy of high-value, high-technology aerospace exports is underlined by this fact: in the last five years, when the U.S. as a whole experienced annual trade deficits totaling $145 billion, the adverse impact was softened by an offsetting aerospace trade surplus of more than $51 billion.

Among the troubling statistics for 1981 is the fact that the industry's backlog of orders declined in real, inflation-adjusted terms after five years of solid gain during which the backlog increased by more than 80 percent. The major reason was a lull in orders of civil aircraft, occasioned by foreign competition, the recession, high interest rates and the depressed financial status of many of the world's airlines. The backlog of civil jetliners, which had grown in big jumps for several years, declined by some $3.6 billion dollars. And that doesn't tell the whole story because the statistics cited are for 1981; continuing airline financial distress has brought a number of can-

cellations of transport orders in 1982.

Despite the peak levels attained in 1981, international trade is another area of concern; while we were exporting more aerospace products than ever, we were also importing aerospace products at a record pace. Another factor in the international trade picture was a sharp reduction in the backlog of orders from foreign airlines, a drop in value of more than one-third in 1981. That is an especially disturbing note, because jetliner sales to foreign customers have for many years constituted not only the major element of the aerospace export volume but also the primary dollar-value component of the industry's overall civil aircraft production.

Thus, the immediate future outlook is dim for the civil aircraft manufacturing segment of the industry, due to the combined effects of the recession and the still-increasing competition from foreign manufacturers. But projections of the world civil aircraft market for the coming decade remain high; the need for new and replacement aircraft has not diminished, only the customers' ability to buy. Given an economic upturn and improvement in the airlines' financial health, civil aircraft production could rise well beyond current levels in the latter half of the decade.

There is a brighter outlook in the other major areas of industry effort. The Administration's defense buildup is moving into high gear and projections indicate considerably expanded industry activity in aircraft and missile research, development and production.

Similarly, the industry's sales of space systems are increasing steadily, due largely to a rapidly growing military space program. Space funding for the Department of Defense is now greater than for NASA. Budget plans contemplate substantial growth in combined DOD/NASA outlays, suggesting broadened industry workload in development and fabrication of space equipment.

The story of the aerospace industry in 1981 is further chronicled in this 30th edition of *Aerospace Facts and Figures,* a significantly improved version that has been comprehensively revised to enhance statistical precision and to reflect more accurately the changing character of the aerospace industry. We trust this useful and informative volume will meet the wide acceptance enjoyed by its predecessors.

Karl G. Harr, Jr.
President
Aerospace Industries
Association

Aerospace Summary

The aerospace industry's 1981 sales volume was the best in history, with real (inflation-adjusted) gains in most categories and an overall real increase of about 10 percent. There were, however, some disquieting notes. In production of civil aircraft, sales increased in current dollars but declined—for the first time in four years—in real terms. And the industry's backlog showed zero real growth after five years of impressive gains.

Here is a breakdown of the industry's 1981 peformance:

Sales. Total sales amounted to $63.5 billion, up $10.6 billion, or 20 percent above the 1980 level. Half of the increase—$5.4 billion—was in sales of military aircraft; there were also appreciable increases in the missiles, space and non-aerospace categories. Considered in inflation-adjusted constant dollars, the 1981 sales volume topped the previous peak (1968) by more than four percent.

Aerospace industry sales represented 2.2 percent of the Gross National Product and 3.2 percent of

total sales by all U.S. manufacturing industries; both figures were the highest in a decade.

Profit. The industry's net profit after taxes amounted to $2.9 billion, or 4.3 percent of net sales; the latter figure exactly matched that of the previous year. The aerospace profit edged closer to, but remained below, the average for all U.S. manufacturing corporations, which was 4.7 percent in 1981.

Backlog. The aerospace backlog increased by a substantial $8.2 billion, but the rate of increase was far below the dramatic gains of the three prior years; converted to constant dollars, the backlog was almost exactly the same as last year's. At year-end 1981, orders on the books amounted to just under $99 billion in current dollars, including $45.8 billion in orders from the U.S government and $52.9 billion in work for other customers.

As is traditional, orders for aircraft—including engines and parts—constituted the principal element of the backlog—$62.1 billion or 63 percent of the total. The major backlog increases were in U.S. government aircraft—largely military aircraft and related R&D—and in "other aerospace," a category that embraces conversions, modifications, ground support equipment and certain R&D contracts. There was a moderate increase in missile/space backlog and slight declines were recorded in the non-aerospace category and in aircraft orders from customers other than the U.S. government.

Civil Aircraft Production. In 1981, the industry shipped 10,916 civil aircraft, more than 2,700 units below the 1980 figures; it was the third consecutive year of decline in terms of numbers and the lowest level of shipments since 1972. Despite the decline, total dollar value of shipments continued to increase, but only slightly, from $13.1 billion in 1980 to $13.2 billion in 1981. The latter figure does not include spare parts or payments for R&D work and other services related to civil aircraft manufacture; the grand total was $17.4 billion.

As is customary, the bulk of the dollar value was in sales of commercial transports—$9.7 billion, or $200 million less than in 1980. The industry delivered 387 transports, the same as in 1980; 255 of them went to foreign customers (up from 237) and 132 to U.S. buyers (down from 150). Backlog for transports dropped sharply, from $20.8 billion in 1980 to $17.2 billion at the end of 1981. Of special note was the fact that orders from foreign airlines, which traditionally constitute more than half of the backlog, dropped by $4.5 billion, reducing the foreign backlog to less than 45 percent of the total.

The four-year pattern of increasing civil helicopter production was broken as shipments declined almost 300 units to a 1981 total of 1,072. The dollar value of sales also declined, from $656 million in 1980 to $597 million in 1981.

General aviation plane shipments totaled 9,457, down from 11,881 in the previous year. However, the value of shipments increased some $400 million to more than $2.9 billion, due to the fact that continuing strong production of higher-value jet and turboprop business aircraft more than offset reduced shipments of light single-engine aircraft; sales in the latter area have been most severely impacted by the economy, high interest rates and fuel costs.

Military Aircraft Production. In terms of numbers, the industry's output of military aircraft was approximately the same as in the previous year; 1,048 units, five fewer than in 1980. The total included 689 planes

destined for use by U.S. armed services; the figure compares with 631 in 1980. The Department of Defense also accepted 215 aircraft for delivery to foreign governments under Foreign Military Sales or Military Assistance Programs. In addition, the industry sold 144 planes to foreign customers on a commercial basis, 84 fewer than in 1980. The value of DOD acceptances—904 aircraft compared with 825 in 1980—was $8.6 billion, up $2.1 billion. The grand total of all industry effort related to military aircraft—deliveries to DOD, commercial shipments, aircraft and engine spare parts and R&D contracts—was $19.2 billion, which compares with $13.9 billion in 1980.

Missile Programs. Industry sales of missile systems, including production and R&D work, amounted to $6.8 billion in 1981; this represented an increase of almost $800 million, or 12.7 percent. Sales of missile systems and parts, excluding R&D, totaled $4.7 billion, up 17 percent over the previous year. Backlog at year-end 1981 was $5.5 billion, same as in 1980.

Space Programs. Combined sales of civil and military space systems, including R&D programs, amounted to $9.5 billion in 1981, up more than 20 percent over 1980. The increase was due largely to rapidly growing military space activity, as evidenced in federal budget authority figures. For Fiscal Year 1981, NASA was authorized $5 billion and the Department of Defense $4.8 billion; in FY 1982, DOD funding ($5.9 billion) is greater than NASA's ($5.6 billion); for FY 1983, the Administration requested $8.5 billion for DOD, $6.6 billion for NASA.

Non-aerospace Sales. AIA estimates for sales of non-aerospace products and services by aerospace manufacturers continued their 10-year climb and reached a new peak of $10.6 billion, up from $8.8 billion in 1980. The 1981 figure represented almost 17 percent of total industry sales.

Research and Development. Expenditures for aerospace research and development in 1981 increased by some $200 million over 1980—but in real, inflation-adjusted terms declined by 6.7 percent. This compared with the all-industries gain of 3.5 percent. Aerospace R&D funding by government and industry amounted to $9.8 billion; aerospace placed second among U.S. industries in level of funding, behind the electrical machinery/communications equipment industry. However, estimates for 1982 indicate that aerospace R&D will increase about 25 percent to $12.2 billion and that aerospace will regain its top ranking.

Federal outlays for R&D, a general indicator of industry activity levels, are expected to increase in FY 1982. In areas primarily affecting the aerospace industry, R&D outlays for the Department of Defense are estimated at $18.8 billion (up more than 19 percent) and for NASA at $5.7 billion (up 7.9 percent). A further 21 percent increase in DOD funding —to $22.7 billion—is projected for FY 1983; NASA funding for FY 1983 is estimated at $6.5 billion, up more than 13 percent over 1982.

Foreign Trade. In a year when the U.S. experienced another large international trade deficit, the aerospace industry once again demonstrated the importance to the U.S economy of high-value, high-technology aerospace exports. The industry set new records for exports and trade balance, thereby offsetting U.S. deficits in other areas of international trade. Exports totaled $17.6 billion and the aerospace trade balance was $13.1 billion; the figures compare with exports of $15.5 billion

and a trade balance of $12 billion in 1980.

Within the generally bright foreign trade picture, however, there were some negative aspects, among them the lack of growth in civil exports, which at $13.3 billion barely topped 1980's $13.2 billion. As in previous years, sales of commercial transport aircraft constituted the greatest dollar value among civil exports—$7.2 billion, up from $6.7 billion. However, the major growth was in military exports, which increased by more than 91 percent to $4.3 billion.

Another matter of industry concern was the continuing growth of aerospace imports, reflecting further penetration of the U.S. civil aviation market by foreign manufacturers. Imports amounted to $4.5 billion, a record level almost $1 billion higher than the previous peak (1980).

Employment. Declining activity in civil aircraft production brought about a 1981 drop of some 50,000 workers in that segment of the industry, a drop minimized by employment gains in military and space work. The industry's total labor force at year-end 1981 numbered 1,203,000 down from 1,218,000 at the end of 1980.

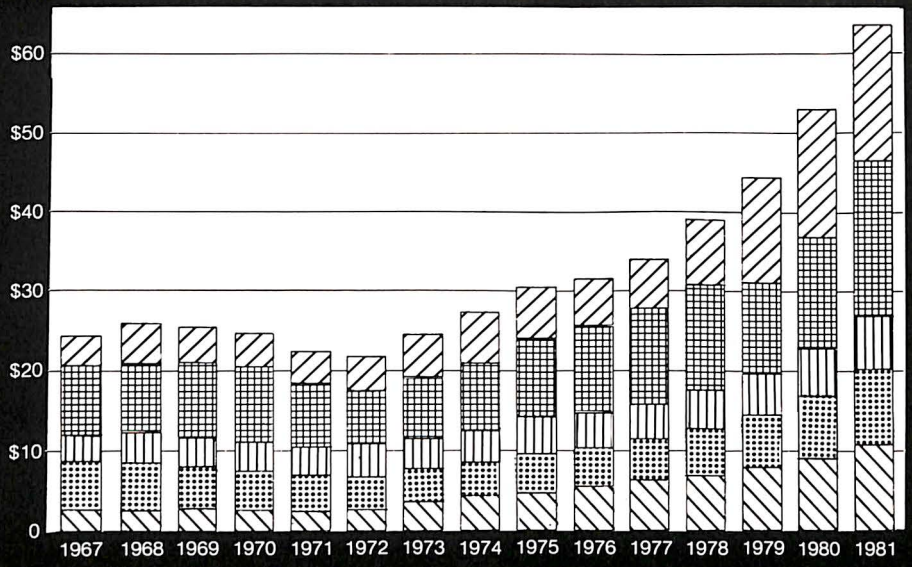
However, computed on an annual average basis, industry employment in 1981 was 1,207,000, compared with 1,187,000 in the previous year. Thus, the upward annual average trend in evidence since 1977 continued, but at a sharply lower rate of gain. The largest employment gain was in missiles and space activity—9,000 workers. Despite the decline in civil aircraft production, the overall aircraft manufacturing work force increased by 2,000 workers.

A comparison of year-end figures indicates that the number of production workers declined for the first time in several years, down 5.6 percent to 578,000; there was a slight dip in the number of scientists and engineers, and a 7.7 percent increase in technicians. As in previous years, most production workers—377,000 or 65 percent of the total—were engaged in manufacture of aircraft and related equipment. Their hourly earnings averaged $10.31, up 11 percent over the previous year; average weekly earnings rose from $390 to $426.

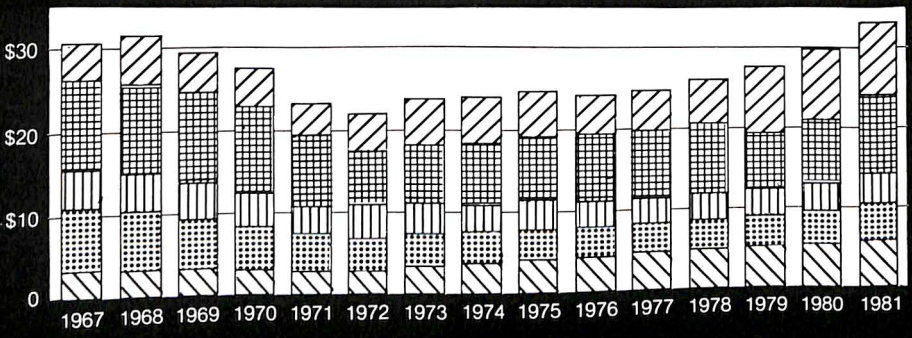
An AIA survey indicated that the total labor force will increase to 1,220,000 by the end of 1982 and continue the upward trend to 1,269,000 employees by year-end 1983.

AEROSPACE INDUSTRY SALES BY PRODUCT GROUP

(Billions of Current Dollars)



(Billions of Constant Dollars)
1972 = 100



CIVIL AIRCRAFT
MILITARY AIRCRAFT
MISSILES
SPACE
NON-AEROSPACE

Source: AIA.

AEROSPACE INDUSTRY SALES BY PRODUCT GROUP[r]

Calendar Years 1967-1981
(Millions of Dollars)

Year	TOTAL SALES	Aircraft			Missiles	Space	Non-Aerospace[a]
		Total	Civil	Military			
CURRENT DOLLARS							
1967	$24,130	$12,161	$ 3,562	$ 8,599	$3,388	$6,001	$ 2,580
1968	25,927	13,756	5,025	8,731	3,651	5,971	2,549
1969	25,278	13,660	4,267	9,393	3,624	5,295	2,699
1970	24,924	13,899	4,382	9,517	3,656	4,725	2,644
1971	22,064	11,897	3,764	8,133	3,283	4,361	2,523
1972	21,512	10,750	4,181	6,569	3,953	4,163	2,646
1973	24,744	13,376	5,742	7,634	3,899	4,126	3,343
1974	27,145	14,761	6,320	8,441	3,905	4,412	4,067
1975	30,356	16,350	6,463	9,887	4,528	4,686	4,792
1976	31,528	16,988	6,007	10,981	4,442	4,787	5,311
1977	33,854	18,312	6,183	12,129	4,437	5,001	6,104
1978	38,939	21,617	8,222	13,395	4,792	5,717	6,813
1979	44,210	24,659	13,227	11,432	5,291	6,545	7,715
1980	52,896	30,144	16,285	13,859	6,041	7,892	8,819
1981	63,490	36,625	17,392	19,233	6,807	9,472	10,586
CONSTANT DOLLARS (1972 = 100)							
1967	$30,521	$15,382	$ 4,505	$10,877	$4,285	$7,590	$3,263
1968	31,411	16,666	6,088	10,578	4,423	7,234	3,088
1969	29,125	15,739	4,916	10,823	4,176	6,101	3,110
1970	27,254	15,198	4,792	10,407	3,998	5,167	2,891
1971	22,981	12,391	3,920	8,471	3,419	4,542	2,628
1972	21,512	10,750	4,181	6,569	3,953	4,163	2,646
1973	23,412	12,656	5,433	7,223	3,689	3,904	3,163
1974	23,621	12,845	5,499	7,345	3,398	3,839	3,539
1975	24,176	13,022	5,147	7,874	3,606	3,732	3,817
1976	23,865	12,859	4,547	8,312	3,362	3,623	4,020
1977	24,211	13,096	4,422	8,674	3,173	3,576	4,365
1978	25,951	14,407	5,480	8,927	3,194	3,810	4,540
1979	27,161	15,150	8,126	7,023	3,251	4,021	4,740
1980	29,824	16,996	9,182	7,814	3,406	4,450	4,972
1981	32,776	18,907	8,978	9,929	3,514	4,890	5,465

Source: Aerospace Industries Association.
NOTE: See Glossary for explanation of "Aerospace Sales."
a Products and services other than aircraft, missiles, and space vehicles and parts, produced by establishments whose principal business is the development and/or manufacture of aerospace products.
r A comprehensive revision of the AIA aerospace industry sales series for 1967-1980 was completed in 1982 in order to incorporate different data sources selected to better reflect the evolving composition of the aerospace industry.

AEROSPACE INDUSTRY SALES BY CUSTOMER[r]

Calendar Years 1967-1981
(Millions of Dollars)

Year	TOTAL SALES	Aerospace Products and Services			Non-Aerospace[a]	
		U.S. Government				
		Dept. of Defense	NASA and Other Agencies	Other Customers[b]	U.S. Gov't.	Other Customers
CURRENT DOLLARS						
1967	$24,130	$12,901	$4,219	$ 4,430	$1,750	$ 830
1968	25,927	13,609	3,978	5,791	1,568	981
1969	25,278	13,832	3,369	5,378	1,633	1,066
1970	24,924	14,011	3,000	5,269	1,465	1,179
1971	22,064	11,877	2,779	4,885	1,372	1,151
1972	21,512	11,195	2,649	5,022	1,546	1,100
1973	24,744	11,846	2,459	7,096	1,925	1,418
1974	27,145	12,329	2,608	8,141	2,060	2,007
1975	30,356	13,795	2,838	8,931	2,496	2,296
1976	31,528	15,106	2,938	8,173	2,879	2,432
1977	33,854	16,023	3,012	8,715	3,625	2,479
1978	38,939	16,770	3,151	12,205	3,860	2,953
1979	44,210	17,708	3,453	15,334	4,087	3,628
1980	52,896	20,994	4,106	18,977	4,762	4,057
1981	63,490	25,896	4,688	22,320	5,822	4,764
CONSTANT DOLLARS (1972 = 100)						
1967	$30,521	$16,318	$5,336	$ 5,603	$2,214	$1,050
1968	31,411	16,488	4,819	7,016	1,900	1,189
1969	29,125	15,937	3,882	6,197	1,882	1,228
1970	27,254	15,321	3,280	5,762	1,602	1,289
1971	22,981	12,371	2,894	5,088	1,429	1,199
1972	21,512	11,195	2,649	5,022	1,546	1,100
1973	23,412	11,208	2,327	6,714	1,821	1,342
1974	23,621	10,728	2,269	7,084	1,793	1,746
1975	24,176	10,987	2,260	7,113	1,988	1,829
1976	23,865	11,434	2,224	6,187	2,179	1,841
1977	24,211	11,459	2,154	6,233	2,592	1,773
1978	25,951	11,176	2,100	8,134	2,572	1,968
1979	27,161	10,879	2,121	9,421	2,511	2,229
1980	29,824	11,837	2,315	10,700	2,685	2,287
1981	32,776	13,368	2,420	11,522	3,006	2,459

Source: Aerospace Industries Association.
NOTE: See Glossary for explanation of "Aerospace Sales."

a Products and services other than aircraft, missiles, and space vehicles and parts, produced by establishments whose principal business is the development and/or manufacture of aerospace products.

b All civil sales of aircraft (domestic and export), commercial space sales, and all military aircraft and missile exports, including both commercial (manufacture-to-foreign government) and Foreign Military Sales (FMS)/Military Assistance Programs (MAP).

r A comprehensive revision of the AIA aerospace industry sales series for 1967-1980 was completed in 1982 in order to incorporate different data sources selected to better reflect the evolving composition of the aerospace industry.

SALES OF MAJOR AEROSPACE COMPANIES AS REPORTED BY THE BUREAU OF THE CENSUS

Calendar Years 1968-1981
(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	
CURRENT DOLLARS									
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	29,473	17,314	12,159	6,859	7,797	6,310	2,070	1,645	4,792
1976	31,328	19,083	12,245	8,314	7,622	5,880	2,368	1,833	5,311
1977	33,315	20,704	12,611	8,848	7,530	5,775	2,839	2,219	6,104
1978	37,968	21,888	16,080	8,724	10,581	6,380[a]	3,363	2,107[a]	6,813
1979	46,173	23,229	22,944	8,649	16,023	7,197	3,930	2,659	7,715
1980[r]	58,440	26,674	31,766	9,427	20,097	8,393	6,869	2,609	11,045
1981[b]	70,536	32,504	38,032	12,168	22,527	9,842	8,170	3,120	14,709
CONSTANT DOLLARS (1972 = 100)[c]									
1968	$31,006	$20,154	$10,852	$8,979	$ 7,801	$7,361	$2,516	$1,260	$3,088
1969	28,400	19,081	9,319	8,251	6,456	6,521	2,925	1,136	3,110
1970	27,066	17,941	9,125	8,295	6,430	5,929	2,541	980	2,891
1971	22,580	14,701	7,879	6,575	5,290	5,178	1,988	921	2,628
1972	21,499	13,492	8,007	4,954	5,199	5,598	2,067	1,035	2,646
1973	22,996	13,654	9,342	5,241	6,376	5,280	1,990	947	3,163
1974	23,363	13,223	10,140	5,205	6,578	5,094	1,828	1,118	3,539
1975	23,473	13,789	9,684	5,463	6,210	5,025	1,649	1,310	3,817
1976	23,714	14,445	9,269	6,293	5,769	4,451	1,792	1,388	4,020
1977	23,825	14,807	9,019	6,328	5,385	4,130	2,030	1,587	4,365
1978	25,304	14,587	10,716	5,814	7,052	4,252	2,241	1,404	4,540
1979	28,367	14,271	14,096	5,314	9,844	4,422	2,414	1,634	4,740
1980	32,950	15,039	17,910	5,315	11,331	4,732	3,873	1,471	6,227
1981	36,413	16,780	19,633	6,282	11,629	5,081	4,218	1,611	7,593

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

a AIA estimate based on MQ37D data.

b The Bureau of the Census has issued a downward revision for first and second quarter data by a total of $1,947 million, such that the restated level of 1981 annual sales amounts to $68,589. Product group detail is not yet available for the revised totals.

c Based on GNP implicit price deflator.

r Revised.

BACKLOG OF MAJOR AEROSPACE COMPANIES AS REPORTED BY THE BUREAU OF THE CENSUS

As of December 31, 1968-1981
(Millions of Dollars)

Year	GRAND TOTAL	TOTAL		Aircraft, Engines, and Parts		Missiles & Space Incl. Propulsion	Other Aerospace		Non-Aerospace
		U.S. Gov't.	Other	U.S. Gov't.	Other		U.S. Gov't.	Other	
CURRENT DOLLARS									
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	35,038	22,168	12,870	10,751	8,141	6,415	1,983	2,088	5,660
1976	39,702	24,141	15,561	11,950	8,929	6,286	2,046	3,496	6,995
1977	45,309	26,119	19,190	12,471	12,592	6,743	2,761	3,447	7,295
1978	57,160	30,223	26,937	14,897	18,972	7,557	4,029	3,668	8,037
1979	78,259	36,136	42,123	17,316	33,168	7,388	5,613	5,112	9,662
1980[r]	90,517	37,200	53,317	17,514	41,267	8,572	8,564	4,447	10,153
1981	98,742	45,821	52,921	21,017	41,119	9,016	12,916	4,640	10,034
CONSTANT DOLLARS (1972 = 100)[a]									
1968	$37,253	$19,800	$17,453	$9,874	$15,034	$6,158	$2,243	$1,191	$2,754
1969	32,604	16,474	16,130	8,168	13,941	4,998	2,306	1,014	2,178
1970	27,015	14,086	12,928	6,466	10,716	4,945	2,172	880	1,836
1971	25,600	14,579	11,022	6,480	8,394	4,979	2,325	1,085	2,338
1972	26,922	15,322	11,600	7,027	8,605	5,272	2,018	972	3,028
1973	28,064	15,796	12,268	7,394	8,090	5,365	1,721	1,020	4,474
1974	30,905	18,177	12,728	8,518	8,355	5,781	1,676	1,449	5,126
1975	27,905	17,655	10,250	8,562	6,484	5,109	1,579	1,663	4,508
1976	30,052	18,273	11,779	9,045	6,759	4,758	1,549	2,646	5,295
1977	32,403	18,679	13,724	8,919	9,005	4,822	1,975	2,465	5,217
1978	38,094	20,142	17,952	9,928	12,644	5,036	2.685	2,445	5,356
1979	48,079	22,201	25,879	10,638	20,377	4,539	3. 48	3,141	5,936
1980	51,036	20,974	30,061	9,875	23,267	4,833	4,829	2,507	5,725
1981	50,974	23,654	27,320	10,850	21,227	4,654	6,668	2,395	5,180

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
a Based on GNP Implicit price deflator.
r Revised.

AEROSPACE SALES AND THE NATIONAL ECONOMY

Calendar Years 1967-1981
(Billions of Dollars)

Year	Gross National Product	Sales			Aerospace Sales As Percent of		
		Manufacturing Industries	Durable Goods Industries	Aerospace Industry[a]	GNP	Manufacturing Industries	Durable Goods Industries
CURRENT DOLLARS							
1967	$ 799.6	$ 557.8	$ 303.2	$ 24.1	3.0%	4.3%	7.9%
1968	873.4	603.2	332.4	25.9	3.0	4.3	7.8
1969	944.0	642.5	353.7	25.3	2.7	3.9	7.2
1970	992.7	633.7	338.6	24.9	2.5	3.9	7.4
1971	1,077.6	671.1	359.7	22.1	2.1	3.3	6.1
1972	1,185.9	756.5	408.5	21.5	1.8	2.8	5.3
1973	1,326.4	875.4	476.4	24.7	1.9	2.8	5.2
1974	1,434.2	1,017.9	531.0	27.1	1.9	2.7	5.1
1975	1,549.2	1,039.4	524.1	30.4	2.0	2.9	5.8
1976	1,718.0	1,185.7	608.4	31.5	1.8	2.7	5.2
1977	1,918.0	1,330.1	696.1	33.9	1.8	2.5	4.9
1978	2,156.1	1,496.6	798.1	38.9	1.8	2.6	4.9
1979	2,413.9	1,727.3[r]	909.6[r]	44.2	1.8	2.6	4.9
1980	2,626.1	1,845.9[r]	936.0[r]	52.9	2.0	2.9	5.7
1981	2,925.5	1,997.8	1,019.9	63.5	2.2	3.2	6.2
CONSTANT DOLLARS (1972 = 100)					**GNP Implicit Price Deflator 1972 = 100**		
1967	$1,011.4	$ 705.5	$ 383.5	$ 30.5	79.06		
1968	1,058.1	730.8	402.7	31.4	82.54		
1969	1,087.6	740.3	407.5	29.1	86.79		
1970	1,085.6	692.9	370.3	27.3	91.45		
1971	1,122.4	699.0	374.6	23.0	96.01		
1972	1,185.9	756.5	408.5	21.5	100.00		
1973	1,255.0	828.3	450.8	23.4	105.69		
1974	1,248.0	885.7	462.1	23.6	114.92		
1975	1,233.9	827.8	417.4	24.2	125.56		
1976	1,300.4	897.5	460.5	23.9	132.11		
1977	1,371.7	951.2	497.8	24.2	139.83		
1978	1,436.9	997.4	531.9	26.0	150.05		
1979	1,483.0	1,061.2	558.8	27.2	162.77		
1980	1,480.7	1,040.8	527.7	29.8	177.36		
1981	1,510.3	1,031.3	526.5	32.8	193.71		

Source: Gross National Product and GNP Implicit Price Deflator: "Economic Report of the President" (Annually) and "Survey of Current Business" (Monthly). Sales of Manufacturing and Durable Goods Industries: "Survey of Current Business" (Monthly). Aerospace Sales: Aerospace Industries Association.

NOTE: See Glossary for explanation of "Aerospace Sales."

a A comprehensive revision of the AIA aerospace industry sales series for 1967-1980 was completed in 1982 in order to incorporate different data sources selected to better reflect the evolving composition of the aerospace industry.

r Revised.

ANNUAL AVERAGE EMPLOYMENT
AEROSPACE INDUSTRY AND ALL MANUFACTURING INDUSTRIES
Calendar Years 1961-1981
(Thousands of Employees)

Year	All Manufacturing Industries TOTAL	Aerospace			Aerospace As Percent of All Manufacturing
		TOTAL	Production Workers	Other	
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	19,367[r]	1,166	604	562	6.0
1971	18,623[r]	951	480	471	5.1
1972	19,151	912	455	457	4.8
1973	20,154	956	482	474	4.7
1974	20,077	982	494	488	4.9
1975	18,323	941	461	480	5.1
1976	18,997	896	433	463	4.7
1977	19,682	893	429	464	4.5
1978	20,505	977	476	501	4.8
1979	21,040[r]	1,109[r]	562[r]	547[r]	5.3
1980	20,300[r]	1,187[r]	598[r]	589[r]	5.8
1981	20,261	1,207	593	614	6.0

Source: Manufacturing Employment from Bureau of Labor Statistics, "Employment and Earnings," (Monthly); Aerospace Employment from Aerospace Industries Association estimates, based on "Employment and Earnings," Bureau of Labor Statistics.

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

r Revised.

ANNUAL PAYROLL
AEROSPACE INDUSTRY AND ALL MANUFACTURING INDUSTRIES
Calendar Years 1961-1981
(Millions of Dollars)

Year	All Manufacturing Industries TOTAL	Aerospace[a]			Aerospace As Percent of All Manufacturing
		TOTAL	Production Workers	Other	
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	10,504	4,280	6,224	6.0
1973	196,200	12,107	5,087	7,020	6.2
1974	211,400	13,535	5,672	7,863	6.4
1975	211,000	14,608	5,935	8,673	6.9
1976	237,400	14,881	5,951	8,930	6.3
1977	266,000	16,276	6,464	9,812	6.1
1978	299,200	19,501	7,873	11,628	6.5
1979	333,400	24,243[r]	10,247[r]	13,996[r]	7.3
1980	350,700	28,795[r]	12,087[r]	16,708[r]	8.2
1981	387,300	32,105	13,088	19,017	8.3

Source: Manufacturing Payroll from Bureau of Economic Analysis, "Survey of Current Business;" Aerospace Payroll from Aerospace Industries Association estimates.

a Based on AIA estimates of annual average employment and earnings for the aerospace industry; derived from BLS data (see Glossary, "Aerospace Employment" and "Aerospace Payroll").

r Revised.

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

Calendar Years 1961-1981
(Thousands of Employees)

Year	All Manufacturing Industries	Durable Goods Industries	Aerospace Industry		
			TOTAL	As Percent of	
				All Manufacturing	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	10,405r	1,175	6.5	11.3
1966	19,214	11,282r	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	19,367r	11,208r	1,166	6.0	10.4
1971	18,623r	10,636r	951	5.1	8.9r
1972	19,151	11,049	912	4.8	8.3
1973	20,154	11,891	956	4.7	8.0
1974	20,077	11,925	982	4.9	8.2
1975	18,323	10,688	941	5.1	8.8
1976	18,997	11,077	896	4.7	8.1
1977	19,682	11,597	893	4.5	7.7
1978	20,505	12,274	977	4.8	8.0
1979	21,040r	12,760r	1,109r	5.3	8.7
1980	20,300r	12,181r	1,187r	5.8	9.7
1981	20,261	12,136	1,207	6.0	9.9

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

NOTE: For explanation of "Aerospace Employment," see the Glossary.

r Revised.

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

Calendar Years 1977-1981

	1977	1978	1979	1980	1981
TOTAL AIRCRAFT IN SERVICE	7,298	7,550	7,787	8,010	8,726
Number Manufactured in U.S. . .	5,027	5,159	5,341	5,590	5,900
Percent Manufactured in U.S. . .	68.9%	68.3%	68.6%	69.8%	67.6%
Turbojet Aircraft in Service	5,137	5,288	5,534	5,756	6,085
Number Manufactured in U.S.	4,345	4,467	4,671	4,916	5,188
Percent Manufactured in U.S.	84.6%	84.5%	84.4%	85.4%	85.3%
Turboprop Aircraft in Service . .	1,856	1,931	2,013	2,059	2,508
Number Manufactured in U.S.	429	422	477	515	638
Percent Manufactured in U.S.	23.1%	21.9%	23.7%	25.0%	25.4%
Turbine-Powered Helicopters in Service	305	331	240	195	133
Number Manufactured in U.S.	253	270	193	159	74
Percent Manufactured in U.S.	83.0%	81.6%	80.4%	81.5%	55.6%

Source: Exxon International Company, "Air World Survey," (Annually).
NOTE: The "Air World Survey" covers the world's airlines with the exception of Aeroflot, the USSR national airline, and includes aircraft in service on June 30. Excludes air taxi operators. Effective 1979, excludes a number of companies operating smaller types of aircraft and not providing scheduled service.

U.S. EXPORTS AND EXPORTS OF AEROSPACE PRODUCTS

Calendar Years 1960-1981
(Millions of Dollars)

Year	TOTAL Exports[a] of U.S. Merchandise	Exports of Aerospace Products				
		TOTAL	Percent of Total U.S. Exports	Civil		Military
				Transports	Other	
1960	$ 20,375	$ 1,726	8.5%	$ 480	$ 609	$ 637
1961	20,754	1,653	8.0	263	615	775
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	5.0	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	106,561	7,792	7.3	2,397	2,927[r]	2,468
1976	113,666	7,843	6.9	2,468	3,209[r]	2,166
1977	119,006	7,581	6.4	1,936	3,113	2,532
1978	141,126	10,001	7.1	2,558	3,460	3,983
1979	178,591	11,747	6.6	4,998	4,774	1,975
1980	216,668[r]	15,506	7.2	6,727	6,521[r]	2,258[r]
1981	228,961	17,634	7.7	7,180	6,132	4,322

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually); "Highlights of U.S. Export and Import Trade," Report FT 990 (Monthly).

a Exports of domestic merchandise including DOD shipments.

r Revised.

GROSS NATIONAL PRODUCT, FEDERAL BUDGET AND DEFENSE BUDGET

Selected Fiscal Years
(Billions of Dollars)

Fiscal Year	GNP[r]	Federal Budget Outlays[r]			Defense Outlays[a] as Percent of	
		NET TOTAL[b]	Defense	Others	GNP[r]	Federal Budget[r]
1950—Lowest defense budget since World War II peak	$ 261.1	$ 43.1	$ 12.0	$ 31.1	4.6%	27.8%
1953—Korea peak	361.3	76.8	47.5	29.3	13.1	61.8
1964—Last prewar year	618.2	118.6	51.5	67.1	8.3	43.4
1968—South East Asia peak	831.3	178.1	78.8	99.3	9.5	44.2
1973—Actual	1,252.0	245.6	74.5	171.1	6.0	30.3
1974—Actual	1,379.4	267.9	77.8	190.1	5.6	29.0
1975—Actual	1,479.9	324.2	85.6	238.6	5.8	26.4
1976—Actual	1,640.1	364.5	89.4	275.1	5.5	24.5
1977—Actual	1,864.1	400.5	97.5	303.0	5.2	24.3
1978—Actual	2,083.8	448.4	105.2	343.2	5.0	23.5
1979—Actual	2,353.3	491.0	117.7	373.3	5.0	24.0
1980—Actual	2,567.5	576.7	135.9	440.8	5.3	23.6
1981—Actual	2,858.6	657.2	159.8	497.4	5.6	24.3
1982—Estimate	3,082.4	725.3	187.5	537.8	6.1	25.9
1983—Estimate	3,433.6	757.6	221.1	536.5	6.4	29.2

Source: "The Budget of the United States Government" (Annually).
a "Defense" includes the military budget of DOD and other defense-related activities.
b "Net Total" is government-wide total less intragovernmental transactions; excludes off-budget entities.
r Revised.

