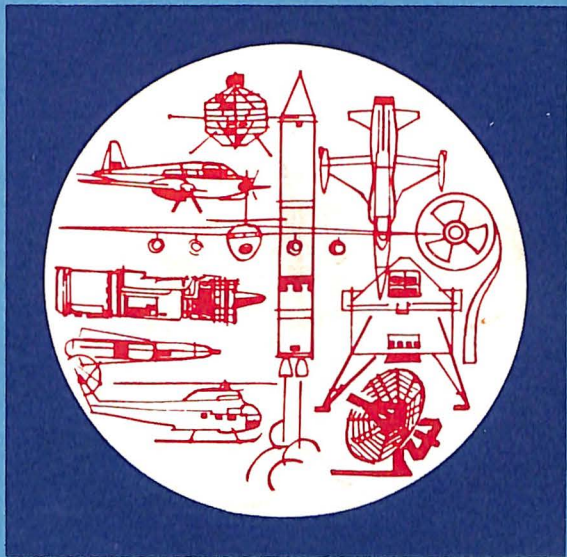


# 1966 AEROSPACE Facts and Figures



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SPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

# 1966 AEROSPACE Facts and Figures

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Library of Congress Card 46-25007

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Published by

*Aero Publishers, Inc.*

329 AVIATION ROAD, FALLBROOK, CALIF. 92028

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**\$3.00 Per Copy**

## FOREWORD

*Aerospace Facts and Figures* provides statistical information on historical trends in the industry for the use of management in both government and industry, legislators, writers and editors, and analysts and students.

The record of the aerospace industry during 1965, which is detailed in the various chapters of this 14th annual edition, was impressive by every measurement, and there are indications that 1966 will exceed the productivity of 1965.

Key elements of this 1965 record include:

- Sales increased to \$20.9 billion, compared with \$20.8 billion in 1964.
- Average employment was 1,154,000 persons, an increase of 37,000 over 1964. However, in December 1965, employment was 1,220,000 and growing.
- Exports attained a post-World War II high of \$1.474 billion, and the percentage of aerospace exports of total U. S. exports increased from 4.7 percent in 1964 to 5.4 percent.
- Aircraft production was the highest since 1947 with an estimated 2,500 military aircraft and 12,549 civil aircraft delivered in 1965. Aircraft sales gained from \$8.9 billion in 1964 to \$9.7 billion in 1965. Utility aircraft sales, valued at manufacturers' net billing price, reached the highest point since 1947 of nearly \$320 million.

Significantly, the increases in these prime economic indicators were accompanied by a decline in government business from 81 percent in 1964 to 76 percent in 1965. The major indicator for future activities—backlog—reached the highest level since World War II



at the end of 1965 with \$20.4 billion in orders. This indicates that sales in 1966 will exceed \$22 billion.

Orders for turbine-powered commercial aircraft, scheduled for delivery within the next few years, reached nearly \$4 billion at the end of 1965.

Another indicator of growth—capital investment in facilities and equipment—further buttresses the outlook for growth. Value of plant and equipment increased from \$1.591 billion in 1964 to \$1.670 billion in 1965. Industry expenditures for research and development also achieved a new high with \$490 million spent on projects largely aimed at future markets. The total of company and government financed research and development increased from \$4.8 billion in 1964 to \$5.1 billion in 1965.

With these new peaks of activities in its basic fields of providing equipment for national defense, space exploration and commercial aviation, the aerospace industry has moved into other areas where its techniques in systems analysis and systems management can be effectively applied. These include such social and economic challenges as water and air pollution control, crime control and inter- and intra-urban ground transportation as well as oceanology and other fields representing more obvious extensions of its capabilities. Whereas such projects accounted for only a fractional part of total aerospace sales in 1965, there were many indications of potentials for substantial and early increase.

KARL G. HARR, JR.

*President*

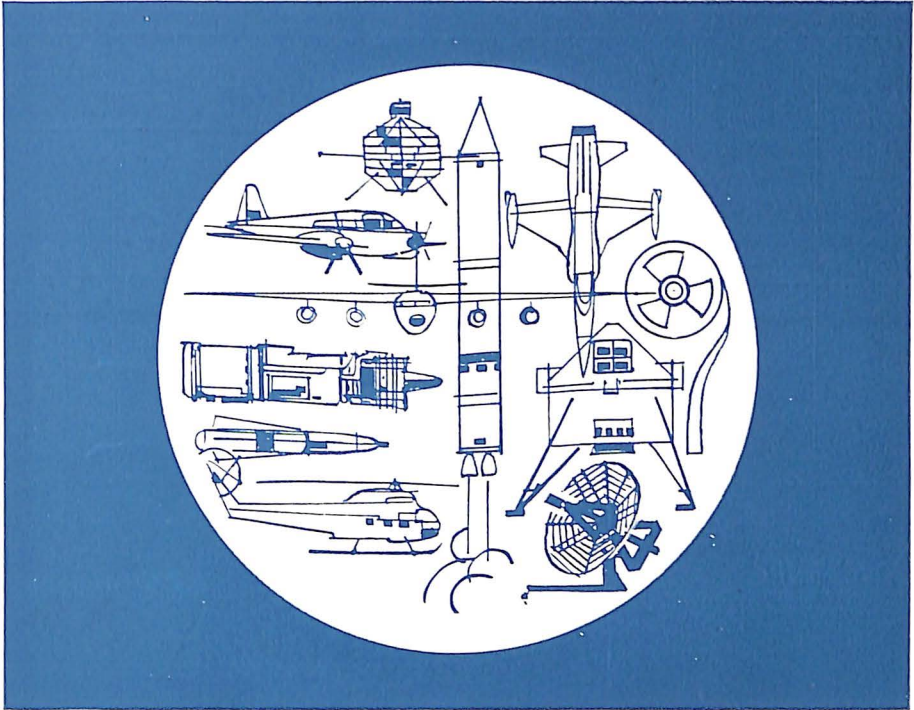
*Aerospace Industries Association*



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# AEROSPACE SUMMARY



Sales in the aerospace industry increased to a new record of \$20.9 billion in 1965 compared with \$20.8 billion in 1964. Sales in every product area except missiles increased in the 1964-65 period. The largest increase was in the value of aircraft sales which rose from \$8.9 billion to \$9.7 billion, an increase of more than \$800 million.

Aerospace sales in 1965, by product group, were: aircraft, over \$9.7 billion; missiles, \$3.6 billion; space vehicles, \$5.3 billion; non-aerospace, \$2.2 billion. In the 1964-65 period the value of aircraft production as a proportion of total aerospace sales increased from 42.9 percent to 46.7 percent. The increase in aircraft sales is the result of the demand for military aircraft for Vietnam operations, the growing need for commercial aircraft resulting from the present re-equipment cycle of the airlines, and the rapid gain in utility aircraft sales.

Total aerospace sales to the government decreased from \$16.8 billion to \$15.9 billion while other sales of the aerospace industry increased from \$3.9 billion to almost \$5 billion. As a proportion of total industry sales, government sales declined from 81 percent in 1964 to 76 percent in 1965.

The contribution to the Gross National Product by the aerospace

AEROSPACE FACTS AND FIGURES, 1966

AEROSPACE SALES AND THE NATIONAL ECONOMY  
Calendar Years 1960 to Date  
(Dollar Figures in Billions)

Year Ending December 31	Total Gross National Product	SALES OF			AEROSPACE SALES AS PER CENT OF		
		Manufacturing Industries	Durable Goods Industry	Aerospace Industry	GNP	Manufacturing Industries	Durable Goods
1960	\$502.6	\$369.6	\$189.8	\$17.3	3.4	4.7	9.1
1961	518.7	370.6	186.4	18.0	3.5	4.9	9.7
1962	556.2	399.7	206.2	19.2	3.5	4.8	9.3
1963	583.9	417.5	217.0	20.1	3.4	4.8	9.3
1964	628.4	445.6	230.8	20.7	3.3	4.6	9.0
1965	676.3	484.1	253.0	20.9	3.1	4.3	8.3

Sources:

Manufacturing and Durable Goods Industries: Department of Commerce, Bureau of the Census, "Manufacturers' Shipments, Inventories, and Orders, Series M3-1" (Monthly).

Gross National Product: Department of Commerce, "Survey of Current Business," (Monthly).

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

AEROSPACE CONTRIBUTION TO GROSS NATIONAL PRODUCT  
Calendar Years 1960 to Date  
(Dollar Figures in Billions)

Year	Total Gross National Product <sup>r</sup>	Contribution to GNP by		Aerospace Contribution as Per Cent of	
		Manufacturing Industries <sup>r</sup>	Aerospace Industry	GNP	Manufacturing Industries <sup>r</sup>
1960	\$503.8	\$125.8	\$ 8.9	1.8%	7.1%
1961	520.1	125.1	9.5	1.8	7.6
1962	560.3	137.0	10.6	1.9	7.7
1963	589.2	143.8	10.8	1.8	7.5
1964	628.7	154.7	10.8	1.7	7.0
1965	676.3	169.6	11.1	1.6	6.5

<sup>r</sup> Revised.

NOTE: The contribution of an industry to Gross National Product is composed of the value added by manufacturing with adjustments for taxes and services.

Source: U. S. Department of Commerce, "Survey of Current Business" (Monthly). Aerospace Industries Association estimates, based on latest available information.

AEROSPACE SUMMARY

ESTIMATED SALES OF THE AEROSPACE INDUSTRY, BY PRODUCT GROUP  
 Calendar Years 1948 to Date  
 (Millions of Dollars)

Year Ending December 31	TOTAL SALES	Product Group			
		Aircraft	Missiles	Space Vehicles	Non- aerospace
1948	\$ 1,493	\$1,359	—	—	\$ 134
1949	2,232	2,032	—	—	200
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	9,126	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 <sup>r</sup>	20,134	8,527	6,003	3,774	1,830
1964	20,766	8,911	5,242	4,720	1,893
1965 <sup>E</sup>	20,867	9,747	3,626	5,329	2,165
1966 <sup>E</sup>	22,158	11,206	3,535	5,144	2,273

NOTE: Includes military and nonmilitary sales and research, development, test and evaluation. Because of changes in source material, individual years are not always strictly comparable.

<sup>r</sup> Revised.

<sup>E</sup> Estimate.

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

industry rose from \$10.8 billion in 1964 to \$11.1 billion in 1965. However, the growth of the aerospace industry was not as rapid as that of the general economy causing the industry to decline from 1.7 percent of the total value of GNP in 1964 to 1.6 percent in 1965.

Aerospace profits as a proportion of sales after taxes increased from 2.6 percent in 1964 to 3.2 percent in 1965. This increase was largely attributable to the reevaluation of profit incentives by the Department of Defense as well as to the rising proportion of commercial activity.



AEROSPACE FACTS AND FIGURES, 1966

Aerospace employment increased by over 3 percent between 1964 and 1965 going from an average of 1,117,000 to 1,154,000, an increase of 37,000 in this twelve-month period. This increase, contrasted with the decline in the previous year, is the result of the substantially increased

ESTIMATED SALES OF THE AEROSPACE INDUSTRY, BY CUSTOMER  
(Millions of Dollars)  
Calendar Years 1948 to Date

Year Ending December 31	TOTAL SALES	Aerospace Products and Services			Non- aerospace Products and Services
		Government		Non- government	
		Department of Defense	NASA and Other		
1948	\$ 1,493	\$ 1,182	—	\$ 177	\$ 134
1949	2,232	1,802	—	230	200
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 <sup>r</sup>	20,134	14,191	2,628	1,485	1,830
1964	20,766	13,218	3,635	2,020	1,893
1965 <sup>E</sup>	20,867	11,396	4,490	2,816	2,165
1966 <sup>E</sup>	22,158	12,029	4,336	3,520	2,273

NOTE: Includes military and nonmilitary sales and research, development, test and evaluation. Because of changes in source material, individual years are not always strictly comparable.

<sup>r</sup> Revised.

<sup>E</sup> Estimate.

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

## AEROSPACE SUMMARY



demand for commercial and military aircraft, space related products, and nonaerospace activities. In 1965, average aerospace employment was 6.4 percent of total U. S. manufacturing employment.

Aerospace payroll rose from \$8.6 billion to over \$9 billion between 1964 and 1965, an increase of 7.7 percent. In 1965 the aerospace manufacturing payroll was 7.9 percent of the total payroll for U. S. manufacturing.

As of December 1965, an AIA survey showed industry employment of 203,000 scientists and engineers, approximately 17 percent of total aerospace industry employment. The National Science Foundation reported 101,200 scientists and engineers engaged in aerospace research and development as of January 1965.

Aerospace exports in calendar year 1965 reached a post World War II high of \$1,474 million. For the eighth time in the past ten years aerospace exports exceeded one billion dollars. Aerospace exports rose in 1965 to 5.4 percent of total U. S. exports from 4.7 percent in 1964. Exports of commercial transports in the period 1964 to 1965 rose by 67 percent.

AEROSPACE FACTS AND FIGURES, 1966

DEPARTMENT OF DEFENSE  
 TOTAL EXPENDITURES, BY APPROPRIATION GROUP  
 Fiscal Years, 1960 to Date  
 (Millions of Dollars)

	Year Ending June 30		
	1960	1961	1962
TOTAL .....	\$42,824	\$44,676	\$48,205
Military Personnel .....	11,738	12,085	13,032
Active Forces .....	10,390	10,651	11,530
Reserve Forces .....	654	648	607
Retired Pay .....	694	786	894
Operation and Maintenance .....	10,223	10,611	11,594
PROCUREMENT .....	13,334	13,095	14,532
AIRCRAFT .....	6,272	5,898	6,400
MISSILES .....	3,027	2,972	3,442
Ships .....	1,744	1,801	1,906
Ordnance, Vehicles, & Related Equipment .....	443	675	1,137
Electronics and Communications .....	1,093	1,042	1,139
Other procurement .....	755	707	508
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION .....	4,710	6,131	6,319
AIRCRAFT .....	632	547	624
MISSILES .....	2,059	3,025	2,777
ASTRONAUTICS .....	512	518	749
Other .....	1,507	2,041	2,169
Military Construction .....	1,626	1,605	1,347
Family Housing .....	—	—	—
Civil Defense .....	—	—	90
Military Assistance .....	1,609	1,449	1,390
AIRCRAFT .....	224	265	206
MISSILES .....	287	154	161
Other .....	1,098	1,030	1,023
Other .....	(416)	(300)	(99)

(Continued on next page)

AEROSPACE SUMMARY

DEPARTMENT OF DEFENSE  
 TOTAL EXPENDITURES, BY APPROPRIATION GROUP—*Continued*  
 Fiscal Years, 1961 to Date  
 (Millions of Dollars)

Year Ending June 30

1963	1964	1965	1966 <sup>E</sup>	1967 <sup>E</sup>
\$49,973	\$51,245	\$47,401	\$54,200	\$58,300
13,000	14,195	14,711	16,600	18,150
11,386	12,312	12,662	14,250	15,560
599	674	725	770	840
1,015	1,209	1,384	1,580	1,750
11,874	11,932	12,349	14,160	14,980
16,632	15,351	11,839	13,880	15,970
6,309	6,053	5,200	6,000	6,717
3,817	3,577	2,096	1,872	1,751
2,522	2,078	1,713	1,650	1,700
1,665	1,597	1,073	2,117	3,403
1,427	1,264	897	1,001	1,048
892	782	625	1,051	1,065
6,376	7,021	6,236	6,370	6,400
544	939	1,017	1,094	1,034
2,241	2,352	1,901	1,855	2,063
946	1,284	921	981	835
2,645	2,446	2,397	2,440	2,468
1,144	1,026	1,007	1,140	1,120
427	580	619	650	545
203	107	93	100	100
1,721	1,485	1,229	1,275	1,150
262	218	278	208	173
183	218	80	98	22
1,276	1,267	871	969	955
(1,404)	(452)	(741)	25	(115)

<sup>E</sup> Estimate.

NOTE: Data in parentheses are minus figures.

Source: Department of Defense, Reports "FAD 524, 526," January 24, 1966.



AEROSPACE FACTS AND FIGURES, 1966

FEDERAL EXPENDITURES FOR SELECTED FUNCTIONS AND FOR  
AEROSPACE PRODUCTS AND SERVICES  
Fiscal Years, 1948 to Date

Year Ending June 30	Federal Expenditures (Millions of Dollars)				AEROSPACE as Per Cent of	
	TOTAL FEDERAL	Total, National Defense	NASA Space Activities	TOTAL AERO- SPACE PRODUCTS AND SERVICES	Total Federal	Total National Defense and NASA
1948	\$33,791	\$11,983	N.A.	\$ 891	2.6%	7.4%
1949	40,057	13,988	N.A.	1,474	3.7	10.5
1950	39,617	13,009	N.A.	2,130	5.4	16.4
1951	44,058	22,444	N.A.	2,878	6.5	12.8
1952	65,408	45,963	N.A.	6,075	9.3	13.2
1953	74,120	50,442	\$ 79	9,204	12.4	18.2
1954	67,537	46,986	90	11,194	16.6	23.8
1955	64,389	40,695	74	10,470	16.3	25.7
1956	66,224	40,723	71	10,544	15.9	25.8
1957	68,966	43,368	76	12,506	18.1	28.8
1958	71,369	44,234	89	13,160	18.4	29.7
1959	80,342	46,483	145	13,330	16.6	28.6
1960	76,539	45,691	401	13,269	17.3	28.8
1961	81,515	47,494	744	13,866	17.0	28.7
1962	87,787	51,103	1,257	15,295	17.4	29.2
1963	92,642	52,755	2,552	16,214	17.5	29.3
1964	97,684	54,181	4,171	17,940	18.4	30.7
1965	96,507	50,163	5,093	15,697	16.3	28.4
1966 <sup>a</sup>	106,428	56,560	5,600	16,907	15.9	27.2
1967 <sup>b</sup>	112,847	60,541	5,300	17,400	15.4	26.4

NOTE: "National Defense" includes the military budget of the Department of Defense and Atomic Energy Commission. Amounts from Trust Funds are not included. "Space Activities" includes research and development activities and administrative operations and construction of facilities of NASA. NASA construction is not included in "Total aerospace products and services," nor is military assistance.

N.A.—Not available.

<sup>a</sup> Estimate.

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

## AEROSPACE SUMMARY

### DEPARTMENT OF DEFENSE AEROSPACE EXPENDITURES Fiscal Years 1960 to Date (Millions of Dollars)

Year Ending June 30	DOD Aerospace Expenditures	Procurement		Research, Development, Test, and Evaluation
		Military Functions	Military Assistance <sup>a</sup>	
1960	\$13,013	\$ 9,299	\$511	\$3,203
1961	13,379	8,870	419	4,090
1962	14,359	9,842	367	4,150
1963	14,302	10,126	445	3,731
1964	14,423	9,630	218	4,575
1965	11,487	7,290	358	3,839
1966 <sup>B</sup>	12,107	7,872	305	3,930
1967 <sup>B</sup>	12,597	8,468	197	3,932

<sup>a</sup>Data on Military Assistance shown in this table are not included in most other tables on Department of Defense expenditures in this book.  
Sources: Department of Defense Reports "FAD 526, 527," January 24, 1966 and Department of Defense "Military Assistance Facts" annually.



AEROSPACE FACTS AND FIGURES, 1966

ACTIVE MILITARY FORCES OF THE UNITED STATES,  
1961 to Date

	Actual, June 30, 1961	Actual, June 30, 1965	Estimated	
			June 30, 1966	June 30, 1967
Military personnel (in thousands):				
Army .....	858	968	1,159	1,234
Navy .....	627	671	724	728
Marine Corps .....	177	190	250	278
Air Force .....	820	824	854	853
Total, Department of Defense .....	2,482	2,653	2,987	3,093
Selected military forces:				
Strategic retaliatory forces:				
Intercontinental ballistic missiles (squadrons):				
Minuteman .....	—	16	17	20
Titan .....	—	6	6	6
Atlas .....	4	—	—	—
Polaris submarines (in commission) .....	5	29	37	41
Strategic bombers (wings):				
B-52 .....	13	14	13	12
B-58 .....	1	2	2	2
B-47 .....	20	5	—	—
Continental air and missile defense forces:				
Manned fighter interceptor squadrons ...	42	39	34	31
Interceptor missile squadrons (BOMARC)	7	6	6	6
Army air defense missile battalions <sup>a</sup> ....	49½	23½	18	18
General purpose forces:				
Army divisions (combat ready) .....	11	16	16	17
Army special forces groups .....	3	7	7	7
Warships (in commission):				
Attack carriers .....	15	16	15	15
Antisubmarine warfare carriers .....	9	9	8	8
Nuclear attack submarines .....	13	21	24	40
Other .....	328	331	331	311
Amphibious assault ships (in commission)	110	135	168	168
Carrier air groups (attack and ASW) ...	28	28	27	27
Marine Corps divisions/aircraft wings ...	3	3/3	4/3	4/3
Air Force tactical forces squadrons .....	93	117	125	128
Airlift and sealift forces:				
Airlift aircraft (squadrons):				
C-130 through C-141 .....	16	38	41	46
C-118 through C-124 .....	35	19	16	11
Troopships, cargo ships, and tankers ...	101	106	118	117
Active aircraft inventory (all programs):				
Army .....	5,564	6,957	7,940	9,282
Navy .....	8,793	8,056	8,086	8,315
Air Force .....	16,905	14,875	14,042	13,785
Commissioned ships in fleet (all programs) .	819	880	941	939

<sup>a</sup> Decrease reflects phaseout of Nike-Ajax and transfer of Nike-Hercules battalions to Army National Guard.

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

## AEROSPACE SUMMARY

### EMPLOYMENT IN ALL MANUFACTURING, DURABLE GOODS, AND AEROSPACE INDUSTRIES Calendar Years 1959 to Date (Thousands of Employees)

Year Ending December 31	All Manu- facturing Industries	Durable Goods Industries	AEROSPACE INDUSTRY		
			TOTAL	As Per Cent of	
				Manufac- turing	Durable Goods
1959	16,675	9,373	1,128	6.8%	12.0%
1960	16,796	9,459	1,074	6.1	10.8
1961	16,326	9,070	1,096	6.7	12.1
1962	16,853	9,480	1,177	7.0	12.4
1963	16,995	9,616	1,174	6.9	12.2
1964	17,259	9,813	1,117	6.5	11.3
1965 <sup>E</sup>	17,894	10,379	1,154	6.4	11.1

<sup>E</sup> Estimate.

Sources:

Manufacturing and Durable Goods: Bureau of Labor Statistics, "Employment and Earnings," (Monthly).

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

### ESTIMATED EMPLOYMENT AND PAYROLL IN THE AEROSPACE INDUSTRY Calendar Years 1959 to Date

Year Ending December 31	Aerospace Employment			Aerospace Payroll			Aerospace as Per Cent of Total	
	TOTAL (Thousands of Employees)	Sala- ried	Produc- tion Worker	TOTAL (Millions of Dollars)	Sala- ried	Produc- tion Worker	Manu- factur- ing Em- ploy- ment	Manu- factur- ing Pay- roll
1959	1,128	455	673	\$7,239	\$3,598	\$3,641	6.8%	8.5%
1960	1,074	467	607	7,108	3,756	3,352	6.1	8.1
1961	1,096	499	597	7,582	4,145	3,437	6.7	8.6
1962	1,177	558	619	8,525	4,814	3,711	7.0	9.0
1963	1,174	594	580	8,833	5,152	3,681	6.9	8.9
1964	1,117	565	552	8,598	5,013	3,585	6.5	8.3
1965	1,154	570	584	9,258	5,216	4,042	6.4	8.0

Sources:

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

Manufacturing Payroll: Bureau of the Census, "Annual Survey of Manufacturers."

Aerospace Employment and Payroll: Aerospace Industries Association, based on latest available information.



AEROSPACE FACTS AND FIGURES, 1966

U. S. EXPORTS AND EXPORTS OF AEROSPACE PRODUCTS  
 Calendar Years 1948 to Date  
 (Millions of Dollars)

Year Ending December 31	Total U. S. Exports of Merchandise <sup>a</sup>	Exports of Aerospace Products			
		TOTAL	Commer- cial Transports	Other Aerospace Products	Per Cent of Total U. S. Exports
1948	\$12,532	\$ 154	\$ 37	\$ 117	1.2%
1949	11,936	283	22	261	2.4
1950	10,142	242	40	202	2.4
1951	14,879	301	13	288	2.0
1952	15,049	603	18	585	4.0
1953	15,652	881	79	802	5.6
1954	14,981	619	93	526	4.1
1955	15,419	728	81	647	4.7
1956	18,940	1,059	133	926	5.6
1957	20,671	1,028	179	849	5.0
1958	17,745	972	147	826	5.5
1959	17,438	770	108	662	4.4
1960	20,349	1,330	480	850	6.5
1961	20,717	1,210	268	942	5.8
1962	21,359	1,436	255	1,181	6.7
1963	22,922	1,240	191	1,049	5.4
1964	25,987	1,212	211	1,001	4.7
1965	27,300	1,474	353	1,121	5.4

<sup>a</sup> Excluding re-exports and shipments of military aircraft under the Mutual Security Program.  
 Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).

AEROSPACE EXPENDITURES IN THE FEDERAL BUDGET  
Fiscal Year Ending June 30, 1966

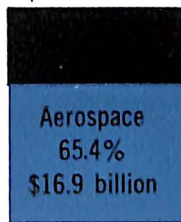
Total,  
Federal Expenditures  
\$106.4 billion



Total  
National Defense  
and Space  
Expenditures  
\$56.6 billion



Total,  
Procurement, and  
Research and Development  
(DOD and NASA)  
\$25.9 billion



For statistical data on which this chart is based, see Federal Expenditures for Selected Functions and for Aerospace Products and Services, Page 12.  
Department of Defense, Total Expenditures for Appropriation Group, Page 10-11.

AEROSPACE FACTS AND FIGURES, 1966

AIRCRAFT IN OPERATION ON WORLD CIVIL AIRLINES, NUMBER AND PERCENTAGE  
MANUFACTURED IN THE UNITED STATES  
Calendar Years 1958 to Date

Year Ending December 31	TOTAL AIRCRAFT IN OPERATION	Number Manufactured in the United States	Per Cent Manufactured In the United States
1958	3,402	2,819	82.9%
1959	3,479	2,868	82.4
1960	3,376	2,766	81.9
1961	3,319	2,542	76.6
1962	3,162	2,345	74.2
1963	3,086	2,266	73.4
1964	3,137	2,319	73.9

NOTE: Based on reports by 93 members of the International Air Transport Association.  
Source: International Air Transport Association.

NET PROFIT AFTER TAXES AS A PER CENT OF SALES FOR  
MANUFACTURING CORPORATIONS  
1957 to Date

Year	All Manufacturing Corporations (except Newspapers)	Non- Durable Goods	Durable Goods	AEROSPACE
1957	4.8%	4.9%	4.8%	2.9%
1958	4.2	4.4	3.9	2.4
1959	4.8	4.9	4.8	1.6
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

Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

## AEROSPACE SUMMARY

### DEPARTMENT OF DEFENSE OBLIGATIONS FOR AEROSPACE ACTIVITIES 1960 to Date (Millions of Dollars)

Year Ending June 30	TOTAL	Aircraft	Missiles	Astronautics
1960	\$11,624	\$ 6,513	\$4,672	\$ 439
1961	11,098	5,667	4,911	520
1962	13,017	6,591	5,604	822
1963	14,112	6,499	6,415	1,198
1964	13,567	6,254	5,822	1,491
1965	12,464	7,025	4,550	889
1966 <sup>E</sup>	15,033	10,466	3,550	1,017
1967 <sup>E</sup>	12,112	7,004	5,265	843

<sup>E</sup> Estimate.

Source: Department of Defense, Reports "FAD 526, 527," January 24, 1966.

### FEDERAL OBLIGATIONS FOR AEROSPACE PRODUCTS AND SERVICES 1960 to Date (Millions of Dollars)

Year Ending June 30	TOTAL	Department of Defense	National Aeronautics and Space Administration
1960	\$11,939	\$11,624	\$ 315
1961	11,751	11,098	653
1962	14,321	13,017	1,304
1963	16,628	14,112	2,516
1964	17,443	13,567	3,876
1965	16,808	16,464	4,344
1966 <sup>E</sup>	19,584	15,003	4,581
1967 <sup>E</sup>	16,365	12,112	4,253

<sup>E</sup> Estimate.

