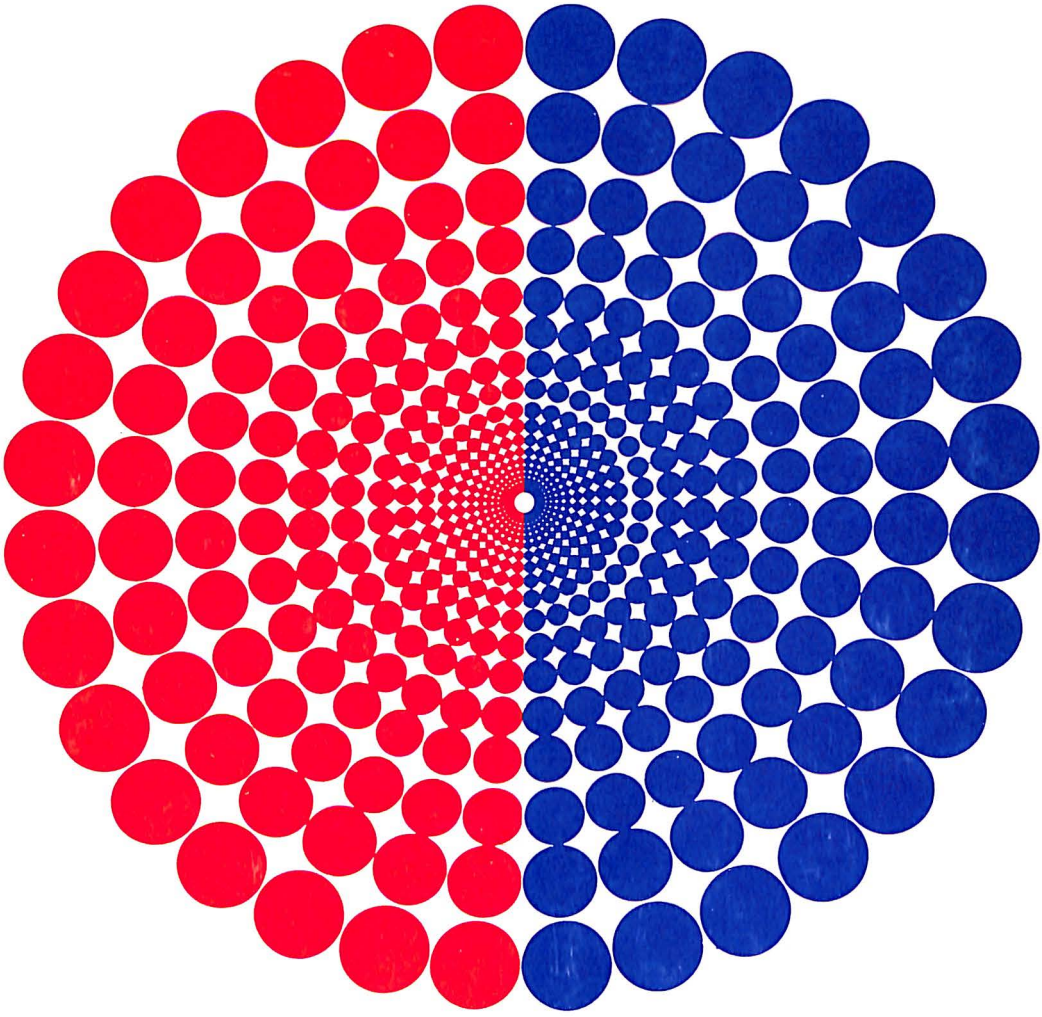
AEROSPACE FACTS AND FIGURES 1978/79



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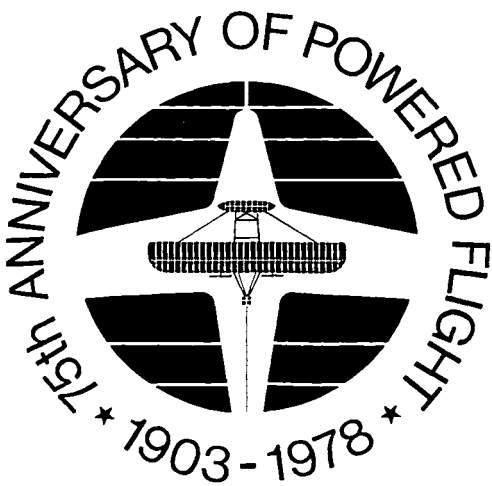
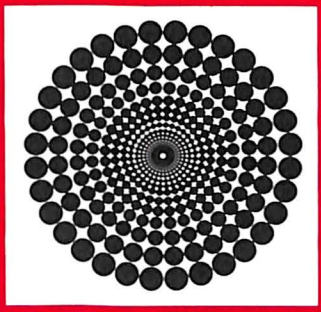


This 26th edition of Aerospace Facts and Figures commemorates the 75th anniversary of powered flight. In the logo above, the Department of Transportation's symbol for aviation's diamond anniversary, the circular area represents the world, divided into two hemispheres; the original Wright Flyer of 1903 is superimposed on the outline of a modern jet. The emblem signifies the impact on the world of the extraordinary progress achieved in three quarters of a century of flight.

1978/79
AEROSPACE FACTS AND FIGURES



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Foreword

For the aerospace industry, 1977 was an encouraging year of solid gain and brightening outlook. Sales, profits and backlog increased substantially and the signposts pointed to further improvement in 1978.

Sales in 1977 were the highest in aerospace history. However, such a record must be qualified, since our current economy is tainted by the effects of inflation. Industry activity, as measured in inflation-adjusted sales volume, was well below that of the peak years of the latter sixties. Still, there was *real* improvement in 1977 as sales gains outstripped inflation; in constant dollars, 1977 was the best year of the last four. Gains of a similar order are anticipated in 1978. Thus, the industry is experiencing a moderate but welcome upturn of real productivity after a net decline during the earlier seventies.

Profits as a percentage of sales reached their highest level in recent memory, a heartening improvement for a high-technology industry whose capital investment needs are of an exceptionally high order. The aerospace profit ratio remained below the average for all U.S. manufacturing industries but edged appreciably closer to the average.

The industry's performance in international trade continued strong in 1977; for the fourth straight year exports topped the $7 billion level and imports amounted to less than one-tenth the dollar value of exports. The resultant aerospace trade surplus represented a significant contribution to the U.S. economy, particularly in view of the massive international trade deficit experienced by the nation as a whole.

Looking toward tomorrow, the picture is hazy in some respects due to uncertainties as to future levels of government outlays for defense hardware, traditionally the largest source of industry contractual effort. There are, however, indicators of increasing activity in other areas.

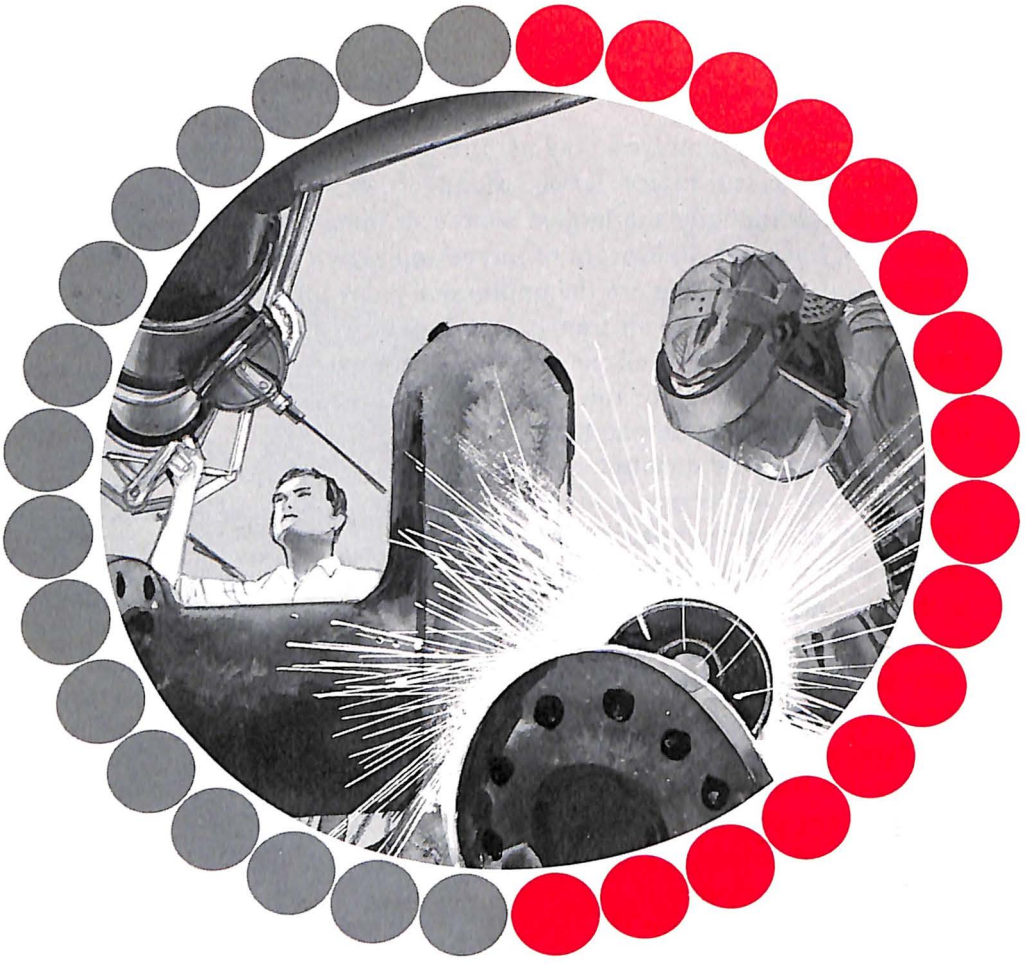
Foremost among them are the impressive gains in traffic and the corresponding earnings of the air transportation industry. Financially reinvigorated, the airlines have already embarked on major re-equipment programs, and projections for the 1980s indicate transport aircraft purchases on a scale heretofore unmatched.

There remains the question as to what percentage of this business U.S. plane builders can secure in the face of increasing competition from their foreign counterparts. Foreign manufacturers enjoy a distinct advantage: they have the solid backing of their governments. Aware of the importance to their economies of capturing a greater share of the international market, foreign producers are either nationalized corporations or are subsidized by their governments, thus enabling foreign manufacturers to offer more attractive financial arrangements to potential customers. It is a situation that demands the attention of the U.S. government. Given opportunity to operate in a truly free competitive marketplace, American manufacturers are confident of continuing leadership in the international market, with attendant high levels of commercial airplane production.

Research, development and production of space equipment is another area of future promise for the industry. For the years immediately ahead, only moderate gains are expected; however, the 1980 operational debut of the Space Shuttle, together with increasing opportunities for economic benefit from space, augurs well for expansion of the industry's space workload in later years. A third area of industry effort which shows an encouraging upward trend is non-aerospace products and services, sales of which have more than doubled over the past five years. Generally, there is cause for optimism that the decade of the eighties will bring industry activity levels higher than those of the seventies.

This 26th edition of Aerospace Facts and Figures presents a statistical summary of the aerospace year 1977, together with estimates for near-future years to the extent they are possible. We trust this useful and informative volume will meet with the wide acceptance enjoyed by its predecessors.

Karl G. Harr, Jr.
President
Aerospace Industries Association



AEROSPACE SUMMARY

From the standpoint of sales, profits and workload, 1977 was a good year for the aerospace industry. Statistically, sales reached a new record level, as they had in the previous year. The bare statistics, however, do not recognize the effects of inflation; adjusted to constant dollars, 1977 sales were some $12 billion below those of 1968, the industry's real peak year.

Nonetheless, there was marked improvement in 1977 because sales increased at a rate greater than the national inflation rate for the first time in several years. The year marked a new upturn in what has been a mildly fluctuating, more or less flat activity curve throughout the decade of the seventies.

The principal reason for the upturn in the activity curve is the improving financial posture of U.S. airlines and the consequent resumption of order placements for new transport aircraft; this was reflected in a sharp increase in commercial transport backlog during 1977.

Further increases were expected in view of stated plans of the air transportation industry to spend about $65 billion for re-equipment in the period from 1977 to 1990. Industry activity in space equipment fabrication was also expected to gain moderately, due to approaching operational status of NASA's Space Shuttle and planned increase in the number of U.S. payloads launched annually.

Following is a breakdown of the industry's 1977 performance by major category:

Sales. Total sales amounted to $32.3 billion, compared with $30 billion in 1976, which was previously the statistical peak. The sales gain was composed of increases in all four major product groups—aircraft, missiles, space and non-aerospace products. Aerospace sales as a percentage of the Gross National Product declined slightly, to 1.7 percent from 1.8 percent in 1976; the figures compare with an average of 2 percent for the preceding years of the 1970s. Aerospace sales also declined in relation to total sales of all U.S. manufacturing industries, down to 2.4 percent from the previous year's 2.6 percent.

Profit. The industry's net profit after taxes as a percentage of sales amounted to 4.2 percent, a substantial gain over the 3.4 percent in 1976.

Backlog. The industry's backlog at year-end 1977 was $44.3 billion, an increase of $4.6 billion over 1976. The gain was due for the most part to increasing orders for commercial transports, but the backlog of government orders also climbed almost $900 million.

Civil Aircraft Production. Sales of commercial transport aircraft declined in both numbers and dollar value. The industry delivered 185 jetliners valued at $2.9 billion, compared with 238 aircraft worth $3.2 billion shipped in the previous year. Due to the lead time involved, the decline reflects in part the lag in transport orders experienced in the mid-1970s, but was aggravated by a strike in the industry during the last quarter of the year. However, a major increase in future transport production is indicated by a new surge of orders in late 1977. Backlog climbed from $5 billion in 1976 to $8.9 billion at the end of 1977. Transport manufacturers reported orders, at year-end 1977, for 466 airplanes which compares with 326 orders on the books at the end of the previous year.

Manufacture of general aviation planes continued its steady growth in 1977. Sales reached a new peak of $1.5 billion, up more than $300 million above the 1976 level, which was the previous high. The number of units delivered—16,920—was also a record; it compared with 15,447 in 1976 and 15,747 in 1966, the previous peak.

Civil helicopter production also reached record levels. The industry produced 884 helicopters, 20 more than the previous high (1975) and 109 more than were shipped in 1976.

In dollar value, helicopter sales in 1977 amounted to $316 million, compared $305 million in 1976.

Overall civil aircraft production totaled 17,965 units, again a peak; the figure represents an increase of more than 1,500 aircraft in comparison with deliveries in the previous year.

Military Aircraft Production. Manufacture of military aircraft in 1977 dipped again, following the declining trend in evidence for more than a decade. In the Vietnam war year 1967, the industry delivered more than 4,500 planes to the military services; since then, production has declined in every year but one. In 1977, the number fell slightly below the 1,000 mark for the first time in more than a quarter-century—to 873 airplanes, down from the 1,160 in 1976. However, because relatively high-value fighter and attack aircraft made up most of the deliveries, the decline in dollar value was moderate. Flyaway value, excluding spares and support equipment, was $4.3 billion in 1977, down from $4.7 billion in 1976.

Missile Programs. After a minor dip in 1976, missile sales climbed in 1977. Total sales, including missile systems, parts, propulsion units and ground support equipment, came to $5.5 billion, up more than $500 million. Unadjusted for inflation, the 1977 figure was the highest since the ICBM build-up years of the early 1960s.

Space Programs. Civil and military space programs accounted for $3.4 billion of the industry's total sales, and showed a very slight increase of $36 million. When the effects of inflation are taken into consideration, space activity showed a decline in 1977. Budget plans indicated moderate increases in space funding for fiscal years 1978 and 1979.

Non-aerospace Sales. The steady climb of sales activity in non-aerospace products continued in 1977. Non-aerospace sales includes some of the industry's effort to transfer to the non-aerospace sector the technology developed in aerospace programs. This category generated sales of more than $6 billion in 1977, an increase over 1976 of almost $700 million, and marked the fifth consecutive year in which non-aerospace sales set new records.

Research and Development. Federal outlays for research and development, a general indicator of aerospace R&D activity, increased sharply in fiscal year 1977. At $22.5 billion, total outlays were up almost 11 percent, well above the national inflation rate and marked a reversal of the previously-declining trend in *real* R&D funding as reflected in inflation-adjusted dollars. Department of Defense outlays for all types of R&D increased from $8.9 billion in 1976 to $9.8 billion in 1977. Defense aerospace R&D outlays, the principal ource of industry

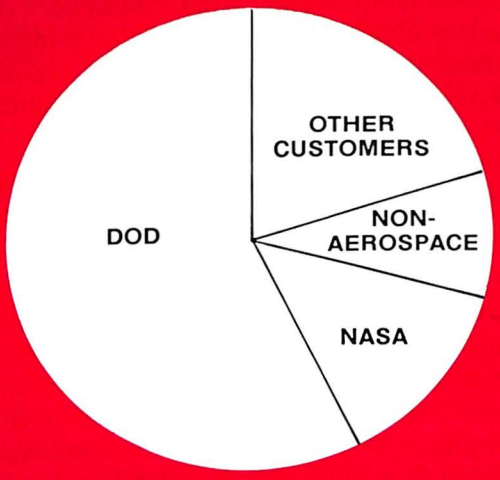
R&D contracts, increased some $500 million, with aircraft R&D the prime area of gain. There were slight drops in both missile and astronautics R&D outlays, but missile programs nonetheless continued to be the heaviest-funded portion of DoD's aerospace-related research, development, test and evaluation efforts. Substantial increases for defense R&D were indicated in budget estimates for fiscal years 1978 and 1979.

Exports. The growing importance of aerospace exports to the U.S. economy was evident in the fact that the aerospace industry recorded a trade surplus approaching $7 billion while the U.S. as a whole experienced a trade deficit of $29 billion. At $7.6 billion, aerospace exports amounted to more than 10 times the dollar value of aerospace imports. As in previous years, civil exports accounted for the bulk of foreign sales. Shipments of civil aircraft, engines and other civil equipment came to more than $5 billion, roughly two-thirds of the total. The overall aerospace export figure was below that of the preceding two years but better than any other year. Forecasts indicate new growth in aerospace exports and trade balance. The U.S. Department of Commerce estimated that the 1978 aerospace contribution to the U.S. international trade balance would reach $8.5 billion.

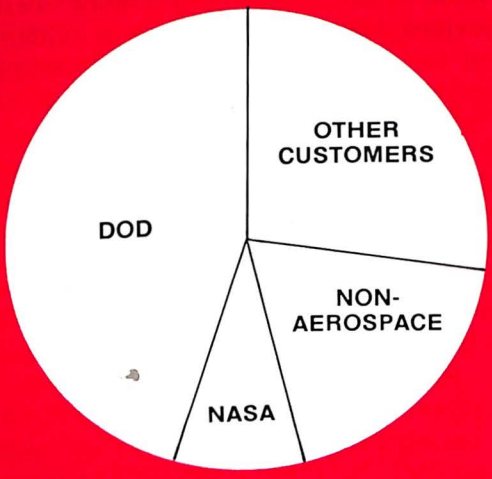
Employment. Aerospace industry employment during 1977 averaged 890,000, some 9,000 below the previous year's figure, but the 1977 average was lowered by late-year labor strikes. Aerospace employment amounted to 4.6 percent of all employment in U.S. manufacturing industries; aerospace payroll, close to $16 billion, came to 6 percent of the total manufacturing payroll. Although the year's average employment was the lowest in recent history, there were signs that the decline in evidence since 1974 had bottomed. Predicting gains in all categories of occupational classification, an Aerospace Industries Association survey forecast a new upturn to an estimated 930,000 by the end of 1978.

AEROSPACE INDUSTRY SALES BY CUSTOMER

1968
$29 Billion



1977
$32.3 Billion



Source: Aerospace Industries Association

AEROSPACE INDUSTRY SALES BY CUSTOMER

Calendar Years 1950 to Date
(Millions of Dollars)

Year	TOTAL Sales	Aerospace Products and Services			Non-Aerospace Products and Services
		U.S. Government		Other Customers	
		Department of Defense	NASA and Other Agencies		
1950	$ 3,116	$ 2,598	$ –	$ 238	$ 280
1951	6,264	5,353	–	347	564
1952	10,130	8,568	–	650	912
1953	12,459	10,604	–	734	1,121
1954	12,807	10,832	–	822	1,153
1955	12,411	10,508	–	786	1,117
1956	13,946	11,525	–	1,166	1,255
1957	15,858	12,833	–	1,598	1,427
1958	16,065	13,246	1	1,372	1,446
1959	16,640	13,171	130	1,841	1,498
1960	17,326	13,196	363	2,208	1,559
1961	17,997	13,871	630	1,876	1,620
1962	19,162	14,331	1,334	1,772	1,725
1963	20,134	14,191	2,628	1,485	1,830
1964	20,594	13,218	3,635	2,020	1,721
1965	20,670	11,396	4,490	2,816	1,968
1966	24,610	13,284	5,026	3,663	2,637
1967	27,267	15,855	4,201	4,632	2,579
1968	28,977	16,573	3,938	5,917	2,549
1969	26,149	15,771	3,337	4,342	2,699
1970	24,904	14,643	2,974	4,643	2,644
1971	22,154	12,584	2,745	4,302	2,523
1972	22,818	13,295	2,608	4,269	2,646
1973	24,809	12,886	2,394	6,186	3,343
1974	26,400	12,650	2,527	7,156	4,067
1975	28,373	13,127	2,727	7,727	4,792
1976[r]	30,018	13,402	2,815	8,531	5,370
1977	32,294	14,389	2,880	8,993	6,032

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

AEROSPACE INDUSTRY SALES BY PRODUCT GROUP

Calendar Years 1950 to Date
(Millions of Dollars)

Year	TOTAL Sales	Product Group			
		Aircraft	Missiles	Space	Non-Aerospace
1950	$ 3,116	$ 2,731	$ 105	$ –	$ 280
1951	6,264	5,067	633	–	564
1952	10,130	8,442	776	–	912
1953	12,459	10,420	918	–	1,121
1954	12,807	10,460	1,194	–	1,153
1955	12,411	9,781	1,513	–	1,117
1956	13,946	10,485	2,206	–	1,255
1957	15,858	11,398	3,033	–	1,427
1958	16,065	10,582	4,036	1	1,446
1959	16,640	9,714	5,042	386	1,498
1960	17,326	9,127	5,762	878	1,559
1961	17,997	8,847	6,266	1,264	1,620
1962	19,162	8,944	6,311	2,182	1,725
1963	20,134	8,527	6,003	3,774	1,830
1964	20,594	8,911	5,242	4,720	1,721
1965	20,670	9,747	3,626	5,329	1,968
1966	24,610	11,951	4,053	5,969	2,637
1967	27,267	14,981	4,417	5,290	2,579
1968	28,977	16,578	4,719	5,131	2,549
1969	26,149	14,097	5,058	4,295	2,699
1970	24,904	13,293	5,379	3,588	2,644
1971	22,154	11,442	5,018	3,171	2,523
1972	22,818	11,866	5,217	3,089	2,646
1973	24,809	13,338	5,177	2,951	3,343
1974	26,400	14,050	5,187	3,096	4,067
1975	28,373	15,227	5,126	3,228	4,792
1976[r]	30,018	16,426	4,936	3,386	5,370
1977	32,294	17,388	5,452	3,422	6,032

Source: Aerospace Industries Association estimates, based on latest available information.
NOTE: For explanation of "Aerospace Sales" see "NOTE" page 11.
r Revised

SALES AND BACKLOG OF MAJOR AEROSPACE COMPANIES BY PRODUCT GROUP

Calendar Years 1966 to Date
(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	
SALES									
1966	$20,227	$14,530	$ 5,697	$ 5,458	$ 3,267	$6,241	$1,755	$ 869	$2,637
1967	23,444	16,334	7,110	7,141	4,753	6,054	1,914	1,002	2,580
1968	25,592	16,635	8,957	7,411	6,439	6,076	2,077	1,040	2,549
1969	24,648	16,560	8,088	7,161	5,603	5,660	2,539	986	2,699
1970	24,752	16,407	8,345	7,586	5,880	5,422	2,324	896	2,644
1971	21,679	14,114	7,565	6,313	5,079	4,971	1,909	884	2,523
1972	21,499	13,492	8,007	4,954	5,199	5,598	2,067	1,035	2,646
1973	24,305	14,431	9,874	5,539	6,739	5,580	2,103	1,001	3,343
1974	26,849	15,196	11,653	5,982	7,560	5,854	2,101	1,285	4,067
1975	29,473	17,314	12,159	6,859	7,797	6,310	2,070	1,645	4,792
1976[r]	30,153	18,605	11,548	7,977	7,215	5,609	2,275	1,707	5,370
1977	32,934	20,243	12,691	8,543	7,507	5,903	2,724	2,225	6,032
BACKLOG—AS OF DECEMBER 31									
1966	$27,547	$15,711	$11,836	$ 8,761	$ 9,718	$4,510	$1,588	$ 904	$2,066
1967[a]	29,339	16,951	12,388	— 19,699 —		5,447	1,635	876	1,682
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[r]	39,702	24,530	15,172	11,950	8,929	6,286	2,046	3,496	6,995
1977	44,287	25,355	18,932	12,172	12,358	5,981	2,974	3,421	7,381

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
NOTE: Based on reports from about 70 aerospace companies.
a Due to revision in the data base, 1967 data are estimates.
r Revised.

AEROSPACE SALES AND THE NATIONAL ECONOMY

Calendar Years 1960 to Date
(Billions of Dollars)

Year	TOTAL Gross National Product[r]	Sales			Aerospace Sales as Percent of		
		Manufacturing Industries	Durable Goods Industry	Aerospace Industry	GNP	Manufacturing Industries	Durable Goods Industry
1960	$ 506.0	$ 345.7	$ 173.9	$ 17.3	3.4%	5.0%	9.9%
1961	523.3	356.4	175.2	18.0	3.4	5.1	10.3
1962	563.8	389.9	195.5	19.2	3.4	4.9	9.8
1963	594.7	412.7	209.0	20.1	3.4	4.9	9.6
1964	635.7	443.1	226.3	20.6	3.2	4.6	9.1
1965	688.1	492.2	257.0	20.7	3.0	4.2	8.1
1966	753.0	554.2	291.7	24.6	3.3	4.4	8.4
1967	796.3	575.4	300.6	27.3	3.4	4.7	9.1
1968	868.5	631.9	335.5	29.0	3.3	4.6	8.6
1969	935.5	694.6	366.5	26.1	2.8	3.8	7.1
1970	982.4	708.8	363.1	24.9	2.5	3.5	6.9
1971	1,063.4	751.4	382.5	22.2	2.1	3.0	5.8
1972	1,171.1	849.5	435.8	22.8	1.9	2.7	5.2
1973	1,306.3	1,017.2	527.3	24.8	1.9	2.4	4.7
1974[r]	1,412.9	1,060.7	529.0	26.4	1.9	2.5	5.0
1975[r]	1,528.8	1,046.7	526.9	28.4	1.9	2.7	5.4
1976[r]	1,706.5	1,178.0	604.7	30.0	1.8	2.6	5.0
1977	1,890.4	1,325.8	691.5	32.3	1.7	2.4	4.7

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

NOTE: For explanation of "Aerospace Sales" see "NOTE" on page 11.

r Revised.

AEROSPACE SALES AND THE NATIONAL ECONOMY IN CONSTANT DOLLARS

Calendar Years 1960 to Date
(Billions of 1972 Dollars)

Year	TOTAL Gross National Product	Sales			GNP Implicit Price Deflator 1972=100
		Manu-facturing Industries	Durable Goods Industry	Aerospace Industry	
1960	$ 736.9	$ 503.4	$ 253.2	$ 25.2	68.67
1961	755.3	514.4	252.9	26.0	69.28
1962	799.1	522.6	277.1	27.2	70.55
1963	830.7	576.5	291.9	28.1	71.59
1964	874.3	609.4	311.2	28.3	72.71
1965	925.9	662.3	345.8	27.9	74.32
1966	981.0	722.0	380.0	32.0	76.76
1967	1,007.7	728.2	380.4	34.5	79.02
1968	1,051.8	765.3	406.3	35.1	82.57
1969	1,078.8	801.0	422.6	30.1	86.72
1970	1,075.3	775.8	397.4	27.3	91.36
1971	1,107.5	782.5	398.4	23.1	96.02
1972	1,171.1	849.5	435.8	22.8	100.00
1973	1,234.6	961.4	498.4	23.4	105.80
1974[r]	1,217.8	914.2	455.9	22.7	116.02
1975[r]	1,202.1	823.0	414.3	22.3	127.18
1976[r]	1,274.7	879.9	451.7	22.4	133.88
1977	1,337.5	938.2	489.3	22.9	141.32

Source: Deflator Series: "Economic Report of the President," January 1978.
r Revised.

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

Calendar Years 1961 to Date
(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	10,406	1,175	6.5	11.3
1966	19,214	11,284	1,375	7.2	12.2
1967	19,447	11,439	1,484	7.6	13.0
1968	19,781	11,626	1,502	7.6	12.9
1969	20,167	11,895	1,402	7.0	11.8
1970	19,349	11,195	1,166	6.0	10.4
1971	18,529	10,565	951	5.1	9.0
1972	18,933	10,884	922	4.9	8.5
1973	19,820	11,633	948	4.8	8.1
1974	20,016	11,837	965	4.8	8.2
1975	18,347	10,679	942	5.1	8.8
1976	18,956	11,026	899	4.7	8.4
1977	19,554	11,480	890	4.6	7.8

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

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

AEROSPACE INDUSTRY AND ALL MANUFACTURING INDUSTRIES

Annual Average Employment and Payroll
Calendar Years 1961 to Date

Year	All Manufacturing Industries TOTAL[r]	Aerospace			Aerospace As Percent of All Manufacturing
		TOTAL	Production Workers	Other[b]	
EMPLOYMENT — Thousands of Employees					
1961	16,326	1,178	612	566	7.2%
1962	16,853	1,270	635	635	7.5
1963	16,995	1,267	625	642	7.5
1964	17,274	1,209	600	609	7.0
1965	18,062	1,175	597	578	6.5
1966	19,214	1,375	731	644	7.2
1967	19,447	1,484	804	680	7.6
1968	19,781	1,502	807	695	7.6
1969	20,167	1,402	746	656	7.0
1970	19,349	1,166	604	562	6.0
1971	18,529	951	480	471	5.1
1972	18,933	922	453	469	4.9
1973	19,820	948	475	473	4.8
1974	20,016	965	478	487	4.8
1975	18,347	942	455	487	5.1
1976	18,956	899	422	477	4.7
1977	19,554	890	412	478	4.6
PAYROLL — Millions of Dollars[a]					
1961	$ 89,800	$ 9,140	$ 4,342	$ 4,798	10.2%
1962	96,700	10,232	4,871	5,361	10.6
1963	100,600	10,173	4,588	5,585	10.1
1964	107,100	10,067	4,563	5,504	9.4
1965	115,500	10,188	4,504	5,684	8.8
1966	128,000	12,139	5,641	6,498	9.5
1967	134,100	13,727	6,382	7,345	10.2
1968	145,800	14,397	6,582	7,815	9.9
1969	157,500	14,649	6,401	8,248	9.3
1970	158,200	12,275	5,322	6,953	7.8
1971	160,300	10,480	4,409	6,071	6.5
1972	175,400	11,197	4,565	6,632	6.4
1973	196,200	12,257	5,114	7,143	6.2
1974	211,400	13,250	5,454	7,796	6.3
1975	211,700	14,561	5,822	8,739	6.9
1976	238,200	14,908	5,766	9,142	6.3
1977	267,300	15,948	6,173	9,775	6.0

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

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

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

r Revised.