DEPARTMENT OF DEFENSE
TOTAL MILITARY OUTLAYS BY FUNCTIONAL TITLE
Fiscal Years 1975-1983
(Millions of Dollars)

	1975	1976	Transition Quarter
TOTAL	$85,020	$88,036	$21,927
PROCUREMENT—TOTAL	16,042	15,964	3,766
AIRCRAFT	5,484	6,520	1,557
MISSILES	2,889	2,296	402
Ships	2,627	2,606	661
Combat Vehicles, Weapons & Torpedoes	395	240	134
Ordnance, Vehicles & Related Equipment	1,492	856	150
Electronics & Communications	897	1,031	271
Other Procurement	2,258	2,415	591
RESEARCH, DEVELOPMENT, TEST & EVALUATION—TOTAL	8,866	8,923	2,206
AIRCRAFT	1,698	1,603	410
MISSILES	2,176	2,295	520
ASTRONAUTICS	515	581	129
Other	4,477	4,444	1,147
Military Personnel—TOTAL	31,210	32,359	8,305
Active Forces	23,235	23,259	5,846
Reserve Forces	1,733	1,804	512
Retired Pay	6,242	7,296	1,947
Military Construction	1,462	2,019	376
Family Housing	1,124	1,192	296
Civil Defense	86	80	18
Operations and Maintenance	26,330	27,902	7,261
Other	(100)	(403)	(301)

Source: Department of Defense Budget (Annually).
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.
a Includes all items in the DOD military budget; excludes the DOD civil budget for the Army Corps of Engineers and other non-defense-related activities.
b Transferred to Federal Emergency Management Agency (FEMA) in 1979.
E Estimate.
NA Not Available.

DEPARTMENT OF DEFENSE
TOTAL MILITARY OUTLAYS BY FUNCTIONAL TITLE[a] (Continued)
Fiscal Years 1975-1983
(Millions of Dollars)

1977	1978	1979	1980	1981	1982[E]	1983[E]
$95,650	$103,042	$115,013	$132,840	$156,096	$182,800	$215,900
18,178	19,976	25,404	29,021	35,191	41,325	55,144
6,608	6,971	8,836	11,124	13,193	15,767	21,746
2,781	1,794	2,084	2,461	3,513	4,437	6,262
2,841	3,048	4,553	4,222	5,217	5,414	6,295
833	2,140	2,949	3,222	4,145	4,941	6,462
940	732	958	1,271	1,368	1,525	2,005
1,197	1,349	1,618	} 6,721	} 7,755	} 9,241	} 12,374
2,978	3,942	4,406				
9,795	10,508	11,152	13,127	15,278	18,299	22,200
2,176	} NA	} NA	} NA	} NA	} NA	} NA
2,259						
537						
4,823						
33,931	36,246	38,686	42,761	50,138	53,284	61,005
23,857	25,116	26,300	28,465	33,378	34,839	40,054
1,858	1,959	2,107	2,376	3,031	3,445	4,480
8,216	9,171	10,279	11,920	13,729	15,000	16,471
1,914	1,932	2,080	2,450	2,463	2,744	3,975
1,358	1,405	1,468	1,680	1,721	2,138	2,436
93	82	(b)	(b)	(b)	(b)	(b)
30,587	33,578	36,424	44,770	51,920	60,585	67,279
(206)	(685)	(200)	(969)	(615)	4,425	3,861

FEDERAL OUTLAYS
DEFENSE, NASA AND AEROSPACE PRODUCTS AND SERVICES
Fiscal Years 1960-1983
(Millions of Dollars)

Year	TOTAL National Defense	TOTAL NASA	Federal Outlays for Aerospace Products & Services			Aerospace as Percent of Total National Defense and NASA
			TOTAL	DOD[a]	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	74,571[r]	3,315	15,945	12,675	3,270	20.5
1974	77,781[r]	3,256	15,782	12,601	3,181	19.5
1975	85,552[r]	3,266	15,943	12,762	3,181	18.0
1976	89,430[r]	3,669	16,843	13,295	3,548	18.1
Tr. Qtr.	22,307[r]	952	3,944	3,018	926	17.0
1977	97,501	3,945	18,201	14,361	3,840	17.9
1978	105,186	3,983	12,624	8,765	3,859	11.6
1979	117,681	4,196	14,984	10,920	4,064	12.3
1980	135,856	4,852	18,297	13,585	4,712	13.0
1981	159,765	5,426	21,984	16,706	5,278	13.3
1982[E]	187,497	5,831	25,900	20,204	5,696	13.4
1983[E]	221,068	6,582	34,468	28,008	6,460	15.1

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

NOTE: "National Defense" includes the military budget of the Department of Defense and other defense-related 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 Prior to 1978, DOD outlays for aircraft and missile procurement and RDT&E. Effective 1978, includes only procurement; outlays for RDT&E by product group not available.

r Revised.

E Estimate.

FEDERAL OUTLAYS FOR AEROSPACE PRODUCTS AND SERVICES

Fiscal Years 1960-1983
(Millions of Dollars)

Year	TOTAL	Department of Defense[a]			NASA[b]
		TOTAL	Aircraft	Missiles	
1960	$12,849	$12,502	$ 7,416	$5,086	$ 347
1961	13,606	12,960	6,963	5,997	646
1962	15,135	13,992	7,773	6,219	1,143
1963	16,186	13,857	7,799	6,058	2,327
1964	17,938	14,205	8,276	5,929	3,733
1965	15,697	11,135	7,138	3,997	4,562
1966	17,771	12,411	8,541	3,870	5,360
1967	20,011	14,874	10,442	4,432	5,137
1968	21,355	16,757	12,016	4,741	4,598
1969	20,472	16,286	11,367	4,919	4,185
1970	18,747	15,048	9,940	5,108	3,699
1971	17,335	13,997	8,849	5,148	3,338
1972	16,999	13,627	8,461	5,166	3,372
1973	15,945	12,675	7,614	5,061	3,270
1974	15,782	12,601	7,460	5,141	3,181
1975	15,943	12,762	7,697	5,065	3,181
1976	16,843	13,295	8,704	4,591	3,548
Tr. Qtr.	3,944	3,018	2,096	922	926
1977	18,201	14,361	9,321	5,040	3,840
1978	12,624	8,765	6,971	1,794	3,859
1979	14,984	10,920	8,836	2,084	4,064
1980	18,297	13,585	11,124	2,461	4,712
1981	21,984	16,706	13,193	3,513	5,278
1982[E]	25,900	20,204	15,767	4,437	5,696
1983[E]	34,468	28,008	21,746	6,262	6,460

Source: Department of Defense Budget (Annually); NASA Budget (Annually).
a Prior to 1978, DOD outlays for aircraft and missile procurement and RDT&E. Effective 1978, includes only procurement; outlays for RDT&E by product group no longer available.
b Includes Research & Development, and Research & Program Management; excludes Construction of Facilities.
E Estimate.

DEPARTMENT OF DEFENSE
AEROSPACE OUTLAYS

Fiscal Years 1960-1983
(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
1977	14,361	9,389	4,972
1978	NA	8,765	NA
1979	NA	10,920	NA
1980	NA	13,585	NA
1981	NA	16,706	NA
1982[E]	NA	20,204	NA
1983[E]	NA	28,008	NA

Source: Department of Defense Budget (Annually).
a Excludes Military Assistance.
E Estimate.
NA Not Available.

Aircraft Production

Production of aircraft, as measured in dollar value of deliveries, climbed to a new record level in 1981. Sales of complete aircraft, engines and parts totaled $34.7 billion, which compares with $29.5 billion in the previous year. The increase amounted to slightly more than 17 percent.

The larger increase was in sales to U.S. government customers, predominantly the Department of Defense. This was a switch from the experience of recent years, in which non-government sales volume grew at a faster rate. In 1981, aircraft sales to government agencies totaled $12.2 billion, a gain of approximately 30 percent over 1980's $9.4 billion, reflecting the increasing momentum of the U.S. defense expansion program. Sales to other customers also increased, from $20.1 billion in 1980 to $22.5 billion in 1981, a gain of over 12 percent. As is traditional, aircraft sales accounted for more than half of the industry's aerospace sales.

The industry's backlog of orders for aircraft, engines and parts experienced a significant change: it

increased in terms of current dollars but actually declined—for the first time since 1975—in inflation-adjusted constant dollars. Total backlog at the end of 1981, in current dollars, was $62.1 billion. At $41.1 billion, orders from non-government customers accounted for two-thirds of the backlog. The greater backlog growth, however, was in orders from the U.S. government, which amounted to $21 billion, up from $17.5 billion at the end of the previous year.

Among other aircraft production highlights:

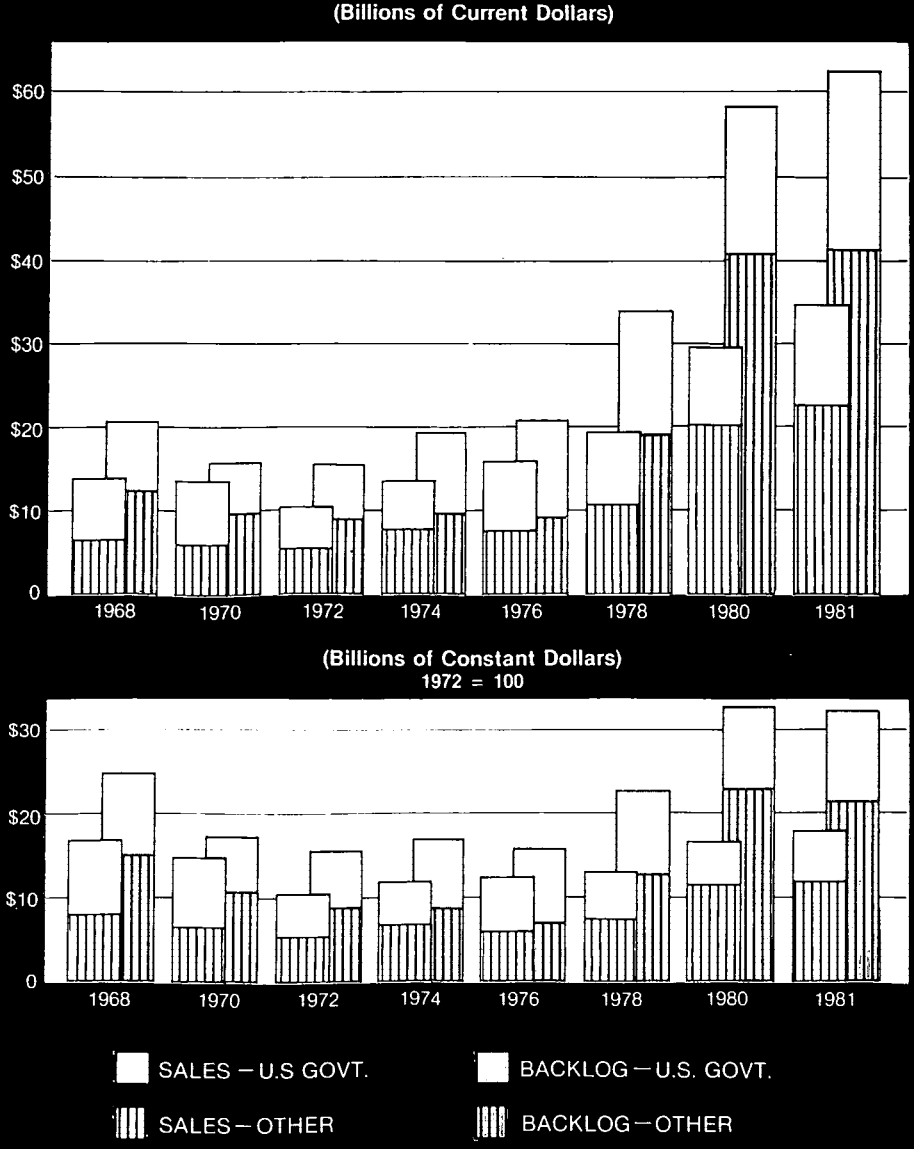
• Shipments of general aviation aircraft dropped to 9,457 units, down from 11,881 in 1980 and the lowest level in a decade. However, the dollar value of sales increased some $400 million to $2.9 billion. The higher value of fewer shipments is due to continuing strong production of high-value jet and turboprop business aircraft and a recession-induced reduction in sales of lower-value piston-powered planes.

• Civil helicopter production, which had grown dramatically over the prior decade, declined in 1981. The rotary wing segment of the industry produced 1,072 helicopters, 294 fewer than in the previous year; dollar value dropped from $656 million in 1980 to $597 million in 1981. Military acceptances of helicopters (for both U.S. and foreign use) totaled 158 (down 31) with a total dollar value of $825 million (up more than $300 million).

• The industry delivered 387 civil transport aircraft, the same number as in 1980, but dollar value—$9.7 billion in 1981—declined some $200 million. The transport backlog dropped sharply; at year-end 1981 it was $17.2 billion, down from $20.8 billion a year earlier. The drop was due for the most part to the financial difficulties of the world's airlines, which caused deferment, and in some cases cancellations, of orders for new equipment. Of particular note was the reduction in orders from foreign carriers, which for several years had constituted more than half of the U.S. aircraft industry's backlog; such orders amounted to 45 percent of the total backlog at year-end 1981.

Military aircraft production remained at approximately the previous year's level in terms of numbers. Overall production amounted to 1,048 aircraft, five fewer than in 1980; this included 689 planes for use by U.S. military agencies (up 58); 215 accepted by the Department of Defense for delivery to foreign governments under Foreign Military Sales or Military Assistance Programs (up 21); and 144 military aircraft sold to foreign customers on a commercial basis (down 84). The value of DOD acceptances—904 aircraft compared with 825 in 1980—was $8.6 billion, up $2.1 billion over the previous year. The grand total of all military aircraft work performed by the industry, including deliveries to DOD, commercial shipments, aircraft and engine spare parts, and aircraft-related R&D was $19.2 billion, which compares with $13.9 billion in 1980.

SALES AND BACKLOG OF AIRCRAFT, ENGINES, AND PARTS



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

SALES OF COMPLETE AIRCRAFT, AIRCRAFT ENGINES, AND PARTS

Calendar Years 1968-1981
(Millions of Dollars)

Year	TOTAL			Aircraft & Parts		Aircraft Engines & Parts	
	TOTAL	U.S. Gov't.	Other	U.S. Gov't.	Other	U.S. Gov't.	Other
CURRENT DOLLARS							
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	14,656	6,859	7,797	5,269	6,001	1,590	1,796
1976	15,936	8,314	7,622	6,336	5,900	1,978	1,722
1977	16,378	8,848	7,530	6,855	5,670	1,993	1,860
1978	19,305	8,724	10,581	6,853	7,873	1,871	2,708
1979	24,672	8,649	16,023	6,378	12,701	2,271	3,322
1980[r]	29,524	9,427	20,097	6,724	15,901	2,703	4,196
1981	34,695	12,168	22,527	8,598	17,996	3,570	4,531
CONSTANT DOLLARS (1972 = 100)[a]							
1968	$16,780	$8,979	$7,801	$6,902	$6,285	$2,077	$1,516
1969	14,707	8,251	6,456	6,201	5,205	2,050	1,251
1970	14,725	8,295	6,430	6,204	5,121	2,091	1,309
1971	11,865	6,575	5,290	5,159	4,263	1,417	1,027
1972	10,153	4,954	5,199	3,666	4,085	1,288	1,114
1973	11,617	5,241	6,376	4,003	5,035	1,238	1,341
1974	11,784	5,205	6,578	3,970	5,087	1,236	1,491
1975	11,673	5,463	6,210	4,197	4,779	1,266	1,430
1976	12,063	6,293	5,769	4,796	4,466	1,497	1,303
1977	11,713	6,328	5,385	4,902	4,055	1,425	1,330
1978	12,866	5,814	7,052	4,567	5,247	1,247	1,805
1979	15,158	5,314	9,844	3,918	7,803	1,395	2,041
1980	16,646	5,315	11,331	3,791	8,965	1,524	2,366
1981	17,911	6,282	11,629	4,439	290	1,843	2,339

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
a Based on GNP implicit price deflator.
r Revised.

BACKLOG OF COMPLETE AIRCRAFT, AIRCRAFT ENGINES, AND PARTS

As of December 31, 1968-1981
(Millions of Dollars)

Year	TOTAL			Aircraft & Parts		Aircraft Engines & Parts	
	TOTAL	U.S. Gov't.	Other	U.S. Gov't.	Other	U.S. Gov't.	Other
CURRENT DOLLARS							
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	16,365	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	18,892	10,751	8,141	8,743	6,646	2,008	1,495
1976	20,879	11,950	8,929	9,905	7,416	2,045	1,513
1977	25,063	12,471	12,592	9,557	10,152	2,914	2,440
1978	33,869	14,897	18,972	11,759	16,508	3,138	2,464
1979	50,484	17,316	33,168	13,331	27,955	3,985	5,213
1980[r]	58,183	17,514	40,669	13,062	33,526	4,452	7,143
1981	62,136	21,017	41,119	15,682	32,564	5,335	8,555
CONSTANT DOLLARS (1972 = 100)[a]							
1968	$24,908	$9,874	$15,034	$7,268	$12,853	$2,606	$2,181
1969	22,109	8,168	13,941	6,072	11,914	2,096	2,027
1970	17,182	6,466	10,716	5,099	9,405	1,367	1,311
1971	14,873	6,480	8,394	5,079	7,419	1,401	975
1972	15,632	7,027	8,605	5,705	7,355	1,322	1,250
1973	15,484	7,394	8,090	5,972	6,843	1,422	1,247
1974	16,873	8,518	8,355	6,699	6,779	1,820	1,576
1975	15,046	8,562	6,484	6,963	5,293	1,599	1,191
1976	15,804	9,045	6,759	7,498	5,614	1,548	1,145
1977	17,924	8,919	9,005	6,835	7,260	2,083	1,745
1978	22,572	9,928	12,644	7,837	11,002	2,091	1,642
1979	31,016	10,638	20,377	8,190	17,175	2,448	3,203
1980	32,805	9,875	22,930	7,365	18,903	2,510	4,027
1981	32,077	10,850	21,227	8,096	16,811	2,754	4,416

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
a Based on GNP implicit price deflator.
r Revised.

U.S. AIRCRAFT PRODUCTION

Calendar Years 1968-1981

CIVIL AIRCRAFT

Year	TOTAL	Domestic Shipments[a]			Export Shipments		
		Transports[a]	Helicopters	General Aviation	Transports	Helicopters	General Aviation
1968	14,922	462	279	10,819	240	243	2,879
1969	13,505	332	282	9,996	182	252	2,461
1970	8,076	127	150	5,246	184	332	2,037
1971	8,158	50	171	5,900	173	298	1,566
1972	10,576	79	319	7,702	148	256	2,072
1973	14,709	143	342	10,482	151	428	3,163
1974	15,326	91	433	9,903	241	395	4,263
1975	15,251	127	528	10,804	188	336	3,268
1976	16,429	64	442	12,232	158	315	3,218
1977	17,913	54	527	13,441	101	321	3,469
1978	18,962	130	536	14,346	111	368	3,471
1979	18,450	176	560	13,177	200	459	3,878
1980	13,634	150	841	8,703	237	525	3,178
1981	10,916	132	619	6,840	255	453	2,617

MILITARY AIRCRAFT[r]

Year	TOTAL	U.S. Military Agencies	Exports		
			Total	FMS/MAP	Commercial
1968	4,894	4,440	454	NA	NA
1969	4,290	3,644	646	NA	NA
1970	3,720	3,085	635	NA	NA
1971	2,914	2,232	682	NA	NA
1972	2,530	1,993	537	124	413
1973	1,821	1,243	578	129	449
1974	1,513	799	714	365	349
1975	1,779	844	935	525	410
1976	1,318	625	693	518	175
1977	1,134	454	680	408	272
1978	996	467	529	256	273
1979	837	531	306	203	103
1980	1,053	631	422	194	228
1981	1,048	689	359	215	144

Source: Civil shipments data from company reports to AIA and General Aviation Manufacturers Association. Military acceptances for use of U.S. military agencies and for Foreign Military Sales and Military Assistance Programs reported by USAF, USN and Army. Export data from Dept. of Commerce (Bureau of the Census) Report FT410.

a Prior to 1976, includes the C-130 military transport.

NA Not available.

r Revised from previously published data for 1968-1975 to include military aircraft exported commercially (manufacturer-to-government).

CIVIL AIRCRAFT SHIPMENTS

Calendar Years 1967-1981

Year	TOTAL	Transport Aircraft	Helicopters	General Aviation
NUMBER OF AIRCRAFT SHIPPED				
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	15,326	332	828	14,166
1975	15,251	315	864	14,072
1976[a]	16,429	222	757	15,450
1977[a]	17,913	155	848	16,910
1978[a]	18,962	241	904	17,817
1979[a]	18,450	376	1,019	17,055
1980	13,634	387	1,366	11,881
1981	10,916	387	1,072	9,457
VALUE—Millions of Dollars				
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	5,091	3,993	189	909
1975	5,086	3,779	274	1,033
1976[a]	4,592	3,078	285	1,229
1977[a]	4,451	2,649	251	1,551
1978[a]	6,458	4,308	328	1,822
1979[a]	10,644	8,030	403	2,211
1980	13,058	9,895	656	2,507
1981	13,223	9,706	597	2,920

Source: Transport Aircraft and Helicopters: Aerospace Industries Association, company reports.
General Aviation: General Aviations Manufacturers' Association and Aerospace Industries Association, company reports.

a Transport aircraft shipments data have been revised for 1976-1979 to exclude the Lockheed C-130, such that data for previous years are not strictly comparable.

CIVIL TRANSPORT AIRCRAFT BACKLOG

As of December 31, 1977-1981

Company and Model	1977	1978	1979	1980	1981
TOTAL AIRCRAFT ON ORDER					
(Domestic and Foreign Orders)	345	622	828	715	526
Value (Millions of Dollars)	$ 6,182	$13,098	$21,322	$20,799	$17,198
Boeing—TOTAL	242	426	611	535	447
B-707	4	1	—	—	—
B-727	157	195	212	104	35
B-737	36	111	159	175	146
B-747	45	89	106	71	37
B-757	—	—	40	49	82
B-767	—	30	94	136	147
Lockheed—TOTAL	18	40	56	50	27
L-1011	18	40	56	47	21
L-100	—	—	—	3	6
McDonnell Douglas—TOTAL	85	156	161	130	52
DC-9	55	101	108	105	43
DC-10	30	55	53	25	9
TOTAL FOREIGN ORDERS	165	304	436	401	213
Value (Millions of Dollars)	$ 3,785	$ 7,100	$11,848	$12,166	$ 7,702
Boeing—TOTAL	95	194	312	303	180
B-707	4	1	—	—	—
B-727	35	51	74	48	10
B-737	16	77	127	134	71
B-747	40	65	88	70	37
B-757	—	—	19	22	22
B-767	—	—	4	29	40
Lockheed—TOTAL	11	17	33	32	17
L-1011	11	17	33	29	11
L-100	—	—	—	3	6
McDonnell Douglas—TOTAL	59	93	91	66	16
DC-9	41	58	58	46	8
DC-10	18	35	33	20	8

Source: Aerospace Industries Association, company reports.

a Firm unfilled orders, excluding options, for U.S. manufactured transport aircraft over 33,000 pounds, including all jet transports plus the turboprop-powered Lockheed L-100.

SPECIFICATIONS OF U.S. CIVIL JET TRANSPORT AIRCRAFT[a]

In Production as of 1982

Manufacturer & Model by Number of Engines	Crew Complement	No. of Aisles	No. of Passengers	Operating Empty Wt. (000's lbs.)	Most Efficient Cruise Speed (Mach)
Four Engines					
Boeing 707	3	1	147	146	M.8-.83
Boeing 747 Series	3	2	331-550	324-397	M.8-.84
Three Engines					
Boeing 727 series	3	1	145-189	98-102	M.8-.84
Lockheed L-1011 series	3	2	242-304	242-249	M.83
McDonnell-Douglas DC-10 series	3	2	250-380	245-272	M.82
Two Engines					
Boeing 737 series	2	1	115-132	61-72	M.73-.78
Boeing 757 series	2	1	178-186	128-130	M.8
Boeing 767 series	2	2	211	178-179	M.8
McDonnell-Douglas DC-9 series	2	1	107-172	60-81	M.76-.78

Source: AIA, company reports.
a All jet-powered passenger transport aircraft having empty weight of 33,000 pounds or more.

CIVIL TRANSPORT AIRCRAFT SHIPMENTS

Calendar Years 1977-1981

Company and Model	1977	1978	1979	1980	1981
TOTAL					
Number of Aircraft Shipped	155	241	376	387	387
Value (Millions of Dollars)	$ 2,649	$4,308	$ 8,030	$ 9,895	$ 9,706
Boeing—TOTAL	115	193	281	296	255
B-707	3	3	1	—	—
B-727	67	118	136	131	94
B-737	25	40	77	92	108
B-747	20	32	67	73	53
Lockheed—TOTAL	12	10	21	26	36
L-1011	11	8	14	24	28
L-100	1	2	7	2	8
McDonnell Douglas—TOTAL	28	38	74	65	96
DC-9	16	20	39	25	77
DC-10	12	18	35	40	19

Source: Aerospace Industries Association, company reports.

COMMERCIAL HELICOPTER SHIPMENTS[a]

Calendar Years 1977-1981

Company and Model	1977	1978	1979	1980	1981
COMMERCIAL SHIPMENTS	884	935	1,054	1,452	1,105
Value (Millions of Dollars)	$316	$367	$457	$754	$783
CIVIL SHIPMENTS	848	904	1,019	1,366	1,072
Value (Millions of Dollars)	$251	$328	$403	$656	$597
Bell—TOTAL	374	438	612	780	609
205	11	23	18	30[c]	—
206 series	283	322	469	550	476
212	47	50	86	116	49
214 series	9	16	8	7	12
222	—	—	—	41	21
412	—	—	—	—	51
AH-1J[b]	7	—	—	—	—
AH-1S[b]	—	—	1	1	—
UH-1H[b]	17	27	30	35	—
Boeing Vertol—TOTAL	12	4	4	6	28
CH-47[b]	12	4	4	6	23
234	—	—	—	—	5
Brantley-Hynes—TOTAL	1	11	2	—	—
B-2B	1	11	2	—	—
Enstrom—TOTAL	96	91	46	48	46
F-28 series	44	44	27	18	29
280C	52	47	19	30	10
280F	—	—	—	—	7
Hiller—TOTAL	40	52	43	49	30
12-E series	35	52	43	41	23
12-ET series	5	—	—	8[c]	6
FH-1100	—	—	—	—	1
Hughes—TOTAL	336	312	306	401	186
300 series	125	116	110	136	50
500 series	211	196	196	265[c]	136[c]
Robinson—TOTAL	—	—	—	78	156
R22	—	—	—	78	156
Sikorsky(UTC)—TOTAL	25	27	41	90	50
S-61	25	27	5	5	—
S-76	—	—	3[c]	85	50[c]

Source: Aerospace Industries Association, company reports.

NOTE: All data exclude production by foreign licensees.

a Shipments to customers other than the U.S. Government, including all civil shipments plus commercial (manufacturer-to-customer) military exports, and excluding deliveries to U.S. military agencies for shipment to foreign governments under Military Assistance Programs and Foreign Military Sales.

b Military configuration for commercial export sale.

c Includes the following helicopters commercially exported in military configuration: 4 Bell 205's, 4 Hiller 12-ET's, and 36 Hughes 500's in 1980; 2 Hughes 500's and 8 Sikorsky S-76's in 1981.

GENERAL AVIATION AIRCRAFT SHIPMENTS

By Selected Manufacturers
Calendar Years 1977-1981

	1977	1978	1979	1980	1981
NUMBER OF AIRCRAFT SHIPPED	16,910	17,817	17,055	11,881	9,457
Single-Engine, Piston	13,167	13,651	12,693	8,283	6,268
Multi-Engine, Piston	2,195	2,630	2,843	2,116	1,542
Agricultural	890	748	593	357	340
Turboprop	428	548	637	795	918
Turbojet	230	240	289	330	389
VALUE OF SHIPMENTS[a] (Millions of Dollars)	$ 1,551	$ 1,822	$ 2,211	$ 2,507	$ 2,920
Single-Engine, Piston	435	486	490	365	315
Multi-Engine, Piston	389	492	557	402	389
Agricultural	39	33	35	25	24
Turboprop	295	393	550	874	1,017
Turbo-jet	393	418	579	841	1,175
Number of Aircraft By Selected Manufacturer					
Ayres	—	134	99	44	59
Beech	1,203	1,367	1,508	1,394	1,242
Bellanca	252	370	443	103	—
Cessna	8,839	8,770	8,400	6,393	4,680
Fairchild/Swearingen	28	51	70	86	85
Gates Learjet	105	102	107	120	138
Gulfstream American	866	933	400	167	284
Lake	99	98	96	79	52
Lockheed Jetstar	16	9	7	4	—
Maule	108	88	67	59	44
Mooney	362	379	439	332	330
Piper	4,499	5,272	5,255	2,954	2,495
Rockwell International	432	244	164	146	40
Schweizer Aircraft	—	—	—	—	8
Ted Smith Aerostar	101	—	—	—	—

Source: General Aviation Manufacturers' Association and Aerospace Industries Association.
a Manufacturers' net billing price.

MILITARY AIRCRAFT ACCEPTED BY U.S. MILITARY AGENCIES

Number and Flyaway Value
Calendar Years 1967-1981

Year	TOTAL	Bomber/ Patrol	Fighter/ Attack	Transport/ Tanker	Trainer	Helicopter	Other
NUMBER							
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	62	624	34	40	601	8
1976	1,143	55	646	67	11	348	16
1977	862	44	488	25	12	273	20
1978	723	22	478	36	—	166	21
1979	734	12	529	21	—	158	14
1980[r]	825	16	557	37	18	189	8
1981	904	19	650	17	45	158	15
FLYAWAY VALUE—Millions of Dollars							
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	3,247	129	2,068	536	100	396	18
1973	2,571	325	1,490	348	140	268	—
1974	2,224	584	1,222	101	111	206	—
1975	3,172	599	2,054	128	27	359	5
1976	4,729	547	3,421	340	27	384	10
1977	4,364	499	3,190	331	14	316	14
1978	4,664	313	3,496	613	—	225	17
1979	5,470	199	4,660	379	-	219	13
1980[r]	6,521	475	5,289	202	32	516	7
1981	8,630	526	6,719	509	32	825	19

Source: Department of Defense.
NOTE: Data exclude gliders and targets, and include spares, spare parts, and support equipment that are procured with the aircraft. 1966-1967, Navy attack planes included with bombers; 1968-1978, Navy attack planes included under fighter/attack. Effective 1972, includes aircraft accepted for shipment to foreign governments for military assistance programs and foreign military sales. 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 FOR UNITED STATES AIR FORCE[a] BY TYPE AND MODEL

Calendar Years 1980 and 1981
(Millions of Dollars)

Type and Model	Number		Flyaway Cost[b]		Weapon System Cost[c]	
	1980[r]	1981	1980[r]	1981	1980[r]	1981
AIR FORCE—TOTAL	365	398	$3,123	$3,687	$3,787	$4,081
Fighter/Attack—TOTAL	353	385	2,798	3,109	3,434	3,458
A-7K	—	16	—	141	—	155
A-10A	144	141	701	740	782	812
F-15A/B/C/D	84	67	1,182	1,018	1,373	1,101
F-16A/B	125	161	915	1,210	1,279	1,390
Transports/Tankers—TOTAL	8	10	56	391	63	403
C-130H	8	4	56	41	63	42
KC-10A	—	6	—	350	—	361
Command/Control—TOTAL	4	3	269	187	290	220
E-3A	4	2	269	162	290	194
TR-1A	—	1	—	25	—	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 Air Force acceptances for own use; exclude FMS/MAP shipments.
b Flyaway Cost includes airframe, engines, electronics, communications, armament, other installed equipment and non-recurring costs associated with the manufacture of the aircraft.
c Weapon System Cost includes flyaway costs, peculiar ground equipment, training equipment and technical data.
r Revised.

MILITARY AIRCRAFT PRODUCTION FOR UNITED STATES NAVY[a] BY TYPE AND MODEL

Calendar Years 1980 and 1981 (Millions of Dollars)

Type and Model	Number		Flyaway Cost[b]		Weapon System Cost[c]	
	1980[r]	1981	1980[r]	1981	1980[r]	1981
NAVY—TOTAL	106	140	$1,581	$2,158	$1,989	$2,636
Patrol—TOTAL	12	12	206	260	347	307
P-3C	12	12	206	260	347	307
Attack—TOTAL	33	24	332	406	451	514
A-6E	12	12	102	207	146	256
EA-6B	6	6	127	157	170	204
A-7E	15	6	103	42	135	54
Fighters—TOTAL	34	41	899	1,210	1,031	1,474
F-14A	30	30	717	804	782	909
F1A-18[d]	4	11	182	406	249	565
Helicopters—TOTAL	2	15	38	178	40	221
CH-53E	2	15	38	178	40	221
Support—TOTAL	25	48	106	104	120	120
C-9B	—	2	—	36	—	41
UC-12B	22	—	24	—	26	—
T-34	—	45	—	32	1	32
EC-130Q	3	1	82	36	93	47

Source: Department of the Navy.

a Navy acceptances for own use; exclude FMS/MAP shipments.

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

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

d Four aircraft in 1980 and five aircraft in 1981 were pilot production aircraft, and other six 1981 acceptances were limited production aircraft; thus cost figures are not representative of full-rate production costs.

r Revised.

MILITARY AIRCRAFT PRODUCTION FOR UNITED STATES ARMY[a] BY TYPE AND MODEL

Calendar Years 1980 and 1981
(Millions of Dollars)

Type and Model	Number		Flyaway Cost[b]	
	1980	1981	1980	1981
ARMY—TOTAL	160	151	$463	$657
Helicopters—TOTAL	152	141	456	645
AH-1S	78	21	137	77
CH-47C	7	—	74	—
UH-60A	67	120	245	568
Other—TOTAL	8	10	7	12
C-12D	6	10	5	12
UV-18	2	—	2	—

Source: Department of the Army.
a Army acceptances for own use; exclude FMS/MAP shipments.
b Flyaway cost includes airframes, engines, electronics, communications, armament and other installed equipment.
r Revised.

MILITARY AIRCRAFT PRODUCTION FOR MILITARY ASSISTANCE PROGRAMS AND FOREIGN MILITARY SALES, BY ACCEPTING AGENCY, TYPE AND MODEL

Calendar Years 1980 and 1981
(Millions of Dollars)

Accepting Agency, Type and Model	Number of Aircraft Accepted		Flyaway Cost[a]	
	1980	1981	1980	1981
TOTAL ACCEPTANCES FOR REIMBURSABLE PROGRAMS	194	215	$1,354	$2,128
AIR FORCE—TOTAL	154	204	1,301	2,040
Fighter/Attack—TOTAL	137	200	1,260	1,994
A-37	10	—	1	—
F-5E	47	44	202	242
F-5F	17	17	90	102
F-15C/D	2	10	34	290
F-16A/B	61	129	933	1,360
Transport/Tankers—TOTAL	4	4	40	46
C-130	4	4	40	46
Trainers—TOTAL	13	—	0.6	—
T-33	4	—	0.2	—
T-37	9	—	0.4	—
NAVY—TOTAL	5	4	31	79
Trainers—TOTAL	5	—	31	—
TA-7H	5	—	31[b]	—
Patrol—TOTAL	—	4	—	79
P-3C	—	4	—	79
ARMY—TOTAL	35	7	22	9
Helicopters—TOTAL	35	2	22	2
UH-1H	35	—	22	—
205-A	—	2	—	2
Other—TOTAL	—	5	—	7
C-12D	—	5	—	7

Source: Departments of the Air Force, Navy and Army.

a Flyaway cost includes airframe, engines, electronics, communications, armament, other installed equipment and nonrecurring costs associated with the manufacture of the aircraft.

b Engines excluded.

DEPARTMENT OF DEFENSE
OUTLAYS FOR AIRCRAFT PROCUREMENT

By Agency
Fiscal Years 1960-1983
(Millions of Dollars)

Year	TOTAL AIRCRAFT PROCUREMENT	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
1977	6,608	3,586	2,721	301
1978	6,971	3,989	2,602	380
1979	8,836	5,138	3,140	558
1980	11,124	6,647	3,689	788
1981	13,193	7,941	4,397	855
1982 *E*	15,767	9,165	5,658	944
1983 *E*	21,746	12,458	7,820	1,468

Source: Department of Defense Budget (Annually).
E Estimate.