Sources: Department of Defense, Reports "FAD 526, 527" January 24, 1966; National Aeronautics and Space Administration, Financial Analysis Division; The Budget of the United States (Annually).



# AIRCRAFT PRODUCTION



Aerospace industry production and sales of civil and military aircraft continued to increase in 1965. According to Census Bureau and Department of Defense data, the industry produced 15,049 aircraft, a gain of 2,996 from 1964.

Dollar value of 1965 aircraft sales, as reported by 60 aerospace companies, amounted to \$7 billion. Of this amount, \$4.5 billion were sales to the U. S. government; the balance, \$2.5 billion, were sales to other customers, principally commercial and foreign governments.

Backlog of unfilled orders for aircraft, aircraft engines, propellers and parts rose spectacularly from \$7.8 billion in 1964 to \$11.4 billion in 1965.

In terms of airframe weight delivered, civilian purchases predominated for the first time since 1947. In 1965, 32.2 million airframe pounds were produced for non-military consumption, up from 22.9 million pounds in 1964. Airframe weight production for the military remained at 30 million pounds, the same as in 1964.

Production or development of military aircraft during 1965 included attack, bomber, cargo, fighter, reconnaissance and trainer aircraft.

## AIRCRAFT PRODUCTION

For security reasons, the Department of Defense does not release current production figures for military aircraft. However, expenditures for military aircraft during Fiscal Year 1965 amounted to \$5.2 billion, down \$853 million from 1964.

Production of commercial transport aircraft showed a marked increase in 1965 with a total of 268 as compared with 195 in 1964.

Utility aircraft production, as reported by eight AIA member com-

AIRCRAFT SALES AND BACKLOG, REPORTED BY MAJOR MANUFACTURERS OF  
COMPLETE AIRCRAFT, AIRCRAFT ENGINES, PROPELLERS, AND PARTS  
Calendar Years 1948 to Date  
(Millions of Dollars)

Year Ending December 31	Aircraft, Aircraft Engines, Propellers, and Parts	
	Net Sales During Year	Backlog December 31
1948	\$1,061 <sup>a</sup>	\$ 2,983
1949	1,668	2,853
1950	2,116	4,717
1951	2,872	11,898
1952	5,654	16,692
1953	7,754	15,928
1954	7,471	13,755
1955	7,231	13,864
1956	7,689	16,000
1957	9,482	12,363
1958	8,661	10,182
1959	7,206	8,082
1960	6,527	7,791
1961	5,842	7,214
1962	5,898	6,528
1963	5,613	6,722
1964	6,428	7,799
1965	7,057	11,387

<sup>a</sup> Three quarters only.

NOTE: 1948 to 1960 based on reports from about 48 companies—all companies known to be engaged in the manufacture of complete aircraft, aircraft engines, and aircraft propellers. After 1960, based on reports from about 60 aerospace companies.

Source: Bureau of the Census, "Current Industrial Reports, Series M37D," (Quarterly).

AEROSPACE FACTS AND FIGURES, 1966

panies, increased from 9,336 in 1964 to 11,852 in 1965. The net billing price for these deliveries amounted to \$318,732,000, up 60 percent from the previous year's billings.

Aircraft engine production in 1965 rose to 23,941, including an estimated 350 reciprocating and 5,400 jets for the military and 17,018 reciprocating and 1,173 jets for civil use.

AIRCRAFT SALES BY MAJOR MANUFACTURERS OF COMPLETE AIRCRAFT,  
AIRCRAFT ENGINES, PROPELLERS AND PARTS  
Calendar Years 1948 to Date  
(Millions of Dollars)

Year Ending Dec 31	Total Aircraft Sales			Aircraft & Parts		Aircraft Engines & Parts		Aircraft Propellers & Parts	
	TOTAL	U.S. Gov- ern- ment	Other	U.S. Gov- ern- ment	Other	U.S. Gov- ern- ment	Other	U.S. Gov- ern- ment	Other
1948 <sup>a</sup>	\$1,061	\$ 884	\$ 177	\$ 626	\$ 122	\$ 222	\$ 43	\$ 36	\$12
1949	1,668	1,438	230	927	171	461	47	50	12
1950	2,116	1,878	238	1,255	161	561	64	62	13
1951	2,872	2,525	347	1,657	226	779	100	89	21
1952	5,654	5,004	650	3,442	455	1,440	169	122	26
1953	7,754	7,026	734	4,661	518	2,189	189	176	27
1954	7,471	6,649	822	4,626	600	1,872	190	151	32
1955	7,231	6,445	786	4,605	559	1,728	205	112	22
1956	7,689	6,523	1,166	4,704	814	1,718	317	101	35
1957	9,482	7,884	1,598	5,607	1,165	2,137	390	140	43
1958	8,661	7,289	1,372	5,305	1,014	1,858	321	126	37
1959	7,206	5,395	1,841	4,063	1,395	1,268	408	64	38
1960	6,527	4,319	2,208	3,333	1,766	913	417	73	25
1961	5,842	3,966	1,876	2,945	1,442	1,021	434	<sup>b</sup>	<sup>b</sup>
1962	5,898	4,126	1,772	2,998	1,389	1,130	383	<sup>b</sup>	<sup>b</sup>
1963	5,613	4,154	1,459	2,986	1,055	1,168	404	<sup>b</sup>	<sup>b</sup>
1964	6,428	4,571	1,857	3,506	1,409	1,065	448	<sup>b</sup>	<sup>b</sup>
1965	7,057	4,525	2,532	3,393	1,950	1,132	582	<sup>b</sup>	<sup>b</sup>

<sup>a</sup> Total for the last three quarters of 1948 only.

<sup>b</sup> Included in "Aircraft and Parts."

NOTE: 1948 to 1960 based on reports from about 48 companies—all companies known to be engaged in the manufacture of complete aircraft, aircraft, engines, and aircraft propellers.

After 1960, based on reports from about 60 aerospace companies.

Source: Bureau of the Census, "Current Industrial Reports, Series M37D" (Quarterly).

## AIRCRAFT PRODUCTION

### AIRCRAFT BACKLOG OF ORDERS REPORTED BY MAJOR MANUFACTURERS OF COMPLETE AIRCRAFT, AIRCRAFT ENGINES, PROPELLERS AND PARTS 1948 to Date (Millions of Dollars)

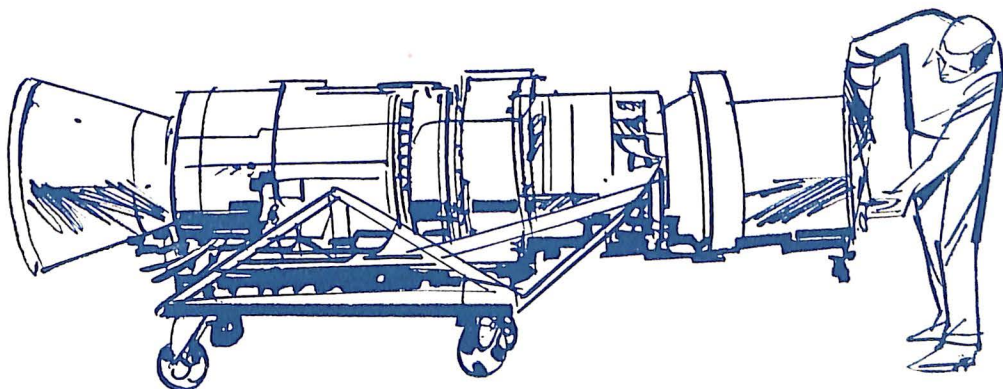
Dec. 31	Total Aircraft Backlog			Aircraft & Parts		Aircraft Engines & Parts		Aircraft Propellers & Parts	
	TOTAL	U.S. Government	Other	U.S. Government	Other	U.S. Government	Other	U.S. Government	Other
1948	\$ 2,983	\$ 2,817	\$ 166	\$1,962	\$ 132	\$ 759	\$ 27	\$ 96	\$ 7
1949	2,853	2,708	145	1,913	100	710	39	85	6
1950	4,717	4,287	430	2,759	343	1,399	71	129	16
1951	11,898	10,899	999	7,336	790	3,350	181	213	28
1952	16,692	15,626	1,066	10,367	855	4,992	180	267	31
1953	15,928	14,984	944	10,840	764	3,953	153	191	27
1954	13,755	12,835	920	9,868	771	2,806	123	161	26
1955	13,864	11,553	2,311	8,717	1,956	2,730	331	106	24
1956	16,000	12,299	3,701	8,837	2,907	3,316	749	146	45
1957	12,363	8,942	3,421	6,437	2,799	2,379	590	126	32
1958	10,182	6,933	3,249	5,407	2,688	1,479	539	47	22
1959	8,082	5,442	2,640	4,419	2,231	985	400	48	9
1960	7,791	5,406	2,385	4,101	2,031	1,256	348	49	6
1961	7,214	5,084	2,130	3,996	1,673	1,088	457	"	"
1962	6,528	4,864	1,664	3,687	1,301	1,177	363	"	"
1963	6,722	4,825	1,897	3,844	1,467	1,081	430	"	"
1964	7,799	5,283	2,516	4,291	1,988	992	528	"	"
1965	11,387	6,071	5,316	4,425	4,460	1,646	856	"	"

NOTE: 1948 to 1960 based on reports from about 48 companies—all companies known to be engaged in the manufacture of complete aircraft, aircraft engines, and aircraft propellers.

After 1960, based on reports from about 60 aerospace companies.

" Included in "Aircraft and Parts."

Source: Bureau of the Census, "Current Industrial Reports, Series M37D" (Quarterly).



AEROSPACE FACTS AND FIGURES, 1966

U. S. AIRCRAFT PRODUCTION  
 Calendar Years 1909 to Date  
 (Number of Aircraft)

Year Ending December 31	TOTAL	Military	Civil
1909	N.A.	1	N.A.
1910	N.A.	—	N.A.
1911	N.A.	11	N.A.
1912	45	16	29
1913	43	14	29
1914	49	15	34
1915	178	26	152
1916	411	142	269
1917	2,148	2,013	135
1918	14,020	13,991	29
1919	780	682	98
1920	328	256	72
1921	437	389	48
1922	263	226	37
1923	743	687	56
1924	377	317	60
1925	789	447	342
1926	1,186	532	654
1927	1,995	621	1,374
1928	4,346	1,219	3,127
1929	6,193	677	5,516
1930	3,437	747	2,690
1931	2,800	812	1,988
1932	1,396	593	803
1933	1,324	466	858

(Continued on next page)

AIRCRAFT PRODUCTION

AIRCRAFT PRODUCTION  
1909 TO DATE (cont'd)  
(Number of Aircraft)

Year Ending December 31	TOTAL	Military	Civil
1934	1,615	437	1,178
1935	1,710	459	1,251
1936	3,010	1,141	1,869
1937	3,773	949	2,824
1938	3,623	1,800	1,823
1939	5,856	2,195	3,661
1940	12,813	6,028	6,785
1941	26,289	19,445	6,844
1942	47,675	47,675	—
1943	85,433	85,433	—
1944	95,272	95,272	—
1945	48,912	46,865	2,047
1946	36,418	1,417	35,001
1947	17,739	2,122	15,617
1948	9,838	2,536	7,302
1949	6,137	2,592	3,545
1950	6,200	2,680	3,520
1951	7,532	5,055	2,477
1952	10,640	7,131	3,509
1953	13,112	8,978	4,134
1954	11,478	8,089	3,389
1955	11,484	6,664	4,820
1956	12,408	5,203	7,205
1957	11,943	5,198	6,745
1958	10,938	4,078	6,860
1959	11,076	2,834	8,242
1960	10,237	2,056	8,181
1961	9,054	1,582	7,472
1962	9,308	1,975	7,333
1963	10,125	1,970	8,155
1964	12,053 <sup>B</sup>	2,000 <sup>B</sup>	10,053
1965	15,049 <sup>B</sup>	2,500 <sup>B</sup>	12,549

NOTE: 1950 to date excludes aircraft produced for the Military Assistance Program.

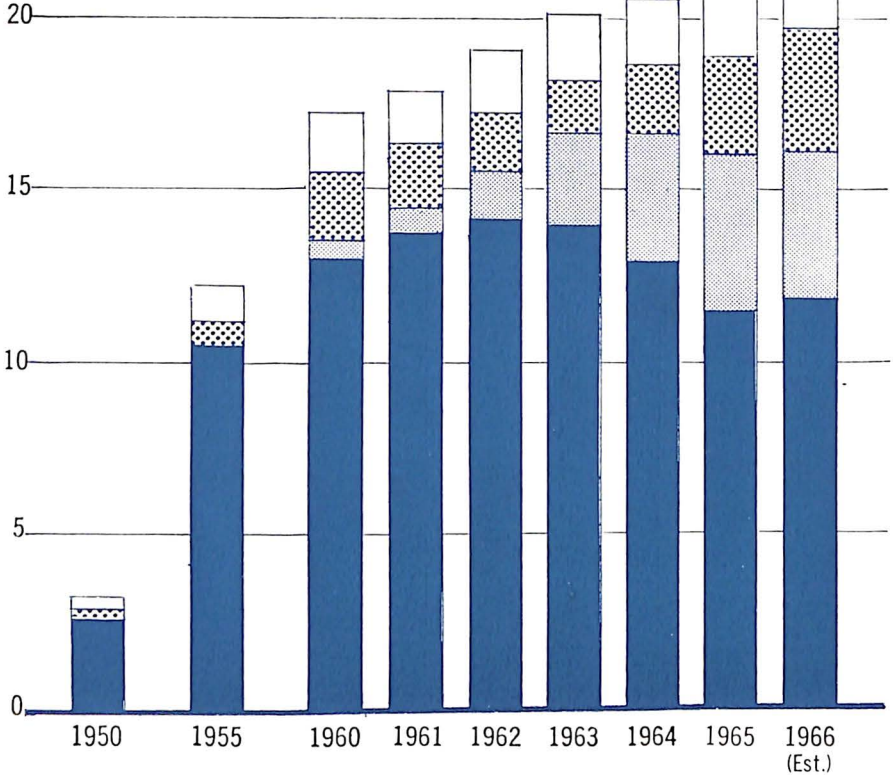
<sup>B</sup> Estimate.

N.A.—Not available.

Sources: Aerospace Industries Association, "Aerospace Facts and Figures" (Annually).  
Department of Commerce, Bureau of the Census, "Current Industrial Reports, Series M37G" (Monthly).  
Department of Defense.

SALES OF THE AEROSPACE INDUSTRY, BY CUSTOMER

Billions of Dollars



- NONAEROSPACE
- ▤ NONGOVERNMENT
- ▨ NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
- DEPARTMENT OF DEFENSE

For statistical data on which this chart is based, see Estimated Sales of the Aerospace Industry, by Customer, Page 8.



## AIRCRAFT PRODUCTION

### AIRFRAME WEIGHT PRODUCTION Calendar Years 1939 to Date

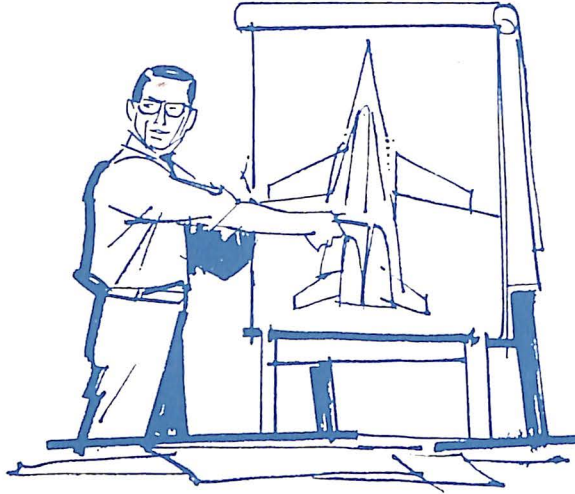
Year Ending December 31	Weight in Millions of Pounds (Excluding Spares)		
	TOTAL	Military	Civil
1939	12.5 <sup>B</sup>	10.1	2.4 <sup>B</sup>
1940	27.8 <sup>B</sup>	23.1	4.7 <sup>B</sup>
1941	86.1 <sup>B</sup>	81.4	4.7 <sup>B</sup>
1942	275.8	275.8	—
1943	654.2	654.2	—
1944	961.1	961.1	—
1945	541.1	539.4	1.7
1946	38.4	12.9	25.5
1947	29.3	11.4	17.9
1948	35.2	25.1	10.1
1949	37.0	30.3	6.7
1950	41.9	35.9	6.0
1951	55.2	50.2	5.0
1952	116.6	107.3	9.3
1953	148.4	138.0	10.4
1954	140.9	130.4	10.5
1955	124.5	114.3	10.2
1956	106.2	90.0	16.2
1957	101.2	79.4	21.8
1958	82.8	66.1	16.7
1959	74.9	51.8	23.1
1960	64.0	35.8	28.2
1961	51.5	29.6	21.9
1962	55.8	35.6	20.2
1963	48.2	32.1	16.1
1964	52.9 <sup>B</sup>	30.0 <sup>B</sup>	22.9
1965	62.2 <sup>B</sup>	30.0 <sup>B</sup>	32.2

<sup>B</sup> Estimate.

Sources:

Aerospace Industries Association, "Aerospace Facts and Figures" (Annually).  
 Bureau of the Census, "Current Industrial Reports, Series M37G" (Monthly).  
 Department of Defense.

AEROSPACE FACTS AND FIGURES, 1966



DEPARTMENT OF DEFENSE  
EXPENDITURES FOR AIRCRAFT PROCUREMENT, BY AGENCY  
Fiscal Years 1951 to Date  
(Millions of Dollars)

Year Ending June 30	Total Defense Department	Air Force	Navy	Army
1951	\$2,412	\$1,812	\$ 594	\$ 7
1952	4,888	3,633	1,205	51
1953	8,189	N.A.	N.A.	N.A.
1954	9,080	N.A.	N.A.	N.A.
1955	8,804	N.A.	N.A.	N.A.
1956	7,835	N.A.	N.A.	N.A.
1957	8,647	N.A.	N.A.	N.A.
1958	8,793	N.A.	N.A.	N.A.
1959	7,730	N.A.	N.A.	N.A.
1960	6,272	4,414	1,765	93
1961	5,898	3,926	1,832	141
1962	6,400	4,387	2,102	170
1963	6,309	3,746	2,328	234
1964	6,053	3,894	1,859	300
1965	5,200	3,115	1,739	346
1966 <sup>E</sup>	6,000	3,900	1,801	299
1967 <sup>E</sup>	6,717	3,700	2,163	854

N.A.—Not available.

<sup>E</sup> Estimate.

Source: Department of Defense, Reports "FAD 526," January 24, 1966.

MILITARY AIRCRAFT AND DRONES IN DEVELOPMENT OR PRODUCTION, 1966  
(Fixed Wing)

Type	Designation	Name	Service	Manufacturer
<b>ATTACK</b>				
Anti-submarine	S-2E (S2F-3S)	Tracker	Navy	Grumman
Attack	A-4E (A4D-5)	Skyhawk	Navy	Douglas
Attack	A/EA-6A, EA-6B, (A2F-1,1H)	Intruder	Navy	Grumman
Attack	A-7A	Corsair II	Navy & USAF	Ling Temco- Vought
<b>BOMBER</b>				
Bomber	FB-111A	—	USAF	General Dynamics
<b>CARGO</b>				
Cargo	C-2A (W2F-COD)	—	Navy	Grumman
Cargo/Rescue	HC-130H	Hercules	USAF	Lockheed
Cargo	C-130E	Hercules	USAF	Lockheed
Cargo	C-141A	Starlifter	USAF	Lockheed
Cargo	CV-2B (AC-1A)	Caribou	Army	DeHavilland
Cargo	C-5A	—	USAF	Lockheed
Cargo	CV-7A	Buffalo	Army	DeHavilland
Cargo	XC-142	Unknown	Tri-Service	Ling-Temco- Vought
<b>FIGHTER</b>				
Fighter/Recon.	F/RF-4B; F4-J (F4H-1, 1P)	Phantom II	Navy	McDonnell
Fighter	F-4C/D/E	—	USAF	McDonnell
Recon. Fighter	RF-4C	—	USAF	McDonnell
Fighter/Recon.	F/RF-111A/B	TFX	USAF & Navy	General Dynamics
Fighter/Int. Fighter	YF-12A F-5A/B	— Freedom Fighter	USAF USAF	Lockheed Northrop
Fighter	F-104G	Starfighter	USAF	Lockheed
<b>TRAINER</b>				
Trainer	TA-4E	Skyhawk	Navy	Douglas
Trainer	T-2B (T2J-2)	Buckeye	Navy	North American
Trainer	T-38A	Talon	USAF	Northrop
Trainer	T-39A	Sabreliner	USAF	North American
Trainer	T-41A	—	USAF	Cessna
Trainer	T-42A	—	Army	Beech
<b>OTHER</b>				
Patrol	P-3A (P3V-1)	Orion	Navy	Lockheed
Surveillance	OV-1 (AO-1)	Mohawk	Army	Grumman
Warning	E-2A (W2F-1)	—	Navy	Grumman
Strategic Recon.	SR-71	—	USAF	Lockheed
Surveillance	OV-10A	—	USAF/ Marine	North American
<b>DRONE</b>				
Drone	AQM-37A (KD-2B)	—	Navy	Maxon
Drone	BQM-34A (Q-2C)	Firebee	USAF/ Navy	Ryan
Drone	MQM-36A (KD2R)	—	Navy	Northrop- Ventura
Drone	MQM-42	Roadrunner	Army	North American
Drone	MQM-57A (USD-1A)	—	Army	Northrop- Ventura
Drone	QH-D (DSN-3)	—	Navy	Gyrodyne
Drone	Type II	Firebee/ Towbee	Army	Ryan/Hayes

Source: Department of Defense.

AEROSPACE FACTS AND FIGURES, 1966

MILITARY AIRCRAFT PRODUCED: NUMBER, FLYAWAY VALUE,  
AND AIRFRAME WEIGHT  
Calendar Years 1950 to Date

Year Ending December 31	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Trans- port	Trainer	Heli- copter	Other
<i>NUMBER</i>							
1950	2,680	560	1,477	176	351	60	56
1951	5,055	502	1,937	271	558	349	1,438
1952	7,131	1,193	2,117	479	1,363	961	1,018
1953	8,978	1,156	3,958	713	1,510	873	768
1954	8,089	1,806	3,511	626	1,403	373	370
1955	6,664	1,353	3,128	513	1,111	410	149
1956	5,203	1,164	1,916	362	778	644	339
1957	5,198	873	2,073	224	819	659	550
1958	4,078	676	1,482	271	560	641	448
1959	2,834	511	922	215	564	451	171
1960	2,056	471	595	142	268	488	92
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
<i>FLYAWAY VALUE<sup>a</sup> (Millions of Dollars)</i>							
1950	1,141.3	546.4	339.7	178.5	47.7	6.3	22.7
1951	1,684.3	690.5	559.1	278.5	78.2	29.6	48.4
1952	3,162.0	1,334.7	751.7	647.9	256.1	101.4	70.2
1953	4,722.9	1,799.2	1,672.5	791.5	253.6	124.4	81.7
1954	5,715.0	2,405.4	2,087.0	854.4	261.3	82.0	24.9
1955	4,927.9	2,013.8	1,907.4	652.7	166.4	169.2	18.4
1956	5,075.3	2,202.9	1,987.4	537.0	115.5	184.6	47.9
1957	5,284.9	2,163.4	2,086.5	676.2	169.5	156.6	32.7
1958	5,365.3	2,157.2	2,106.6	781.9	139.4	156.0	24.2
1959	5,101.0	2,066.1	1,829.5	759.4	216.1	163.1	66.8
1960	3,384.4	1,560.7	1,109.1	415.5	130.0	172.9	50.2
1961 <sup>a</sup>	4,497.4	2,570.0	1,054.6	385.2	199.7	228.2	54.7
1962 <sup>a</sup>	3,816.1	1,629.5	1,005.2	674.3	193.7	249.6	63.8
1963 <sup>a</sup>	2,876.1	798.3	931.0	587.2	181.5	337.3	40.8

(Continued on next page)

## AIRCRAFT PRODUCTION

### MILITARY AIRCRAFT PRODUCED: NUMBER, FLYAWAY VALUE, AND AIRFRAME WEIGHT—*Continued* Calendar Years 1950 to Date

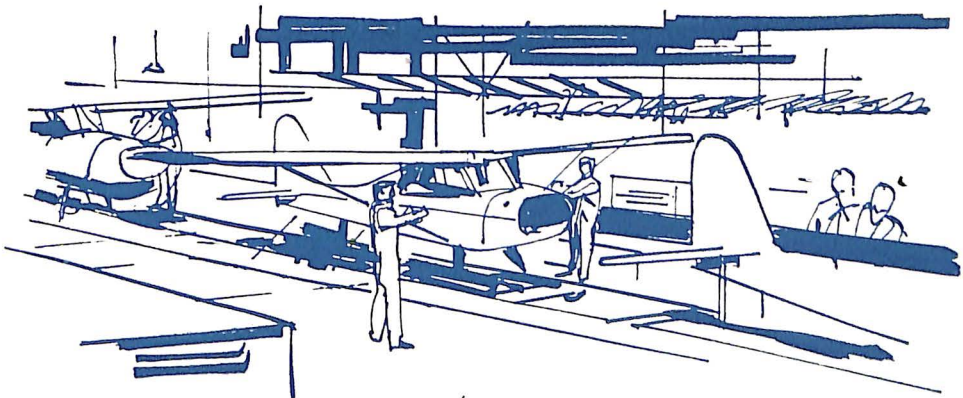
Year Ending December 31	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Trans- port	Trainer	Heli- copter	Other
<i>AIRFRAME WEIGHT<sup>a</sup> (Millions of Pounds)</i>							
1950	35.9	16.4	10.2	6.7	1.9	b	0.7
1951	50.2	17.0	15.7	11.5	3.1	b	2.0
1952	107.3	36.7	31.7	24.6	9.5	b	4.8
1953	138.0	44.1	40.7	36.5	11.3	b	5.4
1954	130.4	51.8	35.4	31.1	9.6	b	2.5
1955	114.3	39.9	43.2	20.9	7.4	b	2.9
1956	90.0	38.6	30.6	13.1	3.3	b	4.4
1957	79.4	32.7	28.7	9.3	4.2	b	4.5
1958	66.1	25.2	18.0	15.9	3.1	b	3.9
1959	51.8	18.6	12.9	14.6	3.5	b	2.2
1960	35.8	13.6	9.1	9.7	1.1	b	2.3
1961	29.6	11.9	6.1	8.3	0.9	b	2.4
1962	35.6	10.3	7.4	13.2	1.3	b	3.4
1963	32.1	4.1	8.2	14.5	1.3	b	4.0

NOTE: Data exclude gliders and targets.

<sup>a</sup> Values up to 1961, are based on unit prices in latest production contracts and do not include values of spares, spare parts, and other support equipment. Since 1961, data include spares, spare parts and support equipment that are procured with the basic aircraft. They are estimated at 20 to 25 per cent of basic aircraft value.

<sup>b</sup> Airframe weight of helicopters is included in the "other" category.

Source: Department of Defense. Data released with a two year lag for security reasons.