FEDERAL BUDGET AND DOD OUTLAYS

Source: U.S. Department of Defense

GNP, FEDERAL BUDGET AND DEFENSE BUDGET

Selected Fiscal Years
(Billions of Dollars)

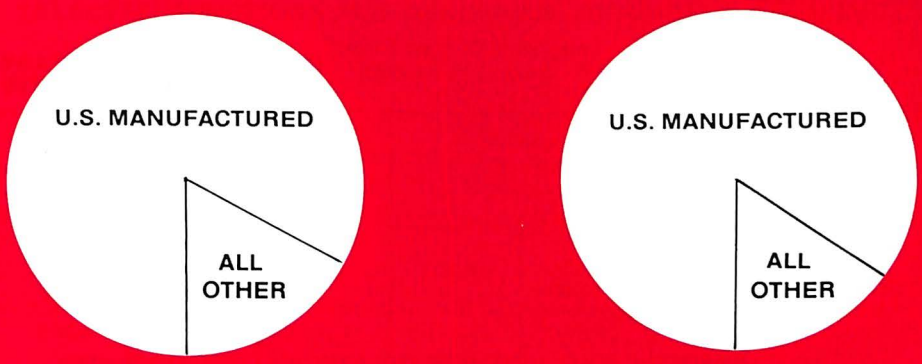
Year	GNP	Federal Budget Outlays			DOD Outlays as Percent of	
		NET TOTAL[a]	DOD	Others	GNP	Federal Budget
1950 - Lowest defense budget since World War II peak	$ 263.3	$ 43.1	$ 12.0	$ 32.8	4.5%	26.8%
1953 - Korea peak	358.9	76.8	47.5	31.3	13.3	60.3
1964 - Last prewar year	612.2	118.6	50.8	70.7	8.3	41.8
1968 - South East Asia peak	826.1	178.8	78.0	105.3	9.4	42.5
1973 - Actual	1,220.0	246.5	73.8	181.1	6.0	29.0
1974 - Actual	1,348.9	268.4	78.4	199.9	5.8	28.2
1975 - Actual	1,440.0	324.6	86.0	238.6	6.0	26.5
1976 - Actual	1,609.5	366.5	88.5	278.0	5.5	24.1
1977 - Actual	1,838.0	401.9	95.7	306.2	5.2	23.8
1978 - Budget Estimate	2,043.2	462.2	105.3	356.9	5.2	22.8
1979 - Budget Estimate	2,274.6	500.2	115.2	385.0	5.1	23.0

Source: Department of Defense, Budget Press Release, OASD (Comptroller) January 23, 1978.

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

WORLD AIRLINE FLEET

Total Turbojet Aircraft in Service



Source: Exxon, "Air World Survey"

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

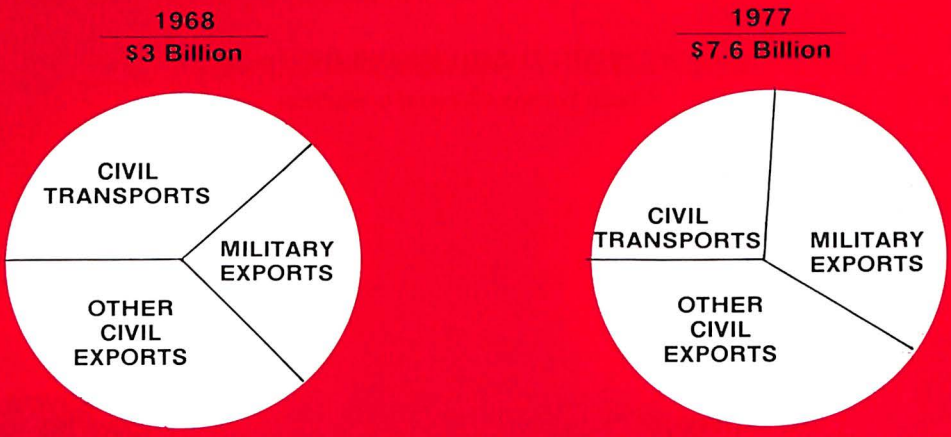
Calendar Years 1973 to Date

	1973	1974	1975	1976[a]	1977
TOTAL AIRCRAFT IN SERVICE . .	6,744	6,870	7,153	7,195	7,298
Number Manufactured in U.S.	4,452	4,561	4,866	4,891	5,027
Percent Manufactured in U.S.	66.0%	66.4%	68.0%	68.0%	68.9%
Turbojet Aircraft in Service	4,291	4,628	4,919	5,012	5,137
Number Manufactured in U.S.	3,575	3,842	4,129	4,237	4,345
Percent Manufactured in U.S.	83.3%	83.0%	83.9%	84.5%	84.6%
Turboprop Aircraft in Service	1,843	1,972	1,916	1,914	1,856
Number Manufactured in U.S.	485	525	497	455	429
Percent Manufactured in U.S.	26.3%	26.6%	25.9%	23.8%	23.1%
Turbine-Powered Helicopters in Service.	610	270[b]	318	269	305
Number Manufactured in U.S.	392	194	240	199	253
Percent Manufactured in U.S.	64.3%	71.9%	75.5%	74.0%	83.0%

Source: "Air World Survey," Exxon International Company, (Annually).
NOTE: In order to provide the most complete coverage possible, the Exxon "Air World Survey" has been used as a source. The "Air World Survey" covers the world's airlines with the exception of Aeroflot, the USSR national airline, and covers aircraft in service on June 30.

a Air taxi operators no longer included.
b Scheduled helicopter services only, starting in 1974.

AEROSPACE EXPORTS



Source: U.S. Department of Commerce

U. S. EXPORTS AND EXPORTS OF AEROSPACE PRODUCTS

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL Exports of U.S. Merchandise	Exports of Aerospace Products				
		TOTAL	Percent of Total U.S. Exports	Civil		Military
				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	106,102	7,792	7.3	2,397	2,926	2,469
1976[r]	113,319	7,843	6.9	2,468	3,200	2,175
1977	117,963	7,581	6.4	1,936	3,113	2,532

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

FEDERAL OUTLAYS
SELECTED FUNCTIONS AND AEROSPACE PRODUCTS & SERVICES

Fiscal Years[a] 1960 to Date
(Millions of Dollars)

Year	TOTAL National Defense	TOTAL NASA	Federal Outlays for AEROSPACE Products & Services			AERO-SPACE as Percent of Total National Defense and NASA
			TOTAL	DOD	NASA	
1960	$45,691	$ 401	$12,849	$12,502	$ 347	27.9%
1961	47,494	744	13,606	12,960	646	28.2
1962	51,103	1,257	15,135	13,992	1,143	28.9
1963	52,755	2,552	16,186	13,857	2,327	29.3
1964	53,591	4,171	17,938	14,205	3,733	31.1
1965	49,578	5,093	15,697	11,135	4,561	28.7
1966	56,785	5,933	17,771	12,411	5,360	28.3
1967	70,081	5,426	20,011	14,874	5,137	26.5
1968	80,517	4,724	21,355	16,757	4,598	25.1
1969	81,232	4,251	20,472	16,286	4,185	23.9
1970	80,295	3,753	18,747	15,048	3,699	22.3
1971	77,661	3,382	17,335	13,997	3,338	21.4
1972	78,336	3,422	16,999	13,627	3,372	20.8
1973	76,021	3,315	15,945	12,675	3,270	20.1
1974	78,569	3,256	15,782	12,601	3,181	19.3
1975	86,585	3,266	15,943	12,762	3,181	17.7
1976	89,996	3,669	16,843	13,295	3,548	18.0
Tr. Qtr.	22,518	952	3,944	3,018	926	16.8
1977	97,501	3,945	18,201	14,361	3,840	17.9
1978[E]	107,626	3,982	N.A.	N.A.	3,750	N.A.
1979[E]	117,779	4,270	N.A.	N.A.	4,116	N.A.

Source: "The Budget of the United States Government" (Annually).
NOTE: "National Defense" includes the military budget of the Department of Defense and atomic energy defense activities. "Total NASA" includes research and development activities, administrative operations and construction of facilities. NASA construction is not included in "Total Aerospace Products and Services."
a For an explanation of the change in the Federal Government's Fiscal Year and the Transition Quarter (Tr. Qtr.), see page 24.
E Estimate.
N.A. Not available.

FEDERAL OUTLAYS FOR AEROSPACE PRODUCTS AND SERVICES

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	Department of Defense				NASA
		TOTAL	Aircraft	Missiles	Astro-nautics	
1960	$ 12,849	$ 12,502	$ 6,904	$ 5,086	$ 512	$ 347
1961	13,606	12,960	6,445	5,997	518	646
1962	15,135	13,992	7,024	6,219	749	1,143
1963	16,186	13,857	6,853	6,058	946	2,327
1964	17,938	14,205	6,992	5,929	1,284	3,733
1965	15,697	11,135	6,217	3,997	921	4,562
1966	17,771	12,411	7,611	3,870	930	5,360
1967	20,011	14,874	9,459	4,432	983	5,137
1968	21,355	16,757	10,829	4,707	1,221	4,598
1969	20,472	16,286	10,208	4,919	1,159	4,185
1970	18,747	15,048	9,187	5,108	753	3,699
1971	17,335	13,997	8,330	5,148	519	3,338
1972	16,999	13,627	7,993	5,166	468	3,372
1973	15,945	12,675	7,102	5,061	512	3,270
1974	15,782	12,601	6,899	5,141	561	3,181
1975	15,943	12,762	7,182	5,065	515	3,181
1976	16,843	13,295	8,123	4,591	581	3,548
Tr. Qtr.	3,944	3,018	1,967	922	129	926
1977	18,201	14,361	8,784	5,040	537	3,840

Source: Department of Defense, Budget Press Briefing, January 23, 1978. NASA, Budget Briefing, January 23, 1978.
Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 24.

DEPARTMENT OF DEFENSE
AEROSPACE OUTLAYS

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	DOD Aerospace Outlays[a]		
	TOTAL	Procurement	Research, Development, Test and Evaluation
1960	$ 12,502	$ 9,299	$ 3,203
1961	12,960	8,870	4,090
1962	13,992	9,842	4,150
1963	13,857	10,126	3,731
1964	14,205	9,630	4,575
1965	11,135	7,296	3,839
1966	12,411	8,704	3,707
1967	14,875	10,341	4,534
1968	16,757	11,681	5,076
1969	16,286	11,686	4,600
1970	15,048	10,860	4,188
1971	13,997	9,771	4,226
1972	13,627	8,936	4,691
1973	12,675	8,089	4,586
1974	12,601	7,987	4,614
1975	12,762	8,373	4,389
1976	13,295	8,816	4,479
Tr. Qtr.	3,018	1,959	1,059
1977	14,361	9,389	4,972

Source: Department of Defense, OASD (Comptroller), FAD 748/77, September 30, 1977 and earlier reports.
a Excludes Military Assistance.
Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 24.

DEPARTMENT OF DEFENSE
TOTAL OUTLAYS BY FUNCTIONAL TITLE
Fiscal Years 1971 to Date
(Millions of Dollars)

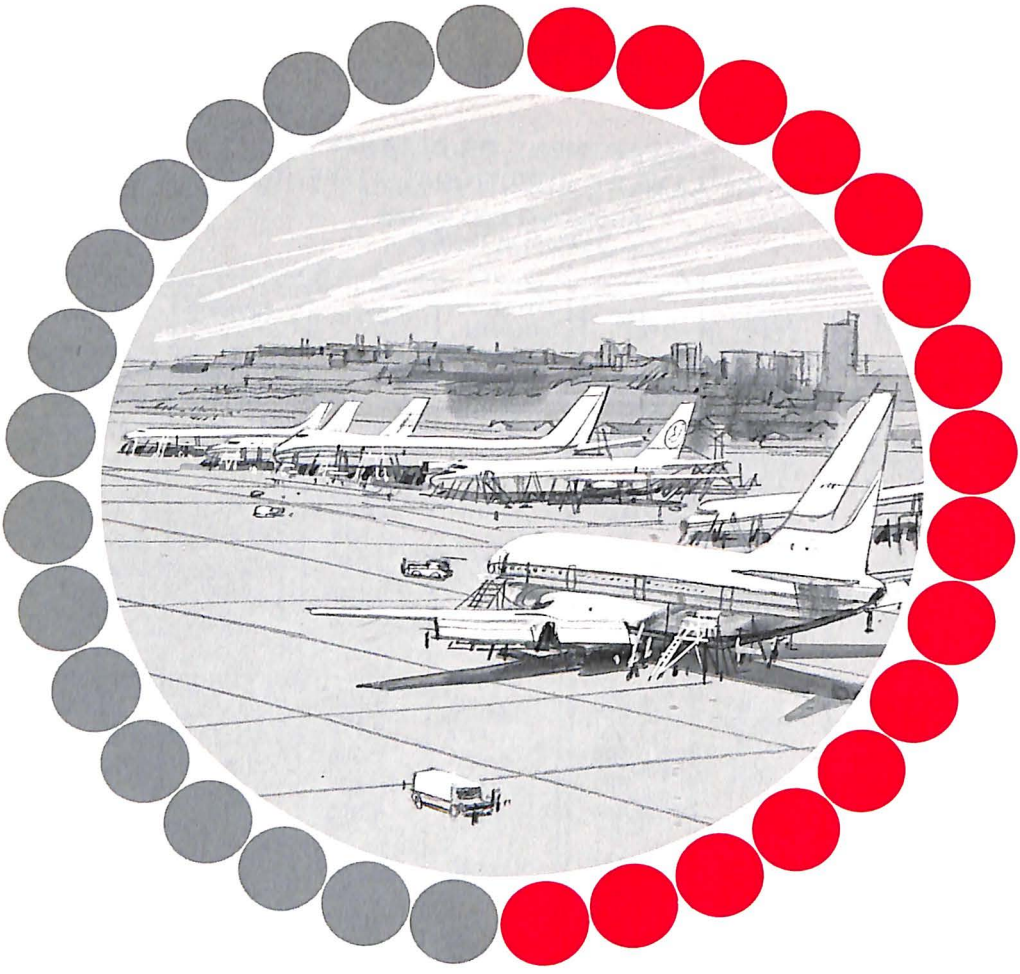
	1971	1972	1973
TOTAL	$ 74,546	$ 75,151	$ 73,297
PROCUREMENT – TOTAL	18,858	17,131	15,654
AIRCRAFT	6,631	5,927	5,066
MISSILES	3,140	3,009	3,023
Ships	2,114	1,978	1,982
Combat Vehicles, Weapons & Torpedoes	545	491	354
Ordnance, Vehicles & Related Equipment	3,586	3,040	2,508
Electronics & Communications	1,163	946	675
Other Procurement	1,679	1,740	2,046
RESEARCH, DEVELOPMENT, TEST & EVALUATION – TOTAL	7,303	7,881	8,157
AIRCRAFT	1,699	2,066	2,036
MISSILES	2,008	2,157	2,038
ASTRONAUTICS	519	468	512
Other	3,077	3,190	3,571
Military Personnel – TOTAL	26,018	26,921	27,635
Active Forces	21,428	21,629	21,722
Reserve Forces	1,204	1,407	1,523
Retired Pay	3,386	3,885	4,390
Military Construction	1,095	1,108	1,119
Family Housing	598	688	729
Civil Defense	75	75	74
Operations and Maintenance	20,941	21,675	21,069
Other	(342)	(328)	(1,140)

Source: Department of Defense, Budget Press Briefing, January 23, 1978.
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. Military Assistance Outlays are included in International Affairs Outlays.
Tr. Qtr. Transition Quarter: Until June 30, 1976, the fiscal years ran from July 1 to June 30. Beginning October 1, 1976, the fiscal years run from October 1 through September 30. A three-month "Transition Quarter" from July 1 through September 30, 1976 belongs to neither fiscal year.
E Estimate.
N.A. Not available.

DEPARTMENT OF DEFENSE
TOTAL OUTLAYS BY FUNCTIONAL TITLE (Continued)

Fiscal Years 1971 to Date
(Millions of Dollars)

1974	1975	1976	Transition Quarter	1977	1978E	1979E
$ 77,626	$ 85,020	$ 88,036	$ 21,927	$ 95,650	$ 105,300	$ 115,200
15,241	16,042	15,964	3,766	18,178	21,552	24,208
5,006	5,484	6,520	1,557	6,608		
2,981	2,889	2,296	402	2,781		
2,104	2,627	2,606	661	2,841		
446	395	240	134	833	N.A.	N.A.
2,044	1,492	856	150	940		
854	897	1,031	271	1,197		
1,806	2,258	2,415	591	2,978		
8,582	8,866	8,923	2,206	9,795	10,714	11,861
1,893	1,698	1,603	410	2,176		
2,160	2,176	2,295	520	2,259	N.A.	N.A.
561	515	581	129	537		
3,968	4,477	4,444	1,147	4,823		
28,856	31,210	32,359	8,305	33,931	36,043	36,988
22,150	23,235	23,259	5,846	23,857	24,864	24,919
1,579	1,733	1,804	512	1,858	1,968	1,947
5,127	6,242	7,296	1,947	8,216	9,211	10,122
1,407	1,462	2,019	376	1,914	1,919	1,976
884	1,124	1,192	296	1,358	1,455	1,436
75	86	80	18	93	98	98
22,478	26,330	27,902	7,261	30,587	33,494	36,454
103	(100)	(403)	(301)	(206)	25	2,179



AIRCRAFT PRODUCTION

As in previous years, aircraft manufacturing in 1977 constituted the principal element of the aerospace industry's workload. At $16 billion, or almost half of the industry's total sales, the 1977 sales figure represents a new peak—some $800 million or more than six percent above the previous year's total.

Among other statistical highlights of aircraft production in 1977 were these:

- Government sales totaled $8.5 billion, a new high which compares with $8 billion in 1976.
- Non-government sales were up some $300 million to $7.5 billion.
- The industry's backlog at year-end 1977 reached a new peak of $24.5 billion, a gain of $3.5 billion, due largely to a big jump in commercial transport orders.
- Aircraft deliveries of all types numbered 18,838, up 1,135 units from 1976. Deliveries of both military aircraft and commercial trans-

ports dropped well below the 1976 level, but these reductions were more than offset by increases in general aviation airplanes and commercial helicopters.

• General aviation shipments increased by almost 1,500 planes to a 1977 total of 16,920. Dollar value was more than $1.5 billion, up some $300 million from 1976.

• The industry produced some 884 helicopters valued at $316 million. The 1977 figures compare with 1976 shipments of 775 helicopters worth $305 million.

As had been expected, commercial transport sales declined in both dollar value and numbers delivered. The industry shipped 185 airplanes, compared with 238 in 1976; dollar value dropped to $2.9 billion from the previous year's $3.2 billion. The decline, however, was not indicative of a continuing trend; to the contrary, the commercial transport production curve appeared to be heading for a sharp upturn due to a flow of new orders in the latter part of 1977. Backlog at year-end 1977 was $8.9 billion, up from $5 billion at the end of 1976. U.S. airlines alone were expected to spend some $65 billion on new aircraft by 1990.

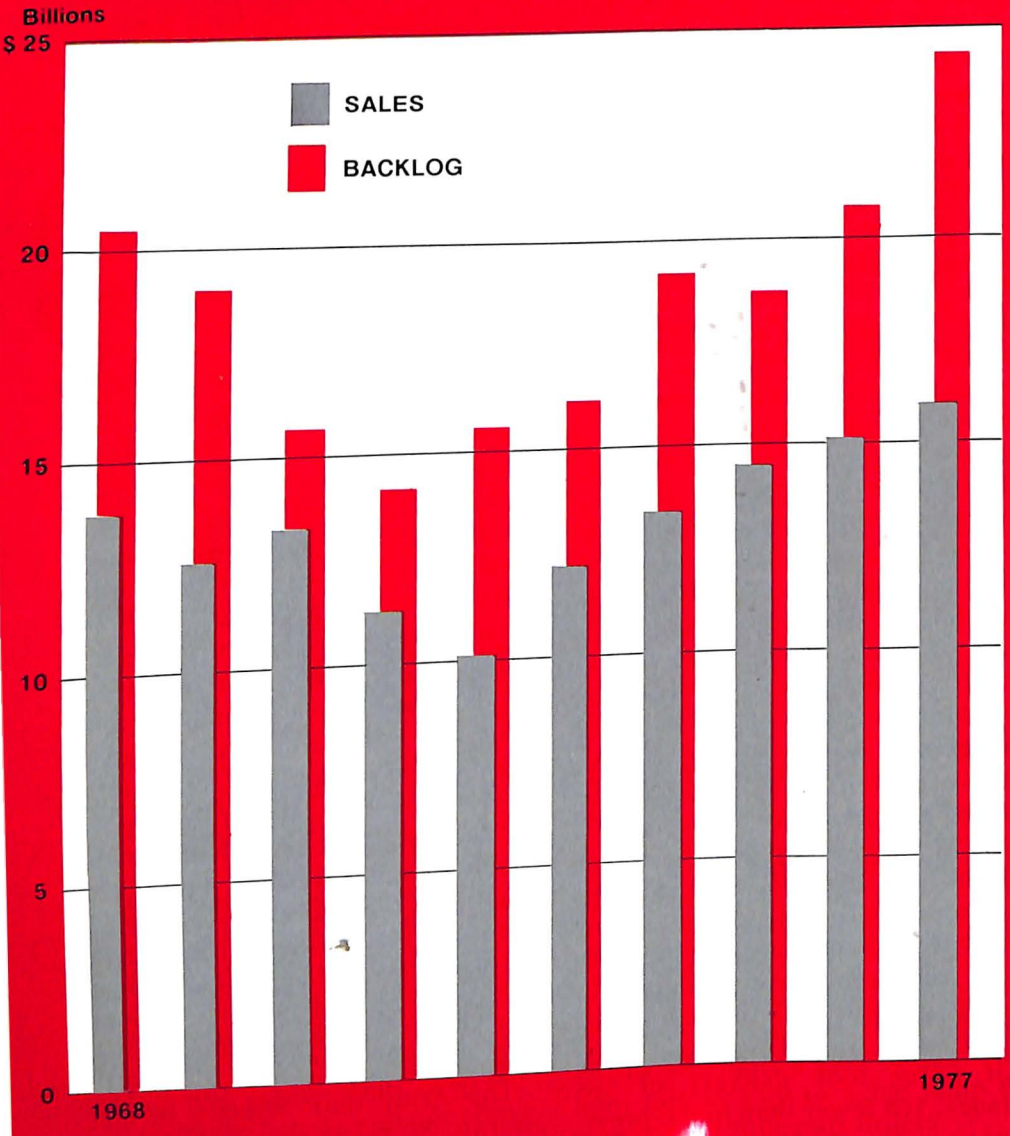
In military aircraft production, acceptances by all three services were down from 1976 levels. The Air Force took delivery of 184 planes, 108 fewer than in the previous year. Nearly all of the Air Force production was concentrated in two airplane types: the F-15 Eagle air superiority fighter and the A-10 close air support aircraft. The USAF also accepted 223 aircraft to be delivered to foreign governments, predominantly F-4E/F and F-5E/F fighters.

Air Force aircraft production was expected to increase with the 1978 entry into production status of the F-16 air combat fighter, scheduled for large-scale manufacture. Another new production airplane is the Advanced Tanker/Cargo Aircraft (ATCA), a derivative of the DC-10 commercial transport. Plans for production of the B-1 bomber were cancelled in 1977.

Navy acceptances in 1977 totaled 182 planes, down from 212 the previous year. Production was spread among 11 different types; largest in terms of numbers was the F-14 Tomcat fleet air superiority fighter. Other major production involved the S-3A Viking antisubmarine aircraft, the P-3C Orion patrol plane, the A-7E Corsair 2 and the A-4M Skyhawk attack aircraft. In preproduction status and scheduled for production under fiscal year 1979 funding is the Navy's F-18 Hornet fleet air defense fighter. Also slated for production is the LAMPS (Light Airborne Multi-Purpose System) helicopter designed for antisubmarine warfare.

The Army took delivery of 260 aircraft, 80 fewer than in 1976. Of the 1977 total, 242 were helicopters of which 170 of them were accepted in behalf of a foreign government.

AIRCRAFT SALES AND BACKLOG



Source: U.S. Department of Commerce

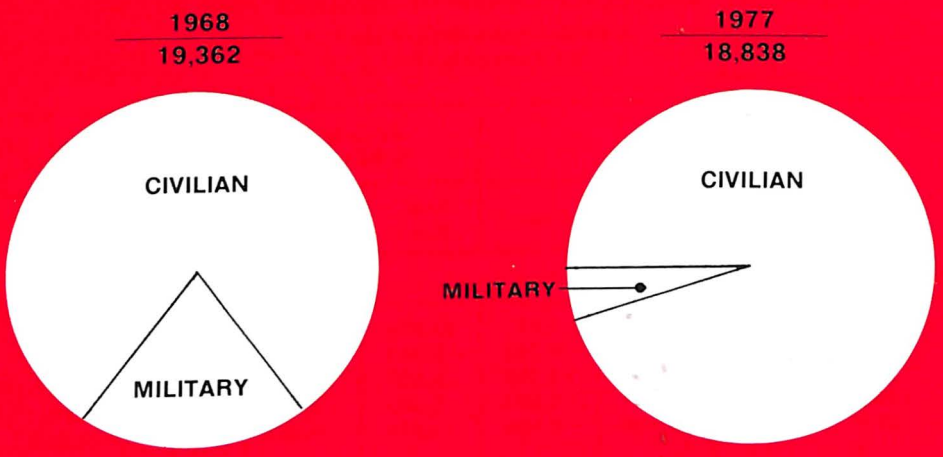
AIRCRAFT SALES AND BACKLOG
COMPLETE AIRCRAFT, AIRCRAFT ENGINES, AND PARTS

Calendar Years 1966 to Date
(Millions of Dollars)

Year	TOTAL			Aircraft & Parts[a]		Aircraft Engines & Parts	
	TOTAL	U.S. Gov't	Other	U.S. Gov't	Other	U.S. Gov't	Other
SALES							
1966	$ 8,725	$ 5,458	$ 3,267	$4,086	$ 2,544	$1,372	$ 723
1967	11,894	7,141	4,753	5,345	3,737	1,796	1,016
1968	13,850	7,411	6,439	5,697	5,188	1,714	1,251
1969	12,764	7,161	5,603	5,382	4,517	1,779	1,086
1970	13,466	7,586	5,880	5,674	4,683	1,912	1,197
1971	11,392	6,313	5,079	4,953	4,093	1,360	986
1972	10,153	4,954	5,199	3,666	4,085	1,288	1,114
1973	12,278	5,539	6,739	4,231	5,322	1,308	1,417
1974	13,542	5,982	7,560	4,562	5,846	1,420	1,714
1975	14,656	6,859	7,797	5,269	6,001	1,590	1,796
1976[r]	15,192	7,977	7,215	6,066	5,528	1,911	1,687
1977	16,050	8,543	7,507	6,683	5,585	1,860	1,922
BACKLOG—AS OF DECEMBER 31							
1966	$18,479	$ 8,761	$ 9,718	$6,515	$ 8,140	$2,246	$1,578
1967	19,699	— 19,699 —		6,753	8,887	— 4,059 —	
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[r]	20,879	11,950	8,929	9,905	7,416	2,045	1,513
1977	24,530	12,172	12,358	9,240	10,120	2,932	2,238

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

U.S. AIRCRAFT PRODUCTION



Source: AIA, GAMA, DOD

U.S. AIRCRAFT PRODUCTION

Calendar Years 1961 to Date
(Number of Aircraft)

Year	TOTAL	Civil	Military
1961	8,936	7,354	1,582
1962	9,213	7,238	1,975
1963	10,143	8,173	1,970
1964	12,517	10,078	2,439
1965	15,489	12,683	2,806
1966	20,283	16,674	3,609
1967	18,993	14,512	4,481
1968	19,362	14,922	4,440
1969	17,249	13,505	3,644
1970	11,161	8,076	3,085
1971	10,390	8,158	2,232
1972	12,693	10,576	2,117
1973	16,081	14,709	1,372
1974	16,345	15,325	1,110
1975	16,605	15,236	1,369
1976[r]	17,703	16,453	1,160
1977	18,838	17,965	873

Source: Aerospace Industries Association, company reports; General Aviation Manufacturers' Association, company reports; Department of Defense.
NOTE: As of 1972, aircraft produced for Security Assistance Programs are included.
r Revised.

CIVIL AIRCRAFT SHIPMENTS

Number and Value
Calendar Years 1961 to Date

Year	TOTAL	Transport Aircraft	Helicopters	General Aviation
NUMBER OF AIRCRAFT SHIPPED				
1961	7,354	198	378	6,778
1962	7,238	134	407	6,697
1963	8,173	100	504	7,569
1964	10,078	163	579	9,336
1965	12,683	233	598	11,852
1966	16,674	344	583	15,747
1967	14,512	480	455	13,577
1968	14,922	702	522	13,698
1969	13,505	514	534	12,457
1970	8,076	311	482	7,283
1971	8,158	223	469	7,466
1972	10,576	227	575	9,774
1973	14,709	294	770	13,645
1974	15,325	332	828	14,165
1975	15,236	315	864	14,057
1976	16,460[r]	238	775[r]	15,447
1977	17,989	185	884	16,920
VALUE—Millions of Dollars				
1961	$ 849	$ 725	$ N.A.	$ 124
1962	742	605	N.A.	137
1963	559	406	N.A.	153
1964	986	787	N.A.	199
1965	1,554	1,197	39	318
1966	2,183	1,699	40	444
1967	2,861	2,458	43	360
1968	4,267	3,789	57	421
1969	3,598	2,939	75	584
1970	3,546	3,158	49	339
1971	2,984	2,594	69	321
1972	3,308	2,660	90	558
1973	4,665	3,718	121	826
1974	5,090	3,993	189	908
1975	5,086	3,779	274	1,033
1976	4,726[r]	3,192	305[r]	1,229
1977	4,756	2,889	316	1,551

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

TRANSPORT AIRCRAFT ORDERS

Calendar Years 1973 to Date

Company and Model	Orders as of December 31				
	1973	1974	1975	1976	1977
TOTAL AIRCRAFT ON ORDER					
(Domestic and Foreign Orders)	573	564	381	326	466
VALUE (Millions of Dollars)[a]	$7,252	$7,587	$6,369	$5,070	$8,913
Boeing, TOTAL[b]	180	210	130	155	242
B-707	21	14	9	5	4
B-727	104	121	60	106	157
B-737	36	46	29	22	36
B-747	19	29	32	22	45
Lockheed, TOTAL	179	178	134	97	62
L-1011	142	112	81	70	61
L-100-30	—	15	12	1	—
C-130	37	51	41	26	1[b]
McDonnell Douglas[b], TOTAL	214	176	117	74	162
DC-9	83	91	65	47	101
DC-10	131	85	52	27	61
TOTAL FOREIGN ORDERS	378	356	258	163	233
VALUE (Millions of Dollars)[a]	$4,634	$5,293	$4,622	$3,113	$5,544
Boeing, TOTAL[b]	122	112	82	50	95
B-707	21	14	9	5	4
B-727	50	41	20	13	35
B-737	34	32	28	12	16
B-747	17	25	25	20	40
Lockheed, TOTAL	86	117	87	59	28
L-1011	54	55	36	32	27
L-100-30	—	11	10	1	—
C-130	32	51	41	26	1[b]
McDonnell Douglas[b], TOTAL	170	12	89	54	110
DC-9	78	58	40	30	69
DC-10	92	69	49	24	41

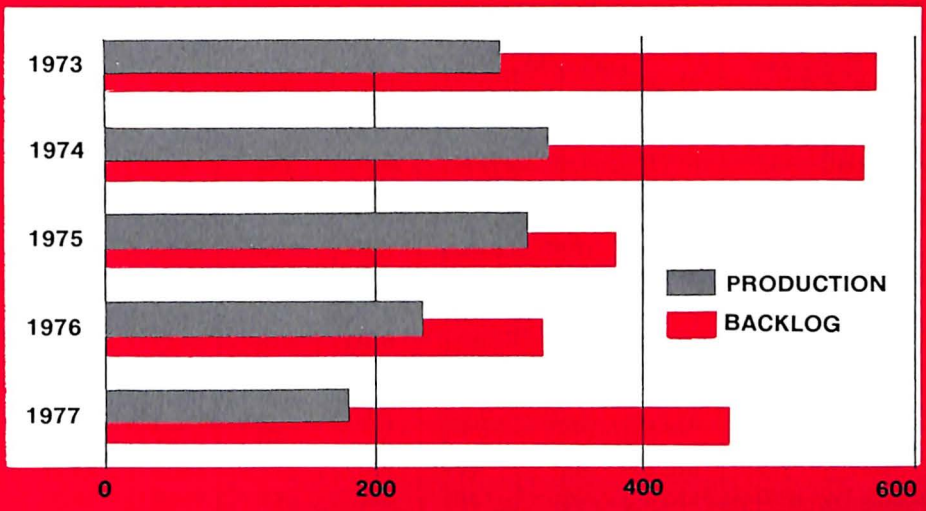
Source: Aerospace Industries Association, company reports.

a Dollar value excludes the cost of spare parts.

b Excludes options.

U.S. TRANSPORT AIRCRAFT PRODUCTION AND BACKLOG

Number of Aircraft



Source: Aerospace Industries Association

TRANSPORT AIRCRAFT PRODUCTION

Calendar Years 1973 to Date

Company and Model	1973	1974	1975	1976	1977
TOTAL					
Number of Aircraft Shipped	294	332	315	238	185
Value — Millions of Dollars	$ 3,718	$ 3,993	$ 3,779	$ 3,192	$ 2,889
Boeing — TOTAL	148	174	169	132	115
B-707	11	21	7	3	3
B-727	92	91	91	61	67
B-737	17	41	51	41	25
B-747	28	21	20	27	20
Lockheed — TOTAL	68	64	68	43	42
L-1011	39	41	25	16	11
L-100-30 (Hercules)	29	23	43	11	1
C-130 (Hercules)				16	30
McDonnell Douglas — TOTAL	78	94	78	63	28
DC-9	21	48	35	44	16
DC-10	57	46	43	19	12

Source: Aerospace Industries Association, company reports.
NOTE: Differs from FAA totals which include executive type aircraft.