MILITARY AIRCRAFT PROGRAM PROCUREMENT INCLUDING INITIAL SPARES[a]

Fiscal Years 1981, 1982 and 1983
(Millions of Dollars)

Agency, Type and Model	1981		1982[E]		1983[E]	
	No.	Cost	No.	Cost	No.	Cost
AIR FORCE						
A-7K	6	$ 107.9	–	$ –	–	$ –
A-10 A/E Thunderbolt II	60	613.5	20	235.9	20	360.7
B-1B	–	–	1	1,621.9	7	4,033.5
B-52G Cruise Missile Carrier Aircraft Modification	40	85.8	40	95.6	22	155.6
B-52G/H Avionics Modernization	64	284.0	61	256.1	64	312.2
C-5 Wing Modification	12	165.3	18	186.5	18	190.2
C-5	–	–	–	270.0	2	860.0
C-130 Hercules	6	72.0	8	113.6	–	–
C-141 Modification	33	25.6	–	–	–	–
E-3A (AWACS)	2	270.0	2	257.9	2	176.7
European Distribution System Aircraft (EDSA)	–	–	–	–	2	6.5
EF-111A Modification	12	262.8	12	270.6	9	206.4
F-5F	–	7.0	3	25.0	3	29.3
F-15 Eagle	42	1,103.3	36	1,175.0	42	1,682.3
F-16 Multimission Fighter	180	1,941.9	120	2,273.0	120	2,225.9
KC-10A (ATCA)	6	327.0	6	357.4	8	829.1
KC-135 Re-engining/ Modernization	9	102.5	9	246.7	25	584.0
TR-1	4	122.9	5	138.6	4	177.6
UH-60A Blackhawk	5	31.0	6	37.8	–	–
NATO AWACS (U.S. Share)	–	382.0	–	344.3	–	186.1
LANTIRN (Night Precision Attack)	–	1.0	–	5.0	–	15.7
PLSS (Precision Location)	–	–	–	1.7	–	1.8
ARMY						
AH-1S Cobra/Tow	15	$ 46.1	12	$ 55.7	–	$ –
AH-64 Attack Helicopter	–	58.8	–	544.0	48	965.0
C-12	6	8.8	6	10.6	6	11.0
RC-12D	–	–	–	–	6	42.4
UH-60 Blackhawk	80	486.5	96	613.0	96	733.0
CH-47 Modernization	9	212.6	19	310.2	24	288.4
UV-18A	–	–	2	3.6	–	–

(Continued on next page)

MILITARY AIRCRAFT PROGRAM PROCUREMENT INCLUDING INITIAL SPARES[a] (Continued)

Fiscal Years 1981, 1982 and 1983
(Millions of Dollars)

Agency, Type and Model	1981		1982[E]		1983[E]	
	No.	Cost	No.	Cost	No.	Cost
NAVY						
A-6E Intruder	12	$ 270.7	12	$ 295.0	8	$ 276.6
AH-1T Improved Sea Cobra	-	-	-	-	-	17.2
AV-8B	-	88.7	12	669.6	18	942.9
C-2 Greyhound	-	-	-	37.0	8	284.9
C-9B Skytrain II	2	36.5	-	-	-	16.2
CH-53E Super Stallion	14	235.3	14	260.8	11	311.0
E-2C Hawkeye	6	240.8	6	266.2	6	352.7
EA-6B Prowler	6	223.6	6	277.1	6	347.1
EC-130Q Hercules	1	45.5	2	76.6	-	36.8
F-14A Tomcat	30	927.4	30	1,184.9	24	1,178.6
F/A-18 Hornet	60	2,012.3	63	2,420.8	84	2,847.4
KC-130R Hercules	-	-	4	64.0	-	-
P-3C Orion	12	308.5	12	441.0	6	341.8
SH-60B Seahawk LAMPS	-	105.0	18	727.3	48	1,231.6
SH-2F Seasprite (LAMPS MK-I)	-	19.7	18	189.7	18	205.1
T-34C Mentor	60	41.6	60	53.1	30	34.4
TH-57A Sea Ranger	32	14.7	30	20.6	21	23.2

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget, (Annually).
a Total Obligational Authority.
E Estimate.

ACTIVE U.S. MILITARY AIRCRAFT IN CONTINENTAL U.S.[a]

Fiscal Years 1975-1983

Fiscal Year	Total	Fixed Wing Aircraft				Helicopter
		Total	Jet	Turboprop	Piston	
1975	19,889	12,751	9,526	1,298	1,927	7,138
1976	19,775	12,126	9,255	1,511	1,360	7,649
1977	18,670	11,625	9,168	1,382	1,075	7,045
1978	18,931	11,748	8,898	1,794	1,056	7,183
1979	18,526	11,365	8,656	1,859	850	7,161
1980	18,969	11,362	8,794	1,869	699	7,607
1981[p]	19,538	11,823	9,212	1,987	624	7,715
1982[E]	19,828	11,934	9,393	2,020	521	7,894
1983[E]	20,012	12,007	9,480	2,090	437	8,005

Source: Department of Defense, Office of Secretary of Defense, reported in "FAA Aviation Forecasts" (Annually).
a Includes Army, Air Force, Navy, and Marine regular service aircraft, as well as Reserve and National Guard aircraft.
p Preliminary.
E Estimate.

Missile Programs

Industry sales of missile systems increased sharply in 1981, continuing an upward trend initiated in 1978. For 1981, net sales were $4.7 billion, some 17 percent above the previous year's $4 billion. The figures are indicators of broader industry missile activity; they include sales of missiles and parts but do not include propulsion systems or funding for research, development, test and evaluation. The backlog of orders at the end of 1981 was $5.5 billion (again excluding propulsion/RDT&E), the same as at year-end 1980.

The upward trend in missile acquisition is confirmed by Department of Defense data on outlays for Air Force/Army procurement (Navy figures are not available.) USAF/Army procurement in Fiscal Year 1981 totaled $3.5 billion, up 40 percent from 1980's $2.5 billion. The estimate for FY 1982 is $4.4 billion and for FY 1983 $6.3 billion.

On the basis of procurement funding for FY 1982, cruise missiles constitute the largest production program; combined funding of $1.2 billion is provided for three types:

the USAF Air Launched Cruise Missile, the Navy's sea-launched Tomahawk and the USAF's Ground Launched Cruise Missile. Production of the Navy's Trident 1 fleet ballistic missile, operational since 1979, ranks as the second largest program ($900 million).

The Army's principal missiles in production at year-end were the Patriot air defense system and the Pershing II field ballistic missile; the latter progressed to production status in 1981. Also in production and in flight test during 1981 was the Multiple Launch Rocket System (MLRS), an Army system for neutralizing enemy artillery and air defense weapons by rocket firepower from self-propelled loader/launchers.

Among other missile systems in production during 1981/82 are the Navy's air-launched/sea-launched Harpoon, an antishipping missile; four versions of the Navy air defense weapon Standard; the Army's man-portable, shoulder-fired Stinger, a short range antiaircraft missile; the TOW antitank missile, being produced for the Army and Marine Corps; the improved Hawk mobile air defense system, operational with Army, Marine Corps and NATO units; the Army's Laser Hellfire, a long-range helicopter-launched antiarmor weapon; the Army's Copperhead laser-guided artillery projectile; the Navy's long-range air-to-air missile Phoenix; and several versions of the infrared-guided Sidewinder and the radar-guided Sparrow, air-to-air missiles carried aboard Air Force and Navy aircraft.

Heading the list of missile development programs which have not yet reached production status is the Air Force MX intercontinental missile. In 1981, the Administration announced plans to deploy 100 MXs, but the manner in which they will be based was not decided. The Administration's strategic weapons program also icludes development of the Navy Trident 2 submarine-launched ballistic missile for deployment in the late 1980s.

Other missile developments under way in 1981/82 include the USAF's Imaging Infrared Maverick air-to-surface missile; the Air Force/Navy Advanced Medium Range Air-to-Air Missile (AMRAAM), which progressed to flight test status in 1981; the Navy/USAF High-speed Anti-Radiation Missile (HARM), an air-to-surface weapon scheduled for production under FY 1983 funding; the Air Force/Navy Laser Maverick, another air-to-surface weapon scheduled for 1983 production; the Tomahawk 2 standoff air-to-surface cruise missile, for use aboard USAF and Navy aircraft; and the Army's Rattler, an advanced man-portable antiarmor sytem in early development. Also in early development is the Advanced Strategic Missile Systems program being conducted by the Air Force, which involves R&D on re-entry vehicles and penetration aids for future ballistic weapons.

MISSILE PROGRAM PROCUREMENT INCLUDING INITIAL SPARES[a]

Fiscal Years 1981, 1982 and 1983
(Millions of Dollars)

Agency, Type and Model	1981		1982[E]		1983[E]	
	No.	Cost	No.	Cost	No.	Cost
AIR FORCE						
ALCM	480	$ 569.9	440	$ 597.1	440	$ 676.7
GLCM	11	164.1	54	350.5	120	530.7
IR Maverick	—	—	490	235.2	2,560	353.1
M-X	—	—	—	—	9	1,497.1
Minuteman II/III	—	140.8	—	111.2	—	—
Rapier	—	90.0	—	148.1	—	98.9
Target Drones[b]	—	48.8	—	99.2	—	136.3
NAVY						
Harm[c]	80	$ 126.9	254	$ 204.8	414	$ 354.6
Harpoon	240	219.2	240	234.3	231	266.7
Laser Maverick	—	—	—	5.0	90	33.1
Phoenix	210	161.0	72	163.0	108	270.8
Poseidon	—	26.2	—	18.7	—	9.7
Sidewinder[c]	1,500	150.1	2,500	189.9	2,420	158.8
Sparrow[c]	1,675	331.5	1,610	358.1	1,970	346.8
Standard ER (SM-2)	275	142.8	375	223.4	375	310.0
Standard MR (SM-1)	500	122.4	600	170.2	650	260.8
Standard MR (SM-2)	70	40.5	120	62.7	150	125.0
Tomahawk	50	190.0	88	236.3	120	308.4
Trident I	72	830.0	72	906.3	72	742.8
ARMY						
Copperhead[d]	3,125	$ 117.6	4,550	$ 141.1	8,420	$ 204.5
Improved Hawk[d]	—	25.0	388	82.4	213	77.5
Laser Hellfire	—	25.7	680	116.1	3,971	250.3
MLRS	2,340	115.6	2,496	205.6	23,640	444.4
Patriot	130	462.2	176	755.1	376	881.0
Pershing II	—	2.3	21	221.6	91	508.6
Roland	110	425.0	—	50.6	—	61.3
Stinger[d]	1,415	101.0	3,032	232.8	3,816	330.3
TOW[d]	12,000	100.9	14,666	141.9	13,000	174.1

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget (Annually).
E Estimate.
a Total Obligational Authority.
b Includes Army, Navy and Air Force procurement.
c Includes Navy and Air Force procurement.
d Includes Army and Marine Corps procurement.

MAJOR MISSILES
RESEARCH, DEVELOPMENT, PRODUCTION, OPERATION

Project	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR-TO-AIR					
AMRAAM	USAF/USN	D	Hughes/ Raytheon	—	Hughes/ Raytheon
Falcon-4F/G	USAF	O	Hughes	Thiokol	Hughes
Phoenix-54A	USN	O	Hughes	Hercules	Hughes
Phoenix-54C	USN	P	Hughes	Hercules	Hughes
Sidewinder-9G	USN	O	NASC	Bermite/ Hercules	Raytheon
Sidewinder-9H	USN	O	Ford/ Raytheon	Bermite/ Hercules	Ford Aerospace
Sidewinder-9J	USAF	O	Ford Aerospace	Hercules/ Aerojet	Ford Aerospace
Sidewinder-9L	USN/USAF	P,O	NASC/Raytheon/Ford	Bermite	Raytheon/ Ford Aero.
Sidewinder-9M	USN/USAF	P	NASC/Ford/ Raytheon	Thiokol	Raytheon/ Ford Aero.
Sidewinder-9N	USAF	O	Ford Aero.	—	Ford Aero.
Sidewinder-9P	USAF	P,O	Ford Aero.	—	Ford Aero.
Sparrow-7E	USN/USAF	P,O	Raytheon	Hercules/ Aerojet	Raytheon
Sparrow-7F	USN/USAF	P,O	Raytheon/GD	Hercules	Raytheon/GD
Sparrow-7M	USN/USAF	D,P	Raytheon/GD	Hercules	Raytheon
AIR-TO-SURFACE					
ALCM	USAF	P	Boeing	Williams International	McDonnell Douglas
HARM	USN/USAF	D	Texas Instr.	Thiokol	Texas Instr.
Harpoon*	USN	P,O	McDonnell Douglas	Teledyne CAE	TI/IBM/LSI Northrop
GBU-15	USAF	D	Rockwell	—	Rockwell
Maverick-65A/B	USAF	P, O	Hughes	Thiokol/Aerojet	Hughes
Maverick-65D	USAF	D	Hughes	Thiokol/Aerojet	Hughes
Maverick-65E	USMC	D	Hughes	Thiokol/Aerojet	Hughes
Maverick-65F	USN	D	Hughes	Thiokol/Aerojet	Hughes
Shrike	USN/USAF	O	NWC/PMTC	Aerojet/ Hercules	Texas Instruments
SRAM	USAF	O	Boeing	Lockheed	Singer
Standard ARM	USN/USAF	O	GD	NOSIH	GD
Tomahawk 2	USN/USAF	D	General Dynamics	Teledyne CAE	McDonnell Douglas
Walleye 1	USN	O	Martin Marietta/ Hughes	—	Martin Marietta/ Hughes
Walleye 1ER	USN	R,D	NAC	—	NAC
Walleye 2	USN	O	NAC	—	NAC

* Also Surface-to-Surface

(Continued on next page)

MAJOR MISSILE PROJECTS (Continued)

Project	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR TO SURFACE (Cont'd.)					
Walleye 2 (ER/DL)	USN	O	NAC	—	NAC
Wasp	USAF	D	Boeing/ Hughes	Atlantic Res./ Hercules	Sperry/ Hughes
ANTI-SUBMARINE					
Subroc	USN	O	Goodyear Aerospace	Thiokol	Singer
SURFACE-TO-AIR					
Chaparral	Army	O	Ford Aerospace	Hercules/ Bermite	GE/Raytheon
Improved Chaparral	Army	P,O	Ford Aerospace	—	Ford Aerospace
Improved Hawk	Army/ USMC	P,O	Raytheon	Aerojet	Raytheon
Patriot	Army	P	Raytheon	Thiokol	Raytheon
RAM	USN	D	General Dynamics	Bermite/ Hercules	General Dynamics
Redeye	Army	O	General Dynamics	Atlantic Research	General Dynamics
Roland	Army	P	Hughes/ Boeing	Hercules	Hughes/ Boeing
Sea Sparrow	USN	O	Raytheon	Aerojet/ Hercules	Raytheon
Standard MR (SM-1)	USN	P,O	General Dynamics	Aerojet/ Hercules	General Dynamics
Standard MR (SM-2)	USN	P,O	General Dynamics	Aerojet/ Hercules	General Dynamics
Standard ER (SM-1)	USN	P,O	General Dynamics	Atlantic Research	General Dynamics
Standard ER (SM-2)	USN	P,O	General Dynamics	Atlantic Research	General Dynamics
Stinger	Army/ USMC	P,O	General Dynamics	Atlantic Research	General Dynamics
Talos	USN	P,O	Bendix	Bendix	Bendix
Tartar	USN	O	GD	Aerojet	GD
Terrier	USN	O	General Dynamics	Atlantic Research	General Dynamics
SURFACE-TO-SURFACE					
Minuteman 2	USAF	O	AFLC Hill AFB	Thiokol/ Aerojet/ Hercules	Rockwell Autonetics
Minuteman 3	USAF	O	AFLC Hill AFB	Thiokol/ Aerojet	Rockwell Autonetics

(Continued on next page)

MAJOR MISSILE PROJECTS (Continued)

Project	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
SURFACE-TO-SURFACE (Cont'd.)					
MX	USAF	R,D	BMO/TRW	Thiokol/ Aerojet/ Hercules/ Rocketdyne	Autonetics/ Northrop
Polaris A3	USN	O	Lockheed MSC	Aerojet/ Hercules	GE/Hughes/ MIT/Raytheon
Poseidon C3	USN	O	Lockheed MSC	Thiokol/ Hercules	GE/MIT/ Raytheon/ Hughes
Tomahawk (SLCM)	USN	P	General Dynamics	Williams International	McDonnell Douglas
Tomahawk (GLCM)	USAF	D	General Dynamics	Williams International	McDonnell Douglas
Titan 2	USAF	O	AFLC Hill AFB	Aerojet	GM/Delco Electronics
Trident C4	USN	P,O	Lockheed MSC	Hercules/ Thiokol	GE/Draper/ Raytheon/ Hughes
BATTLEFIELD SUPPORT AND ANTIARMOR					
Copperhead	Army	P	Martin Marietta	—	—
Dragon	Army	P,O	Raytheon/ Kollsman	MDD/ Hercules/ Raytheon	Raytheon
Hellfire	Army	P	Rockwell	Thiokol	Martin Marietta
Lance	Army	O	Vought	RI/ Rocketdyne	E-Systems/ Sys-Donner/Arma
MLRS	Army	D,P	Vought	Atlantic Res.	—
Pershing 1A	Army	O	Martin Marietta	Thiokol	Bendix
Pershing 2	Army	D,P	Martin Marietta	Hercules	Goodyear Aerospace
Shillelagh	Army	O	Ford Aerospace	Hercules	Ford Aerospace
TOW	Army/ USMC	P,O	Hughes	Hercules	Emerson Electric

Source: Aerospace Industries Association, based on information from "Aviation Week & Space Technology Magazine."
Status: R—Research; D—Development; P—Production; O—Operational.

Abbreviations:
AFB - Air Force Base
AFLC - Air Force Logistics Cmd.
BMO - Ballistic Missile Office
GD - General Dynamics
GE - General Electric
LSI - Lear Siegler
MDD - McDonnell Douglas
MIT - Massachusetts Institute of Technology
NAC - Naval Avionics Center
NASC - Naval Air Systems Command
NWC - Naval Weapons Center
PMTC - Pacific Missile Test Center
RI - Rockwell International
TI - Texas Instruments
USAF - United States Air Force
USMC - United States Marine Corps
USN - United States Navy

DEPARTMENT OF DEFENSE
OUTLAYS FOR MISSILES
Fiscal Years 1960-1983
(Millions of Dollars)

Year	TOTAL MISSILE OUTLAYS	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
1977	5,040	2,781	2,259
1978	NA	1,794	NA
1979	NA	2,084	NA
1980	NA	2,461	NA
1981	NA	3,513	NA
1982[E]	NA	4,437	NA
1983[E]	NA	6,262	NA

Source: Department of Defense Budget (Annually).
E Estimate.
NA Not Available.

DEPARTMENT OF DEFENSE
OUTLAYS FOR MISSILE PROCUREMENT

By Agency
Fiscal Years 1960-1983
(Millions of Dollars)

Year	TOTAL MISSILE PROCUREMENT	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)
1977	2,781	1,502	905	374
1978	1,794	1,376	NA	418
1979	2,084	1,537	NA	547
1980	2,461	1,810	NA	651
1981	3,513	2,367	NA	1,146
1982 *E*	4,437	2,934	NA	1,503
1983 *E*	6,262	4,178	NA	2,084

Source: Department of Defense Budget (Annually).
E Estimate.
NA Not Available.

SALES AND BACKLOG
MISSILE SYSTEMS AND PARTS
Calendar Years 1968-1981
(Millions of Dollars)

Year	Missile Systems and Parts[a]	
	Net Sales	Backlog December 31
CURRENT DOLLARS		
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	4,580
1976	3,237	4,379
1977	3,118	4,541
1978	3,264[b]	4,581
1979	3,706	4,916
1980[r]	3,971	5,539
1981	4,661	5,544
CONSTANT DOLLARS (1972 = 100)[c]		
1968	3,407	3,899
1969	3,083	2,893
1970	3,090	2,975
1971	2,751	3,483
1972	3,335	3,642
1973	3,208	3,660
1974	3,006	3,892
1975	2,826	3,648
1976	2,450	3,315
1977	2,230	3,248
1978	2,175	3,053
1979	2,277	3,020
1980	2,239	3,123
1981	2,406	2,862

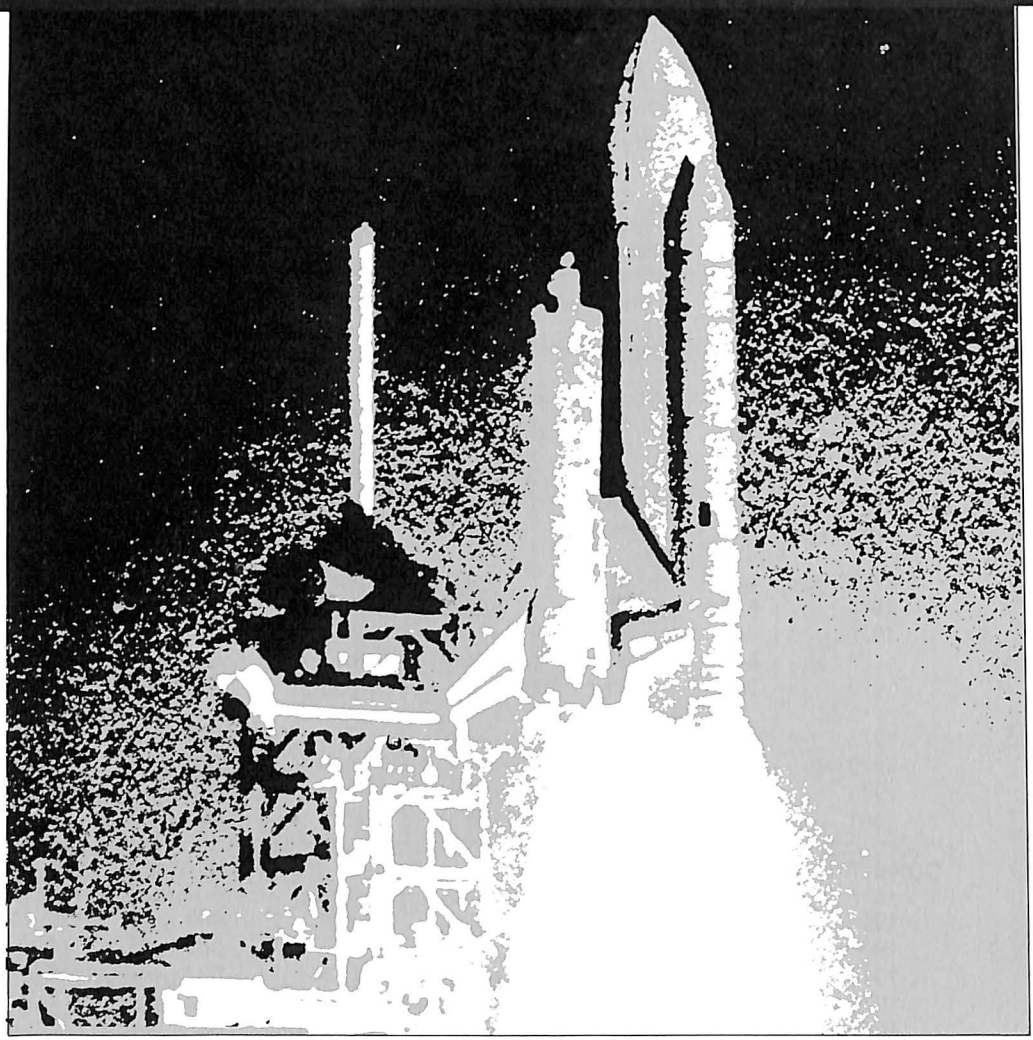
Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
a Prior to 1980, includes space vehicle systems and parts sold to other than U.S. Government customers.
b AIA estimate based on MQ37D.
c Based on GNP implicit price deflator.
r Revised.

SALES AND BACKLOG
ENGINES AND PROPULSION UNITS FOR MISSILES AND SPACE VEHICLES
Calendar Years 1968-1981
(Millions of Dollars)

Year	Net Sales			Backlog, December 31		
	TOTAL	Military[a]	Non-Military	TOTAL	Military[a]	Non-Military
CURRENT DOLLARS						
1968	907	676	231	535	406	129
1969	702	667	35	497	485	12
1970	640	398	242	617	610	7
1971	605	596	9[r]	520	513	7
1972	607	596	11	671	659	12
1973	627	607	20	625	615	10
1974	649	633	16	678	662	16
1975	643	626	17	531	517	14
1976	641	621	20	673	659	14
1977	787	757	30	613	595	18
1978	792	760	32	788	754	34
1979	952	915	37	1,024	980	44
1980[r]	939	661	278	1,219	853	366
1981	1,167	774	393	1,293	800	493
CONSTANT DOLLARS (1972 = 100)[b]						
1968	1,099	819	280	648	492	156
1969	809	769	40	573	559	14
1970	700	435	265	675	667	8
1971	630	621	9	542	534	7
1972	607	596	11	671	659	12
1973	593	574	19	591	582	9
1974	565	551	14	590	576	14
1975	512	499	14	423	412	11
1976	485	470	15	509	499	11
1977	563	541	21	438	426	13
1978	528	506	21	525	502	23
1979	585	562	23	629	602	27
1980	529	373	157	687	481	206
1981	602	400	203	667	413	255

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
a Prior to 1980, includes figures for nonmilitary U.S. Government customers.
b Based on GNP implicit price deflator.
r Revised.

Space Programs



United States space activity, as measured by federal budget authority, continued to gain momentum in Fiscal Year 1981. Total space budget authority for the Department of Defense, NASA and other government agencies approached $10 billion, up almost 15 percent over the previous year's $8.7 billion. The FY 1982 budget provided for a further increase of approximately 18 percent, to $11.7 billion.

The increased activity is due for the most part to a rapidly growing military space program. Where a decade ago military spending for space was about half NASA's space budget, the Department of Defense almost matched NASA's budget authority in FY 1981 and in FY 1982 surpassed NASA for the first time since 1960.

For FY 1981 space activities, NASA was authorized $5 billion and DOD $4.8 billion. In FY 1982, DOD's authorization is up 23.5 percent to $5.9 billion, compared with NASA's $5.6 billion. Funding for military space is expected to predominate in immediate future years as DOD

moves into Space Shuttle operations and simultaneously expands its space communications, surveillance and warning, navigation, geodesy and meteorological programs. The Administration requested $8.5 billion for military space activities in FY 1983. The FY 1983 budget authority requested for NASA is $6.6 billion.

The U.S. conducted 18 successful spacecraft launches in 1981, five more than in the previous year, but well below the average annual launch rate for the 1970s. Worldwide space launches numbered 123, up from 105 in 1980. The Soviet Union made 97 successful launches, eight more than in the previous year; Japan launched three payloads, India and the European Space Agency two each and the People's Republic of China one. The all-time total of successful launchings reached 2,265 of which 1,436—more than 63 percent—were conducted by the Soviet Union. The U.S. total at year-end was 774.

The 18 U.S. launches of 1981, 13 of them by NASA, boosted 20 payloads (two flights orbited dual payloads). Counted as payloads were the experimental equipment packages aboard the first two orbital test flights of the Space Shuttle; other payloads included seven DOD satellites, five commercial communications satellites, three scientific satellites, two weather satellites and one supplementary piggyback payload. Among the DOD programs, five were classified; the others were the first of three Nova navigation satellites and the fifth of the five-spacecraft Navy/USAF FLTSATCOM communications network.

The only NASA spacecraft launched in 1981 were three scientific satellites: two Dynamic Explorers intended to study the interaction of solar energy and magnetic forces in the atmosphere, and the Solar Mesosphere Explorer, designed to study reactions between solar energy, ozone and other atmospheric chemicals. The NASA-launched commercial communications satellites included two of the International Telecommunications Satellite Organization's Intelsat V series; a Comstar domestic satellite launched for Comsat General Corporation; the second of the Satellite Business System series; and the fourth of the RCA Satcom domestic satellites. NASA also launched, for the National Oceanic and Atmospheric Administration (NOAA), the fifth of the GOES weather satellites and the seventh spacecraft of the operational NOAA environmental satellite system.

Chief among space programs in development status at year-end 1981 was the NASA/DOD Space Shuttle, scheduled for first operational service late in 1982. Other NASA developments included the Space Telescope, an advanced astronomical observatory scheduled for 1985 launch; the advanced Landsat family of Earth resources monitoring satellites, first of which was slated for 1982 launch; Galileo, a Jupiter orbiter/probe scheduled for 1985 launch; and the Gamma Ray Observatory (1988 launch). Among the unclassified military space programs were the Navstar Global Positioning System, to be fully operational in 1985; the third generation Defense Satellite Communications System III; and the highly advanced Milstar extremely high frequency communications satellite system.

U.S. SPACECRAFT RECORD[a]

Calendar Years 1957-1981

Year	Earth Orbit[b]		Earth Escape[b]		Year	Earth Orbit[b]		Earth Escape[b]	
	Success	Failure	Success	Failure		Success	Failure	Success	Failure
1957	0	1	0	0	1970	36	1	3	0
1958	5	8	0	4	1971	45	2	8	1
1959	9	9	1	2	1972	33	2	8	0
1960	16	12	1	2	1973	23	2	3	0
1961	35	12	0	2	1974	27	2	1	0
1962	55	12	4	1	1975	30	4	4	0
1963	62	11	0	0	1976	33	0	1	0
1964	69	8	4	0	1977	27	2	2	0
1965	93	7	4	1	1978	34	2	7	0
1966	94	12	7	1[c]	1979	18	0	0	0
1967	78	4	10	0	1980	16	4	0	0
1968	61	15	3	0	1981	20	1	0	0
1969	58	1	8	1	TOTAL	977	134	79	15

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

a Payloads, rather than launchings; some launches account for multiple spacecraft. Includes spacecraft from cooperating countries launched by U.S. launch vehicles.

b The criterion of success or failure used is attainment of earth orbit or earth escape rather than judgment of mission success. "Escape" flights include all that were intended to go at least an altitude equal to lunar distance from the earth.

c This earth-escape failure did attain earth orbit and therefore is included in the earth-orbit success totals.

WORLDWIDE SPACE LAUNCHINGS WHICH ATTAINED EARTH ORBIT OR BEYOND[a]

Calendar Years 1957-1981

Country	Total 1957-1981	1977	1978	1979	1980	1981
TOTAL	2,265	124	124	106	105	123
U.S.S.R.	1,436	98	88	87	89	97
United States	774	24	32	16	13	18
Japan	20	2	3	2	2	3
People's Republic of China	9	—	1	—	—	1
European Space Agency	3	—	-	1	—	2
India	3	—	—	—	1	2
Other[b]	20	—	—	—	—	—

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

a Number of launchings rather than spacecraft; some launches orbited multiple spacecraft.

b Includes 10 by France, 8 by Italy, 1 by Australia, and 1 by the United Kingdom.

U.S. MAJOR LAUNCH RECORD

Calendar Year 1981

Launch Date, Spacecraft, and Launch Vehicle	Objectives and Remarks
Feb. 21 Comstar D-4 Atlas-Centaur	COMMUNICATIONS SATELLITE: to provide communications to 50 states and Puerto Rico. Can carry more than 14,000 two-way high quality voice circuits. Last in a series of four domestic communications satellites launched by NASA for Comsat General Corp. Leased to AT&T.
Feb. 28 Defense Titan IIIB-Agena D	DOD SATELLITE: to develop spaceflight techniques and technology. Spacecraft not announced. Reentered June 20.
Mar. 16 Defense Titan III	DOD SATELLITE: to develop spaceflight techniques and technology. Spacecraft not announced. Still in orbit.
Apr. 12 Columbia (STS-1) Space Shuttle	First of four planned orbital flight tests of Space Transportation System. Demonstrated safe ascent and return of Orbiter and crew; carried payload of development flight instrumentation; tested cargo bay doors; proved thermal protection system (TPS). First use of liquid- and solid-fueled rocket engines for launch of manned mission. First post-orbital aircraft-type landing for reuse. Space Shuttle consists of (a) reusable manned Orbiter (size of DC-9 aircraft, designed to carry payload of 29,500 kg in cargo bay; 3 liquid-fueled rocket engines); (b) external tank (ET), only non-reusable part of Shuttle, jettisoned prior to achieving orbit; and (c) two solid-fueled rocket boosters (SRBs), dropped after ascent and recovered for reuse.
Apr. 28 Defense Titan IIIB-Agena D	DOD SATELLITE: to develop spaceflight techniques and technology. Spacecraft not announced. Still in orbit.
May 15 Nova 1 Scout	NAVIGATION SATELLITE: to enable Navy to provide worldwide positional data to military and commercial users. First of a series of improved satellites launched by NASA for TRANSIT Navy Navigational Satellite System, for DOD. Still in orbit.
May. 22 GOES 5 Thor-Delta	WEATHER OBSERVATION SATELLITE: to provide near-continual, high-resolution, visual and infrared imaging over North and South America and surrounding oceans; to continue demonstration and validation of temperature and moisture soundings. Launched by NASA for National Oceanic and Atmospheric Administration (NOAA); fifth operational spacecraft funded by NOAA; second of three satellites to replace intial three operational satellites.

(Continued on next page)

U.S. MAJOR LAUNCH RECORD, 1981 (Continued)

Launch Date, Spacecraft, and Launch Vehicle	Objectives and Remarks
May 23 Intelsat V F-1 Atlas-Centaur	COMMUNICATIONS SATELLITE: to provide 12,000 voice circuits plus two television channels simultaneously, to be positioned over Atlantic Ocean. Second in series of nine satellites; launched by NASA for 106-member-nation International Telecommunications Satellite Organization (INTELSAT).
June 23 NOAA 7 Atlas F	WEATHER OBSERVATION SATELLITE: to make dependable daytime and nighttime meteorological observations of the earth. Launched by NASA for NOAA; third in a series of operational environmental monitoring satellites; joined NOAA 6 in orbit as part of two-satellite operating system.
Aug. 3 Dynamic Explorer 1 Dynamic Explorer 2 Thor-Delta	SCIENTIFIC SATELLITES: to study interaction between earth's magnetosphere, ionosphere, and atmosphere in higher (DE-1) and lower (DE-2) regions. Dual launch; mission success relies on correlative sets of measurements from two satellites. Both satellites returning data, although from lower final orbits than predicted; returned first color views from space of auroras of North and South Poles.
Aug. 6 Fltsatcom 5 Atlas-Centaur	COMMUNICATIONS SATELLITE: fifth of five planned satellites launched by NASA for Navy, to serve DOD via USAF narrow-band and wide-band communications and USN fleet-relay and broadcast channels. Providing limited communications after structural damage received during orbital insertion.
Sept. 3 Defense Titan IIID	DOD SATELLITE: to develop spaceflight techniques and technology. Spacecraft not announced; still in orbit.
Sept. 24 SBS 2 Thor-Delta	COMMUNICATIONS SATELLITE: to provide integrated, all-digital, interference-free transmission of telephone, computer, electronic mail, and video teleconferencing to business clients of Satellite Business Systems (SBS). Second of four domestic communications satellites built for SBS, launched by NASA. Commercial operations began Dec. 15.

(Continued on next page)

U.S. MAJOR LAUNCH RECORD, 1981 (Continued)

Launch Date, Spacecraft, and Launch Vehicle	Objectives and Remarks
Oct. 6 SME and UOSAT (Oscar 9) Thor-Delta	SCIENTIFIC SATELLITES: dual launch of NASA's Solar Mesosphere Explorer (SME) and amateur scientific satellite developed by University of Surrey, United Kingdom (Oscar). SME to study reactions between sunlight, ozone, and other chemicals in atmosphere and how concentrations of ozone are transported in the region from 30 to 90 km altitude; instruments returning data for first comprehensive study of creation and destruction of ozone. Oscar to provide radio amateurs and educational institutions with operational satellite usable with minimal ground station for studying ionosphere and radio propagation conditions; designed to transmit scientific data and pictures of earth's surface for display on domestic TV set.
Oct. 31 Defense Titan IIIC	DOD SATELLITE: to develop spaceflight techniques and technology. Spacecraft not announced; still in orbit.
Nov. 12 Columbia (STS-2) Space Shuttle	Second of four planned orbital flight tests of initial Space Transportation System. Demonstrated (a) reusability of Orbiter; (b) launch, in-orbit, and reentry performance under conditions more demanding than for STS-1; and (c) Orbiter capability to support scientific and applications research with attached payload. Remote manipulator system (RMS) checked out; arm performed well but could not be cradled in backup mode. Fuel-cell problem developed after Shuttle entered orbit; shortened planned five-day mission to minimal mission of 36 orbits. Landed on runway 23 (dry lakebed landing facility) at Edwards AFB and returned to Kennedy Space Center for refurbishment for next flight.
Nov. 20 RCA Satcom 3R Thor-Delta	COMMUNICATIONS SATELLITE: to provide television, voice channels, and high-speed data transmission to 50 states and Puerto Rico, and to provide video programming to cable television (CATV) systems throughout the U.S. Launched by NASA; fourth in a series of RCA commercial communications satellites; replaces RCA Satcom 3 lost in space in late 1979.
Dec. 15 Intelsat V F-3 Atlas-Centaur	COMMUNICATIONS SATELLITE: to provide 12,000 voice circuits plus two television channels simultaneously, to be positioned over Atlantic Ocean. Third in series of nine satellites; launched by NASA for 106-member-nation International Telecommunications Satellite Organization (INTELSAT).

Source: NASA, "Aeronautics and Space Report of The President" (Annually) and NASA Historian's Office.
NOTE: Includes government and commercial payloads carried by all rocket vehicles larger than sounding rockets launched into orbit by NASA and DOD.