AEROSPACE FACTS AND FIGURES, 1966

PRODUCTION OF COMMERCIAL TRANSPORT AIRCRAFT  
1957 to Date  
(Fixed Wing, Multiple Engine)

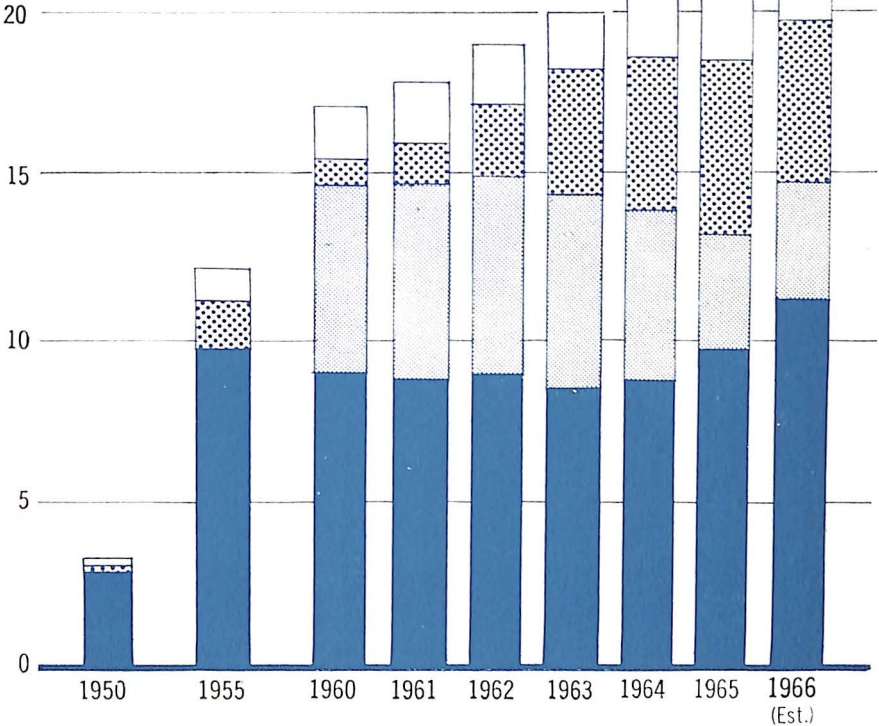
Company and Aircraft	1957	1958	1959	1960	1961	1962	1963	1964	1965
<b>TOTAL*</b>	<b>323</b>	<b>216</b>	<b>262</b>	<b>245</b>	<b>231</b>	<b>160</b>	<b>134</b>	<b>195</b>	<b>268</b>
Boeing									
707	—	7	73	68	11	38	28	32	54
720	—	—	—	24	61	30	6	6	9
727	—	—	—	—	—	—	6	95	112
Convair									
340	—	—	—	—	—	—	—	—	—
440	79	21	14	5	—	—	—	—	—
880	—	—	—	15	49	9	14	—	—
990	—	—	—	—	—	22	15	—	—
Douglas									
DC-6	44	65	1	—	—	—	—	—	—
DC-7	123	57	—	—	—	—	—	—	—
DC-8	—	—	21	91	42	22	19	20	31
DC-9	—	—	—	—	—	—	—	—	5
Fairechild									
F-27J	—	25	41	14	8	7	6	5	12
Grumman									
Gulfstream	—	—	—	—	19	17	24	26	17
Lockheed									
1049	42	21	5	—	—	—	—	—	—
1649	35	8	—	—	—	—	—	—	—
Electra	—	12	107	24	21	—	—	—	—
Jet Star	—	—	—	—	14	9	10	6	18
130	—	—	—	4	6	6	6	—	10
Other	—	—	—	—	—	—	—	5	—

\* Commercial transport totals differ from FAA totals for "transports" because they exclude some executive and other transports for other than commercial use.  
Source: Aerospace Industries Association, company reports.

# AIRCRAFT PRODUCTION

## SALES OF THE AEROSPACE INDUSTRY, BY PRODUCT

Billions of Dollars



For statistical data on which this chart is based, see Estimated Sales of the Aerospace Industry, by Product Group, Page 7.



AEROSPACE FACTS AND FIGURES, 1966

PRODUCTION OF UTILITY AIRCRAFT, BY EIGHT MANUFACTURERS, 1965

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
<b>TOTAL</b>	11,852	\$318,732
<b>Aero Commander</b>		
500B .....	30	
560F .....	1	
680F .....	1	\$ 27,727
680FP .....	6	
Grand Commander .....	22	
Pressurized Grand Commander .....	15	
Turbo Commander .....	3	
Jet Commander .....	32	
<b>Beech</b>		
King Air 90 .....	84	
H Super 18 .....	24	
Queen Air 88 .....	8	72,211
Queen Air 80 .....	53	
Queen Air 65 .....	42	
Baron C-55 .....	40	
Baron B-55 .....	149	
Travel Air (95) .....	45	
Bonanza (35) .....	291	
Debonair (33) .....	171	
Musketeer (23) .....	285	
<b>Cessna</b>		
150 .....	1,637	
172 (Skyhawk) .....	1,437	
F172 .....	114	
180 .....	156	
182 (Skylane) .....	865	97,238
185 (Skywagon) .....	181	
205 .....	2	
Superskylane .....	126	
206 (Super Skywagon) .....	180	
210/Centurion .....	224	
Super Skymaster .....	277	
310 .....	217	
Skyknight .....	91	
411 .....	122	

(Continued on next page)

AIRCRAFT PRODUCTION

PRODUCTION OF UTILITY AIRCRAFT, BY EIGHT MANUFACTURERS, 1965—*Continued*

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
Champion Citabria .....	271	\$ 1,618
Lake LA-4 .....	19	505
Lear—Lear Jet .....	80	45,130
Mooney M-20-C (Mark 21) .....	371	12,173
M-20-D (Master) .....	7	
M-20-E (Super 21) .....	397	
Piper Super Cub PA-18-150 .....	145	
Apache PA-23-235 .....	13	
Aztec PA-23-250 .....	365	
Comanche PA-24-250 .....	4	
Comanche PA-24-260 .....	239	
Comanche PA-24-400 .....	55	
Pawnee PA-25-235 .....	634	62,130
Cherokee PA-28-140 .....	762	
Cherokee PA-28-150 .....	60	
Cherokee PA-28-160 .....	46	
Cherokee PA-28-180 .....	800	
Cherokee PA-28-235 .....	149	
Cherokee PA-32-260 .....	245	
Comanche PA-30-160 .....	259	

NOTE: The totals here may differ from FAA figures because they are based on selected reports only. Excludes aircraft shipped to the military, helicopters and gliders.  
Source: Aerospace Industries Association, company reports.

PRODUCTION OF UTILITY AIRCRAFT, 1947 TO DATE

Year	TOTAL	Aero Com- mand- er	Beech	Cess- na	Cham- pion	Moon- ey	Piper	All Other Man- ufac- turers
<b>NUMBER OF AIRCRAFT SHIPPED</b>								
1947	15,594	—	1,288	2,390	N.A.	—	3,464	8,452
1948	7,037	—	746	1,631	N.A.	—	1,479	3,181
1949	3,405	—	341	857	N.A.	74	1,278	855
1950	3,386	—	489	1,134	N.A.	51	1,108	604
1951	2,302	—	429	551	N.A.	26	1,081	215
1952	3,058	39	414	1,373	N.A.	49	1,161	22
1953	3,788	69	375	1,434	N.A.	37	1,839	34
1954	3,071	67	579	1,200	N.A.	14	1,191	52
1955	4,434	72	680	1,746	N.A.	32	1,870	34
1956	6,738	154	724	3,235	162	79	2,329	55
1957	6,118	139	788	2,489	217	107	2,300	78
1958	6,414	97	694	2,926	296	160	2,160	79
1959	7,689	148	893	3,588	274	182	2,530	74
1960	7,588	155	962	3,720	248	172	2,313	18
1961	6,778	139	818	2,746	112	286	2,646	31
1962	6,697	121	830	3,124	91	387	2,139	5
1963	7,569	114	1,061	3,456	99	502	2,321	16
1964	9,336	109	1,103	4,188	60	650	3,196	30
1965	11,852	110	1,192	5,629	271	775	3,776	99
<b>MANUFACTURERS NET BILLING PRICE (Thousands of Dollars)</b>								
1947	\$ 57,929	—	13,405	5,976	N.A.	—	7,697	30,851
1948	32,469	—	10,126	6,768	N.A.	—	3,083	12,492
1949	17,731	—	6,177	4,545	N.A.	133	3,244	3,632
1950	19,157	—	6,516	5,506	N.A.	82	3,092	3,961
1951	16,887	—	7,708	3,573	N.A.	45	3,933	1,628
1952	26,159	2,011	9,848	9,220	N.A.	100	4,891	89
1953	34,458	4,260	9,545	12,094	N.A.	91	8,286	182
1954	43,461	4,517	20,056	10,666	N.A.	31	8,070	121
1955	68,258	5,119	24,893	21,880	N.A.	182	16,008	176
1956	103,791	11,183	28,770	38,570	597	741	23,474	456
1957	99,652	9,914	32,110	30,988	1,045	1,095	23,294	1,206
1958	101,939	6,902	27,072	36,897	1,516	1,868	26,548	1,136
1959	129,876	10,626	35,701	45,703	1,521	2,091	33,134	1,100
1960	151,220	11,917	43,061	56,664	1,492	2,781	35,102	203
1961	124,323	11,047	37,072	42,266	690	3,987	28,889	372
1962	136,837	10,846	37,359	50,181	683	5,525	32,142	101
1963	153,415	11,840	38,594	55,662	1,119	7,235	38,540	425
1964	198,876	11,973	54,923	66,818	394	9,659	54,479	720
1965	318,732	27,727	72,211	97,238	1,618	12,173	62,130	45,635

N.A.—Not available.

NOTE: The totals shown here may vary from Bureau of the Census figures because they are based on reports by selected manufacturers only. Bureau of the Census totals for all civil aircraft including commercial transport aircraft are shown on pages 24 and 25. 1965 figures for "all other" include Lear which is shown in detail in other tables.

Source: Aerospace Industries Association, company reports.

VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1966

Company and Civil Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
Bell Aerosystems —	X-22A X-14A	— —	X-22A X-14A	— —	X-22A X-14A	Flight Test Flight Test	8 2
Bell Helicopter 47G	—	—	OH-13E OH-13G	—	— TH-13M	Operational	3
47G-2	—	—	OH-13H	—	—	Operational	3
47G-2A	—	—	—	—	—	Operational	3
47G-3	—	—	OH-13K	—	—	Operational	3
47G-3B	—	—	OH-13S	—	—	Opr./In Prod.	3
47G-3B1	—	—	—	—	—	Opr./In Prod.	3
47G-3B1	—	—	TH-13T	—	—	Opr./In Prod.	2
47G-2A1	—	—	—	—	—	Operational	3
47G-4	—	—	—	—	—	Opr./In Prod.	3
47G-4A	—	—	—	—	—	Opr./In Prod.	3
47G-5	—	—	—	—	—	Opr./In Prod.	3
AG-5	—	—	—	—	—	Opr./In Prod.	2
47J	UH-13J	HH-13Q	—	—	UH-13F	Operational	4
47J2	—	—	—	—	—	Operational	4
47J2-A	—	—	—	—	—	Opr./In Prod.	4
—	—	—	—	—	UH-13R	R & D	4
206A	—	—	—	—	—	R & D	5
204	—	—	UH-1A	—	—	Operational	7
204B	—	—	UH-1B	UH-1E	—	Opr./In Prod.	9-10
204B	UH-1F	—	—	—	—	Opr./In Prod.	9-11
—	—	—	UH-1B High performance compound helicopter	—	—	R & D	2
205	—	—	UH-1D	—	—	Opr./In Prod.	13
200	—	—	XV-3A	—	—	R & D	4
207	—	—	—	—	—	—	—
Sioux Scout	—	—	—	—	—	R & D	2
208	—	—	UH-1D Huey-Cobra	—	—	Prototype Development	13
209	—	—	—	—	—	—	2
Boeing Vertol Div. BV/PD-14	—	—	—	—	HUP	Operational	6
BV42	CH-21A	—	—	—	—	Operational	22
BV43	—	—	CH-21C	—	—	Operational	22
BV44	—	—	—	—	—	Operational	21
BV107	—	—	—	CH-46A&D Sea Knight	UH-46	Opr./In Prod.	27
BV107-II	—	—	—	—	—	Opr./In Prod.	27
BV114	—	—	CH-47A	—	—	Opr./In Prod.	36
BV76	—	—	—	—	—	R & D	2
Curtiss-Wright VTOL Systems Group Model 200	X-19 (Tri-Service)	—	—	—	—	Flight Test	8-12

(Continued on next page)

AEROSPACE FACTS AND FIGURES, 1966

VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1966—Continued

Company and Civil Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
Fairchild-Hiller							
Hiller-12E	—	—	OH-23G	—	—	Opr./In Prod.	3
Hiller-12E4	—	—	OH-23F	—	—	Opr./In Prod.	4
Hiller-L4	—	—	—	—	—	Opr./In Prod.	4
Hiller-SL4	—	—	—	—	—	Opr./In Prod.	4
Hiller-L3	—	—	—	—	—	12E Conversion Kit	3
Hiller-SL3	—	—	—	—	—	12E Conversion Kit	3
—	—	—	OH-23D	—	—	Operational	3
FH-1100	—	—	—	—	—	Production	5
—	XC-142	—	XC-142 (Vought, Hiller, Ryan)	—	XC-142	Flight Test	3 crew 32 pass.
Gyrodyne							
Model 60	—	—	—	—	QH-50A	Opr./Test	Drone
Model 61	—	—	—	—	QH-50B	Operational	Drone
Model 63	—	—	—	—	QH-50C	Production	Drone
Model 70	—	—	—	—	QH-50D	In Prod.	Drone
Rotocycle							
Model 41	—	—	—	—	YRON-1	Production	1
Rotorcycle	—	—	—	—	YRON-1 Solar	Production	1
Rotorcycle							
Model 59	—	—	—	—	XRON-1	Production	1
Hughes Tool Aircraft Div.							
269A	—	—	TH-55A	—	—	Opr./In Prod.	2
200	—	—	—	—	—	Opr./In Prod.	2
300	—	—	—	—	—	Opr./In Prod.	3
300 Ag	—	—	—	—	—	Opr./In Prod.	1
—	—	—	OH-6A	—	—	Opr./In Prod.	4
—	—	—	XV-9A	—	—	Military	2
500	—	—	OH-6A	—	—	research	5
500U	—	—	OH-6A	—	—	Prototype	7
Kaman							
K-20	—	—	—	UH-2 Sea- sprite	UH-2	Opr./In Prod.	12
K-600	HH-43A	—	—	OH-43D	UH-43C	Operational	5
K-600-3	HH-43B	—	—	—	—	Opr./In Prod.	12
K-600-4	Huskie	—	—	—	—	Opr./In Prod.	12
K-20A	HH-43F	—	—	—	—	Opr./In Prod.	12
Twin	Huskie	—	—	UH-2C	UH-2C	Quality Test	12
Compound	—	—	—	—	—	Experimental	—
Ling-Temco-Vought							
—	XC-142A	—	XC-142A (Tri-Service—Vought, Hiller, Ryan)	—	XC-142A	Flight Test	3 crew 32 pass.

(Continued on next page)

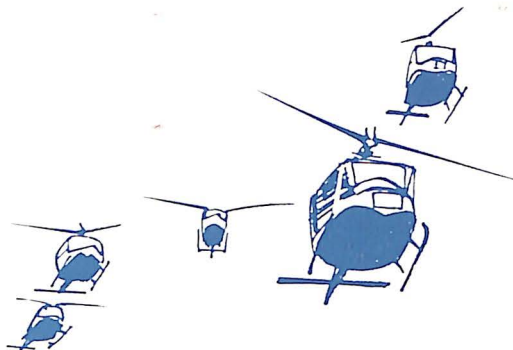
AIRCRAFT PRODUCTION

VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1966—Continued

Company and Civil Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
Lockheed							
Hummingbird	—	—	XV-4A	—	—	Inactive	2
L-186	—	—	XH-51A	—	XH-51A	R & D	2
L-186	—	—	XA-51A	—	XA-51A	R & D	1
Compound			Compound		Compound		
L-186 (NASA51N)	—	—	—	—	—	In Prod.	2
L-286	—	—	—	—	—	Flight Test	5
CL-840	—	—	AAFSS	—	—	Development	2
Republic							
Alouette II	—	—	—	—	—	Operational	5
Ryan							
—	—	—	XV-5A	—	—	} Phase II } Flight Test	1-2
—	—	—	XV-8A	—	—		1
—	XC-142A	—	XC-142A (Vought, Hiller, Ryan)	—	XC-142A		3 crew
—	—	—	VZ-3RY	—	VZ-3RY		pass. 1
United Aircraft Sikorsky Div.							
S-51	—	—	—	—	—	Operational	4
S-55A	UH-19B	HH-19G	UH-19C UH-19D	CH-19E	UH-19F	Operational	12
S-55C	H-19A	—	UH-19C	HRS-1 HRS-2	HO4S-1 HO4S-2	Operational	12
S-56	—	—	CH-37A CH-37B	CH-37C	HR2S-1W	Operational	36
S-58C	—	—	—	—	—	Operational	14
S-58D	—	HH-34F	CH-34A CH-34C	UH-34E UH-34D VH-34D	SH-34G SH-34H SH-34J	Opr./In Prod.	20
S-61A	CH-3B	—	—	—	—	Opr./In Prod.	28
S-61B&D	—	—	VH-3A	VH-3A	SH-3A SH-3D	Opr./In Prod.	ASW-4 VIP-15
S-61L	—	—	—	—	—	Opr./In Prod.	31
S-61N	—	—	—	—	—	Opr./In Prod.	29-31
S-61R	CH-3C&E HH-3E	—	—	—	—	Opr./In Prod.	28
S-62A	—	—	—	—	—	Opr./In Prod.	13
S-62C	—	HH-52A	—	—	—	Opr./In Prod.	14
S-64A	—	—	CH-54A	—	—	Opr./In Prod.	5-67 with pod
S-65A	—	—	—	CH-53A	—	In Prod.	41

Source: Aerospace Industries Association, company reports.

AEROSPACE FACTS AND FIGURES, 1966



PRODUCTION OF MILITARY HELICOPTERS  
Calendar Years 1941 to Date

Year Ending December 31	TOTAL <sup>a</sup>	Air Force	Navy	Army
1941	7	7	—	—
1942	—	—	—	—
1943	22	19	3	—
1944	144	120	24	—
1945	275	241	34	—
1946	44	40	4	—
1947	57	36	21	—
1948	153	94	59	—
1949	73	24	43	6
1950	60	6	39	15
1951	360	14	143	192
1952	983	49	353	559
1953	943	165	245	463
1954	431	172	46	155
1955	444	82	128	200
1956	647	62	152	430
1957	689	16	193	450
1958	668	2	204	435
1959	451	28	101	322
1960	494	57	147	284
1961	366	42	187	137
1962	624	33	208	313
1963	762	45	165	462

<sup>a</sup>The total includes helicopters bought by the Department of Defense under the Military Assistance Program and for other federal agencies.

Source: Department of Defense. Data released with a two-year lag for security reasons.

AIRCRAFT PRODUCTION

PRODUCTION OF COMMERCIAL HELICOPTERS  
BY SIX MANUFACTURERS  
(Number of Helicopters)  
1957 to Date

Company and Helicopter	1957	1958	1959	1960	1961	1962	1963	1964	1965
<b>TOTAL</b>	<b>314</b>	<b>240</b>	<b>253</b>	<b>233</b>	<b>301</b>	<b>345</b>	<b>468</b>	<b>531</b>	<b>559</b>
<b>Bell</b>									
U.S. production									
47 series . . . .	132	95	89	87	93	92	101	118	134
204 series . . .	—	—	—	—	—	1	13	8	16
Foreign licensees									
47 series . . . .	59	59	107	57	70	63	81	103	123
204 series . . .	—	—	—	—	—	18	32	48	48
102 series . . .	—	—	—	1	2	—	—	—	—
<b>Boeing-Vertol</b>									
U.S. production									
H-21 . . . . .	19	17	8	—	—	—	—	—	—
BV-44/43 . . .	40	34	17	12	—	1	—	—	—
BV-107 . . . .	—	—	—	—	—	4	5	16	13
Foreign licensees									
BV-107 . . . .	—	—	—	—	—	—	7	3	1
<b>Fairchild-Hiller</b>									
12 series . . . .	21	12	25	72	99	54	34	34	73
<b>Hughes</b>									
200's . . . . .	—	—	—	—	17	86	163	46	28
300's . . . . .	—	—	—	—	—	—	—	121	81
<b>Kaman</b>									
HH-433 . . . .	—	—	—	—	6	11	11	11	10
<b>Sikorsky</b>									
U.S. and foreign production									
S-55 . . . . .	26	17	4	1	3	—	—	—	—
S-58 . . . . .	17	4	—	2	—	—	1	—	—
S-61 . . . . .	—	—	—	—	1	8	13	18	31
S-62 . . . . .	—	2	3	2	10	6	6	5	1
S-64 . . . . .	—	—	—	—	—	1	1	—	—

Source: Aerospace Industries Association, company reports.



AEROSPACE FACTS AND FIGURES, 1966

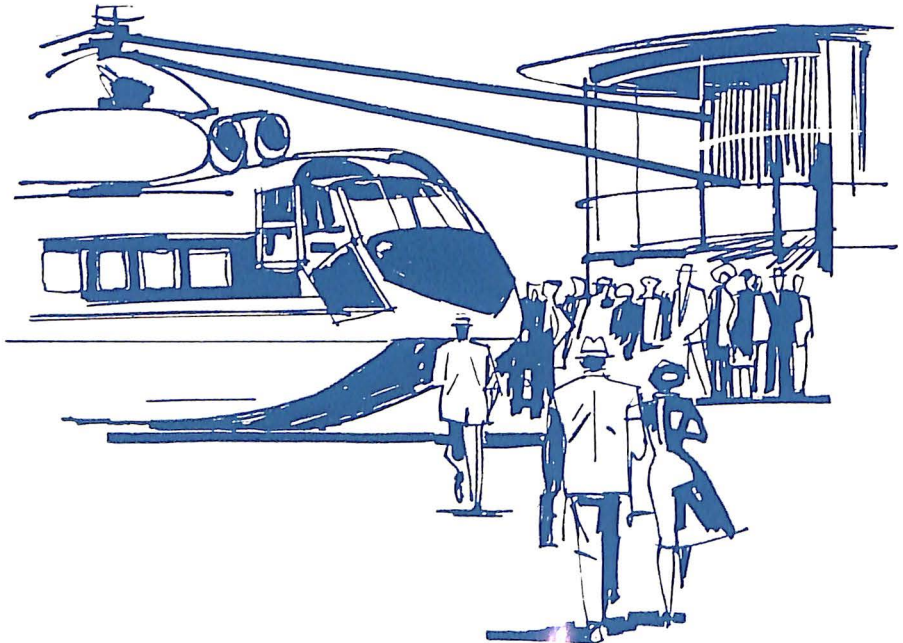
PRODUCTION OF HELICOPTERS  
 TOTAL, COMMERCIAL AND MILITARY  
 Calendar Years 1954 to Date

Year Ending December 31	TOTAL <sup>r</sup>	Commercial <sup>r</sup>	Military <sup>r</sup>
1954	562	131	431
1955	590	146	444
1956	915	268	647
1957	1,003 <sup>r</sup>	314	689
1958	908 <sup>r</sup>	240	668
1959	704	253	451
1960	727	233	494
1961	667	301	366
1962	969	345	624
1963	1,230	468	762
1964	N.A.	531	N.A.
1965	N.A.	559	N.A.

N.A.—Not available.

<sup>r</sup> Revised.

Source: Aerospace Industries Association, company reports.  
 Department of Defense.



## AIRCRAFT PRODUCTION

### AIRCRAFT ENGINE PRODUCTION, CALENDAR YEARS 1917 TO DATE (Number of Engines)

Year Ending December 31	TOTAL	Military		Civil	
1917-1919	N.A.	44,453		N.A.	
1928	3,252	2,620		632	
1929	7,378	1,861		5,517	
1930	3,766	1,841		1,925	
1935	2,965	991		1,974	
1940	30,167 <sup>B</sup>	22,667		7,500 <sup>B</sup>	
1941	64,681 <sup>B</sup>	58,181		6,500 <sup>B</sup>	
1942	138,089	138,089		—	
1943	227,116	227,116		—	
		Recipr.	Jet	Recipr.	Jet
1944	256,911	256,789	122	—	—
1945	111,650 <sup>B</sup>	108,442	1,208	2,000 <sup>B</sup>	—
1946	43,407	1,680	905	40,822	—
1947	20,912	2,683	1,878	16,351	—
1948	14,027	2,495	2,493	9,039	—
1949	11,972	2,981	5,009	3,982	—
1950	13,675	3,122	6,239	4,314	—
1951	20,867	6,471	9,816	4,580	—
1952	31,041	8,731	16,928	5,382	—
1953	40,263	13,365	20,251	6,647	—
1954	26,959	7,868	13,572	5,519	—
1955	21,108	3,875	9,594	7,639	—
1956	21,348	2,663	7,186	11,499	—
1957	21,946	2,429	8,658	10,859	38
1958	18,354	1,452	6,669	10,233	515
1959	17,162	661	3,965	11,152	1,384
1960	16,199	756	2,917	10,891	1,635
1961	15,835	417	4,755	9,669	994
1962	15,920	241	5,200	9,921	558
1963	17,185	155	5,235	11,322	473
1964	19,455 <sup>B</sup>	250 <sup>B</sup>	5,000 <sup>B</sup>	13,346	859
1965	23,941 <sup>B</sup>	350 <sup>B</sup>	5,400 <sup>B</sup>	17,018	1,173

NOTE: Jet includes turboprop and turbopan.

N.A.—Not available.

<sup>B</sup> Estimate.

Sources: Aerospace Industries Association, "Aerospace Facts and Figures" (Annually).  
Bureau of the Census, "Current Industrial Reports, Series M37G" (Monthly).  
Department of Defense.

AEROSPACE FACTS AND FIGURES, 1966

CIVIL AIRCRAFT ENGINE PRODUCTION  
 Calendar Years 1958 to Date  
 (Number of Engines)

Manufacturer and Engine Designation <sup>a</sup>	1958	1959	1960	1961	1962	1963	1964	1965
TOTAL .....	10,251	12,259	12,159	10,663	10,479	11,795	14,205	18,191
Reciprocating ....	9,736	10,875	10,524	9,669	9,921	11,322	13,346	17,018
Jet .....	515	1,384	1,635	994	558	473	859	1,173
Allison Division								
General Motors								
282 .....	242	604	576	22	—	—	—	—
Continental								
205 .....	77	16	56	46	51	45	30	41
223 .....	—	—	—	—	—	—	—	127
246 .....	15	23	20	16	8	5	5	3
252 .....	829	1,348	840	828	826	773	918	2,059
253 .....	1,734	953	1,252	987	1,104	1,210	1,368	1,678
267 .....	36	36	9	12	12	8	8	3
273 .....	2,181	2,816	3,207	850	1,006	902	—	—
298 .....	—	713	469	86	78	21	1	—
3E-1 .....	—	—	—	1,888	1,974	1,595	1,281	1,295
3E-3 .....	—	—	—	322	140	133	1,284	1,127
E-1CE .....	—	—	—	—	—	—	141	680
E-2CE .....	—	—	—	—	—	—	52	12
E-3CE .....	—	—	—	—	—	—	92	291
E-5CE .....	—	—	—	—	—	394	983	1,023
E-7CE .....	—	—	—	—	—	271	42	704
Other .....	23	8	20	70	43	52	11	2
General Electric								
306 .....	—	—	—	70	15	—	—	—
308 .....	18	90	212	—	—	—	—	—
1E3 .....	—	—	—	—	—	—	25	31
1E5 .....	—	—	66	185	25	—	—	1
J79-11A .....	—	—	—	69	43	12	—	—
CJ805-3 .....	—	—	—	—	—	1	—	—
CJ805-23 .....	—	—	—	—	—	1	—	—
Lycoming								
223 .....	2	8	111	1,241	289	264	67	62
228 .....	—	—	—	12	7	206	230	405
229 .....	95	113	80	17	17	13	11	11
274 .....	2,023	2,021	1,452	1,128	1,248	1,578	2,068	1,942
275 .....	419	308	271	102	142	169	121	204
277 .....	—	—	—	11	5	3	—	—

(Continued on next page)

AIRCRAFT PRODUCTION

CIVIL AIRCRAFT ENGINE PRODUCTION—*Continued*  
 Calendar Years 1958 to Date

Manufacturer and Engine Designation <sup>a</sup>	1958	1959	1960	1961	1962	1963	1964	1965
<b>Lycoming—Cont.</b>								
286 .....	768	1,044	701	218	1,080	1,508	1,729	2,330
284 .....	—	247	294	718	95	—	—	—
295 .....	561	906	1,247	728	1,194	2,070	2,749	2,969
304 .....	—	—	115	—	—	—	—	—
1E .....	—	—	233	—	—	—	—	—
1E4 .....	—	—	—	122	162	—	—	—
1E7 .....	—	—	—	90	286	—	—	—
1E10 .....	—	—	—	—	60	—	—	—
1E11 .....	—	—	—	65	36	—	—	—
1E15 .....	—	—	—	—	—	—	152	43
Other .....	167	53	107	—	—	6	—	7
<b>Pratt &amp; Whitney Aircraft</b>								
230 .....	6	1	—	—	—	—	—	—
231, 264 .....	315	3	6	—	—	—	—	—
290 .....	232	275	172	145	21	5	—	—
291 .....	23	410	523	46	—	—	—	—
IE8 .....	—	—	63	357	406	251	337	491
IE9 .....	—	—	23	97	44	38	87	151
JTF10 .....	—	—	—	3	1	—	—	4
E2EA .....	—	—	—	—	3	165	410	495
Other .....	—	5	—	—	—	—	—	—
<b>Wright Aero-nautical</b>								
243 .....	51	6	—	6	—	—	—	—
259 .....	129	202	34	49	58	92	3	—
272 .....	22	—	—	—	—	—	—	—
287 .....	283	26	—	—	—	—	—	—
289 .....	—	24	—	1	—	4	—	—
Other .....	—	—	—	36	—	—	—	—

<sup>a</sup> Type certificate number.