U.S. HELICOPTER COMMERCIAL PRODUCTION

Calendar Years 1973 to Date

Company and Model	1973	1974	1975	1976[r]	1977
Number of Helicopters Shipped	770	828	864	775	884
VALUE (Millions of Dollars)	$ 121	$ 189	$ 274	$ 305	$ 316
Bell, Total	477	467	495	424[a]	374[b]
47 Series	92	3	3	11	*
204 Series	4	—	1	2	*
205 Series	29	26	40	36	28
206 Series	304	368	325	290	283
212 Series	48	70	126	71	47
214 Series	—	—	—	13	9
AH-1J	—	—	—	1	7
Boeing-Vertol, Total	2	11	10	11	12
CH-47C	2	11	10	11	12
Brantly-Hynes, Total	—	—	—	2	1
B-2B	—	—	—	2	1
Enstrom, Total	64	87	77	87	96
F-28A	64	86	59	4	1
F-28C	—	—	—	40	43
280	—	1	18	3	—
280C	—	—	—	40	52
Fairchild, Total	10	—	—	—	—
FH-1100	10	—	—	—	—
Hiller, Total	—	3	35	34	40
12-E	—	3	35	29	35
12-E4	—	—	—	2	—
12-E (Turbine)	—	—	—	3	5
Hughes, Total	211	248	214	204	336
300's	96	105	92	94	125
500's	115	143	122	110	211
Sikorsky (UTC), Total	6	12	33	13	25
S-61	6	12	13	13	25
S-64	—	—	3	—	—
S-65	—	—	17	—	—

Source: Aerospace Industries Association, company reports.
NOTE: All figures exclude the production by foreign licensees.
a Includes 6-206B and 1-AH-1J exported in a military configuration.
b Includes 17-205 (UH-1H) and 7-AH-1J exported in a military configuration.
* Out of production.

GENERAL AVIATION AIRCRAFT SHIPMENTS

By Selected Manufacturers
Calendar Years 1965 to Date

Year	TOTAL	Beech	Cessna	Gates Learjet	Grumman American	Piper	Rockwell Intl.	Other
NUMBER OF AIRCRAFT SHIPPED								
1965	11,852	1,192	5,629	80	–	3,776	110	1,065
1966	15,747	1,535	7,888	51	70	4,437	265	1,501
1967	13,577	1,260	6,233	34	52	4,490	386	1,122
1968	13,698	1,347	6,578	41	N.A.	4,228	471	1,033
1969	12,457	1,061	5,887	61	306	3,951	344	847
1970	7,283	793	3,730	35	217	1,675	211	622
1971	7,466	519	3,859	23	435	2,055	202	373
1972	9,774	802	4,964	39	620	2,461	242	646
1973	13,645	1,110	7,262	66	663	3,233	418	893
1974	14,165	1,303	7,187	66	628	3,415	545	1,021
1975	14,057	1,212	7,564	79	758	3,070	433	941
1976	15,447	1,220	7,888	84	762	4,042	595	856
1977	16,920	1,203	8,839	105	866	4,499	432	976
VALUE[a] (Millions of Dollars)								
1965	$318.3	$72.2	$97.2	$45.1	$ –	$61.7	$27.7	$14.4
1966	444.2	97.3	128.2	28.6	N.A.	80.1	51.5	58.5
1967	359.6	92.0	116.6	20.2	N.A.	79.4	31.8	19.6
1968	421.5	115.7	138.8	28.7	N.A.	85.5	22.3	30.5
1969	584.5	113.1	145.6	46.5	129.0	98.2	25.4	26.7
1970	339.4	80.7	97.2	26.9	42.2	48.5	20.1	23.8
1971	321.5	52.1	102.4	18.1	45.6	56.7	24.7	21.9
1972	557.6	113.3	183.2	35.1	58.4	72.3	60.9	34.4
1973	826.4	140.4	298.0	61.5	75.0	126.8	80.4	44.3
1974	907.7	170.2	313.9	66.0	67.6	131.7	125.2	33.1
1975	1,032.9	187.1	336.3	99.7	89.9	160.6	114.4	44.9
1976	1,228.8	236.1	382.7	120.0	112.1	209.6	119.2	49.1
1977	1,551.0	262.7	483.0	168.6	119.1	259.2	128.6	129.8

Source: Aerospace Industries Association and General Aviation Manufacturers' Association.
NOTE: "Other" includes Bellanca, Lake, Lockheed Jetstar, Maule, Mooney and Swearingen.
a Manufacturers' Net Billing Price.
N.A. Not available.

MILITARY AIRCRAFT PRODUCED

Number and Flyaway Value

Calendar Years 1961 to Date

Year	TOTAL	Bomber	Fighter/ Attack	Trans- port	Trainer	Heli- copter	Other
NUMBER							
1961	1,582	397	376	148	203	366	92
1962	1,975	398	437	256	211	554	119
1963	1,970	310	423	282	204	672	79
1964	2,439	362	586	254	191	1,007	39
1965	2,806	283	496	136	396	1,470	25
1966	3,609	214	627	142	442	2,164	20
1967	4,481	404	811	135	331	2,448	352
1968	4,440	34	1,007	18	292	2,800	289
1969	3,644	31	792	44	295	2,165	317
1970	3,085	66	734	37	173	1,944	131
1971	2,232	48	386	42	135	1,587	34
1972	2,117	13	563	29	148	1,312	52
1973	1,372	30	422	22	90	808	—
1974	1,110	50	478	27	49	506	—
1975	1,369	62	624	34	40	601	8
1976	1,143[r]	55	646	67	11	348	16
1977	849	44	478	22	12	273	20
FLYAWAY VALUE — Millions of Dollars							
1961	$4,497	$2,575	$1,054	$385	$200	$228	$55
1962	3,816	1,629	1,005	674	194	250	64
1963	2,876	798	931	587	182	337	41
1964	3,080	802	1,155	624	122	356	21
1965	2,875	639	960	655	108	490	23
1966	3,554	612	1,289	701	190	749	13
1967	4,476	822	1,721	759	144	962	68
1968	3,871	117	2,451	81	167	905	150
1969	3,693	248	2,204	101	164	845	131
1970	3,920	545	1,940	555	111	694	75
1971	2,996	397	1,322	688	112	469	8
1972[a]	3,247	129	2,068	536	100	396	18
1973[a]	2,571	325	1,490	348	140	268	—
1974[a]	2,224	584	1,222	101	111	206	—
1975[a]	3,172	599	2,054	128	27	359	5
1976	4,729[r]	547	3,421	340	27	384	10
1977	4,356	499	3,157	356	14	316	14

Source: Department of Defense.

NOTE: Data excludes gliders and targets, and includes spares, spare parts, and support equipment that are procured with the aircraft.
1961—1967, Navy attack planes included with bombers; 1968—1973, Navy attack planes included under fighter/attack.

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

r Revised.

MILITARY AIRCRAFT PRODUCTION
AIR FORCE ACCEPTANCES BY TYPE AND MODEL

Calendar Years 1976 and 1977
(Millions of Dollars)

Type and Model	Number		Flyaway Cost[a]		Weapon System Cost[b]	
	1976[r]	1977	1976[r]	1977	1976[r]	1977
AIR FORCE, TOTAL . . .	292	184	$ 1,739	$ 1,939	$ 1,858	$ 2,112
Fighter/Attack, TOTAL . .	247	178	1,609	1,707	1,722	1,878
A-7D	24	–	76	–	98	–
A-10A	17	56	107	298	119	350
F-4E	37	–	141	–	147	–
F-5E	58	–	88	–	95	–
F-15A/B	102	122	1,065	1,409	1,131	1,528
F-111F	9	–	132	–	132	–
Transport/Tankers, TOTAL	45	-0-	130	-0-	136	-0-
C-130H	24	–	115	–	121	–
C-12A	21	–	15	–	15	–
Command/Control, TOTAL	-0-	4	-0-	232	-0-	232
E-3A	–	4	–	232	–	232
Other Aircraft, TOTAL	-0-	2	-0-	2	-0-	2
UV-18B (U4B Type) . .	–	2	–	2	–	2

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. In the case of Security Assistance Programs, Aircraft Configuration & Equipage may vary greatly from country to country causing substantial differences in average unit costs.
a Flyaway Cost includes airframe, engines, electronics, communications, armament and other installed equipment.
b Weapon System Cost includes flyaway costs, initial spares, ground equipment, training equipment and technical data.

MILITARY AIRCRAFT PRODUCTION
REIMBURSABLE PROGRAMS[a] BY TYPE AND MODEL

Calendar Years 1976 and 1977
(Millions of Dollars)

Type and Model	Number of Aircraft Accepted		Flyaway Cost	Weapon System Cost
	1976[r]	1977	1977	1977
Security Assistance, TOTAL	299	223	$ 762	$ 796
Fighter/Attack, TOTAL	273	195	647	668
AU-23	15	–	–	–
A-37B	32	23	26	26
F-4E/F	118	58	280	288
F-5B	14	–	–	–
F-5E	69	77	193	199
F-5F	25	35	119	123
F-15A/B	–	2	29	32
Transport/Tankers, TOTAL	22	18	124	124
C-130H	13	18	124	124
KC-130H	2	–	–	–
KC-707-3J9C	7	–	–	–
Trainers, TOTAL	4	10	4	4
T-37C	–	7	4	4
T-41D	4	3	(b)	(b)

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. In the case of Security Assistance Programs, Aircraft Configuration & Equipage may vary greatly from country to country causing substantial differences in average unit costs.

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

b Less than $500,000.

MILITARY AIRCRAFT PRODUCTION
NAVY ACCEPTANCES BY TYPE AND MODEL
Calendar Years 1976 and 1977
(Millions of Dollars)

Type and Model	Number		Flyaway Cost[a]		Weapon System Cost[b]	
	1976	1977	1976	1977	1976	1977
NAVY, TOTAL	212	182	$ 1,471	$ 1,316	$ 1,724	$ 1,753
Patrol, Total	55	44	547	499	689	585
P-3C	11	11	134	148	152	173
S-3A	44	33	413	351	537	412
Attack, Total	81	69	410	258	351	312
A-4M	25	24	58	48	70	97
A-6E	11	6	105	37	54[r]	16
EA-6B	6	6	85	65	30[r]	62
A-7E	36	30	153	99	185	125
AV-8A	3	3	9	9	12	12
Fighters, Total	45	36	462	545	623	839
F-14A	45	36	462	545	623	839
Trainers, Total	7	2	27	10	33	12
TA-4J	2	–	3	–	3	–
TAV-8A	5	2	24	10	30	12
Helicopters, Total	24	31	25	4	28	5
AH-1T	–	7	–	3	–	4
UH-1N	24	24	25	1	28	1

Source: Department of the Navy
a Flyaway Cost includes airframe, engines, electronics, communications, armament and other installed equipment.
b Weapon System Cost includes flyaway items, initial spares, ground equipment, training equipment and other support items.
r Revised.

MILITARY AIRCRAFT PRODUCTION
ARMY ACCEPTANCES BY TYPE AND MODEL

Calendar Years 1976 and 1977
(Millions of Dollars)

Type and Model	Number		Flyaway Cost[a]	
	1976	1977	1976	1977
ARMY, TOTAL	340	260	$ 369	$ 324
Helicopters, Total	324	242	359	312
AH-1J	73	35	80	34
AH-1S	–	39	–	43
UH-1H	107	3	66	2
UH-1N	–	20[a]	–	18
OH-58A	16	–	3	–
CH-47C	17	10	55	33
214-A	111	110	155	150
214-C	–	25	–	32
Other, Total	16	18	10	12
C-12A	14	18	8	12
UV-18A	2	–	2	–
Accepted for Shipment to a Foreign Government, Total[b]	219	170	$ 249	$ 215
Helicopters, Total	219	170	249	215
AH-1J	73	35	80	33
UH-1H	19	–	12	–
OH-58A	16	–	2	–
214-A	111	110	155	150
214-C	–	25	–	32

Source: Department of the Army, Materiel Development and Readiness Command.
a Accepted for other Department of Defense branch.
b Included in ARMY, TOTAL.

DEPARTMENT OF DEFENSE
OUTLAYS FOR AIRCRAFT PROCUREMENT

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

Year	TOTAL DOD	Air Force	Navy	Army
1960	$ 6,272	$ 4,414	$ 1,765	$ 93
1961	5,898	3,926	1,832	140
1962	6,659	4,387	2,102	170
1963	6,309	3,747	2,328	234
1964	6,053	3,894	1,859	300
1965	5,200	3,115	1,739	346
1966	6,635	4,074	2,021	540
1967	8,411	4,842	2,607	962
1968	9,462	5,079	3,244	1,139
1969	9,177	5,230	2,821	1,126
1970	7,948	4,623	2,488	837
1971	6,631	3,960	2,125	546
1972	5,927	3,191	2,347	389
1973	5,066	2,396	2,557	113
1974	5,006	2,078	2,806	122
1975	5,484	2,211	3,137	136
1976	6,520	3,323	3,061	136
Tr. Qtr.	1,557	859	672	26
1977	6,608	3,586	2,721	301

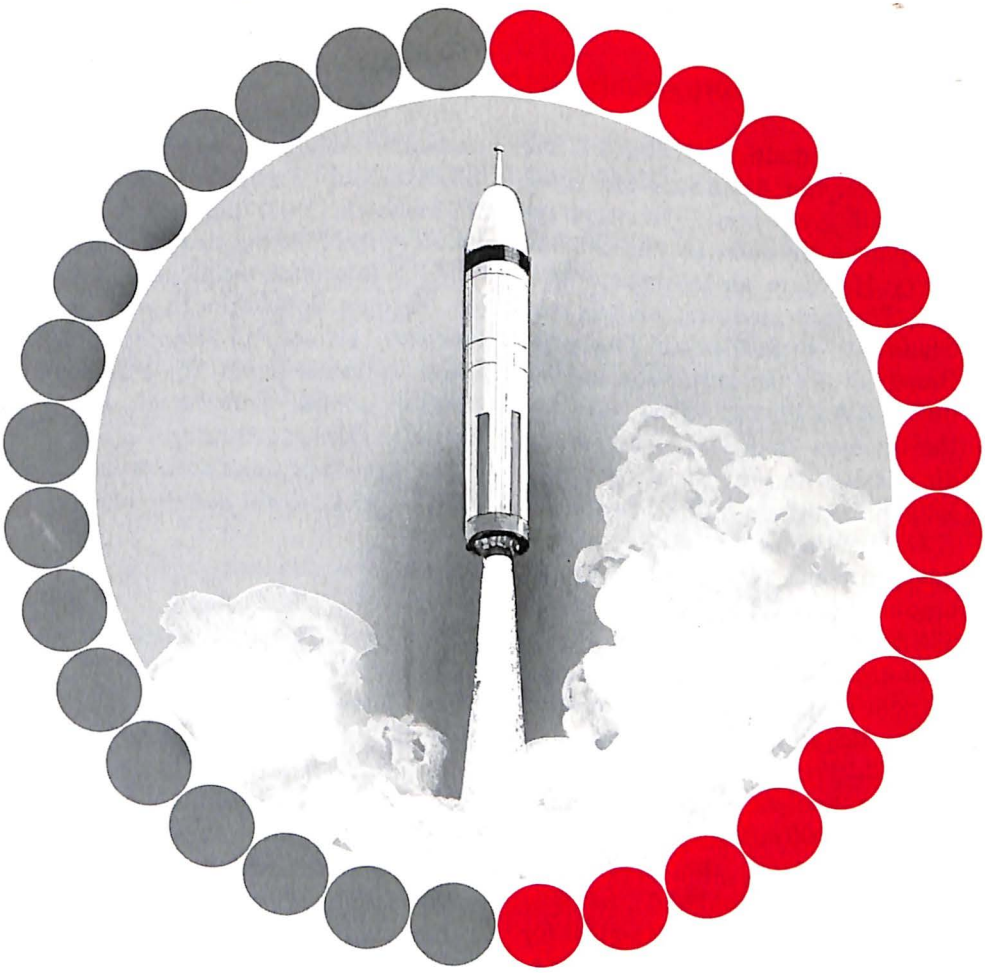
Source: Department of Defense, OASD (Comptroller), FAD 748/77, September 30, 1977 and earlier reports.
Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 24.

MILITARY AIRCRAFT PROGRAM PROCUREMENT INCLUDING INITIAL SPARES[a]

By Agency, Type and Model
Fiscal Years 1977, 1978 and 1979
(Millions of Dollars)

Agency, Type and Model	1977		1978[E]		1979[E]	
	No.	Cost	No.	Cost	No.	Cost
AIR FORCE						
A-10	100	$ 592.7	144	$ 814.3	162	$ 906.9
Adv. Tanker Cargo Aircraft (ATCA)	—	28.8	—	—	2	156.8
B-1 Bomber	3	1,073.0	—	—	—	—
C-130 Hercules	—	—	8	62.0	—	—
E-3A (AWACS)	6	459.5	3	272.9	3	245.5
EF-111A	—	—	1	35.2	5	188.8
F-15 Eagle	108	1,435.7	96	1,604.0	78	1,405.7
F-16 Air Combat Fighter	—	251.6	105	1,491.2	145	1,486.6
TR-1	—	—	—	—	—	10.2
NAVY						
A-4M Skyhawk	21	$ 83.2	—	$ 7.2	18	$ 116.9
A-6E Intruder	6	94.8	12	181.8	12	192.4
A-7E Corsair II	30	224.5	12	126.1	—	26.1
AH-IT Sea Cobra	23	64.3	8	31.2	—	—
CH-53E Sea Stallion	6	98.4	—	—	14	183.2
CTX	—	—	22	21.6	22	27.4
E-2C Hawkeye	6	156.5	6	196.6	6	207.8
EA-6B Prowler	6	135.5	6	141.4	6	172.5
EC-130Q Tacamo II	—	—	—	—	1	32.5
F-5F	3	13.9	—	—	—	—
F-14A Tomcat	36	697.3	44	856.0	24	671.9
F-18 Hornet	—	—	—	29.3	5	391.2
P-3C Orion	12	239.2	14	321.6	12	332.9
S-3A Viking	—	22.1	—	59.6	—	—
T-34C Mentor	33	13.7	13	18.6	—	1.3
T-44A Adv. Multi-Engined Trainer	20	15.5	23	17.7	—	0.8
UH-1N Iroquois	12	18.8	—	—	—	—
ARMY						
AH-1S Cobra/Tow	82	$ 124.1	83	$ 130.1	78	$ 140.7
Blackhawk	15	140.6	56	235.8	129	376.9
C-12A	20	16.9	20	17.2	—	—
CH-47C	—	—	—	—	16	78.4
UV-18A Twin Otter	—	—	2	2.6	—	—

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1979.
NOTE: For an explanation of the change in the Fiscal Year, see page 24.
a Total Obligational Authority.
E Estimate.



MISSILE PROGRAMS

In fiscal year 1977, industry sales of missile systems and parts (excluding propulsion units and support equipment) amounted to $3.3 billion, an increase of $229 million or about seven percent above the previous year's level. Year-end backlog, however, declined by more than $500 million.

Department of Defense (DoD) outlays for missiles totaled $5 billion in FY 1977. The figure represented an increase of some $500 million over FY 1976, but it was lower than any other year of the 1970s.

The funding increase in 1977 was due largely to higher levels of procurement, as missile research and development outlays remained at approximately the previous year's figure. Principal procurement programs involved two long-range strategic missiles, the USAF Minuteman III ICBM and the Navy Trident 1 submarine-launched ballistic missile.

Among other major missile sys-

tems in production during 1977/78 are these: the Air Force Maverick air-to-air weapon, the Army Chaparral air defense missile, the Navy Harpoon air-to-surface missile, Phoenix air-to-air missile and Standard surface-to-air weapon. Being jointly procured for use by both the Air Force and the Navy are the Sparrow and Sidewinder air-to-air missiles and the Shrike bomber-launched surface-to-air weapon.

DoD outlays for missile research, development, test and evaluation amounted to $2.2 billion in FY 1977, $36 million below the previous year. Although it is in production status, Trident 1 is also the heaviest-funded DoD development program in 1977/78. Trident 1, equipped with multiple nuclear warheads, has a range of 4,000 miles, compared with 2,500 miles for the operational Poseidon sub-launched ballistic missile. The Trident is designed for eventual use with a new submarine, but initially it will be "backfitted" into 12 Poseidon submarines, thus providing those submarines with an increase in operating range.

Another strategic missile in development status is the Air Force MX, a planned successor to Minuteman with a greater degree of survivability as well as improvements in throw-weight and accuracy.

Development of air-breathing cruise missiles was accelerated as a result of the cancellation of production plans for the B-1 bomber. In full-scale development in 1977/78 are two air-to-surface cruise missiles, the Air Force AGM-86 and an air-launched version of the Navy Tomahawk. DoD planned a competitive flyoff of the two systems in 1979 to determine the most effective for further development and production. Also in full-scale development is the Navy's sea-launched version of the Tomahawk. Additionally, DoD accelerated work on a third version of the Tomahawk, the Air Force Ground-Launched Cruise Missile.

Other missiles in development during 1977/78 include the Air Force/Navy Brazo air-to-air anti-radiation missile; the Navy HARM (High Speed Anti-Radiation) air-to-surface missile; the Navy Anti-ship Missile Defense system; the Army Patriot battlefield air defense system; and the Army Roland short-range air defense weapon. Development projects aimed at improving the Army's battlefield support and anti-armor effectiveness include the Pershing II, a nuclear-tipped intermediate range ballistic missile, the Hellfire helicopter-launched anti-armor weapon and the Viper anti-tank missile. In research status are the Air Force BDM (Bomber Defense Missile), an air-launched weapon which homes on enemy bombers, and the Air Force ASALM (Advanced Strategic Air-Launched Missile).

Another important area of R&D is the Space Defense Program, in which DoD is developing technology to deal with the threats posed by Soviet satellites and anti-satellite interceptors.

MISSILE PROGRAM PROCUREMENT INCLUDING INITIAL SPARES[a]

By Agency, Type and Model
Fiscal Years 1977, 1978 and 1979
(Millions of Dollars)

Agency, Type and Model	1977		1978[E]		1979[E]	
	Units	Cost	Units	Cost	Units	Cost
AIR FORCE						
AGM-86/AGM-109, ALCM	–	$ –	24	$ 104.6	36	$ 178.3
BGM-109, GLCM	–	–	–	–	–	40.1
LGM-30F/G, Minuteman II/III[b]	40	663.1	–	267.0	–	68.7
AGM-65 A/B, E/O Maverick	–	4.9	–	8.3	–	34.5
AGM-65C, Laser Maverick	–	1.5	100	49.9	–	–
Target Drones[c]	–	65.7	–	77.6	–	79.4
NAVY						
Poseidon	–	$ 17.7	–	$ 20.2	–	$ 24.4
Trident I	48	968.2	96	1,135.1	86	892.3
Harpoon	225	150.2	234	132.5	240	133.4
Phoenix	240	86.2	210	87.1	210	90.2
Shrike[d]	1,275	47.3	900	41.0	600	31.4
Sidewinder[d]	1,420	90.3	2,900	144.4	3,150	132.9
Sparrow[d]	1,380	152.9	1,725	177.8	2,010	195.0
Standard ER	36	46.8	40	49.7	40	53.7
Standard MR	330	55.5	480	104.8	480	94.4
ARMY						
Chaparral	2,000	$ 62.1	859	$ 30.7	–	$ 31.8
Dragon[e]	16,080	71.9	–	94.5	–	0.2
Hawk[e]	526	88.8	559	98.7	608	72.3
Lance	360	74.2	360	77.5	–	64.3
Patriot	–	–	–	–	–	67.3
Pershing	–	–	–	18.7	–	65.6
U.S. Roland	–	–	–	55.7	314	202.7
Stinger[e]	–	–	258	38.1	2,678	123.1
TOW[f]	13,051	100.1	12,261	79.5	–	50.6
AN/TSQ-73	12	43.5	9	39.8	–	–

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1979.

E Estimate.
a Total Obligational Authority.
b Includes force modernization.
c Includes Army and Navy procurement.
d Includes Air Force procurement.
e Includes Marine Corps procurement.
f Includes Navy and Marine Corps procurement.

MAJOR MISSILES
DEVELOPMENT, PRODUCTION AND OPERATION

Project	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR-TO-AIR					
BDM	USAF	R	Raytheon	—	Raytheon
Brazo	USAF/USN	D	Hughes	—	USAF/ADTC
Falcon	USAF	O	Hughes	Thiokol	Hughes
Super Falcon	USAF	O	Hughes	Thiokol	Hughes
Genie	USAF	O	McDonnell Douglas	Thiokol	—
Phoenix	USN	P	Hughes	RI/Rocketdyne	Hughes
Sidewinder-9G	USN	O	Raytheon	—	Raytheon
Sidewinder-9J	USAF	P	Ford Aerospace	—	Ford Aerospace
Sidewinder-9H	USN	O	NWC/Ford Aerospace	Bermite/ Rocketdyne	Ford Aerospace
Sidewinder-9L	USAF/USN	P	NWC/ Raytheon/ Ford Aerospace	Bermite/ Rocketdyne	Raytheon/ Ford Aerospace
Sparrow-7E	USN	O	Raytheon	RI/Rocketdyne	Raytheon
Sparrow-7F	USAF/USN	O	Raytheon/GD	Hercules	Raytheon/GD
AIR-TO-SURFACE					
ALCM	USAF	D	Boeing	Williams	McDonnell Douglas
ASALM	USAF	R	Martin Marietta	—	Raytheon
Bullpup A (12B)	USN	O	Numax	Thiokol	Numax
HARM	USN/USAF	D	NASC/TI	Thiokol	Texas Instruments
Harpoon	USN	P	McDonnell Douglas	Teledyne CAE	Texas Instruments/IBM
Hound Dog	USAF	O	RI	P&W	RI/Autonetics
Maverick	USAF	P	Hughes	Thiokol	—
Quail	USAF	O	McDonnell Douglas	General Electric	McDonnell Douglas
Shrike	USAF/USN	O	NASC/NWC	Aerojet	Texas Instruments
SRAM	USAF	O	Boeing	Thiokol	Singer
Standard ARM	USAF/USN	O	General Dynamics	NOTS	General Dynamics
Tomahawk	USAF	D	General Dynamics	Williams Research	McDonnell Douglas

NOTE: For footnotes, see page 48.

(Continued on next page)

MAJOR MISSILES
DEVELOPMENT, PRODUCTION AND OPERATION (Continued)

Project	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR-TO-SURFACE (Cont.)					
Walleye 1	USN	O	Martin Marietta/ Hughes	—	Martin Marietta/ Hughes
Walleye 2	USN	O	NAFI	—	NAFI
ANTI-SUBMARINE					
Subroc	USN	O	Goodyear Aerospace	Thiokol	Singer
SURFACE-TO-AIR					
Antiship Missile Defense	USN	D	General Dynamics	Bermite/ Rocketdyne	General Dynamics
Chaparral	Army	O	Ford Aerospace	RI/Rocket-dyne	GE/Raytheon
Improved Hawk	Army	O	Raytheon	Aerojet	Raytheon
Nike-Hercules	Army	O	Western Electric	Thiokol/ Hercules	BTL/Western Electric
Redeye	Army	O	General Dynamics	Atlantic Research	General Dynamics
Patriot	Army	D	Raytheon	Thiokol	Raytheon
Roland	Army	D	Hughes/ Boeing	Hercules	Hughes/ Boeing
Sea Sparrow	USN	O	Raytheon	Aerojet	Raytheon
Safeguard/Spartan	Army	P	BTL/Western Electric	Thiokol	BTL/Western Electric
Standard (MR)	USN	O	General Dynamics	Aerojet/ Hercules	General Dynamics
Standard (ER)	USN	O	General Dynamics	Atlantic Research	General Dynamics
Stinger	Army/USMC	D	General Dynamics	Atlantic Research	General Dynamics
Talos	USN	O	Bendix	Bendix	Bendix
Tartar	USN	O	General Dynamics	Aerojet	General Dynamics
Terrier	USN	O	General Dynamics	Atlantic	General Dynamics
Minuteman 2	USAF	O	AFLC Hill AFB	Thiokol/ Aerojet/ Hercules	RI/Autonetics

NOTE: For footnotes, see page 48.

(Continued on next page)

MAJOR MISSILES
DEVELOPMENT, PRODUCTION AND OPERATION (Continued)

Project	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
SURFACE-TO-SURFACE					
Minuteman 3	USAF	O	Boeing	Thiokol/ Aerojet	RI/Autonetics
Missile MX	USAF	D	AFRPL	Hercules	—
Polaris A2	USN	O	Lockheed MSC	Aerojet/ Hercules	GE/MIT/ Hughes/ Raytheon
Polaris A3	USN	O	Lockheed MSC	Aerojet/ Hercules	GE/MIT/ Hughes/ Raytheon
Poseidon	USN	O	Lockheed MSC	Thiokol/ Hercules	GE/MIT/ Hughes/ Raytheon
Tomahawk	USN	D	General Dynamics	Williams	McDonnell Douglas
Titan 2	USAF	O	AFLC Hill AFB	Aerojet	GM/Delco Electronics
Trident	USN	D	Lockheed MSC	Hercules/ Thiokol	C. S. Draper Lab
BATTLEFIELD SUPPORT AND ANTIARMOR					
Dragon	Army	O	Kollsman/ Raytheon	McDonnell/ Douglas Hercules	Raytheon
Hellfire	Army	D	RI	Thiokol	RI/Autonetics
Lance	Army	O	Vought	RI/Rocket-dyne	Arma/ E-Systems
Pershing 1-A	Army	O	Martin Marietta	Thiokol	Bendix
Pershing 2	Army	D	Martin Marietta	Thiokol	Goodyear Aerospace
Sergeant	Army	O	SR/Univac	Thiokol	SR/Univac
Shillelagh	Army	O	Ford Aerospace	Hercules	Ford Aerospace
TOW	Army	O	Hughes	Hercules	Emerson Electric
Viper	Army	D	General Dynamics	Atlantic Research	—
Hellfire	Army	D	Rockwell	Thiokol	RI/Autonetics

Source: Aerospace Industries Association, based on latest available information.
Status: R — Research
D — Development
O — Operational
P — Production

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

Year	TOTAL DOD	Procurement	Research, Development, Test and Evaluation
1960	$ 5,086	$ 3,027	$ 2,059
1961	5,997	2,972	3,025
1962	6,219	3,442	2,777
1963	6,058	3,817	2,241
1964	5,929	3,577	2,352
1965	3,997	2,096	1,901
1966	3,870	2,069	1,801
1967	4,432	1,930	2,502
1968	4,741	2,219	2,522
1969	4,919	2,509	2,410
1970	5,108	2,912	2,196
1971	5,148	3,140	2,008
1972	5,166	3,009	2,157
1973	5,061	3,023	2,038
1974	5,141	2,981	2,160
1975	5,065	2,889	2,176
1976	4,591	2,296	2,295
Tr. Qtr.	922	402	520
1977	5,040	2,781	2,259

Source: Department of Defense, OASD (Comptroller), FAD 748/77, September 30, 1977 and earlier reports.
NOTE: Does not include Military Assistance.
Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 24.

DEPARTMENT OF DEFENSE
OUTLAYS FOR MISSILE PROCUREMENT

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

Year	TOTAL DOD	Air Force	Navy	Army
1960	$ 3,027	$ 2,021	$ 423	$ 583
1961	2,972	1,922	493	557
1962	3,442	2,385	593	464
1963	3,817	2,676	718	423
1964	3,577	2,100	981	496
1965	2,096	1,320	522	254
1966	2,069	1,313	512	244
1967	1,930	1,278	432	220
1968	2,219	1,388	436	395
1969	2,509	1,382	534	593
1970	2,912	1,467	702	743
1971	3,140	1,497	791	852
1972	3,009	1,334	831	844
1973	3,023	1,454	628	941
1974	2,981	1,537	541	903
1975	2,889	1,602	615	672
1976	2,296	1,549	584	163
Tr. Qtr.	402	347	148	(93)
1977	2,781	1,502	905	374

Source: Department of Defense, OASD (Comptroller), FAD 748/77, September 30, 1977 and earlier reports.
NOTE: For data on research and development outlays for missiles, see page 102.
Tr. Qtr.: Transition Quarter. For an explanation of the Transition Quarter, and the change in the Federal Government's Fiscal Year, see page 24.