U.S. SPACE LAUNCH VEHICLES AS OF 1981

Vehicle and Initial Launch & First Launch of this Modification	Stages	Thrust (Kilo-newtons)	Maximum Payload (Kg)[a]		
			185-Km Orbit	Geo-synch.-Transfer Orbit	Circular Sun-Synch. Orbit
Scout (1960; 1979)	1. Algol IIIA* 2. Castor IIA* 3. Antares IIIA* 4. Altair IIIA*	431.1 285.2 83.1 25.6	255 205[b]	—	155[b]
Delta 2900 Series (Thor-Delta) (1960; 1973)	1. Thor plus 9 TX 354-5* 2. Delta 3. TE 364-4*	912.0 147[c] 44.2 65.8	2,000 1,410[b]	705	1,250[b]
Delta 3900 Series (Thor-Delta) (1960; 1982)	1. Thor plus 9 TX 526-2* 2. Delta 3. TE 364-4*	912.0 375[c] 44.2 65.8	3,045 2,180[b]	1,275	2,135[b]
Atlas E/F- TE 364-4 (1967; 1972)	1. Atlas booster & sustainer 2. TE 364-4*	1,722.0 65.8	2,090[b,d]	—	1,500[b]
Atlas-Centaur (1962)	1. Atlas booster & sustainer 2. Centaur	1,913.0 146.0	5,680	2,045	—
Vehicle and Launch Date	**Stages**	**Thrust (Kilo-newtons)**	**185-Km Orbit**	**Direct Geo-synch Orbit**	**Sun-Synch. Transfer Orbit**
Titan IIIB-Agena (1966)	1. LR-87 2. LR-91 3. Agena	2,341.0 455.1 71.2	3,600[b]	—	3,060[b]
Titan IIIC (1965)	1. Two-segment 3.05-m. dia.* 2. LR-87 3. LR-91 4. Transtage	10,675.2 2,341.0 455.0 69.8	13,245	1,610[b]	—
Titan IIID (1971)	Same as Titan IIIC without Transtage		11,020[b]	—	9,750[b]

(Continued on next page)

U.S. SPACE LAUNCH VEHICLES AS OF 1981 (Continued)

Vehicle and Launch Date	Stages	Thrust (Kilo-newtons)	Maximum Payload (Kg)[a]		
			185-Km. Orbit	Direct Geo-synch. Orbit	Sun-Synch. Transfer Orbit
Titan III (34)D *(e)*	1. Two 5½-segment 3.05-m. dia* 2. LR-87 3. LR-91	11,564.8 2,366.3 449.3	12,520[b]	—	11,340[b]
Titan III (34) D/IUS (1982)	Same as Titan III (34)D plus: 4. IUS 1st stage* 5. IUS 2nd stage*	 275.8 115.7	14,920	1,850[b]	—
Titan III (34)D Transtage *(f)*	Same as Titan III (34)D plus: 4. Transtage	 69.8	14,920	1,855[b]	—
Space Shuttle (reusable) (1981)	1. Orbiter; 3 main engines (SSMEs) fire in parallel with SRBs 2. Two solid-fueled rocket boosters (SRBs) mounted on external tank (ET) fire in parallel with SSMEs	1,670[c] 11,790[c]	29,500 in full performance configuration (280-420 km orbit)		

Source: NASA, "Aeronautics and Space Report of the President" (Annually) and NASA Historian's office.

* Solid propellant; all others are liquid.

a Due east launch except as indicated.

b Polar launch.

c Each.

d With dual TE 364-4.

e Initial operational capability in December 1981; launch to be scheduled as needed.

f Initial operational capability in December 1982, launch to be scheduled as needed.

U.S. MANNED SPACE FLIGHT LOG

Calendar Years 1961-1981

Launch Date	Spacecraft and Crew	Flight Time (days:hrs:min)	Highlights
1961			
May 5	MR-3 (Shepard)	0:00:15	First U.S. flight; suborbital.
July 21	MR-4 (Grissom)	0:00:16	Suborbital; capsule sank after landing; astronaut safe.
1962			
Feb. 20	MA-6 (Glenn)	0:04:55	First American to orbit.
May 24	MA-7 (Carpenter)	0:04:56	Landed 400 km. beyond target.
Oct. 3	MA-8 (Schirra)	0:09:13	Landed 8 km. from target
1963			
May 15	MA-9 (Cooper)	1:10:20	First U.S. flight exceeding 24 h.
1965			
Mar. 23	Gemini 3 (Grissom, Young)	0:04:53	First U.S. 2-man flight; first manual maneuvers in orbit.
June 3	Gemini 4 (McDivitt, White)	4:01:56	21-min extravehicular activity (White).
Aug. 21	Gemini 5 (Cooper, Conrad)	7:22:55	Longest-duration manned flight to date.
Dec. 4	Gemini 7 (Borman, Lovell)	13:18:25	Longest-duration manned flight to date.
Dec. 15	Gemini 6-A (Schirra, Stafford)	1:01:51	Rendezvous within 30 cm of Gemini 7.
1966			
Mar. 16	Gemini 8 (Armstrong, Scott)	0:10:41	First docking of two orbiting spacecraft (Gemini 8 with Agena target rocket).
June 3	Gemini 9-A (Stafford, Cernam)	3:00:21	Extravehicular activity, rendezvous.
July 18	Gemini 10 (Young, Collins)	2:22:47	First dual rendezvous (Gemini 10 with Agena 10, then Agena 8).
Sept. 12	Gemini 11 (Conrad, Gordon)	2:23:17	First initial-orbit docking; first tethered flight; highest earth-orbit altitude (1372 km).
Nov. 11	Gemini 12 (Lovell, Aldrin)	3:22:35	Longest extravehicular activity to date (Aldrin, 5 hr 37 min).

(Continued on next page)

U.S. MANNED SPACE FLIGHT LOG (Continued)

Calendar Years 1961-1981

Launch Date	Spacecraft and Crew	Flight Time (days:hrs:min)	Highlights
1968			
Oct. 11	Apollo 7 (Schirra, Eisele, Cunningham)	10:20:09	First U.S. 3-man mission
Dec. 21	Apollo 8 (Borman, Lovell, Anders)	6:03:01	First manned orbit(s) of moon; first manned departure from earth's sphere of influence; highest speed ever attained in manned flight.
1969			
Mar. 3	Apollo 9 (McDivitt, Scott, Schweickart)	10:01:01	Successfully simulated in earth orbit operation of Lunar Module to landing and take off from lunar surface and rejoining with Command Module.
May 18	Apollo 10 (Stafford, Young, Cernan)	8:00:03	Successfully demonstrated complete system including Lunar Module descent to 14,300 m. from lunar surface.
July 16	Apollo 11 (Armstrong, Collins, Aldrin)	8:03:09	First manned landing on lunar surface and safe return to earth. First return of rock and soil samples to earth, and manned deployment of experiments on lunar surface.
Nov. 14	Apollo 12 (Conrad, Gordon, Bean)	10:04:36	Second manned lunar landing. Explored surface of moon and retrieved parts of Surveyor 3 spacecraft, which landed in Ocean of Storms Apr. 19, 1967.
1970			
April 11	Apollo 13 (Lovell, Haise, Swigert)	5:22:55	Mission aborted; explosion in Service Module. Ship circled moon, with crew using LM as "lifeboat" until just before reentry.
1971			
Jan. 31	Apollo 14 (Shepard, Roosa, Mitchell)	9:00:02	Third manned lunar landing. Mission demonstrated pinpoint landing capability and continued manned exploration.

(Continued on next page)

U.S. MANNED SPACE FLIGHT LOG (Continued)

Calendar Years 1961-1981

Launch Date	Spacecraft and Crew	Flight Time (days:hrs:min)	Highlights
July 26	Apollo 15 (Scott, Worden, Irwin)	12:07:12	Fourth manned lunar landing and first Apollo "J" series mission; carried Lunar Roving Vehicle. Worden's in flight EVA of 38 min 12 sec performed during return trip.
1972			
April 16	Apollo 16 (Young, Duke, Mattingly)	11:01:51	Fifth manned lunar landing, with Lunar Roving Vehicle.
Dec. 7	Apollo 17 (Cernan, Schmitt, Evans)	12:13:52	Sixth and final Apollo manned lunar landing, again with roving vehicle.
1973			
May 25	Skyklab 2 (Conrad, Kerwin, Weitz)	28:00:50	Docked with Skylab 1 for 28 days. Repaired damaged station.
July 28	Skylab 3 (Bean, Lousma, Garriott)	59:11:09	Docked with Skylab 1 for more than 59 days.
Nov. 16	Skylab 4 (Carr, Gibson, Pogue)	84:01:16	Docked with Skylab 1 in long-duration mission; last of Skylab program
1975			
July 15	Apollo (ASTP) (Stafford, Slayton, Brand)	9:01:28	Docked with Soyuz 19 in joint experiments of Apollo Soyuz Test Program (ASTP) mission.
1981			
Apr. 12	STS-1 (Orbiter Columbia) (Young, Crippen)	2:06:21	First flight of Space Shuttle, tested spacecraft in orbit. First landing of airplanelike craft from orbit for reuse.
Nov. 12	STS-2 (Orbiter Columbia) Engle, Truly)	2:06:13	Second flight of Space Shuttle, first scientific payload. Tested remote manipulation arm. Returned for reuse.

Source: NASA, "Aeronautics and Space Report of The President" (Annually) and NASA Historian's Office.

SALES AND BACKLOG
SPACE VEHICLE SYSTEMS[a]
(Excluding Engines and Propulsion Units)
Calendar Years 1968-1981
(Millions of Dollars)

Year	Net Sales			Backlog, December 31		
	TOTAL	Military	Non-Military	TOTAL	Military	Non-Military
CURRENT DOLLARS						
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	2,119	1,096	1,023	1,304	1,019	285
1976	2,002	904	1,098	1,234	902	332
1977	1,870	814	1,056	1,589	1,263	326
1978	2,324	1,006	1,318	2,188	1,693	495
1979	2,539	1,105	1,434	1,448	909	539
1980[r]	3,483	1,461	2,022	1,814	951	863
1981	4,014	1,680	2,334	2,179	1,165	1,014
CONSTANT DOLLARS (1972 = 100)[b]						
1968	$ 2,856	$ 1,089	$ 1,766	$ 1,610	$ 1,010	$ 600
1969	2,629	1,368	1,262	1,532	1,001	531
1970	2,139	1,121	1,018	1,295	859	435
1971	1,797	896	901	954	628	326
1972	1,656	905	751	959	646	313
1973	1,478	853	624	1,114	873	240
1974	1,524	821	702	1,298	984	314
1975	1,688	872	815	1,039	812	227
1976	1,515	684	831	934	683	251
1977	1,337	582	755	1,136	903	233
1978	1,549	670	878	1,458	1,128	330
1979	1,560	679	881	890	558	331
1980	1,964	824	1,140	1,023	536	487
1981	2,072	867	1,205	1,125	601	523

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

a Space vehicle systems and parts sold to other than U.S. Government customers included as of 1980; previously, this product group combined with missile systems and parts (see p. 55).

b Based on GNP implicit price deflator.

r Revised.

SPACE ACTIVITIES BUDGET AUTHORITY

Fiscal Years 1959-1982[a]
(Millions of Current Dollars)

Year	TOTAL	NASA[b]	DOD	Energy	Commerce	Other[c]
1959	$ 785	$ 261	$ 490	$ 34	$ —	$ —
1960	1,066	462	561	43	—	(d)
1961	1,808	926	814	68	—	1
1962	3,295	1,797	1,298	148	51	1
1963	5,435	3,626	1,550	214	43	2
1964	6,831	5,016	1,599	210	3	3
1965	6,956	5,138	1,574	229	12	3
1966	6,970	5,065	1,689	187	27	3
1967	6,710[r]	4,830	1,664	184	29	3
1968	6,529[r]	4,430	1,922	145	28	4
1969	5,976	3,822	2,013	118	20	3
1970	5,341	3,547	1,678	103	8	4
1971	4,741	3,101	1,512	95	27	5
1972	4,575	3,071	1,407	55	31	10
1973	4,825	3,093	1,623	54	40	15
1974	4,640	2,759	1,766	42	60	14
1975	4,914	2,915	1,892	30	64	13
1976	5,320	3,225	1,983	23	72	16
Tr. Qtr.	1,341	849	460	5	22	4
1977	5,983	3,440	2,412	22	91	18
1978	6,509	3,623	2,729	34	103	20
1979	7,419	4,030	3,211	59	98	21
1980	8,689	4,680	3,848	40	93	28
1981[E]	9,951	4,997	4,789	42	92	30
1982[E]	11,730	5,617	5,916	38	126	32

Source: NASA, "Aeronautics and Space Report of the President" (Annually).
Note: Detail may not add to totals because of rounding.
a FY 1983 and revised FY 1982 estimates not available at time of publication.
b Excludes amounts for air transportation.
c Departments of Interior and Agriculture, and the National Science Foundation.
d Less than $500,000.

SPACE ACTIVITIES BUDGET AUTHORITY IN CONSTANT DOLLARS

Fiscal Years 1959-1982[a]
(Millions of Constant Dollars, 1972 = 100[b])

Year	TOTAL	NASA[c]	DOD	Energy	Commerce	Other[d]
1959	$ 1,152	$ 383	$ 719	$ 50	$ —	$ —
1960	1,537	666	809	62	—	(d)
1961	2,577	1,320	1,160	97	—	1
1962	4,616	2,518	1,818	207	71	1
1963	7,341	4,897	2,093	289	58	3
1964	9,226	6,775	2,160	284	4	4
1965	9,277	6,852	2,099	305	16	4
1966	9,055	6,580	2,194	243	35	4
1967	8,443	6,078	2,094	232	36	4
1968	7,930	5,381	2,335	176	34	5
1969	6,935	4,435	2,336	137	23	3
1970	5,866	3,896	1,843	113	9	4
1971	4,958	3,243	1,581	99	28	5
1972	4,575	3,071	1,407	55	31	10
1973	4,620	2,962	1,554	52	38	14
1974	4,145	2,464	1,577	38	54	13
1975	3,993	2,369	1,537	24	52	11
1976	4,041	2,450	1,506	17	55	12
Tr. Qtr.	991	627	340	4	16	3
1977	4,257	2,447	1,716	16	65	13
1978	4,340	2,416	1,820	23	69	13
1979	4,555	2,474	1,972	36	60	13
1980	4,916	2,648	2,177	23	53	16
1981[E]	5,143	2,582	2,475	22	48	16
1982[E]	5,602	2,683	2,825	18	60	15

Source: AIA, derived from NASA, "Aeronautics and Space Report of the President," (Annually).
a FY 1983 and revised FY 1982 estimates not available at time of publication.
b Based on fiscal year GNP implicit price deflator.
c Excludes amounts for air transportation.
d Departments of Interior and Agriculture, and The National Science Foundation.
E Less than $500,000.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
BUDGET AUTHORITY

Fiscal Years 1960-1983
(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	3,819	2,856	118	845
1978	4,064	3,012	162	890
1979	4,559	3,477	148	934
1980	5,243	4,088	159	996
1981	5,522	4,334	117	1,071
1982*E*	5,981	4,738	99	1,145
1983*E*	6,613	5,334	100	1,179

Source: "The Budget of the United States" (Annually); FY 81-83 from NASA FY 1983 Budget Briefing.
NOTE: Detail may not add to totals because of rounding.
a Included in Research & Development for one year.
E Estimate.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OUTLAYS
Fiscal Years 1960-1983
(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	3,945	2,980	105	860
1978	3,983	2,989	124	870
1979	4,196	3,139	133	925
1980	4,852	3,702	140	1,010
1981	5,426	4,228	147	1,050
1982[E]	5,831	4,593	135	1,103
1983[E]	6,582	5,281	122	1,179

Source: "The Budget of the United States" (Annually).
NOTE: Detail may not add to totals because of rounding.
E Estimate.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND DEVELOPMENT PROGRAMS BUDGET AUTHORITY

Fiscal Years 1979-1983
(Millions of Dollars)

	1979	1980	1981	1982*E*	1983*E*
TOTAL	$ 3,477	$ 4,088	$ 4,334	$ 4,738	$ 5,334
Space Transportation—TOTAL	2,012	2,385	2,729	3,090	3,468
Space Shuttle	1,638	1,871	1,995	2,163	1,718
Space Flight Operations	300	447	679	896	1,707
Expendable Launch Vehicles	74	67	55	31	43
Space Science and Applications—TOTAL	789	945	882	902	1,002
Physics and Astronomy	283	337	324	323	472
Planetary Exploration	182	220	176	205	155
Life Sciences	40	44	42	40	56
Space Applications	275	332	332	326	316
Technology Utilization	9	12	9	8	4
Aeronautics and Space Technology—TOTAL	376	427	384	344	355
Aeronautical Research and Technology	264	308	271	233	232
Space Research and Technology	107	116	111	111	123
Energy Technology	5	3	2	—	—
Space Tracking and Data Systems—TOTAL	300	332	340	402	509

Source: "The Budget of the United States," (Annually).
NOTE: Detail may not add to totals because of rounding.
E Estimate.

DEPARTMENT OF DEFENSE
SPACE AND SPACE-RELATED PROGRAMS[a]
Fiscal Years 1981-1983
(Millions of Dollars)

Program	1981	1982[E]	1983[E]
TOTAL	$ 4,797.1	$ 6,362.3	$ 8,451.7
Mission-Oriented—**TOTAL**	$ 1,218.2	$ 1,910.9	$ 2,646.6
Navigation	166.9	224.5	291.3
Communications	687.6	979.7	1,352.2
Warning	265.6	563.2	714.1
Mapping/Charting/Geodesy	11.6	29.2	53.1
Weather	86.5	114.3	235.9
Vehicle Development	758.5	863.8	1,110.4
Space Ground Support[b]	315.2	433.4	557.6
Supporting RDT&E[c]	586.1	755.2	972.5
General Support[d]	1,919.1	2,399.0	3,164.6

Source: Department of Defense, statement to Senate Subcommittee on Science, Technology, and Space.
a Total obligational authority.
b Includes range support, instrumentation, ground based satellite detection, tracking, and control.
c Includes research, exploratory and advanced development.
d Includes support organizations as well as general operational support.
E Estimate.

DEPARTMENT OF DEFENSE SPACE PROGRAMS[a]
PROCUREMENT (INCLUDING INITIAL SPARES) AND RDT&E
Fiscal Years 1981, 1982 and 1983
(Millions of Dollars)

Agency and Program	1981		1982[E]		1983[E]	
	Procurement	RDT&E	Procurement	RDT&E	Procurement	RDT&E
AIR FORCE						
Afsatcom	$ 5.0	$ 25.9	$ —	$ 80.1	$ 28.6	$ 50.9
Defense Meteorological Satellite Program (DMSP)	42.8	18.9	36.6	47.2	167.9	27.8
Defense Satellite Communications System (DSCS)	80.5	35.1	129.6	40.1	192.9	53.1
Navstar Global Positioning System	—	126.2	—	165.4	102.0	122.8
*Space Defense System	—	133.9	—	200.9	—	213.5
Space Launch Support	0.7	15.0	103.0	20.2	155.8	16.4
Space Shuttle	117.0	246.3	200.7	266.0	136.0	355.6
Space Boosters	121.2	29.4	68.2	19.2	71.1	15.0
NAVY						
Fleet Satellite Communications (Fltsatcom)	$ 27.0	$ 1.6	$ 65.1	$ 1.3	$ 231.3	$ —
Navstar Global Positioning System	—	17.1	—	34.0	—	39.8
ARMY						
Navstar Global Positioning System	$ —	$ 17.8	$ —	$ —	$ —	$ 11.9

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget (Annually) and Office of the Comptroller, DOD.

a Total Obligational Authority.

E Estimate.

* Program in R&D only.

In 1981, the U.S. scheduled airline industry experienced the worst financial losses in its history. Overall operating costs remained high despite some stabilization in fuel prices, the principal cost factor; fuel stayed above the dollar-a-gallon level. Airline deregulation contributed to excessive fare competition, hence to reduced revenues; revenues were further cut by a recession-induced decline in traffic volume. The end result for all domestic and international operations was a loss of $421 million, according to the Air Transport Association. The loss was not only the greatest ever, it was almost double the previous record operating loss of $222 million in 1980.

For the second consecutive year, after a decade of sharp increase, passenger traffic dipped. The scheduled U.S. carriers boarded 286 million passengers in 1981 and flew them 249 billion passenger miles. The figure compare with 297 million passengers flown 255 billion passenger miles in 1980. Cargo ton-miles—seven billion—remained at

approximately the previous year's level.

Among other statistical highlights of the U.S. scheduled airlines' 1981 performance:

- Domestic flights accounted for 93 percent of all passengers boarded, compared with 92 percent a year earlier. The airlines carried 265 million passengers on domestic routes, a decline of about three percent from 1980.
- International traffic dropped more sharply. Passengers carried on international flights totaled less than 21 million, down more than 14 percent from 1980's 24 million.

U.S. air carriers, including operators other than scheduled airlines, were flying 3,973 aircraft at year-end 1981; the figure represents an increase of 168 planes over 1980. Turbojet airlines numbered 2,511, about 63 percent of the total. The fleet also included 852 turboprops and 605 piston-powered aircraft.

Worldwide commercial air traffic experienced a drop in passenger volume while cargo haulage edged up slightly. World scheduled airlines, excluding the Soviet Union, carried 619 million passengers, down four percent from the 645 million boarded in the previous year. In terms of passenger miles, however, the decline was negligible; the figure for 1981 is 574 billion passenger miles, which compares with 577 billion in 1980. Cargo ton-miles increased from 18.2 billion in 1980 to 18.8 billion in 1981.

When U.S.S.R. traffic is included, the number of passengers boarded in 1981 was down but revenue passenger miles were up. Passengers carried worldwide totaled 728 million, down less than three percent; passenger miles, at 679 billion, were up three billion. Cargo ton-miles increased by 600 million, or about three percent, and topped the 20 billion mark for the first time.

Despite the airlines' financial problems and the lack of traffic growth, the world fleet of turbine engine aircraft in commercial service increased significantly during 1980/81, according to Exxon International's annual survey. Excluding airplanes operated by the Soviet Union, the total number of aircraft in service at midyear 1981 was 8,726, up more than 700 units over 1980; fleet increases for three prior years had averaged fewer than 250 units. Of the 1981 total, 6,805 aircraft—70 percent— were turbojet-powered. There were 2,508 turboprops and 133 turbine-powered helicopters.

Planes of U.S. manufacture accounted for 85.3 percent of the jet-powered transports and 67.6 percent of the total world turbine engine aircraft fleet; the latter figure, however, was down from the 69.8 percent reported in the Exxon survey for 1980. Among the jetliners, the most widely used is the Boeing 727, 1,585 of which are in service. Other jet models in wide service include the McDonnell Douglas DC-9 (882 aircraft), the Boeing 737 (708), the Boeing 707 (547), the Boeing 747 (473), the McDonnell Douglas DC-8 (358), the McDonnell Douglas DC-10 (338), the Lockheed L-1011 TriStar (192), the B.Ae. 111 (159), and the European-built Airbus A300 (132).

WORLD AIRLINE TRAFFIC SCHEDULED SERVICES

Calendar Years 1970-1981
(Millions)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles	Mail Ton-Miles
	Excludes U.S.S.R.				
1970	4,360	311	237,000	7,260[r]	1,880[r]
1971	4,390	333	252,000	7,880[r]	1,750
1972	4,490	368	289,000	9,060	1,660
1973	4,670[r]	404[r]	323,000	10,670[r]	1,700
1974	4,580	423	340,000[r]	11,630[r]	1,680
1975	4,670	436	357,000	11,820[r]	1,660
1976	4,870	476[r]	393,000[r]	13,240[r]	1,740
1977	5,030	517	430,000[r]	14,620	1,830
1978	5,280	581	495,000	16,170	1,880
1979	5,690[r]	652[r]	565,000[r]	17,580[r]	1,970
1980	5,870[r]	645[r]	577,000[r]	18,230[r]	2,120
1981[E]	5,720	619	574,000	18,770	2,190
	Includes U.S.S.R.				
1970	NA	382	286,000	8,280[r]	2,150[r]
1971	NA	411	307,000	9,060	1,990[r]
1972	NA	450	348,000	10,290	1,900
1973	NA	489	384,000[r]	12,010[r]	1,970
1974	NA	515	407,000	13,030	1,970
1975	NA	534	433,000	13,270[r]	1,990
1976	NA	576	475,000[r]	14,750[r]	2,080
1977	NA	610	508,000	16,180	2,180
1978	NA	679	582,000	17,770	2,240
1979	NA	754[r]	659,000[r]	19,180[r]	2,350
1980	NA	748[r]	676,000[r]	19,950[r]	2,520[r]
1981[E]	NA	728	679,000	20,550	2,600

Source: International Civil Aviation Organization, "Development of World Scheduled Revenue Traffic" (Annually).
NOTE: Excludes states which were not members of ICAO on December 31, 1981. Figures represent revenue traffic on international and domestic scheduled services.
r Revised.
E Estimate.
NA Not Available.

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT
By Model
1977-1981

	1977	1978	1979	1980	1981
TOTAL AIRCRAFT IN SERVICE . .	7,298	7,550	7,787	8,010	8,726
Number Manufactured in U.S. . . .	5,027	5,159	5,341	5,590	5,900
Percent Manufactured in U.S. . . .	68.9%	68.3%	68.6%	69.8%	67.6%
Turbojets—TOTAL	5,137	5,288	5,534	5,756	6,085
Aerospatiale Caravelle	141	131	111	102	119
Aerospatiale Corvette	25	22	19	13	11
Airbus A300	35	53	76	102	132
B.Ae. 111	164	164	162	158	159
B.Ae. HS-125	6	5	5	6	6
B.Ae. VC-10	22	17	17	6	1
B.Ae./Aerospatiale Concorde .	8	9	9	13	14
B.Ae. Comet	16	10	7	4	—
B.Ae. Trident	93	99	97	64	86
Boeing 707/720	702	673	638	569	547
Boeing 727	1,228	1,315	1,427	1,560	1,585
Boeing 737	464	498	555	593	708
Boeing 747	291	308	349	420	478
Cessna Citation I/II	5	4	3	13	37
Convair 880/990	15	13	13	14	12
Dassault Falcon	45	47	36	33	45
Dassault Mercure	10	10	10	10	10
Fokker-VFW F.28	94	103	122	115	128
Gates Lejet	18	11	10	14	35
Gulfstream II/III	5	5	6	8	12
Ilyushin IL-62	26	32	39	41	39
Ilyushin IL-76	—	—	—	6	2
Israel Aircraft 1121/1124	—	—	—	—	5
Lockheed JetStar	1	1	1	1	4
Lockheed L-1011 TriStar	138	145	160	177	192
MBB Hansa HFB-320	—	—	—	6	5
McDonnell Douglas DC8	468	450	396	382	358
McDonnel Douglas DC-9	774	794	836	856	882
McDonnell Douglas DC-10 . . .	234	248	276	307	338
Rockwell Sabreliner	2	2	1	2	—
Tupolev Tu. 124	—	—	—	2	—
Tupolev Tu. 134	60	66	68	82	68
Tupolev Tu. 154	15	17	26	33	31
VFW-Fokker 614	5	11	12	2	5
Yakolev Yak-40/42	27	25	47	42	31

(Continued on next page)

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT (Continued)
By Model
1977-1981

	1977	1978	1979	1980	1981
Turboprops—TOTAL	1,856	1,931	2,013	2,059	2,508
Aerospatiale N.262 Mohawk 298	34	40	33	30	29
Antonov An.12	2	2	2	10	3
Antonov An.24/26	54	65	90	125	96
Antonov An.30	—	—	—	1	—
B.Ae. Britannia	26	14	9	10	12
B.Ae./HP Jetstream	7	8	6	3	17
B.Ae. Vanguard	22	24	23	11	8
B.Ae. Viscount	90	86	91	84	77
B.Ae. HS-748	122	138	133	141	144
Beech 99	111	110	118	107	123
Beech 90 King Air	14	19	11	15	16
Beech 200 King Air	—	—	—	—	20
Beech 18-TP Conv.	6	6	6	5	—
Canadair CL-44	24	24	17	12	10
CASA/Nurtanio C-212	2	6	9	9	34
Cessna 400 Srs. TP Conv.	—	1	1	2	—
Cessna 441 Conquest	—	—	—	—	2
Convair 580/600/640	103	104	121	132	147
Douglas DC-3	—	—	3	—	—
DHC-2 Turbo Beaver	11	7	14	11	8
DHC-6 Twin Otter	308	335	327	321	456
DHC-7 Dash 7	—	4	8	18	38
Embraer EMB-110 Bandeirante	43	49	61	60	157
Fokker-VFW F.27/ Fairchild F.27 & FH.227	354	370	364	363	402
GAF Nomad	3	6	10	9	34
Grumman Gulfstream I	3	—	—	8	16
Grumman Mallard	1	—	—	—	1
Grumman Turbo Goose	2	2	2	3	2
Handley Page Herald	29	32	36	34	31
Hawker-Siddeley Argosy	7	8	9	8	5
Ilyushin IL-18	84	72	82	79	61
LET L-410	12	12	11	11	11
Lockheed L-188 Electra	96	87	86	89	96
Lockheed L-100 Hercules	40	36	44	41	48
Mitsubishi MU-2	17	15	15	10	13
NAMC YS-11	125	126	121	112	117

(Continued on next page)

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT (Continued)
By Model
1977-1981

	1977	1978	1979	1980	1981
Turboprops (continued)					
Pilatus Turbo Porter	10	12	12	7	5
Piper Cheyenne I/III	1	2	1	1	6
Rockwell Turbo Commander	2	1	2	1	12
Saunders ST-27	4	2	2	11	5
Shorts Skyliner/Skyvan	32	29	21	22	29
Shorts 330	—	—	26	36	63
Swearingen Merlin	—	—	—	3	6
Swearingen Metro	31	47	81	108	143
Transall C-160	—	—	—	—	5
Other	18	24	5	—	—
Turbine-Powered Helicopters—TOTAL	305	331	240	195	133
Aerospatiale SA-315 Lama	—	8	—	—	2
Aerospatiale SA-318 Alouette	25	26	21	7	7
Aerospatiale SA-321 Super Frelon	1	—	—	1	—
Aerospatiale SA-330 Puma	20	20	20	17	3
Aerospatiale SA-332 Super Puma	—	—	—	—	1
Aerospatiale SA-341 Gazelle	—	—	—	—	1
Aerospatiale SA-360 Dauphin	—	—	—	—	7
Bell 204	8	9	9	5	4
Bell 205	31	27	4	1	—
Bell 206	71	79	50	26	7
Bell 212	10	15	11	7	5
Bell 222	—	—	1	—	—
Bell (Fuji) 214	—	1	1	4	3
Boeing Vertol 234 Chinook	—	—	—	—	1
Hughes (Kawasaki) 500	74	76	63	72	24
M.B.B. Bo. 105	6	6	5	4	11
Mil Mi-8	—	—	—	3	—
Sikorsky S-55T	1	2	3	—	3
Sikorsky S-58T	14	12	10	8	9
Sikorsky S-61	39	45	38	35	34
Sikorsky S-62	2	2	—	—	1
Sikorsky S-64	3	3	—	—	1
Sikorsky S-76	—	—	4	5	9

Source: Exxon International Company, "Air World Survey," (Annually).
NOTE: 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. Excludes air taxi operators. Effective 1979, excludes a number of companies operating smaller types of aircraft and not providing scheduled services.

AIRLINE TRAFFIC
U.S. SCHEDULED AIRLINES
Calendar Years 1960-1981
(Millions)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles[a]
1960	998	58	38,863	1,130
1961	970	58	39,831	1,331
1962	1,010	63	43,760	1,738
1963	1,095	71	50,365	1,714
1964	1,189	82	58,494	2,017
1965	1,354	95	68,676	2,764
1966	1,482	109	79,889	3,810
1967	1,834	132	98,484	4,522
1968	2,146	150	113,958	5,140
1969	2,385	159	125,414	5,788
1970	2,418	170	131,710	5,346
1971	2,379	174	135,652	5,964
1972	2,376	191	152,406	6,403
1973	2,448	202	161,957	6,492
1974	2,258	207	163,919	6,495
1975	2,241	205	162,810	6,200
1976	2,320	223	178,988	6,525
1977	2,419	240	193,219	6,976
1978	2,520	275	226,781	7,001
1979	2,791	317	262,023	7,189
1980[r]	2,816	297	255,192	7,084
1981	2,700	286	248,757	7,058

Source: Civil Aeronautics Board, Information Management Division.
NOTE: Figures represent total domestic and international scheduled service excluding nonrevenue operations of U.S. certificated route air carriers.
a Includes freight express, and U.S. and foreign mail ton-miles in scheduled operations.
r Revised.

PASSENGER SERVICE
U.S. SCHEDULED AIRLINES

Calendar Years 1960-1981

Year	Domestic		International	
	Passenger Miles Flown (Millions)	Passengers Carried (Thousands)	Passenger-Miles Flown (Millions)	Passengers Carried (Thousands)
1960	30,557	52,377	8,306	5,499
1961	31,062	52,712	8,769	5,699
1962	33,623	55,950	10,138	6,598
1963	38,457	63,925	11,905	7,513
1964	44,141	72,988	14,352	8,775
1965	51,887	84,460	16,789	10,195
1966	60,591	97,746	19,298	11,646
1967	75,487	118,669	23,259	13,424
1968	87,508	134,423	26,451	15,728
1969	95,946	142,340	29,468	16,848
1970	104,147	153,662	27,563	16,260
1971	106,294	156,098	29,358	17,569
1972	118,138	172,452	34,268	18,897
1973	126,217	183,272	35,640	18,936
1974	129,732	189,733	33,186	17,725
1975	131,728	188,746	31,082	16,316
1976	145,271	206,274	33,717	17,039
1977	156,609	222,283	36,610	18,043
1978	182,669	253,960	44,112	20,759
1979	208,891	292,700	53,132	24,163
1980 *r*	200,829	272,829	54,363	24,074
1981	198,632	265,107	50,125	20,613

Source: Civil Aeronautics Board, Information Management Division.
NOTE: Figures represent scheduled passenger services excluding non-revenue operations of certificated route air carriers.
r Revised.

U.S. AIRLINES[a]
TOTAL ASSETS AND INVESTMENT IN EQUIPMENT
Fiscal Years 1960-1981
(Millions of Dollars)

Year	TOTAL Assets[b]	Value of Flight Equipment	Value of Ground Property, Equipment & Other[c]	Less: Depreciation	Equals: Net Value of Owned Property & Equipment	Investment in Owned Property and Equipment as a Percent of Total Assets
1960	$ 1,760	$ 2,174	$ 90	$ 890	$ 1,374	78.1%
1961	2,099	2,719	77	1,062	1,734	82.6
1962	2,273	3,006	52	1,183	1,875	82.4
1963	2,211	3,132	27	1,341	1,818	82.2
1964	2,415	3,383	48	1,402	2,029	84.0
1965	2,816	3,844	52	1,505	2,391	84.9
1966	3,747	4,520	107	1,646	2,981	79.6
1967	5,003	5,485	153	1,805	3,833	76.6
1968	6,294	6,936	204	2,044	5,096	76.6
1969	7,107	8,003	195	2,334	5,864	82.5
1970	7,417	8,546	298	2,814	6,030	81.3
1971	7,664	9,375	203	3,231	6,347	82.8
1972	8,017	9,813	200	3,484	6,529	81.4
1973	13,967	12,377	350	4,495	8,232	58.9
1974	14,979	13,288	194	4,846	8,636	57.7
1975	15,098	13,668	192	5,278	8,582	56.8
1976	15,452	14,398	189	6,376	8,211	53.1
1977	16,868	14,822	187	8,140	6,869	40.7
1978	20,745	16,127	3,367	8,799	10,695	51.6
1979[r]	24,907	18,561	3,985	9,746	12,800	51.4
1980[r]	28,900	20,859	4,682	10,309	15,232	52.7
1981[p]	30,729	22,537	5,167	11,053	16,651	54.2

Source: Civil Aeronautics Board, Information Management Division.

a Through 1979, includes certificated domestic trunks, local service, Intra-Alaska, Intra-Hawaii, other carriers, all-cargo, regional carriers, and helicopters. Effective 1980, includes all U.S. certificated route and charter carriers. Commuters and air taxis excluded.

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

c Includes construction work in progress.

r Revised.

p Preliminary.