Source: Aerospace Industries Association, company reports.

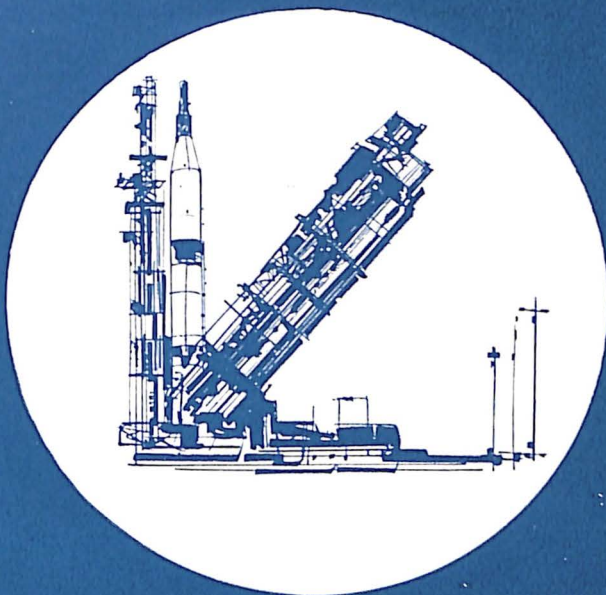
AEROSPACE FACTS AND FIGURES, 1966

MILITARY AIRCRAFT ENGINE ACCEPTANCES  
Calendar Years 1954 to Date  
(Number of Engines)

ENGINE DESIGNATION	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
<b>TOTAL</b>	<b>21,440</b>	<b>13,469</b>	<b>9,849</b>	<b>11,087</b>	<b>8,121</b>	<b>4,626</b>	<b>3,674</b>	<b>5,172</b>	<b>5,441</b>	<b>5,390</b>
<b>Jet</b> .....	<b>13,367</b>	<b>9,333</b>	<b>6,532</b>	<b>8,104</b>	<b>6,135</b>	<b>3,421</b>	<b>2,025</b>	<b>2,821</b>	<b>3,162</b>	<b>2,871</b>
J-33 .....	1,188	514	95	106	20	—	—	—	—	—
J-34 .....	—	—	40	76	99	139	80	—	—	—
J-44 .....	—	—	—	181	320	55	—	—	—	—
J-48 .....	496	131	318	214	60	24	—	—	—	—
J-52 .....	—	—	—	—	5	36	220	305	471	318
J-57 .....	739	1,918	3,876	5,391	4,000	1,957	565	532	562	476
J-60 .....	—	—	—	—	—	1	29	184	219	207
J-69 .....	—	32	235	542	652	538	487	284	435	321
J-75 .....	—	—	27	70	209	293	256	229	219	174
J-79 .....	—	2	102	302	460	309	174	598	752	894
J-85 .....	—	—	—	2	32	69	214	688	486	471
J-93 .....	—	—	—	—	—	—	—	1	—	—
J-65 .....	3,308	3,252	1,135	798	137	—	—	—	—	—
J-71 .....	130	388	507	422	135	—	—	—	—	—
J-83 .....	—	—	—	—	6	—	—	—	—	—
J-35 .....	1,300	507	—	—	—	—	—	—	—	—
J-40 .....	51	61	—	—	—	—	—	—	—	—
J-46 .....	515	265	—	—	—	—	—	—	—	—
J-47 .....	5,204	1,871	191	—	—	—	—	—	—	—
J-73 .....	436	392	6	—	—	—	—	—	—	—
JT-3D .....	—	—	—	—	—	—	—	—	18	10
<b>Turbo-Fan</b> .....	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>—</b>	<b>168</b>	<b>683</b>	<b>298</b>	<b>76</b>
TF-33 .....	—	—	—	—	—	—	168	683	298	76
<b>Turbo-Prop</b> .....	<b>205</b>	<b>261</b>	<b>654</b>	<b>554</b>	<b>534</b>	<b>544</b>	<b>724</b>	<b>1,251</b>	<b>1,740</b>	<b>2,288</b>
T-33 .....	—	—	—	—	—	2	—	—	—	—
T-34 .....	17	87	73	52	103	63	49	—	—	—
T-50 .....	—	—	—	—	—	—	—	43	68	78
T-53 .....	—	—	—	—	40	163	339	358	452	759
T-56 .....	31	165	580	481	371	260	234	522	763	1,019
T-58 .....	—	—	1	21	20	54	96	298	384	348
T-40 .....	152	2	—	—	—	—	—	—	—	—
T-49 .....	5	7	—	—	—	—	—	—	—	—
T-YT-55 .....	—	—	—	—	—	—	—	30	73	68
T-64 .....	—	—	—	—	—	—	—	—	1	16
<b>Reciprocating</b> ..	<b>7,868</b>	<b>3,875</b>	<b>2,663</b>	<b>2,429</b>	<b>1,452</b>	<b>661</b>	<b>756</b>	<b>417</b>	<b>241</b>	<b>155</b>
O-435 .....	—	4	96	217	298	327	189	—	—	—
O-480 .....	—	—	30	230	285	66	57	11	—	—
O-470 .....	477	435	377	143	173	—	—	—	—	—
O-335 .....	25	95	137	13	—	—	—	—	—	—
O-526 .....	—	—	—	4	—	—	—	—	—	—
O-525 .....	—	—	—	9	—	—	—	—	—	—
R-1340 .....	—	—	—	7	22	—	—	—	—	—
R-1820 .....	1,240	1,035	1,160	1,191	506	155	418	282	241	155
R-3350 .....	1,901	1,022	547	198	87	113	93	124	—	—
R-1300 .....	188	118	77	201	11	—	—	—	—	—
R-2800 .....	1,052	529	239	216	70	—	—	—	—	—
R-4360 .....	2,933	637	—	—	—	—	—	—	—	—
R-975 .....	52	—	—	—	—	—	—	—	—	—

Source: Department of Defense. Data released with a two-year lag for security reasons.

# MISSILE PROGRAMS



Net sales for military missile systems and parts and for propulsion units for missiles and space systems continue to decline. During 1965 sales amounted to \$3 billion as compared to the previous year's figure of \$3.4 billion reported by major manufacturers.

Phase-out was completed of all Titan I intercontinental ballistic missiles. Sixty-four Titan IIs remain in the operational inventory. Of the 1000 Minuteman missile force, operational deployment of the programmed 800 Minuteman I was completed as of June and initial deliveries of the improved Minuteman II were made with site turnover beginning at Grand Forks Air Force Base, N. D. The first ten Minuteman II missiles, possessing improved guidance and targeting capability over that of the "I" series, became operational in October. Development of the still more sophisticated Minuteman III is progressing with initial procurements scheduled in 1967.

By the end of FY 1966, thirty-seven Polaris boats (512 missiles) are scheduled to be in operation. With completion of the A-1 conversion program, all boats will be fitted with long range A-2 (1,500-mile) or A-3 (2,500-mile) missiles. The ultimate Polaris fleet is programmed

AEROSPACE FACTS AND FIGURES, 1966

to consist of thirteen submarines with A-2 missiles and twenty-eight submarines with the longer range A-3 missile. Deployment of the Poseidon, characterized by improved payload and accuracy and scheduled after FY 1967, awaits the outcome of development programs.

Action has been initiated to phase out twenty-two anti-bomber defense batteries of Nike-Hercules deployed throughout the U. S. Additional surface-to-air missile projects during 1965 included the Army's revised program for a major purchase of the Redeye, a shoulder-fired, bazooka-type missile, for defense against low flying aircraft; a build-up in the stock of the Hawk system and a project to convert the missile to a self-propelled configuration; and a production of the ground vehicle mounted Chaparral.

The Navy continued to seek a replacement for its Tartar/Terrier shipboard anti-aircraft missiles with continued development of the Standard missile, a flexible range anti-aircraft weapon.

In the surface-to-surface tactical missile category, the FY 1966 procurement of Pershing missiles will complete the planned inventory. Future programs for this missile involve improvements of ground support equipment. Additionally, available FY 1966 funds are being expended for the production tooling and advance production engineering of the Lance battlefield support missile and for an accelerated buy of the Shillelagh for use against stationary or moving targets.

SALES AND BACKLOG REPORTED BY MAJOR MANUFACTURERS OF MISSILE  
SYSTEMS AND PARTS  
Calendar Years 1961 to Date  
(Millions of Dollars)

Year Ending December 31	Missile Systems and Parts	
	Net Sales During Year	Backlog December 31
1961	\$3,628	\$2,873
1962	3,699	2,139
1963	3,313	2,114
1964	2,580	1,921
1965	2,449	2,203

NOTE: Based on data from 60 companies engaged in the manufacture of aerospace products. Data exclude sales of propulsion units for military missiles.

Source: Bureau of the Census "Current Industrial Reports, M37D," (Quarterly).

MISSILE PROGRAMS

SALES AND BACKLOG REPORTED BY MAJOR MANUFACTURERS OF MILITARY ENGINES  
AND PROPULSION UNITS FOR MISSILES AND SPACE VEHICLES  
Calendar Years 1961 to Date  
(Millions of Dollars)

Year Ending December 31	Net Sales During Year	Backlog as of Dec. 31
1961	\$ 784	\$367
1962	1,060	494
1963	1,153	699
1964	851	557
1965	560	514

NOTE: Based on data from 60 companies engaged in the manufacture of aerospace products. Nonmilitary engines and propulsion units are reported with the sales and backlog of nonmilitary space vehicle systems. The figures are inflated by the inclusion of subcontracts.

Source: Bureau of the Census, "Current Industrial Reports, Series M37D" (Quarterly).

DEPARTMENT OF DEFENSE  
EXPENDITURES FOR GUIDED MISSILE PROCUREMENT, BY AGENCY  
Fiscal Years 1951 to Date  
(Millions of Dollars)

Year Ending June 30	TOTAL DEFENSE DEPARTMENT	Air Force	Navy	Army
1951	\$ 21	\$ 16	\$ 5	—
1952	169	66	56	\$ 46
1953	245	N.A.	N.A.	N.A.
1954	417	N.A.	N.A.	N.A.
1955	604	N.A.	N.A.	N.A.
1956	1,005	N.A.	N.A.	N.A.
1957	1,855	N.A.	N.A.	N.A.
1958	2,434	N.A.	N.A.	N.A.
1959	3,337	N.A.	N.A.	N.A.
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	2,101	981	496
1965	2,096	1,320	521	254
1966 <sup>B</sup>	1,872	1,210	544	118
1967 <sup>B</sup>	1,751	1,055	472	224

NOTE: For data on research and development expenditures for missiles see pages 50 and 72.

N.A.—Not available.

<sup>B</sup> Estimate.

Source: Department of Defense, Report "FAD 526," January 24, 1966.



AEROSPACE FACTS AND FIGURES, 1966

Major activities in the air-to-air missile category include continued effort by the Navy in the development of the Phoenix, designed for use on the F-111B.

The Air Force accelerated the development program of its air-launched interdiction missile, SRAM. With the decision by DoD to proceed with the early procurement of the FB-111, development of the SRAM is being reoriented so as to be consistent with the FB-111 procurement schedule.

DEPARTMENT OF DEFENSE  
EXPENDITURES FOR GUIDED MISSILES  
Fiscal Year 1960 to Date  
(Millions of Dollars)

Year Ending June 30	TOTAL DEFENSE DEPARTMENT	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 <sup>E</sup>	3,727	1,872	1,855
1967 <sup>E</sup>	3,814	1,751	2,063

NOTE: Does not include military assistance which amounted to \$80 million in 1965, \$98 million in 1966, and \$22 million in 1967.

<sup>E</sup> Estimate.

Source: Department of Defense, Reports "FAD 524, 526," January 24, 1966.



MISSILE PROGRAMS

ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
<b>SURFACE-TO-AIR</b>						
ASMS	Navy	Raytheon	—	—	—	Early development
Chapparral	Army	Philco, Motorola	—	—	—	Advanced Development
Hawk	Army	Raytheon	Aerojet	Solid	Raytheon	Operational
HIBEX	Army	Boeing		Solid		Early development
Nike-Hercules	Army	Western Electric	Hercules Powder & Thiokol	Solid	Western Electric	Operational
Nike-Zeus	Army	Western Electric	Thiokol & Lockheed	Solid	Bell Telephone Labs.	Improved Development
Nike-X	Army	Western Electric	Thiokol & Lockheed	Solid	Bell Telephone Labs.	Development
Redeye	Army	General Dynamics	Atlantic Research	Solid	Philco	Development
Sprint	Army	Martin				Development
Talos	Navy	Bendix	Bendix & McDonnell	Ramjet	Sperry	Operational
Tartar	Navy	General Dynamics	Aerojet	Solid	Raytheon	Operational
Terrier	Navy	General Dynamics	Allegany Ballistic Lab.	Solid	General Dynamics S. D. Hicks & Cameron Iron Works	Operational
Standard	Navy	General Dynamics	—	—	—	Advanced development
<b>AIR-TO-AIR</b>						
Falcon	USAF	Hughes	Thiokol	Solid	Hughes	Operational
Genie MB-1	USAF	Douglas	Aerojet	Solid	Unguided	Operational
Phoenix	USAF-Navy	General Dynamics	Grumman & Hughes	Solid	General Precision	Development
Sidewinder 1-C	USAF-Navy	Philco & Motorola	Navy Propellant Plant	Solid	Philco & General Electric	Operational
Sparrow III	Navy	Raytheon	Aerojet	Solid	Raytheon	Operational

(Continued on next page)

ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION—*Continued*

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
<b>SURFACE-TO-SURFACE</b>						
ASBD	Navy	—	—	—	—	Study
Davy Crockett	Army	Army Weapons Cmd.	—	Solid	—	Operational
Honest John	Army	Douglas & Emerson Electric	Hercules Powder	Solid	Unguided	Operational (Phasing Out)
Lance	Army	Chrysler & Ling-Temco-Vought	North American	Solid	Systron-Donner	Advanced development
Little John	Army	Emerson	Hercules Thiokol & General Motors	Solid	Unguided	Operational
Mace B	USAF	Martin	Thiokol & General Motors	Solid & Turbojet	Goodyear & General Motors	Operational
MAW	Army	McDonnell, Sperry Rand	Thiokol	Solid	Sperry Rand	Early development
Minuteman II & III	USAF	Boeing	Aerojet Thiokol	Solid	No. American	Operational
Pershing	Army	Martin	Thiokol	Solid	Bendix General Electric, Hughes, MIT	Operational
Polaris	Navy	Lockheed	Aerojet	Solid	—	Operational
Poseidon	Navy	—	—	—	—	Early development
Sergeant Shillelagh	Army	Sperry Ford/Aeronutronics	Thiokol Amco Chemical & Picatinny Arsenal	Solid	Sperry Clary, Whittaker	Operational
Titan II	USAF	Martin	Aerojet	Liquid	General Motors	Operational
TOW	Army	Hughes	—	Solid	—	Development

*(Continued on next page)*

## MISSILE PROGRAMS

### ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION—*Continued*

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
<b>AIR-TO-SURFACE</b>						
ATGAR	USAF	North American Martin	—	—	—	Early development
Bullpup	Navy-USAF		Thiokol	Solid	Maxson Electronics Texas Instruments	Operational
Shrike	Navy	Naval Ordnance Test Station	—	Solid		Unguided
Zuni	Navy		—	Solid	Operational	
SRAM	USAF	—	—	—	—	Study
<b>SURFACE-TO-UNDERWATER</b>						
Alpha Asroc	Navy	In-House Honeywell	—	Solid	—	Operational
	Navy		Honeywell	Solid	General Precision	Operational
<b>UNDERWATER-TO-UNDERWATER</b>						
Subroc	Navy	Goodyear	Thiokol	Solid	General Precision	Operational

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

### INTERCONTINENTAL BALLISTICS MISSILES PRODUCED FOR THE AIR FORCE Calendar Year 1961 to Date

Year Ending December 31	Weapons Systems in Acquisition December 31	Intercontinental Ballistic Missiles Delivered
1961	4	111
1962	4	186
1963	2	486
1964	1	405
1965	1	172

Source: Air Force Systems Command, 1965 "Annual Report."

# SPACE PROGRAMS



U. S. space program expenditures by the National Aeronautics and Space Administration, the Department of Defense and other government agencies continued to increase during Fiscal Year 1966, with indications that a temporary plateau may have been reached. Space expenditure estimates for FY 1967 largely reflect the completion of the Gemini program and the progress to date of the manned lunar landing program from the development phase to the flight operations stage.

Space expenditures during FY 1966 by all federal agencies are estimated at \$7.4 billion. NASA's share is estimated to be \$5.5 billion. This compares with a total expenditure of \$6.9 billion by all agencies in FY 1965 and an estimated \$7.1 billion in FY 1967. The major portion of these funds is being devoted to products of the aerospace industry for the achievement of a manned lunar landing within this decade, the continuance of unmanned space exploration, a military Manned Orbiting Laboratory (MOL), improved boosters, communication and navigation satellite programs, and for supporting research and development.

The year 1965 revealed the highest point yet reached in this nation's space accomplishments during the past eight years. One hundred

## SPACE PROGRAMS

and two spacecraft were successfully orbited; the moon and Mars were photographed at close range; manned flight activities reached new peaks; space activities were increasingly devoted to providing augmented benefits to mankind and national security.

The record was particularly impressive in manned space flight. With five manned Gemini spacecraft, the U. S. achieved more manned hours in space in 1965 than had the U.S.S.R. throughout the history of its program and the U. S. up until 1965. Highlights of the manned space flight program were the extra-vehicular activity (walk in space) and the rendezvous of two Gemini vehicles in space. Also in 1965 the decision was announced to move forward with the development, testing, and flight of the MOL. Responsibility for that project was given to DoD and the USAF.

The 1965 record for unmanned space flights was equally impressive. Two Ranger spacecraft televised to earth some 13,000 photographs of the moon's surface, thereby furnishing significant new knowledge of that environment. Mariner completed a 325 million-mile trip to Mars which began on November 28, 1964, and returned the first close-up photographs of its surface.

Highlights of the year included:

**GEMINI.** Five successful manned flights in the course of 1965 advanced U. S. capabilities in space to new levels. Major milestones were passed in physiological and operational experience in long duration missions. The eight-day orbital flight of Gemini V and the subsequent fourteen-day mission of Gemini VII conclusively demonstrated the importance of man as an integral system in a spacecraft and his ability to withstand prolonged exposure to weightlessness and to endure safely the stress of reentry following extended space flight. The overall excellence of spacecraft and equipment permitted achievement of such specific mission objectives as rendezvous in space, astronaut extra-vehicular space activity, the changing of orbital paths, and the conduct of flight operations in a "shirt sleeve" cabin environment.

**APOLLO.** Results achieved from Gemini flights provide a foundation for the subsequent Apollo program which is expected to begin its space flight phase in 1966. Scheduled milestones that were met included completion of the Saturn I flight test program in which all ten launchings were successful, verifying engine techniques vital to the design of Saturn IB and Saturn V. Structural tests were continued on Apollo boilerplate spacecraft while flight test and qualification of the Apollo launch escape system under various abort conditions continued throughout the year.

AEROSPACE FACTS AND FIGURES, 1966

**MARINER.** On July 14, Mariner IV completed its 228-day journey to Mars and transmitted twenty-one historic and clear photographs of the planet. Detailed environmental data transmitted failed to provide any evidence of a dust belt, magnetic field or radiation band as are found around the earth. Still left unanswered was the question of existence of any life on that planet.

**EXPLORER.** With the 1965 launch of five more Explorer satellites, the total number of spacecraft in this program of geophysical observations was increased to thirty-one. Four such launchings are still providing data on the electron content of the earth's atmosphere (Explorer 27), interplanetary magnetic fields (Explorer 28), solar radiation (Explorer 30), and topside ionospheric soundings (Alouette II/Explorer 31—joint Canada-U. S.). The fifth, Explorer 29, is the first satellite devoted to geodetic studies and is designed to provide the precise data required for mapping long distances.

**EARLY BIRD.** Early Bird I, the world's first communications satellite, was launched on April 6 and placed into synchronous earth orbit. Following preliminary tests the space vehicle was put into commercial service in June by the Communications Satellite Corporation (COMSAT). With power derived from 6,000 solar cells providing forty-five watts of daylight power and twenty-one nickel cadmium batteries for nighttime operation, Early Bird is providing a trans-Atlantic link of high quality duplex voice channels and duplex TV transmission.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, EXPENDITURES BY PROGRAM  
Fiscal Years, 1964 to Date  
(Millions of Dollars)

Program	Year Ending June 30			
	1964	1965	1966 <sup>E</sup>	1967 <sup>E</sup>
TOTAL	\$4,171	\$5,093	\$5,600	\$5,300
Manned space flight . . . . .	2,768	3,538	3,810	3,600
Unmanned investigation in space .	641	662	735	656
Meteorology, communications and other space applications . . .	112	89	101	100
Other research, technology, and supporting operations . . . . .	650	801	954	944

<sup>E</sup> Estimate.  
Source: "The Budget of the United States Government" (Annually).

## SPACE PROGRAMS

### SPACECRAFT IN ORBIT AS OF 14 APRIL 1966

Country	TOTAL	Earth Orbit	Space Probes
TOTAL	237	218	19
United States .....	180	171	9
U.S.S.R. ....	50	40	10
U.S./Canada .....	2	2	—
U.S./U.K. ....	2	2	—
France .....	3	3	—

Source: National Aeronautics and Space Administration.

TIROS. Tiros X, the first meteorological satellite completely funded by the Department of Commerce, was placed into near-polar sun-synchronous orbit. The operation was unique in that with the execution of an in-space change to a near polar orbit, the spacecraft's cameras are now acquiring three times the photographic coverage of earlier Tiros satellites. This improvement, accomplished without modifying the satellite or the launch vehicle, has resulted in a greatly improved capability for tropical storm watch.

MILITARY PROGRAMS. The military portion of the national space program during 1965 was devoted to a continuing investigation of the space environment for defense purposes and to complementing the work of NASA and other government agencies. Two significant events occurred during the year which will permit future exploration and exploitation of the potential usefulness of military manned space system operations.

On June 18, the first TITAN III-C vehicle was successfully launched. For the first time, two 120-inch diameter "strap-on" solid motors, developing approximately 2.4 million pounds thrust at lift-off, were employed to provide initial boost to the first and second liquid stages of the basic vehicle.

All test objectives of this launch were met including the injection into orbit of a payload in excess of 21,000 pounds, and all components of the TITAN III-C were successfully demonstrated in flight. The second and third flights conducted on October 15 and December 21 were equally successful in demonstrating the performance of the vehicle.

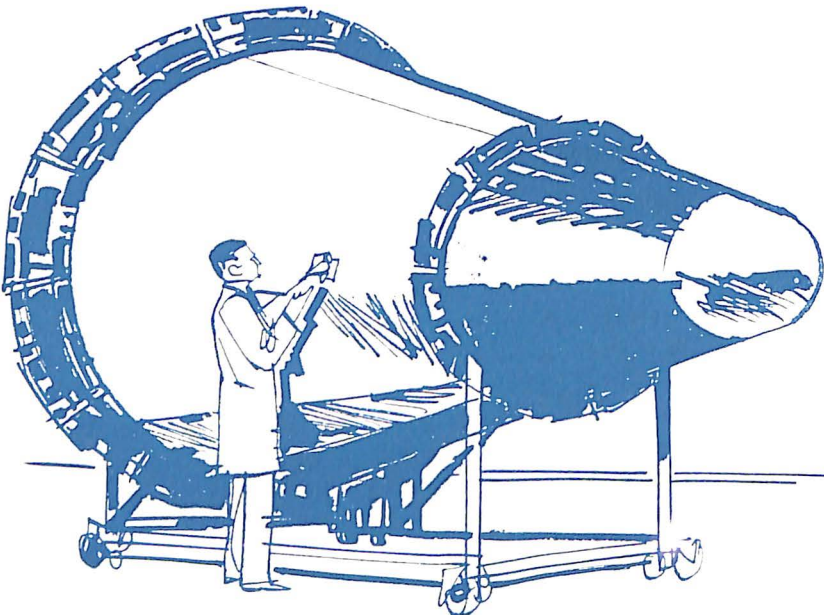
On August 25, the President authorized the Department of Defense and the Air Force to develop the MOL. Designed to accommodate two



men for periods of thirty days after being placed in orbit by higher thrust versions of the Titan III-C, the MOL project will serve both to define manned military space applications and to develop technology and equipment which will aid in future space conquests.

In order to provide an early worldwide operational capability for high priority military communications, DoD acquired from NASA the Syncom satellites II and III. Concurrently with this action, DoD continued with design of an Initial Defense Communications Satellite System consisting of both space and surface segments. Twenty-two satellites will be launched into high, randomly spaced equatorial orbits, using a total of three TITAN III-C boosters. The launchings are scheduled for 1966.

Other 1965 military space activities included the launch of two VELA nuclear detection space satellites, an expansion of the Navy Navigation Satellite System, initiation of studies pointing toward a tactical communications satellite system, measures to update the capability of SPADATS for support of possible anti-satellite systems, the gaining of information and experience applicable to future developments leading to maneuverable spacecraft (Project PRIME), and continuation of studies in large solid motors (156") for possible future missile and space launch vehicles.



SPACE PROGRAMS

CHRONOLOGY OF MANNED SPACE FLIGHTS

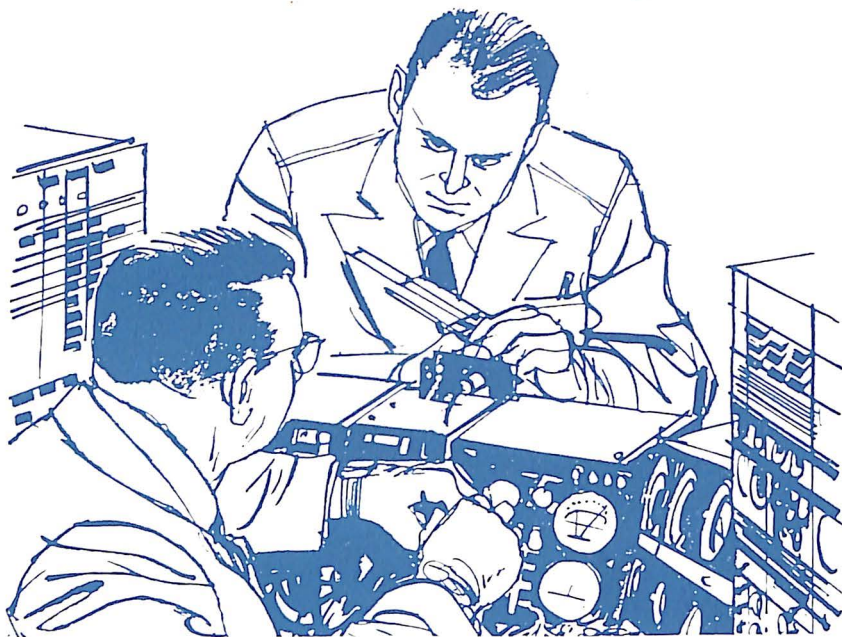
Launch Date	Project	Pilot	Nation	Duration
<i>Suborbital</i>				
May 5, 1961	Mercury-Redstone 3	Alan Shepard	USA	302 miles
July 21, 1961	Mercury-Redstone 4	Virgil Grissom	USA	303 miles
<i>Orbital</i>				
April 12, 1961	Vostok 1	Yuri Gagarin	USSR	One Orbit
Aug 6, 1961	Vostok 2	Gherman Titov	USSR	17 Orbits
Feb 20, 1962	Mercury-Atlas 6	John Glenn	USA	3 Orbits
May 24, 1962	Mercury-Atlas 7	Scott Carpenter	USA	3 Orbits
Aug 11, 1962	Vostok 3	Andreyan Nikolayev	USSR	64 Orbits
Aug 12, 1962	Vostok 4	Pavel Popovich	USSR	48 Orbits
Oct 3, 1962	Mercury-Atlas 8	Walter Schirra	USA	6 Orbits
May 15, 1963	Mercury-Atlas 9	Gordon Cooper	USA	22 Orbits
June 14, 1963	Vostok V	Valery Byovsky	USSR	81 Orbits
June 16, 1963	Vostok VI	Miss Valentina Tereshkova	USSR	48 Orbits
Oct 12, 1964	Voskhod I	Vladimir M. Komarov Konstantin Feoktistov	USSR	16 Orbits
Mar 18, 1965	Voskhod II	Boris B. Yegorov Pavel Belyayev Alexei Leonov	USSR	"
Mar 23, 1965	GT-3	Virgil I. Grissom John W. Young	USA	3 Orbits
June 3, 1965	GT-4	James A. McDivitt Edward H. White II	USA	63 Orbits
Aug 21, 1965	GT-5	L. Gordon Cooper Charles Conrad	USA	120 Orbits
Dec 4, 1965	GT-7	Frank Borman James A. Lovell, Jr.	USA	206 Orbits
Dec 15, 1965	GT-6 <sup>b</sup>	Walter M. Schirra, Jr. Thomas P. Stafford	USA	17 Orbits
Mar 16, 1966	GT-8	Neil A. Armstrong David R. Scott	USA	7 Orbits

<sup>a</sup> Actual number in doubt.