SALES AND BACKLOG
MISSILE SYSTEMS AND PARTS

Calendar Years 1961 to Date
(Millions of Dollars)

Year	Missile Systems and Parts	
	Net Sales	Backlog December 31
1961	$ 3,628	$ 2,873
1962	3,699	2,143
1963	3,318	2,146
1964	2,580	1,921
1965	2,082	2,394
1966	2,260	2,157
1967	2,877	3,121
1968	2,812	3,218
1969	2,676	2,511
1970	2,826	2,721
1971	2,641	3,344
1972	3,335	3,642
1973	3,391	3,868
1974	3,454	4,473
1975	3,548	4,580
1976[r]	3,054	4,379
1977	3,283	3,844

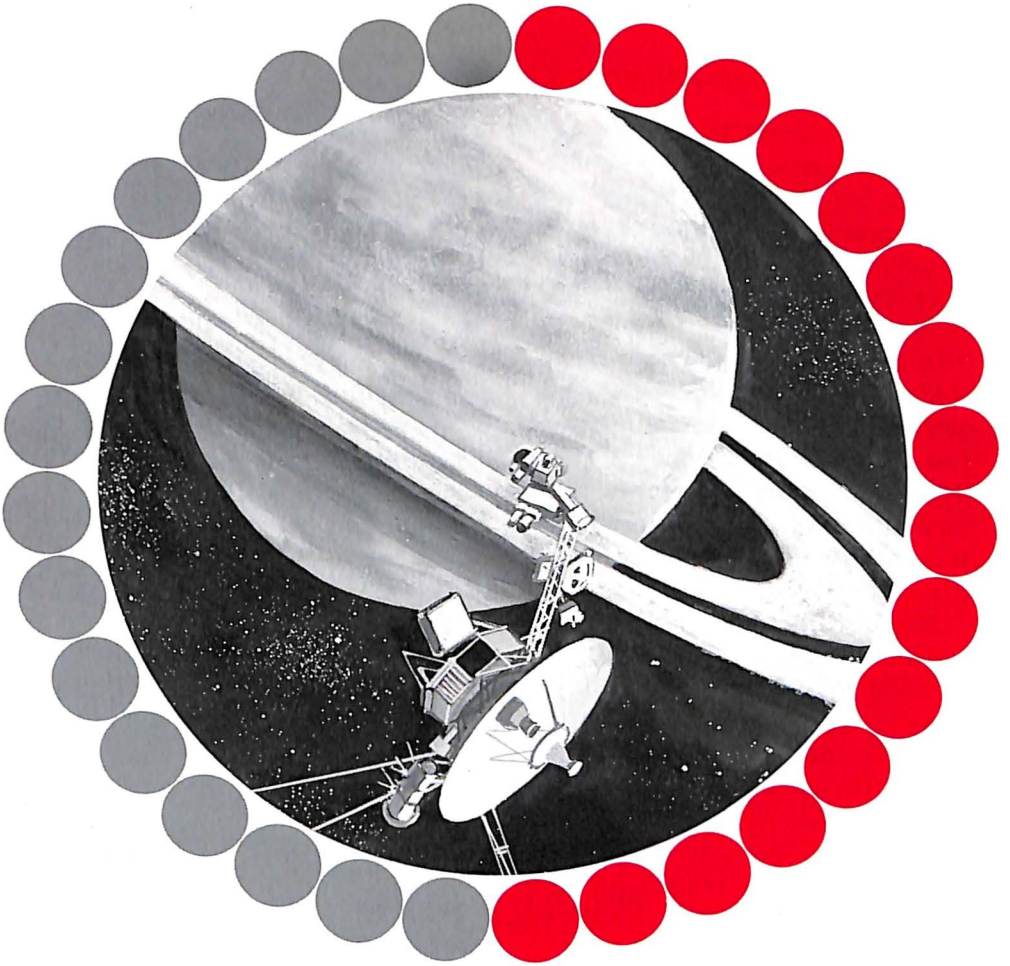
Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
NOTE: Based on data from about 70 companies engaged in the manufacture of aerospace products. Data exclude sales of military engines and propulsion units. See page 52.
r Revised.

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

Calendar Years 1961 to Date
(Millions of Dollars)

Year	Net Sales			Backlog, December 31		
	TOTAL	Military	Non-Military	TOTAL	Military	Non-Military
1961	$ N.A.	$ 784	$ (a)	$ N.A.	$ 367	$ (a)
1962	N.A.	1,060	(a)	N.A.	498	(a)
1963	1,675	1,153	522	888	699	189
1964	1,579	851	728	1,024	557	467
1965	1,288	560	728	883	513	370
1966	1,211	511	700	859	534	325
1967	978	441	537	609	405	204
1968	907	676	231	535	406	129
1969	702	667	35	497	485	12
1970	640	398	242	617	610	7
1971	605	596	9	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[r]	625	602	23	673	659	14
1977	491	463	28	582	565	17

Source: Bureau of the Census, "Current Industrial Reports," Series MQ37D (Quarterly).
NOTE: Based on data from about 70 companies engaged in the manufacture of aerospace products. The figures are inflated by the inclusion of subcontracts.
a Data included in totals for space vehicle systems. See page 68.
r Revised.
N.A. Not available.



SPACE PROGRAMS

U.S. space launch activity in 1977 remained at approximately the level of the preceding years of the 1970s. Including both NASA and military payloads, there were 24 launches during the year, of which two were interplanetary spacecraft.

Worldwide, 124 spacecraft were sent into Earth orbit or interplanetary trajectories. Of the total, 98 were launched by the Soviet Union and two by Japan. Several other nations sponsored or co-sponsored space payloads launched by NASA.

NASA's overall outlays in fiscal year 1977—predominantly for space activity but also including aeronautics, energy and other programs—totaled $3.9 billion. this represented an increase of $276 million over the previous fiscal year. Estimates for FY 1978 and 1979 indicated further moderate increases.

A highlight of the U.S. space program in 1977 was a series of atmospheric flights by the Shuttle Orbiter, the manned segment of NASA's Space Shuttle. Carried

aloft by a modified Boeing 747, the Orbiter *Enterprise* was released at altitude for glide approaches and landings at Dryden Flight Research Center, California. Five such flights were conducted in the latter part of the year.

In August and September, 1977, NASA continued its planetary exploration program with launches of two Voyager spacecraft. They will fly by and examine Jupiter in 1979, then proceed to Saturn for encounters with the ringed planet in 1980–81.

NASA launched 12 Earth-orbital spacecraft during 1977, all but one of them successful. Nine of the 12 were in the reimbursable category, wherein payload sponsors pay NASA for launch costs. Among the reimbursables were four communications satellites, one each for Intelsat, Indonesia, Japan and the North Atlantic Treaty Organization; three weather satellites for Japan, the European Space Agency and the U.S. National Oceanic and Atmospheric Administration; one Italian scientific satellite; and a U.S. military satellite. NASA's own payloads included HEAO-1, first of three High Energy Astronomical Observatories, and two International Sun-Earth Explorers (ISEEs), the latter part of a joint NASA-European Space Agency program aimed at better understanding of how the sun influences Earth weather, climate, ozone and energy production.

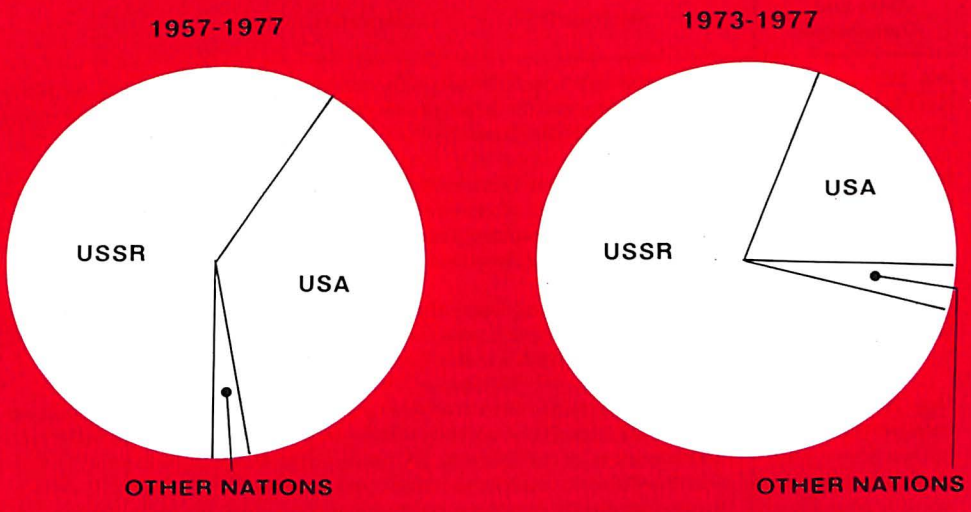
Among the unclassified military spacecraft launched in 1977 were two DSCS-II (Defense Satellite Communications Systems) satellites, a Navy transit navigation satellite, and the NTS-2 Navigation Technology Satellite, forerunner of the NavStar Global Positioning System in development.

NASA planned a higher level of launch activity for 1978 with 25 launches scheduled, 15 of them reimbursables and the rest NASA's own payloads, equally divided between scientific and applications systems.

The principal 1977/78 space development project of both NASA and the Department of Defense is, of course, the Space Shuttle. The principal components of the Shuttle system—the manned Orbiter, the solid rocket boosters, the huge external fuel tank to be used in the launch phase, and the Orbiter's propulsion system—are undergoing extensive ground testing preparatory to the first orbital flight of the complete Shuttle scheduled for the spring of 1979.

Manned space flight operations in 1977 were confined to the Soviet Union, which launched three Soyuz spacecraft, each crewed by two astronauts. The final flight of the year—Soyuz 26, launched December 10—continued well into 1978 and set a new record for manned duration in space. A day after launch, cosmonauts Yuriy Romanenko and Georgiy Grechko made rendezvous with the Salyut 6 space station and remained in space for 96 days 10 hours, surpassing the U.S. manned endurance record of 84 days.

SPACECRAFT LAUNCHINGS



Source: National Aeronautics and Space Administration

SPACECRAFT LAUNCHINGS WHICH ATTAINED EARTH ORBIT OR BEYOND

1957 to Date

Country	Total 1957 to 1977	1973	1974	1975	1976	1977
TOTAL	1,807	109	106	125	128	124
U.S.S. R.	1,075	86	81	89	99	98
United States	695	23	22	27	26	24
France	10	—	—	3	—	—
Japan	10	—	1	2	1	2
Italy	8	—	2	1	—	—
People's Republic of China	7	—	—	3	2	—
Australia	1	—	—	—	—	—
United Kingdon	1	—	—	—	—	—

Source: National Aeronautics and Space Administration.

NASA MAJOR LAUNCH RECORD, 1977

Date and Designation	Objectives
Jan. 28 NATO III B	To launch spacecraft into synchronous orbit over equator for use by NATO. Second of three planned NATO communication satellites launched by NASA for NATO.
Mar. 10 Palapa 2	To launch satellite into synchronous transfer orbit. Satellite to provide transmission of television, voice, and other data throughout Indonesia. Launched for Indonesia's satellite communication system. Successfully placed into transfer orbit.
Apr. 20 Geos	To launch satellite into synchronous transfer orbit. Spacecraft to provide data on magnetic and electric fields 36,000 k above Earth. Launched by NASA for the European Space Agency.
May 26 Intelsat IV-A F-4	To launch satellite into transfer orbit. Satellite to provide 6250 two-way voice circuits plus two television channels simultaneously or a combination of telephone, TV, and other forms of communications traffic. Third in a series of improved intelsat IV-A spacecraft with almost two-thirds greater communications capacity than Intelsat IV. Launched by NASA for ComSat Corp., manager of Intelsat.
June 16 Geos 2	To launch spacecraft into a synchronous orbit of sufficient accuracy to enable it to provide the capability for continuous observations of the atmosphere on an operational basis. Second operational spacecraft of a series of Geostationary Operational Environmental Satellites; launched by NASA for NOAA.
July 14 GMS (Himawari)	To launch satellite into a synchronous transfer orbit accurate enough to allow the spacecraft to enter a stationary synchronous orbit; day/night meteorological observation on nearly continuous basis, collection and transmission of data, monitor solar activities, and improve Japanese as well as international meteorological services. Launched by NASA for the National Space Development Agency of Japan (NASDA) as part of World Weather Watch program.
Aug. 12 HEAO 1	To obtain high resolution, experimental data on astrophysical phenomena by surveying the x-ray and gamma ray sky over the range from 150 electron volts to 10 million electron volts, measure size and location of x-ray sources in the range of 1 thousand to 15 thousand electron volts, determine the contribution of discrete sources to the x-ray background, and determine temporal behavior of x-ray sources; to demonstrate spacecraft capability of supporting the onboard experiments for six months. First in a series of three NASA High Energy Astronomical Observatories. Launched successfully into orbit, all experiments operational and returning excellent data. Largest Earth-oriented unmanned scientific satellite ever launched. Observatory configuration based on modular concept maximizing commonality among the three planned missions. During first 100 days of operation 15 previously unknown x-ray sources located. First six months to be spent mapping the sky.

(Continued on next page)

NASA MAJOR LAUNCH RECORD, 1977 (Continued)

Date and Designation	Objectives
Aug. 20 Voyager 2	To investigate the Jupiter and Saturn planetary systems and the interplanetary medium. Scientific objectives: To conduct comparative studies of the Jupiter and Saturn systems, including the environment, atmosphere, surface and body characteristics of the planets; one or more of their satellites; and the nature of Saturn's rings. First in twin Voyager series, following July 1979 Jupiter flyby, spacecraft will use gravitational assist of planet to change course to Saturn for projected 1981 rendezvous. Spacecraft may flyby Uranus in 1986.
Aug. 25 Sirio	To launch spacecraft into synchronous transfer orbit. Satellite to conduct various communications experiments. Launched by NASA for the Consiglio Nazionale delle Ricerche—National Research Council of Italy (CNR)—into successful transfer orbit.
Sept. 5 Voyager 1	To investigate the Jupiter and Saturn planetary systems and the interplanetary medium. Scientific objectives: To conduct comparative studies of the Jupiter and Saturn systems, including the environment, atmosphere, surface and body characteristics of the planets; one or more of their satellites; and the nature of Saturn's rings. Second in dual Voyager series. Following a Mar. 1979 flyby of Jupiter, spacecraft will alter course for a Nov. 1980 rendezvous with Saturn.
Oct. 22 ISEE 1	To measure the structure of the magnetosphere boundaries and their fluctuations from space and to obtain sample near-Earth measurements of the solar wind.
Oct. 22 ISEE 2	To measure the structure of the magnetosphere boundaries and their fluctuations from space and to obtain sample near-Earth measurements of the solar wind. Built for the European Space Agency by the STAR consortium, launched by NASA as a secondary payload.
Oct. 28 Transit	To place satellite into an orbit which will enable the Navy to provide a worldwide, two-dimensional system for position fixing to an accuracy of better than .5 k. Launched by NASA for the Navy Navigation Satellite System, referred to as Transit.
Nov. 23 Meteosat 1	To launch satellite into synchronous transfer orbit of sufficient accuracy to allow the spacecraft to achieve a stationary synchronous orbit. European contribution to the World Meteorological Organization's World Weather Watch program. Launched into successful transfer orbit by NASA for ESA.
Dec. 15 CS (Sakura)	To place satellite into a successful synchronous transfer orbit; development of a domestic communications satellite system for Japan; experimentation with K-band and C-band. Japanese National Space Development Agency (NASDA) Satellite launched into synchronous transfer orbit by NASA.

Source: National Aeronautics and Space Administration.
NOTE: For data for earlier years, see previous editions of "Aerospace Facts and Figures."

UNITED STATES SPACE LAUNCH VEHICLES

1977

Vehicle	Stages	Thrust (in kilo-newtons)	Payload (kg)	
			550 km Miles Orbit	Escape
Scout	1. Algol IIIA* 2. Castor IIA* 3. Antares IIB* 4. Altair III*	481.7 281.1 126.8 26.9	185	36.8
Thor-Delta 2900 Series	1. Thor plus nine TX354-5* 2. Delta (DSV-3) 3. TE 364-4	911.9 440.4 45.8 66.7	1,750	476
Atlas F/TE 364-4	1. Atlas Booster and Sustainer (Atlas F) 2. TE 364-4*	1,970.6 66.7	1,500	–
Atlas-Agena	1. Atlas Booster and Sustainer (SLV-3A) 2. Agena	2,237.5 71.2	2,720	454
Titan IIIB-Agena	1. LR-87 2. LR-91 3. Agena	2,353.1 444.8 71.2	3,600	–
Titan IIIC	1. Two 5-segment 3.05-m diameter* 2. LR-87 3. LR-91 4. Transtage	11,565.4 2,353.1 444.8 71.2	–	1,461
Titan IIID	1. Two 5-segment 3.05-m diameter* 2. LR-87 3. LR-91	11,565.4 2,353.1 444.8	11,100	–
Titan III (34)D	1. Two 5½-segment 3.05-m diameter* 2. LR-87 3. LR-91	11,540.4 2,353.1 444.8	12,750	–
Thor LV-2F	1. Thor 2. TE 364-4* 3. TE 364-15*	756.2 66.7 44.5	512	–
Thor SLV-2A/ Block 5D-2	1. Thor plus 3-TX 364-5* 2. TE 364-4* 3. TE 364-15*	756.2 689.5 66.7 44.5	653	–

Source: "Aeronautics and Space Report of the President" (Annually).
* Solid propellant, all others are liquid.

U.S. APPLICATIONS SATELLITES

1977

Launch Date	Name and Launch Vehicle	Remarks
COMMUNICATIONS SATELLITES		
Jan 28	NATO IIIB Thor-Delta (TAT)	Second of a new series.
Mar 10	Palapa 2 Thor-Delta (TAT)	Indonesian domestic communications.
May 12	DSCS II-7, 8 Titan IIIC	Defense communications.
May 26	Intelsat IV-A (F-4) Atlas-Centaur	Positioned over Atlantic.
Aug 25	Sirio Thor-Delta (TAT)	Italian experiment.
Dec 15	Sakura Thor-Delta (TAT)	Japanese experiment.
WEATHER OBSERVATION		
June 16	Geos 2 Thor-Delta	Second of this series.
July 14	Himawari Thor-Delta	Japanese geosynchronous satellite.
Nov 23	Meteosat Thor-Delta	European Space Agency geosynchronous satellite.
NAVIGATION		
June 23	NTS 2 Atlas F	Forerunner of Navstar Global Positioning System.
Oct 28	Transit Scout	Developmental model.

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

U.S.—LAUNCHED SCIENTIFIC PAYLOADS

1975-1977

Launch Date	Name and Launch Vehicle	Remarks
1975		
May 7	SAS-C (Explorer 53) Scout	Measure x-ray emission of discrete extra-galactic sources. (Italian-launched.)
June 21	OSO-8 Thor-Delta	To study minimum phase of solar cycle.
Aug. 9	COS-B Thor-Delta	Extraterrestrial gamma radiation studies. (ESA European satellite.)
Oct. 6	Atmosphere (Explorer 54) Thor-Delta	Photochemical processes in absorption of solar energy.
Nov. 20	Atmosphere (Explorer 55) Thor-Delta	Photochemical processes in absorption of solar energy. Measure spatial distribution of ozone.
1976		
Mar. 15	Solrad HiA/HiB Titan IIIC	Measure radiation and particles at close to 120,000 km circular.
May 22	P-76-5 Scout	Plasma effects on radar and communications.
July 8	SESP 74-2 Titan IIID	Particle measurements up to 8000 km.
1977		
Apr. 20	Geos Thor-Delta	European Space Agency, study of magnetic and electric fields from geosynchronous orbit (not attained).
Aug. 12	HEAO 1 Atlas-Centaur	X-ray and gamma ray astronomy.
Oct. 22	ISEE 1, 2 Thor-Delta	Magnetosphere and solar wind measurements (for NASA and European Space Agency respectively).

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

CHRONOLOGY OF MANNED SPACE FLIGHTS

Calendar Years 1974-1977

Launch Date	Project	Pilots	Nation	Duration
1974				
July 3	Soyuz 14	Pavel Popovich Yuriy Artyukhin	USSR	377 hr. 30 min.
Aug 26	Soyuz 15	Gennadiy Sarafanov Lev Demin	USSR	48 hr. 12 min.
Dec 2	Soyuz 16	Anatoliv Filipchenko Nikolai Rukavishnikov	USSR	142 hr. 24 min.
1975				
Jan 10	Soyuz 17	Aleksey Gubarev Georgiy Grechko	USSR	709 hr. 20 min.
Apr 5	Anomaly	Vasiley Lazarev Oleg Makarov	USSR	— 20 min.
May 24	Soyuz 18	Petr Klimak Viraliy Sevastyanov	USSR	1,511 hr. 20 min.
July 15	Soyuz 19	Aleksey Leonov Valeriy Rubasov	USSR	142 hr. 31 min.
July 15	Apollo	Thomas P. Stafford Donald K. Slayton Vance D. Brand	USA	217 hr. 28 min.
1976				
July 6	Soyuz 21	Boris Volynov Vitaliv Zholobov	USSR	1,182 hr. 24 min.
Sept 15	Soyuz 22	Valeriv Bykovskiy Vladimir Aksenov	USSR	189 hr. 54 min.
Oct. 14	Soyuz 23	Vyacheslav Zudov Valeriy Rozhdestvenskiy	USSR	48 hr. 06 min.
1977				
Feb 7	Soyuz 24	Viktor Gorbato	USSR	425 hr. 23 min.
Oct 9	Soyuz 25	Yuriy Glazkov Valeriy Ryumin Vladimir Kovalenok	USSR	48 hr. 46 min.
Dec 10	Soyuz 26	Yuriy Romanenko Georgiy Grechko	USSR	Continued into 1978

Source: "Aeronautics and Space Report of the President" (Annually).
NOTE: For data for earlier years, see previous editions of "Aerospace Facts and Figures."

U. S. SPACE FLIGHT TIME LOG

Calendar Years 1961 to Date

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

(Continued on next page)

U. S. SPACE FLIGHT TIME LOG (Continued)

Calendar Years 1961 to Date

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

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

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION OUTLAYS

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	Research and Development	Construction of Facilities	Research & Program Management
1960	$ 401	$ 256	$ 54	$ 91
1961	744	487	98	159
1962	1,257	936	114	207
1963	2,552	1,912	225	416
1964	4,171	3,317	438	416
1965	5,093	3,984	531	578
1966	5,933	4,741	573	619
1967	5,426	4,487	289	650
1968	4,724	3,946	126	652
1969	4,251	3,530	65	656
1970	3,753	2,992	54	707
1971	3,382	2,630	44	708
1972	3,422	2,623	50	749
1973	3,315	2,541	45	729
1974	3,256	2,421	75	760
1975	3,266	2,420	85	761
1976	3,669	2,749	121	799
Tr. Qtr.	952	731	26	195
1977[E]	3,945	2,980	105	860
1978[E]	3,982	2,961	132	889
1979[E]	4,270	3,204	154	912

Source: "The Budget of the United States" (Annually).
NOTE: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 24.
E Estimate.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
BUDGET AUTHORITY

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	Research and Development	Construction of Facilities	Research & Program Management
1960	$ 614	$ 333	$ 190	$ 91
1961	964	672	125	167
1962	1,825	1,285	326	214
1963	3,673	2,929	744	(a)
1964	5,099	3,890	713	496
1965	5,250	4,360	267	623
1966	5,175	4,502	61	612
1967	4,968	4,235	85	648
1968	4,589	3,912	38	639
1969	3,995	3,314	33	648
1970	3,749	2,993	53	703
1971	3,312	2,556	26	730
1972	3,308	2,523	53	732
1973	3,408	2,599	79	730
1974	3,040	2,194	101	745
1975	3,231	2,323	143	765
1976	3,552	2,678	82	792
Tr. Qtr.	932	700	11	221
1977	3,819	2,856	118	845
1978[E]	4,064	3,012	162	890
1979[E]	4,372	3,305	153	914

Source: "The Budget of the United States" (Annually).
NOTE: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 24.
a Included in Research & Development for one year.
E Estimate.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION RESEARCH AND DEVELOPMENT PROGRAMS BUDGET PLAN

Fiscal Year 1976 to Date
(Millions of Dollars)

	1976	Tr. Qtr.	1977	1978E	1979E
TOTAL	$ 2,677	$ 701	$ 2,883	$ 3,012	$ 3,305
Space Transportation Systems, TOTAL	1,561	407	1,764	1,752	1,828
Space Shuttle	1,206	321	1,413	1,349	1,439
Space Flight Operations	189	49	199	268	312
Expendable Launch Vehicles	166	37	152	135	77
Space Science, TOTAL	434	116	380	405	513
Physics and Astronomy	159	44	166	224	285
Lunar and Planetary Explorations	254	67	192	147	187
Life Sciences	21	5	22	34	41
Space and Terrestrial Applications, TOTAL	185	50	206	244	283
Space Applications	178	48	198	235	274
Technology Utilization	7	2	8	9	9
Aeronautics and Space Technology, TOTAL	256	65	278	333	375
Aeronautical Research and Technology	175	44	190	228	264
Space Research and Technology	75	19	82	98	108
Energy Technology Applications	6	2	6	7	3
Space Tracking and Data Systems, TOTAL	241	63	255	278	306

Source: NASA, Briefing on the Budget of the United States, January 23, 1978.
Tr. Qtr. Transition Quarter. For an explanation of the Transition Quarter and the change in the Fiscal Year, see page 24.
E Estimate.

OUTLAYS FOR SPACE ACTIVITIES

Fiscal Years 1960 to Date
(Millions of Dollars)

Year	TOTAL	NASA[a]	DOD[b]	AEC	Other
1960	$ 960	$ 401	$ 518	$ —	$ 41
1961	1,518	744	710	—	64
1962	2,418	1,257	1,029	130	2
1963	4,114	2,552	1,368	181	13
1964	5,970	4,171	1,564	220	15
1965	6,886	5,035	1,592	232	27
1966	7,719	5,858	1,638	188	35
1967	7,237	5,337	1,673	184	43
1968	6,667	4,595	1,890	146	36
1969	6,330	4,083	2,095	116	36
1970	5,453	3,565	1,756	103	29
1971	4,999	3,171	1,693	97	38
1972	4,772	3,195	1,470	60	47
1973	4,719	3,069	1,557	51	42
1974	4,854	2,960	1,777	39	78
Year	**TOTAL**	**NASA[a]**	**DOD[b]**	**ERDA[c]**	**Other**
1975	4,891	2,951	1,831	34	75
1976	5,321	3,227	1,983	23	88
Tr.Qtr.	1,341	850	460	5	26
Year	**TOTAL**	**NASA**	**DOD**	**Energy**	**Other**
1977	5,559	3,600	1,833	22	104

Source: 1960-1969: "The Budget of the United States" (Annually).
1970-Date: "Aeronautics and Space Report of the President" (Annually).

a Excludes amount for aircraft technology beginning with 1965.

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

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

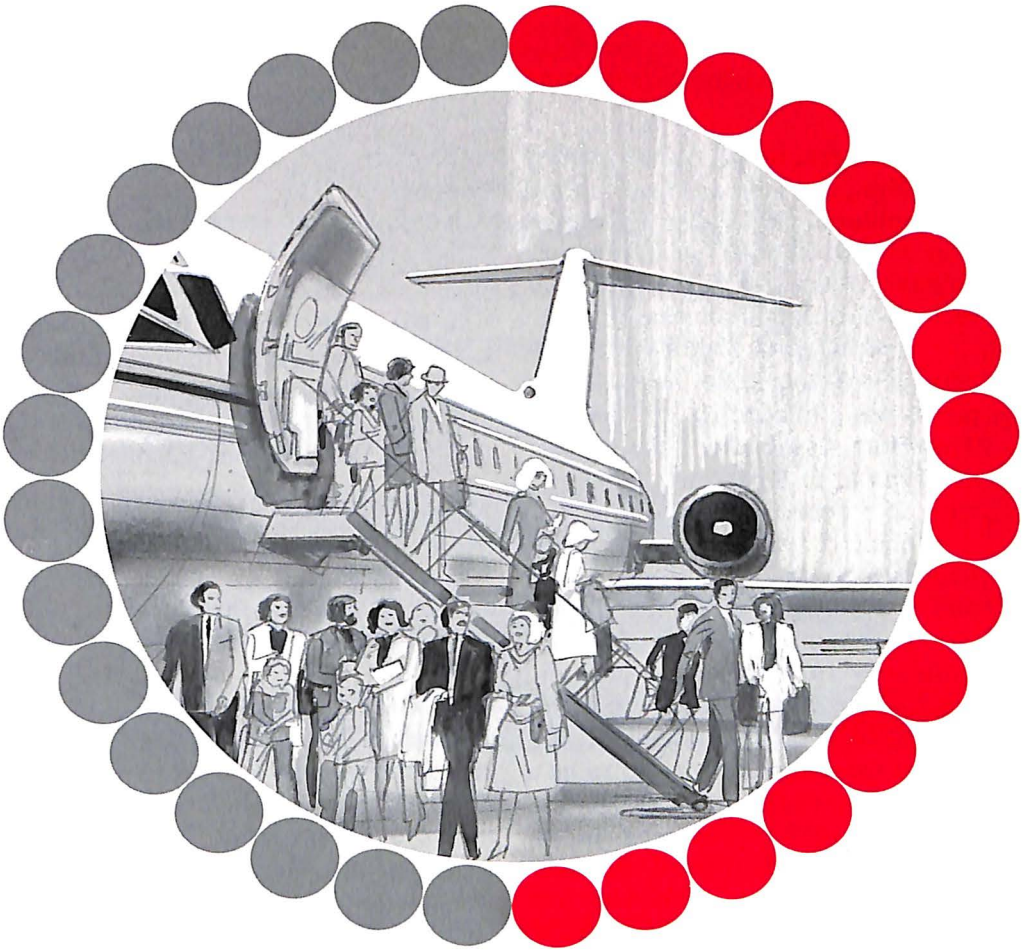
Tr. Qtr. Transition Quarter. For an explanation of the change in the Federal Government's Fiscal Year and the Transition Quarter, see page 24.

SALES AND BACKLOG
SPACE VEHICLE SYSTEMS

(Excluding Engines and Propulsion Units)
Calendar Years 1961 to Date
(Millions of Dollars)

Year	Net Sales			Backlog, December 31		
	TOTAL	Military	Non-Military	TOTAL	Military	Non-Military
1961	$ 775	$ 551	$ 224[a]	$ 586	$ 350	$ 236[a]
1962	1,319	712	607[a]	1,435	852	583[a]
1963	1,911	1,061	850	1,612	856	756
1964	2,222	732	1,490	1,611	391	1,220
1965	2,449	602	1,847	2,203	503	1,700
1966	2,710	734	1,976	1,494	428	1,066
1967	2,199	789	1,410	1,974	1,096	878
1968	2,357	899	1,458	1,329	834	495
1969	2,282	1,187	1,095	1,330	869	461
1970	1,956	1,025	931	1,184	786	398
1971	1,725	860	865	916	603	313
1972	1,656	905	751	959	646	313
1973	1,562	902	660	1,177	923	254
1974	1,751	944	807	1,492	1,131	361
1975	2,119	1,096	1,023	1,304	1,019	285
1976[r]	1,930	888	1,042	1,234	902	332
1977	1,969	884	1,085	1,555	1,165	390

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



AIR TRANSPORTATION

The U.S. scheduled airline industry in 1977 experienced another year of sharp improvement in its economic posture and posted new all-time records in several categories of performance measurement.

U.S. carriers boarded 240 million passengers during the year and flew more than 193 billion passenger miles. These figures represent increases of about eight percent above previous peak levels recorded in 1976. Other statistical highlights of the U.S. scheduled airlines' 1977 performance include:

• Cargo ton-miles increased some 400 million—7.7 percent—to a new high of 5.8 billion.

• Domestic flights accounted for more than 90 percent of all passengers boarded. Domestic passenger boardings of 222 million surpassed the previous record by about 16 million.

• U.S. international traffic continued to rebound from the sharp drops of the 1974–75 world recession years. In 1977, passengers car-

ried on international flights totaled 18 million, an increase of more than one million above the previous year's level. The 1977 performance, however, was still below the 1973 record of 18.9 million passengers.

• Overall load factor—the percentage of available seats occupied—was, according to the Air Transport Association, the highest in 10 years, 55.9 percent, compared with 55.5 percent in 1976.

• The U.S. commercial transport fleet numbered 2,747 aircraft at the end of 1977, 40 more than in 1976.

• The Civil Aeronautics Board estimated 1977 operating profit in domestic operations at $633 million.

Despite the high earnings level, capital formation continued to be a matter of concern for U.S. airlines. Profits in 1977 represented an encouraging trend toward financial stability, but they remained well below the level necessary to meet future capital investment needs. To meet anticipated passenger volume, and to replace older jet transports with quieter, more fuel-efficient aircraft, capital investment requirements through the 1980s are estimated at $65 billion.

Worldwide air traffic in 1977 showed an increase similar to that experienced by U.S. airlines. The International Civil Aviation Organization calculated the number of passengers carried by world scheduled services, including those of the Soviet Union, at 620 million—an increase of 7.6 percent over the 576 million passengers boarded in 1976.