SOURCES OF OPERATING REVENUE
TOTAL DOMESTIC OPERATIONS, ALL U.S. AIRLINES[a]
Calendar Years 1960-1981
(Millions of Dollars)

Year	TOTAL Operating Revenues	Passenger	Mail[b]	Express and Freight	Excess Baggage	Other[c]
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	13,901	11,856	294	933	22	796
1977	15,821	13,771	355	1,109	21	565
1978	18,184	15,507	266	1,325	23	1,063
1979	21,652	18,720	387	1,456	28	1,061
1980[r]	26,404	23,317	446	1,582	32	1,026
1981[p]	29,008	25,681	503	1,664	36	1,124

Source: Civil Aeronautics Board, Information Management Division.
NOTE: Detail may not add to totals because of rounding.

a Through 1979, includes certificated domestic trunks, local service, Intra-Alaska, Intra-Hawaii, other carriers, all-cargo regional carriers, and helicopters. Effective 1980, includes all U.S. certificated route and charter carriers. Commuters and air taxis excluded.

b Includes U.S. as well as foreign mail.

c Includes revenues not related to transport. Effective 1980, includes subsidy, which previously was included with mail. In 1981, includes $12 million of transport revenues not specifically broken out by category by some small carriers.

r Revised.

p Preliminary.

REVENUES AND EXPENSES
TOTAL DOMESTIC OPERATIONS, ALL U.S. AIRLINES[a]
Calendar Years 1960-1981
(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	13,901	13,326	575
1977	15,821	15,164	657
1978	18,184	17,151	1,033
1979	21,652	21,522	130
1980[r]	26,404	26,409	-6
1981[p]	29,008	29,272	-264

Source: Civil Aeronautics Board, Information Management Division.
NOTE: Detail may not add to totals because of rounding.
a Through 1979, includes certificated domestic trunks, local service, Intra-Alaska, Intra-Hawaii, other carriers, all cargo, regional carriers, and helicopters. Effective 1980, includes all U.S. certificated route and charter carriers. Commuters and air taxis excluded.
r Revised.
p Preliminary.

COMPOSITION OF ACTIVE U.S. AIR CARRIER FLEET
TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL
Active as of December 1977-1981

	1977[r]	1978[r]	1979[r]	1980	1981
TOTAL	2,473	2,545	3,609	3,805	3,973
Turbojets—TOTAL	2,168	2,237	2,486	2,526	2,511
Four-Engine—TOTAL	544	509	517	441	365
Boeing 707/720	243	215	182	149	68
Boeing 747	108	115	131	144	147
B.Ae. Aerospatiale Concorde	—	—	9	—	—
Convair 880 (22)/990(30)	—	—	6	6	6
Lockheed L-1329	—	1	1	—	—
McDonnell Douglas DC-8	193	178	188	142	144
Three-Engine—TOTAL	1,069	1,146	1,256	1,347	1,363
Boeing 727	865	931	1,029	1,092	1,096
Lockheed L-1011	77	82	87	102	106
McDonnell Douglas DC-10	127	133	140	153	161
Twin-Engine—TOTAL	555	582	713	738	783
Airbus A-300	2	6	12	19	25
Boeing 737	160	173	206	220	236
B.Ae. BAC-111	31	30	28	27	27
Cessna C500 Citation I	—	—	4	—	1
Dassault MD-20, Falcon	—	—	44	42	27
Fokker F-28	—	—	—	5	9
Grumman G-1159	—	—	6	5	3
Hamburger Flugzeugbau HF-320	—	—	4	—	—
Israel Westwind 1123/1124	—	—	2	1	—
Learjet LR-23/LR-24	—	—	8	5	3
Learjet LR-25	—	—	6	7	1
Learjet LR-35	—	—	4	3	—
McDonnell Douglas DC-9	362	373	381	394	447
Rockwell NA-265	—	—	2	2	—
Sud Aviation SE210 Caravelle	—	—	6	5	2
Sud Aviation SN601	—	—	—	3	2
Turboprops—TOTAL	234	240	565	682	852
Four-Engine—TOTAL	60	67	81	92	105
Canadair CL44D	—	—	1	2	4
De Havilland DHC-7	—	—	8	18	29
Lockheed 188 Electra	40	46	52	52	51
Lockheed 382/L-100 Hercules	20	21	20	20	20
Vickers V745	—	—	—	—	1

(Continued on next page)

COMPOSITION OF ACTIVE U.S. AIR CARRIER FLEET
TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL(Continued)

	1977[r]	1978[r]	1979[r]	1980	1981
Twin-Engine—TOTAL	174	173	484	590	747
Beech BE99	—	—	85	87	102
Beech BE90	—	—	3	2	2
Beech BE 200	—	—	4	1	2
Cessna C212	—	—	—	2	15
Cessna C441	—	—	—	1	—
Convair 580/600/640[r]	98	91	120	119	251
DeHavilland DHC-6	14	13	78	107	96
Embraer EMB110	—	—	4	34	66
Fairchild/Fokker F-27/FH-227[r]	26	30	28	15	16
Fairchild Swearingen SA-226	6	8	66	100	72
Fairchild Swearingen SA-227	—	—	—	—	4
GAF N22/N24 Nomad	—	—	1	9	3
Grumman G-73	—	—	—	—	1
Grumman G-159	1	1	15	16	17
Handley Page HP-137	—	—	16	15	12
Hawker-Siddeley HS748	1	1	1	2	2
Israel Aircraft AR101B	—	—	—	—	2
Nihon YS-11	23	19	18	22	27
Nord ND-262/STC-262	5	9	24	22	15
Piper PA31T	—	—	—	—	1
Short SD-3	—	—	—	34	39
Short SC-7	—	—	—	2	2
Short SD-330	—	1	21	—	—
Piston-Engine—TOTAL	68	65	557	595	606
Four-Engine—TOTAL	33	42	58	73	68
DeHavilland DHC-114	—	—	7	27	21
Douglas DC-4	1	2	4	5	6
Douglas DC-6	30	39	46	41	41
Douglas DC-7	1	—	—	—	—
Lockheed 1049	1	1	1	—	—
Twin-Engine—TOTAL	34	21	499	522	535
Single-Engine—TOTAL	1	2	—	—	3
Helicopters—TOTAL	3	3	1	2	4

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation," (Annually).
NOTE: Effective 1978, includes certified route air carriers, supplemental air carriers (charters), and all aircraft over 12,500 pounds operated by air taxis, commercial operators and travel clubs. Effective 1979, includes multi-engine aircraft in passenger service of commuters. "Active aircraft" must have a current U.S. registration and have been flown during the calendar year.

ACTIVE U.S. CIVIL AIRCRAFT
as of December 31, 1960-1980

Year	TOTAL[r]	Air Carrier[a]	General Aviation Aircraft					
			TOTAL	Fixed-Wing Aircraft			Rotor-craft[b]	Other[c]
				Multi-Engine	Single-Engine			
					4-place & over	3-place & less		
1960	78,684	2,135	76,549	7,243	34,829	33,472	634	371
1961	82,736	2,104	80,632	8,401	38,206	32,800	798	427
1962	86,168	2,047	84,121	9,186	41,120	32,341	967	507
1963	87,167	2,079	85,088	9,695	42,647	30,977	1,171	588
1964	90,823	2,081	88,742	10,644	45,777	30,367	1,306	648
1965	97,567	2,125	95,442	11,977	49,789	31,364	1,503	809
1966	106,978	2,272	104,706	13,548	52,972	35,687	1,622	877
1967	116,638	2,452	114,186	14,651	56,865	39,675	1,899	1,096
1968	126,823	2,586	124,237	16,760	60,977	42,830	2,350	1,320
1969	133,496	2,690	130,806	18,111	63,703	45,001	2,557	1,434
1970	134,422	2,679	131,743	18,291	64,759	44,884	2,255	1,554
1971	133,790	2,642	131,148	17,855	64,464	44,792	2,352	1,685
1972	147,593	2,583	145,010	19,849	70,998	49,448	2,787	1,928
1973	156,139	2,599	153,540	21,929	74,831	51,386	3,143	2,251
1974	163,974	2,472	161,502	23,418	78,924	53,008	3,610	2,542
1975	170,970	2,495	168,475	24,559	82,621[r]	54,390	4,073	2,832
1976	180,796	2,492	178,304	25,684	88,211	56,730	4,505	3,174
1977	186,767	2,473	184,294	26,652	91,960	57,340	4,726	3,616
1978	201,323	2,545	198,778[d]	28,782	101,466	59,185	5,315	4,028
1979	213,944	3,609	210,335	31,311	106,028	62,362	5,864	4,770
1980	214,850	3,805	211,045	31,664	107,930	60,505	6,001	4,945

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation," (Annually).
NOTE: Before 1971, an active aircraft was one certified as eligible to fly. Currently, an "active aircraft" must have a current U.S. registration and have been flown during the previous calendar year.

a Effective 1978, includes certificated route air carriers, supplemental air carriers (charters), and all aircraft over 12,500 pounds operated by air taxis, commercial operators and travel clubs. Effective 1979, includes multi-engine aircraft in passenger service of commuters.
b Includes autogiros; excludes air carrier helicopters.
c Includes gliders, dirigibles and balloons.
d Detail does not add to total because of estimating procedures.
r Revised.

ACTIVE U.S. CIVIL AIRCRAFT BY PRIMARY USE AND TYPE OF AIRCRAFT

As of December 31, 1980

Primary Use[a]	TOTAL	Fixed Wing			Helicopter	Other
		Turbojet	Turboprop	Piston		
TOTAL—ALL AIRCRAFT	214,850	5,518	4,772	193,609	6,003	4,945
Air Carrier—TOTAL	3,805	2,526	682	595	2	—
Certificated Route Air Carriers	2,505	2,336	163	6	—	—
Supplemental Air Carriers	148	59	73	16	—	—
Commercial Operators	24	8	7	9	—	—
Air Taxis	135	29	37	67	2	—
Commuters	835	9	375	451	—	—
All Cargo	146	76	24	46	—	—
Air Travel Clubs	12	9	3	—	—	—
General Aviation—TOTAL	211,045	2,992	4,090	193,014	6,001	4,945
Executive	14,860	2,350	2,600	8,845	947	116
Business	49,391	110	420	47,717	749	393
Commuter[b]	944	9	256	673	1	1
Air Taxi[b]	7,615	187	501	6,139	785	1
Aerial Application	7,294	—	58	6,548	684	1
Industrial	2,813	23	9	1,824	956	—
Instructional	14,862	52	1	13,934	274	598
Rental	11,829	44	70	11,229	260	224
Personal	96,222	8	10	92,301	592	3,308
Other	5,216	203	161	3,800	749	299

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation," (Annually).
NOTE: Detail may not add to totals because of estimating procedures.
a Definitions of "primary use " categories available in Glossary of "FAA Statistical Handbook."
b Air taxis under 12,500 pounds and single-engine commuters; other aircraft in these categories included with "air carriers."

U.S. GENERAL AVIATION
ACTIVE AIRCRAFT AND HOURS FLOWN
BY PRIMARY USE
Calendar Years 1977-1980

Primary Use[a]	1977	1978	1979	1980
ACTIVE AIRCRAFT AS OF DECEMBER 31				
TOTAL	184,294	198,778	210,339	211,045
Executive	8,782	12,666	13,638	14,860
Business	41,396	42,809	49,658	49,391
Commuter[b]	6,838	7,936	8,399	944
Air Taxi[b]				7,615
Aerial Application	7,392	7,418	7,494	7,294
Industrial	1,342	2,059	3,259	2,813
Instructional	16,096	14,742	15,456	14,862
Rental	8,619	8,189	12,771	11,829
Personal	88,292	96,209	94,427	96,222
Other	4,799	6,749	5,236	5,216
THOUSANDS OF HOURS FLOWN				
TOTAL	35,792	39,290	43,340	41,016
Executive	3,487	4,882	5,001	5,332
Business	6,822	8,014	8,979	8,434
Commuter[b]	4,130	4,424	4,573	961
Air Taxi[b]				3,535
Aerial Application	2,058	2,066	2,372	2,044
Industrial	453	702	1,120	1,053
Instructional	6,529	5,009	6,462	5,748
Rental	2,793	3,284	4,206	3,917
Personal	8,453	9,601	9,471	8,894
Other	879	1,308	1,052	1,008

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation," (Annually).
NOTE: Detail may not add to totals because of rounding and estimating procedures.
a Definitions of "primary use" categories available in Glossary of "FAA Statistical Handbook."
b Air taxis under 12,500 pounds and single-engine commuters; other aircraft in these categories classified as "air carriers."

ACTIVE U.S. AIRMAN CERTIFICATES HELD

As of December 31, 1977-1981

	1977	1978	1979	1980	1981
Pilots—TOTAL	783,932	798,833	814,667	827,071	764,182
Students	203,510	204,874	210,180	199,833	179,912
Private	327,424	337,644	343,276	357,479	328,562
Commercial	188,763	185,833	182,097	183,442	168,580
Airline Transport	50,149	55,881	63,652	69,569	70,311
Helicopter (only)	4,819	4,874	5,218	6,030	6,453
Glider (only)[a]	6,208	6,541	6,796	7,039	7,388
Other Pilot[a]	3,059	3,186	3,448	3,679	2,976
Non-Pilots—TOTAL	348,584	362,350	377,213	393,486	398,368
Mechanics[b]	220,768	228,743	237,611	250,157	262,705
Parachute Rigger[b]	8,994	9,200	9,381	9,547	9,716
Ground Instructor[b]	55,717	57,738	59,680	61,550	63,246
Dispatcher[b]	5,972	6,161	6,446	6,799	7,094
Control Tower Operator	25,107	25,388	25,232	25,130	15,528
Flight Navigator	2,155	2,092	1,994	1,936	1,785
Flight Engineer	29,871	33,028	36,869	38,367	38,294
Flight Instructor Certificates[c]	49,362	52,201	54,398	60,440	57,523
Instrument Ratings[c]	226,334	236,312	247,096	260,461	252,535

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

a Glider and lighter-than-air pilots are not required to have a medical examination; however, the totals above are the pilots who received a medical.

b No periodic medical examination required; therefore, no determination as to current activity can be made.

c Special ratings shown on pilot certificates represented above, not additional certificates.

U.S. CIVIL AND JOINT-USE AIRCRAFT FACILITIES[a] BY TYPE AND STATE

As of December 31, 1981

State	TOTAL	Public	Paved	Lighted	State	TOTAL	Public	Paved	Lighted
TOTAL	15,476[a]	4,798	6,012	4,796					
U.S.—TOTAL	15,422	4,768	5,971	4,778					
Alabama	165	97	122	96	Nebraska	334	94	90	93
Alaska	689	477	57	104	Nevada	128	62	51	26
Arizona	224	96	108	72	New Hampshire	52	15	29	19
Arkansas	157	81	89	76	New Jersey	271	35	104	62
California	832	295	547	275	New Mexico	156	66	70	48
Colorado	312	90	134	93	New York	486	83	191	140
Connecticut	105	15	58	28	N. Carolina	286	90	116	107
Delaware	37	3	12	15	N. Dakota	365	97	65	87
Dist. of Col.	16	7	13	5	Ohio	674	133	230	197
Florida	506	132	203	151	Oklahoma	297	126	153	128
Georgia	293	125	149	122	Oregon	318	96	122	84
Hawaii	51	18	36	12	Pennsylvania	698	77	220	156
Idaho	196	126	58	43	Rhode Island	18	8	10	7
Illinois	929	98	175	174	S. Carolina	137	66	65	65
Indiana	365	78	112	123	S. Dakota	162	74	47	71
Iowa	270	117	113	155	Tennessee	164	77	100	81
Kansas	376	129	115	140	Texas	1,431	322	650	400
Kentucky	125	62	79	58	Utah	102	57	62	42
Louisiana	292	74	137	77	Vermont	65	20	16	9
Maine	158	45	41	31	Virginia	260	58	105	84
Maryland	145	24	62	48	Washington	363	118	165	126
Massachusetts	136	35	83	44	W. Virginia	90	28	50	33
Michigan	417	133	154	166	Wisconsin	408	102	122	129
Minnesota	493	145	107	141	Wyoming	105	44	46	32
Mississippi	180	82	93	78	Puerto Rico	33	13	28	11
Missouri	393	118	155	143	Virgin Islands	6	4	2	2
Montana	190	118	80	82	S. Pacific[b]	15	13	11	5

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

a 15,476 aircraft facilities = 12,427 airports, 2,507 heliports, 57 stolports, and 485 seaplane bases. Facilities having joint civil-military use are included.

b American Samoa, Guam, and Trust Territories.

Helicopter Transportation

In 1981, the number of heliports in the United States, Canada and Puerto Rico reached 3,985, an all-time high that reflects continuing growth of rotary wing services. Of the total, 3,666 are ground level heliports and 319 are rooftop facilities. These statistics are contained in the 1981 *Directory of Heliports in the United States, Canada and Puerto Rico,* compiled by Aerospace Industries Association and jointly published by AIA and *Aviation Week & Space Technology* magazine. The directory estimates that there are approximately 1,000 additional heliports on offshore oil rigs in American waters.

The number of land-based heliports represented an increase of more than 16 percent over the 3,134 facilities reported in 1977, the last prior year the directory was published. The greatest increase was in hospital heliports; the 1981 directory listed 905 such facilities, a 29 percent increase over the 699 in use in 1977.

The Pacific region of the United States led in heliport availability

with 734; close behind were the Middle Atlantic (727) and East North Central (718) regions. The directory reported 107 heliports in Canada and 71 in Puerto Rico.

In 1980, the latest year for which figures are available, there were 2,573 civil operators flying 8,575 helicopters in the U.S., Canada and Puerto Rico. A breakdown of helicopters in operation showed 5,581—65 percent of the total—in commercial service, 1,635 being used as corporate/executive aircraft and 1,360 in service with civil government agencies.

After a two-year hiatus, scheduled U.S. helicopter operations resumed as three operators inaugurated services during the year; they boarded more than 56,000 passengers and flew a combined 1,183,000 ton-miles. New York Helicopter, operating between New York area airports and a downtown Manhattan heliport, carried the bulk of the traffic; the airline began scheduled operations in January 1981 and flew some 50,000 passengers. Executive Airlines, Inc., Houston, Texas, started service in August and boarded 5,280 passengers during the remainder of the year. SFO Helicopter Airlines, headquartered at Oakland (California) International Airport, initiated service in mid-November and flew about 1,000 passengers.

Two new American-built civil helicopter types were introduced to operational services in 1981. In the spring, Boeing Vertol started deliveries of its Model 234 tandem-rotor 44-passenger civil transport and the first customer—British Airways Helicopters—inaugurated service in July. Early in the year, Bell Helicopter Textron made first deliveries of its Model 412 transport and by year-end 50 of the aircraft were operational, the majority of them in the petroleum support service. Production continued on the Sikorsky S-76 transport and at the end of 1981 the S-76 fleet numbered 166 aircraft operating in 26 countries. Back in production after a hiatus of several years was Hiller Aviation's redesigned FH-1100; the first model was delivered late in the year.

In rotorcraft research, flight testing continued on two prototypes of the Bell/NASA/Army XV-15 Tilt Rotor Research Aircraft, which has both military and civil potential. After a lengthy series of tests by NASA, the No. 1 XV-15 was returned to the Bell plant for modification and further company testing; NASA's Ames Research Center continued to explore the XV-15's performance envelope with the No. 2 aircraft. NASA was also conducting flight tests of two Sikorsky/NASA/Army Rotor Systems Research Aircraft, flying laboratories for evaluation of new rotor, propulsion and other helicopter systems.

CIVIL HELICOPTER OPERATORS AND HELICOPTERS OPERATED IN THE UNITED STATES, CANADA AND PUERTO RICO

Selected Years 1965-1980

Year	TOTAL	Commercial	Corporate and Executive	Civil Government Agencies[a]
CIVIL HELICOPTER OPERATORS				
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
1977	2,547	959	1,219	369
1978	3,003	1,126	1,515	362
1980[c]	2,573	1,065	1,160	348
HELICOPTERS OPERATED[b]				
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
1977	7,160	4,294	1,578	1,288
1978	8,023	4,904	1,891	1,228
1980[c]	8,575	5,581	1,635	1,360

Source: Aerospace Industries Association, "Directory of Helicopter Operators in the United States, Canada and Puerto Rico, 1980."

a Federal, state and local governments.

b Includes helicopters on order.

c Latest available data. Because computerization of Directory data resulted in the elimination of some duplication of operator and helicopter listings, 1980 data are not comparable with those of previous years.

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

By Region
Selected Years 1972-1981

Region	1972	1973	1975	1977	1981
TOTAL	2,326	2,384	3,268	3,433	3,985
Elevated Facilities	211	241	277	299	319
New England	87	78	143	164	168
Middle Atlantic	571	581	684	795	727
East North Central	281	307	411	397	718
West North Central	109	110	98	107	164
South Atlantic	190	204	352	306	416
East South Central	65	64	107	144	203
West South Central	216	217	338	339	409
Mountain	168	176	241	213	268
Pacific	545	551	789	821	734
Puerto Rico	24	24	30	73	71
Canada	70	72	75	74	107

Source: Aerospace Industries Association, "Directory of Heliports in the U.S., Canada, Puerto Rico, 1981."
NOTE: Totals include proposed facilities.

HOSPITAL HELIPORTS IN THE UNITED STATES, CANADA AND PUERTO RICO

By Region
Selected Years 1972-1981

Region	1972	1973	1975	1977	1981
TOTAL	354	384	565	699	905
New England	5	5	16	21	31
Middle Atlantic	43	42	55	73	93
East North Central	82	99	126	150	193
West North Central	22	21	22	29	69
South Atlantic	39	50	76	82	135
East South Central	18	18	29	54	171
West South Central	26	26	59	67	77
Mountain	29	32	56	67	88
Pacific	87	87	119	147	135
Puerto Rico	–	–	–	2	2
Canada	3	4	7	7	11

Source: Aerospace Industries Association, "Directory of Heliports in the U.S., Canada, Puerto Rico, 1981."
NOTE: Totals include proposed facilities.

SPECIFICATIONS OF U.S. CIVIL HELICOPTERS IN OPERATION/PRODUCTION

As of April 1982

COMPANY	Commercial Model	Number of Places	Useful Load (Lbs.)	Range with Useful Load N. Miles	External Cargo Payload (Lbs.)
Bell Helicopter Textron Fort Worth, TX	47G Series	3	670-1210	212-238	0-1000
	47J Series	4	1090-1204	224-258	—
	AG-5	2	1300	102	—
	204 Series	7-11	1956-4880	123-335	—
	205A-1	15	4542	276	5000
	206 Series	4-5	1315-1630	240-304	1200-1500
	206L Series	7	1894-1931	297-308	2000
	212	15	5238	226	5000
	214 Series	16	5450-8035	219-435	6000-8000
	222	7-10	2985	356	2500
	412	15	5333	232	5000
Boeing Vertol Company Philadelphia, PA	107-II	28	7585	240	11,500
	234 Chinook (LR)	47	23,300	620	28,000
	234 Chinook (UT)	3	30,000	264	28,000
Brantley-Hynes Helicopter, Inc. Frederick, OK	B2B	2	670	225	400
	305	5	1200	275	800
The Enstrom Helicopter Corp. Menominee, MI	F-28 Series	3	700-1000	238-272	500-1000
	280 Series	3-4	700-1038	263-270	500-1000
Hiller Aviation Porterville, CA	12-E Series	3-4	1264-1341	215	1000
	12-ET Series	3-4	1450	351	1000
	FH-1100	5	1355	396	1500
Hughes Helicopters, Inc. Culver City, CA	300 Series	3	698-1004	191-224	1104
	500 Series	4-7	1320-1660	276-287	1560-2000
Robinson Helicopter Co. Torrance, CA	R22	2	486	208	—
United Technologies Corp. Sikorsky Aircraft Div. Stratford, CT	S-58T	14-16	5370	271	5000
	S-58JT	14-16	4923	282	5000
	S-62A	13	2967	453	3000
	S-61L(MARK II) Airline	30	7208	305	6500
	S-61 (MARK II) Payloader	2	11,600	305	11,000
	S-61N(MARK II)	26-28	7990	490	6000
	S-76(MARK II)	14	4525	466	4200

Source: Aerospace Industries Association, "Directory of Helicopter Operators in the United States, Canada and Puerto Rico, 1980/81."

CIVIL HELICOPTER FLEET
UNITED STATES, CANADA AND PUERTO RICO
1980[a]

State	OPERATORS				HELICOPTERS			
	TOTAL	Commercial	Corp. and Exec.	Civil Gov't.	TOTAL	Commercial	Corp. and Exec.	Civil Gov't.
Alabama	51	11	29	11	346	19	40	287
Alaska	52	34	14	4	290	261	24	5
Arizona	62	32	24	6	204	135	43	26
Arkansas	16	6	7	3	28	9	14	5
California	271	122	103	46	927	544	175	208
Colorado	52	24	19	9	135	83	29	23
Connecticut	17	7	10	–	29	14	15	–
Delaware	7	–	6	1	8	–	6	2
Dist. of Col.	9	2	–	7	29	2	–	27
Florida	153	61	55	37	489	315	81	93
Georgia	23	7	8	8	66	28	7	31
Hawaii	19	13	5	1	37	28	7	2
Idaho	38	18	14	6	87	58	18	11
Illinois	48	23	15	10	114	72	20	22
Indiana	53	19	22	12	97	41	28	28
Iowa	24	12	8	4	40	22	8	10
Kansas	20	8	8	4	37	16	10	11
Kentucky	56	10	43	3	91	34	49	8
Louisiana	56	22	22	12	692	593	76	23
Maine	8	4	3	1	18	10	4	4
Maryland	16	7	6	3	52	30	6	16
Massachusetts	22	9	11	2	50	32	15	3
Michigan	56	17	28	11	103	43	33	27
Minnesota	30	15	14	1	73	50	19	4
Mississippi	10	2	2	6	20	4		14
Missouri	31	15	9	7	74	42	9	23
Montana	24	15	4	5	63	46	4	13
Nebraska	19	8	9	2	35	19	14	2
Nevada	23	10	8	5	56	34	13	9
New Hampshire	12	6	6	–	25	15	10	–
New Jersey	66	23	37	6	145	84	46	15
New Mexico	19	7	10	2	36	18	13	5

(Continued on next page)

CIVIL HELICOPTER FLEET
UNITED STATES, CANADA AND PUERTO RICO (Continued)
1980[a]

State	OPERATORS				HELICOPTERS			
	TOTAL	Commercial	Corp. and Exec.	Civil Gov't.	TOTAL	Commercial	Corp. and Exec.	Civil Gov't.
New York	91	29	48	14	245	133	68	44
North Carolina	27	6	16	5	48	15	18	15
North Dakota	14	10	4	–	30	26	4	–
Ohio	85	30	48	7	153	77	56	20
Oklahoma	33	13	16	4	115	78	18	19
Oregon	87	40	42	5	406	320	52	34
Pennsylvania	114	34	79	1	202	101	93	8
Rhode Island	4	2	1	1	6	3	2	1
South Carolina	26	7	14	5	59	38	15	6
South Dakota	7	3	1	3	8	4	1	3
Tennessee	49	14	25	10	101	38	25	38
Texas	195	71	107	17	564	340	170	54
Utah	25	17	7	1	144	132	11	1
Vermont	6	–	6	–	6	–	6	–
Virginia	39	12	20	7	56	17	22	17
Washington	89	46	35	8	200	128	42	30
West Virginia	54	10	40	4	74	19	46	9
Wisconsin	21	6	12	3	68	52	11	5
Wyoming	14	8	6	–	34	28	6	–
Puerto Rico	5	1	2	2	9	1	2	6
Not Stated	3	2	–	1	4	3	–	1
TOTAL—U.S.	2,351	930	1,088	333	7,028	4,254	1,506	1,268
Canada	222	135	72	15	1,547	1,327	129	91
GRAND TOTAL	2,573	1,065	1,160	348	8,575	5,581	1,635	1,359

Source: Aerospace Industries Association, "Directory of Helicopter Operators in the United States, Canada and Puerto Rico, 1980/81."

a Latest available data.

HELICOPTER TRAFFIC
U.S. AIRLINES
Calendar Years 1960-1981[a]
(Thousands)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Ton-Miles[b]
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	709	444	7,490	755
1977	468	268	4,625	466
1978	403	282	4,927	495
1979	58	36	625	63
1980	—	—	—	—
1981	—	—	—	—

Source: Civil Aeronautics Board, Information Management Division.

a No scheduled helicopter operations by certificated route air carriers from April 1979 through 1981. During 1981, however, one certificated carrier offered non-scheduled service, and three non-certificated carriers began operating scheduled helicopter service, carrying a total of more than 56,000 passengers.

b Passengers, mail, express, and freight.

REVENUE TON-MILE TRAFFIC CARRIED HELICOPTER SERVICES BY U.S. AIRLINES

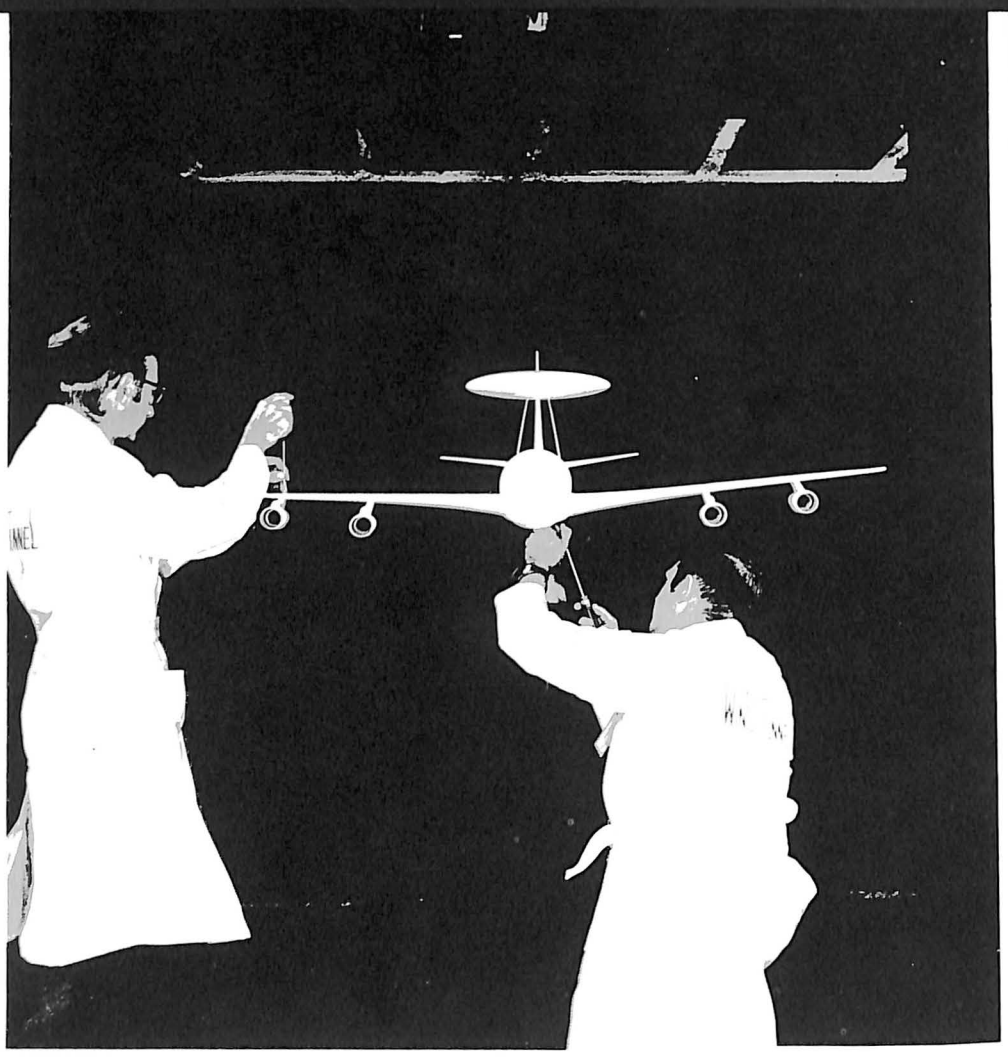
Calendar Years 1960-1981[a]
(Thousands)

Year	TOTAL Ton-miles	Passenger	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
1977	465	462	2	—	1
1978	495	493	1	—	1
1979	63	63	—	—	—
1980	—	—	—	—	—
1981	—	—	—	—	—

Source: Civil Aeronautics Board, Information Management Division.

a No scheduled helicopter operations by certificated route air carriers from April 1979 through 1981. During 1981, however, one certificated carrier offered non-scheduled service, and three non-certificated carriers began operating scheduled helicopter service, carrying a total of more than 56,000 passengers.

Research and Development



Expenditures for aerospace research and development, including both federal and industry funding, increased only slightly in 1981 and in real terms—adjusted for inflation—declined by some 6.5 percent. The decline was contrary to the national all-industries experience, in which real expenditures increased by more than 3.5 percent.

In current dollars, aerospace R&D funding amounted to $9.8 billion, up approximately $200 million over 1980. Federal funding increased from $6.9 billion in 1980 to $7.9 billion in 1981; the latter figure represented 80 percent of the combined government/industry funding. Aerospace companies provided $2 billion for R&D, compared with $2.7 billion in the previous year.

Estimates for 1982 indicate that aerospace R&D will rebound and that the aerospace industry will regain its top ranking; in 1980 and 1981, aerospace was in second place behind the electrical machinery/communications equipment industry. A forecast by Battelle Institute projects 1982 aerospace

R&D expenditures of $12.2 billion, which would represent an increase of almost 25 percent compared with a projected all-industries average increase of 12.3 percent. The Battelle forecast estimates an increase in company aerospace R&D funding of $1.2 billion (to $3.2 billion) and almost a $1.2 billion increase in federal funding (to $9 billion). Aerospace would rank first in total expenditures among U.S. industries, with outlays more than $1 billion higher than the second place electrical machinery/communications equipment industry.

National Science Foundation data show that funding for aerospace industry R&D, measured as a percentage of net sales, is substantially higher than the average for all manufacturing industries. In 1980, the latest year for which figures are available, total aerospace R&D funding (federal and company money) amounted to 11.6 percent of the industry's net sales; the national all-industry average was 3.1 percent. R&D funding provided by aerospace companies was 3.3 percent of net sales, compared with the national average of 2.2 percent. For the decade of the seventies, aerospace company R&D funding averaged 3.2 percent of net sales annually, while company funding in all manufacturing industries averaged 2.1 percent.

Overall federal outlays for research and development increased in Fiscal Year 1981 by $3.9 billion to $34.2 billion. Estimates for FY 1982 show a total of $37.4 billion, up more than nine percent over FY 1981. The Administrations's budget plan contemplates R&D outlays of $41.1 billion in FY 1983; that would represent a 10 percent increase over the FY 1982 estimate.

In R&D areas primarily affecting the aerospace industry, Department of Defense outlays for FY 1982 are estimated at $18.8 billion, an increase of almost 20 percent over the previous year. For FY 1983, a further 20 percent increase is projected, bringing defense R&D outlays to $22.7 billion.

NASA R&D funding was expected to increase some $400 million, but the gain approximates the anticipated inflation rate so FY 1982 is essentially a zero growth year. However, the budget plan contemplates a major boost in NASA outlays for FY 1983—almost $800 million, or about 13 percent.

Reflecting the Administration's policy of reduced federal R&D sponsorship for those energy technologies sufficiently advanced to warrant industry investment, energy R&D funding by the government is projected to drop slightly in FY 1982 and sharply in FY 1983. The budget plan shows a decline of $173 million (3.3 percent) to a FY 1982 level of $4.9 billion; in FY 1983, there will be a further drop of $844 million (17 percent) to $4.1 billion.

In FY 1982, federal outlays for aeronautical R&D are projected to increase by $258 million, about eight percent or slightly below the inflation rate. Defense funding for aeronautics is expected to increase by $278 million to $2.8 billion; NASA funding will decline $21 million to $501 million; and Department of Transportation funding will remain approximately level at $107 million.