<sup>b</sup> Mission originally scheduled October 25, 1965, postponed when Agena target vehicle failed to achieve orbit.

Source: National Aeronautics and Space Administration.

AEROSPACE FACTS AND FIGURES, 1966



UNITED STATES SPACE LAUNCHINGS  
1957 to Date

Year	Earth Satellite Attempts		Escape Payload Attempts	
	Success	Failure	Success	Failure
1957	-	1	-	-
1958	5	8	-	4
1959	9	9	1	2
1960	16	12	1	2
1961	35	12	-	2
1962	54	12	4	1
1963	60	11	-	-
1964	69	8	4	-
1965	94	8	3	-
TOTAL	342	81	13	11

NOTE: Information contained in this table is drawn from unclassified sources. Numbers are given in terms of separate payloads placed in earth orbit, sent to the moon, or placed in solar orbit.

Source: National Aeronautics and Space Council, "Report to the Congress from the President of the United States, United States Aeronautics and Space Activities, 1965."

SPACE PROGRAMS

CHRONOLOGY OF MAJOR UNITED STATES SPACE LAUNCHINGS  
1961 to March 1966

Date	Designation	Purpose
<u>1961</u>		
Jan 31	Mercury	Suborbital Mercury test
Feb 16	Explorer IX	Scientific earth satellite
Feb 21	Mercury	Suborbital Mercury test
Feb 24	Explorer	Scientific earth satellite
Mar 18	Little Joe 5A	Suborbital Mercury test
Mar 24	Mercury	Vehicle test for Mercury flight
Mar 25	Explorer X	Scientific satellite-probe
April 25	Mercury	Orbital Mercury test
April 27	Explorer XI	Scientific earth satellite
April 28	Little Joe 5B	Suborbital Mercury test
May 5	Freedom 7	Suborbital manned Mercury flight; Shepard flight
May 24	Explorer	Scientific earth satellite
June 30	Explorer	Scientific earth satellite
July 12	Tiros III	Meteorological earth satellite
July 21	Liberty Bell 7	Suborbital manned Mercury flight; Grissom flight
Aug 15	Explorer XII	Scientific earth satellite
Aug 23	Ranger I	Scientific lunar probe
Aug 25	Explorer XIII	Scientific earth satellite
Sept 13	Mercury	Orbital Mercury test
Oct 19	P-21 Probe	Scientific geoprobe
Oct 27	Saturn	Launch vehicle test
Nov 1	Mercury	Orbital Mercury network check
Nov 18	Ranger II	Scientific lunar probe
Nov 29	Mercury	Orbital Mercury test
<u>1962</u>		
Jan 15	Echo (test)	Suborbital communications test
Jan 26	Ranger III	Scientific lunar probe
Feb 8	Tiros IV	Meteorological earth satellite
Feb 20	Friendship 7	Orbital manned Mercury flight; Glenn flight, 3 orbits
Mar 1	Re-entry	28,000 ft/sec re-entry test
Mar 7	OSO I	Scientific earth satellite
Mar 29	P-21A Probe	Scientific geoprobe
April 23	Ranger IV	Scientific lunar lander
April 25	Saturn	Launch vehicle test
April 26	Ariel I	U. S./U. K. scientific earth satellite
May 8	Centaur	Launch vehicle test

(Continued on next page)

AEROSPACE FACTS AND FIGURES, 1966

CHRONOLOGY OF MAJOR UNITED STATES SPACE  
LAUNCHINGS—Continued  
1961 to March 1966

Date	Designation	Purpose
May 24	Aurora 7	Orbital manned Mercury flight
June 19	Tiros V	Carpenter flight, 3 orbits
July 10	Telstar I	Meteorological earth satellite
July 18	Echo (test)	Communications earth satellite
July 22	Mariner I	Suborbital communications test
July 22	Mariner I	Scientific Venus probe
Aug 27	Mariner II	Scientific Venus probe
Aug 31	Re-entry	28,000 ft/sec re-entry test
Sept 18	Tiros VI	Meteorological earth satellite
Sept 28	Alouette	U. S./Canada scientific satellite
Oct 2	Explorer XIV	Scientific earth satellite
Oct 3	Sigma 7	Orbital manned Mercury flight;
		Schirra flight, 6 orbits
Oct 18	Ranger V	Scientific lunar probe
Oct 27	Explorer XV	Scientific earth satellite
Nov 16	Saturn	Launch vehicle test
Dec 13	Relay	Communications earth satellite
Dec 16	Explorer XVI	Scientific earth satellite
<u>1963</u>		
Feb 14	Syncom	Communications earth satellite
Mar 28	Saturn	Launch vehicle test
April 2	Explorer XVII	Atmospheric structure satellite
May 7	Telstar II	Communications
May 15	Faith 7	Orbital manned Mercury flight;
		Cooper flight, 22 orbits
June 19	Tiros VII	Meteorological earth satellite
June 27	Radiation	Atmospheric structure satellite
	Monitor	
July 26	Syncom II	Communications earth satellite
Nov 27	Explorer XVIII	Scientific satellite
Nov 27	Centaur II	Launch vehicle testing
Dec 19	Explorer XIX	Scientific earth satellite
Dec 21	Tiros VIII	Weather satellite
<u>1964</u>		
Jan 21	Relay II	Communications earth satellite
Jan 25	Echo II	Communications earth satellite
Jan 29	Saturn	Launch vehicle testing
Jan 30	Ranger VI	Scientific lunar probe
Mar 27	Ariel II	U.S./U.K. scientific earth satellite
Jan 21	Relay II	Communications earth satellite
Jan 25	Echo II	Communications earth satellite

(Continued on next page)

SPACE PROGRAMS

CHRONOLOGY OF MAJOR UNITED STATES SPACE  
LAUNCHINGS—*Continued*  
1961 to March 1966

Date	Designation	Purpose
Jan 29	Saturn	Launch vehicle testing
Jan 30	Ranger VI	Scientific lunar probe
Mar 27	Ariel II	U.S./U.K. scientific earth satellite
April 8	GT-1	Full systems test
April 14	Fire	Re-entry experiment
May 28	Saturn SA-6	Launch vehicle test
June 30	Centaur AC-3	Launch vehicle test
July 28	Ranger VII	Lunar photographic mission
Aug 19	Syncom III	Synchronous communications satellite
Aug 25	Explorer XX	Ionosphere studies
Aug 28	Nimbus I	R&D weather satellite
Sept 4	OGO I	Geophysical research
Sept 18	Saturn SA-7	Apollo boilerplate & launch vehicle test
Oct 3	Explorer XXI (IMPB)	Measurement of magnetic fields
Oct 9	Explorer XXII (S-66)	Ionospheric research laser experiment
Nov 5	Mariner III	Venusian explorer
Nov 6	Explorer XXIII	Microsteroid study
Nov 21	Explorer XXIV	12 foot balloon
Nov 21	Explorer XXV	Radiation and air density experiments
Nov 28	Mariner IV	Photograph Martian surface
Dec 11	Centaur AC-4	Launch vehicle test
Dec 15	San Marco	Full systems orbital interface test
Dec 21	Explorer XXVI	Energetic particles
<u>1965</u>		
Jan 19	GT-2 Gemini	Full systems suborbital test
Jan 22	Tiros IX (I)	Initial cartwheel weather satellite
Feb 3	OSO-B	Solar research
Feb 16	Saturn/Pegasus SA-9	Meteoroid detection
Feb 17	Ranger VIII	Lunar photographic mission
Mar 2	Centaur AC-5	Vehicle test
Mar 21	Ranger IX	Lunar photographic mission
Mar 23	Gemini GT-3	Initial two-man orbital flight
April 6	Early Bird	Initial commercial communications satellite

(Continued on next page)

AEROSPACE FACTS AND FIGURES, 1966

CHRONOLOGY OF MAJOR UNITED STATES SPACE  
LAUNCHINGS—*Continued*  
1961 to March 1966

Date	Designation	Purpose
April 29	Explorer XXVII	Geodetic Studies
May 19	Apollo Hi-Abort	Hi Altitude Abort System
May 22	Fire II	Re-entry Heating
May 25	Pegasus II	Meteoroid Detection
May 29	Explorer XXVIII	Interplanetary Studies
June 3	Gemini 4	Manned 4-day Mission
June 18	Titan IIIC	Launch Vehicle Test
July 2	TIROS X	Weather Observation
July 20	VELA V & VI	Nuclear Detection Observation
July 30	Pegasus III	Meteoroid Detection
Aug 10	Scout Evaluation	Launch Vehicle Evaluation
Aug 11	Atlas Centaur 6	Vehicle Development (from parking orbit)
Aug 21	Gemini 5	Manned 8-day Mission
Aug 25	OSO-C	Solar Observations
Oct 14	OGO II	Geophysical Observations
Oct 15	Titan IIIC	Launch Vehicle Test
Oct 25	Gemini Target (GTV)	Rendezvous with Gemini
Nov 6	Explorer XXIX	Geodesy (Earth Mapping)
Nov 18	Explorer XXX	Solar Astronomy (for IQSY)
Nov 28	Alouette II	Topside Sounder Direct Ionospheric Measurements
Dec 4	Gemini 7	Manned 2-week Mission
Dec 6	FR-1 (French)	Ionospheric & Electron Study
Dec 15	Gemini 6 <sup>a</sup>	Rendezvous with Gemini 7
Dec 16	Pioneer VI	Interplanetary Data Collection
Dec 21	Titan IIIC	Launch Vehicle Test
<u>1966</u>		
Jan 20	Apollo Launch Escape	Intermediate Altitude Abort Test
Feb 3	ESSA 1	Operational Weather Satellite
Feb 26	Saturn 1B	Launch Vehicle Spacecraft Test
Feb 28	ESSA II	Operational Weather Satellite
Mar 16	GT V	Gemini Rendezvous/Docking Vehicle
Mar 16	GT 8	Two-man Rendezvous/Docking GT V

<sup>a</sup> Originally scheduled for October 25, postponed when Agena target vehicle failed to achieve orbit.

NOTE: This chronology of major U.S. space programs includes the successful, partially successful, and unsuccessful launchings of all vehicles larger than sounding rockets.

Source: National Aeronautics and Space Administration.

## SPACE PROGRAMS



### EXPENDITURES FOR SPACE ACTIVITIES Fiscal Years, 1955 to Date (Millions of Dollars)

Year Ending June 30	TOTAL	National Aeronautics and Space Administration <sup>a</sup>	Department of Defense <sup>b</sup>	Other
1955	\$ 75	\$ 74	\$ 1	—
1956	100	71	17	\$ 12
1957	150	76	48	26
1958	249	89	136	24
1959	521	146	341	34
1960	960	401	518	41
1961	1,518	744	710	64
1962	2,418	1,257	1,029	132
1963	4,114	2,552	1,368	194
1964	5,970	4,171	1,564	235
1965	6,886	5,035	1,592	259
1966 <sup>b</sup>	7,385	5,521	1,640	224
1967 <sup>b</sup>	7,065	5,211	1,650	204

NOTE: Most of the activities of the National Aeronautics and Space Administration are classified as Research and Development. See chapter on Research and Development for additional tables.

<sup>b</sup> Estimate.

<sup>a</sup> Excludes amount for aircraft technology beginning with 1965.

<sup>b</sup> This includes the astronautics budget activity and other activities which contribute to the space effort.

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



AEROSPACE FACTS AND FIGURES, 1966

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,  
EXPENDITURES BY BUDGET FUNCTION  
Fiscal Years, 1959 to Date  
(Millions of Dollars)

Year Ending June 30	TOTAL EXPENDITURES	Research and Development	Construction of Facilities	Adminis- trative Operations
1959	\$ 145	\$ 34	\$ 25	\$ 87
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	417
1965	5,093	3,984	531	578
1966 <sup>E</sup>	5,600	4,520	495	585
1967 <sup>E</sup>	5,300	4,340	300	660

<sup>E</sup> Estimate.

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

SALES AND BACKLOG REPORTED BY MAJOR MANUFACTURERS OF  
SPACE VEHICLE SYSTEMS  
Calendar Years 1961 to Date  
(Millions of Dollars)

Year Ending December 31	Net Sales During Year			Backlog, December 31		
	TOTAL	Military <sup>a</sup>	Non- military	TOTAL	Military <sup>a</sup>	Non- military
1961	\$ 763	\$ 551	\$ 212	\$ 596	\$368	\$ 228
1962	1,319	712	607	881	577	304
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

NOTE: Based on data from 60 companies engaged in the manufacture of aerospace products.  
<sup>a</sup> Data for military space vehicle systems exclude engines and propulsion units, those for nonmilitary space vehicle systems include engines and propulsion units. For sales and backlog of military engines and propulsion units, see chapter on missiles, page 49.

Source: Bureau of the Census, "Current Industrial Reports, Series M37D" (Quarterly).

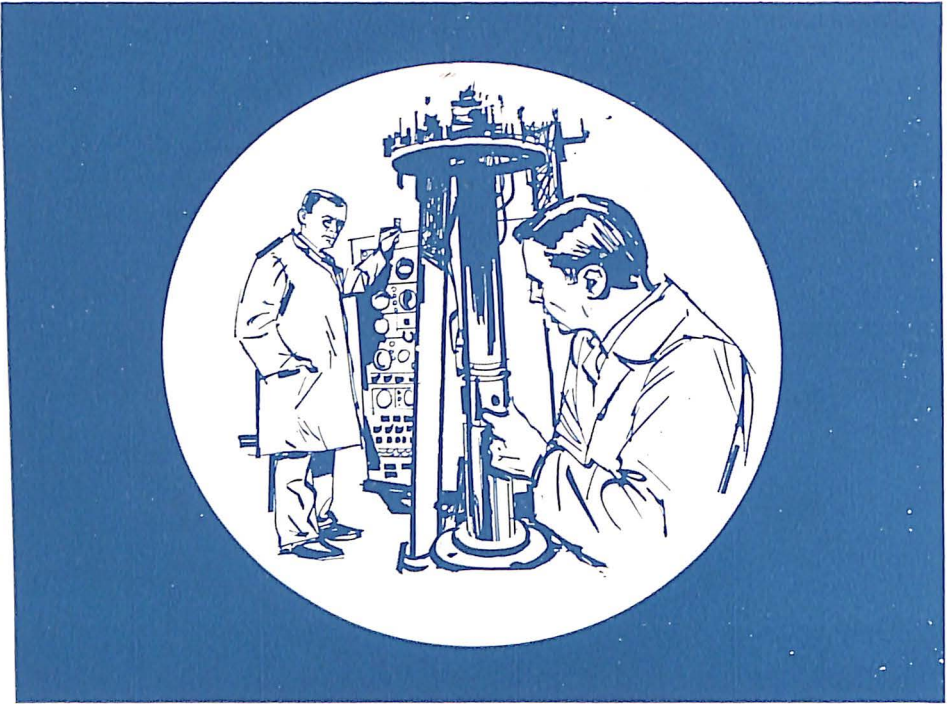
SPACE PROGRAMS

U.S. MAN HOURS SPACE FLIGHT TIME LOG

Mission	Launch Date	Man Hours In Mission		Total Cumulative Time	
		Hrs.	Min.	Hrs.	Min.
MR-3 (Shepard)	May 5, 1961	—	15	—	15
MR-4 (Grissom)	Jul 21, 1961	—	15	—	30
MA-6 (Glenn)	Feb 20, 1962	4	55	5	25
MA-7 (Carpenter)	May 24, 1962	4	56	10	21
MA-8 (Schirra)	Oct 3, 1962	9	13	19	34
MA-9 (Cooper)	May 15, 1963	34	20	53	54
Gemini 3 (Grissom, Young)	Mar 23, 1965	9	46	63	40
Gemini 4 (McDivitt, White)	Jun 3, 1965	195	53	259	33
Gemini 5 (Cooper, Conrad)	Aug 21, 1965	381	51	641	24
Gemini 6 (Schirra, Stafford)	Dec 15, 1965	51	43	693	07
Gemini 7 (Borman, Lovell)	Dec 4, 1965	661	10	1,354	17
Gemini 8 (Armstrong, Scott)	Mar 16, 1966	21	12	1,375	29

Source: National Aeronautics and Space Administration.

# RESEARCH AND DEVELOPMENT



While federal expenditures for research and development continue to reflect a significant effort, actual expenditures of \$13.8 billion for Fiscal Year 1965 did not meet the spending rate of \$15.3 billion anticipated by the U. S. government a year earlier. Expenditures for FY 1966 are currently forecast at \$14.9 billion, down a half billion from the estimates a year ago. This trend is largely attributable to expanding U. S. efforts to cope with the requirements of Vietnam operations.

R&D funded by aerospace companies continued to increase. This accounts for approximately nine percent of aerospace applied research and development and forty-nine percent of aerospace basic research.

During FY 1965, the Department of Defense continued to fund nearly one-half of the federally-sponsored R&D effort; the National Aeronautics and Space Administration, the Atomic Energy Commission and other agencies accounted for the balance. Estimates for FY 1966 show the same pattern.

**NASA PROGRAMS.** A summary of the NASA space R&D budget is presented in the preceding chapter. Approximately \$100,000,000 was

## RESEARCH AND DEVELOPMENT

spent by NASA in aircraft technology research and development and related support activities. Such research included the development, improvement and simplification of analytical techniques for the efficient design of hypersonic aircraft; the correlation of wind tunnel studies with supersonic flight data regarding aircraft structural design factors; research on a hydrogen-fueled, supersonic ramjet engine; and thirty-two flights of the X-15 for the purpose of acquiring additional data on manned, maneuverable flight at hypersonic speeds.

**MILITARY PROGRAMS.** Approximately \$3.8 billion of the total military R&D budget of \$6.2 billion continues to remain aerospace industry oriented. The Air Force portion of the \$6.2 billion total, while still by far the largest, showed a decline to \$3.1 billion for FY 1965 from the previous year's high of \$3.7 billion.

Major military aerospace industry R&D during 1965 (exclusive of space which is discussed in the preceding chapter) included:

### FEDERAL EXPENDITURES FOR RESEARCH AND DEVELOPMENT Fiscal Years, 1954 to Date (Millions of Dollars)

Year Ending June 30	TOTAL	Department of Defense	National Aeronautics and Space Adminis- tration	Atomic Energy Commission	Other
1954	\$ 3,148	\$2,487	\$ 90	\$ 383	\$ 188
1955	3,308	2,630	74	385	219
1956	3,446	2,639	71	474	262
1957	4,462	3,371	76	657	358
1958	4,990	3,664	89	804	433
1959	5,803	4,183	145	877	598
1960	7,738	5,654	401	986	697
1961	9,278	6,618	744	1,111	805
1962	10,373	6,812	1,251	1,284	1,026
1963	11,988	6,849	2,540	1,335	1,264
1964	14,674	7,516	4,171	1,503	1,484
1965	13,753	6,623	4,555	1,241	1,334
1966 <sup>a</sup>	14,906	6,770	5,097	1,256	1,783
1967 <sup>b</sup>	15,099	6,800	4,993	1,270	2,036

NOTE: Includes military personnel, procurement, civil functions, and some other items not included in other tables in this chapter.

<sup>a</sup> Estimate.

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

**EXPLORATORY DEVELOPMENTS.** Army efforts during 1965 were largely devoted to studies relating to improvements in helicopter stability and delivery methods, and new and improved propulsion systems for Army close support aircraft and air defense missile systems. Navy exploratory development investigations were pointed toward improvements in missile propellant technology and advanced aircraft concepts suitable for carrier use. While the major portion of Air Force exploratory development effort was devoted to investigations related to space, concurrent studies progressed on advanced concepts regarding the design and employment of tactical and strategic missiles, V/STOL aircraft technology, new materials and structural concepts and improved command and control techniques.

**ADVANCED DEVELOPMENTS.** In this category of applied R&D, theory advanced to the status of application in experimental hardware, and the Army continued in its tri-service partnership role in the operational evaluation of a V/STOL and in developments for improved battlefield surveillance aircraft. Additional effort during 1965 was devoted to the successful field testing in Vietnam of heavy lift helicopters. In addition to participating in the V/STOL program, Navy advanced development studies were continued in airborne anti-submarine warfare (ASW) detection systems and an improved surface-to-air missile system. The Air Force, as manager for V/STOL development, broadened its investigations of advanced tactical fighter avionics, investigated improved capabilities for strategic and tactical reconnaissance-strike and continued its evaluation for an improved close support fighter aircraft.



RESEARCH AND DEVELOPMENT

DEPARTMENT OF DEFENSE  
EXPENDITURES FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION  
Fiscal Years 1951 to Date  
(Millions of Dollars)

Year Ending June 30	Department of Defense	Air Force	Navy	Army	Other
1951	\$ 758	N.A.	N.A.	N.A.	N.A.
1952	1,165	N.A.	N.A.	N.A.	N.A.
1953	2,148	N.A.	N.A.	N.A.	N.A.
1954	2,187	N.A.	N.A.	N.A.	N.A.
1955	2,261	N.A.	N.A.	N.A.	N.A.
1956	2,101	N.A.	N.A.	N.A.	N.A.
1957	2,406	N.A.	N.A.	N.A.	N.A.
1958	2,504	N.A.	N.A.	N.A.	N.A.
1959	2,866	N.A.	N.A.	N.A.	N.A.
1960	4,710	N.A.	N.A.	N.A.	N.A.
1961	6,131	\$3,300	\$1,435	\$1,207	\$189
1962	6,319	3,493	1,364	1,280	181
1963	6,376	3,301	1,429	1,355	291
1964	7,022	3,722	1,578	1,338	384
1965	6,236	3,146	1,294	1,344	452
1966 <sup>D</sup>	6,370	3,100	1,400	1,400	470
1967 <sup>E</sup>	6,400	2,940	1,565	1,435	460

NOTE: For RDT&E expenditures for aircraft, missiles and astronautics only, see page 72. Emergency fund of \$30 million for 1966 not included.

N.A.—Not available.

<sup>D</sup> Estimate.

Source: Department of Defense, Report "FAD 527" January 24, 1966.

ENGINEERING DEVELOPMENTS. In this category of R&D, systems and partial subsystems of actual engineering hardware are exhaustively tested to determine performance characteristics so as to aid in decisions regarding full-scale production and deployment. Prime activity in the case of the Army was devoted to a reoriented NIKE X anti-ballistic missile (ABM) effort involving an austere version of a multi-function phased array radar and initial flight test of the high acceleration Sprint missile. Further analysis of a forward ground-to-air defense system was continued. Major Navy efforts were devoted to project definition of Poseidon, with total developmental costs estimated to be \$1.2 billion. Air Force 1965 engineering developmental efforts



AEROSPACE FACTS AND FIGURES, 1966



were highlighted by the decision to proceed with a strategic version of the F-111 and a reorientation of the Short Range Attack Missile (SRAM) program as an element of that decision. Additionally, engineering flight tests were continued on the YF-12A and SR-71. Continuing XB-70 flights were flown, thereby increasing the fund of knowledge pertaining to large supersonic aircraft technology.

ATOMIC ENERGY COMMISSION. Management control of the Commission's space related research and development activities was improved by placing all such activities under the control of a single director. Technology was advanced in nuclear propulsion systems for future space needs with the successful testing of the second of the series of NERVA power reactors. Earlier successes in ground experimentation of space reactor power systems came to fruition with the highly successful launch, in April, of SNAPSHOT-I and flight test of the SNAP 10A reactor.

DEPARTMENT OF DEFENSE  
EXPENDITURES FOR RESEARCH, DEVELOPMENT, TEST AND  
EVALUATION, BY FUNCTIONS  
Fiscal Years, 1960 to Date  
(Millions of Dollars)

Year Ending June 30	TOTAL, ALL RDT&E FUNC- TIONS	AEROSPACE				Other
		TOTAL	Aircraft	Missiles	Astro- nautics	
1960	\$4,710	\$3,203	\$ 632	\$2,059	\$ 512	\$1,507
1961	6,131	4,090	547	3,025	518	2,041
1962	6,319	4,150	624	2,777	749	2,169
1963	6,376	3,731	544	2,241	946	2,645
1964	7,021	4,575	939	2,352	1,284	2,446
1965	6,236	3,839	1,017	1,901	921	2,397
1966 <sup>E</sup>	6 370	3,930	1,094	1,855	981	2,440
1967 <sup>E</sup>	6,400	3,932	1,034	2,063	835	2,468

<sup>E</sup> Estimate.

Source: Department of Defense, Report "FAD 527" January 24, 1966.

RESEARCH AND DEVELOPMENT

INDUSTRIAL RESEARCH AND DEVELOPMENT, ALL INDUSTRIES  
AND THE AEROSPACE INDUSTRY  
CALENDAR YEARS 1956 TO DATE  
(Millions of Dollars)

Year Ending December 31	TOTAL, RESEARCH AND DEVELOPMENT	AEROSPACE <sup>a</sup>		
		Total	Federal Government Funds	Company Funds
1956	\$6,605	\$2,138	N.A.	N.A.
1957	7,731	2,574	\$2,275	\$299
1958	8,389	2,609	2,276	333
1959	9,618	3,110	2,769	341
1960	10,509	3,558	3,180	378
1961	10,908	3,904	3,490	414
1962	11,464	4,147	3,675	472
1963	12,686	4,846	4,373	473
1964	13,354	5,097	4,607	490

N.A.—Not available.

<sup>a</sup> 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.

Source: National Science Foundation.

INDUSTRIAL RESEARCH AND DEVELOPMENT IN AEROSPACE, BY TYPE  
OF RESEARCH AND FUND SOURCE<sup>a</sup>  
Calendar Years 1957 to Date  
(Millions of Dollars)

Year Ending December 31	TOTAL AERO- SPACE	Applied Research and Development Funds			Basic Research Funds		
		Total	Federal Govern- ment	Com- pany	Total	Federal Govern- ment	Com- pany
1957	\$2,574	\$2,549	N.A.	N.A.	\$25	N.A.	N.A.
1958	2,609	2,583	\$2,266	\$317	26	\$10	\$16
1959	3,110	3,078	2,751	327	32	18	14
1960	3,558	3,496	3,148	348	62	32	30
1961	3,904	3,864	N.A.	N.A.	40	N.A.	N.A.
1962	4,147	4,091	N.A.	N.A.	55	N.A.	N.A.
1963	4,846	4,787	4,341	446	60	32	28
1964	5,097	5,038	4,578	460	59	30	29

N.A.—Not available.

<sup>a</sup> 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.

Source: National Science Foundation.



# EXPORTS



Exports of aerospace products during 1965 reached a postwar peak of \$1,474 million. The highest previous postwar peak was in 1962 when aerospace exports amounted to \$1,436 million.

Export data for 1965 have been compiled by the Bureau of the Census on a somewhat different basis from that of previous years. The new data are thus not totally comparable with previous statistics. The significant trends for exports in 1965 are:

- Exports of commercial transport aircraft during 1965 amounted to almost \$353 million.
- Exports of utility aircraft for primarily commercial purposes were around \$69 million in 1965.
- Rotary wing aircraft sales abroad amounted to over \$39 million in 1965.
- Sales abroad during 1965 of internal combustion, jet and gas turbine engines both military and non-military and including parts exceeded \$256 million.
- Exports of military aircraft and engines for 1965 exceeded \$330 million.