Among other measurements of world airline performance were these:

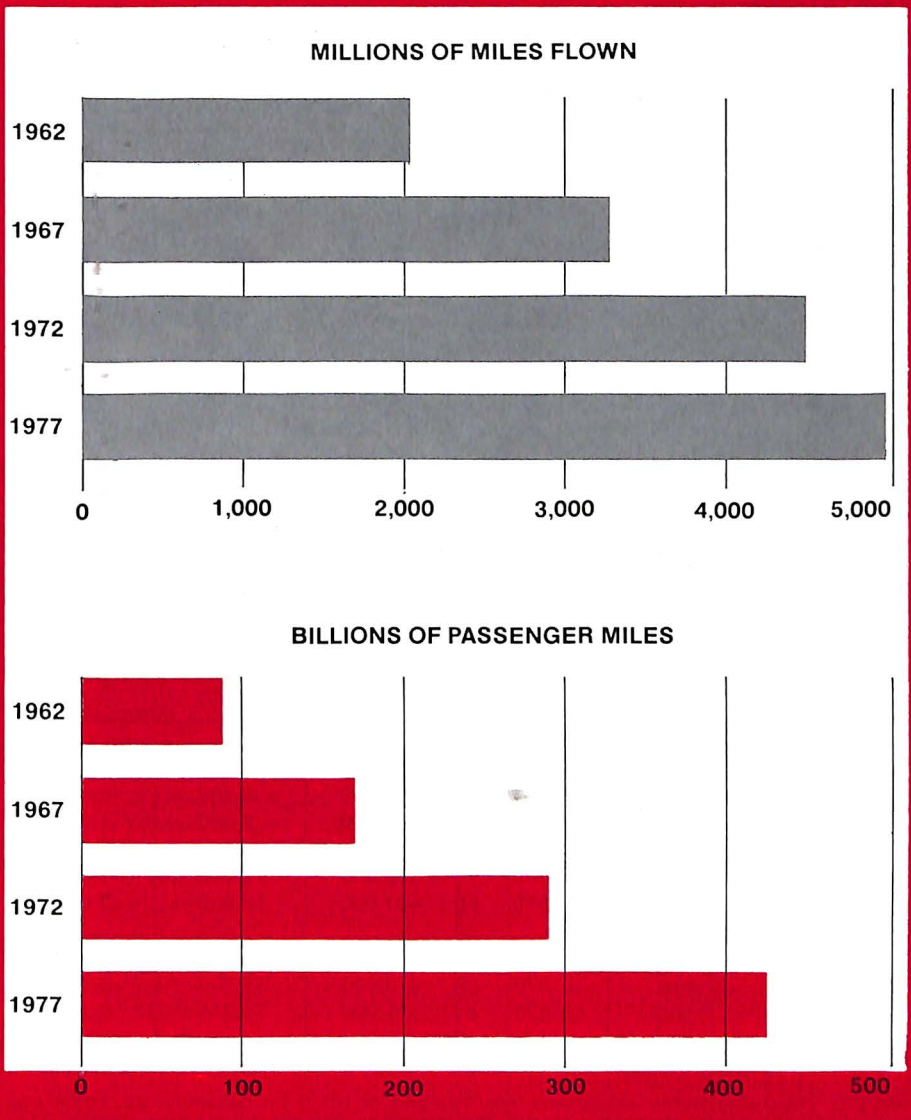
• Passenger miles topped the half-trillion mark for the first time. The 511 billion passenger miles flown in 1977 compared with 473 billion in the previous year.

• Cargo ton-miles climbed to almost 16 billion, from a 1976 level of 14.7 billion.

The world airline fleet of turbine-engined aircraft increased 7,298 in 1977, a gain of 103 airplanes. The new total included 5,137 turbojet-powered transports, 1,856 turboprops and 305 turbine-powered helicopters. Despite growing competition from their foreign counterparts, U.S. transport builders maintained their dominant position in the production of airline equipment; the proportion of U.S.-built jet aircraft in the world fleet increased to 84.6 percent, up from 84.5 percent in 1976.

In another area of air transportation, U.S. general aviation continued to grow. In 1976—the latest year for which figures are available—the active general aviation fleet increased by almost 10,000 airplanes, to a new record of 178,304. Of the total, some 145,000—more than 80 percent—were single engine aircraft; multi-engine planes numbered more than 25,000.

WORLD AIRLINE TRAFFIC



Source: ICAO

WORLD AIRLINE TRAFFIC
SCHEDULED SERVICES

Calendar Years 1960 to Date
(Millions)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles	Mail Ton-Miles
	Excludes U.S.S.R.				
1960	1,930	106	67,500	1,400	415
1961	1,940	111	72,500	1,615	490
1962	2,015	121	80,500	1,900	555
1963	2,130	135	91,500	2,130	590
1964	2,300	155	106,000	2,575	625
1965	2,550	177	123,000	3,290	755
1966	2,780	200	142,000	3,905	1,050
1967	3,280	233	169,500	4,470	1,295
1968	3,730	261	192,500	5,425	1,610
1969	4,170	293	218,000	6,685	1,720
1970	4,360	311	237,000	7,165	1,885
1971	4,390	333	252,000	7,870	1,750
1972	4,490	368	289,000	9,060	1,660
1973	4,680	405	323,000	10,680	1,700
1974	4,580	423	341,000	11,625	1,680
1975	4,670	436	357,000	11,810	1,660
1976[r]	4,870	475	392,000	13,170	1,740
1977[E]	4,970	514	426,000	14,350	1,810
	Includes U.S.S.R.				
1970	N.A.	382	286,000	8,230	2,110
1971	N.A.	411	307,000	9,060	1,970
1972	N.A.	450	348,000	10,290	1,900
1973	N.A.	489	385,000	12,015	1,970
1974	N.A.	515	407,000	13,030	1,970
1975	N.A.	534	433,000	13,260	1,990
1976[r]	N.A.	576	473,000	14,690	2,080
1977[E]	N.A.	620	511,000	15,950	2,160

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

NOTE: Excludes states which were not members of ICAO on December 31, 1977. Figures represent revenue traffic on international and domestic scheduled services.

r Revised.

E Estimate.

N.A. Not available.

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT

By Model
1973 to Date

	1973	1974	1975	1976[a]	1977
TOTAL AIRCRAFT IN SERVICE	6,744	6,870	7,153	7,195	7,298
Number Manufactured in U.S.	4,452	4,561	4,866	4,891	5,027
Percent Manufactured in U.S.	66.0%	66.4%	68.0%	68.0%	68.9%
Turbojets, TOTAL	4,291	4,628	4,919	5,012	5,137
Aerospatiale Caravelle	253	232	215	187	141
Aerospatiale Corvette	—	—	8	15	25
Airbus A300B	—	3	8	24	35
BAC-1-11	166	168	163	163	164
BAC VC10	34	33	25	26	22
BAC/Aerospatiale Concorde	—	—	—	6	8
Boeing 707/720	718	741	733	719	702
Boeing 727	935	1,032	1,140	1,185	1,228
Boeing 737	305	333	399	436	464
Boeing 747	208	232	253	268	291
Cessna Citation	—	6	15	5	5
Convair 880/990	72	27	26	18	15
Dassault-Brequet Falcon	—	—	—	—	45
Dassault Mystere	22	59	57	35	—
Dassault Mercure	—	—	9	10	10
Douglas DC-8	514	514	494	482	468
Douglas DC-9	650	678	706	758	774
Fokker-VFW F28	44	52	73	81	94
Gates Learjet	38	43	60	17	18
Grumman Gulfstream 2	3	3	7	4	5
Hawker Siddeley HS125	15	31	35	7	6
Hawker Siddeley Comet	25	19	15	17	16
Hawker Siddeley Trident	75	81	71	86	93
Ilyushin IL-62	19	24	25	26	26
Lockheed Jetstar	1	1	1	1	1
Lockheed L-1011	34	75	109	126	138
McDonnell Douglas DC-10	97	157	186	218	234
Rockwell Sabreliner	—	—	—	—	2
Tupolev TU-134	33	38	51	59	60
Tupolev TU-154	3	16	9	13	15
VFW-Fokker 614	—	1	2	6	5
Yakovlev 40	11	16	15	14	27
Other	16	13	9	—	—

(Continued on next page)

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT (Continued)

By Model
1973 to Date

	1973	1974	1975	1976[a]	1977
Turboprops, TOTAL	1,843	1,972	1,916	1,914	1,856
Aero Spacelines Guppy	–	–	2	2	2
Aerospatiale 262	31	25	28	28	34
AJ1 Turbo Star (Cessna 400)	–	–	–	–	4
Antonov 10/12	–	–	1	2	2
Antonov 24	45	55	45	54	54
BAC Britannia	15	10	10	23	26
BAC Vanguard	27	28	23	25	22
BAC Viscount	155	138	115	104	90
Beechcraft 99	102	113	129	136	111
Beech King Air	13	19	22	12	14
Beech Westwind	1	9	7	8	6
Canadair CL-44	27	30	26	27	24
Casa C-212	–	–	–	–	2
Convair 580	114	116	81	81	79
Convair 600/660	52	57	48	48	24
DHC Turbo Beaver	3	4	8	6	11
DHC Twin Otter	224	282	297	307	308
Embraer EMB 110	2	14	10	14	43
F-27/FH227	361	379	376	394	354
Fairchild Hiller Heliporter	–	–	–	–	2
Fairchild Swearingen Merlin	2	–	2	1	1
Fairchild Swearingen Metro	3	10	16	14	31
GAF Nomad	–	–	–	–	3
Grumman Goose	–	2	–	2	2
Grumman Gulfstream 1	2	1	2	2	3
Gruman Mallard	1	1	2	1	1
Handley Page Herald	31	31	26	29	29
Handley Page Jetstream	–	3	5	6	–
Hawker Siddeley Argosy	6	9	9	8	7
Hawker Siddeley 748	135	136	126	128	122
Ilyushin IL-18	73	74	80	88	84
J. A. Jetstream	–	–	–	–	7
Let 410	5	12	12	12	12
Lockheed Electra	114	112	102	102	96
Lockheed Hercules	32	30	29	32	40
Mitsubishi MU-2	6	4	6	15	17
NAMC YS-11	129	133	136	123	125
N. A. Commander	8	8	8	3	2
Pilatus Turbo-Porter	41	47	48	11	10
Piper Cheyenne	–	–	1	2	1
Potez 840	–	–	–	–	1
Saunders ST-27 Heron	2	4	5	7	4
Short Skyvann/Skyliner	29	41	39	35	32
Other	52	35	34	22	14

(Continued on next page)

WORLD AIRLINE FLEET
TURBINE-ENGINED AIRCRAFT (Continued)

By Model
1973 to Date

	1973	1974	1975	1976[a]	1977
Turbine-Powered Helicopters, TOTAL	610	270[b]	318	269	305
Aerospatiale Alouette	129	56	37	27	25
Aerospatiale SA-315B-LAMA	11	8	2	10	—
Aerospatiale Super Frelon	—	—	—	1	1
Aerospatiale Puma	—	—	—	—	20
Aerospatiale/Westland SA 330	10	9	26	17	—
Aerospatiale/Westland SA 341	5	1	1	1	—
Agusta Bell 204/206	16	—	—	—	—
Bell 204	59	6	16	5	8
Bell 205	50	19	37	26	31
Bell 206	67	65	58	53	71
Bell 212	23	11	13	8	10
Bolkow B-105	6	1	4	6	—
Fairchild-Hiller F-1100	22	1	4	1	—
Hughes 500	86	43	55	50	74
Kawasaki KV-107	3	—	—	—	—
MBB-105	—	—	—	—	6
Sikorsky S-58	23	13	14	17	14
Sikorsky S-55T	5	2	1	—	1
Sikorsky S-61	44	31	37	34	39
Sikorsky S-62	12	2	2	2	2
Sikorsky S-64	1	1	3	3	3
Westland WS-55/Wesser	36	—	4	—	—
Other	2	1	4	8	—

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

a Air taxi operators no longer included.
b Scheduled helicopter services only, starting in 1974.

AIRLINE TRAFFIC
UNITED STATES SCHEDULED AIRLINES

Calendar Years 1960 to Date
(Millions)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles[a]	Mail Ton-Miles[b]
1960	998	58	38,863	880	250
1961	970	58	39,831	1,023	308
1962	1,010	63	43,760	1,388	350
1963	1,095	71	50,365	1,346	368
1964	1,189	82	58,494	1,634	383
1965	1,354	95	68,676	2,270	494
1966	1,482	109	79,889	3,048	762
1967	1,834	132	98,484	3,537	985
1968	2,146	150	113,958	3,872	1,268
1969	2,385	159	125,414	4,443	1,345
1970	2,418	170	131,710	3,862	1,484
1971	2,379	174	135,652	4,637	1,327
1972	2,376	191	152,406	5,198	1,205
1973	2,448	202	161,957	5,283	1,209
1974	2,258	207	162,919	5,332	1,163
1975	2,241	205	162,810	5,090	1,110
1976	2,320	223	178,988	5,399	1,126
1977	2,419	240	193,219	5,815	1,161

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.
NOTE: Figures represent total scheduled service excluding nonrevenue operations of U.S. International and domestic certificated route air carriers.
a Includes freight plus express revenue ton-miles in scheduled and nonscheduled operations.
b U.S. mail ton-miles plus foreign mail ton-miles in scheduled and nonscheduled operations.

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

Year	Domestic		International	
	Passenger Miles Flown (Millions)	Passengers Carried (Thousands)	Passenger-Miles Flown (Millions)	Passengers Carried (Thousands)
1960	30,556.6	52,377	8,306.2	5,499
1961	31,062.3	52,712	8,768.5	5,699
1962	33,623.0	55,950	10,138.0	6,598
1963	38,456.6	63,925	11,905.4	7,513
1964	44,141.3	72,988	14,352.4	8,775
1965	51,887.4	84,460	16,789.0	10,195
1966	60,590.8	97,746	19,298.4	11,646
1967	75,487.3	118,669	23,259.3	13,424
1968	87,507.6	134,423	26,450.6	15,728
1969	95,945.8	142,340	29,468.3	16,848
1970	104,146.8	153,662	27,563.2	16,260
1971	106,293.9	156,098	29,357.9	17,569
1972	118,138.0	172,452	34,268.3	18,897
1973	126,317.3	183,272	35,640.0	18,936
1974	129,732.4	189,733	33,186.2	17,725
1975	131,728.4	188,746	31,081.7	16,316
1976	145,270.8	206,274	33,716.7	17,039
1977	156,609.3	222,283	36,609.6	18,043

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.
NOTE: Figures represent total scheduled passenger services excluding nonrevenue operations of certificated route air carriers.

U.S. AIRLINE FLEET
TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL
As of December 31, 1973 to Date

	1973	1974	1975	1976	1977p
TOTAL	2,599	2,472	2,672	2,707	2,747
Turbojets, TOTAL	2,145	2,078	2,171	2,205	2,254
Four-Engine, Total	750	632	602	583	543
Boeing 707/720	361	316	293	265	242
Boeing 747	111	104	98	105	107
Convair 880/990	45	5	—	—	—
Lockheed L-1329	—	1	1	2	—
McDonnell Douglas DC-8	233	206	210	211	194
Three-Engine, Total	872	923	994	1,022	1,074
Boeing 727	733	747	792	820	869
Lockheed L-1011	48	68	77	77	78
McDonnell Douglas DC-10	91	108	125	125	127
Twin-Engine, Total	523	523	575	600	637
Airbus A-300B	—	—	—	—	4
Boeing 737	152	150	147	152	161
BAC-111	31	36	30	31	31
Dassault MD-20, Falcon	—	—	44	43	45
DeHavilland DH-125	—	—	1	3	2
Grumman G-1159	—	—	2	4	5
Learjet LR-23	—	3	—	1	1
Learjet LR-24	—	—	—	—	1
Learjet LR-25	—	—	7	8	9
Learjet LR-35	—	—	1	4	6
McDonnell Douglas DC-9	340	334	341	352	366
Hamburger Flugzeugbau HF-320	—	—	1	1	3
Rockwell NA-265	—	—	1	1	2
Sud Aviation, SE210, Caravelle	—	—	—	—	1
Turboprops, TOTAL	304	266	273	260	269
Four-Engine, Total	74	67	68	69	63
Boeing 377S	1	—	—	—	—
Lockheed 188, Electra	53	48	48	49	43
Lockheed 382, Hercules	20	19	20	20	20
Twin-Engine, Total	230	199	205	191	206
Aero Commander AC-680-V	1	—	—	—	—
Beech 99	—	—	4	3	—
Convair 580	105	89	71	73	77
Convair 600/640	32	29	32	25	22
DeHavilland DHC-6	9	8	21	18	14

(Continue on next page)

U.S. AIRLINE FLEET
TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL (Continued)
As of December 31, 1973 to Date

	1973	1974	1975	1976	1977p
Fairchild F-27	25	15	10	7	4
Fairchild FH-227	31	33	29	27	23
Fairchild Swearingen SA-226	–	–	–	–	7
Grumman G-159	1	1	2	1	7
Hawker-Siddeley HS748	1	1	1	1	1
Nihon YS-11	23	21	23	23	22
Nord ND-262	–	–	10	12	24
Short SD-3	–	–	–	–	3
Short SC-7	2	2	2	–	–
Short SD-330	–	–	–	1	2
Piston-Engine, TOTAL	137	118	221	235	218
Four-Engine, Total	42	31	40	40	36
Boeing 377	1	–	–	–	–
Douglas DC-4	4	1	1	1	1
Douglas DC-6	31	28	36	36	33
Douglas DC-7	5	1	2	2	1
Lockheed 1049	1	1	1	1	1
Twin Engine, Total	80	75	173	184	181
Aero Commander 500/680E	1	2	3	3	–
Beech BE-18	–	1	3	4	1
Britten-Norman BN2	–	–	–	2	–
Cessna CE-310	1	1	–	–	–
Cessna 402	2	1	–	–	–
Cessna CE-421	–	–	1	–	–
Convair 340/440	6	6	14	15	15
Curtis CW-46	30	25	23	21	18
Dornier DO-28	–	–	–	1	–
Douglas DC-3	12	14	104	112	125
Fairchild FC-82	2	2	2	2	2
Grumman G-21/G-44/G-73	8	8	8	5	–
Martin 404	18	15	15	19	20
Single-Engine, Total	15	12	8	11	1
Helicopters, TOTAL	13	10	7	7	6
Turbine Engine, Total	10	10	7	6	6
Sikorsky S-61	7	7	7	6	6
Bell BL-206	3	3	–	–	–
Piston Engine, Total	3	–	–	1	–

Source: Department of Transportation, Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).
Note: Effective 1975, large air taxi aircraft (gross takeoff weight 12,500 pounds and over) are included.
p Preliminary

SOURCES OF OPERATING REVENUE
TOTAL DOMESTIC OPERATIONS[a], ALL AIR CARRIER SERVICES

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL Operating Revenues	Passenger	Mail (including subsidy)	Express and Freight	Excess Baggage	Other
1960	$ 2,129	$ 1,860	$ 113	$ 103	$ 21	$ 32
1961	2,245	1,951	130	115	20	29
1962	2,498	2,168	139	136	20	35
1963	2,722	2,375	143	152	17	35
1964	3,095	2,701	149	182	17	46
1965	3,608	3,142	157	220	12	77
1966	4,070	3,534	162	251	6	117
1967	4,887	4,260	170	287	7	163
1968	5,606	4,913	182	343	9	159
1969	6,438	5,662	186	401	10	179
1970	7,131	6,246	205	461	12	207
1971	7,753	6,736	227	527	13	250
1972	8,652	7,565	230	596	13	248
1973	9,694	8,379	263	694	14	344
1974	11,545	9,758	264	759	17	747
1975	12,020	10,123	253	782	19	843
1976[r]	13,901	11,856	294	933	22	796
1977[E]	15,409	12,873	365	1,290	20	861

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.
a Includes domestic trunks, local service, Intra-Alaska, Intra-Hawaii, helicopter, other carriers, all-cargo, and regional carriers.
E Estimate.
r Revised.

REVENUES AND EXPENSES
TOTAL DOMESTIC OPERATIONS[a], ALL AIR CARRIER SERVICES

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL Operating Revenues	TOTAL Operating Expenses	Operating Profit
1960	$ 2,129	$ 2,091	$ 38
1961	2,245	2,244	1
1962	2,498	2,408	90
1963	2,722	2,580	142
1964	3,094	2,778	316
1965	3,608	3,165	443
1966	4,070	3,589	481
1967	4,887	4,476	411
1968	5,606	5,298	308
1969	6,438	6,156	282
1970	7,131	7,128	3
1971	7,753	7,496	257
1972	8,652	8,158	493
1973	9,694	9,200	494
1974	11,545	10,760	785
1975	12,020	11,902	117
1976[r]	13,901	13,326	575
1977[E]	15,409	14,776	633

Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.
a Includes domestics trunks,local service, Intra-Alaska, Intra-Hawaii, helicopters, other carriers, all-cargo, and regional carriers.
E Estimate.
r Revised.

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

Fiscal Years[a] 1960 to Date
(Millions of Dollars)

Year	TOTAL NET ASSETS[b]	Value of Flight Equipment				Investment in Flight Equipment as a Percent of Total Assets
		TOTAL Gross Value	Less: Depreciation	Plus: Construction Work in Process	Equals: Net Value of Flight Equipment	
1960	$ 1,760	$ 2,174	$ 890	$ 90	$ 1,374	78.1%
1961	2,099	2,719	1,062	77	1,734	82.6
1962	2,273	3,006	1,183	52	1,875	82.4
1963	2,211	3,132	1,341	27	1,818	82.2
1964	2,415	3,383	1,402	48	2,029	84.0
1965	2,816	3,844	1,505	52	2,391	84.9
1966	3,747	4,520	1,646	107	2,981	79.6
1967	5,003	5,485	1,805	153	3,833	76.6
1968	6,294	6,936	2,044	204	5,096	76.6
1969	7,107	8,003	2,334	195	5,864	82.5
1970	7,417	8,546	2,814	298	6,030	81.3
1971	7,664	9,375	3,231	203	6,347	82.8
1972	8,017	9,813	3,484	200	6,529	81.4
1973	13,967	12,377	4,495	350	8,232	58.9
1974	14,979	13,288	4,846	194	8,636	57.7
1975	15,098	13,668	5,278	192	8,582	56.8
1976[r]	15,452	14,398	6,376	189	8,211	53.1
1977[E]	15,695	14,596	6,672	187	8,111	51.7

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

NOTE: 1960 through 1972: Includes data for trunk and local service carriers only; international carriers, helicopter service and air taxi operators excluded.
1973 to date: Pan American Airlines is reclassified as a trunk carrier. Data includes trunk, local service, helicopters, Alaskan, Hawaiian, regional, All-cargo, and "Other" carrier groups.

a Fiscal Years ending June 30.
b Comprises net investment in buildings and ground equipment, flight equipment, working capital, etc.
r Revised.
E Estimate.

ACTIVE CIVIL AIRCRAFT

as of December 31
Years 1960 to Date

Year	Active Civil Aircraft							
	TOTAL	TOTAL 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	78,760	2,211	76,549	7,243	34,829	33,472	634	371
1961	82,853	2,221	80,632	8,401	38,206	32,800	798	427
1962	86,287	2,166	84,121	9,186	41,120	32,341	967	507
1963	87,267	2,179	85,088	9,695	42,657	30,977	1,171	588
1964	90,935	2,193	88,742	10,644	45,777	30,367	1,306	648
1965	97,741	2,299	95,442	11,977	49,789	31,364	1,503	809
1966	107,085	2,379	104,706	13,548	52,972	35,687	1,622	877
1967	116,781	2,595	114,186	14,651	56,865	39,675	1,899	1,096
1968	127,164	2,927	124,237	16,760	60,977	42,830	2,350	1,320
1969	133,814	3,008	130,806	18,111	63,703	45,001	2,557	1,434
1970	134,539	2,796	131,743	18,291	64,759	44,884	2,255	1,554
1971	133,869	2,721	131,148	17,855	64,464	44,792	2,352	1,685
1972	147,695	2,685	145,010	19,849	70,998	49,448	2,787	1,928
1973	156,207	2,667	153,540	21,929	74,831	51,386	3,143	2,251
1974	164,160	2,658	161,502	23,418	78,924	53,008	3,610	2,542
1975	171,156	2,681	168,475	24,559	82,261	54,390	4,073	2,832
1976	180,854	2,550	178,304	25,684	88,211	56,730	4,505	3,174

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

a Registered, not necessarily in operation. Includes helicopters.
b Includes autogiros; excludes air carrier helicopters.
c Includes gliders, dirigibles and balloons.

ACTIVE AIRMAN CERTIFICATES HELD

as of December 31
1973–1977

	1973[a]	1974	1975	1976	1977
Pilots, TOTAL	714,607	733,728	728,187	744,246	783,933
Students	181,905	180,795	176,978	188,801	203,510
Private	298,921	305,848	305,863	309,005	327,424
Commercial	182,444	192,425	189,342	187,801	188,763
Airline	38,139	41,002	42,592	45,072	50,149
Helicopter (only)	5,968	5,647	4,932	4,804	4,819
Glider (only)[b,c]	4,288	4,824	5,348	5,789	6,208
Other Pilot[b,c]	2,942	3,187	3,132	2,974	3,060
Non-Pilots, TOTAL	304,747	314,394	323,934	334,681	348,584
Mechanics[b]	193,337	198,863	205,436	212,303	220,768
Parachute Rigger[b]	6,941	7,800	8,327	8,718	8,994
Ground Instructor[b]	46,827	49,249	51,365	53,464	55,717
Dispatcher[b]	5,527	5,576	5,741	5,838	5,972
Control Tower Operator	23,250	23,342	23,956	24,584	25,107
Flight Navigator	2,636	2,509	2,321	2,214	2,155
Flight Engineer	26,229	26,955	26,788	27,560	29,871
Flight Instructor Certificates[d]	36,795	42,418	44,777	46,236	49,362
Instruments Ratings[d]	185,969	199,323	203,954	211,364	226,334

Source: Federal Aviation Administration, Office of Management Systems.

a The decrease in the number of airmen resulted from a purging of the airmen certification files. During this process approximately 26 thousand duplicates or faulty records were eliminated.

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

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

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

GENERAL AVIATION
MILES AND HOURS FLOWN

By Type of Flying
Calendar Years 1965 to Date

Year	TOTAL	Business		Commercial		Instructional		Personal & Other	
		Units	Per-cent	Units	Per-cent	Units	Per-cent	Units	Per-cent
MILES FLOWN BY TYPE OF FLYING—Millions of Miles									
1965	2,562	1,204	47	461	18	359	14	538	21
1966	3,336	1,536	46	516	16	646	19	638	19
1967	3,440	1,431	42	569	16	713	21	727	21
1968	3,701	1,406	38	666	18	814	22	815	22
1969	3,926	1,426	36	723	19	910	23	867	22
1970	3,207	1,134	35	555	17	686	22	832	26
1971	3,143	1,129	36	506	16	651	21	857	27
1972	3,317	1,144	34	581	18	692	21	900	27
1973	3,729	1,344	36	688	18	778	21	919	25
1974	4,043	1,433	35	790	20	816	20	1,004	25
1975	4,238	1,487	35	818	19	829	20	1,104	26
1976	4,476	1,563	35	885	20	873	20	1,155	26
HOURS FLOWN BY TYPE OF FLYING—Thousands of Hours									
1965	16,733	5,857	35	3,348	20	3,346	20	4,182	25
1966	21,023	7,057	33	3,555	17	5,674	27	4,737	23
1967	22,153	6,578	30	3,918	18	6,262	28	5,395	24
1968	24,053	6,976	29	4,810	20	6,494	27	5,773	24
1969	25,351	7,064	28	4,928	19	7,023	28	6,336	25
1970	26,030	7,204	28	4,582	18	6,791	26	7,453	28
1971	25,512	7,141	28	4,264	17	6,416	25	7,691	30
1972	26,974	7,239	27	4,831	18	6,814	25	8,090	30
1973	30,048	8,558	28	5,608	19	7,646	25	8,236	28
1974	32,475	9,140	28	6,294	19	7,972	25	9,069	28
1975	34,165	9,545	28	6,480	19	8,174	24	9,966	29
1976	36,128	10,095	28	7,029	19	8,591	24	10,413	29

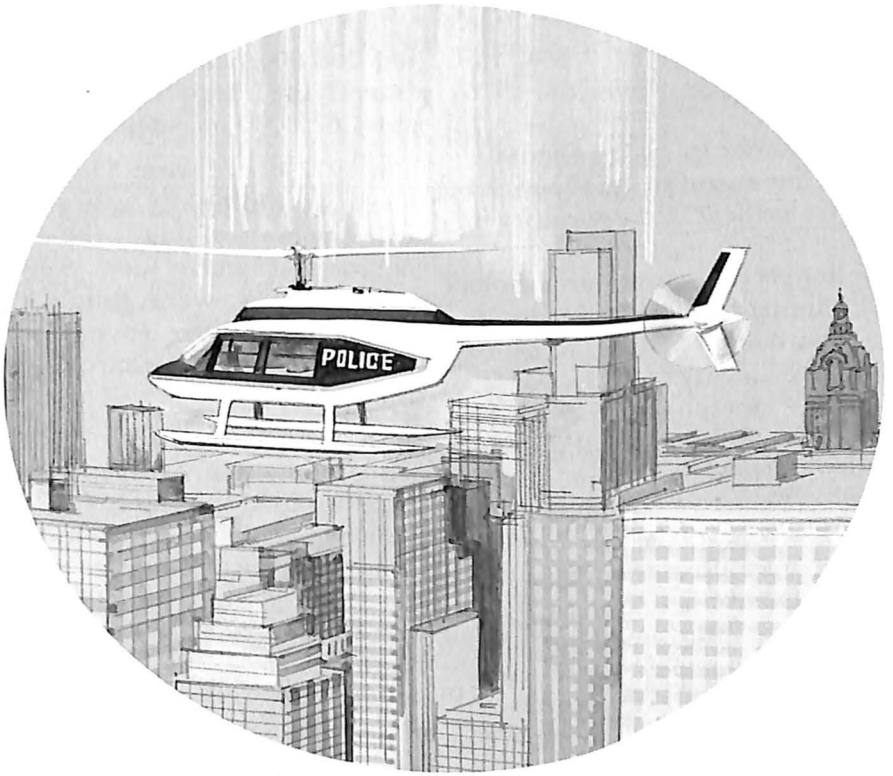
Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).

U. S. CIVIL AIRPORTS[a]

By Length of Runway and Region
December 31, 1977

FAA Region	TOTAL	Airports by Length of Runway (in feet)		
		Under 5,000	5,000-9,999	10,000 & Over
TOTAL	14,117	12,458	1,399	260
New England	542	456	66	20
Eastern	1,906	1,757	122	27
Great Lakes	2,832	2,617	180	35
Central	1,274	1,195	70	9
Southern[b]	1,666	1,436	214	16
Southwest	2,123	1,872	228	23
Rocky Mountain	961	807	147	7
Western	1,140	962	159	19
Northwest	841	757	71	13
Alaska	763	547	127	89
Pacific	53	46	6	1
South Pacific[c]	16	6	9	1

Source: Department of Transportation, Federal Aviation Administration.
a Includes seaplane bases, heliports, stolports and military fields having joint civil-military use.
b Includes Puerto Rico (27 airports) and the Virgin Islands (5 airports).
c American Samoa, Guam, Saipan, and Trust Territory.



HELICOPTERS

Timber tracts once considered inaccessible are now being harvested by helicopter. Banks are using helicopters to airlift checks for faster clearance. Auto parts are being helicopter-lifted from harbor to inland assembly plants, saving time and money. These are among the newer uses of the versatile civil helicopter, which is also serving breweries, vineyards, race tracks, stadia, department stores, cosmetic firms and a great variety of new industrial applications.

This dramatic expansion of helicopter usage is reflected in the latest statistics. In 1977, in addition to all-time high levels of sales and deliveries (see Aircraft Production), new peaks were recorded in the numbers of civil helicopter operators, craft in service and active heliports.

AIA's 1977 *Directory of Helicopter Operators in the United States, Canada and Puerto Rico* lists these growth highlights:

- The number of civil helicopters

reached a new high of 7,160, increasing 15.8 percent over the 1976 total of 6,181.

• The number of civil helicopter operators increased to 2,547, up 9.3 percent from the 2,330 operators in 1976.

• Helicopters in commercial operation climbed from the previous year's record level of 3,702 to a new peak of 4,294, a 16 percent increase.

• A 13.4 percent gain was recorded in the number of helicopters flown by corporations and executives, which increased from 1,392 in 1976 to 1,578 in 1977; this marked the third consecutive record-setting year for business helicopters.

• The helicopter fleets of civil government agencies were augmented by more than 200 aircraft, to a total of 1,288 in 1977, compared with 1,087 a year earlier.