FUNDS FOR RESEARCH AND DEVELOPMENT
ALL INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1968-1982
(Millions of Dollars)

Year	All Industries[a]			Aerospace Industry[b]		
	Total	Federal Funds	Company Funds[c]	Total	Federal Funds	Company Funds[c]
CURRENT DOLLARS						
1968	$17,429	$ 8,560	$ 8,869	$ 5,765	$4,533	$1,230
1969	18,308	8,451	9,857	5,882	4,524[r]	1,354
1970	18,067	7,779	10,288	5,219	4,005	1,213
1971	18,320	7,666	10,654	4,881	3,864	1,017
1972	19,552	8,017	11,535	4,950	3,970	978
1973	21,249	8,145	13,104	5,052	3,899	1,154
1974	22,887	8,220	14,667	5,278	4,000	1,278
1975	24,187	8,605	15,582	5,713	4,428	1,285
1976	26,997	9,561	17,436	6,339	4,921	1,418
1977	29,928	10,521	19,407	7,104	5,541	1,563
1978	33,365	11,209	22,156	7,690	5,811	1,879
1979[r]	38,147	12,492	25,655	8,290	5,997	2,293
1980[r]	43,879	13,939	29,940	9,626	6,896	2,730
1981[E]	49,600	15,750	33,850	9,814	7,860	1,954
1982[E]	55,700	17,800	37,900	12,244	9,055	3,187
CONSTANT DOLLARS (1972 = 100)						
1968	$21,116	$10,371	$10,745	$6,984	$5,492	$1,490
1969	21,095	9,737	11,357	6,778	5,213	1,560
1970	19,756	8,506	11,250	5,707	4,379	1,326
1971	19,081	7,985	11,097	5,084	4,025	1,059
1972	19,552	8,017	11,535	4,950	3,970	978
1973	20,105	7,707	12,399	4,780	3,689	1,092
1974	19,916	7,153	12,763	4,593	3,481	1,112
1975	19,263	6,851	12,410	4,550	3,527	1,023
1976	20,435	7,237	13,198	4,798	3,725	1,073
1977	21,403	7,524	13,879	5,080	3,963	1,118
1978	22,236	7,470	14,766	5,125	3,873	1,252
1979	23,436	7,675	15,762	5,093	3,684	1,409
1980	24,740	7,859	16,881	5,427	3,888	1,539
1981[E]	25,605	8,131	17,474	5,066	4,057	1,009
1982[E]	26,663	8,521	18,143	5,861	4,335	1,526

Source: National Science Foundation, for historical data and All Industries estimates; Battelle Memorial Institute, "Probable Levels of R&D Expenditures....Forecast and Analysis," (Annually) for Aerospace Industry estimates; "Economic Report of the President," (Annually) and "The Budget of the United States Government," (Annually) for GNP deflator series used to calculate constant dollar values.

NOTE: Detail may not add to totals because of rounding.

a Includes all manufacturing industries, plus those non-manufacturing industries known to conduct or finance research and development.

b Companies classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, and parts.

c Company funds include all funds for industrial R&D work performed within company facilities except funds provided by the Federal Government. Excluded are company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other non-profit organizations.

r Revised.

E Estimate.

FUNDS FOR RESEARCH AND DEVELOPMENT IN AEROSPACE

By Type of Research and Fund Source
Calendar Years 1960-1980
(Millions of Dollars)

YEAR	TOTAL AERO-SPACE	Applied Research and Development Funds			Basic Research Funds		
		TOTAL	Federal Govern-ment Contracts	Company	TOTAL	Federal Govern-ment 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	5,765	5,694	4,508	1,185	70	25	45
1969	5,882	5,816	4,500	1,313	65	23	42
1970	5,219	5,156	3,985	1,170	63	20	43
1971	4,881	4,831	3,848	983	50	16	34
1972	4,950	4,887	3,949	937	62	21	41
1973	5,052	4,992	3,871	1,118	58	20	38
1974	5,278	5,221	3,895	1,236	57	18	39
1975	5,713	5,659	4,416	1,243	54	18	36
1976	6,339	6,285	4,899[E]	1,386[E]	54	22[E]	32[E]
1977	7,104	7,048	5,516[E]	1,532[E]	56	25[E]	31[E]
1978	7,690	NA	NA	NA	NA	NA	NA
1979	8,290	8,202[E]	5,993[E]	2,209[E]	88[E]	45[E]	43[E]
1980[a]	9,626	NA	NA	NA	NA	NA	NA

Source: National Science Foundation.
NOTE: Totals may not add because of rounding.
a Latest year available.
r Revised.
NA Not available; details on sources and application of funds available only for odd-numbered years.

RESEARCH AND DEVELOPMENT FUNDS AS PERCENT OF NET SALES ALL MANUFACTURING INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1967-1980

Year	All Manufacturing Industries[a]		Aerospace Industries[b]	
	Total R&D Funds as Percent of Net Sales	Company R&D Funds as Percent of Net Sales	Total R&D Funds as Percent of Net Sales	Company R&D Funds as Percent of Net Sales
1967	4.2%	2.1%	19.7%	4.0%
1968	4.0	2.1	19.0	4.1
1969	4.0	2.2	20.2	4.6
1970	3.7	2.2	16.2	3.8
1971	3.5	2.1	16.2	3.4
1972	3.4	2.0	16.6	3.3
1973	3.3	2.0	13.3	3.0
1974	3.1	2.0	14.1	3.5
1975	3.1	2.0	12.7	2.8
1976	3.1	2.0	12.7	2.8
1977	3.1	2.0	12.8	2.8
1978	3.2	2.1	12.2	3.0
1979	3.0	2.1	11.4	3.2
1980	3.1	2.2	11.6	3.3

Source: National Science Foundation.
a Includes all manufacturing industries known to conduct or finance research and development.
b Companies classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles and parts.

FUNDS FOR ENERGY RESEARCH AND DEVELOPMENT ALL INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1977-1981
(Millions of Dollars)

	1977	1978	1979	1980	1981[E]
All Industries[a] — TOTAL	$2,599	$3,026	$3,795	$4,366	$4,753
Federal Funds	951	1,193	1,497	1,669	NA
Company Funds	1,648	1,833	2,298	2,697	NA
Aerospace Industry[b] — TOTAL	$ 165	$ 283	$ 372	$ 441	$ 394
Federal Funds	108	215	259	295	NA
Company Funds	57	68	113	146	NA

Source: National Science Foundation.
a Includes all manufacturing industries, plus those non-manufacturing industries known to conduct or finance research and development.
b Companies classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles and parts.
NA Not available.
E Estimated by surveyed companies.

EXPENDITURES FOR POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT ALL INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1976-1980
(Millions of Dollars)

	1976	1977	1978	1979	1980
All Industries,[a]	$ 754	$ 901	$1,054	$1,237	$1,183
Aerospace Industry[b]	48	57	64	64	38

Source: National Science Foundation.
a Includes all manufacturing industries, plus those non-manufacturing industries known to conduct or finance research and development.
b Companies classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles and parts.

FEDERAL AERONAUTICS RESEARCH AND DEVELOPMENT

Budget Authority
Fiscal Years 1967-1982
(Millions of Dollars)

Year	TOTAL	NASA[a]	DOD[b]	DOT[c]
1967	$1,613	$105	$1,199	$309
1968	1,404	136	1,126	142
1969	1,300	169	1,161	—30[d]
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
1977	2,727	378	2,256	93
1978	3,338	437	2,807	94
1979	2,850	519	2,240	91
1980	2,991	560	2,336	95
1981[E]	3,161	522	2,533	106
1982[E]	3,419	501	2,811	107

Source: NASA, "Aeronautics and Space Report of the President" (Annually).
NOTE: Latest available data, based on proposed FY 1982 Federal budget.
a Research and Development, Construction of Facilities, Research and Program Management.
b Research, Development, Testing and Evaluation of aircraft and related equipment.
c Federal Aviation Administration Research, Engineering and Development and Facilities, Engineering and Development.
d Unobligated balances for SST research and development, rescinded in 1969.
E Estimate.

FEDERAL OUTLAYS FOR CONDUCT OF RESEARCH AND DEVELOPMENT

Fiscal Years 1960-1983
(Millions of Dollars)

Year	TOTAL	DOD	NASA	Energy[a]	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
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	22,462	10,176	3,763	3,181	5,342
1978	24,532	10,726	3,833	3,925	6,048
1979	26,578	11,454	4,064	4,413	6,648
1980	30,351	13,451	4,711	4,698	7,492
1981	34,252	15,720	5,279	5,121	8,132
1982[E]	37,425	18,784	5,696	4,948	7,997
1983[E]	41,122	22,673	6,460	4,104	7,885

Source: "The Budget of the United States Government," (Annually).
NOTE: Totals may not add because of rounding.
a Energy research and development programs transferred from AEC to ERDA with 1974 reorganization, to Dept. of Energy in 1977, and is proposed to be funded through the Energy Research and Technology Administration of the Dept. of Commerce as of 1983.
E Estimate.

DEPARTMENT OF DEFENSE
APPROPRIATIONS FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION
Fiscal Years 1981-1983
(Millions of Dollars)

	1981	1982[E]	1983[E]
TOTAL—APPROPRIATIONS FOR RDT&E	$16,633	$20,044	$24,257
BY APPROPRIATION			
Army	3,124	3,610	4,484
Navy	5,025	5,807	6,232
Air Force	7,133	8,876	11,221
Defense Agencies	1,309	1,698	2,260
Director of Test Evaluation	42	53	60
BY RESEARCH CATEGORIES			
Research	615	695	828
Exploratory Development	1,985	2,213	2,509
Advanced Development	2,806	3,476	4,689
Engineering Development	6,394	7,683	8,919
Management and Support	1,736	2,009	2,224
Operational Systems Development	3,097	3,968	5,088
RECAP OF BUDGET ACTIVITIES			
Technology Base	2,600	2,907	3,337
Advanced Technology Development	593	736	952
Strategic Programs	3,440	4,643	6,647
Tactical Programs	6,130	6,900	7,576
Intelligence and Communications	1,632	2,202	2,772
Defensewide Mission Support	2,238	2,656	2,973
RECAP OF FYDP PROGRAMS			
Strategic Forces	682	713	854
General Purpose Forces	713	848	1,250
Intelligence and Communications	1,661	2,362	2,953
Airlift/Sealift	27	31	13
Research and Development (FYDP Program 6)	13,537	16,075	19,169
Central Supply and Maintenance	10	11	14
Training, Medical and Other	1	1	1
Support of Other Nations	2	3	3

Source: Department of Defense Budget (Annually).
E Estimate.

DEPARTMENT OF DEFENSE
OUTLAYS FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION
Fiscal Years 1970-1983
(Millions of Dollars)

By Function

Year	TOTAL, All RDT&E Functions	Aircraft	Missiles	Astronautics	Other
1970	$ 7,166	$ 1,239	$ 2,196	$ 753	$ 2,978
1971	7,303	1,699	2,008	519	3,077
1972	7,881	2,066	2,157	468	3,190
1973	8,157	2,036	2,038	512	3,571
1974	8,582	1,893	2,160	561	3,968
1975	8,866	1,698	2,176	515	4,477
1976	8,923	1,603	2,295	581	4,444
Tr. Qtr.	2,206	410	520	129	1,147
1977[a]	9,795	2,176	2,259	537	4,823

By Agency

Year	TOTAL, All RDT&E Functions	Air Force	Navy	Army	Other
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.	2,203	830	778	437	161
1977	9,795	3,618	3,481	2,069	627
1978	10,508	3,626	3,825	2,342	715
1979	11,152	4,080	3,826	2,409	837
1980	13,127	5,017	4,382	2,707	1,021
1981	15,278	6,341	4,783	2,958	1,196
1982[E]	18,299	7,969	5,412	3,366	1,552
1983[E]	22,200	10,197	5,947	4,039	2,017

Source: Department of Defense Budget (Annually).
a Data no longer available in this format.
E Estimate

DEPARTMENT OF DEFENSE
PRIME CONTRACT AWARDS[a]
FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION
Fiscal Years 1977-1981
(Millions of Dollars)

Program Categories	1977	1978	1979	1980	1981
TOTAL—RDT&E	$7,893	$8,683	$8,543	$9,470	$10,483
Research	319	323	381	648	694
Exploratory Development	673	780	726	868	1,081
Other Development	6,247	6,895	6,327	6,920	8,233
Management & Support	654	685	1,109	1,034	474
Aircraft—TOTAL	$1,649	$1,640	$1,315	$1,171	$ 739
Research	3	2	9	3	4
Exploratory Development	31	43	25	39	57
Other Development	1,606	1,591	1,268	1,126	672
Management & Support	9	4	13	3	6
Missile and Space Systems—TOTAL	2,302	2,721	3,064	3,363	4,603
Research	16	20	13	36	27
Exploratory Development	133	178	137	173	277
Other Development	2,023	2,415	2,530	2,800	4,184
Management & Support	130	108	384	354	115
Electronics & Communications Equipment—TOTAL	1,789	1,765	1,893	2,417	2,582
Research	35	37	56	67	74
Exploratory Development	165	156	226	260	305
Other Development	1,500	1,476	1,499	1,977	2,110
Management & Support	89	96	112	113	93
All Other—TOTAL[b]	2,153	2,557	2,271	2,519	2,558
Research	265	264	304	542	589
Exploratory Development	344	403	338	396	441
Other Development	1,118	1,413	1,029	1,017	1,268
Management & Support	426	477	600	564	260

Source: Department of Defense, "Prime Contract Awards by Service Category and Federal Supply Classification" (Annually).

NOTE: Detail may not add to totals because of rounding.

a Effective FY 1980, data include DOD contract awards for civil functions; data for prior years limited to military prime contract awards.

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

MILITARY AIRCRAFT PROGRAMS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION[a]
By Agency, Type and Model
Fiscal Years 1981, 1982 and 1983
(Millions of Dollars)

Agency, Type and Model	1981	1982[E]	1983[E]
AIR FORCE			
A-10 A/E Thunderbolt II	$ 34.8	$ 13.9	$ 6.5
B-1B	219.1	471.0	753.5
B-52G Cruise Missile Carrier Aircraft Modification	9.0	15.0	37.6
B-52G/H Avionics Modernization	45.0	21.9	4.5
C-5 Wing Modification	11.0	15.6	6.9
C-141 Modification	7.0	—	—
E-3A (AWACS)	62.1	52.4	78.9
*Engine Model Derivative Program (EMDP)	73.7	38.5	10.3
European Distrib. System Aircraft (EDSA)	—	—	1.3
EF-111A Modification	5.5	9.2	27.3
F-15 Eagle	11.0	32.3	125.3
F-16 Multimission Fighter	42.4	57.3	86.1
KC-135 Re-Engining/Modernization	16.2	24.9	26.4
LANTIRN (Night Precision Attack)	57.2	90.4	108.3
Precision Location Strike System (PLSS)	62.8	87.8	98.9
NAVY			
A-6E Intruder	$ —	$ —	$ 4.7
AV-8B	236.4	226.4	114.1
CH-53E Super Stallion	8.3	10.9	11.2
E-2C Hawkeye	16.8	18.9	52.3
EA-6B Prowler	9.0	10.6	12.7
F-14A Tomcat	35.9	21.2	21.7
F/A-18 Hornet	170.9	190.0	109.2
P-3C Orion	29.6	18.6	21.6
SH-2F Seasprite (LAMPS MK-I)	—	8.1	10.1
SH-60B Seahawk LAMPS	100.2	72.6	9.0
ARMY			
AH-1S Cobra/Tow	$ 2.5	$ 19.6	$ 12.2
UH-60A Black Hawk	—	6.2	6.7
CH-47 Modernization	0.6	—	—
AH-64 Attack Helicopter	172.9	91.9	33.7

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget (Annually).
a Total Obligational Authority.
E Estimate.
* Programs in R&D only.

MISSILE PROGRAMS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION[a]
By Agency, Type and Model
Fiscal Years 1981, 1982 and 1983
(Millions of Dollars)

Agency, Type and Model	1981	1982[E]	1983[E]
AIR FORCE			
ALCM	$ 108.9	$103.7	$186.8
* AMRAAM[b]	45.4	144.4	212.4
* ASMS	96.5	99.6	50.1
GLCM	107.6	80.1	28.6
IR Maverick	39.3	14.6	5.4
Minuteman II/III	53.1	19.6	13.0
M-X	1,491.6	1,963.2	2,759.3
Target Drones[b]	59.7	71.1	57.7
NAVY			
Harm[b]	$ 77.8	$ 19.8	$ 6.7
Harpoon	—	—	1.9
* MRASM (Tomahawk II)	9.0	19.0	19.9
Phoenix	35.4	30.4	23.8
Sidewinder[b]	2.1	—	—
Sparrow	3.1	5.0	—
Standard ER (SM2)	29.1	24.5	26.9
Standard MR(SM-1)	15.8	15.0	10.3
Standard MR(SM-2)	23.7	24.2	15.9
Tomahawk	133.9	141.7	96.9
Trident I	26.0	41.5	36.2
* Trident II	96.7	239.2	366.7
ARMY			
Copperhead	$ 6.0	$ 3.3	$ 2.1
Laser Hellfire	44.5	24.2	19.3
MLRS	69.9	38.2	23.2
Patriot	75.4	57.8	47.1
Pershing II	149.4	150.6	111.3
Roland	12.6	—	—
Stinger[c]	5.7	16.1	—
TOW[c]	22.7	6.6	2.0

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget (Annually).
E Estimate.
a Total Obligational Authority.
b Includes Navy and Air Force.
c Includes Army and Marine Corps.
* Programs in R&D only.

Foreign Trade

In 1981, the United States experienced an international trade deficit of more than $30 billion, the sixth consecutive year of U.S. deficits and the second largest during that span. There was, however, a bright spot in the otherwise gloomy U.S. trade picture: another solid performance by the aerospace industry, the nation's most export-productive manufacturing sector. Reaching new peak levels of export sales and trade balance, aerospace softened the adverse impact of deficits incurred in other areas of U.S. international trade and once again demonstrated the vital importance to the U.S. economy of high-value, high-technology aerospace exports.

Aerospace exports totaled $17.6 billion, $2.1 billion more than in 1980, which was the previous record year. The 1981 aerospace trade balance, best among the U.S. manufacturing industries, was $13.1 billion, up from $12 billion in 1980. This exceptional trade performance was more impressive for the fact that it was achieved in a year when foreign aerospace competition, on

the rise for several years, reached peak intensity.

A signpost of concern for the aerospace industry and the U.S. economy was the unprecedented level of sales to U.S. customers by foreign manufacturers, particularly in certain civil aircraft, engines and parts categories. U.S. imports of aerospace products totaled a record $4.5 billion, up almost $1 billion from the previous year.

Aircraft imports, almost entirely civil-use planes, amounted to $1.4 billion, up from $975 million in the preceding year. Imports of aircraft engines and parts totaled $1.5 billion, virtually all of it in civil turbine engines and parts; the figure compares with $1.1 billion in 1980.

Among aircraft imports, the key figure was $913 million for general aviation aircraft, defined herein as all civil-use fixed wing planes under 33,000 pounds. This figure represented an increase over 1980 of $417 million and marked the first time that U.S. imports of general aviation aircraft exceeded exports ($790 million). It reflects the increasing penetration of the U.S. market for certain commuter-type airliners, business jets and other high-value multi-engine airplanes in the 10,000-33,000 pounds category; imports in that category alone totaled $788 million. Imports of larger transport aircraft (over 33,000 pounds) declined from $286 million in 1980 to $196 million in 1981, but helicopter imports almost doubled, increasing from $54 million in 1980 to $105 million in 1981.

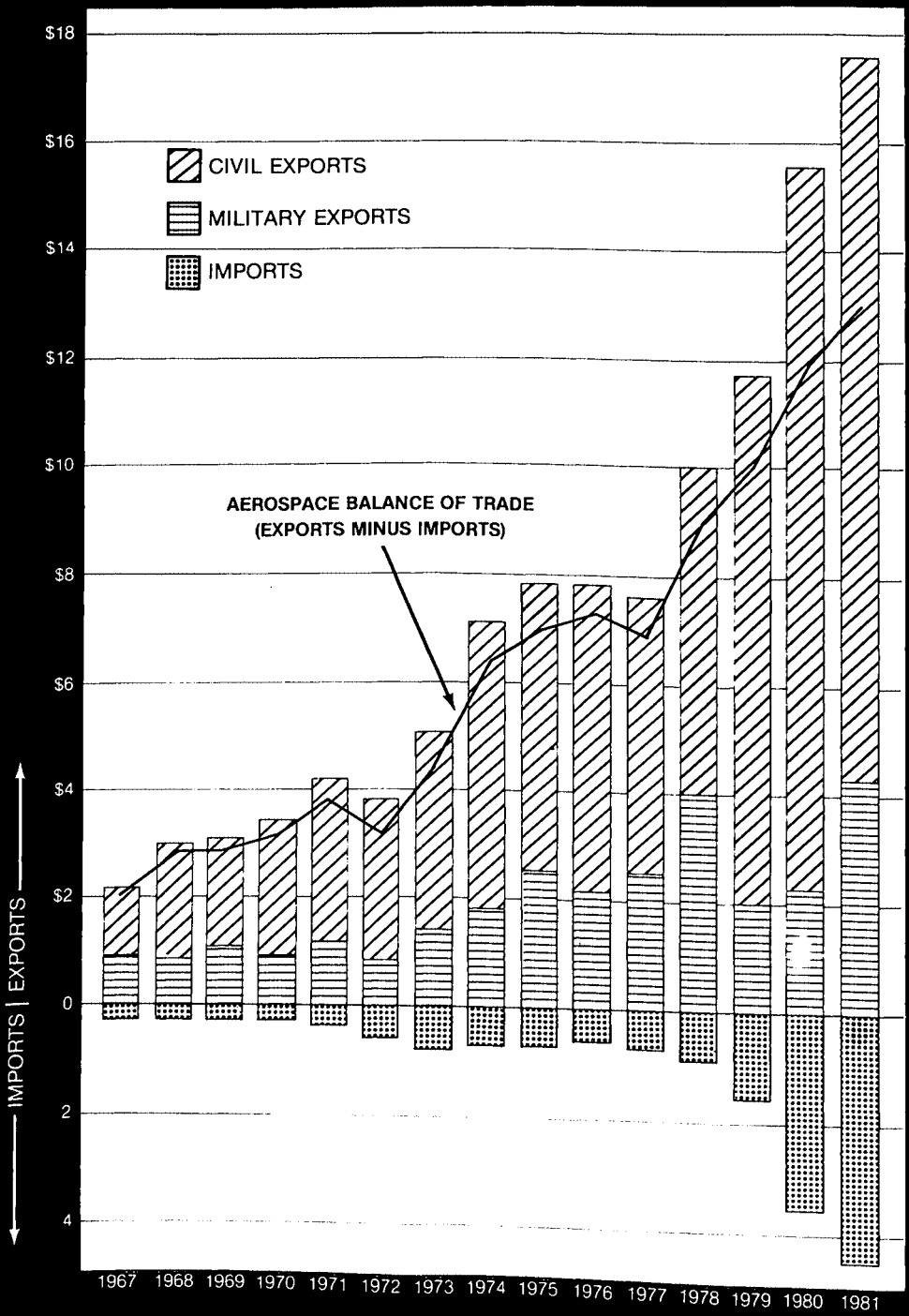
Within the $17.6 billion of U.S. aerospace exports, sales of civil products predominated, accounting for $13.3 billion or more than 75 percent of the total. Civil exports, however, barely topped the 1980 value of $13.2 billion. The major growth in 1981 was in military exports which, at $4.3 billion, were up $2 billion over the previous year.

As in previous years, sales of commercial transport aircraft represented the greatest dollar value among aerospace exports. However, the rate of increase was far below that of previous years; only 6.7 percent in 1981, compared with 35 percent in 1980 and 95 percent in 1979. For 1981, export sales of transports totaled $7.2 billion, up from $6.7 billion in 1980. Shipments of general aviation aircraft to foreign buyers declined in numbers for the second straight year (2,617 units, down 561) but increased in dollar value ($790 million, up $50 million). Similarly, helicopter shipments abroad declined (to 453 units, down 72) but dollar value gained ($346 million, up $48 million).

The large growth in military exports was in complete aircraft (up from $949 million in 1980 to $1.7 billion in 1981) and in aircraft and engine parts (almost $2 billion, compared with $497 million in 1980). Exports of guided missiles and rockets dropped to $556 million from $749 million in the previous year.

AEROSPACE EXPORTS, IMPORTS, AND TRADE BALANCE

(Billions of Current Dollars)



Source: Bureau of the Census

TOTAL AND AEROSPACE BALANCE OF TRADE

Calendar Years 1960-1981
(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	25.3
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	44.5
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	9,630	7,045	7,792	747	73.2
1976	– 7,786	7,267	7,843	576	[c]
1977	– 28,970	6,850	7,581	731	[c]
1978	– 31,786	9,058	10,001	943	[c]
1979	– 27,260	10,123	11,747	1,624	[c]
1980	– 27,340[r]	11,952	15,506	3,554	[c]
1981	– 30,051	13,134	17,634	4,500	[c]

Source: Bureau of the Census, "Highlights of U.S. Export and Import Trade," Report FT990 (Monthly); "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually); "U.S. Imports for Consumption and General Imports, TSUSA Commodity and Country of Origin," Report FT 246 (Annually).

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.

U.S. IMPORTS OF AEROSPACE PRODUCTS

Calendar Years 1977-1981
(Millions of Dollars)

	1977	1978	1979	1980	1981
TOTAL	$731.2	$943.1	$ 1,624.3	$ 3,553.6	$ 4,500.4
TOTAL AIRCRAFT	310.2	291.8	512.1	975.1	1,379.7
Civil Aircraft - TOTAL	258.0	284.5	508.6	969.1	1,336.2
Transports	100.1	58.1	199.8	285.5	195.5
General Aviation[a]	108.5	146.8	260.4	495.8	913.0
Helicopters	18.1	28.0	21.6	53.9	105.4
Other, Including Used	31.3	51.6	26.8	133.9	122.3
Military Aircraft	50.2	4.9	1.5	4.0	41.4
Gliders	1.8	2.1	1.6	1.5	1.6
Civil	NA	NA	NA	1.5	1.6
Military	NA	NA	NA	—	(*b*)
Balloons & Airships	0.2	0.3	0.4	0.5	0.5
Civil	NA	NA	NA	0.3	0.3
Military	NA	NA	NA	0.2	0.2
TOTAL AIRCRAFT ENGINES & PARTS	131.4	283.0	547.0	1,097.4	1,465.0
Piston, Civil	1.7	1.6	4.0	11.0	5.1
Pist. Engs. & Parts, Mil.				1.1	0.1
Piston Engine Parts, Civil				8.3	7.2
Turbine, Civil	129.7	281.4	324.2	720.3	1,040.6
Turbine, Military				27.5	7.6
Turbine Engine Parts, Civil	NA	NA	218.8	295.1	354.4
Turbine Engine Parts, Military	NA	NA		34.1	50.0
TOTAL OTHER	289.6	368.3	565.2	1,481.1	1,655.7
Aircraft Parts, Civil	NA	NA	NA	198.5	229.6
Spacecraft & Other Parts, Civil	289.1	368.2	564.5	679.1	714.2
Aircraft Parts, Military				121.4	426.8
Other Parts, Military				136.8	64.8
Aircraft, Engs., & Parts Previously Exported from U.S.	NA	NA	NA	345.2	220.0
Other	0.5	0.1	0.7	0.1	0.3

Source: Bureau of the Census, "U.S. Imports for Consumption and General Imports, TSUSA Commodity and Country of Origin," Report FT 246 (Annually).

Note: Import classifications have been revised as of 1980 data, with the total number of categories increased, and most former categories divided into military and civil items. Also effective, 1980, import data include two new commodity groupings: civil aircraft parts, and aerospace products previously exported from the U.S. Excluded from aerospace trade data as of 1980 are 'Kites and Parts Thereof'; for comparability of annual data, this category has been deducted from totals for previous years.

a All fixed-wing aircraft under 33,000 pounds.

b Less than $50,000

NA Not available.

U.S. IMPORTS OF COMPLETE AIRCRAFT
Calendar Years 1977-1981

	1977	1978	1979	1980	1981
TOTAL NUMBER OF AIRCRAFT	638	571	634	676	882
Civil Aircraft	303	362	393	580	733
Helicopters	55	74	91	177	213
Single-Engine	74	6	3	6	9
Multi-Engine Under 4400 lbs		47	5	6	2
Multi-Engine 4400-10,000 lbs		87	86	119	123
Multi-Engine 10,000-33,000 lbs	48	50	102	156	218
Multi-Engine Over 33,000 lbs	15	5	9	16	8
Used or Rebuilt	111	93	97	100	160
Military Aircraft	60	61	121	23	25
Gliders	275	148	120	73	124
Balloons & Airships	NA	NA	NA	NA	NA
TOTAL VALUE (Millions of Dollars)	$310.2	$291.8	$512.1	$975.1	$1,379.7
Civil Aircraft	258.0	284.5	508.6	969.1	1,336.2
Helicopters	18.1	28.0	21.6	53.9	105.4
Single-Engine	27.8	0.5	(a)	0.3	0.8
Multi-Engine Under 4400 lbs		2.8	0.4	1.2	0.1
Multi-Engine 4400-10,000 lbs		42.1	37.2	95.2	123.7
Multi-Engine 10,000-33,000 lbs	80.7	101.4	222.8	399.1	788.4
Multi-Engine Over 33,000 lbs	100.1	58.1	199.8	285.5	195.5
Used or Rebuilt	31.3	51.6	26.8	133.9	122.3
Military Aircraft	50.2	4.9	1.5	4.0	41.4
Gliders	1.8	2.1	1.6	1.5	1.6
Balloons & Airships	0.2	0.3	0.4	0.5	0.5

Source: Bureau of the Census, "U.S. Imports for Consumption and General Imports, TSUSA Commodity and Country of Origin," Report FT 246 (Annually).
(a) Less than $50,000.
NA Not Available.

EXPORTS OF U.S. AEROSPACE PRODUCTS

Calendar Years 1977-1981
(Millions of Dollars)

	1977	1978	1979	1980	1981
TOTAL	$7,581	$10,001	$11,747	$15,506	$17,634
TOTAL CIVIL	5,049	6,018	9,772	13,248[r]	13,312
Complete Aircraft—TOTAL	2,747	3,625	6,177	8,256	8,613
Transports	1,936	2,558	4,998	6,727	7,180
General Aviation[a]	389	496	650	739	790
Helicopters	105	156	207	299	346
Other, Including Used	317	415	322	491	297
Aircraft Engines—TOTAL	233	277	375	556	784
Jet & Gas Turbines	196	231	323	514	739
Piston	37	46	52	42	45
Aircraft & Eng. Parts Incl. Spares—TOTAL	2,069	2,116	3,220	4,436[r]	3,915
Aircraft Parts & Accessories	1,586	1,472	2,412	3,296[r]	2,960
Aircraft Engine Parts	483	644	808	1,140[r]	955
TOTAL MILITARY	2,532	3,983	1,975	2,258[r]	4,322
Complete Aircraft—TOTAL[b]	1,186	2,243	838	949	1,712
Fighters & Fighter Bombers	686	1,707	494	449	1,006
Transports	317	232	162	231	158
Helicopters	84	82	61	88	177
Other, Including Used	99	222	121	181	371
Aircraft Engines—TOTAL	71	61	67	63	83
Jet & Gas Turbines	64	59	61	58	78
Piston	7	2	6	5	5
Aircraft & Eng. Parts Incl. Spares—TOTAL	826	1,044	467	497[r]	1,971
Aircraft Parts & Accessories	685	912	326	369[r]	1,475
Aircraft Engine Parts	141	132	141	128[r]	496
Guided Missiles, Rockets, & Parts—TOTAL	449	635	603	749	556
Guided Missiles & Rockets	168	335	292	327	213
Missile & Rocket Parts	270	273	279	393	313
Missile & Rocket Engines	5	3	7	13	4
Missile & Rocket Engine Parts	6	24	25	16	26

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446(Annually).
a All fixed-wing aircraft under 33,000 pounds.
b Includes aircraft exported under Military Assistance Programs and Foreign Military Sales
r Revised.

EXPORT—IMPORT BANK
GROSS AUTHORIZATIONS OF CREDITS AND GUARANTEES

Fiscal Years 1970-1981
(Millions of Dollars)

Year	TOTAL Credits[a]	Credits in Support of Commercial Aircraft Exports			
		TOTAL[c]	Percent of TOTAL Credits	Commercial Jet Aircraft	Other[d]
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
1977	747	139.0	18.6	137.6	1.4
1978	2,927	195.2	6.7	189.5	5.7
1979	3,825	1,428.7	37.4	1,399.4	29.3
1980	4,087	1,710.7	41.8	1,692.6	17.5
1981	5,079	2,553.1	50.3	2,550.3	2.8

Year	TOTAL Guarantees[b]	Guarantees in Support of Commercial Aircraft Exports			
		TOTAL[c]	Percent of TOTAL Guarantees	Commercial Jet Aircraft	Other[d]
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
1977	1,021	319.6	31.3	294.0	25.6
1978	589	97.6	16.6	77.2	20.4
1979	908	261.9	28.8	239.3	22.6
1980	2,510	1,131.9	45.1	1,088.1	43.8
1981	1,506	553.9	36.8	533.4	20.5

Source: Export-Import Bank of the United States.

a "Credit" is a loan commitment for direct financing by the Export-Import Bank.

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

c Effective 1981, includes engines as well as complete aircraft.

d Includes business aircraft, general aviation aircraft, and related goods and services.

EXPORTS OF CIVIL AIRCRAFT

Calendar Years 1977-1981

	1977	1978	1979	1980	1981
TOTAL NUMBER OF AIRCRAFT	4,368	4,399	5,115	4,434	3,826
Helicopters, Under 2200 lbs.	233	243	294	335	268
Helicopters, Over 2200 lbs.	88	125	165	190	185
Single-Engine Aircraft	2,664	2,640	2,821	2,172	1,800
Multi-Engine Aircraft, Under 4400 lbs.	273	455	645	546	371
Multi-Engine Aircraft, 4400-10,000 lbs.	525	339	360	432	426
Multi-Engine Aircraft, 10,000-33,000 lbs.	7	37	52	28	20
Passenger Aircraft, Over 33,000 lbs.	101	99	172	215	236
Cargo Aircraft, Over 33,000 lbs.		3	13	8	7
Other Aircraft, Over 33,000 lbs.		9	15	14	12
Other Aircraft, Including Balloons, Gliders & Kites	NA	NA	NA	NA	NA
Used or Rebuilt Aircraft	477	449	578	494	501
TOTAL VALUE (Millions of Dollars)	$2,747	$3,625	$6,177	$8,256	$8,613
Helicopters, Under 2200 lbs.	38	42	61	82	71
Helicopters, Over 2200 lbs.	68	114	146	217	275
Single-Engine Aircraft	93	103	124	114	105
Multi-Engine Aircraft, Under 4400 lbs.	27	62	94	88	72
Multi-Engine Aircraft, 4400-10,000 lbs.	262	240	306	454	526
Multi-Engine Aircraft, 10,000-33,000 lbs.	6	91	126	83	87
Passenger Aircraft, Over 33,000 lbs.	1,936	2,111	4,128	5,511	6,087
Cargo Aircraft, Over 33,000 lbs.		142	322	480	363
Other Aircraft, Over 33,000 lbs.		305	548	736	730
Other Aircraft, Including Balloons, Gliders & Kites	4	27	11	5	62
Used or Rebuilt Aircraft	313	388	311	486	235

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually).
NA Not available.

EXPORTS OF MILITARY AIRCRAFT

Calendar Years 1977-1981

	1977	1978	1979	1980	1981
TOTAL NUMBER OF AIRCRAFT[a]	721	589	332	462	508
Fighters & Fighter Bombers	244	286	133	90	113
Transports	53	25	17	23	22
Helicopters.....	95	108	65	89	68
New Aircraft, NEC	288	110	91	220	156
Used or Rebuilt Aircraft.....	41	60	26	40	149
Airships, Balloons, Gliders, etc..	—	NA	NA	NA	NA
TOTAL VALUE (Millions of Dollars)[a]	$1,186	$2,243	$ 838	$949	$ 1,712
Fighters & Fighter Bombers	686	1,707	494	449	1,006
Transports	317	232	162	231	158
Helicopters.....	84	82	61	88	177
New Aircraft, NEC	20	187	96	148	306
Used or Rebuilt Aircraft.....	79	11	5	2	15
Airships, Balloons, Gliders, etc..	—	24	20	31	50

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually).
NEC Not elsewhere classified.
NA Not available.
a Includes aircraft exported under Military Assistance Programs and Foreign Military Sales.

EXPORTS OF AIRCRAFT ENGINES

Calendar Years 1979-1981
(Millions of Dollars)

	1979		1980		1981	
	Number	Value	Number	Value	Number	Value
TOTAL	5,421	$442	4,970	$616	5,014	$867
Turbine Engines-New	862	265	1,012	384	1,259	580
Civil	579	211	840	333	1,085	515
Military	283	54	172	51	174	65
Turbine Engines-Used	463	119	635	188	722	237
Civil	417	112	553	181	644	224
Military	46	7	82	7	78	13
Piston Engines	4,096	58	3,323	47	3,033	50
Civil, New, Under 550 HP	2,141	17	1,677	17	1,302	14
Civil, New, Over 500 HP	205	19	171	8	171	10
Civil, Used	1,575	16	1,365	17	1,308	21
Military	175	6	110	5	252	5

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually).

IMPORTS OF TURBINE AIRCRAFT ENGINES

Calendar Years 1979-1981
(Millions of Dollars)

	1979		1980		1981	
	Number	Value	Number	Value	Number	Value
Turbine Engines	5,067	$324	2,645	$748	3,404	$1,049
Civil	NA	NA	2,549	720	3,326	1,041
Military	NA	NA	96	28	78	8

Source: Bureau of the Census, "U.S. Imports for Consumption and General Imports, TSUSA Commodity and Country of Origin," Report FT246 (Annually).

NA Not available.