EXPORTS

U. S. AEROSPACE EXPORTS, 1965 Units and Value		Value (Millions of Dollars)
<b>TOTAL VALUE, All Aerospace Exports . . . . .</b>	<b>Units</b>	<b>\$1,474.2</b>
<b>AIRCRAFT, TOTAL . . . . .</b>	<b>3,697</b>	<b>1,056.8</b>
<u>Transports . . . . .</u>	116	416.3
Military . . . . .	40	63.5
Passenger, new . . . . .	3	0.3
Cargo, new . . . . .	37	63.2
Nonmilitary . . . . .	76	352.8
Under 33,000 lbs. new . . . . .	16	4.9
Passenger . . . . .	15	4.8
Cargo . . . . .	1	0.1
33,000 lbs. and over, new . . . . .	60	347.9
Passenger . . . . .	47	261.4
Cargo . . . . .	2	14.6
Passenger/cargo . . . . .	11	71.9
Utility . . . . .	2,562	71.0
Military, new . . . . .	105	2.1
Nonmilitary . . . . .	2,457	68.9
Single engine, new . . . . .	2,031	30.7
Multi-engine, under 3,000 lbs. new . . . . .	184	8.4
Multi-engine, 3,000 lbs. and over, new . . . . .	242	29.8
Rotary Wing . . . . .	234	39.5
Military, new . . . . .	57	23.3
Nonmilitary . . . . .	177	16.2
Under 2,000 lbs. new . . . . .	110	4.7
2,000 lbs. and over . . . . .	67	11.5
Fighters, including bombers, military, new . . . . .	163	156.6
Trainers, military, new . . . . .	124	57.1
Other aircraft, including used . . . . .	498	40.3
Military . . . . .	79	0.9
Nonmilitary . . . . .	419	39.4
Parts and accessories for aircraft, NEC . . . . .	—	276.0
<b>ENGINES, TOTAL . . . . .</b>	<b>4,238</b>	<b>256.1</b>
<u>Jet and gas turbines, new and used . . . . .</u>	757	60.9
Military . . . . .	385	22.1
Nonmilitary . . . . .	372	38.8
Missile turbines . . . . .	203	5.1
<u>Internal combustion . . . . .</u>	3,278	20.3
Military, new and used . . . . .	320	2.9
Nonmilitary . . . . .	2,958	17.4
Under 500 h.p., new . . . . .	1,491	4.8
500 h.p. and over, new . . . . .	175	2.2
Used . . . . .	1,292	10.4
Spare parts . . . . .	—	169.8
Jet and gas turbine . . . . .	—	52.9
Missile turbine . . . . .	—	0.7
Internal combustion . . . . .	—	116.2
<b>OTHER PARTS AND EQUIPMENT, NEC . . . . .</b>	<b>—</b>	<b>161.3</b>

Source: Bureau of the Census, Report FT410 (Monthly).

AEROSPACE FACTS AND FIGURES, 1966



U. S. AEROSPACE EXPORTS  
Calendar Years 1948 to 1964  
(Millions of Dollars)

Year Ending Dec 31	TOTAL AERO- SPACE PRODUCTS	Nonmilitary				Other
		Trans- ports	Utility	Engines	Rotary Wing	
1948	\$ 153.6	\$ 37.4	\$ 4.2	\$0.3	\$ 1.9	\$ 109.8
1949	283.0	22.2	2.8	0.1	1.2	256.6
1950	242.4	40.4	2.2	0.3	0.9	198.6
1951	301.4	13.2	3.7	0.5	0.9	283.1
1952	603.2	18.2	5.6	0.9	1.4	577.1
1953	880.6	79.2	5.4	0.7	4.9	790.4
1954	618.9	93.0	4.5	1.5	4.0	502.9
1955	727.5	81.2	7.4	2.0	4.2	632.7
1956	1,059.3	132.9	11.0	3.5	3.7	908.2
1957	1,028.0	179.3	13.1	8.7	11.9	815.0
1958	972.3	147.2	12.1	4.3	9.6	799.1
1959	769.5	107.6	14.5	2.4	8.2	636.8
1960	1,329.5	480.1	23.6	3.7	7.7	814.4
1961	1,210.0	267.6	27.5	4.4	6.8	903.7
1962	1,435.5	254.9	23.1	4.5	8.8	1,144.2
1964	1,240.1	191.0	26.9	3.6	9.8	1,008.8
1963	1,212.4	211.0	33.3	5.3	14.6	948.2
Military and Nonmilitary						
1965	1,474.2	416.3	71.0	256.1 <sup>a</sup>	39.5	691.3 <sup>b</sup>

<sup>a</sup> Statistics for 1965 include military data which were formerly included in "Other."

<sup>b</sup> Includes \$437.3 million of parts, accessories, and equipment, \$213.7 million of new military fighters and trainers, and \$40.3 million of other aircraft.

NOTE: Export figures for 1965 have been collected on a basis different from that used in previous years and the new data are generally not comparable with previous figures. This issue includes a summary of 1965 data on page 75. New series will be included in future issues.

Source: Bureau of the Census, "U.S. Exports of Domestic and Foreign Merchandise, Report FT410" (Monthly).

EXPORTS

EXPORTS OF NEW NONMILITARY PASSENGER TRANSPORT AIRCRAFT  
Calendar Years 1948 to 1964

Year Ending Dec 31	TOTAL		3,000-14,999 lbs airframe weight		15,000-29,999 lbs airframe weight		30,000 lbs & over airframe weight	
	Num- ber	Value (Millions)	Num- ber	Value (Millions)	Num- ber	Value (Millions)	Num- ber	Value (Millions)
1948	91	\$37.4	34	\$2.4	14	\$4.2	43	\$30.8
1949	51	22.2	16	1.3	25	7.6	10	13.4
1950	48	40.4	4	.4	15	6.6	29	33.4
1951	26	13.2	13	1.1	1	"	12	12.1
1952	25	18.2	9	.6	1	.6	15	17.0
1953	87	79.2	17	1.3	13	7.5	57	70.4
1954	110	93.0	29	2.0	7	4.0	74	87.0
1955	95	81.2	39	2.5	5	2.4	51	76.3
1956	151	132.9	64	4.7	2	.8	85	127.4
1957	203	179.3	94	7.7	9	6.9	100	164.7
1958	128	147.2	36	3.5	9	5.6	83	138.1
1959	65	107.6	23	2.3	3	1.7	39	103.6
1960	159	480.1	57	6.7	10	9.1	92	464.3
1961	120	267.6	64	7.7	4	3.5	52	256.4
1962	172	254.9	120	11.1	2	2.7	50	241.1
1963	181	191.0	147	14.6	4	3.6	30	172.8
1964	225	211.1	188	22.1	5	7.0	32	182.0

<sup>a</sup> Less than \$500,000.

Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).

NOTE: Export figures for 1965 have been collected on a basis different from that used in previous years and the new data are generally not comparable with previous figures. This issue includes a summary of 1965 data on page 75. New series will be included in future issues.

AEROSPACE FACTS AND FIGURES, 1966

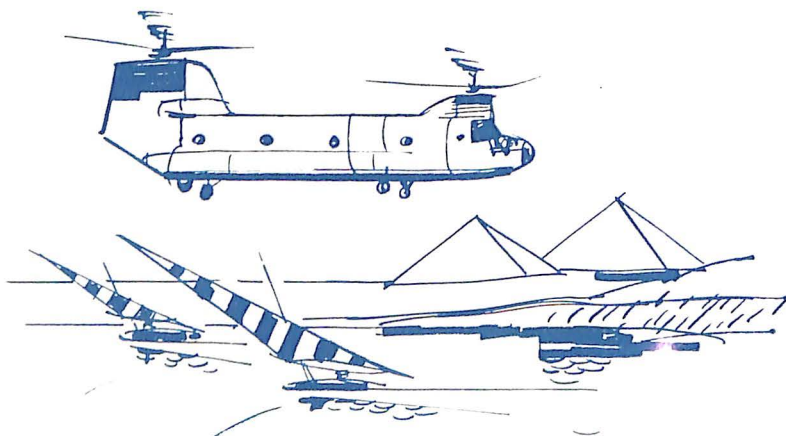
EXPORTS OF NEW UTILITY, PERSONAL, AND LIAISON PLANES  
UNDER 3000 POUNDS AIRFRAME WEIGHT  
Calendar Years 1948 to 1964

Year Ending Dec 31	TOTAL		3-Places or less		4-Places and over	
	Number	Value (Millions)	Number	Value (Millions)	Number	Value (Millions)
1948	935	\$4.2	552	\$1.5	383	\$2.7
1949	510	2.8	235	.7	275	2.1
1950	408	2.2	173	.5	235	1.7
1951	540	3.7	237	1.0	303	2.7
1952	815	5.6	551	3.1	264	2.5
1953	776	5.4	370	1.5	406	3.9
1954	529	4.5	223	1.1	306	3.4
1955	749	7.4	296	1.9	453	5.5
1956	966	11.0	340	2.5	626	8.5
1957	1,086	13.1	368	2.5	718	10.6
1958	896	12.1	268	2.2	628	9.9
1959	1,033	14.5	394	3.6	639	10.9
1960	1,528	23.6	374	3.0	1154	20.6
1961	1,646	27.5	582	4.3	1064	23.2
1962	1,458	23.1	431	3.8	1027	19.3
1963	1,583	26.9	484	5.7	1099	21.2
1964	1,834	33.3	640	7.4	1194	25.9

NOTE 1: This table excludes light transports such as the Aero Commander, Beech 18, etc., which are included in other tables in this chapter.

NOTE 2: Export figures for 1965 have been collected on a basis different from that used in previous years and the new data are generally not comparable with previous figures. This issue includes a summary of 1965 data on page 75. New series will be included in future issues.

Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).



## EXPORTS

### EXPORTS OF LIGHT TRANSPORTS AND UTILITY AIRCRAFT UNDER 20,000 POUNDS AIRFRAME WEIGHT, BY SELECTED U. S. MANUFACTURERS Calendar Years, 1960 to Date

Year Ending December 31	Number	Value (Thousands of Dollars)
1960	1,481	\$27,312.6
1961	1,583	29,789.8
1962	1,458	30,938.7
1963	1,579	35,060.6
1964	1,775	44,118.4
1965	2,325	61,155.9

NOTE: Data based on exports for Aero Commander, Beech, Cessna, Lear Jet, and Piper of new civil aircraft under 20,000 pounds, empty airframe weight.

NOTE: This table shows the exports of selected AIA member companies which sell both utility aircraft (under 3,000 lbs.) and light transports (3,000 lbs. to 20,000 lbs.) While they export fewer aircraft than the entire utility aircraft industry shown on page 78, the inclusion of the light transports accounts for the higher value of the exports.

Source: Aerospace Industries Association, company reports.

### EXPORTS OF LIGHT TRANSPORTS AND UTILITY AIRCRAFT, BY SELECTED U. S. MANUFACTURERS, BY DESTINATION, CALENDAR YEAR 1965

Total and Destination	Number	Value (Thousands of Dollars)
TOTAL	2,325	\$61,155.9
Europe .....	655	19,065.2
Africa .....	311	7,211.6
Asia .....	77	3,495.4
Oceania .....	365	5,631.3
Canada .....	239	6,920.3
Latin America .....	595	17,272.3
Not distributed by area ...	83	1,559.8

NOTE: Data based on exports of new civil aircraft under 20,000 pounds, empty airframe weight.  
Source: Aerospace Industries Association, company reports.

AEROSPACE FACTS AND FIGURES, 1966

MUTUAL SECURITY PROGRAM, SHIPMENT OF MILITARY AIRCRAFT  
1950 TO DATE

Year	Total	Air Force	Navy
1950	251	818	283
1951	850		
1952	1,317	1,124	193
1953	2,689	2,274	415
1954	1,170	923	247
1955	1,292	1,138	154
1956	2,659	2,580	79
1957	2,182	2,085	97
1958	1,714	1,565	149
1959	620	528	92
1960	355	317	38
1961	483	427	56
1962	358	341	17
1963	456	439	17
1964 (15 months)	622	511	111
1965 (6 months)	385	322	63
TOTAL <sup>a</sup>	17,403	15,392	2,011

<sup>a</sup> October 6, 1949 to June 30, 1965.  
Source: Department of Defense.

U. S. AEROSPACE IMPORTS  
Calendar Years 1955 to Date  
(Thousands of Dollars)

Year Ending Dec 31	TOTAL	Aircraft <sup>a</sup>	Aircraft Engines	Aircraft Parts, N.E.C.
1955	\$32,096	\$14,415	\$1,265	\$16,416
1956	86,790	55,594	2,300	28,896
1957	52,671	15,476	1,639	35,556
1958	78,560	32,715	5,991	39,854
1959	68,066	16,273	7,510	44,283
1960	60,901	6,841	7,388	46,672
1961	151,667	82,821	17,485	51,361
1962	128,204	54,280	9,707	64,217
1963	95,290	26,831	4,675	63,784
1964	90,062	21,505	6,573	61,984
1965	158,837	73,406	20,14	65,282

<sup>a</sup> Aircraft includes new and used airplanes, seaplanes, and amphibians.  
Source: Bureau of the Census, "U. S. Imports of Merchandise for Consumption, Report FT 110, 125" (Monthly).



## EXPORTS

### U. S. EXPORTS OF NEW SMALL AIRCRAFT ENGINES<sup>a</sup> FOR CIVILIAN AIRCRAFT Calendar Years 1948 to 1964

Year Ending December 31	Number	Value (Thousands of dollars)
1948 <sup>b</sup>	660	\$326
1949 <sup>b</sup>	107	112
1950	247	285
1951	304	509
1952	551	941
1953	347	708
1954	728	1,516
1955	897	2,016
1956	1,371	3,529
1957	1,516	3,860
1958	1,552	4,312
1959	948	2,448
1960	1,464	3,716
1961	1,575	4,399
1962	1,819	4,510
1963	1,292	3,635
1964	1,677	5,257

NOTE: Export figures for 1965 have been collected on a basis different from that used in previous years and the new data are generally not comparable with previous figures. This issue includes a summary of 1965 data on page 75. New series will be included in future issues.

<sup>a</sup> Under 400 h.p.

<sup>b</sup> Under 250 hp.

Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).





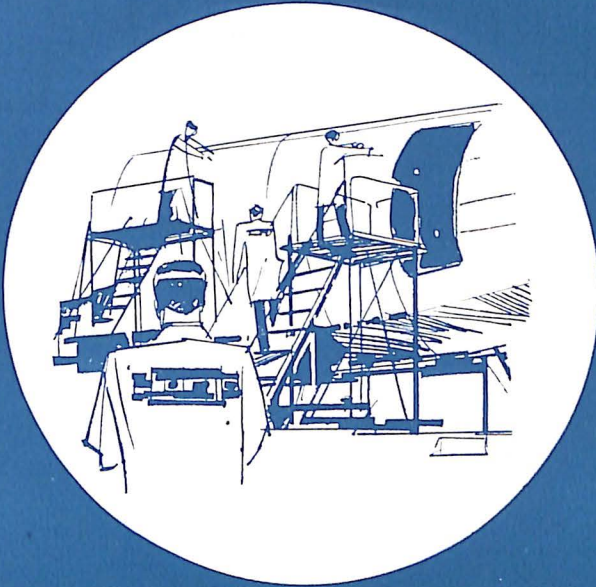
AEROSPACE FACTS AND FIGURES, 1966

EXPORTS OF ROTARY WING AIRCRAFT, USED, AND OTHER AIRCRAFT  
Calendar Years 1948 to Date

Year Ending Dec 31	Rotary Wing Aircraft (nonmilitary)		Used Aircraft (nonmilitary)		Other (nonmilitary)	
	Number	Value (Millions)	Number	Value (Millions)	Number	Value (Millions)
1948	47	\$1.9	202	\$ .7	.....	.....
1949	31	1.2	252	.6	.....	.....
1950	38	.9	262	.9	.....	.....
1951	28	.9	300	.9	.....	.....
1952	37	1.4	303	1.5	.....	.....
1953	98	4.9	416	1.5	.....	.....
1954	74	4.0	340	1.2	.....	.....
1955	66	4.2	800	37.1	4	0.01
1956	55	3.7	534	22.7	1	0.002
1957	104	11.9	627	43.2	4	0.005
1958	67	9.6	595	35.8	4	4.3
1959	63	8.2	461	20.5	6	2.9
1960	82	7.7	564	25.7	3	0.02
1961	119	6.8	495	33.9	81	4.0
1962	110	8.8	382	36.6	9	0.1
1963	123	9.8	356	16.4	8	0.05
1964	123	14.6	389	28.2	6	0.17
1965	177	16.2	407	39.0	12	0.4

Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).

# MANPOWER



Aerospace industry employment during 1965 increased by 37,000 over the previous year to a high yearly average of 1,154,000.

Missile and space activities accounted for 526,000 of the total employment. The aircraft segment of the industry employed 458,000.

In 1965 nearly 30 percent of the 346,300 scientists and engineers involved in industrial research and development were in aerospace. Total number of scientists and engineers employed in the aerospace industry increased from 177,000 in March 1965 to 203,000 in December 1965.

Production workers averaged 584,000 monthly during the year throughout the industry. This was 32,000 more than recorded during an average month in 1964. Of the 1965 total, 236,000 were employed in missiles and space production and 262,000 in aircraft including propulsion.

In addition to increased employment in the industry, wages also were up in 1965. Average weekly paychecks in aircraft and parts plants were \$131.88, \$6.52 above the 1964 average. Hourly earnings in aircraft and parts plants increased nine cents from \$3.05 to \$3.14.

AEROSPACE FACTS AND FIGURES, 1966

ESTIMATED AEROSPACE EMPLOYMENT, TOTAL AND PRODUCTION WORKERS  
Calendar Years 1959 to Date

Monthly Average for the Year	TOTAL AERO-SPACE	AIRCRAFT <sup>a</sup>		MISSILES AND SPACE <sup>b</sup>		OTHER <sup>d</sup>
		TOTAL (Including Propulsion)	Propulsion	TOTAL Missiles and Space	Communications Equipment <sup>c</sup>	
<b>TOTAL EMPLOYMENT (Thousands)</b>						
1959	1,128	707	128	342	106	79
1960	1,074	638	124	356	118	80
1961	1,096	557	121	421	165	118
1962	1,177	458	116	562	174	157
1963	1,174	446	116	578	185	150
1964	1,117	434	109	535	166	148
1965	1,154	458	105	526	183	170
<b>PRODUCTION WORKERS (Thousands)</b>						
1959	673	443	73	183	49	47
1960	607	370	68	191	53	46
1961	597	317	67	215	80	65
1962	619	269	66	273	85	77
1963	580	244	62	260	83	76
1964	552	243	58	236	72	73
1965	584	262	57	236	78	86

<sup>a</sup> "Aircraft" includes employees in the aircraft industry (SIC 372) engaged in aircraft, aircraft engine, propellers, or parts production.

<sup>b</sup> "Missiles and Space" includes employees in the aircraft, complete missile and space, and electronic industries engaged in missile and space work.

<sup>c</sup> "Communications equipment" includes employees in the electrical machinery industry (SIC 36) engaged in missile and space work.

<sup>d</sup> "Other" includes employees in industry classifications (SIC 28, 35, 38, 73, 89 and others) engaged in missile and space work.

Sources:

Bureau of Labor Statistics "Employment and Earnings."

Bureau of Employment Security, "Missiles, Spacecraft and Aircraft"

AIA estimates.

MANPOWER

LABOR TURNOVER RATES IN THE AEROSPACE INDUSTRY  
 Calendar Years 1958 to Date  
 (Rates per 100 Employees per Year)

Year Ending Dec. 31	Complete Missiles and Spacecraft		Aircraft							
			TOTAL		Airframes		Engines and Parts		Other Parts and Equipment	
	Acces- sions	Sepa- ra- tions	Acces- sions	Sepa- ra- tions	Acces- sions	Sepa- ra- tions	Acces- sions	Sepa- ra- tions	Acces- sions	Sepa- ra- tions
1958	58.1	26.0	28.3	33.3	26.9	29.8	27.8	35.0	33.8	42.0
1959	48.9	29.2	27.4	37.9	22.4	36.5	29.1	35.0	39.4	45.0
1960	32.3	30.9	28.6	39.2	23.4	33.8	35.1	39.5	34.3	53.9
1961	37.0	27.2	32.6	30.9	31.3	29.3	28.9	24.8	43.2	44.9
1962	37.2	31.6	35.2	31.3	32.9	29.0	30.5	23.9	49.3	47.9
1963	29.9	31.5	28.9	29.4	28.6	27.9	24.3	25.0	39.5	42.9
1964	23.5	39.1	24.7	31.0	23.0	28.9	20.2	28.0	38.6	42.9
1965	32.6	28.7	38.7	26.9	38.5	22.8	32.2	28.4	51.9	20.5

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

RESEARCH AND DEVELOPMENT—SCIENTISTS AND ENGINEERS—  
 TOTAL AND ~~AEROSPACE~~ *Aircraft*  
 1957 to Date

As of January	TOTAL Scientists and Engineers in Industry	Aerospace Scientists and Engineers	Aerospace as a Per Cent of Total
1957	229,400	58,700	25.6
1958	243,800	58,600	24.0
1959	268,400	65,900	24.6
1960	292,000	74,200	25.4
1961	312,100	81,400	26.1
1962	312,000	83,400	26.7
1963	327,300	95,800	29.3
1964	347,500	108,900	31.3
1965	346,300	101,200	29.2

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

Source: National Science Foundation.

AEROSPACE FACTS AND FIGURES, 1966

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY  
Calendar Years 1939 to Date  
(Thousands of Employees)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
1939	63.2	45.1	11.3	6.8 <sup>B</sup>
1940	148.6	101.8	31.4	15.4 <sup>B</sup>
1941	347.1	234.6	75.3	37.2 <sup>B</sup>
1942	831.7	549.6	192.0	90.1 <sup>B</sup>
1943	1,345.6	882.1	314.9	148.6 <sup>B</sup>
1944	1,296.6	815.5	339.7	141.4 <sup>B</sup>
1945	788.1	489.9	210.9	87.3 <sup>B</sup>
1946	237.3	159.0	49.9	28.4 <sup>B</sup>
1947	239.3	158.5	50.1	30.7 <sup>B</sup>
1948	237.7	158.0	48.6	31.1 <sup>B</sup>
1949	264.2	175.3	53.6	35.3 <sup>B</sup>
1950	283.1	188.4	57.0	37.7 <sup>B</sup>
1951	467.8	313.3	95.0	59.5 <sup>B</sup>
1952	670.6	425.9	148.6	96.1 <sup>B</sup>
1953	795.5	472.4	191.2	131.9 <sup>B</sup>
1954	782.9	470.0	178.2	134.7 <sup>B</sup>
1955	761.3	466.6	168.0	126.7 <sup>B</sup>
1956	837.3	494.4	194.9	148.0 <sup>B</sup>
1957	895.8	519.0	213.2	163.6 <sup>B</sup>
1958	783.6	448.5	184.3	150.8
1959	747.6	419.5	182.8	145.3
1960	645.7	350.8	173.6	121.3
1961	619.2	324.3	186.6	108.4
1962	634.6	331.4	199.4	103.9
1963	635.2	332.0	200.7	102.5
1964	605.5	317.8	189.0	98.7
1965	617.8	330.6	187.5	99.7
1966				
Feb.	694.1	381.1	202.1	110.9

<sup>B</sup> Estimate.

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. An estimated 125,500 employees in the aircraft and parts industry worked on missiles and spacecraft in 1965.

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

## MANPOWER

### PRODUCTION WORKERS IN THE AIRCRAFT AND PARTS INDUSTRY 1939 to Date (Thousands of Production Workers)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
1939	49.6	34.8	9.5	5.3 <sup>B</sup>
1940	118.0	79.2	26.5	12.3 <sup>B</sup>
1941	278.3	183.8	65.0	29.5 <sup>B</sup>
1942	674.8	433.9	168.3	72.6 <sup>B</sup>
1943	1,090.5	692.1	278.8	119.6 <sup>B</sup>
1944	1,016.0	616.3	290.3	109.4 <sup>B</sup>
1945	591.0	360.5	164.9	65.6 <sup>B</sup>
1946	167.5	113.1	34.0	20.4 <sup>B</sup>
1947	176.7	117.4	36.5	22.8 <sup>B</sup>
1948	175.2	117.4	34.9	22.9 <sup>B</sup>
1949	196.6	132.2	38.6	25.8 <sup>B</sup>
1950	209.4	140.4	40.8	28.2 <sup>B</sup>
1951	348.4	234.8	66.5	47.1 <sup>B</sup>
1952	495.4	315.0	105.5	74.9 <sup>B</sup>
1953	586.2	346.8	136.1	103.3 <sup>B</sup>
1954	560.2	335.1	121.6	103.5 <sup>B</sup>
1955	525.5	322.5	108.5	94.5 <sup>B</sup>
1956	561.0	330.3	122.5	108.2 <sup>B</sup>
1957	591.4	342.4	132.1	116.9 <sup>B</sup>
1958	499.4	287.6	107.5	104.3
1959	458.0	257.4	104.1	96.5
1960	376.8	203.8	96.6	76.4
1961	351.5	178.8	103.9	68.8
1962	350.6	175.9	108.7	65.9
1963	348.4	174.8	107.2	66.4
1964	338.4	175.0	99.1	64.3
1965	352.9	183.3	102.4	67.2
1966				
Feb.	408.3	216.9	115.2	76.2

<sup>B</sup> Estimate.

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. An estimated 72,000 production workers in the aircraft and parts industry worked on missiles and spacecraft in 1965.

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

AEROSPACE FACTS AND FIGURES, 1966

AVERAGE HOURLY EARNINGS IN AIRCRAFT AND PARTS PLANTS  
1939 to Date  
(Includes Overtime Premiums)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	\$0.812	N.A.
1940	N.A.	N.A.	0.816	N.A.
1941	N.A.	N.A.	1.008	N.A.
1942	N.A.	N.A.	1.189	N.A.
1943	N.A.	N.A.	1.236	N.A.
1944	N.A.	N.A.	1.287	N.A.
1945	N.A.	N.A.	1.286	N.A.
1946	N.A.	N.A.	1.316	N.A.
1947	\$1.372	\$1.360	1.384	N.A.
1948	1.487	1.465	1.519	N.A.
1949	1.560	1.548	1.571	N.A.
1950	1.637	1.622	1.662	N.A.
1951	1.78	1.75	1.85	N.A.
1952	1.89	1.87	1.94	N.A.
1953	1.99	1.98	1.99	N.A.
1954	2.07	2.08	2.05	N.A.
1955	2.16	2.17	2.13	N.A.
1956	2.27	2.27	2.24	N.A.
1957	2.35	2.35	2.35	N.A.
1958	2.50	2.51	2.51	\$2.44
1959	2.62	2.64	2.64	2.55
1960	2.70	2.71	2.73	2.64
1961	2.77	2.78	2.81	2.70
1962	2.87	2.87	2.91	2.80
1963	2.95	2.95	2.99	2.90
1964	3.05	3.05	3.09	2.99
1965	3.14	3.15	3.17	3.06
1966				
Feb.	3.26	3.30	3.27	3.13

NOTE: The production workers surveyed include substantial missile and spacecraft employment. See NOTE page 87.

N.A.—Not available.

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

MANPOWER

AVERAGE WEEKLY EARNINGS IN AIRCRAFT AND PARTS PLANTS  
1939 to Date  
(Includes Overtime Premiums)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	\$ 36.05	N.A.
1940	N.A.	N.A.	37.62	N.A.
1941	N.A.	N.A.	47.78	N.A.
1942	N.A.	N.A.	58.38	N.A.
1943	N.A.	N.A.	59.33	N.A.
1944	N.A.	N.A.	60.75	N.A.
1945	N.A.	N.A.	57.48	N.A.
1946	N.A.	N.A.	54.22	N.A.
1947	\$ 54.74	\$ 54.13	54.67	N.A.
1948	60.97	60.36	61.52	N.A.
1949	63.34	62.85	63.31	N.A.
1950	68.10	67.15	69.31	N.A.
1951	77.96	75.95	83.07	N.A.
1952	81.27	79.85	84.20	N.A.
1953	83.38	81.99	84.77	N.A.
1954	84.66	85.28	82.62	N.A.
1955	89.21	89.84	86.48	N.A.
1956	95.57	95.11	94.30	N.A.
1957	96.35	95.88	95.65	N.A.
1958	101.25	101.66	99.65	\$100.53
1959	106.63	105.86	108.50	106.34
1960	110.43	110.03	112.20	109.30
1961	114.68	114.26	116.62	113.40
1962	119.97	119.97	120.77	118.72
1963	122.43	121.84	123.49	122.67
1964	125.36	123.53	127.31	126.78
1965	131.88	131.26	133.46	131.27
1966				
Feb.	142.14	142.89	142.25	139.60

NOTE: The production workers surveyed include substantial missile and spacecraft employment. See NOTE page 87.