• In terms of the number of operators, the greatest gain was in the business category, up more than 12.5 percent from 1,082 in 1976 to 1,219 in 1977. Commercial operators increased more than five percent, from 911 to 959, and the number of civil government operators climbed from 337 to 369, about nine percent.

During 1977, there was only one U.S. scheduled passenger service in operation, that was flown by New York Airways in the New York-New Jersey area. The company carried 268,000 passengers during the year, flying a total of 468,000 miles and 4,625,000 passenger miles.

In 1977, there were 55 helicopter types—including foreign-built craft—operating in the U.S., Canada and Puerto Rico. American manufacturers were producing 20 types and another seven were in various stages of research and development.

Among the newer types are two commercial transports, the Sikorsky S-76 and the Bell 222. The S-76 is a 14-place twin-turbine helicopter, first deliveries of which were slated for mid-1978. Also twin-turbine powered, the 222 accommodates six to 10 passengers; initial deliveries are planned for September 1979.

In flight status during 1977 were two advanced vertical lift research craft, jointly developed by NASA and the U.S. Army, which have both civil and military potential. The Sikorsky S-72 Rotor Systems Research Aircraft (RSRA) is a flying laboratory designed to test a variety of new rotor systems and to investigate the characteristics of the compound helicopter. The Bell XV-15 is a tilting-rotor research plane whose rotors provide helicopter-like lift for take-off, then tilt forward to operate as propellers in forward flight.

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

1960 to Date

Year	TOTAL	Commercial	Companies and Executives	Government Agencies[a]
CIVIL HELICOPTER OPERATORS				
1960	318	193	94	31
1961	406	265	106	35
1962	503	322	145	36
1963	600	405	150	45
1964	710	451	212	47
1965	860	508	299	53
1966	933	519	353	61
1967	1,023	522	427	74
1969	1,379	689	596	94
1971	1,424	672	590	162
1972	1,491	758	566	167
1973	1,532	752	599	181
1974	1,536	725	608	203
1975	1,891	779	833	279
1976	2,330	911	1,082	337
1977	2,547	959	1,219	369
HELICOPTERS OPERATED[b]				
1960	936	705	134	97
1961	1,179	882	173	124
1962	1,319	994	213	112
1963	1,497	1,157	218	122
1964	1,767	1,333	311	123
1965	2,053	1,537	401	115
1966	2,318	1,699	475	144
1967	2,438	1,764	487	187
1969	3,433	2,390	770	273
1971	3,874	2,605	802	467
1972	4,185	2,992	745	448
1973	4,601	3,295	780	526
1974	4,819	3,418	778	623
1975	5,222	3,342	1,056	824
1976	6,181	3,702	1,392	1,087
1977	7,160	4,294	1,578	1,288

Source: Aerospace Industries Association, manufacturers' and owner/operators' reports.
a Federal, state and local governments.
b Includes helicopters on order.

CIVIL HELICOPTER FLEET
UNITED STATES AND CANADA
1977

State	OPERATORS				HELICOPTERS			
	Comm.	Corp. & Exec.	Civil Gov't.	TOTAL	Comm.	Corp. & Exec.	Civil Gov't.	TOTAL
Alabama	7	22	8	37	14	27	191	232
Alaska	31	12	—	43	243	13	—	256
Arizona	30	11	7	48	159	27	23	209
Arkansas	14	12	—	26	18	14	—	32
California	121	90	54	265	438	125	170	733
Colorado	15	9	7	31	56	12	12	80
Connecticut	9	13	—	22	13	15	—	28
Delaware	3	2	1	6	4	4	1	9
Dist. of Col.	2	3	7	12	2	5	22	29
Florida	63	39	27	129	205	58	75	338
Georgia	11	15	5	31	21	18	20	59
Hawaii	15	6	4	25	18	10	5	33
Idaho	21	20	6	47	56	27	12	95
Illinois	22	34	12	68	55	45	26	126
Indiana	24	23	10	57	54	26	19	99
Iowa	14	18	8	40	19	19	22	60
Kansas	9	10	6	25	17	11	9	37
Kentucky	9	45	2	56	19	47	5	71
Louisiana	16	13	13	42	391	38	24	453
Maine	4	4	2	10	10	4	8	22
Maryland	2	14	3	19	10	15	20	45
Massachusetts	11	26	3	40	36	31	3	70
Michigan	20	50	9	79	45	58	35	138
Minnesota	13	14	3	30	39	14	6	59
Mississippi	5	6	8	19	10	7	14	31
Missouri	14	12	9	35	62	12	20	94
Montana	8	4	3	15	18	5	4	27
Nebraska	12	11	5	28	35	14	10	59
Nevada	7	8	6	21	19	11	14	44
New Hampshire	2	9	—	11	3	10	—	13
New Jersey	16	39	4	59	27	47	11	85
New Mexico	7	9	1	17	14	10	1	25
New York	39	52	16	107	193	67	36	296
North Carolina	11	13	2	26	18	27	3	48
North Dakota	6	7	1	14	8	7	1	16
Ohio	23	44	9	76	58	49	25	132
Oklahoma	10	9	2	21	76	15	3	94
Oregon	15	51	6	72	200	54	14	268
Pennsylvania	27	89	5	121	123	103	13	239

(Continued on next page)

CIVIL HELICOPTER FLEET
UNITED STATES AND CANADA (Continued)
1977

State	OPERATORS				HELICOPTERS			
	Comm.	Corp. & Exec.	Civil Gov't.	TOTAL	Comm.	Corp. & Exec.	Civil Gov't.	TOTAL
Rhode Island	2	3	1	6	4	3	1	8
South Carolina	10	19	1	30	36	22	5	63
South Dakota	1	1	2	4	2	1	2	5
Tennessee	9	17	6	32	21	17	36	74
Texas	50	70	20	140	148	135	46	329
Utah	11	9	2	22	106	10	4	120
Vermont	1	5	—	6	1	5	—	6
Virginia	10	23	8	41	15	28	22	65
Washington	43	52	7	102	123	69	25	217
West Virginia	3	45	4	52	8	48	12	68
Wisconsin	6	—	2	8	34	—	2	36
Wyoming	4	5	—	9	15	6	—	21
Puerto Rico	2	2	3	7	8	2	6	16
Canada	119	100	31	250	967	131	250	1,348
TOTAL	959	1,219	361	2,539	4,294	1,578	1,288	7,160

Source: Aerospace Industries Association," 1977 AIA Directory of Helicopter Operators."

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

By Region
Selected Years 1970 to Date

Region	1970	1972	1973	1975	1977
TOTAL	2,310	2,326	2,384	3,268	3,433
(elevated)	(216)	(211)	(241)	(277)	(299)
New England	93	87	78	143	164
Middle Atlantic	514	571	581	684	795
East North Central	293	281	307	411	397
West North Central	107	109	110	98	107
South Atlantic	192	190	204	352	306
East South Central	47	65	64	107	144
West South Central	205	216	217	338	339
Mountain	157	168	176	241	213
Pacific	593	545	551	789	821
Other[a]	109	94	96	105	147

Source: Aerospace Industries Association.
NOTE: Totals included proposed facilities.
a Includes Canada and Puerto Rico.

HOSPITAL HELIPORTS IN THE UNITED STATES AND CANADA

By Region
Selected Years 1970 to Date

Region	1970	1972	1973	1975	1977
TOTAL	285	354	384	565	699
New England	5	5	5	16	21
Middle Atlantic	29	43	42	55	73
East North Central	74	82	99	126	150
West North Central	18	22	21	22	29
South Atlantic	33	39	50	76	82
East South Central	5	18	18	29	54
West South Central	20	26	26	59	67
Mountain	24	29	32	56	67
Pacific	73	87	87	119	147
Other[a]	4	3	4	7	9

Source: Aerospace Industries Association.
NOTE: Totals include proposed facilities.
a Includes Canada and Puerto Rico.

HELICOPTER DESTINATION CHART

COMPANY	Commercial Model	Number of Places	Useful Load (Lbs.)	Range with Useful Load (No. Miles)	External Cargo Payload (Lbs.)
Bell Helicopter Textron P.O. Box 482 Fort Worth, TX 76101 (817) 280-2011	47G Series 47J Series AG-5 204 Series 205A-1 206 Series 206L 212 214B 222	3 4 2 9 - 11 15 5 7 15 16 6 - 10	670 - 1210 1090 - 1204 1300 4880 4542 1359 - 1650 2050 5672 6059 2730	194 - 261 224 - 258 102 335 276 275 - 313 304 226 219 365	1000 — — — 5000 1200 2000 5000 7000 4000
Boeing Vertol Company P.O. Box 16858 Philadelphia, PA 19142 (215) 522-2437	BO-105C (Twin Jet)	5	2300	310	2000
Brantley-Hynes Helicopter, Inc. P.O. Box 1046 Frederick, OK 73542	B-2B 305	2 5	670 1200	225 275	400 800
The Enstrom Helicopter Corporation 2229 22nd Street Menominee, MI 49858 (906) 863-9971	F-28 Series 280 Series	3 3	700 - 850 700 - 850	243 - 272 243 - 272	500 - 650 500 - 650
Hiller Aviation 2075 W. Scranton Ave. Porterville, CA 93257	12E & 12E4	3 - 4	975 - 1045	225	1000
Hughes Helicopters (Division of Summa Corp.) Culver City, CA 80230 (213) 870-3361	269A 300 Series 500 Series	2 3 - 6 4 - 7	662 698 - 1330 1320 - 1380	178 191 - 318 318 - 330	500 500 - 1570 1410 - 1620
United Technologies Corp. (Sikorsky Aircraft Div.) Stratford, CT 06602 (203) 378-6361	S-55 Series S-58T Series S-61 Series S-62C S-64A/E S-76	12 14 - 16 16 - 30 14 5 in cockpit 45 in pod 14	2250 4923 - 5423 5426 - 11600 3017 22766 4700	339 - 372 282 305 - 736 400 220 400	2000 5000 6500 - 8000 3000 20000 4200

Source: Aerospace Industries Association.

HELICOPTER TRAFFIC
UNITED STATES SCHEDULED AIRLINES

Calendar Years 1960 to Date
(Thousands)

Year	Miles Flown	Passengers Carried	Passenger-Miles	Ton-Miles
1960	2,219	430	9,475	1,054
1961	2,157	490	8,604	963
1962	1,518	359	8,192	897
1963	1,462	458	12,510	1,317
1964	1,976	608	16,003	1,668
1965	1,984	718	18,811	1,948
1966	2,241	1,067	25,420	2,562
1967	2,660	1,220	29,670	2,960
1968	2,547	1,042	24,856	2,482
1969	1,909	737	17,074	1,703
1970	1,427	573	11,341	1,167
1971	1,048	551	8,973	917
1972	1,022	587	10,009	1,020
1973	1,085	613	10,936	1,108
1974	1,029	592	10,298	1,055
1975	873	505	8,370	868
1976	709	444	7,490	755
1977	468	268	4,625	466

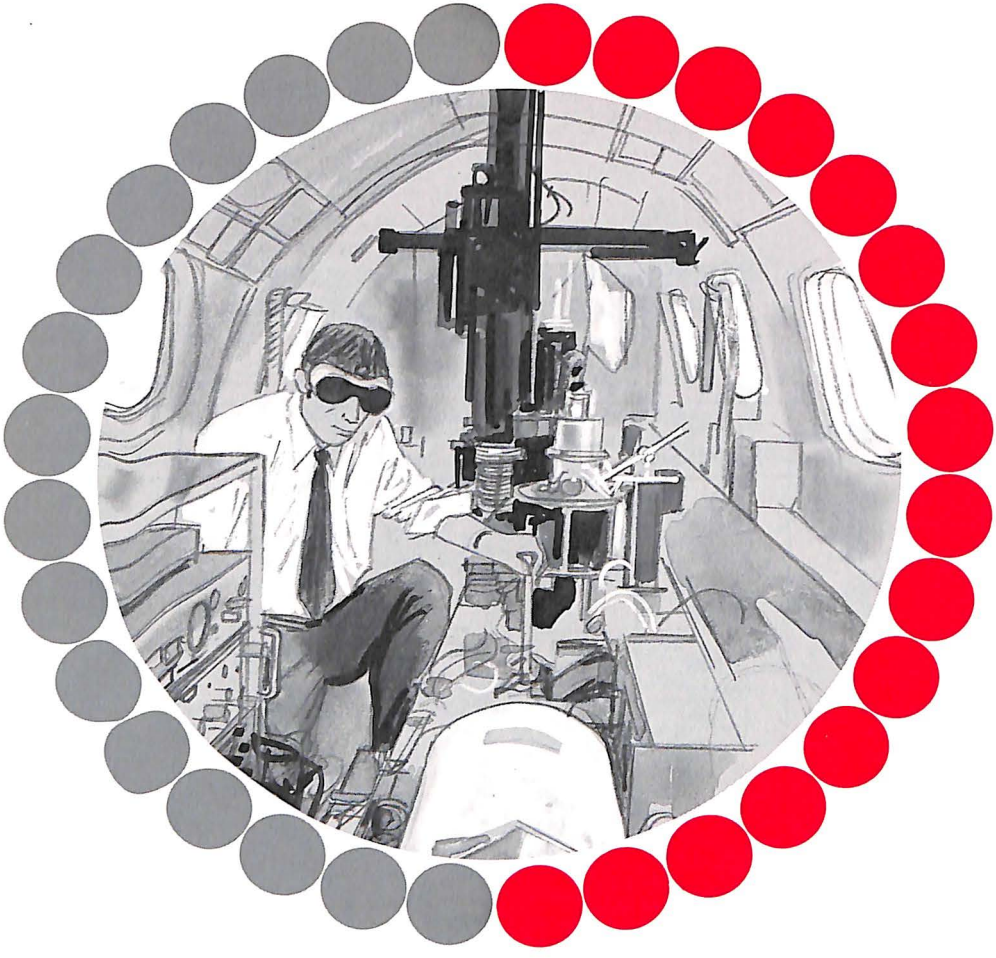
Source: Civil Aeronautics Board, Bureau of Accounts and Statistics.
NOTE: Chicago suspended services indefinitely as of October 13, 1976. Carrier has been granted a waiver from submitting CAB Forms 41 and no reports will be required until such time as Chicago resumes service under its Certificate of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

REVENUE TON-MILE TRAFFIC CARRIED
SCHEDULED HELICOPTER AIRLINES

Calendar Years 1960 to Date
(In 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

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



RESEARCH AND DEVELOPMENT

Federal outlays for research and development, an important indicator of aerospace industry R&D activity, increased about 11 percent in the fiscal year 1977. Outlays totaled $22.5 billion, up from $20.2 billion in the previous year.

Estimates of federal spending for FY 1978 and 1979 show R&D growth beyond the probable rates of inflation. FY 1978 outlays are estimated at $24.9 billion. The FY 1979 budget, if approved by Congress as submitted by the Administration, would provide some $27 billion for R&D. Such levels of outlays would arrest the declining trend of recent years in *real*—inflation-adjusted—R&D funding.

This growth is offset by a continuing budgetary shift from government support for national defense and space technology to health and income security matters. In 1965 defense and space claimed over 46 percent of total federal budget outlays; today they account for under 27 percent. Overall government

support of R&D has declined significantly in recent years, dropping from 12.3 percent of total federal budget outlays in 1965 to 5.7 percent in 1976.

Aerospace industry performance of R&D represents one-fourth of the total of all industries. Company funds for R&D have doubled since 1965 while federal funds have fluctuated but slightly, showing an increase during the past three years.

Department of Defense outlays for aerospace research, development, test and evaluation, the principal source of industry R&D effort, increased in 1977 about $500 million to nearly $5 billion in FY 1977. The overall increase was due to a turnaround in aircraft R&D, funding for which had declined steadily through four preceding years. FY 1977 outlays in the aircraft category totaled almost $2.2 billion, a gain of some $600 million.

Despite the decline, missile programs—at nearly $2.3 billion—continued to be the largest area of DoD's research and development effort. Among missile developments active in 1977/78, by far the greatest in dollar value is the Navy's Trident 1 submarine launched ballistic missile; in flight test status, Trident was scheduled for operational service beginning in 1979. Also in development was another strategic weapon, the Air Force MX advanced intercontinental missile, a multiple-warhead system designed for greater accuracy and survivability.

Cruise missiles accounted for some $200 million of DoD's FY 1977 outlays for research and development, and budget estimates indicated that cruise missile programs collectively would supplant Trident as the heaviest-funded effort in FY 1978 and 1979.

Largest outlays, under FY 1978 and 1979 funding, will go for development of the Navy F-18 Hornet fleet air defense and air superiority fighter. Other major 1977/78 aircraft R&D programs include the Air Force F-16 fighter; the Air Force E-3A Airborne Warning and Control System (AWACS); the Air Force EF-111A, an electronic jamming aircraft; the Navy Light Airborne Multi-Purpose System (LAMPS), a ship-based manned helicopter to be employed as a localization and attack craft; and the YAH-64 Advanced Attack Helicopter (AAH), slated to be the mainstay of the Army's anti-armor helicopter force.

In addition to contractual work for DoD and NASA, which constitutes the bulk of the aerospace industry's R&D activity, the industry is also engaged in energy systems research and development for the Department of Energy, and in development of equipment and techniques for the Federal Aviation Administration.

INDUSTRIAL RESEARCH AND DEVELOPMENT
ALL INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1960 to Date
(Millions of Dollars)

Year	All Industries	Aerospace[a] Industry		
	TOTAL	TOTAL	Federal Government Funds	Company Funds
1960	$ 10,509	$ 3,514	$ 3,150	$ 364
1961	10,908	3,829	3,438	392
1962	11,464	4,042	3,588	454
1963	12,630	4,712	4,261	452
1964	13,512	5,078	4,621	457
1965	14,185	5,148	4,499	649
1966	15,548	5,526	4,724	802
1967	16,385	5,669	4,531	1,138
1968	*17,429*	*5,776*	*4,544*	*1,232*
1969	*18,308*	*5,909*	*4,554*	*1,355*
1970	*18,062*	*5,245*	*4,032*	*1,213*
1971	*18,311*	*4,912*	*3,900*	*1,012*
1972	*19,383*	*4,992*	*4,043*	*948*
1973	*20,921*	*5,084*	*3,995*	*1,089*
1974	*22,399*	*5,318*	*4,140*	*1,177*
1975[r]	24,096	5,711	4,434	1,277
1976	26,618	6,114	4,724	1,390

Source: National Science Foundation.
NOTE: Data for years 1968—1974 are being revised by the Bureau of the Census.
a Includes companies primarily engaged in the manufacture of aircraft and parts, SIC Code 372, and the manufacture of ordnance and accessories, including complete guided missiles and space vehicles, SIC Code 19.
r Revised.

INDUSTRIAL RESEARCH AND DEVELOPMENT IN AEROSPACE

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

Year	TOTAL AERO-SPACE	Applied Research and Development Funds			Basic Research Funds		
		TOTAL	Federal 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	*5,776*	*5,705*	*4,518*	*1,187*	*71*	*26*	*45*
1969	*5,909*	*5,842*	*4,529*	*1,313*	*67*	*25*	*42*
1970	*5,245*	*5,182*	*4,012*	*1,170*	*63*	*20*	*43*
1971	*4,912*	*4,858*	*3,880*	*978*	*54*	*20*	*34*
1972	*4,992*	*4,931*	*4,022*	*908*	*61*	*21*	*40*
1973	*5,084*	*5,034*	*3,975*	*1,059*	*50*	*20*	*30*
1974	*5,318*	*5,267*	*4,122*	*1,145*	*50*	*18*	*32*
1975r	5,711	5,657	N/A	N/A	54	N/A	N/A
1976	6,114	6,062	N/A	N/A	52	N/A	N/A

Source: National Science Foundation.
NOTE: Data for 1968–1974 are being revised by the Bureau of the Census.
r Revised.
N/A Not Available.

FEDERAL OUTLAYS FOR RESEARCH AND DEVELOPMENT

Fiscal Years[a] 1960 to Date
(Millions of Dollars)

Year	TOTAL	DOD	NASA	AEC	Other
1960	$ 7,738	$ 5,654	$ 401	$ 986	$ 697
1961	9,278	6,618	744	1,111	805
1962	10,379	6,812	1,257	1,284	1,026
1963	12,000	6,849	2,552	1,335	1,264
1964	14,694	7,517	4,171	1,505	1,501
1965	14,875	6,728	5,093	1,520	1,534
1966	16,002	6,735	5,933	1,462	1,872
1967	16,842	7,680	5,426	1,467	2,269
1968	16,865	8,148	4,724	1,593	2,400
1969	16,207	7,858	4,251	1,654	2,444
1970	15,632	7,568	3,753	1,616	2,695
1971	15,050	7,541	3,382	1,303	2,824
1972	16,629	8,275	3,422	1,552	3,380
1973	17,407	8,574	3,315	1,623	3,895
Year	**TOTAL**	**DOD**	**NASA**	**ERDA**	**Other**
1974	18,239	8,956	3,256	1,825	4,202
1975	19,525	9,341	3,266	2,277	4,641
1976	20,233	9,329	3,521	2,225	5,158
Year	**TOTAL**	**DOD**	**NASA**	**ENERGY**	**Other**
1977	22,462	10,176	3,763	3,181	5,342
1978[E]	24,854	11,137	3,824	3,881	6,012
1979[E]	26,984	12,315	4,090	4,188	6,391

Source: "The Budget of the United States Government" (Annually).
NOTE: Includes military personnel, procurement, civil functions and some other items not included in other tables. Includes R&D facilities and administrative operating costs. AEC research and development programs transferred to ERDA with 1974 reorganization, to Dept. of Energy in 1977.

a For an explanation of the change in the Federal Government's Fiscal Year, see page 24.

E Estimate.

FEDERAL AERONAUTICS RESEARCH AND DEVELOPMENT

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

Year	TOTAL	NASA	DOD	DOT
1967	$ 1,613	$ 105	$ 1,199	$ 309
1968	1,404	136	1,126	142
1969	1,300	169	1,161	-30[a]
1970	1,882	199	1,641	42
1971	1,990	210	1,707	73
1972	2,295	236	1,964	95
1973	2,187	313	1,799	75
1974	2,030	278	1,678	74
1975	2,015	314	1,627	74
1976	2,351	325	1,941	85
Tr. Qtr.	584	83	480	22
1977	2,727	378	2,256	93
1978[E]	3,111	441	2,572	98
1979[E]	2,733	522	2,118	93

Source: "Aeronautics and Space Report of the President" (Annually).
a Unobligated balances for SST research and development, rescinded in 1969.
E Estimate.
Tr. Qtr. Transition Quarter. For an explanation of the changes in the Federal Government's Fiscal Year and the Transition Quarter, see page 24.

DEPARTMENT OF DEFENSE
OUTLAYS FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION

By Agency
Fiscal Years 1970 to Date
(Millions of Dollars)

Year	TOTAL	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.	2,206	830	778	437	161
1977	9,795	3,618	3,481	2,069	627
1978[E]	10,714	3,927	3,800	2,304	683
1979[E]	11,861	4,247	4,184	2,575	855

Source: Department of Defense, Budget, Fiscal Year 1979.
NOTE: For RDT&E for aircraft, missiles and astronautics, see page
Tr. Qtr.: For an explanation of the Transition Quarter, (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 22.
E Estimate.

By Function
Fiscal Years 1970 to Date
(Millions of Dollars)

Year	TOTAL All RDT&E Functions	Aerospace				Other
		TOTAL	Aircraft	Missiles	Astro-nautics	
1970	7,166	4,188	1,239	2,196	753	2,978
1971	7,303	4,226	1,699	2,008	519	3,077
1972	7,881	4,691	2,066	2,157	468	3,190
1973	8,157	4,586	2,036	2,038	512	3,571
1974	8,582	4,614	1,893	2,160	561	3,968
1975	8,866	4,389	1,698	2,176	515	4,477
1976	8,923	4,479	1,603	2,295	581	4,444
Tr. Qtr.	2,206	1,059	410	520	129	1,147
1977	9,795	4,972	2,176	2,259	537	4,823
1978[E]	10,714	N.A.	N.A.	N.A.	N.A.	N.A.
1979[E]	11,861	N.A.	N.A.	N.A.	N.A.	N.A.

Source: Department of Defense, Budget Press Briefing, OASD (Comptroller), January 23, 1978.
NOTE: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Federal Government's Fiscal Year, see page 24.
E Estimate.
N.A. Not available.

MILITARY PRIME CONTRACT AWARDS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION

Fiscal Years 1974, 1975, 1976, 1977
(Millions of Dollars)

Program Categories	1974	1975	1976	1977
TOTAL, RDT&E	$5,815	$6,303	$6,871	$ 7,893
Research	278	234	276	319
Exploratory Development	506	530	593	673
Other Development	4,550	5,027	5,364	6,247
Management & Support	481	512	638	654
Aircraft, Total	$1,318	$1,166	$1,378	$ 1,649
Research	3	3	2	3
Exploratory Development	16	13	18	31
Other Development	1,297	1,146	1,345	1,606
Management & Support	2	4	13	9
Missile and Space Systems, Total	1,706	1,895	2,305	2,302
Research	58	23	34	16
Exploratory Development	75	72	107	133
Other Development	1,488	1,711	1,991	2,023
Management & Support	85	89	173	130
Electronics & Communications Equipment, Total	1,318	1,767	1,491	1,789
Research	31	26	33	35
Exploratory Development	113	96	144	165
Other Development	1,001	1,496	1,253	1,500
Management & Support	173	149	61	89
All Other, Total[a]	1,473	1,475	1,697	2,153
Research	186	182	207	265
Exploratory Development	302	349	324	344
Other Development	764	674	775	1,118
Management & Support	221	270	391	426

Source: Department of Defense, "Military Prime Contract Awards by Service Category and Federal Supply Classification, Fiscal Years 1974, 1975, 1976, 1977."
NOTE: For a description of the Fiscal Year see page 24.
a "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 1977, 1978 and 1979
(Millions of Dollars)

Agency, Type and Model	1977	1978[E]	1979[E]
AIR FORCE			
A-10	$ 12.9	$ 17.6	$ 18.0
B-1 Bomber	482.7	443.4	105.5
E-3A (AWACS)	104.6	100.0	58.6
EF-111A	44.4	17.1	8.8
F-15 Eagle	59.6	62.7	10.0
F-16 Air Combat Fighter	259.1	194.1	107.9
*C-5	18.0	38.1	37.2
*E-4 (AABNCP)	69.0	65.8	32.0
*KC-135	6.2	3.8	1.5
*NATO AEW&C Aircraft	4.6	15.7	10.0
NAVY			
A-4M Skyhawk	$ 3.9	$ 1.9	$ —
A-6E Intruder	1.9	3.0	8.5
A-7E Corsair II	0.2	0.4	1.1
CH-53E Sea Stallion	12.0	18.5	—
E-2C Hawkeye	—	—	0.7
F-14A Tomcat	15.0	34.8	—
F-18 Hornet	340.6	625.1	473.6
P-3C Orion	—	0.9	0.5
*AV8B	33.6	59.8	85.6
*LAMPS	72.1	107.3	124.5
*V/STOL	12.4	22.5	52.5
ARMY			
AH-IS Cobra/Tow	$ 7.2	$ 14.4	$ 10.8
Black Hawk	74.8	38.0	3.0
*Adv. Attack Helicopter	130.8	164.9	177.4
*CH-47 Modernization	25.9	32.0	19.5

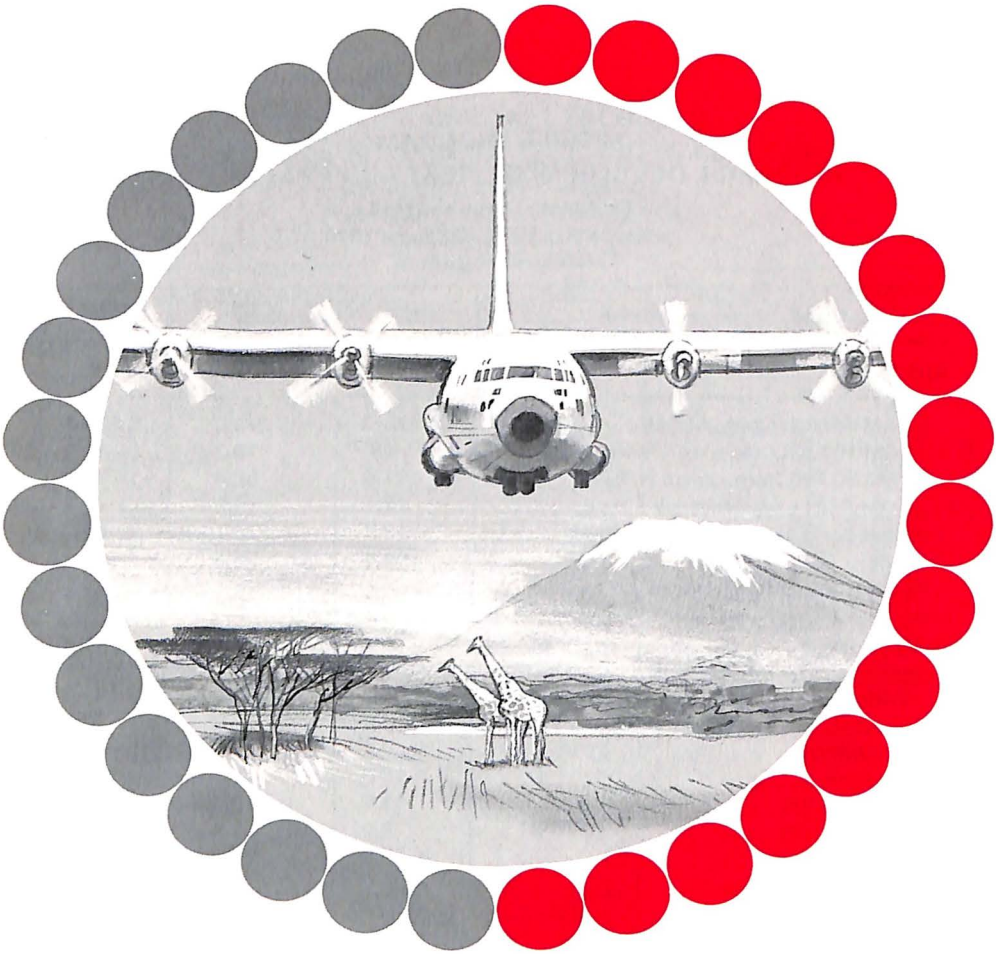
Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1979.
a Total Obligation Authority.
E Estimate.
* Programs in R&D only.

MISSILE PROGRAMS
RESEARCH, DEVELOPMENT, TEST AND EVALUATION[a]

By Agency, Type and Model
Fiscal Years 1977, 1978 and 1979
(Millions of Dollars)

Agency, Type and Model	1977	1978[E]	1979[E]
AIR FORCE			
AGM-86/AGM-109, ALCM	$ 79.2	$ 276.9	$ 237.8
BGM-109, GLCM	—	18.7	33.0
LGM-30 F/G, Minuteman II/III	101.6	66.4	54.1
AGM-65C, Laser Maverick	13.1	9.8	7.9
*Close Air Support Weapon Systems	18.9	10.1	50.6
*M-X	69.0	134.4	158.2
*Within-Visual-Range Air-to-Air Missile	—	—	12.2
NAVY			
Trident I	$ 568.1	$ 327.7	$ 191.8
Phoenix	9.6	7.1	23.8
Sidewinder	2.8	5.9	8.2
Sparrow	16.3	—	—
Standard ER	11.8	16.4	48.7
Standard MR	6.0	3.1	14.8
*AEGIS	28.2	27.2	14.4
*HARM	30.0	29.7	43.4
*Tomahawk	119.4	210.3	152.1
ARMY			
Chaparral	$ 6.0	$ 4.2	$ 0.1
Dragon	4.8	2.8	0.4
Hawk	18.7	12.5	3.1
Lance	1.1	4.2	5.9
Patriot	180.0	216.4	228.4
Pershing	36.3	29.6	10.1
U. S. Roland	85.0	75.4	22.7
Stinger	27.4	12.5	26.8
TOW	2.8	0.5	3.5
AN/TSQ-73	0.6	—	—
*BMD Adv. Tech. Program	102.7	107.3	113.5
*BMD Systems Tech. Program	100.0	106.2	114.0
*Heliborne Missile—Hellfire	19.2	50.5	65.1
*RPVs	5.5	9.2	24.2
*GSRs	6.9	46.4	70.8

Source: "Program Acquisition Costs by Weapon System," Department of Defense Budget for Fiscal Year 1979.
a Total Obligation Authority.
* Program in R&D only.
E Estimate.



FOREIGN TRADE

In 1977, while the United States suffered an international trade balance deficit of more than $29 billion, due not only to the impact of oil importation but also to declining U.S. exports in several categories of non-petroleum trade, the aerospace industry recorded a trade surplus approaching $7 billion. Aerospace exports amounted to more than 10 times the dollar value of imports.

Aerospace was second only to agriculture in positive contribution to the U.S. trade balance.