EXPORTS OF CIVIL HELICOPTERS

Calendar Years 1977-1981

Region of Destination	1977	1978	1979	1980	1981
TOTAL NUMBER EXPORTED . .	321	368	459	525	453
Canada & Greenland	66	57	85	91	78
Latin America & Caribbean . .	80	78	89	143	140
Europe	63	86	103	118	71
Middle East	13	10	11	21	21
Asia	43	99	80	57	70
Oceania	43	31	66	72	32
Africa	13	7	25	23	41
TOTAL VALUE (Millions of Dollars)	$105.5	$155.7	$ 206.8	$ 298.7	$ 346.4
Canada & Greenland	15.9	17.1	29.4	42.9	40.6
Latin America & Caribbean . .	26.9	29.7	42.4	78.4	89.5
Europe	34.3	50.5	51.6	79.4	91.8
Middle East	4.5	6.2	11.4	24.9	27.2
Asia	15.7	44.4	45.6	51.3	65.3
Oceania	5.8	5.4	21.1	16.3	19.5
Africa	2.4	2.4	5.3	5.5	12.5

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually).

IMPORTS OF CIVIL HELICOPTERS

Calendar Years 1977-1981

Country of Origin	1977	1978	1979	1980	1981
TOTAL NUMBER IMPORTED	55	74	90	177	213
France	42	66	81	167	193
Germany	11	-	5	9	12
Italy	2	7	4	1	8
Other Country	-	1	-	-	-
TOTAL VALUE (Millions of Dollars)	$ 18.1	$ 28.0	$ 21.6	$ 53.9	$ 105.4
France	13.0	22.8	17.3	48.4	92.4
Germany	4.0	-	1.3	4.4	6.9
Italy	1.1	4.9	3.0	1.1	6.1
Other Country	-	0.3	-	-	-

Source: Bureau of the Census, "U.S. Imports for Consumption and General Imports, TSUSA Commodity and Country of Origin," Report FT 246 (Annually).
NA Not available.

EXPORTS OF GENERAL AVIATION AIRCRAFT[a]

Calendar Years 1977-1981

Region of Destination	1977	1978	1979	1980	1981
TOTAL NUMBER EXPORTED ..	3,469	3,471	3,878	3,178	2,617
Canada & Greenland	702	461	478	414	336
Latin America & Caribbean ..	1,336	1,195	1,557	1,452	1,220
Europe	592	882	988	760	442
Middle East	17	17	38	19	23
Asia	70	84	120	55	57
Oceania	561	666	537	253	301
Africa	179	166	160	225	238
Country Not Stated	12	-	-	-	-
TOTAL VALUE (Millions of Dollars)	$ 388.4	$ 495.6	$ 650.5	$ 739.5	$ 789.5
Canada & Greenland	39.4	41.2	55.7	49.9	57.7
Latin America & Caribbean ..	135.6	155.0	221.1	239.5	279.6
Europe	115.3	178.2	219.3	235.0	219.7
Middle East	26.0	14.0	27.4	65.1	30.2
Asia	8.6	12.7	31.5	36.9	39.1
Oceania	31.1	53.0	60.7	52.6	75.8
Africa	32.2	41.5	34.8	60.5	87.4
Country Not Stated	0.2	-	-	-	-

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually).
a All fixed-wing aircraft under 33,000 pounds.

IMPORTS OF GENERAL AVIATION AIRCRAFT

Calendar Years 1977-1981

Country of Origin	1977	1978	1979	1980	1981
TOTAL NUMBER IMPORTED ..	122	190	196	287	352
Brazil	-	-	5	20	37
Canada	7	6	11	38	51
France	40	78	35	48	59
Israel	14	14	26	33	42
Japan	28	62	69	56	70
United Kingdom	25	24	40	62	67
Other	8	6	10	30	26
TOTAL VALUE (Millions of Dollars)	$108.5	$146.8	$ 260.4	$ 495.8	$ 913.0
Brazil	-	-	5.3	21.7	54.0
Canada	5.5	10.7	20.5	88.2	243.0
France	45.2	50.6	75.3	141.8	248.2
Israel	25.6	27.4	55.6	79.2	123.8
Japan	8.6	14.6	19.9	21.7	34.3
United Kingdom	23.0	40.6	74.2	107.1	183.7
Other	0.6	2.9	9.6	36.1	26.0

Source: Bureau of the Census, "U.S. Imports for Consumption and General Imports, TSUSA Commodity and Country of Origin," Report FT 246 (Annually).

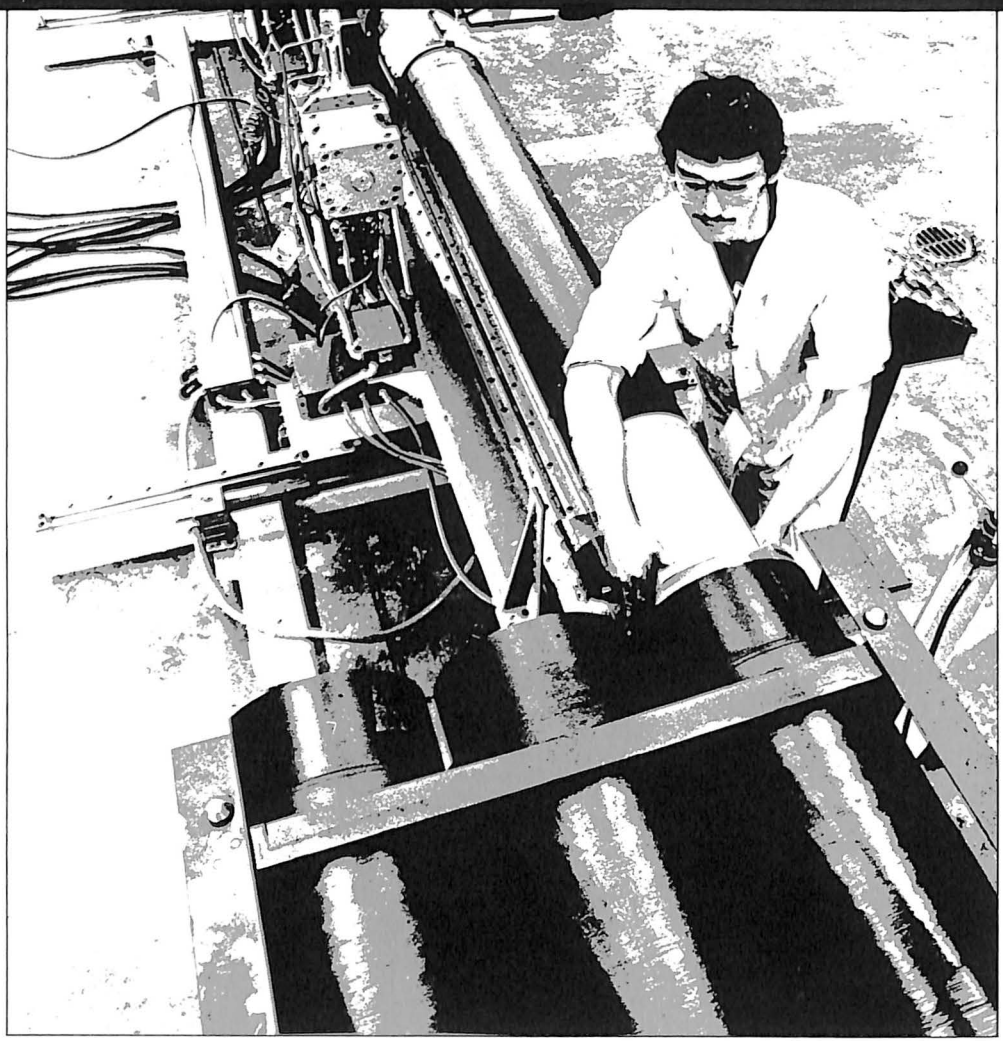
EXPORTS OF COMMERCIAL TRANSPORT AIRCRAFT

33,000 Pounds and Over Airframe Weight
Calendar Years 1977-1981

	1977	1978	1979	1980	1981
TOTAL NUMBER EXPORTED	101	111	200	237	255
Canada	—	4	20	22	25
Latin America & Caribbean	7	14	19	31	35
Europe	32	36	68	109	108
Middle East	20	17	17	9	21
Asia	22	24	60	53	34
Oceania	4	6	6	7	19
Africa	16	10	10	6	13
TOTAL VALUE (Millions of Dollars)	$1,936	$2,558	$4,998	$6,727	$7,180
Canada	—	132	373	299	584
Latin America & Caribbean	59	187	423	640	1,027
Europe	571	906	1,601	2,670	2,528
Middle East	467	541	582	236	841
Asia	468	478	1,722	2,467	1,405
Oceania	155	118	149	179	559
Africa	216	196	148	236	236

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity by Country," Report FT446 (Annually).

Employment



At year-end 1981, aerospace industry employment dropped below the 11-year peak recorded at the end of the previous year. But **average** employment for 1981 topped the 1980 average.

This unusual situation stemmed largely from a reduction in the workforce engaged in commercial transport manufacture, reflecting fewer jetliner orders due to the depressed financial status of the world airline industry and increasing competition from abroad for such airline orders as were available. There was a resulting drop by year-end of some 50,000 workers in the aircraft manufacturing segment of the industry, only partially offset by gains in other areas of activity. At the end of 1981, the total aerospace labor force numbered 1,203,000, down 1.2 percent from the previous year's 1,218,000.

Computed on the annual average basis, overall employment in 1981 was 1,207,000, which compares with 1,187,000 in 1980. Thus, there was continuance of the annual average

upward trend that began in 1978, but the rate of gain was sharply lower than in prior years—less than two percent in 1981, where increases of nine, 14, and seven percent were recorded respectively, in 1978-80. In terms of numbers of employees, the largest increase was in missiles and space activity—9,000 workers. There were moderate increases in the communications equipment and other products and services categories and, despite the decline in commercial aircraft production, the total aircraft manufacturing labor force grew by 2,000 workers.

Industry-wide, the number of production workers in the aerospace industry declined 5.6 percent, from 612,000 at the end of 1980 to 578,000 at year-end 1981. Production workers constituted just under half of the total labor force.

An indication of heightened research and development activity was a sharp rise in the number of scientists and engineers working on aerospace R&D programs; the National Science Foundation reports that their number increased more than 9,000 to a total of 96,100, the highest figure since 1969. Aerospace scientists and engineers represented 20.4 percent of all U.S. scientific/engineering personnel in R&D work.

The geographical pattern of aerospace employment remained constant in 1981. With 42 percent of the total, the Pacific region maintained its traditional dominance. New England (14.1 percent) ranked second, followed by the West North Central (10 percent) and Middle Atlantic (9.5 percent) regions.

The outlook for aerospace employment shows a turnaround from the 1981 decline. A survey conducted by Aerospace Industries Association indicates that the total labor force will increase to 1,220,000 by the end of 1982 and continue the upward trend to 1,269,000 employees by year-end 1983. Among other findings of the survey:

- Employment in the aircraft manufacturing sector will decline further in 1982, but the loss is expected to be less than one percent. For 1983, the survey projects a 3.8 percent increase in aircraft manufacturing employment as defense programs gain momentum and improved airline stability sparks new commercial transport orders. Aircraft employment should fall to 636,000 by the end of 1982—down 5,000—but should climb to 660,000 by year-end 1983.
- The growth in missiles/space employment experienced since 1977 is expected to continue in 1982/83 with increases of approximately two and four percent. Employment in missiles and space activity—262,000 at the end of 1981—should increase to 267,000 in 1982 and 278,000 by the end of 1983.
- Employment in the "other products" category—aerospace activities other than aircraft manufacturing or missile/space fabrication—is projected to increase 5.7 percent (to 317,000) in 1982 and a further 4.4 percent (to 331,000) in 1983.
- Helicopter manufacturing employment—which declined six percent in 1981 to 28,000—is expected to rebound. A total increase of nine percent is projected for 1982/83; year-end estimates are 28,600 for 1982 and 30,400 for 1983.

GEOGRAPHIC DISTRIBUTION OF EMPLOYMENT OF MAJOR AEROSPACE MANUFACTURERS BY PRODUCT GROUP

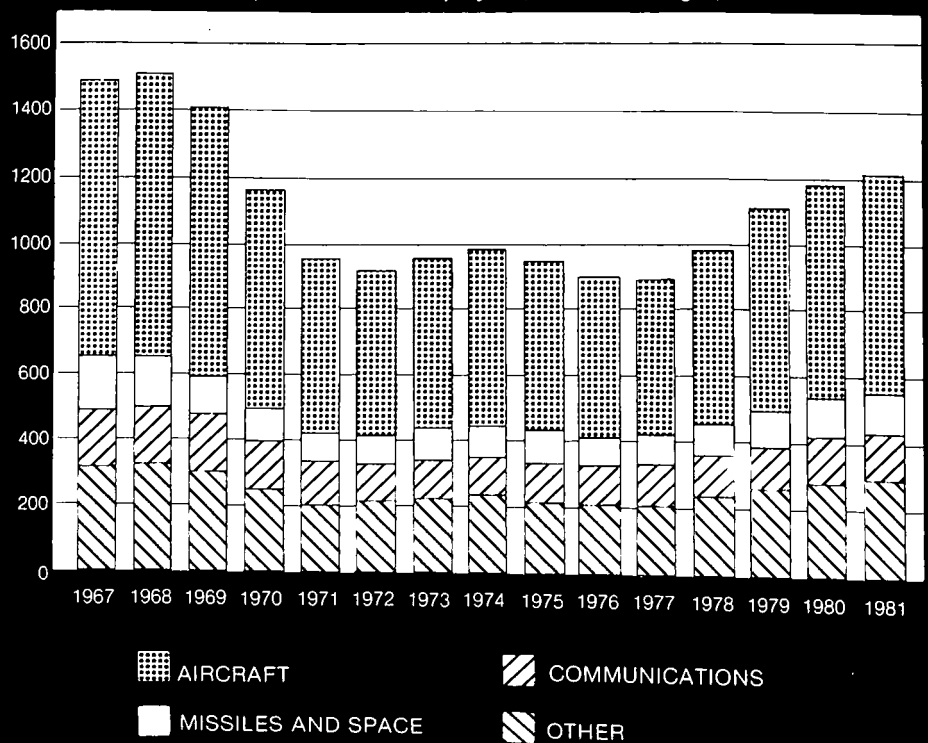
as of December 1981

Region	Percentage Distribution					
	Aircraft		Missiles	Space	Other	
	Civil	Military			Aerospace	Non-Aerospace
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
New England	18.6	12.2	20.3	11.4	15.6	6.8
Middle Atlantic	5.0	17.8	3.3		9.2	9.4
East North Central	12.3	3.4	1.0	5.2	6.2	0.8
West North Central	8.3	19.0	9.3		2.0	10.9
South Atlantic	3.4	7.9	8.6	4.0	14.9	2.3
South Central	5.4	11.6	1.0	4.6	3.9	7.7
Mountain	5.7	1.9	15.3	12.5	48.2	62.1
Pacific	41.3	26.2	41.2	62.3		

Source: Aerospace Industries Association, company reports.

AEROSPACE EMPLOYMENT BY PRODUCT GROUP

(Thousands of Employees; Annual Averages)



Source: AIA, based on data from Bureau of Labor Statistics.

AEROSPACE EMPLOYMENT[a]

Calendar Years 1967-1981
(Annual Average, Thousands of Employees)

Year	TOTAL	Aircraft	Missiles & Space	Communi-cations Equipment	Other
TOTAL EMPLOYMENT					
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	912	495	93	113	211
1973	956	525	93	116	222
1974	982	539	94	121	228
1975	941	514	93	116	218
1976	896	487	86	115	208
1977	893	482	83	121	207
1978	977	527	93	129	228
1979[r]	1,109	611	102	139	257
1980[r]	1,187	655	111	146	275
1981	1,207	657	120	150	280
PRODUCTION WORKERS					
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	455	266	28	55	106
1973	482	284	29	57	112
1974	494	292	29	59	114
1975	461	271	29	54	107
1976	433	251	28	54	100
1977	429	247	26	56	100
1978	476	275	29	61	111
1979[r]	562	332	33	67	130
1980[r]	598	356	35	69	138
1981	593	348	36	71	138

Source: Aerospace Industries Association, derived from "Employment and Earnings" (Monthly), Bureau of Labor Statistics.

a See Glossary for detailed explanation of "Aerospace Employment."

r Revised.

AEROSPACE EMPLOYMENT
BY OCCUPATIONAL CLASSIFICATION AND PRODUCT GROUP
As of December 1977-1981
(Thousands of Employees)

Year	TOTAL	Production Workers	Scientists & Engineers	Technicians	All Others
TOTAL AEROSPACE					
1977	894	410	173	59	252
1978	1,032	519	170	64	279
1979	1,152	592	177	69	314
1980	1,218	612	196	78	332
1981	1,203	578	194	84	347
AIRCRAFT AND PARTS					
1977	482	263	78	23	118
1978	555	330	71	26	128
1979	654	397	76	28	153
1980	691	414	82	35	159
1981	641	377	77	38	149
MISSILES AND SPACE VEHICLES AND PARTS					
1977	191	65	61	14	61
1978	214	79	51	15	69
1979	220	82	51	15	72
1980	233	84	56	16	77
1981	262	96	59	19	88
OTHER RELATED PRODUCTS AND SERVICES					
1977	221	82	44	22	73
1978	263	110	48	23	82
1979	278	113	50	26	89
1980	294	114	57	27	96
1981	300	105	58	27	110

Source: Aerospace Industries Association, based on company reports and data from the Bureau of Labor Statistics.

GEOGRAPHIC DISTRIBUTION OF EMPLOYMENT OF MAJOR AEROSPACE MANUFACTURERS BY OCCUPATIONAL CLASSIFICATION

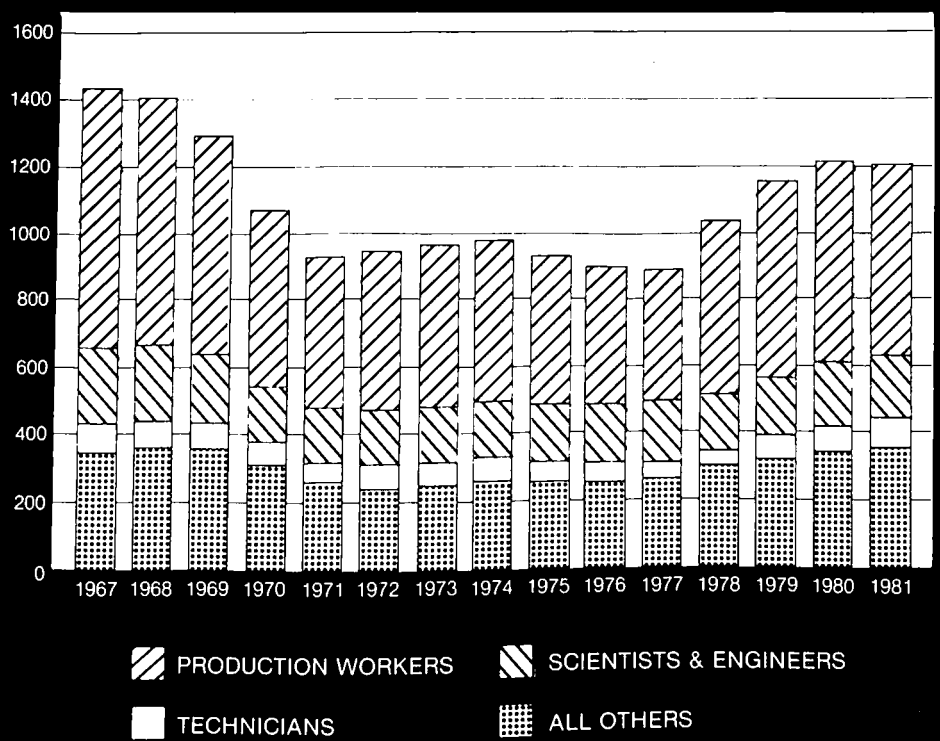
as of December 1981

Region	Percentage Distribution			
	TOTAL	Production Workers	Scientists & Engineers	Technicians
TOTAL	100.0%	100.0%	100.0%	100.0%
New England	14.1	18.2	10.8	10.9
Middle Atlantic	9.5	7.8	10.6	6.7
East North Central	5.6	6.8	3.9	3.9
West North Central	10.0	11.0	9.2	11.1
South Atlantic	7.0	5.7	7.5	7.2
South Central	6.2	7.5	4.5	4.3
Mountain	5.6	4.6	6.5	6.3
Pacific	42.0	38.4	47.0	49.6

Source: Aerospace Industries Association, company reports.

AEROSPACE EMPLOYMENT BY OCCUPATIONAL TYPE

(Thousands of Employees; End of Year)



Source: AIA

LABOR TURNOVER RATES IN THE AEROSPACE INDUSTRY

Calendar Years 1967-1981
(Rates per 100 Employees per Year)

Year	Complete Missiles and Spacecraft	Aircraft			
		TOTAL	Airframes	Engines & Engine Parts	Other Parts & Equipment
ACCESSIONS					
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	20.4	24.0	21.6	21.6	37.2
1973	20.4	26.4	22.8	24.0	43.2
1974	22.8	25.2	24.0	18.0	39.6
1975	15.6	16.8	18.0	10.8	20.4
1976	14.4	18.0	16.8	13.2	25.2
1977	19.2	25.2	22.8	20.4	36.0
1978	21.6	31.2	30.0	24.0	42.0
1979	28.8	32.4	28.8	25.2	50.4
1980	26.4	22.8	20.4	18.0	36.0
1981	21.6	16.8	14.4	13.2	27.6
SEPARATIONS					
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	32.3	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	19.2	24.0	21.6	18.0	39.6
1973	24.0	25.2	22.8	21.6	37.2
1974	22.8	22.8	20.4	19.2	34.8
1975	18.0	26.4	26.4	22.8	32.4
1976	18.0	21.6	20.4	15.6	31.2
1977	18.0	21.6	21.6	15.6	27.6
1978	18.0	18.0	15.6	14.4	30.0
1979	18.0	20.4	16.8	15.6	34.8
1980	15.6	19.2	15.6	15.6	32.4
1981	14.4	21.6	18.0	20.4	30.0

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

WORK STOPPAGES
AIRCRAFT AND PARTS INDUSTRY
Calendar Years 1967-1981

Year	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
1967	22	28,800	160,800
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	2,800	148,100
1973	13	4,500	99,100
1974	27	16,800	370,000
1975	20	22,800	1,245,600
1976	21	13,000	330,500
1977	21	46,700	1,832,200
1978	17	13,700	741,200
1979	12	6,600	103,400
1980	17	4,400	92,900
1981	12	6,100	188,900

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

OCCUPATIONAL INJURY AND ILLNESS INCIDENCE RATES[a]
AEROSPACE AND ALL MANUFACTURING INDUSTRIES
Calendar Years 1972-1980

Year	All Manufacturing	Aircraft & Parts	Guided Missiles, Space Vehicles & Parts
1972	15.6	8.0	4.7
1973	15.3	7.4	4.5
1974	14.6	7.2	4.2
1975	12.5	5.9	3.3
1976	13.2	6.2	3.5
1977	13.1	6.0	3.0
1978	13.2	6.5	4.2
1979	13.3	7.1	3.1
1980	12.2	6.8	3.1

Source: Department of Labor, Bureau of Labor Statistics, "Occupational Injuries and Illnesses" (Annually).
a Defined as the number of injuries and illnesses per 100 man-years of work.
NA Not Available.

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY[a]

Calendar Years 1967-1981
(Annual Average, Thousands of Employees)

Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
TOTAL EMPLOYMENT				
1967	833.6	487.8	221.0	144.4
1968	852.0	468.2	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	494.9	287.2	124.0	83.6
1973	524.9	300.5	132.6	91.8
1974	539.4	307.6	134.6	97.1
1975	514.0	292.8	126.3	94.9
1976	487.1	281.1	119.7	86.3
1977	481.7	270.4	120.9	90.4
1978	527.2	288.3	133.5	105.5
1979[r]	610.8	333.2	151.6	126.1
1980[r]	654.9	354.1	161.3	139.6
1981	656.7	360.6	158.1	138.1
PRODUCTION WORKERS				
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	266.2	145.1	68.6	52.5
1973	284.2	151.5	74.2	58.5
1974	291.9	154.4	75.2	62.3
1975	271.1	140.9	70.5	59.7
1976	250.7	132.2	65.6	53.0
1977	246.8	124.4	66.6	55.8[r]
1978	275.4	133.9	75.3	66.2[r]
1979[r]	332.1	165.9	86.4	79.8
1980[r]	355.8	176.0	92.0	87.8
1981	348.2	175.0	89.9	83.3

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly).
a See Glossary for detailed explanation of "Aerospace Employment."

EARNINGS IN AIRCRAFT AND PARTS PLANTS

Production Workers Only
(Includes Overtime Premiums)
Calendar Years 1967-1981

Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
AVERAGE HOURLY EARNINGS				
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	4.32[r]	4.32[r]	4.38	4.16
1972	4.62	4.65	4.72	4.42
1973	4.99	5.09	5.04	4.70
1974	5.42[r]	5.58[r]	5.41	5.05
1975	6.00	6.21[r]	6.04	5.47[r]
1976	6.44[r]	6.63[r]	6.46	5.95
1977	6.92	7.07	7.05	6.44
1978	7.54	7.70	7.80	6.93
1979	8.26	8.50	8.53	7.48[r]
1980	9.28[r]	9.67[r]	9.42	8.39[r]
1981	10.31	10.74	10.41	9.34
AVERAGE WEEKLY EARNINGS				
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	167.69[r]	169.30[r]	166.05	166.78
1971	172.37[r]	171.50[r]	173.53	170.98
1972	184.80[r]	180.89	193.05[r]	186.52
1973	202.10	199.53[r]	209.66[r]	199.75[r]
1974	220.59[r]	222.08[r]	221.81	213.62
1975	247.80	255.85[r]	247.04	228.65[r]
1976	263.40[r]	273.16[r]	259.69	245.74
1977	289.95	296.23	291.87	273.70
1978	318.19	324.17	325.26	298.68
1979	351.05	359.55	360.82	322.39[r]
1980	389.76[r]	404.21[r]	393.76[r]	357.41[r]
1981	425.80	443.56	421.61	396.02

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

EMPLOYMENT OF SCIENTISTS AND ENGINEERS[a] FOR RESEARCH AND DEVELOPMENT ALL INDUSTRIES AND AEROSPACE INDUSTRY

as of January 1972-1981

Year	All Industries[b]	Aerospace[c]	Aerospace as a Percent of All Industries
1972	350,200	70,800	20.2%
1973	357,700	72,100	20.2
1974	360,000	70,600	19.6
1975	363,300	67,500	18.6
1976	364,400	66,900	18.4
1977	382,800	72,000	18.8
1978	403,700	82,000	20.3
1979	423,200[r]	86,500	20.4
1980	446,600[r]	86,900[r]	19.5
1981	470,200	96,100	20.4

Source: National Science Foundation.

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

b All manufacturing industries and those non-manufacturing industries known to conduct or finance research and development.

c SIC codes 372 and 376.

r Revised.

COST PER R&D SCIENTIST OR ENGINEER[a] ALL INDUSTRIES AND AEROSPACE INDUSTRY

1971-1980

Year	All Industries[b]	Aerospace[c]
1971	$ 51,100	$ 65,500
1972	55,300	69,200
1973	59,200	70,800
1974	63,300	76,400
1975	66,500	85,100
1976	72,200	[illegible],300
1977	76,100	92,300
1978	80,700	91,300
1979	87,700	95,700
1980	95,700	105,300

Source: National Science Foundation.

a The number of R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of each industry.

b All manufacturing industries and those non-manufacturing industries known to conduct or finance research and development.

c SIC codes 372 and 376.

EMPLOYMENT IN NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PROGRAMS

End of Fiscal Years 1960-1983

Year	TOTAL	NASA Employees	Contractor Employees[E]
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
1977	124,136	23,636	100,500
1978	124,637	23,237	101,400
1979	131,931	22,831	109,100
1980	135,613	22,613	113,000
1981	133,473	21,873	111,600
1982[E]	144,852	21,652	108,200
1983[E]	128,219	21,219	107,000

Source: NASA Briefing on the Budget of the United States (Annually).
E Estimate.
r Revised.

Finance

The aerospace industry recorded a 1981 net profit after taxes of almost $2.9 billion. Both earnings and sales figures represented all-time highs, but the rate of profit, measured as as a percentage of sales, was the same as in the previous year—4.3 percent—and well below the five percent peak of 1979.

The aerospace profit rate edged closer to, but remained below, the average for all U.S. manufacturing corporations, which was 4.7 percent in 1981. Measured as a percentage of assets, the aerospace profit amounted to five percent and as a percentage of equity it was 15.6 percent; the comparable averages for all manufacturing industries were 6.7 percent and 13.6 percent.

The figures reflect a relatively strong financial position for the aerospace industry, which has in recent years achieved profit rates considerably better than traditional experience. Among major factors involved are the industry's continuing efforts to reduce overhead costs and higher levels of commercial sales, which usually generate

greater earnings than do government contracts. The 4.3 percent profit-to-sales figure compares with 3.2 percent for the decade of the seventies and only 2.4 percent for the first half of that decade.

A factor in holding down profits is the necessity for large-scale financing of new plant and equipment at a time of high interest rates on borrowings. Aerospace plant and equipment expenditures reached an all-time high of more than $7 billion in 1980, but dropped to $6.4 billion in 1981; this was largely due to reduced need for investment as production facilities for the new generation of commercial transport aircraft neared completion. New plant and equipment requirements generated by the planned defense production buildup are expected to increase outlays in 1982 to a record $7.3 billion.

The aerospace balance sheet for 1981 showed increases in total assets—up $6.5 billion to $58.9 billion—and in net worth—up slightly less than $2 billion to $18.9 billion. Net working capital increased from $7.3 billion at the end of 1980 to $8.8 billion at year-end 1981.

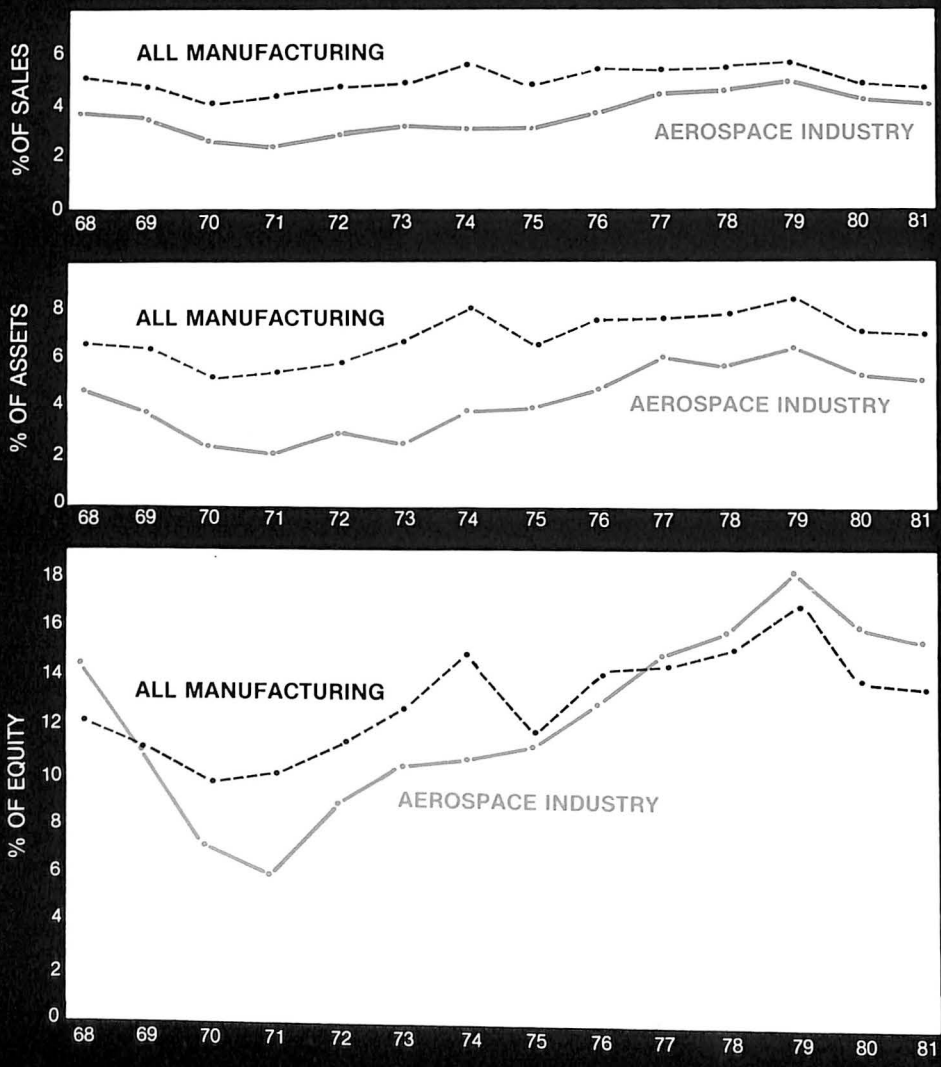
In terms of contract dollar value, McDonnell Douglas Corporation headed the list of companies awarded Department of Defense contracts in Fiscal Year 1981 with $4.4 billion. Other contractors in the top 10 included United Technologies Corporation ($3.8 billion); General Dynamics Corporation ($3.4 billion); General Electric Company ($3 billion); The Boeing Company ($2.7 billion); Lockheed Corporation ($2.7 billion); Hughes Aircraft Company ($2.6 billion); Raytheon Company ($1.8 billion); Grumman Corporation ($1.7 billion); and Chrysler Corporation ($1.4 billion). With the exception of Chrysler, all were in the top 10 in the preceding year.

The list of leading NASA contractors was headed by Rockwell International Corporation ($1.5 billion), the leader every year during the period of Space Shuttle development and production. Rounding out the top 10 were Martin Marietta Corporation, McDonnell Douglas Corporation, Computer Sciences Corporation, Thiokol Corporation, General Electric Company, Bendix Corporation, IBM Corporation, Boeing Services International and United Technologies Corporation.

A geographical breakdown of FY 1981 contracts for defense hard goods shows that the New England area led in production of aircraft-related hardware with 22.1 percent of the total dollar value. The West Central Area placed second with 18.7 percent and the Middle Atlantic region was third at 14.9 percent.

In contracts for missile and space systems, the Pacific area led by a wide margin with 47.1 percent, followed by New England (14.9 percent) and the Mountain region (10.5 percent). Pacific contractors also led in awards for electronics and communication equipment with 28.6 percent of the total; the South Atlantic area was second (19 percent) and the Middle Atlantic third (17.5 percent).

NET PROFIT AFTER TAXES



Source: Federal Trade Commission.

NET PROFIT AFTER TAXES AS A PERCENT OF SALES, ASSETS, AND EQUITY FOR ALL MANUFACTURING CORPORATIONS AND THE AEROSPACE INDUSTRY

Calendar Years 1968-1981

AS A PERCENT OF SALES

Year	All Manufacturing Corporations	Non-Durable Goods	Durable Goods	Aerospace[a] Industry
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	4.6	5.1	4.1	2.9
1976	5.4	5.5	5.2	3.4
1977	5.3	5.3	5.3	4.2
1978	5.4	5.4	5.5	4.4
1979	5.7	6.1	5.2	5.0
1980[r]	4.8	5.6	4.0	4.3
1981	4.7	5.2	4.2	4.3

AS A PERCENT OF ASSETS[b] AND EQUITY[b]

Year	All Manufacturing Corporations		Aerospace Industry[a]	
	Percent of Assets	Percent of Equity	Percent of Assets	Percent of Equity
1968	6.6%	12.1%	4.4%	14.2%
1969	6.1	11.5	3.5	10.6
1970	4.9	9.3	2.2	6.8
1971	5.1	9.7	2.0	5.8
1972	5.5	11.1	2.7	8.6
1973	6.5	12.8	2.4	10.3
1974	8.0	14.9	3.7	10.4
1975	6.2	11.6	3.8	11.0
1976	7.5	14.0	4.7	12.8
1977	7.6	14.2	5.7	14.9
1978	7.8	15.0	5.5	15.7
1979	8.4	16.5	6.3	18.4
1980[r]	6.9	13.9	5.2	16.0
1981	6.7	13.6	5.0	15.6

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

a Based on a sample of corporate entities classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missles, space vehicles, and parts.

b Average of four quarters.

r Revised.