N.A.—Not available.

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



**AVERAGE EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY  
BY GEOGRAPHICAL DIVISION AND SELECTED STATES—1958 TO DATE<sup>a</sup>**

Geographical Divisions and Selected States	1959	1960	1961	1962	1963	1964
<b>TOTAL</b> .....	<b>754,533</b>	<b>668,914</b>	<b>625,095<sup>b</sup></b>	<b>633,024<sup>b</sup></b>	<b>633,875<sup>b</sup></b>	<b>607,095<sup>b</sup></b>
<b>New England</b> .....	<b>71,462</b>	<b>71,313</b>	<b>75,346</b>	<b>76,762</b>	<b>77,531</b>	<b>75,071</b>
Massachusetts .....	9,180	8,546	9,493	9,023	9,407	9,046
Connecticut .....	60,865	61,291	64,012	65,693	66,338	65,117
Me., N.H., Vt., R.I.	1,417	1,476	1,841	2,046	1,786	908
<b>Middle Atlantic</b> .....	<b>74,201</b>	<b>71,554</b>	<b>71,321</b>	<b>74,476</b>	<b>82,771</b>	<b>74,116</b>
New York .....	48,282	45,159	44,168	44,034	50,644	46,116
New Jersey .....	15,445	15,458	14,946	16,017	14,848	10,557
Pennsylvania .....	10,474	10,937	12,207	14,425	17,279	17,433
<b>East North Central</b> ..	<b>94,851</b>	<b>77,846</b>	<b>69,932</b>	<b>70,107</b>	<b>69,023</b>	<b>62,695</b>
Ohio .....	60,217	49,997	41,722	39,893	39,724	34,803
Indiana .....	22,556	18,124	17,821	18,592	19,677	18,894
Illinois .....	5,271	4,304	4,896	6,100	4,110	3,916
Mich., Wisc. ....	6,807	5,421	5,493	5,522	5,512	5,082
<b>West North Central</b> ..	<b>69,306</b>	<b>62,197</b>	<b>57,311</b>	<b>60,047</b>	<b>63,029</b>	<b>70,423</b>
Missouri .....	30,149	27,420	24,026	27,153	33,449	36,874
Kansas .....	37,269	33,193	31,177	31,805	28,840	32,542
Minn., Iowa., N.D., S.D., Neb. ....	1,888	1,584	2,108	1,089	740	1,007
<b>South Atlantic</b> .....	<b>49,380</b>	<b>40,616</b>	<b>31,072</b>	<b>34,551</b>	<b>36,265</b>	<b>37,262</b>
Maryland .....	23,820	16,228	3,668	3,640	3,094	2,577
Del., D.C., Va., W.Va., N.C., S.C.	571	497	4,539	1,210	1,842	1,621
Georgia .....	24,989	23,891	11,288	14,396	17,064	18,482
Florida <sup>c</sup> .....			13,593	15,305	14,265	14,582
<b>East South Central</b> ..	<b>8,509</b>	<b>5,303</b>	<b>5,031</b>	<b>7,498</b>	<b>8,561</b>	<b>6,338</b>
Alabama .....			4,102	7,435	7,435	5,382
Ky., Tenn., Miss. ...	8,509	5,303	929	1,094	1,126	956
<b>West South Central</b> ..	<b>52,267</b>	<b>44,724</b>	<b>43,468</b>	<b>41,237</b>	<b>40,310</b>	<b>44,244</b>
Texas .....			39,051	36,158	34,265	37,385
Ark., La., Okla. ...	52,267	44,724	4,417	5,079	6,045	6,859
<b>Mountain</b> .....	<b>22,196</b>	<b>27,211</b>	<b>17,664</b>	<b>21,956</b>	<b>20,926</b>	<b>17,198</b>
Arizona .....	6,192	14,164	5,167	5,451	5,252	4,833
Utah <sup>d</sup> .....	...	...	8,663	11,695	12,047	8,786
Mont., Idaho, Wyo., Colo., N.Mex., Nev. ....	16,004	13,047	3,834	4,810	3,627	3,579
<b>Pacific</b> .....	<b>312,361</b>	<b>268,150</b>	<b>253,916</b>	<b>246,349</b>	<b>235,459</b>	<b>218,959</b>
California .....	244,670	209,830	191,050	172,413	170,634	165,213
Washington <sup>e</sup> .....	...	...	62,252	73,326	64,204	52,591
Ore., Alaska, Hawaii .....	67,691	58,320 <sup>b</sup>	614	610	621	1,155

NOTE: Corresponding data for the years since 1947 may be found in "Aerospace Facts and Figures," earlier editions.

<sup>a</sup> The difference between these totals and employment totals appearing elsewhere are due to technical differences in methodologies of B.E.S., B.L.S., and Census, and do not seriously affect the usability of the data. The definition used is the narrow "aircraft industry" definition (SIO 372) which is narrower than the definition of "aerospace" used in some other tables.

<sup>b</sup> Includes Puerto Rico.

<sup>c</sup> Until 1961, Utah was included with Montana, Idaho, Wyoming, Colorado, New Mexico, and Nevada.

<sup>d</sup> Until 1961, Washington was included with Oregon, Alaska, and Hawaii.

<sup>e</sup> Until 1961 was included with Georgia.

Source: Department of Labor, Bureau of Employment Security.

MANPOWER



THE TEN LARGEST AEROSPACE LABOR MARKET AREAS  
As of October 1965

	Aerospace Employment (Thousands)	Per Cent of Total U.S. Employment in Aerospace
TOTAL, U.S. aerospace employment <sup>a</sup> . . . . .	1,136.0	100.0
TOTAL, 10 labor market areas <sup>b</sup> . . . . .	523.4	46.1
Los Angeles-Long Beach, California . . . . .	218.0	19.2
New York, New York . . . . .	47.8	4.2
Philadelphia, Pennsylvania . . . . .	39.6	3.5
Hartford, Connecticut . . . . .	39.3	3.5
Anaheim-Santa Ana-Garden Grove, California . . . . .	38.6	3.4
Saint Louis, Missouri . . . . .	36.9	3.3
San Jose, California . . . . .	31.1	2.7
Wichita, Kansas . . . . .	26.4	2.3
San Diego, California . . . . .	24.9	2.2
Fort Worth, Texas . . . . .	20.8	1.8

<sup>a</sup> U.S. aerospace employment as computed by the Bureau of Employment Security differs from the total computed by AIA because of different methodology.

<sup>b</sup> To avoid disclosure, two large labor market areas are excluded. They are Seattle, Washington and Atlanta, Georgia with 85,800 employees.

Source: U. S. Department of Labor, Bureau of Employment Security.

AEROSPACE FACTS AND FIGURES, 1966

WORK STOPPAGES IN THE AIRCRAFT AND PARTS INDUSTRY  
Calendar Years 1927 to Date

Year Ending December 31	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
1927-1933	4	1,153	18,965
1934	4	3,207	111,048
1935	1	1,700	6,800
1936	—	—	—
1937	6	9,390	90,964
1938	N.A.	N.A.	N.A.
1939	2	1,263	85,419
1940	3	6,270	36,402
1941	29	28,422	112,549
1942	15	6,584	12,416
1943	60	52,481	130,112
1944	103	189,801	386,371
1945	85	150,200	581,000
1946	15	21,300	557,000
1947	10	3,520	67,900
1948	8	21,400	1,100,000
1949	10	10,300	451,000
1950	18	23,900	145,000
1951	29	48,800	765,000
1952	44	81,000	927,000
1953	31	57,800	1,350,000
1954	11	6,350	171,000
1955	38	48,500	403,000
1956	21	23,100	1,040,000
1957	18	23,200	88,200
1958	20	36,700	308,000
1959	26	21,700	312,000
1960	28	82,400	1,190,000
1961	14	2,440	35,000
1962	19	23,000	555,000
1963	12	7,510	53,700
1964	19	20,300	160,000

N.A.—Not available

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.

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

# FINANCE



An increase in earnings as a percentage of sales was experienced during 1965 by the aerospace industry. Earnings amounted to 3.2 percent, the highest in recent years and up from the 1964 rate of 2.6 percent. This record, though still well below the average earning rate of 5.6 percent for all manufacturing industries, reflected expanding commercial sales, company achievements in cost reduction programs and a continuing Department of Defense policy utilizing profit to stimulate efficient contract performance.

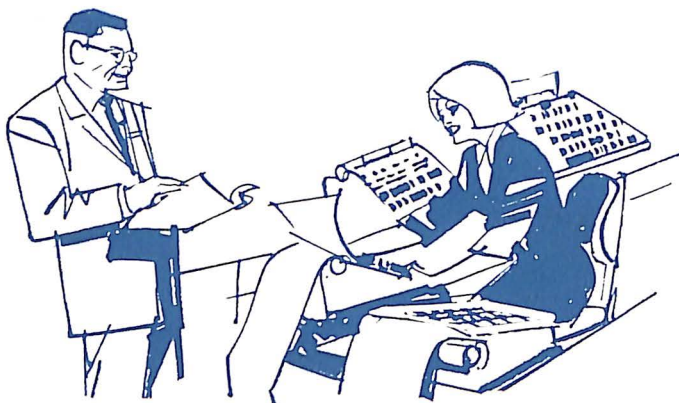
The federal government continued to be the major customer of aerospace products and services in 1965, with 76 percent (as compared to 81 percent in 1964) of aerospace sales made to the Department of Defense, National Aeronautics and Space Administration, the Atomic Energy Commission, the Federal Aviation Agency and other government departments. Reduced government sales were largely attributable to decreased demand by the DoD, only partially offset by increased sales to NASA and other government agencies.

A high percentage of net profit continued to be retained and reinvested by aerospace companies. Between 1964 and 1965 the amount of

AEROSPACE FACTS AND FIGURES, 1966

net profit retained in aerospace companies increased from \$241 million to \$339 million.

The Securities and Exchange Commission reported a 1965 increase of \$79 million since 1964 in the value of net plant and equipment by fifty major aerospace companies. This compares with a much smaller gain in the value of net plant and equipment between 1963 and 1964 of \$16 million. The 1965 increase of 5.0 percent in the total value of net plant and equipment is a significant indication of the rapidly expanding investment in plant and equipment by aerospace companies resulting from the increased demands of consumers of aerospace products and services.



COMPOSITION OF CURRENT ASSETS, 1956 TO DATE, 50 AEROSPACE COMPANIES  
(in Per Cent of Total)

Year	Total Current Assets	Cash and Securities	Inventories	Receivables	Miscellaneous
1956	100.0	9.7	64.1	25.3	0.9
1957	100.0	8.7	62.8	27.2	1.3
1958	100.0	9.7	60.2	28.8	1.3
1959	100.0	8.0	60.8	29.3	1.9
1960	100.0	8.2	60.2	30.2	1.4
1961	100.0	8.0	58.2	32.0	1.8
1962	100.0	7.2	58.4	32.3	2.1
1963	100.0	7.4	61.2	28.7	2.7
1964	100.0	7.8	62.0	27.1	3.1
1965	100.0	7.1	61.0	26.9	5.0

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

Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

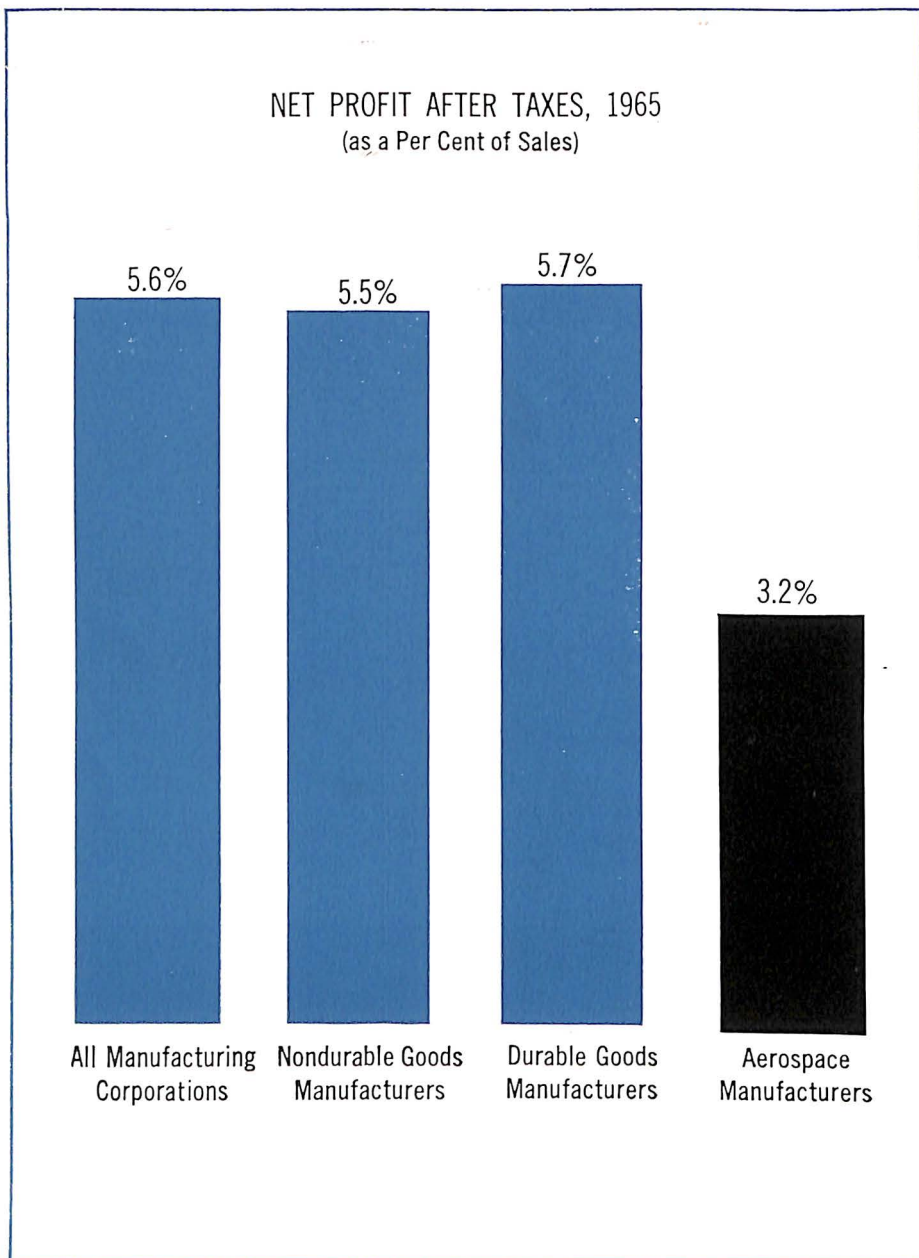
## FINANCE

BALANCE SHEET COMPARISONS, 50 AEROSPACE COMPANIES  
1960 to Date  
(Millions of Dollars)

	1960	1961	1962	1963	1964	1965
<b>Assets:</b>						
<b>Current Assets</b>						
Cash .....	\$ 363	\$ 417	\$ 395	\$ 435	\$ 415	\$ 395
U. S. Government Securities	102	58	46	39	74	75
Total Cash and U. S. Govt. Securities .....	\$ 465	\$ 475	\$ 441	\$ 474	\$ 489	\$ 470
Receivables (total) .....	1,718	1,906	1,981	1,847	1,695	1,788
Inventories (gross) .....	3,425	3,470	3,580	3,936	3,876	4,048
Other current assets .....	82	112	133	174	193	331
Total Current Assets ...	\$5,690	\$5,963	\$6,135	\$6,431	\$6,253	\$6,637
Total Net Plant .....	1,195	1,420	1,509	1,575	1,591	1,670
Other Non-Current Assets ...	229	305	257	278	341	402
Total Assets .....	\$7,113	\$7,688	\$7,901	\$8,284	\$8,185	\$8,709
<b>Liabilities:</b>						
<b>Current Liabilities</b>						
Short term loans .....	745	700	698	461	388	339
Advances by U.S. Govt. ...	1,346	1,308	1,338	1,674	1,725	1,868
Trade accounts and notes payable .....	955	1,005	1,037	1,072	928	835
Federal income taxes accrued .....	165	186	265	255	239	252
Instalments due on long term debt .....	25	24	32	28	38	45
Other current liabilities ...	654	822	769	756	770	1,043
Total current liabilities ..	\$3,890	\$4,045	\$4,139	\$4,246	\$4,088	\$4,382
Long Term Debt .....	645	806	783	835	816	807
Other Non-Current Liabilities	32	28	37	42	47	67
Total Liabilities .....	\$4,567	\$4,879	\$4,959	\$5,123	\$4,951	\$5,256
<b>Stockholders' Equity:</b>						
Capital Stock .....	1,154	1,291	1,318	1,354	1,339	1,312
Earned Surplus and Reserves	1,394	1,517	1,625	1,808	1,895	2,142
Total Net Worth .....	\$2,548	\$2,808	\$2,943	\$3,162	\$3,234	\$3,454
Total Liabilities and Stock- holders' Equity .....	\$7,113	\$7,688	\$7,901	\$8,284	\$8,185	\$8,709
Net Working Capital .....	\$1,800	\$1,918	\$1,996	\$2,185	\$2,166	\$2,256

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

Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."



Source: Net Profit After Taxes as a Percent of Sales for Manufacturing Corporation, Page 18.



FINANCE

INCOME ACCOUNTS, 50 AEROSPACE COMPANIES  
1959 to Date  
(Millions of Dollars)

	1959	1960	1961	1962	1963	1964	1965
Net Sales .....	\$12,488	\$12,974	\$13,954	\$15,206	\$15,313	\$15,403	\$16,073
Net Profit from Operations .....	451	386	570	739	695	756	997
Total Income before Federal Income Taxes .....	411	333	521	682	665	748	984
Provision for Federal Income Taxes .....	215	148	264	322	316	351	460
Net Profit after Taxes	196	185	257	360	350	395	524
Net Profit Retained in Business .....	71	80	147	231	214	241	339

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

Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

FINANCIAL RATIOS, 50 AEROSPACE COMPANIES  
1956 to Date

Year	Net Federal Taxes as a Per Cent of Total Income	Net Profit as a Per Cent of Sales After Taxes
1956	52.3	3.1
1957	52.3	2.9
1958	51.7	2.4
1959	52.3	1.6
1960	44.4	1.4
1961	50.7	1.8
1962	47.2	2.4
1963	47.5	2.3
1964	46.9	2.6
1965	46.7	3.2

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

Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."



AEROSPACE FACTS AND FIGURES, 1966

MAJOR DEFENSE CONTRACTORS  
 (Listed by rank according to net value of military prime contracts  
 awarded, July 1, 1950-June 30, 1965)  
 (Millions of Dollars)

Company	July 1, 1950 to June 30, 1965	July 1, 1964 to June 30, 1965	July 1, 1963 to June 30, 1964	July 1, 1962 to June 30, 1963	July 1, 1961 to June 30, 1962	World War II <sup>a</sup> (Per Cent)
U S. TOTAL, ALL CONTRACTS	\$351,089.5	\$24,177.8	\$25,163.7	\$25,834.0	\$25,588.4	100.0%
Boeing . . . . .	\$ 16,963.0	\$ 583.3	\$ 1,365.2	\$ 1,356.3	\$ 1,132.6	1.5
General Dynamics . . . . .	15,668.7	1,178.6	986.7	1,033.2	1,196.6	N.A.
Lockheed . . . . .	14,094.7	1,715.0	1,455.4	1,517.0	1,419.3	1.9
General Electric . . . . .	12,911.4	824.3	892.6	1,021.2	975.9	1.9
North American . . . . .	12,311.7	745.8	1,019.5	1,062.4	1,032.5	1.6
United Aircraft . . . . .	10,649.2	632.1	625.4	529.9	662.7	2.2
General Motors . . . . .	9,619.6	254.4	255.8	444.0	449.0	7.9
Douglas . . . . .	7,544.5	170.1	203.2	361.1	365.6	2.5
American Telephone and Telegraph . . . . .	7,519.9	587.6	635.6	578.6	467.7	1.5
Martin Marietta . . . . .	6,266.0	315.6	476.4	766.8	802.7	1.3
McDonnell . . . . .	5,685.6	855.8	1,157.4	497.0	310.9	N.A.
Sperry Rand . . . . .	4,788.9	318.4	373.9	445.5	465.6	0.9
Republic . . . . .	4,294.3	70.1	66.9	196.8	332.8	0.7
Hughes . . . . .	3,875.9	278.3	288.7	312.9	243.2	N.A.
Grumman . . . . .	3,869.7	353.4	395.6	390.5	303.6	0.8
Bendix . . . . .	3,747.7	234.9	257.4	290.3	285.9	1.1
Westinghouse Electric Radio Corp. of America . . . . .	3,571.2	260.9	236.9	322.6	246.0	0.8
Curtiss-Wright . . . . .	3,508.9	213.9	233.6	328.6	339.6	0.3
Raytheon . . . . .	3,369.9	49.3	51.2	98.4	144.6	4.1
International Busi- ness Machines . . . . .	3,277.4	293.4	253.0	294.9	406.6	N.A.
General Tire & Rubber Northrop . . . . .	3,114.8	186.2	332.4	203.3	155.5	N.A.
Aveco . . . . .	2,870.3	302.0	364.4	424.6	366.1	N.A.
International Tele- phone & Telegraph . . . . .	2,812.0	255.9	164.9	222.9	152.5	0.1
Textron . . . . .	2,687.9	234.2	278.7	253.1	323.3	0.6
Philco . . . . .	1,695.0	206.7	256.1	265.5	243.6	N.A.
Thiokol . . . . .	1,624.4	195.7	216.3	151.2	117.4	0.7
Ling-Temco-Vought . . . . .	1,446.8	312.0	211.2	227.7	269.1	N.A.
	1,342.6	136.2	253.6	238.6	178.3	N.A.
	1,076.2	264.7	247.5	205.9	133.4	N.A.

N.A.—Not available.

<sup>a</sup> Estimated at \$193.3 billion.

Sources:

1950 to Date: Department of Defense, "100 Companies and their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards" (Annually).  
 World War II: War Production Board.

## FINANCE

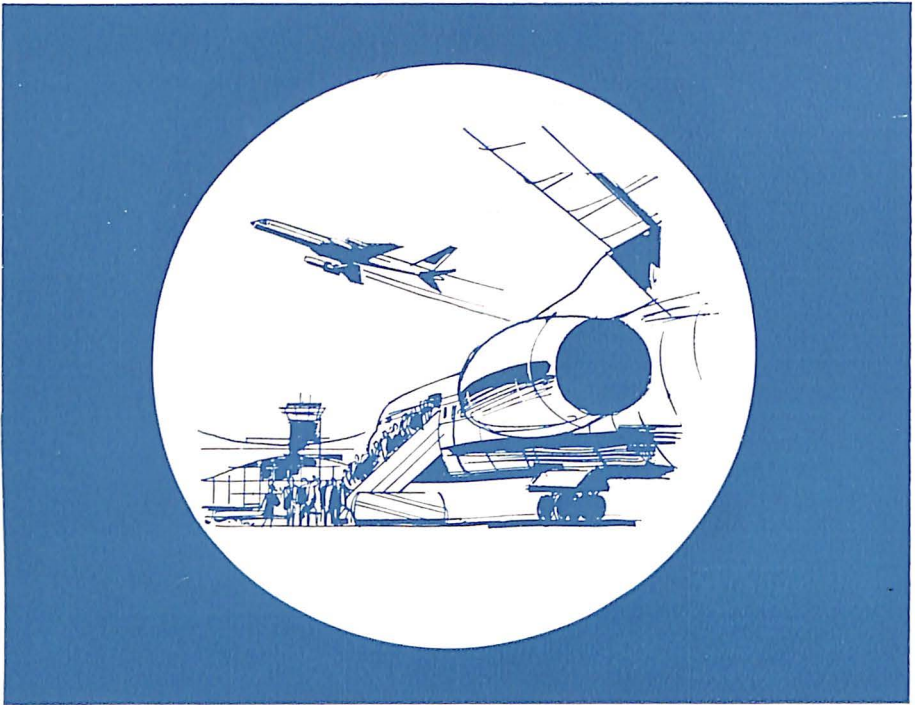
**MAJOR NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CONTRACTORS**  
 (Listed by rank according to net value of NASA prime contracts  
 awarded, July 1, 1960-June 30, 1965)  
 (Millions of Dollars)

Company	July 1, 1960 to June 30, 1965	July 1, 1964 to June 30, 1965	July 1, 1963 to June 30, 1964	July 1, 1962 to June 30, 1963	July 1, 1961 to June 30, 1962	July 1, 1960 to June 30, 1961
<b>U S. TOTAL, ALL CONTRACTS</b>	<b>\$11,401.0</b>	<b>\$4,141.4</b>	<b>\$3,521.1</b>	<b>\$2,261.6</b>	<b>\$1,053.6</b>	<b>\$423.3</b>
North American .....	2,816.5	1,099.4	917.2	525.8	199.1	75.0
Douglas .....	761.6	251.7	250.3	160.5	68.4	30.7
McDonnell .....	737.7	166.7	267.6	193.1	68.5	41.8
Boeing .....	619.7	306.0	197.1	101.0	15.6	a
Grumman .....	507.6	267.2	156.4	48.2	24.6	11.2
Aerojet General .....	492.2	123.2	135.8	160.5	66.4	6.3
General Electric .....	410.3	181.5	143.6	53.0	23.0	9.2
General Dynamics .....	392.4	111.1	148.2	103.1	27.9	2.1
Chrysler .....	305.0	86.0	99.4	75.4	31.3	12.9
International Busi- ness Machines .....	262.6	128.3	85.6	36.1	12.6	a
Radio Corp. of America .....	227.4	106.6	49.8	42.2	20.2	8.6
Bendix .....	166.4	66.1	41.9	32.5	19.4	6.5
United Aircraft .....	163.0	43.3	36.7	48.9	34.1	a
Brown Engineering ..	135.1	30.9	41.6	24.1	11.9	6.7
General Motors .....	124.6	72.5	41.9	10.2	a	a
Lockheed .....	106.8	35.8	39.0	23.7	5.0	3.3
Ling-Temco-Vought ..	99.1	15.1	21.5	26.7	27.0	8.8
Thompson-Ramo- Wooldridge .....	85.0	50.5	39.0	2.6	3.8	a
Phileo .....	95.9	30.0	35.7	14.9	4.4	a
Hayes International ..	83.9	28.5	18.7	15.4	11.0	10.3
Hughes .....	68.9	26.5	14.9	18.3	9.2	a
Sperry Rand .....	56.6	39.4	11.8	3.2	2.2	a
Honeywell .....	44.8	27.1	7.1	3.2	4.7	2.7
Union Carbide .....	44.5	20.0	20.1	a	4.4	a
Collins Radio .....	36.4	31.5	4.9	a	a	a
Western Electric ....	35.3	a	a	a	8.7	26.6
Republic .....	32.7	7.5	9.3	9.3	6.9	a
Fairchild-Hiller .....	31.3	14.7	10.4	6.2	a	a
Catalytic Construction	31.2	25.3	5.9	a	a	a
Martin Marietta .....	25.9	8.4	8.5	7.2	1.8	a
Bellcom .....	25.9	9.8	8.7	6.4	a	a
Raytheon .....	25.6	2.2	23.4	a	a	a
Kollsman Instrument	19.9	a	13.6	5.1	1.2	a

a Not in list of major contractors for indicated year.

Sources: National Aeronautics and Space Administration, "NASA Annual Procurement Report."

# AIR TRANSPORTATION



The U. S. scheduled airlines in 1965 soared to new highs by every major measurement of activity. The airlines carried 95 million passengers (up almost 16 percent from 1964), flew 68.7 billion passenger-miles (up over 17 percent), 2.3 billion cargo ton-miles (up almost 39 percent), and 494 million mail ton-miles (up almost 29 percent).