The facts point up the vital and increasing importance of U.S. aerospace exports to the nation's economy, since for the foreseeable future, the U.S. will be heavily dependent on foreign oil. At the same time, exports of other countries are increasing significantly while those of the U.S. are showing a slower rate of growth. Trade deficits of high order weaken the value of the American dollar against foreign currencies and they

contribute to the escalation of inflation at home. Such trade deficits must be offset by higher levels of American exports. High-valued high-technology exports—such as aerospace products—offer one of the best opportunities for easing the adverse economic impact.

The aerospace industry's foreign trade record speaks for itself. The excellence of American-built aerospace products has created strong demand abroad and provides consistent and substantial contribution to the U.S. international trade balance. While the nation as a whole has experienced trade deficits in three of the last four years, aerospace recorded trade surpluses ranging from $6.3 to more than $7 billion. Aerospace exports topped the $7 billion level in each of those four years, reaching an all-time high of $7.8 billion in 1976.

In 1977, exports fell below the previous year's record, but not significantly—they totaled almost $7.6 billion. Aerospace imports amounted to $731 million, resulting in a trade surplus of $6.8 billion, third best in aerospace history.

Exports of civil aerospace products far outstripped military sales abroad. Shipments of civil aircraft, engines, accessories and other equipment amounted to more than $5 billion, or two-thirds of the total, a figure that compares with $5.7 billion for 1976.

As in previous years, the largest single component among aerospace exports was commercial transport aircraft. Transport sales totaled $1.9 billion, down $500 million from 1976. Sales of general aviation planes were up by 7.5 percent to a 1977 total of $389 million. The dollar value of helicopters delivered abroad declined slightly—$105 million compared with $113 million in 1976.

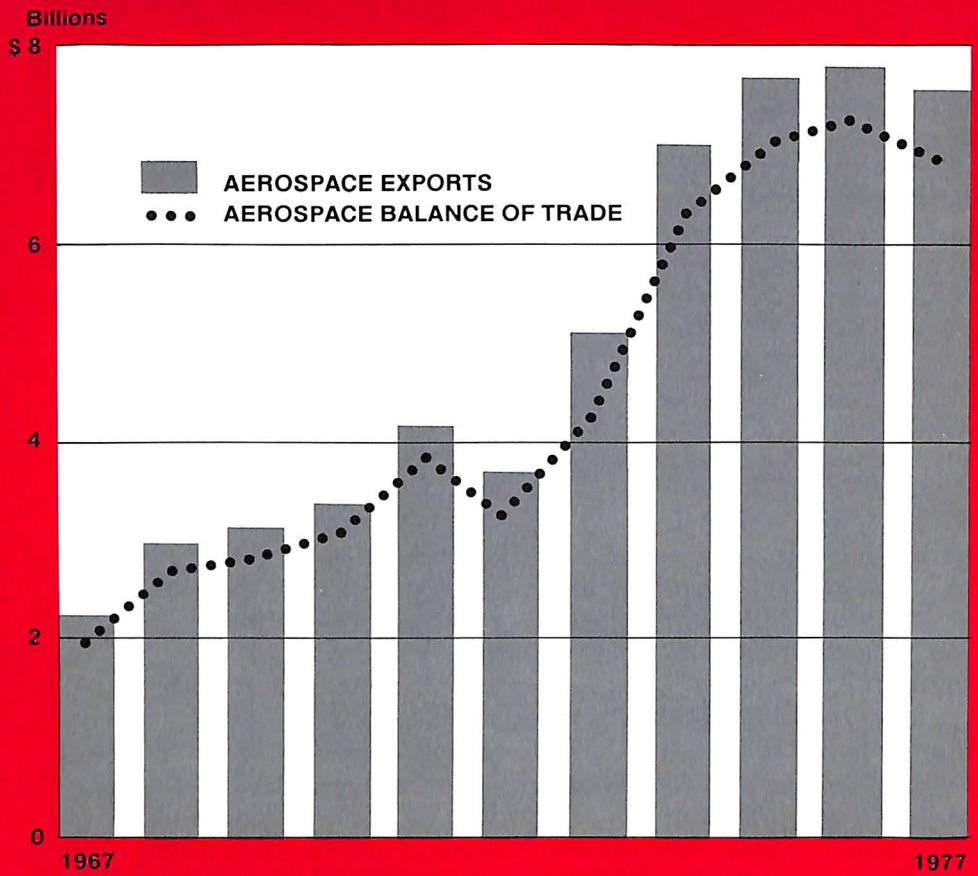
Sales of all types of civil aircraft totaled $2.7 billion, down from $3.2 billion in the previous year. Other civil aerospace exports included $233 million in aircraft engines and $2 billion for aircraft and engine parts, accessories and equipment. The latter figure was $200 million below the record level of 1976 but higher than in any other year.

Exports of military aerospace equipment totaled $2.5 billion, up from $2.1 billion in 1976. Included in the total were $1.2 billion for complete aircraft; $832 million for parts, accessories and equipment; $438 million for rockets, guided missiles and parts; and $16 million for aircraft and missile engines other than rocket systems.

Shipments of fighter and transport aircraft comprised most of the complete military aircraft category. Fighter deliveries accounted for $686 million and transports for $317 million.

Aerospace imports totaled $731 million in 1977. The figure represented an increase of $155 million over 1976, due in part to the first four A-300B Airbuses now in service with Eastern Airlines. The 1977 total breaks down this way: aircraft, $310 million, up $155 million from 1976; parts, $290 million, up $14 million; engines, $131 million, down $14 million.

U.S. AEROSPACE EXPORTS AND BALANCE OF TRADE



Source: U.S. Department of Commerce

TOTAL AND AEROSPACE BALANCE OF TRADE

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL U.S. Trade Balance[a]	Aerospace			Aerospace Trade Balance as Percent of U.S. Total
		Trade Balance	Exports	Imports	
1960	$ 5,369	$ 1,665	$ 1,726	$ 61	31.0%
1961	6,096	1,501	1,653	152	24.6
1962	4,180	1,795	1,923	128	42.9
1963	6,061	1,532	1,627	95	25.3[r]
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[r]
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	9,625	7,045	7,792	747	73.2
1976[r]	-7,803	7,267	7,843	576	(c)
1977	-29,113	6,850	7,581	731	(c)

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

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

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

c Not applicable.

r Revised.

U. S. AEROSPACE IMPORTS

Calendar Years 1973 to Date
(Millions of Dollars)

	1973	1974	1975	1976	1977
TOTAL IMPORTS	$ 781.7	$ 744.5	$ 747.4	$ 576.1	$ 731.2
Aircraft, Total	203.0	124.0	192.2	155.5	310.2
Military	123.6	27.1	112.5	64.3	50.2
Non-Military	79.4	96.9	79.6	91.1	259.8
Gliders & Kites	1.0	0.6	0.6	1.1	1.8
Helicopters	8.0	8.0	6.9	4.5	18.1
Under 10,000 lbs.	22.4	44.3	35.0	26.3	27.8
10,000–33,000 lbs.	21.7	26.7	20.4	40.8	80.7
Over 33,000 lbs.	14.4	5.6	5.1	7.8	100.1
Used or Rebuilt	11.9	11.7	11.6	10.6	31.3
Balloons & Airships	(b)	(b)	0.1	0.1	0.2
Aircraft Engines, Total	221.5	235.7	229.5	144.9	131.4
Internal Combustion[a]	0.7	1.5	1.3	1.0	1.7
Turbojets & Gas Turbine, New	185.8	203.9	190.5	119.6	89.5
Non-Piston, NES	35.0	30.3	37.7	24.3	40.2
Other, Total[c]	357.2	384.8	325.7	275.7	289.6

Source: Bureau of the Census, "U.S. Imports for Consumption and General Imports, TSUSA Commodity," FT 246.
a Includes some toy engines.
b Less than $50,000.
c Aircraft parts not elsewhere specified.
NES Not elsewhere specified.

EXPORTS OF U.S. AEROSPACE PRODUCTS

Calendar Years 1973 to Date
(Millions of Dollars)

	1973	1974	1975	1976[r]	1977
GRAND TOTAL	$ 5,142	$ 7,095	$ 7,792	$ 7,843	$ 7,581
TOTAL CIVILIAN	3,788	5,273	5,324	5,677	5,049
Complete Aircraft, TOTAL	2,315	3,366	3,203	3,211	2,747
Transports	1,664	2,654	2,397	2,468	1,936
General Aviation[a]	206	297	312	362	389
Helicopters	83	110	105	113	105
Other, Including Used	362	305	389	268	317
Engines, TOTAL	175	229	231	254	233
Jet & Gas Turbines	145	195	186	213	196
Internal Combustion	30	34	45	41	37
Parts, Accessories & Equipment for Aircraft and Engines, Including Spares, TOTAL	1,298	1,678	1,890	2,212	2,069
Engine Spares & Accessories	368	474	492	515	483
Other Spares & Equipment	930	1,204	1,398	1,697	1,586
TOTAL MILITARY	1,354	1,822	2,468	2,166	2,532
Complete Aircraft, TOTAL	791	1,101	1,306	967	1,186
Transports	131	190	235	151	317
General Aviation	1	1	(b)	1	—
Helicopters	38	50	123	102	84
Fighters & Bombers	588	845	905	513	686
Trainers	12	6	5	2	13
Other, Including Used	21	9	38	198	86
Engines, TOTAL	46	50	94	71	76
Jet & Gas Turbines	36	36	83	58	64
Missile Turbines	3	2	2	5	5
Internal Combustion	7	12	9	8	7
Parts, Accessories & Equipment for Aircraft and Engines, Including Spares, TOTAL	415	515	771	649	832
Engine Spares & Accessories	97	120	205	138	147
Other Spares & Equipment	318	395	566	511	685
Rockets, Guided Missiles & Parts, TOTAL	102	156	297	479	438
Complete Rockets & Guided Missiles	32	37	47	93	168
Parts & Accessories for Rockets and Guided Missiles	70	119	250	386	270

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).
a Includes transports under 33,000 pounds.
b Less than $500,000.

EXPORT-IMPORT BANK
GROSS AUTHORIZATIONS OF CREDITS AND GUARANTEES

Fiscal Years 1966 to Date
(Millions of Dollars)

Year	TOTAL Credits[a]	Credits in Support of Commercial Aircraft Exports			
		TOTAL	Percent of TOTAL Credits	Jets	Other
1966	$ 1,149	$ 99.3	8.6%	$ 94.4	$ 4.9
1967	2,723	806.3	29.6	789.1	17.2
1968	2,526	336.8	13.3	336.8	–
1969	1,296	204.7	15.8	197.5	7.2
1970	2,209	636.2	28.8	598.2	38.0
1971	2,362	490.4	20.8	484.2	6.2
1972	3,285	479.6	14.6	475.4	4.2
1973	4,053	722.4	17.8	689.7	32.7
1974	4,905	946.2	19.3	894.6	51.6
1975	3,812	732.3	19.3	691.2	41.1
1976	2,285	421.9	18.4	398.4	23.5
Tr. Qtr.	282	98.3	34.7	93.8	4.5
1977	747	139.0	18.6	137.6	1.4

Year	TOTAL Guarantees[b]	Guarantees in Support of Commercial Aircraft Exports			
		TOTAL	Percent of TOTAL Guarantees	Jets	Other
1966	$ 300	$ 32.8	10.9%	$ 27.9	$ 4.9
1967	193	4.9	2.5	2.2	2.7
1968	290	63.6	21.9	50.0	13.6
1969	397	113.4	28.6	111.2	2.2
1970	612	100.2	16.4	79.2	21.0
1971	1,420	397.3	28.0	363.6	33.7
1972	1,743	202.7	11.6	175.9	26.8
1973	1,988	243.3	12.2	189.6	53.7
1974	1,594	157.7	9.9	133.0	24.7
1975	1,574	96.7	6.1	64.0	32.7
1976	1,661	107.2	6.4	87.2	20.0
Tr. Qtr.	272	62.6	23.2	58.7	3.9
1977	1,021	319.6	31.3	294.0	25.6

Source: Export-Import Bank of the United States.
Tr. Qtr.: For an explanation of the Transition Quarter (Tr. Qtr.) and the change in the Fiscal Year, see page 24.
a "Credit" is a commitment of 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.

EXPORTS OF NEW CIVIL TRANSPORT AIRCRAFT

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL		Under 33,000 Pounds Airframe Weight		33,000 Pounds and Over Airframe Weight	
	Number	Value	Number	Value	Number	Value
1960	159	$ 480.1	67	$ 15.8	92	$ 464.3
1961	119	262.5	68	11.2	51	251.3
1962	172	259.2	122	13.8	50	245.4
1963	181	190.9	151	18.1	30	172.8
1964	225	211.1	193	29.1	32	182.0
1965	76	351.8	16	4.9	60	346.9
1966	82	420.8	6	0.1	76	420.7
1967	134	611.4	13	4.4	121	607.0
1968	240	1,200.2	19	9.9	221	1,190.1
1969	182	946.9	17	25.5	165	921.4
1970	184	1,283.1	19	6.8	165	1,276.3
1971	173	1,566.5	25	24.5	148	1,542.0
1972	147	1,129.1	43	10.0	104	1,119.1
1973	149	1,669.5	21	5.8	128	1,663.7
1974	241	2,664.2	14	9.6	227	2,654.6
1975	187	2,401.7	6	5.0	181	2,396.7
1976[r]	162	2,469.7	4	1.3	158	2,468.4
1977	108	1,941.7	7	5.8	101	1,935.9

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

EXPORTS OF NEW CIVIL HELICOPTERS

Calendar Years 1966 to Date
(Millions of Dollars)

Year	TOTAL		Under 2,000 Pounds		2,000 Pounds and Over	
	Number	Value	Number	Value	Number	Value
1966	161	$ 11.5	119	$ 5.1	42	$ 6.4
1967	223	25.2	166	9.9	57	15.3
1968	242	32.9	169	11.9	73	21.0
1969	252	29.1	212	12.7	40	16.4
1970	332	26.9	284	17.1	48	9.8
1971	298	45.7	230	17.9	68	27.8
1972	256	50.3	184	17.1	72	33.2
1973	428	83.3	317	33.1	111	50.2
1974	395	109.6	267	29.7	128	79.9
1975	336	104.7	210	27.5	126	77.2
1976	315	113.4	201	28.2	114	85.2
1977	321	105.5	233	38.0	88	67.5

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

EXPORTS OF NEW GENERAL AVIATION AIRCRAFT

Calendar Years 1966 to Date
(Millions of Dollars)

Year	TOTAL		Single Engine		Multi-Engine			
					Under 3000 Lbs.		3000 Lbs. & Over	
	Number	Value	Number	Value	Number	Value	Number	Value
1966	2,985	$ 89.1	2,387	$35.2	261	$13.4	337	$40.5
1967	3,125	91.2	2,554	36.9	198	9.5	373	44.8
1968	2,890	101.3	2,295	36.1	163	8.5	432	56.7
1969	2,461	125.6	1,761	35.0	211	11.9	489	78.7
1970	2,037	112.5	1,493	31.5	142	8.7	402	72.3
1971	1,566	89.4	1,199	26.1	80	5.1	287	58.2
1972	2,072	130.3	1,546	34.6	92	5.0	434	90.7
1973	3,163	200.6	2,392	53.2	149	8.4	622	139.0
1974	4,263	287.2	3,367	81.4	116	6.4	780	199.4
1975	3,268	306.8	2,460	70.8	168	11.3	640	224.7
1976	3,214	360.4	2,374	73.9	228	17.3	612	269.2
1977	3,462	382.9	2,664	93.1	273	27.4	525	262.4

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).
NOTE: Excludes transports under 33,000 lbs., airframe weight.

EXPORTS OF MILITARY AIRCRAFT

Calendar Years 1973 to Date

	1973	1974	1975	1976[r]	1977
TOTAL NUMBER OF AIRCRAFT . .	608	736	951	751	721
Bombers, Land & Carrier Type	68	90	3	–	–
Fighters, Land & Carrier Type	208	309	475	331	244
Trainers	62	40	51	13	46
Utility, Personal & Liaison Aircraft . .	19	15	2	2	–
Cargo Transports	45	47	51	32	53
Rotary Wing Aircraft	79	73	116	139	95
New Aircraft, NEC	97	140	237	176	242
Used or Rebuilt Aircraft	24	19	16	58	41
Airships & Balloons	6	3	–	–	–
TOTAL VALUE (Millions of Dollars) .	$ 790.8	$1,101.2	$1,306.4	$ 966.6	$1,186.1
Bombers, Land & Carrier Type	69.6	105.4	1.3	–	–
Fighters, Land & Carrier Type	518.8	739.8	904.0	513.2	685.9
Trainers	12.1	6.0	5.1	2.2	13.0
Utility, Personal & Liaison Aircraft . .	1.0	0.8	0.2	0.5	–
Cargo Transports	131.2	190.3	235.0	150.5	317.6
Rotary Wing Aircraft	37.6	50.1	123.3	101.8	83.7
New Aircraft, NEC	19.4	6.9	33.2	142.8	6.9
Used or Rebuilt Aircraft	1.0	1.8	4.3	55.6	79.0
Airships & Balloons	0.1	0.1	–	–	–

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).
NEC Not elsewhere classified.
r Revised

EXPORTS OF USED AIRCRAFT

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL		Civil		Military	
	Number	Value	Number	Value	Number	Value
1960	634	$ 26.2	564	$ 25.7	70	$ 0.5
1961	618	35.1	494	33.9	124	1.2
1962	511	37.5	382	36.6	129	0.9
1963	423	16.6	356	16.4	67	0.2
1964	489	30.7	288	27.9	201	2.8
1965	474	39.7	407	39.0	67	0.7
1966	397	45.7	364	30.7	33	15.0
1967	391	85.5	362	60.2	29	25.3
1968	304	75.5	290	68.7	14	6.8
1969	382	137.7	379	137.7	3	(a)
1970	361	106.1	358	104.0	3	2.1
1971	419	205.3	413	205.2	6	0.1
1972	471	301.4	450	299.0	21	2.4
1973	621	358.5	597	357.5	24	1.0
1974	709	301.1	690	299.3	19	1.8
1975	597	391.3	581	387.0	16	4.3
1976	650	319.5	592	263.9	58	55.6
1977	518	392.1	477	313.1	41	79.0

Source: Bureau of the Census, "U.S. Exports, Schedule B, Commodity and Country," Report FT 410 (Monthly).
a Less than $0.05 million.

EXPORTS OF NEW AND USED CIVIL AIRCRAFT ENGINES

Calendar Years 1960 to Date
(Millions of Dollars)

Year	TOTAL		Jet and Gas Turbine		Internal Combustion	
	Number	Value	Number	Value	Number	Value
1960	3,725	$ 70.7	480	$ 47.5	3,245	$ 23.2
1961	3,640	75.3	364	53.6	3,276	21.7
1962	3,690	63.0	341	44.8	3,349	18.2
1963	3,143	45.1	253	25.7	2,890	19.4
1964	4,062	46.7	247	25.0	3,815	21.7
1965	3,330	56.2	372	38.8	2,958	17.4
1966	4,006	77.0	564	49.3	3,442	27.7
1967	4,236	101.2	756	69.6	3,480	31.6
1968	3,279	115.6	866	92.4	2,413	23.2
1969	4,178	102.4	759	82.0	3,419	20.4
1970	3,790	117.6	634	98.4	3,156	19.2
1971	3,530	148.5	707	128.6	2,823	19.9
1972	3,823	184.3	592	158.6	3,231	25.7
1973	5,017	175.7	641	144.8	4,376	30.9
1974	4,924	228.8	801	195.0	4,123	33.8
1976	4,243	253.7	745	212.8	3,498	40.9
1977	4,199	233.1	667	195.9	3,532	37.2

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

EXPORTS OF HELICOPTERS

By Selected U.S. Manufacturers
Calendar Years 1973 to Date

	1973	1974	1975	1976	1977
TOTAL NUMBER EXPORTED	413	420	437	369	548
Canada & Greenland	68	67	67	45	41
Latin America	82	103	80	78	114
Europe	126	121	103	82	87
Middle East	2	28	58	49	152
Asia	86	61	72	68	114
Oceania	27	31	19	34	34
Africa	22	9	21	13	6
Countries not identified	—	—	17	—	—
TOTAL VALUE (Millions of Dollars)[a]	$ 84.8	$ 123.7	$ 219.9	$ 181.1	$ 368.0
Canada & Greenland	11.2	13.1	20.4	12.1	12.7
Latin America	23.8	24.5	35.9	24.2	37.8
Europe	32.0	63.4	58.7	57.7	87.0
Middle East	0.1	4.9	40.4	46.2	152.1
Asia	12.7	14.2	21.9	30.9	73.4
Oceania	1.7	2.5	3.7	7.8	4.0
Africa	3.3	1.1	2.2	2.2	1.0
Countries not identified	—	—	36.7	—	—

Source: Aerospace Industries Association, company reports from Bell, Boeing-Vertol, Enstrom, Hiller, Hughes and Sikorsky.
a Manufacturers' Net Billing Price.
NOTE: 1976 helicopter exports included 13 military helicopters; 1977 helicpoter exports included 204 military helicopters.

EXPORTS OF GENERAL AVIATION AIRCRAFT

By Selected U. S. Manufacturers
Calendar Year 1973 to Date

	1973	1974	1975	1976	1977
TOTAL NUMBER EXPORTED	3,531	4,248	3,512	3,539	3,611
Canada & Greenland	429	514	610	637	498
Latin America	1,125	1,583	1,206	1,221	1,382
Europe	1,268	1,177	925	927	1,023
Asia	121	153	172	165	68
Oceania	219	450	237	387	440
Africa	269	371	362	207	200
TOTAL VALUE (Millions of Dollars)[a]	$286.4	$230.3	$318.6	$331.4	$354.6
Canada & Greenland	19.7	23.2	26.0	31.9	25.6
Latin America	69.1	99.1	102.4	101.4	122.5
Europe	89.1	92.9	90.4	101.6	139.2
Asia	10.0	21.6	34.5	44.2	17.8
Oceania	17.1	21.0	18.9	20.2	27.4
Africa	25.3	28.6	46.4	32.1	22.1

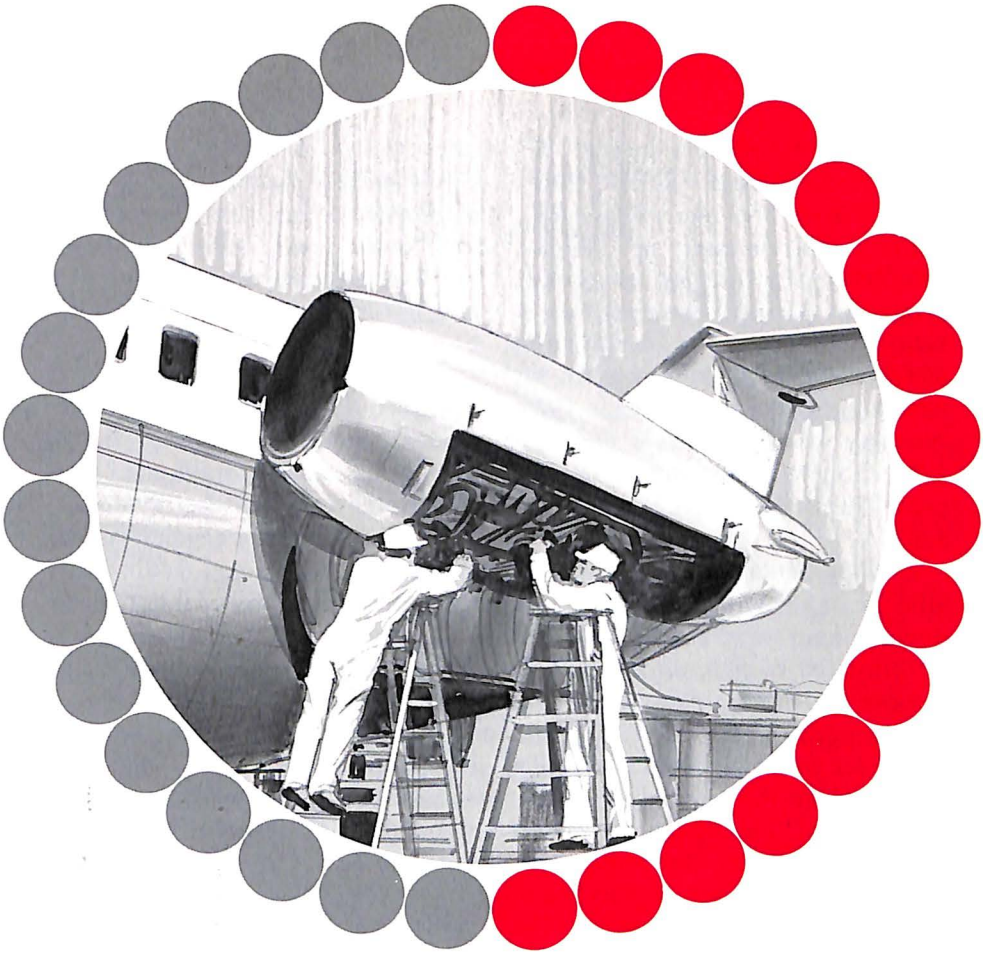
Source: General Aviation Manufacturers' Association.
NOTE: Data are based on exports reported by Beech, Bellanca, Cessna, Gates Learjet, Grumman American Aviation, Lake, Maule, Mooney, Piper, Rockwell and Swearingen of new civil aircraft.
a Manufacturers' Net Billing Price.

EXPORTS OF COMMERCIAL TRANSPORT AIRCRAFT

33,000 Pounds and Over Airframe Weight
Calendar Years 1973 to Date

	1973	1974	1975	1976[r]	1977
TOTAL UNITS	128	227	181	158	101
Canada	11	15	18	1	–
Latin America	6	31	27	15	7
Europe	65	91	67	49	32
Middle East	3	16	11	31	20
Asia	18	49	32	20	22
Oceania	5	11	9	4	4
Africa	20	14	17	38	16
TOTAL VALUE (Millions of Dollars)	$ 1,664	$ 2,655	$ 2,397	$ 2,468	$ 1,936
Canada	178	187	162	6	–
Latin America	36	268	213	138	59
Europe	908	1,044	935	700	571
Middle East	42	163	264	504	467
Asia	255	686	525	549	468
Oceania	68	175	147	82	155
Africa	177	132	151	489	216

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



EMPLOYMENT

The aerospace employment curve, influenced by major late-year labor strikes, dipped lower in 1977 for the third straight year, but there were signs of a brightening employment picture for 1978 and later years.

Average industry employment in 1977 was 890,000, a figure which represented a moderate decline—9,000 people, or about one percent—from the previous year's level. The decline however was more a statistical matter than an indication of reduced workload, because the prolonged strikes at the plants of two major manufacturers lowered the year's active employment average.

Workers engaged in aircraft manufacture—including civil and military airplanes, engines, parts and related equipment—dropped 6,000 to a total of 479,000. Employment in missile and space programs fell by 4,000 to 81,000. These reductions were partially offset by an increase of 3,000 workers, to a total of 138,000, in the communications equipment category.

Production workers in the 1977 labor force totaled 412,000, down 10,000 from the preceding year. Almost 60 percent of them—243,000—were working on aircraft programs. Average hourly compensation for production workers in aircraft and parts plants was $6.91, which compared with $6.45 in 1976. Average weekly earnings came to $288.15 in 1977, up almost 10 percent from the 1976 average of $263.16.

Employment of scientists and engineers in aerospace research and development programs at year-end 1977 totaled 69,500, up 2,600 from the previous year. Aerospace as a percentage of all U.S. scientists and engineers working on R&D projects remained at the preceding year's 18.3 percent. This figure, the lowest recorded, reflects the continuous decline in aerospace research and development activity since the mid-sixties. In 1964, aerospace R&D-engaged scientists and engineers numbered 101,000 and they constituted about 30 percent of all U.S. scientific/engineering personnel in R&D work. The percentage has dropped or remained constant in every year since.

With regard to overall industry employment, an Aerospace Industries Association survey conducted early in 1978 forecasts a reversal of the declining trend in evidence since 1968, the industry's peak year in which the labor force numbered more than 1.5 million. The 1977 employment figure of 890,000 amounted to less than 60 percent of the peak year total, but the employment survey predicted a new upturn to an estimated 930,000 by the end of 1978.

The AIA projection, based on data provided by 51 major companies, anticipated gains in all categories of occupational classification. Employment in the aircraft manufacturing segment of the aerospace industry, traditionally the largest in terms of labor force, was expected to rise more than four percent between year-end 1977 and year-end 1978. The principal reason cited was the 1976-77 improvement in the financial posture of the U.S. scheduled airlines, which sparked a significant increase in new orders for commercial transports. The survey also indicated a substantial 1978 gain in helicopter manufacturing employment.

Accelerating activity on programs related to NASA's Space Shuttle, due to become operational in 1980, was expected to boost employment in the missile/space segment of the Industry. AIA forecast a 1978 gain of almost two percent after three consecutive years of decline in this area. An employment increase of 1.2 percent was projected for a third category of industry effort which embraces avionics, non-aerospace products and basic research.