INCOME ACCOUNTS
AEROSPACE COMPANIES
Calendar Years 1977-1981
(Millions of Dollars)

	1977	1978	1979	1980[r]	1981
Net Sales	$34,307	$41,689	$51,801	$60,638	$67,341
Income from Operations	2,338	3,023	3,606	3,659	3,735
Total Income before Income Taxes	2,296	2,726	3,711	3,647	4,518
Provision for Federal Income Taxes	1,003	1,154	1,489	1,341	1,641
As A Percent of Total Income	43.7%	42.3%	40.1%	36.8%	36.3%
Net Profit after Taxes	1,427	1,816	2,614	2,588	2,877
As a Percent of Net Sales	4.2%	4.4%	5.0%	4.3%	4.3%
Net Profit Retained in Business	1,012	1,255	1,897	1,790	1,985

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

NOTE: Based on sample of corporate entities classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, and parts.

r Revised

BALANCE SHEET OF AEROSPACE COMPANIES

December 31, 1977-1981
(Millions of Dollars)

	1977	1978	1979	1980	1981
Assets:					
Current Assets					
Cash[a]	$ 2,138	$ 2,696	$ 3,001	$ 562	$ 1,043
U.S. Government Securities	31	119	79	} 2,250	} 2,777
Other Securities/Com'l Paper[a]	1,097	1,077	564		
Total Cash and U.S. Government Securities	$ 3,267	$ 3,894	$ 3,645	$ 2,812	$ 3,820
Receivables (Total)	3,564	4,475	5,237	5,991	5,932
Inventories (Gross)	10,568	15,968	20,491	26,497	29,966
Other Current Assets	677	840	844	834	870
Total Current Assets	$18,075	$25,195	$30,217	$36,135	$40,588
Net Plant, Property & Equipment	4,320	5,639	7,261	9,368	10,909
Other Non-Current Assets	3,705	5,144	7,041	6,935	7,400
Total Assets	$26,100	$35,978	$44,518	$52,437	$58,896
Liabilities:					
Current Liabilities					
Short Term Loans	$ 279	$ 171	$ 698	$ 1,198	$ 1,701
Advances by U.S. Gov't.	1,886	5,400	6,554	(b)	(b)
Trade Accts. & Notes Payable	2,757	3,296	4,266	5,095	5,193
Income Taxes Accrued	1,779	2,088	2,742	2,769	2,521
Installments Due on Long Term Debts	307	249	272	178	279
Other Current Liabilities	4,612	7,940	9,342	19,589	22,072
Total Current Liabilities	$11,621	$19,144	$23,873	$28,830	$31,767
Long Term Debt	4,117	3,637	3,975	4,525	5,347
Other Non-Current Liabilities	496	1,016	1,356	2,123	2,923
Total Liabilities	$16,233	$23,798	$29,204	$35,478	$40,036
Stockholders' Equity:					
Capital Stock	$ 3,452	$ 3,864	$ 5,013	$ 5,072	$ 5,622
Retained Earnings	6,415	8,315	10,301	11,888	13,239
Total Net Worth	$ 9,866	$12,180	$15,315	$16,959	$18,860
Total Liabilities & Stockholders' Equity	$26,100	$35,978	$44,518	$52,437	$58,896
Net Working Capital	$ 6,454	$ 6,051	$ 6,344	$ 7,304	$ 8,822

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing, Mining and Trade Corps."
NOTE: Based on sample of corporate entities classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles and parts.
a Effective 1980, deposits outside U.S. included in "Other Securities & Commercial Paper;" they previously were included in "Cash" (on hand and in banks).
b Included in "Other Current Liabilities."
r Revised.

NEW PLANT AND EQUIPMENT EXPENDITURES

Calendar Years 1960-1982
(Billions of Dollars)

Year	Total Nonfarm Business	All Manufacturing Industries	Durable Goods	Aerospace	
				Current Dollars	Constant Dollars 1972 = 100
1960	$ 48.63	$ 16.36	$ 8.28	$ 0.34	$ 0.49
1961	47.82	15.53	7.43	0.30	0.43
1962	51.28	16.03	7.81	0.40	0.57
1963	53.25	17.27	8.64	0.44	0.61
1964	61.66	21.23	10.98	0.41	0.56
1965	70.43	25.41	13.49	0.53	0.71
1966	82.22	31.37	17.23	1.17	1.52
1967	83.42	32.25	17.83	1.25	1.58
1968	88.45	32.34	17.93	1.23	1.49
1969	99.52	36.27	19.97	1.29	1.49
1970	105.61	36.99	19.80	0.88	0.96
1971	108.53	33.60	16.78	0.63	0.66
1972	120.25	35.42	18.22	0.68	0.68
1973	137.70	42.37	22.75	0.87	0.82
1974	156.98	53.21	27.44	1.51	1.31
1975	157.71	54.92	26.33	1.68	1.34
1976	171.45	59.95	28.47	1.69	1.28
1977	198.08	69.22	34.04	2.01	1.44
1978	231.24	79.72	40.43	3.22	2.15
1979	270.46	98.68	51.07	5.27	3.24
1980	295.63	115.81	58.91	7.03	3.96
1981[r]	321.49	126.79	61.84	6.43	3.32
1982[E]	345.11	136.81	67.24	7.25	3.47

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Quarterly Report. Aerospace constant dollars based on GNP deflator series of "Economic Report of the President" and "The Budget of the United States Government" (Annually).

NOTE: A comprehensive revision of new plant and equipment expenditure data for 1947-1977 was completed by the BEA in 1980, with results showing P&E expenditures to be substantially higher and growing at a faster rate than the previously published data. The revision also expanded coverage from "All Industries" to "Total Nonfarm Business" with the inclusion of four service industries.

r Revised.

E Estimate.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MAJOR CONTRACTORS

Fiscal Years 1977-1981
By rank according to net value of NASA prime contracts awarded during last fiscal year
(Millions of Dollars)

Company	1977	1978	1979	1980	1981
TOTAL PROCUREMENTS	$3,532	$3,660	$4,212	$4,843	$5,408
Awards to Business Firms	2,838	2,954	3,417	3,868	4,273
Percent of TOTAL PROCUREMENTS	80%	81%	81%	80%	79%
Rockwell International Corp.	1,011	890	1,072	1,273	1,471
Martin Marietta Corp.	119	145	178	233	261
McDonnell Douglas Corp.	139	140	114	160	198
Computer Sciences Corp.	41	66	93	112	129
Thiokol Corp.	62	68	78	79	105
General Electric Co.	69	69	121	114	104
Bendix Corp.	91	95	100	97	103
IBM Corp.	66	73	93	84	95
Boeing Services International	16	43	58	59	81
United Technologies Corp.	34	51	73	75	71
General Dynamics Corp.	79	64	47	46	66
United Space Boosters Inc.	4	18	33	43	65
Ford Aerospace & Commun.	26	30	35	48	62
Lockheed Engrg. & Mgmt. Co. Inc.	68	75	51	59	61
Hughes Aircraft Co.	39	73	71	68	53
Perkins Elmer Corp.	(a)	17	31	43	51
Planning Research Corp.	26	29	35	38	44
Lockheed Missiles & Space Co.	10	21	36	47	43
Boeing Co.	53	43	43	45	40
TRW Inc.	29	20	29	42	37
Pan American World Airways	12	12	27	32	34
Ball Corp.	8	18	22	21	30
Singer Co.	21	20	27	28	30
RCA Corp.	42	53	51	32	27
Air Products & Chemicals, Inc.	7	23	19	17	26
Sperry Corp.	19	26	20	18	24
Northrop Services, Inc.	19	16	20	22	24
Teledyne Industries Inc.	14	9	13	20	23
Computer Sciences Tech. Assoc.	11	14	16	18	20
Kentron Intl. Inc.	4	4	14	23	16

Source: National Aeronautics and Space Administration, "NASA Annual Procurement Report," (Annually).
a Not listed in major contractors for indicated year.

DEPARTMENT OF DEFENSE MAJOR CONTRACTORS

Fiscal Years 1977-1981
Listed by rank according to net value of prime contracts awarded during last fiscal year[a]
(Millions of Dollars)

Company	1977	1978	1979	1980	1981
TOTAL CONTRACTS	$50,385	$59,582	$63,252	$76,807	$97,389
McDonnell Douglas Corp.	2,574	2,863	3,229	3,247	4,409
United Technologies Corp.	1,585	2,400	2,554	3,109	3,776
General Dynamics Corp.	1,372	4,154	3,492	3,518	3,402
General Electric Co.	1,520	1,786	2,042	2,202	3,018
Boeing Co.	1,580	1,525	1,515	2,385	2,683
Lockheed Corp.	1,673	2,226	1,797	2,037	2,657
Hughes Aircraft Co.	1,093	1,489	1,557	1,819	2,552
Raytheon Co.	1,041	1,307	1,249	1,745	1,826
Grumman Corp.	1,428	1,180	1,364	1,322	1,710
Chrysler Corp.	620	743	809	971	1,414
Litton Industries, Inc.	609	1,557	832	652	1,385
Martin Marietta Corp.	426	539	519	809	1287
Philbro Corp.	(b)	(b)	(b)	(b)	1,223
Exxon Corp.	238	311	341	480	1,152
Tenneco Inc.	745	407	1,093	1,524	1,151
Rockwell International Corp.	1,480	890	684	969	1,126
Westinghouse Electric Corp.	802	539	660	932	1,125
FMC Corp.	245	361	352	835	1,052
Standard Oil Co. of CA	297	244	241	475	972
Sperry Corp.	652	612	778	845	928
RCA Corp.	364	565	487	589	877
Honeywell Inc.	457	545	658	687	838
IBM Co.	547	396	553	497	805
AT & T Co.	457	457	570	597	695
Texas Instruments Inc.	324	434	374	431	625
Northrop Corp.	1,047	586	[illegible]	1,227	623
General Motors Corp.	380	420	449	509	622
Coastal Corp.	84	154	178	250	616
Motor Oil Hellas	(b)	(b)	184	1,059	583
Singer Co.	350	282	346	435	565

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

a Effective 1980, data include DOD contract awards for civil functions, while data for prior years were limited to military prime contract awards.

b Not in top 100 companies for the listed year.

PRIME CONTRACT AWARDS OF $10,000 OR MORE[a] FOR SELECTED MAJOR MILITARY HARD GOODS

By Geographic Region
Fiscal Years 1979, 1980, 1981

Program and Region	Millions of Dollars			Percent of Program Total		
	1979	1980	1981	1979	1980	1981
AIRCRAFT—TOTAL	$13,259	$15,142	$19,021	100.0%	100.0%	100.0%
New England	3,198	3,812	4,204	24.1	25.2	22.1
Middle Atlantic	2,042	2,241	2,825	15.4	14.8	14.9
East North Central	747	1,034	1,362	5.6	6.8	7.2
West North Central	2,728	2,551	3,562	20.6	16.9	18.7
South Atlantic	801	868	2,102	6.0	5.7	11.1
East South Central	113	169	181	0.9	1.1	1.0
West South Central	2,208	2,755	2,484	16.7	18.2	13.1
Mountain	146	146	192	1.1	1.0	1.0
Pacific[b]	1,276	1,566	2,108	9.6	10.3	11.1
MISSILE & SPACE SYSTEMS—TOTAL	$ 7,620	$ 9,321	$11,474	100.0%	100.0%	100.0%
New England	938	1,220	1,715	12.3	13.1	14.9
Middle Atlantic	546	596	768	7.2	6.4	6.7
East North Central	187	154	197	2.5	1.7	1.7
West North Central	592	694	703	7.8	7.4	6.1
South Atlantic	613	772	916	8.1	8.3	8.0
East South Central	126	145	156	1.6	1.6	1.4
West South Central	202	273	404	2.7	2.9	3.5
Mountain	449	572	1,208	5.9	6.1	10.5
Pacific[b]	3,967	4,895	5,406	52.1	52.5	47.1
ELECTRONICS & COMMUNICATIONS EQUIPMENT—TOTAL	$ 8,953	$10,619	$12,871	100.0%	100.0%	100.0%
New England	698	1,086	1,231	7.8	10.2	9.6
Middle Atlantic	1,870	1,936	2,255	20.9	18.2	17.5
East North Central	572	686	878	6.4	6.5	6.8
West North Central	490	879	1,004	5.5	8.3	7.8
South Atlantic	1,575	1,800	2,452	17.6	17.0	19.0
East South Central	38	58	71	0.4	0.5	0.5
West South Central	581	581	858	6.5	5.5	6.7
Mountain	310	371	438	3.5	3.5	3.4
Pacific[b]	2,819	3,222	3,685	31.5	30.3	28.6

Source: Department of Defense, "Prime Contract Awards by Region and State" (Annually).

a Effective 1980, data includes DOD contract awards for civil functions, while data for prior years were limited to military prime contract awards.

b Includes Alaska and Hawaii.

PRIME CONTRACT AWARDS OF $10,000 OR MORE[a] FOR RESEARCH, DEVELOPMENT, TEST & EVALUATION

By Region and Type of Contractor
Fiscal Year 1981
(Millions of Dollars)

REGION	TOTAL	Type of Contractor		
		Educational Institutions	Other Non-Profit Institutions[a]	Business Firms
TOTAL—Millions of Dollars	$ 10,331	$ 711	$ 573	$ 9,047
New England	1,257	186	185	885
Middle Atlantic	1,064	57	15	992
East North Central	531	45	24	462
West North Central	225	7	1	217
South Atlantic	1,687	269	79	1,338
East South Central	131	4	3	124
West South Central	458	24	8	426
Mountain	808	37	2	769
Pacific[b]	4,172	82	256	3,833
PERCENT OF TOTAL	100.0%	100.0%	100.0%	100.0%
New England	12.2	26.2	32.3	9.8
Middle Atlantic	10.3	8.0	2.6	11.0
East North Central	5.1	6.3	4.2	5.1
West North Central	2.2	1.0	0.1	2.4
South Atlantic	16.3	37.8	13.9	14.8
East South Central	1.3	0.6	0.5	1.4
West South Central	4.4	3.4	1.4	4.7
Mountain	7.8	5.1	0.3	8.5
Pacific[b]	40.4	11.6	44.7	42.4

Source: Department of Defense, "Prime Contract Awards by Region and State" (Annually).
a Includes contracts with other government agencies.
b Includes Alaska and Hawaii.

Glossary

Accessions: 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.

Aerospace Industry: the industry engaged in research,development and manufacture of aerospace systems, including manned and unmanned aircraft; missiles, space launch vehicles, and spacecraft; propulsion, guidance and control units for all of the foregoing; and a variety of airborne and ground based equipment essential to the test, operation, and maintenance of flight vehicles.

Aerospace Employment: annual average calculated as one-twelfth of sum of monthly estimates of total number of persons employed during a designated pay period by the aircraft and missile and space industries (SIC 372 and 376) plus estimated aerospace-related employment in the communications (SIC 3662) and instruments (SIC 381 and 382) industries and in certain other industries (SIC 28, 35, 73, 89, etc.).

Aerospace Payroll: estimated on the basis of average weekly earnings for a given calendar year for production workers plus an estimated annual salary for other employees.

Aerospace Sales: the AIA estimate of aerospace industry sales, developed by summing the (1) DOD expenditures for procurement of aircraft and missiles; (2) estimates of DOD expenditures for RDT&E of aircraft and missiles; (3) NASA expenditures for research and development; (4) outlays for space activities by DOD and other U.S. Government departments and agencies; (5) net sales of aerospace products to other than U.S. Government, including civil aircraft products (domestic sales and exports), commercial sales of space-related equipment, and exports of missiles and military aircraft (both com-

mercial and FMS/MAP); and (6) non-aerospace sales of major aerospace companies.

Air Carriers: the commercial system of air transportation, consisting of domestic and international certificated and charter 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 Agreement (Agreement on Trade in Civil Aircraft): negotiated in the Tokyo Round of the Multilateral Trade Negotiations, and implemented January 1, 1980, providing for elimination of tariff and non-tariff trade barriers in the civil aircraft sector.

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 such items as engines, accessories, electronics 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 of reserve for bad debts, depreciation and amortization, but before deducting any liabilities, mortgages or other indebtedness.

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

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.

Bureau of the Census: an agency of the Department of Commerce.

Bureau of Economic Analysis (BEA): an agency of the Department of Commerce.

Bureau of Labor Statistics (BLS): an agency of the Department of Labor.

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, offsetting the effect of inflation. The Gross National Product in constant dollars is arrived at by dividing components of the current dollar figures by appropriate price deflators.

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.

DOE: Department of Energy.

DOT: Department of Transportation.

Durable Goods Industry: comprised of major manufacturing industry groups with SIC Codes 24, 25, and 32-39. All major manufacturing industry groups in SIC Codes 20-23 and 26-31 are consid-

ered nondurable goods manufacturing industry groups.

Earnings: the actual return to the worker for a stated period of time. Irregular bonuses, retroactive items, payments of various welfare benefits, and payroll taxes paid by employers are excluded.

Average Hourly Earnings: on a "gross" basis, reflecting not only changes in basic hourly 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 for 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 scattererd among several agencies. The major elements covered were nuclear energy, fossil energy, solar and geothermal energy, conservation through increased efficiency and environmental controls. Most of these functions were assumed by the Department of Energy as of October 1, 1977.

Establishment: the basis for reporting to the Census of Manufacturers; an operating facility in a single location.

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), an agency 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 and are designated by the year in which they end. 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.

Foreign Military Sales (FMS): export sales to foreign governments arranged through the Department of Defense, whereby DOD recovers full purchase price and administrative costs; often mistakenly used to include foreign military aid and foreign commercial sales as well.

FY: see **Fiscal Year.**

General Agreement on Tariff and Trade (GATT): a multilateral treaty, suscribed to by over 80 governments which together account for more than four-fifths of world trade; its aim is to liberalize world trade; the only multilateral instrument that lays down agreed rules for international trade.

General Aviation: all civil flying except that of air carriers.

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.

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.

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 takeoff of **helicopters** but without such auxiliary facilities as waiting room, hangar parking, etc.

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, and are in general based on the market value or price in the foreign country at the time of exportation of such merchandise, including 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 excluding import duties, insurance, 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 Expenses."**

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

Net Income (After Income Taxes): Net Income (Before 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 is divided into two broad types: **Accessions** and **Separations.** 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.

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

Man-Hours: in measuring labor input, takes 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 worked02 or not, when the employee was at the plant. One man-hour 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.

Military Assistance Programs (MAP): grant aid given to qualifying countries.

Missile: sometimes applied to space launch vehicles, but more properly connotes automated weapons of warfare, *i.e.,* a weapon which has an integral system of guidance, as opposed to the unguided rocket.

Multilateral Trade Negotiations (MTN): a forum within the **GATT** in which countries negotiate to overcome their trade problems. In September 1973, in Tokyo, over 100 nations launched new multilateral trade negotiations, called the "Tokyo Round," covering both tariff and non-tariff barriers to trade in industrial and agricultural products, and improvements in the **GATT** itself.

NASA: National Aeronautics and Space Administration.

NATO: North Atlantic Treaty Organization.

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

Non-Aerospace Products and Services: includes all non-aircraft, non-space vehicle, and non-missile products and services 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, basic and applied research in the sciences and in engineering, and design and development of prototype products and processes.

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

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

Payroll: includes the gross earning paid in the calendar year to all employees on the payroll of operating manufacturing **establishments.** Includes all forms of compensation paid 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.

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.

R&D: Research and Development.

Research: systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research is classified as either **basic** or **applied** according to the objectives of the sponsoring agency.

Basic Research: with the objective of gaining fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind.

Applied Research: with the objective of gaining knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

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

Independent Research and Development (IR&D): a term devised by the Department of Defense and used by Federal agencies to differentiate between a contractor's research and development technical effort peformed under a contract, grant, or other arrangement (R&D) and that which is self-initiated and self-funded (IR&D).

Industrial Research and Development: research and development work performed within company facilities, funded by company or Federal funds, and excluding company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other non-profit organizations.

RDT&E (Department of Defense): Research, Development, Test and Evaluation.

Research: see **R&D.**

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.*, 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 revolves around a larger body, such as the moon revolving around the earth, or a man-made object revolving about any body such as the sun, earth, or moon.

Separation: see **Labor Turnover.**

SIC (Standard Industrial Classification): a system developed by the U.S. Government to define the industrial composition of the economy, facilitating comparability of statistics. See **Aerospace Industry** for explanation of SIC codes applicable to the aerospace industry.

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, Mining and Trade 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 (Tr. Qtr.): the three-month interval from July 1, 1976 to September 30, 1976. Beginning with the 1977 budget, the **fiscal year** (FY) runs from October 1 through September 30. To facilitate the conversion, this transition period was 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 "turboprop" or "turbojet."

U.K.: United Kingdom.

U.S.: United States of America.

USA: United States Army, an agency of the U.S. Department of Defense.

USAF: United Sates Air Force, an agency of the U.S. Department of Defense.

USN: United States Navy, an agency of the U.S. Department of Defense.

USSR: Union of Soviet Socialist Republics.

Utility Aircraft: an aircraft designed for general purpose flying.

V/STOL: vertical short take-off and/or landing aircraft.

Wages: the payroll (see **Payroll**) of production and related workers.

Index

—A—

ACCESSIONS, 136

ACTIVE CIVIL AIRCRAFT, 88-91

AERONAUTICS, 109

AEROSPACE INDUSTRY,
- Average Earnings, 139
- Backlog, 16
- Balance of Trade, 119
- Balance Sheet, 147
- Comparison with All Manufacturing and Durable Goods, 17-20, 145, 148
- Employment, 18, 20, 133-141
- Exports, 22, 119, 122-129
- Finance, 145-152
- Imports, 119-121, 126-128
- Payroll, 19
- Profits, 145, 146
- Research and Development, 72-76, 101-115
- Sales, 13-15, 17, 108, 145, 146

AIR CARGO, 79, 83, 86, 91, 102, 103

AIR CARRIERS, See Airlines

AIR FORCE,
- Aircraft Acceptances, 41, 44
- Aircraft Procurement, 45, 46
- Major Missile Systems, 51-53
- Missile Procurement, 50, 55
- RDT&E, 111, 112, 114, 115

AIR TRANSPORTATION, 21, 77-94
- See Also Individual Subjects

AIRCRAFT, 29-47, 80-82, 88-92
- Active Civil, 21, 80-82, 88-92
- Airlines, 21, 79-94, 102-103
- Backlog, 16, 33, 36
- Civil, 34, 35
- Employment, 133-139
- Exports, 34, 36, 38, 122-125, 127-129
- Flyaway Cost, Military, 40-44
- Imports, 120, 121, 127, 128
- Military, 34, 40-47, 120-122, 125
- On Order, 36
- Outlays, DOD, 24. 25, 27, 45
- Prime Contract A ards, 113, 151, 152
- Procurement, DOD, 24, 25, 27, 45-47
- Production, 32-47
- RDT&E, DOD, 24, 25, 112-114
- Sales, 13, 15, 32
- Transports, 22, 34-37, 40, 41, 44, 120, 122, 125, 129

AIRLINES,
- Domestic, 83-87, 102, 103
- Finances, 85-87

Flight Equipment, 80-82, 85, 88-91
Foreign, 79-81
Helicopter, 89, 91, 102, 103
Miles Flown, 79, 83, 102
Passenger Miles, 79, 83, 84, 102
Traffic, 79, 83, 102
U.S. Fleet, 88, 89
World Airline Fleet, 21, 80-82

AIRMAN CERTIFICATES, 93

AIRPORTS, 94

APPLIED RESEARCH AND DEVELOPMENT, 107

ARMY,
Aircraft Acceptances, 43, 44
Aircraft Procurement, 45, 46
Major Missile Systems, 52, 53
Missile Procurement, 50, 55
RDT&E, 111, 112, 114, 115

ASSETS,
Aerospace Industry, 145, 147
Airlines, 85

ASTRONAUTICS,
Outlays, 24, 25
RDT&E, 24, 25, 112

ASTRONAUTS, 66-68

—B—

BACKLOG,
Aerospace, 16
Aircraft, 16, 33
Engines, 16, 33
Missiles, 16, 56, 57
Space, 16, 69
Transport Aircraft, 36

BALANCE OF TRADE, 119

BALANCE SHEET, AEROSPACE COMPANIES, 147

BASIC RESEARCH FUNDS, 107

BOMBERS,
Exports, 122, 125
Flyaway Costs, 40
Production, 40

BUSINESS FLYING, 91, 92, 97, 100, 101

—C—

CAPITAL SPENDING, 148

CARGO TON-MILES, 79, 83

CERTIFICATED PILOTS, 93

CIVIL AIRPORTS, 94

COMMERCIAL FLYING, See Business Flying

COMMUNICATIONS EQUIPMENT,
Contract Awards, 113, 151
Employment, 133

COMMUNICATIONS SATELLITES, 61-63

CONSTANT DOLLARS, 13-17, 32, 33, 56, 57, 69, 71, 101, 148

CONTRACT AWARDS
DOD, 113, 150-152
NASA, 149

—D—

DEFENSE CONTRACTORS, 150

DEFLATORS, 17

DELIVERIES, See Production

DEPARTMENT OF DEFENSE,
Aerospace Sales, 14, 26, 27
Aircraft,
Flyaway Cost, 40-44
Outlays, 24, 25, 27, 45
Procurement, 24, 25, 45-47
RDT&E, 24, 25, 112-114
Aeronautics, R&D, 109
Astronautics, 24, 25, 112
Contractors, 150
Missiles, 24, 25, 27, 50-57
Outlays, 24, 25, 27, 54, 55
Procurement, 24, 25, 27, 50, 54, 55
RDT&E, 24, 25, 112, 113, 115
Outlays, 23-25
Aerospace, 24-28
Aircraft, 24, 25, 27, 45
Astronautics, 24, 25
Functional Title, 24, 25
Missiles, 24, 25, 27, 54
Personnel, 24, 25
R&D, 110
RDT&E, 24, 25
Personnel, 24, 25
Prime Contract Awards, 113, 150-152
Procurement, 24, 25, 28, 45-47, 50, 54, 55
R&D, 109, 110
RDT&E, 24, 25, 111-115, 152
Space Activities, 70, 71

DEPARTMENT OF ENERGY, 70, 71, 110

DEPARTMENT OF TRANSPORTATION,
Aeronautics R&D, 109

DURABLE GOODS INDUSTRY,
Employment, 20

New Plant and Equipment Expenditures, 148
Profits, 145
Sales, 17

—E—

EARNINGS,
Companies, 145, 146
Employees, 19, 139

ELECTRONICS,
Prime Contract Awards, 113, 151

EMPLOYMENT, 18, 20, 130-141
All Manufacturing, 18, 20
Durable Goods, 20
NASA, 141
Scientists and Engineers, R&D, 140

ENGINES,
Aircraft,
Backlog, 33
Exports, 122, 126
Imports, 120, 126
Sales, 32
Missiles and Space Vehicles,
Backlog, 57
Exports, 122
Sales, 57

ERDA, 110

EXPORT-IMPORT BANK, 123

EXPORTS, 23, 34, 38, 44, 119-129
Aerospace, 23, 119-129
Balance of Trade, 119
Civil, 22, 34, 122, 124, 127-129
Engines, 122, 126
General Aviation, 34, 122, 124, 128
Helicopters, 34, 44, 122, 124, 125, 127
Military, 22, 34, 44, 122, 125
Transports, 22, 34, 122, 124, 125, 129
U.S. Exports, 22
Used Aircraft, 122, 124, 125

—F—

FEDERAL (U.S. GOVERNMENT),
Aerospace Sales, 14, 15, 26, 27
Backlog, 16
Outlays, 23
Research and Development, 110

FIGHTER AIRCRAFT,
Exports, 122, 125
Flyaway Cost, 40-42, 44
Procurement, 46, 47
Production, 40-42, 44
RDT&E, 114

FINANCES,
Airlines, 85-87
Government, See Outlays and Federal
Industry, 142-152

FLYING HOURS, 92

FOREIGN TRADE, 22, 116-129, See also Imports, Exports

FUNDS, RESEARCH, 106-109

—G—

GEOGRAPHIC DISTRIBUTION,
Airports, 94
Civil Helicopter Fleet, 100, 101
Contract Awards, 151, 152
Employment, 132, 135
Exports, 127-129
Heliports, 98
Imports, 127-129

GENERAL AVIATION,
Active Civil Aircraft, 90-92
Exports, 34, 122, 124, 128
Hours Flown, 92
Imports, 120, 128
Shipments, 34, 35, 39

GLIDER PILOTS, 93

GOVERNMENT, See Federal

GROSS NATIONAL PRODUCT, 17, 23
Deflator Series, 17

—H—

HELICOPTERS, 34, 35, 38, 40, 42-44, 82, 89-91, 93, 95-103
Active Civil, 82, 89-91
Civil Helicopter Fleet by State, 100, 101
Designation Chart, 99
Exports, 34, 38, 122, 124, 125, 127
Flyaway Cost, Military, 40, 42-44
Imports, 120, 121, 127
Military, 38, 40, 42-44
Operators, 97
Production, 34, 35, 38, 40, 42-44
Traffic, 102, 103
U.S. Airlines, 83-91
World Civil Airlines, 79-82

HELIPORTS, 98

HELISTOPS, 98

HOURS FLOWN, GENERAL AVIATION, 92

—I—

IMPLICIT PRICE DEFLATORS, 17

IMPORTS,
Aerospace, 119, 120
Aircraft, 121
Engines, 126
General Aviation, 128
Helicopters, 127

INCOME ACCOUNTS, 146

INDUSTRIAL RESEARCH AND DEVELOPMENT, 106-109

INJURY RATES, 137

INSTRUCTIONAL FLYING, 91, 92

INVESTMENT IN EQUIPMENT
Aerospace Industry, 148
Durable Goods Industries, 148
Manufacturing Industries, 148
Non-farm Business, 148
U.S. Airlines, 85

—L—

LABOR TURNOVER RATES, 136

LIABILITIES, Corporate, 147

—M—

MAJOR CONTRACTORS, 149, 150

MANPOWER, See Employment, 133-141

MANUFACTURING INDUSTRIES,
Employment, 18, 20
New Plant and Equipment Expenditures, 148
Profits, 145
Payroll, 19
Sales, 17
Work Injury Rates, 137

MILES FLOWN, 79, 83, 84, 102

MILITARY EXPORTS, 22, 34, 44, 122, 125, 126

MISSILES,48-57
Backlog, 16, 56
Employment, 133-135
Engines, 57
Exports, 122
Major Missile Systems, 51-53
Outlays, 24, 25, 27, 54, 55
Prime Contract Awards, 113, 151
Procurement, 24, 25, 27, 50, 54, 55
RDT&E, DOD, 24, 25, 112, 113, 115
Sales, 13, 15, 56, 57

—N—

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
Aeronautics, R&D, 109
Aerospace Sales, 14
Budget Authority, 70-72
Construction of Facilities, 72, 73
Contractors, 149
Employment, 141
Outlays, 26, 27, 73
Research and Development, 72-74, 109, 110
Research and Program Management, 72, 73

NATIONAL DEFENSE, 23, 26

NAVY,
Aircraft Acceptances, 42, 44
Aircraft Flyaway Cost, 42, 44
Aircraft Procurement, 45-47
Major Missile Systems, 51-53
Missile Procurement, 50, 54

—O—

ORDERS, Jet Transports, 36

OUTLAYS,
Aircraft, 24, 25, 27, 45
Aerospace, 24-28
Astronautics, 24
Federal, 23
Missiles, 24, 25, 27
National Defense, 23, 26
RDT&E, 24, 25, 112

OPERATING REVENUE,
U.S. Airlines, 86, 87

—P—

PASSENGER-MILES, 79, 83, 84, 102

PASSENGERS CARRIED, 79, 83, 84, 102

PAYROLL, 19

PILOTS, 93

PLANES, See Aircraft

PLANT AND EQUIPMENT EXPENDITURES, 148

PRIME CONTRACT AWARDS,
DOD, 113, 150-152
NASA, 149

PROCUREMENT, DOD,
Aerospace Products and Services, 14, 24-28
Aircraft, 24, 25, 27, 45-47

Missiles, 24, 25, 27, 50, 54, 55
Total, 24, 25

PRODUCTION, Aircraft, 32-47
General Aviation Aircraft, 34, 35, 39
Helicopters, 34, 35, 38
Military Aircraft, 34, 40-44
Transport Aircraft, 34-37

PROFITS, 145, 146

—R—

RDT&E, See Research, Development, Test and Evaluation

RESEARCH, Applied and Basic, 107

RESEARCH AND DEVELOPMENT, 104-115
Aeronautics, 109
DOD, 109, 110
DOT, 109
Energy, 108, 110
Federal Funds, 106-109
Industrial, 106-109
NASA, 109-110
Scientists and Engineers, 140

RESEARCH AND PROGRAM MANAGEMENT, NASA, 72, 73

RESEARCH, DEVELOPMENT, TEST & EVALUATION, DOD
Aircraft, 24, 25, 112-114
Astronautics, 24, 25, 112
By Agency, 111, 112, 114
Contract Awards, 113, 152
Missiles, 24, 25, 112, 113, 115
Outlays, 24, 25, 112
Total, 24, 25, 112

ROCKETS, See Missiles

ROTARY WING, See Helicopters

—S—

SALES,
Aerospace, 13-15, 17
And National Economy, 17
By Customer, 14, 15
By Product, 13, 15
Aircraft, 13, 15, 33
Constant Dollars, 13-15, 17
Durable Goods, 17
Manufacturing Industries, 17
Missiles, 13, 15, 56
Non-Aerospace, 13-15
Space, 13, 15, 69

SCIENTISTS AND ENGINEERS, 134, 135, 140

SEPARATIONS, 136

SPACE, 58-76
Backlog, 69
DOD, 61-63, 70, 71, 75, 76
Employment, 133-135, 141
Launchings, 60-63
Manned Space Flights, 66-68
NASA, 61-63, 70-74
Procurement, 76
Programs, 74-76
RDT&E, 76
Sales, 13, 15, 69
Satellites, 61-63
Space Launch Vehicles, 64, 65
Spacecraft Record, 60

STOCKHOLDERS' EQUITY, 147

STRIKES, 137

STUDENT PILOTS, 93

—T—

TAXES, 146

TRADE BALANCE, 119

TRANSPORTATION,
Air, 77-94
Helicopter, 95-103
See Also Individual Subjects

TRANSPORTS,
Civil, 34-37
Exports, 22, 34, 122, 124, 125, 129
Imports, 120
Military, 40-44
On Order, 36
Production, 34, 35, 37, 40-44
Specifications, 37

TURBOJET AIRCRAFT, 21, 80, 88, 91

TURBOPROP AIRCRAFT, 21, 81, 82, 88, 89, 91

TURNOVER, LABOR, 136

—U—

USED AIRCRAFT,
Civil Imports, 121
Civil Exports, 122, 124
Military Exports, 122, 125

USED AIRCRAFT ENGINES,
Exports, 127

USAF, See Air Force

U.S. AIRLINES
Assets, 85
Finances, 85-87

Fleet, 88-91
Net Investment, 85
Operating Revenues, 86, 87
Traffic, 83, 84, 102, 103

USN, See Navy

UTILITY AIRCRAFT, See General Aviation

—V—

VERTICAL LIFT AIRCRAFT, See
Helicopters

—W—

WAGES, 139

WORKING CAPITAL, 147

WORK INJURY RATES, 137

WORK STOPPAGES, 137

WORLD AIRLINES,
Fleet, 21, 80-82
Traffic, 79

NOTES

NOTES

MEMBERS

Abex Corporation
Aerojet-General Corporation
Aeronca, Inc.
Avco Corporation
The Bendix Corporation
The Boeing Company
CCI Corporation
  The Marquardt Company
Colt Industries Inc.
  Chandler Evans, Inc.
    Control Systems Division
  Menasco Inc.
Criton Corporation
E-Systems, Inc.
FMC Corporation
  Ordnance Division
The Garrett Corporation
Gates Learjet Corporation
General Dynamics Corporation
General Electric Company
The BFGoodrich Company
  Engineered Products Group
Goodyear Aerospace Corporation
Gould Inc.
Grumman Corporation
Hercules Incorporated
Honeywell Inc.
Howmet Turbine Components Corp.
Hughes Aircraft Company
IBM Corporation
  Federal Systems Division
ITT Telecommunications & Electronics
  Group-North America
  ITT Aerospace/Optical Division
  ITT Avionics Division
  ITT Defense Communications Division
  ITT Gilfillan
Lear Siegler, Inc.
Lockheed Corporation
Martin Marietta Aerospace
McDonnell Douglas Corp.
Northrop Corporation
Parker Hannifin Corporation
Pneumo Corporation
  Cleveland Pneumatic Co.
  National Water Lift Co.
Raytheon Company
RCA Corporation
Rockwell International Corporation
Rohr Industries Inc.
The Singer Company
Sperry Corporation
Sundstrand Corporation
  Sundstrand Advanced Technology
    Group
Teledyne CAE
Textron Inc.
  Bell Aerospace Textron
  Bell Helicopter Textron
  Dalmo Victor Operations
  HR Textron Inc.
Thiokol Corporation
TRW Inc.
United Technologies Corporation
Vought Corporation
Western Gear Corporation
Westinghouse Electric Corp.
  Public Systems Company
Wyman-Gordon Company

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