AEROSPACE EMPLOYMENT

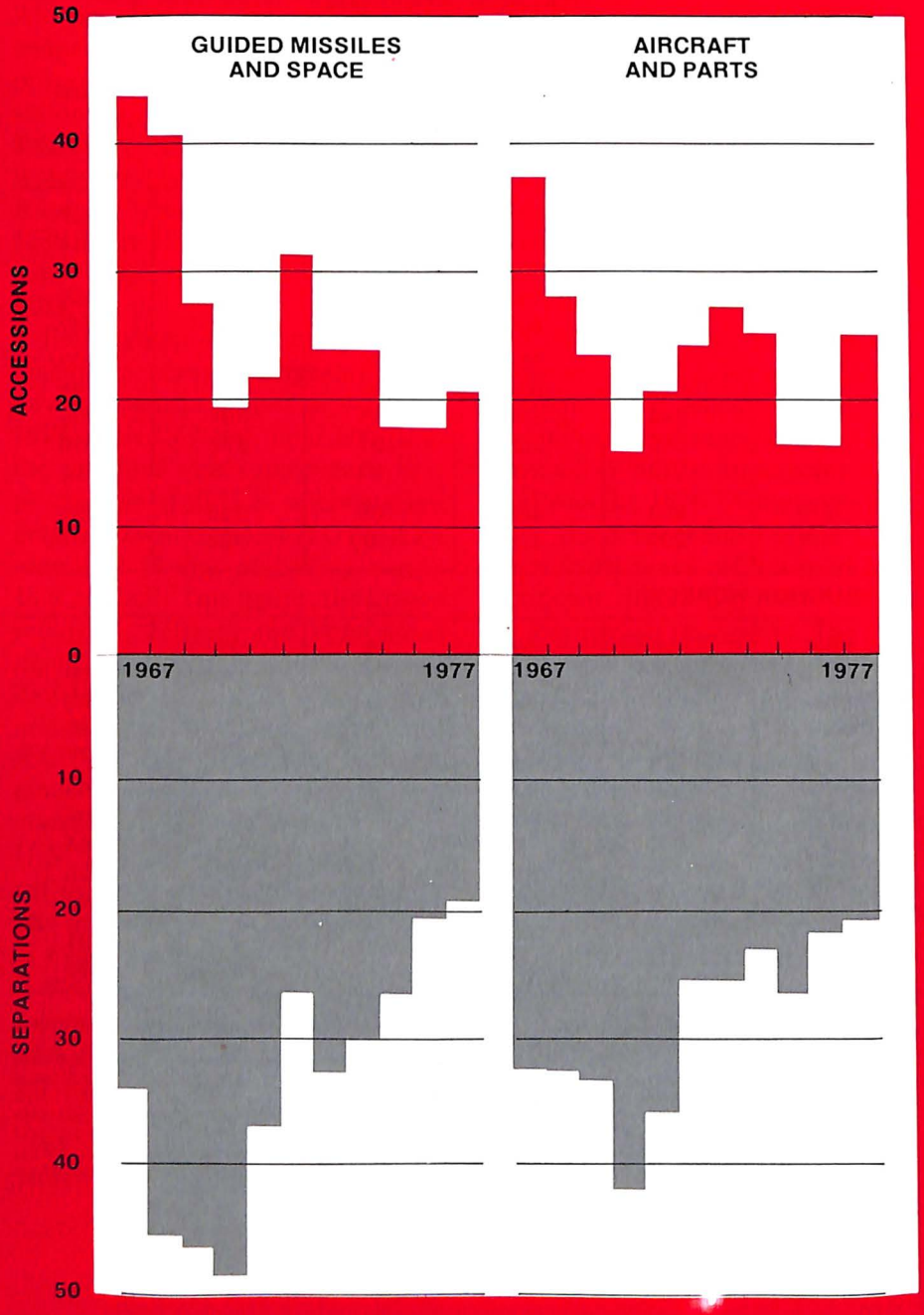
Calendar Years 1966 to Date
(Thousands of Employees)

Year	TOTAL	Aircraft	Missiles & Space	Communi-cations Equipment	Other
TOTAL EMPLOYMENT					
1966	1,375	753	159	166	297
1967	1,484	834	157	179	314
1968	1,502	852	150	184	316
1969	1,402	804	124	179	295
1970	1,166	669	98	152	247
1971	951	531	88	129	203
1972	922	501	90	132	199
1973	948	514	95	134	205
1974	965	532	91	132	210
1975	942	514	90	136	202
1976	899	485	85	135	194
1977	890	479	81	138	192
PRODUCTION WORKERS					
1966	731	446	55	73	157
1967	804	502	55	78	169
1968	807	506	52	80	169
1969	746	464	41	86	155
1970	604	369	31	77	127
1971	480	285	26	66	103
1972	453	271	27	57	98
1973	475	281	31	59	104
1974	478	291	24	58	105
1975	455	273	25	58	99
1976	422	250	23	58	91
1977	412	243	22	57	90

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

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

AEROSPACE INDUSTRY LABOR TURNOVER RATES PER 100 EMPLOYEES



Source: U.S. Department of Labor

LABOR TURNOVER RATES IN THE AEROSPACE INDUSTRY

Calendar Years 1966 to Date
(Rates per 100 Employees per Year)

Year	Complete Missiles and Spacecraft	Aircraft			
		TOTAL	Airframes	Engines and Engine Parts	Other Parts & Equipment
ACCESSIONS					
1966	44.1	48.6	47.3	43.2	61.0
1967	43.5	37.4	36.6	32.5	46.6
1968	40.7	28.1	27.1	22.9	39.8
1969	27.4	23.4	20.8	24.6	31.5
1970	19.3	16.1	13.9	15.1	26.2
1971	21.6	20.4	21.6	13.2	27.6
1972	31.2	24.0	22.8	21.6	33.6
1973	24.0	27.6	24.0	22.8	43.2
1974	24.0	25.2	24.0	19.2	38.4
1975	18.0	16.8	16.8	12.0	20.4
1976	18.0	16.8	16.8	13.2	25.2
1977	20.4	25.2	22.8	20.4	36.0
SEPARATIONS					
1966	30.8	31.5	28.1	31.0	46.9
1967	34.0	32.2	27.9	34.1	43.9
1968	45.4	32.3	30.2	31.3	41.1
1969	46.6	33.2	30.8	32.2	42.4
1970	48.7	41.7	43.8	32.1	47.4
1971	37.2	36.0	32.4	34.8	50.4
1972	26.4	25.2	22.8	19.2	38.4
1973	32.4	25.2	24.0	20.4	37.2
1974	30.0	22.8	20.4	20.4	33.6
1975	26.4	26.4	26.4	22.8	32.4
1976	20.4	21.6	20.4	15.6	33.6
1977	19.2	20.4	19.2	16.8	27.6

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

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY

Calendar Years 1966 to Date
(Thousands of Employees)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
TOTAL EMPLOYMENT				
1966	753.3	417.3	208.1	127.8
1967	833.6	468.2	221.0	144.4
1968	852.0	487.8	216.4	147.8
1969	804.4	456.7	205.0	142.7
1970	668.7	369.6	179.9	119.2
1971	530.8	287.7	150.6	92.6
1972	501.1	272.2	138.5	90.5
1973	514.0	274.6	144.8	94.5
1974	532.0	289.3	146.2	96.5
1975	514.4	275.0	139.6	99.8
1976	484.7	261.7	131.6	91.4
1977	478.7	253.3	132.8	92.6
PRODUCTION WORKERS				
1966	446.4	239.8	119.4	87.2
1967	501.5	272.9	129.4	99.2
1968	505.5	280.9	123.9	100.7
1969	464.0	255.1	114.1	94.8
1970	369.3	197.0	95.0	77.3
1971	284.5	147.1	79.0	58.4
1972	271.2	139.5	73.5	58.2
1973	280.8	140.6	79.1	61.1
1974	290.5	147.4	80.3	62.8
1975	273.4	133.6	76.8	62.9
1976	250.0	124.5	70.7	54.9
1977	243.0	116.6	70.4	56.0

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly).
NOTE: The above figures include substantial missile and spacecraft employment in recent years. They do not, however, represent total aerospace employment, estimates for which appear in preceding tables in this chapter.

EARNINGS IN AIRCRAFT AND PARTS PLANTS

Production Workers Only
(Includes Overtime Premiums)
Calendar Years 1966 to Date

Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
AVERAGE HOURLY EARNINGS				
1966	$ 3.31	$ 3.34	$ 3.32	$ 3.21
1967	3.45	3.49	3.42	3.35
1968	3.62	3.64	3.65	3.53
1969	3.86	3.90	3.87	3.76
1970	4.11	4.17	4.10	3.99
1971	4.35	4.41	4.38	4.16
1972	4.70	4.78	4.76	4.43
1973	5.01	5.13	5.06	4.66
1974	5.40	5.57	5.43	5.01
1975	5.99	6.20	6.03	5.52
1976	6.45	6.62	6.52	5.96
1977	6.91	7.07	7.04	6.42
AVERAGE WEEKLY EARNINGS				
1966	$ 143.32	$ 142.95	$ 144.09	$ 142.85
1967	146.97	147.28	145.35	146.73
1968	152.04	152.88	151.11	151.44
1969	161.35	163.41	158.28	159.05
1970	168.51	170.97	166.05	166.78
1971	175.82	178.76	173.53	170.98
1972	193.44	197.66	193.17	183.10
1973	207.50	210.84	211.09	196.19
1974	218.70	219.46	223.72	210.92
1975	246.19	250.48	249.64	231.29
1976	263.16	271.42	262.10	245.55
1977	288.15	295.53	289.34	272.21

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly).
NOTE: The production workers surveyed include substantial missile and spacecraft employment. See NOTE page 123.

WORK STOPPAGES
AIRCRAFT AND PARTS INDUSTRY

Calendar Years 1966 to Date

Year	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
1966	23	38,000	204,000
1967	22	28,800	161,000
1968	46	45,500	594,300
1969	26	76,400	1,564,600
1970	12	6,800	552,500
1971	24	17,200	465,500
1972	18	20,800	148,100
1973	13	4,531	99,145
1974	27	16,800	370,000
1975	20	22,800	1,245,600
1976	21	13,000	330,500

Source: Department of Labor, Bureau of Labor Statistics, Division of Wages and Industrial Relations.
NOTE: The "aircraft and parts industry" to which this table applies includes substantial missile and spacecraft employment. It represents approximately 60 per cent of total aerospace employment.

WORK-INJURY RATES[a]
AEROSPACE AND ALL MANUFACTURING

Calendar Years 1971 to Date

Year	All Manufacturing	Aircraft & Parts (SIC 372)	Guided Missiles & Spacecraft (SIC 1925)
1971	16.1	N.A.	N.A.
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[b]

Source: Department of Labor, Bureau of Labor Statistics.
a Defined as the number of injuries per 100 man-years of work.
b Effective 1976, SIC 1925 changed to SIC 376.
N.A. Not available.

EMPLOYMENT OF SCIENTISTS AND ENGINEERS FOR RESEARCH AND DEVELOPMENT

Total and Aerospace
1960 to Date

Year	TOTAL	Aerospace	Aerospace as a Percent of Total
AS OF DECEMBER 31			
1960	292,000	72,400	24.8%
1961	312,100	78,500	25.2
1962	312,000	79,400	25.4
1963	327,300	90,700	27.7
1964	340,200	101,100	29.7
1965	343,600	99,200	28.9
1966	353,200	99,300	28.1
1967	367,200	100,400	27.3
1968	376,700	101,100	26.8
1969	*387,100*	*99,900*	*25.8*
1970	*384,800*	*92,600*	*24.1*
1971	*366,800*	*78,300*	*21.3*
1972	*349,900*	*71,200*	*20.3*
1973	*356,600*	*72,300*	*20.3*
1974	*358,200*	*70,800*	*19.8*
1975	*360,400*	*67,600*	*18.8*
1976[r]	364,700	66,900	18.3
1977	380,700	69,500	18.3

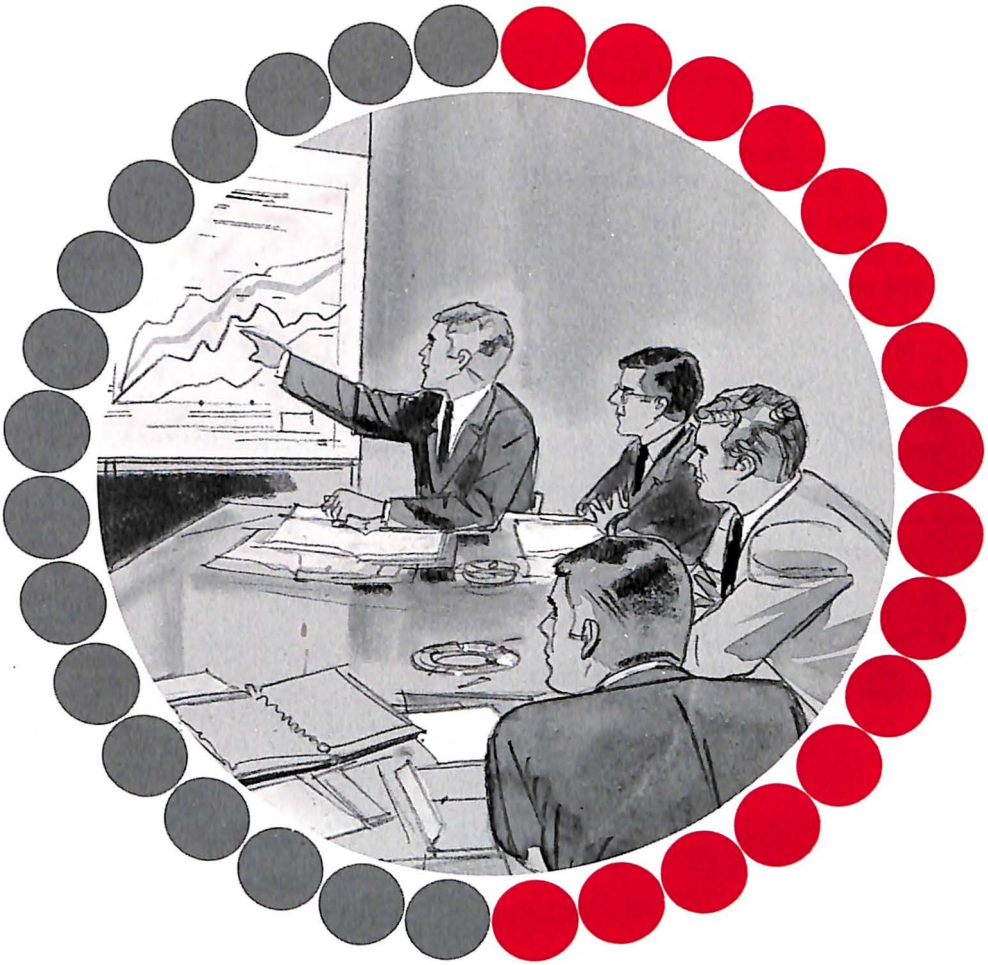
Source: National Science Foundation.
NOTE: Data for years 1969—1975 are being revised by the Bureau of the Census.
a Scientists and engineers working less than full time have been included in terms of their full time equivalent number.
r Revised.

EMPLOYMENT ON NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PROGRAMS

1960 to Date

Year	TOTAL	NASA Employees	Contractor Employees[E]
AS OF JUNE 30			
1960	46,768	10,268	36,500
1961	74,577	17,077	57,500
1962	137,656	22,156	115,500
1963	246,304	27,904	218,400
1964	379,084	31,984	347,100
1965	409,900	33,200	376,700
1966	393,924	33,924	360,000
1967	306,926	33,726	273,200
1968	267,871	32,471	235,400
1969	218,345	31,745	186,600
1970	160,850	31,350	129,500
1971	143,578	29,478	114,100
1972	138,800	27,500	111,300
1973	134,850	26,850	108,000
1974	125,220	25,020	100,200
1975	127,733	24,333	103,400
1976	130,739	24,039	108,000
AS OF SEPTEMBER 30			
1977	124,136	23,636	100,500
1978[E]	126,037	23,237	102,800
1979[E]	127,537	23,237	104,300

Sources: NASA, Briefing on the Budget of the United States, January 23, 1978.
E Estimate.



FINANCE

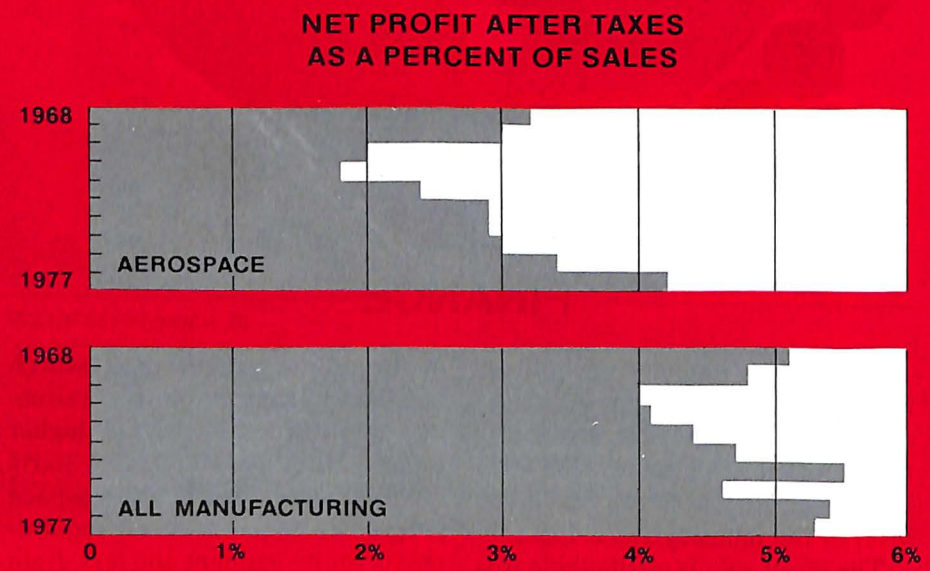
The aerospace industry's profit rate after taxes as a percent of sales, amounted to 4.2 percent, a substantial improvement over the 1976 level of 3.4 percent, and the highest profit level in the industry since 1950.

The profit gain is attributable to a number of factors, among them an upturn in the nation's economy, a concerted industry effort to reduce overhead costs, and a cyclical workload situation described as a "program maturity phase." During the year, the industry had a higher ratio of production programs to research and development programs, a situation that generally yields higher profits. There were fewer new starts in both military and civil aerospace programs, hence reduced requirements for investment and less drain on profitability.

The aerospace balance sheet for 1977 showed an increase in both the industry's total net worth and net working capital. Net worth approached $9.9 billion, compared with $9 billion in 1976. Net working

capital increased by $1.3 billion to a total of $6.4 billion. The industry's provision for federal income taxes was $1 billion, up 44 percent from $694 million in 1976.

McDonnell Douglas Corporation maintained top ranking among defense contractors in terms of fiscal year 1977 contract dollar value. Next, in order, were Lockheed Corporation, United Technologies Corporation, The Boeing Company, and General Electric Company. Rockwell International Corporation led the NASA list, followed by McDonnell Douglas, Martin Marietta Corporation, Bendix Corporation, and General Dynamics Corporation.



Source: Federal Trade Commission

NET PROFIT AFTER TAXES AS A PERCENT OF SALES FOR MANUFACTURING CORPORATIONS

Calendar Years 1960 to Date

Year	All Manufacturing Corporations[a]	Non-Durable Goods	Durable Goods	Aerospace
1960	4.4%	4.8%	4.0%	1.4%
1961	4.3	4.7	3.9	1.8
1962	4.5	4.7	4.4	2.4
1963	4.7	4.9	4.5	2.3
1964	5.2	5.4	5.1	2.6
1965	5.6	5.5	5.7	3.2
1966	5.6	5.5	5.6	3.0
1967	5.0	5.3	4.9	2.7
1968	5.1	5.3	4.9	3.2
1969	4.8	5.0	4.6	3.0
1970	4.0	4.5	3.6	2.0
1971	4.1	4.5	3.8	1.8
1972	4.4	4.6	4.3	2.4
1973	4.7	5.0	4.5	2.9
1974	5.5	6.4	4.7	2.9
1975	4.6	5.1	4.1	3.0
1976[r]	5.4	5.5	5.2	3.4
1977	5.3	5.3	5.3	4.2

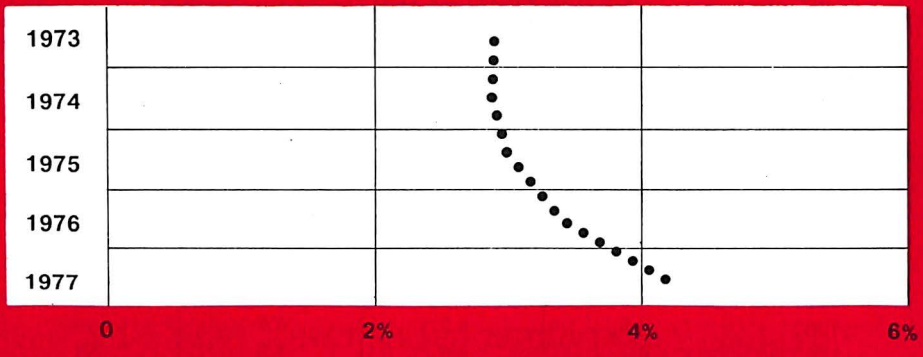
Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

a Does not include newspapers.

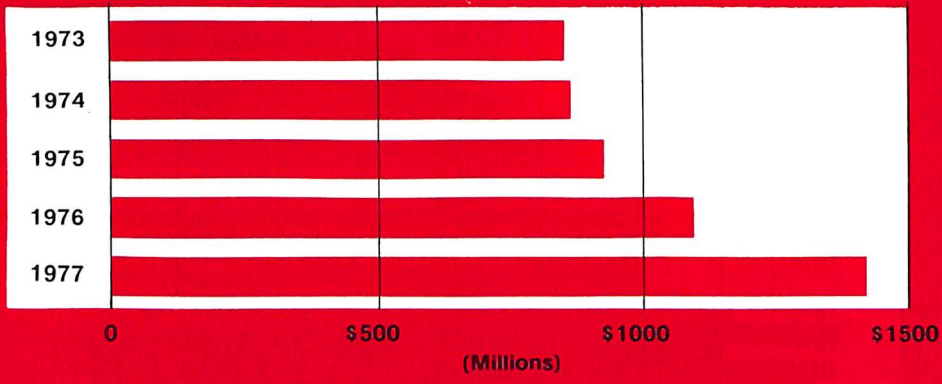
r Revised.

AEROSPACE INDUSTRY

AS A PERCENT OF SALES



NET PROFIT AFTER TAXES



Source: Federal Trade Commission

INCOME ACCOUNTS
AEROSPACE COMPANIES
Calendar Years 1973 to Date
(Millions of Dollars)

	1973	1974	1975	1976[r]	1977
Net Sales	$ 29,494	$ 29,565	$ 31,373	$ 31,828	$ 34,304
Net Profit from Operations	1,619	1,678	1,616	1,874	2,338
Total Income before Federal Income Taxes	1,449	1,328	1,348	1,649	2,295
Provision for Federal Income Taxes . . .	593	537	520	694	1,003
As a Percent of Total Income	40.9%	40.4%	38.9%	42.1%	43.7%
Net Profit after Taxes	855	866	927	1,091	1,427
As a Percent of Net Sales . . .	2.9%	2.9%	3.0%	3.4%	4.2%
Net Profit Retained in Business	571	562	623	750	1,012

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."
NOTE: Does not include data for companies which produce aerospace products but are classified in other than industry group 372.
r Revised.

BALANCE SHEET
AEROSPACE COMPANIES

Calendar Years 1973 to Date
(Millions of Dollars)

	1973	1974	1975	1976[r]	1977
Assets:					
Current Assets					
Cash	$ 643	$ 564	$ 548	$ 765	$ 2,138
U.S. Government Securities	80	14	88	79	31
Other Securities	—	197	206	810	1,098
Total Cash and U.S. Government Securities	$ 723	$ 773	$ 842	$ 1,654	$ 3,267
Receivables (total)	3,621	3,225	3,263	3,088	3,564
Inventories (gross)	11,559	12,180	12,285	10,779	10,568
Other current assets	525	436	527	516	677
Total Current Assets	$ 16,426	$ 16,614	$ 16,917	$ 16,037	$ 18,075
Total Net Plant	4,376	4,077	4,326	4,149	4,320
Other Non-Current Assets	3,173	3,157	3,752	3,693	3,705
Total Assets	$ 23,976	$ 23,848	$ 24,994	$ 23,879	$ 26,100
Liabilities					
Current Liabilities					
Short Term Loans	$ 934	$ 1,114	$ 523	$ 152	$ 279
Advances by U.S. Govt.	2,456	2,821	3,804	3,233	1,886
Trade accounts and notes payable	2,111	2,171	2,029	1,814	2,757
Income taxes accrued	720	821	788	938	1,779
Installments due on long term debts	359	382	291	434	307
Other current liabilities	4,223	4,104	4,080	4,350	4,612
Total Current Liabilities	$ 10,803	$ 11,413	$ 11,514	$ 10,920	$ 11,621
Long Term Debt	4,159	3,753	4,322	3,554	4,117
Other Non-Current Liabilities	540	403	495	398	496
Total Liabilities	$ 15,502	$ 15,569	$ 16,331	$ 14,872	$ 16,233
Stockholders' Equity:					
Capital Stock	$ 2,758	$ 3,033	$ 3,083	$ 3,255	$ 3,452
Earned Surplus and Reserves	5,717	5,246	5,580	5,753	6,415
Total Net Worth	$ 8,475	$ 8,279	$ 8,663	$ 9,007	$ 9,866
Total Liabilities and Stockholders' Equity	$ 23,976	$ 23,848	$ 24,994	$ 23,879	$ 26,100
Net Working Capital	$ 5,625	$ 5,201	$ 5,402	$ 5,118	$ 6,454

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."
NOTE: Includes 72 companies classified in industry group 372 which filed reports with the Securities and Exchange Commission.
r Revised.

NEW PLANT AND EQUIPMENT EXPENDITURES

Calendar Years 1960 to Date
(Billions of Dollars)

Year	All Industries	All Manufacturing Industries	Durable Goods	Aerospace
1960	$ 36.75	$ 15.09	$ 7.23	$ 0.34
1961	35.91	14.33	6.31	0.30
1962	38.39	15.06	6.79	0.40
1963	40.77	16.22	7.53	0.45
1964	46.97	19.34	9.28	0.42
1965	54.42	23.44	11.50	0.46
1966	63.51	28.20	14.96	0.92
1967	65.47	28.51	14.06	0.93
1968	67.76	28.37	14.12	0.86
1969	75.56	31.68	15.96	0.83
1970	79.71	31.95	15.80	0.55
1971	81.21	29.99	14.15	0.38
1972	88.44	31.35	15.64	0.43
1973	99.74	38.01	19.25	0.53
1974	112.40	46.01	22.62	0.80
1975	112.78	47.95	21.84	0.94
1976	120.49	52.48	23.68	0.94
1977[r]	137.02	61.03	28.26	1.00
1978[E]	150.89	67.35	31.57	1.24

Source: 1960-1967: U.S. Department of Commerce, Survey of Current Business January. 1970; 1968-1971: U.S. Department of Commerce, Securities and Exchange Commission, Joint Statistical Report; 1972-to-date U.S. Department of Commerce, Bureau of Economic Analysis.
E Estimate, based on a BEA survey.
r Revised

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MAJOR CONTRACTORS

By rank according to net value of NASA prime contracts awarded during Fiscal Year 1977 (Millions of Dollars)

Company	1973	1974	1975	1976	1977
TOTAL PROCUREMENTS	$2,673	$2,714	$2,866	$3,205	$3,532
TOTAL Awards to Business Firms	2,064	2,119	2,255	2,536	2,838
Percent of TOTAL PROCUREMENTS	77%	78%	79%	79%	80%
Rockwell International Corp.	318	487	682	906	1,011
McDonnell Douglas Corp.	272	156	125	125	139
Martin Marietta Corp.	192	202	130	110	119
Bendix Corp.	79	80	76	75	91
General Dynamics Corp.	80	80	85	76	79
General Electric Co.	87	65	70	61	69
Lockheed Electronics Co.	29	35	46	56	68
International Business Machines Corp.	61	48	54	43	66
Thiokol Corp.	4	17	29	47	62
Boeing Co.	76	60	44	55	53
RCA Corp.	38	35	40	47	42
Computer Sciences Corp.	25	27	27	29	41
Hughes Aircraft Co.	21	18	26	48	39
United Technologies Corp.	25	40	36	18	34
TRW Inc.	28	21	34	45	29
Ford Aerospace & Communications Corp.	38	36	29	20	28
Planning Research Corp.	2	4	14	22	26
Vought Corporation	20	17	19	16	22
Singer Company	7	4	9	15	21
Sperry Rand Corp.	27	22	22	32	19
Global Associates	7	8	9	12	19
Northrop Services, Inc.	17	16	17	17	19
Lockheed Corp.	7	8	7	11	19
Boeing Services International Inc.	(a)	(a)	3	5	16
Teledyne Industries, Inc.	10	12	12	11	14
Federal Electric Co.	25	21	10	15	14
Algernon Blair Inc.	(a)	(a)	(a)	(a)	13
Chicago Bridge & Iron Co.	(a)	(a)	(a)	(a)	13
Pan American World Airways, Inc.	5	10	8	7	12
Blount Bros. Corp.	(a)	(a)	(a)	20	12

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

a Not in list of major contractors for indicated years.

DEPARTMENT OF DEFENSE
MAJOR CONTRACTORS

Listed by rank according to net value of military prime contracts awarded during fiscal year[a] 1977
(Millions of Dollars)

	1973	1974	1975	1976	1977
U.S. TOTAL, ALL CONTRACTS	$31,627	$34,357	$39,501	$41,976	$50,385
McDonnell Douglas Corp.	1,143	1,309	1,398	2,465	2,574
Lockheed Corp.	1,659	1,464	2,080	1,510	1,673
United Technologies Corp	741	1,212	1,407	1,233	1,585
The Boeing Company	1,229	1,076	1,561	1,176	1,580
General Electric Co.	1,416	1,211	1,264	1,347	1,520
Rockwell International Corp.	704	819	732	966	1,480
Grumman Aerospace Corp.	909	687	1,343	982	1,428
General Dynamics Corp.	707	1,853	1,289	1,073	1,372
Hughes Aircraft Co.	547	825	1,026	911	1,093
Northrop Corp.	446	491	620	1,480	1,047
Raytheon Co.	680	740	681	784	1,041
Westinghouse Electric Corp.	505	461	315	482	802
Tenneco Inc.	214	264	242	768	745
Sperry Rand Corp.	447	393	437	506	652
Chrysler Corp.	152	412	283	469	620
Litton Industries, Inc.	424	926	1,038	978	609
International Business Machines Corp.	302	252	360	256	547
Todd Shipyard Corp.	(b)	(b)	(b)	314	468
American Telephone and Telegraph Co.	775	691	510	447	457
Honeywell, Inc.	272	281	292	386	457
Textron Inc.	747	418	546	372	455
Fairchild Industries	55	100	192	227	429
Martin Marietta Corp.	225	246	320	249	426
General Motors Corp.	249	300	390	345	380
RCA Corp.	254	243	286	330	364
TRW Inc.	177	203	292	292	361
Ford Motor Co.	214	175	260	285	352
Singer Company	142	126	214	191	350
Texas Instruments, Inc.	143	115	144	157	324
Teledyne Inc.	188	228	236	296	305

Source: Department of Defense, "100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards," (Annually).
a Fiscal Years ending June 30; effective FY 1977, Fiscal Year ends September 30.
b Not in top 100 companies for listed year.

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

By Geographic Region

Fiscal Years[a] 1974, 1975, 1976

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

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

NOTE: The data for FY 1977 were not available at the time of publication.

a Fiscal Years ending June 30.

b Includes Alaska and Hawaii.

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

By Region and Type of Contractors
Fiscal Year[a] 1976

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

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

NOTE: The data for FY 1977 were not available at the time of publication.

a Fiscal Years ending June 30.

b Includes contracts with other government agencies.

c Includes Alaska and Hawaii.

Glossary

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

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

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

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

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

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

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

Airlines, see **Air Carriers**.

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

Assets, Net, the sum of all recorded assets after reducing such amount by allowance or reserve for bad debts, depreciation and amortization, but before deducting any liabilities, mortgages or other indebtedness.

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

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

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

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

Constant Dollars, see **Deflators.**

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

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

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

DOD, Department of Defense.

DOE, Department of Energy.

DOT, Department of Transportation.

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

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

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

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

ERDA, Energy, Research and Development Administration. ERDA was formed in 1974 to bring together activities previously scattered among several agencies. The major elements covered are nuclear energy, fossil energy, solar and geothermal energy, conservation through increased efficiency, and environmental controls. Most of these functions have been assumed by the Department of Energy as of October 1, 1977.

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

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

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

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

FAA, Federal Aviation Administration (for-

merly the Federal Aviation Agency), part of the Department of Transportation.

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

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

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

FY, see **Fiscal Year.**

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

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

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

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

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

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

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

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

Income

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

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

Other Income and Expense, includes interest income, royalty income, capital

gains and losses, interest expense, cash discounts, etc.

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

Labor Turnover, the gross movement of wage and salary workers into and out of employed status with respect to individual establishments. This movement, which relates to a calendar month or year, is divided into two broad types: **Accessions** (new hires and rehires), **Separations** (terminations of employment initiated by either employer or employee). Each type of action is accumulated for a calendar month or year and expressed as a rate per 100 employees. The data relate to all employees, full- or part-time, permanent or temporary.

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

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

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

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

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

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

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

Man-Hours, in measuring labor input, take into account both the number of production workers and their actual hours of work. The Bureau of Labor Statistics covers all hours paid for, whether worked or not, when the employee was at the plant. One man-hour thus means one hour of a person's time.

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

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

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

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

NASA, National Aeronautics and Space Administration.

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

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

Net Operating Profit, see **Income.**

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

New Hires, see **Labor Turnover.**

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

OASD, Office of the Assistant Secretary of Defense.

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

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

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

Overtime, see **Hours, Overtime.**

Payroll, includes the gross earnings paid in the calendar year to all employees on the payroll of operating manufacturing establishments. Includes all forms of compensation directly to workers such as salaries, wages, commissions, dismissal pay, all bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. Does not include employers' Social Security contributions or other non-payroll labor costs such as employees' pension plans, group insurance premiums, and workmen's compensation.

Passenger-Mile, one passenger moved one mile.

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

Profit, see **Income.**

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

Quits, see **Labor Turnover.**

R&D, Research and Development.

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

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

RDT&E (Department of Defense), research, development, test and evaluation.

Rotorcraft, an aircraft which in all its usual flight attitudes is supported in the air wholly or in part by a rotor or rotors, i.e., by airfoils rotating or revolving about an axis (see **Helicopter**).

Sales, net of returns, allowances, and discounts; the dollar value of shipments less returns and allowances, including dealer's commission, if any, which have passed through the sales account.

Satellite, a body that rotates about another

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

Separation, see **Labor Turnover.**

Space Vehicle, an artificial body operating in outer space (beyond the earth's atmosphere).

Stockholder's Equity, assets minus all obligations of the corporation, except those to stockholders. Annual data are average equity for the year (using four end-of-quarter figures). For details, see Federal Trade Commission's "Quarterly Financial Report for Manufacturing Corporations."

STOL, short take-off and landing aircraft.

Test (Department of Defense), an experiment designed to assess progress in attainment or accomplishment of development objectives (see **RDT&E**).

Thrust, the driving force exerted by an engine, particularly an aircraft or missile engine, in propelling the vehicle to which it is attached.

Ton-Mile, one ton moved one mile.

Total Obligational Authority, the sum of budget authority granted or requested from the Congress in a given year, plus unused budget authority from prior years.

Trade Balance, see **Merchandise Trade Balance.**

Transition Quarter, the three-month interval from July 1, 1976 to September 30, 1976. Beginning with the 1977 budget, the fiscal year (FY) will run from October 1 through September 30. To facilitate the conversion, this transition period has been provided between FY 1976 and FY 1977 as a separate accounting period belonging to neither year.

Turbine, Turbo, a mechanical device or engine that spins in reaction to a fluid flow that passes through or over it. Frequently used in "turboprop" or "turbo-jet."

U.K., United Kingdom.

U.S., United States of America.

USA, United States Army.

USAF, United States Air Force.

USN, United States Navy.

USSR, Union of Soviet Socialist Republics.

Utility Aircraft, an aircraft designed for general purpose work.

V/STOL, vertical take-off and landing aircraft.

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

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