Earnings of the scheduled carriers amounted to \$366.8 million, an increase of 63 percent over 1964.

The U. S. airline fleet numbered 2,125 aircraft, ranging from inter-continental transports with four turbojet engines to a short-haul helicopter with a single piston engine.

At year's end, foreign and domestic carriers had placed orders for 809 turbine transports valued at nearly \$3.7 billion. Domestic orders amounted to 597 aircraft valued at nearly \$2.7 billion, while foreign carrier orders were for 212 transports with a value of nearly \$1 billion.

All of the carriers are in the midst of a re-equipment cycle that far outstrips in number and value the orders placed when turbine-powered transports first entered service.

The surge of air travel and cargo and the rising profit ratio is pre-

## AIR TRANSPORTATION

dominantly due to the operating economies of the jet aircraft, improvement in service and lower fare levels.

The Air Transport Association makes the following growth prediction: "Assuming the continued steady growth of the economy, some rough projections can be made as to the future growth of airline passenger traffic. If the 15-year historic trend of 13.5 percent annual growth in revenue passenger miles continues, traffic will increase from 68 billion in 1965 to 129 billion in 1970. If, however, revenue passenger miles were to continue at the still higher rate experienced in the past three years, they would reach a total of 145 billion by 1970, more than double the 1965 traffic. Assuming, more conservatively, that the increase were at the growth rate of 10.8 percent annually—a growth rate as much below the long-term trend as the growth rate of the past three years has been above it—passenger miles would total 115 billion by 1970."

Regarding the outlook for air cargo, ATA notes that revenue from cargo amounted to 10 percent of the total in 1960 compared with 12 percent in 1965. "The cargo rate of growth has outstripped the rate of growth in passenger service for the past two years. If current trends continue, cargo traffic will double in under five years," ATA states.

INVENTORY OF ELIGIBLE CIVIL AIRCRAFT, BY YEAR OF MANUFACTURE  
As of January 1, 1966

Year of Manufacture	Number	Per Cent of Total
TOTAL	97,743	100.0
1965	17,179	17.6
1964	5,732	5.8
1963	4,932	5.0
1962	4,720	4.8
1961	5,236	5.3
1960	5,735	5.9
1959	4,570	4.8
1958	3,726	3.8
1957	4,369	4.5
1956	2,903	3.0
1955 and prior years	38,600	39.5

NOTE: An eligible aircraft is an aircraft with a current airworthiness certificate which, through a periodic or progressive inspection, has been renewed within the past 12 months.  
Source: Federal Aviation Agency, "FAA Statistical Handbook of Aviation" (Annually).

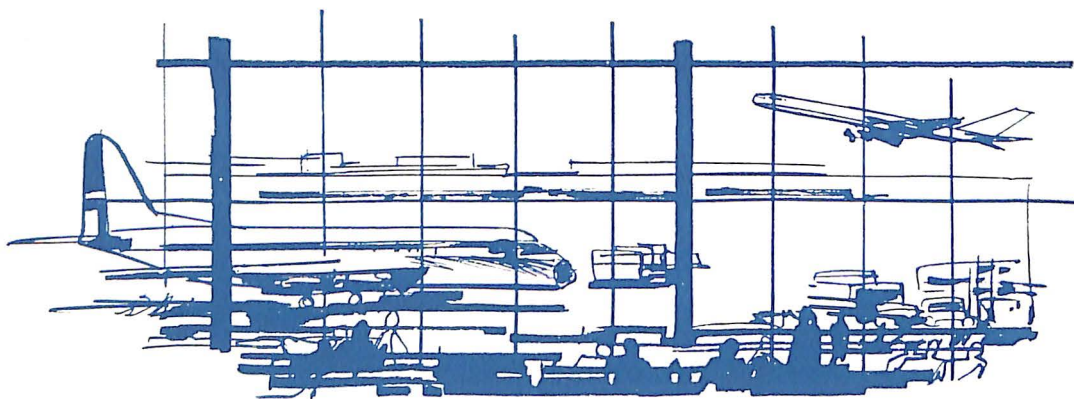
AEROSPACE FACTS AND FIGURES, 1966

INVENTORY OF CIVIL AIRCRAFT  
Including Air Carrier Aircraft  
1928 to Date

Year As of January 1	TOTAL	Eligible	Ineligible
1928	2,740	N.A.	N.A.
1932	10,680	N.A.	N.A.
1935	8,322	N.A.	N.A.
1941	26,013	N.A.	N.A.
1951	92,809	60,921	31,888
1952	88,545	54,039	34,506
1956	92,067	58,994	33,073
1956	85,320	60,432	24,888
1957	87,531	64,688	22,843
1958	93,189	67,153	26,036
1959	98,893	69,718	29,175
1960	105,309	70,747	34,562
1961	111,580	78,760	32,820
1962	117,904	82,853	35,051
1963	124,273	86,287	37,986
1964	129,975	87,267	42,708
1965	137,189	90,935	46,254
1966	142,083	97,743	44,340

N.A.—Not available.

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



AIR TRANSPORTATION

U. S. MANUFACTURED AIRCRAFT IN OPERATION ON WORLD AIRLINES  
Calendar Years 1959 to Date

	1960	1961	1962	1963	1964
TOTAL MANUFACTURED IN U.S. . . .	2,766	2,542	2,345	2,266	2,317
<u>4 Engine</u> . . . . .	1,568	1,505	1,474	1,434	1,417
<u>Turbojets</u> . . . . .	285	423	517	580	627
Boeing 707 . . . . .	143	150	209	206	233
Boeing 720 . . . . .	23	40	51	55	} 109
Boeing 720B . . . . .	—	44	25	52	
Douglas DC-8 . . . . .	110	149	167	183	199
Convair 880 . . . . .	9	40	44	53	53
Convair 990 . . . . .	—	—	21	31	33
<u>Turboprops</u> . . . . .	127	137	137	137	137
Lockheed Electra . . . . .	127	137	137	137	137
<u>Piston Engine</u> . . . . .	1,156	945	820	717	655
Lockheed Constellation . . . . .	362	261	206	179	176
Douglas DC-7 . . . . .	276	254	232	178	133
Douglas DC-6 . . . . .	372	316	277	257	250
Douglas DC-4 . . . . .	146	114	105	103	96
<u>3 Engine</u> . . . . .	—	—	—	4	97
Boeing 727 (turbojet) . . . . .	—	—	—	4	97
<u>2 Engine</u> . . . . .	1,125	971	833	783	754
<u>Turboprops</u> . . . . .	21	8	7	7	7
Fairchild F-27 . . . . .	21	8	7	7	7
<u>Piston Engine</u> . . . . .	1,104	963	826	776	747
Convair 240, 340, 440 . . . . .	321	288	250	228	201
Martin 202, 404 . . . . .	75	40	4	4	—
Curtiss Commando C-46 . . . . .	48	36	36	37	38
Douglas DC-3 . . . . .	634	568	516	479	471
Other . . . . .	26	31	20	28	37
<u>1 Engine</u> . . . . .	37	34	12	18	19
<u>Helicopters</u> . . . . .	36	32	26	27	30
ALL MANUFACTURERS GRAND TOTAL . . . . .	3,376	3,319	3,162	3,086	3,137
Per Cent of Grand Total Manufactured in U.S. . . . .	81.9	76.6	74.2	73.4	73.9

Source: International Air Transport Association. "World Air Transport Statistics" (Annually). Based on reports by IATA members.

AEROSPACE FACTS AND FIGURES, 1966

**WORLD CIVIL AIRLINES**  
 Selected Calendar Years, 1919 to Date  
 (Revenue Traffic, Scheduled Services, International and Domestic)  
 (Data in Millions)

Year Ending December 31	Miles Flown	Passengers Carried	Passenger- Miles	Cargo Ton-Miles	Mail Ton-Miles
1919	1	N.A.	N.A.	N.A.	N.A.
1929	55	N.A.	105	N.A.	N.A.
1934	100	N.A.	405	N.A.	N.A.
1939	185	N.A.	1,260	N.A.	N.A.
1944	260	N.A.	3,410	N.A.	N.A.
1949	840	27	15,000	390	130
1951	1,005	42	22,000	630	190
1953	1,205	52	28,500	720	185
1955	1,425	68	38,000	900	255
1956	1,580	77	44,000	1,030	275
1957	1,765	86	50,500	1,125	295
1958	1,820	87	53,000	1,150	320
1959	1,915	98	61,000	1,330	355
1960	1,925	106	67,500	1,495	415
1961	1,940	111	72,500	1,700	490
1962	2,015	121	80,500	1,995	545
1963	2,125	135	91,500	2,240	590
1964	2,300	155	106,000	2,685	625
1965	2,550	177	123,500	3,400	755

N.A.—Not available.

NOTE: Excludes China (mainland) and the USSR.

SOURCE: International Civil Aviation Organization, "Development of Civil Air Transport, Total Scheduled Services-Revenue Traffic" (Annually).

AIR TRANSPORTATION



UNITED STATES CIVIL AIRLINES  
Selected Calendar Years, 1949 to Date

Year Ending Dec 31	Revenue Miles Flown (Millions)	Passengers Carried (Millions)	Revenue Passenger- Miles (Millions)	Cargo Ton-Miles <sup>a</sup> (Millions)	Mail Ton-Miles <sup>b</sup> (Millions)
1949	463	17	8,827	196	66
1951	527	25	13,204	324	92
1953	657	32	18,245	359	106
1955	780	42	24,351	503	150
1956	869	46	27,625	634	160
1957	976	49	31,261	721	169
1958	973	49	31,499	726	185
1959	1,030	56	36,372	853	209
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	50,362	1,346	368
1964	1,189	82	58,494	1,634	383
1965	1,353	95	68,677	2,270	494

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

<sup>a</sup> Includes freight plus express revenue ton-miles in scheduled and nonscheduled operations.

<sup>b</sup> U. S. mail ton-miles plus foreign mail ton-miles.

Source: Civil Aeronautics Board.



AEROSPACE FACTS AND FIGURES, 1966

COMPOSITION OF U. S. AIR LINE FLEET, BY TYPE OF AIRCRAFT, NUMBER OF ENGINES, AND MODEL: JANUARY 1, 1966, 1965, AND 1964  
(Number of Aircraft)

Type of Aircraft, Number of Engines, and Model	January 1, 1966	January 1, 1965	January 1, 1964
<b>TOTAL, AIRCRAFT</b> .....	2,125	2,081	2,079
<b>Total fixed-wing</b> .....	2,104	2,061	2,059
<u>Turbine-powered—total</u> .....	1,037	840	699
<u>Four engine—total</u> .....	726	669	626
<u>Turbojet—total</u> .....	511	456	412
B-707 .....	191	160	136
B-720 .....	121	112	104
CV-990 .....	18	19	19
CV-880 .....	47	48	46
DC-8 .....	134	117	107
<u>Turboprop, total</u> .....	215	213	214
L-188, 188A .....	126	126	126
V-745 .....	48	48	49
V-810/812 .....	11	11	11
Argosy .....	6	7	7
CL-44 .....	24	21	21
<u>Three engine—total</u> .....	173	88	—
B-727 .....	173	88	—
<u>Twin engine—total</u> .....	130	79	71
<u>Turbojet, total</u> .....	41	20	20
Caravelle .....	20	20	20
BAC-111 .....	17	—	—
DC-9 .....	4	—	—
<u>Turboprop, total</u> .....	89	59	51
CV-340T .....	18	4	—
CV-240T .....	2	—	—
F-27 .....	63	54	50
G-159 .....	1	1	1
NO-262 .....	5	—	—
<u>Single engine—</u>			
<u>Turboprop, total</u> .....	8	4	2
PC-6A .....	4	4	2
PC-6B .....	4	—	—

(Continued on next page)

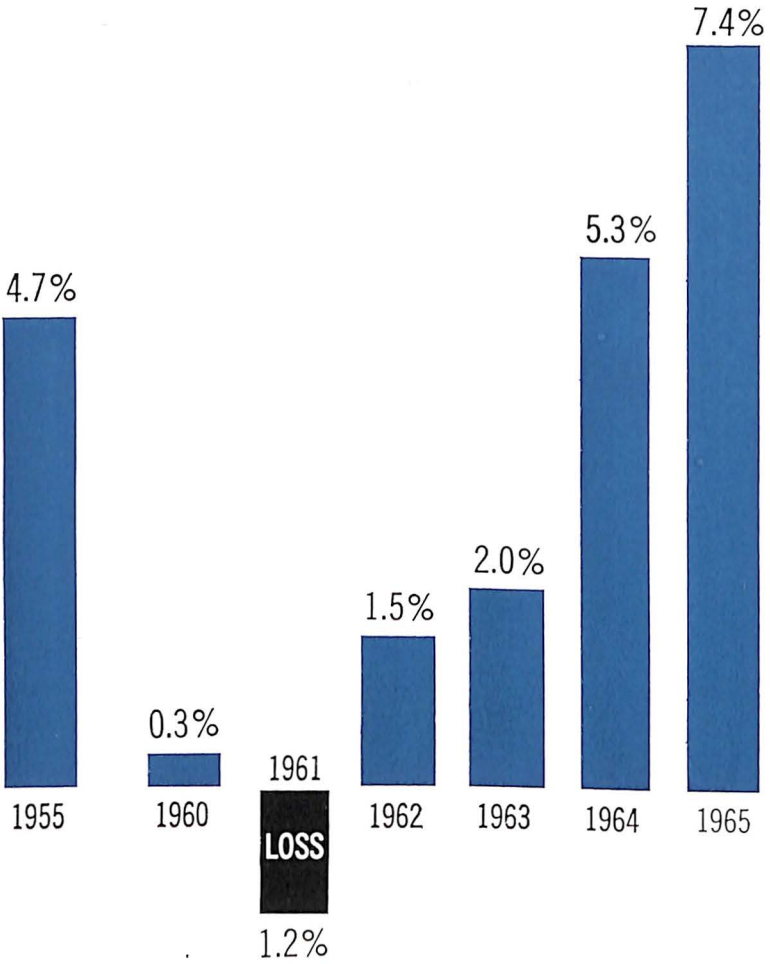
AIR TRANSPORTATION

COMPOSITION OF U. S. AIR LINE FLEET, BY TYPE OF AIRCRAFT, NUMBER OF ENGINES AND MODEL: JANUARY 1, 1965, 1964, AND 1963—*Continued*  
(Number of Aircraft)

Type of Aircraft, Number of Engines, and Model	January 1, 1966	January 1, 1965	January 1, 1964
<u>Piston-powered—total</u> .....	1,067	1,221	1,360
<u>Four engine—total</u> .....	447	563	645
B-377 .....	1	1	1
DC-4 .....	9	22	24
DC-6 .....	210	234	249
DC-7 .....	92	132	173
L-049/149 .....	8	7	13
L-749 .....	38	43	46
L-1049 .....	82	101	109
L-1649 .....	7	23	30
<u>Twin engine—total</u> .....	590	620	662
AC-680E .....	1	1	1
CV-28-5ACF .....	4	3	4
CV-240 .....	56	51	49
CV-340/440 .....	146	154	154
BE-D18, E18, G18 .....	2	—	—
CT-50 .....	—	—	1
C-46, 20T .....	82	88	99
DC-2 .....	1	1	1
DC-3, 3A .....	176	204	247
F-C82 .....	2	1	—
G-21, 21A .....	22	20	20
G-44A .....	6	5	4
G-SA16 .....	2	2	2
G-73 .....	2	2	—
L-12 .....	1	—	—
M-202A .....	15	17	16
M-404 .....	72	71	64
<u>Single engine—total</u> .....	30	38	53
<u>Total rotary-wing</u> .....	21	20	20
<u>Turbine-powered—total</u> .....	15	13	12
S-61 .....	7	6	4
S-62 .....	1	3	4
V-107 II .....	7	4	4
<u>Piston-powered—total</u> .....	6	7	8
B-47 .....	—	—	1
S-51 .....	—	1	1
S-55 .....	2	2	2
S-55C .....	4	4	4

Source: Federal Aviation Agency. "U.S. Civil Air Carrier Fleet" (Annually).

THE AIRLINE INDUSTRY:  
NET PROFIT AFTER TAXES (as a Per Cent of Sales)



NOTE: Figures show net profit as a per cent of total operating revenue of U.S. scheduled airlines.

Source: Air Transport Association.

INTERCITY PASSENGER TRAFFIC BY  
AIR CARRIER, RAILROAD, BUS AND AUTOMOBILE  
Selected Years, 1916 to Date

	TOTAL	Domestic Air Carriers	Railroads <sup>a</sup>	Buses	Automobiles
<i>Billions of Passenger-Miles</i>					
1916	N.A.	<sup>b</sup>	35.2	<sup>b</sup>	N.A.
1939	269.7	.7	22.7	9.5	236.8
1941	308.7	1.4	29.4	13.6	264.3
1944	276.6	2.2	95.7	27.4	151.3
1948	364.1	6.0	46.0	24.7	287.4
1951	531.1	10.6	35.3	27.4	457.8
1954	620.6	16.8	29.4	25.6	548.8
1955	659.7	19.9	28.5	25.5	585.8
1956	693.5	22.4	28.2	25.2	617.7
1957	718.0	25.4	26.3	21.5	644.8
1958	699.0	25.4	23.3	20.8	629.5
1959	731.2	29.3	22.1	20.4	659.4
1960	752.4	30.6	21.3	19.9	680.6
1961	762.9	31.1	20.3	19.7	692.0
1962	794.4	33.6	19.8	21.3	719.7
1963	819.9	38.5	18.5	21.9	741.0
1964	848.0 <sup>B</sup>	44.1	18.2	22.7 <sup>B</sup>	763.0 <sup>B</sup>
1965	878.4 <sup>B</sup>	51.9	17.4 <sup>B</sup>	23.1 <sup>B</sup>	786.0 <sup>B</sup>
<i>Per Cent</i>					
1916	100.0	<sup>b</sup>	N.A.	<sup>b</sup>	N.A.
1939	100.0	0.3	8.4	3.5	87.8
1941	100.0	0.5	9.5	4.4	85.6
1944	100.0	0.8	34.6	9.9	54.7
1948	100.0	1.7	12.6	6.8	78.9
1951	100.0	2.0	6.6	5.2	86.2
1954	100.0	2.7	4.8	4.1	88.4
1955	100.0	3.0	4.3	3.9	88.8
1956	100.0	3.2	4.1	3.6	89.1
1957	100.0	3.5	3.7	3.0	89.8
1958	100.0	3.6	3.3	3.0	90.1
1959	100.0	4.0	3.0	2.8	90.2
1960	100.0	4.1	2.8	2.6	90.5
1961	100.0	4.1	2.6	2.6	90.7
1962	100.0	4.2	2.7	2.7	90.6
1963	100.0	4.7	2.3	2.6	90.4
1964	100.0	5.2	2.2	2.7	89.9
1965	100.0	5.9	2.0	2.6	89.5

N.A.—Not available.

<sup>B</sup> Estimate.

<sup>a</sup> Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.

<sup>b</sup> Negligible.

Sources: Aerospace Industries Association.

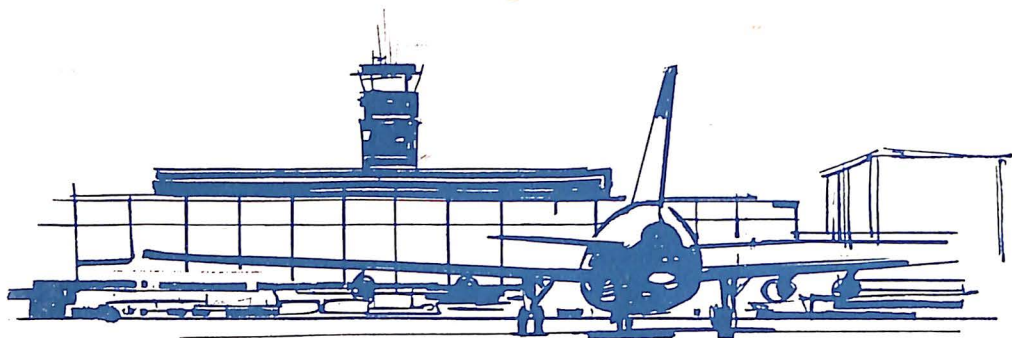
Automobile Manufacturers Association, "Automobile Facts and Figures" (Annually).

Civil Aeronautics Board.

Interstate Commerce Commission.

National Association of Motor Bus Operators.

AEROSPACE FACTS AND FIGURES, 1966



U. S. DOMESTIC AND INTERNATIONAL AIRLINE PASSENGER SERVICE  
Selected Calendar Years, 1926 to Date

Year Ending Dec 31	Domestic		International	
	Passengers Carried (Thousands)	Revenue Passenger- Miles Flown (Millions)	Passengers Carried (Thousands)	Revenue Passenger- Miles Flown (Millions)
1926	6	1.3	N.A.	N.A.
1930	385	85.1	33	7.8
1935	679	281.2	111	46.7
1940	2,803	1,052.2	163	99.8
1945	6,541	3,360.3	511	450.1
1950	17,468	8,029.1	1,752	2,214.0
1951	22,711	10,589.7	2,140	2,613.8
1952	25,176	12,559.3	2,391	3,065.0
1953	28,901	14,793.9	2,745	3,450.8
1954	32,529	16,802.4	2,919	3,810.4
1955	38,221	19,852.1	3,488	3,398.9
1956	41,937	22,398.6	4,068	5,226.2
1957	45,162	25,378.8	4,259	5,882.0
1958	44,741	25,375.5	4,428	6,123.9
1959	51,000	29,307.6	4,999	7,064.2
1960	52,377	30,556.6	5,499	8,306.2
1961	52,712	31,062.3	5,699	8,768.5
1962	55,950	33,623.0	6,598	10,138.0
1963	63,925	38,456.6	7,513	11,905.4
1964	72,988	44,141.3	8,775	14,352.4
1965	84,467	51,887.5	10,195	16,789.0

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

N.A.—Not available.

Source: Civil Aeronautics Board.

AIR TRANSPORTATION

U. S. DOMESTIC AIRLINES  
 TOTAL ASSETS AND NET INVESTMENT IN FLIGHT EQUIPMENT  
 (Dollar Figures in Millions)  
 1958 to Date

As of June 30	Total Assets <sup>a</sup>	Flight Equip- ment (Net-after depreciation)	Per Cent of Total Assets in Flight Equipment
1958	\$1,182	\$ 852	72.1%
1959	1,494	1,048	70.1
1960	1,760	1,374	78.1
1961	2,099	1,734	82.6
1962	2,273	1,874	82.4
1963	2,211	1,818	82.2
1964	2,415	2,029	84.0
1965	2,816	2,391	84.9

<sup>a</sup> Comprises net investment in buildings and ground equipment, flight equipment, working capital, etc.

NOTE: Excludes helicopter airlines.

Sources:

Civil Aeronautics Board 1964, "Annual Report."

Civil Aeronautics Board, Research and Statistics Section.

AIR TRANSPORTATION

U. S. DOMESTIC AIRLINES, VALUE OF FLIGHT EQUIPMENT<sup>a</sup>  
 1958 to Date  
 (Millions of Dollars)

As of June 30	Total Gross Value of Flight Equipment	Less: Depreciation	Plus: Construction Work in Process	Equals: Net Value of Flight Equipment
1958	\$1,498.5	\$ 709.8	\$ 63.4	\$ 852.1
1959	1,752.8	816.8	112.3	1,048.3
1960	2,174.3	889.6	89.5	1,374.2
1961	2,719.2	1,062.0	76.7	1,733.9
1962	3,006.0	1,183.3	51.7	1,874.4
1963	3,132.4	1,341.4	27.1	1,818.1
1964	3,382.7	1,401.6	48.4	2,029.5
1965	3,843.5	1,504.7	51.7	2,390.5

<sup>a</sup> Excludes helicopters.

Source: Civil Aeronautics Board.

AEROSPACE FACTS AND FIGURES, 1966

TOTAL ORDERS FOR JET AIRCRAFT FROM U. S. MANUFACTURERS  
FOR DOMESTIC AND FOREIGN DELIVERY

As of December 31, 1965  
Airline- and Executive-Type, Fixed Wing

	TOTAL For Delivery in 1966 or Later	For Delivery During		
		1966	1967	1968 or Later
<b>TOTAL</b>				
Number of aircraft . .	1,238 <sup>a</sup>	618	468	152
Value-million dollars .	\$3,958.1	\$1,906.2	\$1,516.7	\$535.2
<b>TRANSPORTS</b>				
Number of aircraft . .	809 <sup>a</sup>	376	290	143
Value-million dollars .	\$3,672.3	\$1,758.1	\$1,397.6	\$516.6
<b>EXECUTIVE TYPE</b>				
Number of aircraft . .	429	242	178	9
Value-million dollars .	\$285.8	\$148.1	\$119.1	\$18.6
<b>NUMBER OF TRANSPORT AIRCRAFT</b>				
<b>Boeing</b>				
B-707 . . . . .	132	71	54	7
B-720 . . . . .	6	6	—	—
B-727 . . . . .	215	132	67	16
B-737 . . . . .	96	—	3	93
<b>Douglas</b>				
DC-8 . . . . .	77	36	40	1
DC-9 . . . . .	235	98	111	26
<b>Fairechild Hiller</b>				
F-27 . . . . .	3	3	—	—
FH-227 . . . . .	45	30	15	—

<sup>a</sup> An additional order for 25 Boeing 747's was placed in April, 1966.

AIR TRANSPORTATION



ORDERS FOR JET TRANSPORTS FROM U. S. MANUFACTURERS  
FOR FOREIGN DELIVERY  
As of December 31, 1965  
Airline Type, Fixed Wing

	TOTAL	For Delivery During		
		1966	1967	1968 or Later
<b>TOTAL</b>				
Number of transport aircraft .....	212	80	72	60
Value-million dollars .	\$985.7	\$419.1	\$369.8	\$196.8
<b>NUMBER OF TRANSPORT AIRCRAFT</b>				
<b>Boeing</b>				
B-707 .....	28	21	7	—
B-727 .....	22	17	5	—
B-737 .....	36	—	—	36
<b>Douglas</b>				
DC-8 .....	37	15	22	—
DC-9 .....	89	27	38	24

Source: Aerospace Industries Association, reports from member companies.



# GENERAL AVIATION



During 1965, the individual use of airplanes continued to be the most rapidly growing segment of air transportation. General aviation is all flying except that of the military and the scheduled airlines. It encompasses the use of airplanes for such diverse purposes as agricultural spraying, pleasure travel, air taxi and cargo transportation, business travel and aerial patrol.

The industry produced 11,852 airplanes during 1965 for this wide range of uses. Retail value of these airplanes is estimated at \$422 million. This was the biggest year in the history of the industry. Production included 9,873 single-engine and 1,979 twin-engine models. While all categories of production showed increases, the biggest numerical growth was at the top and bottom of the model line. This indicated a healthy industry trend with high capital investment by business firms for their own air transportation vehicles and substantial increases in the purchase and utilization of trainer/pleasure models.

Substantiating the latter was the issuance of student pilot licenses by the Federal Aviation Agency. During the calendar year, the FAA issued 94,635 new student licenses, an increase of 12 percent over the previous year. The number of eligible airplanes totaled more than 95,000 at year's end. General aviation airplanes accounted for more than seven out of ten takeoffs and landings at the 292 airports where traffic control towers are maintained. More than 26 million movements were recorded for general aviation airplanes at these airports. This averages a landing

AIR TRANSPORTATION

or takeoff every one and one-fifth seconds, day and night, every day of the year and does not take into account the flights at the more than 9,000 other airports where no traffic control tower is maintained.

The capabilities of general aviation airplanes and pilots to meet air transportation requirements are demonstrated by the growth of flights under instrument flight rules (IFR). The number of such flights by general aviation airplanes increased 34 percent in 1965 over 1964.

This capability to fly safely even under adverse weather conditions is one of the factors in the surging growth of general aviation.

ELIGIBLE CIVIL AIRCRAFT BY TYPE AND CIVIL AIRPORTS  
Calendar Years 1954 to Date

Year Jan. 1	Active Civil Aircraft								Air- ports on Record with FAA	
	TOTAL	Total Air Car- rier <sup>a</sup>	General Aviation Aircraft					Rotor- craft <sup>b</sup>		Other <sup>c</sup>
			TOTAL	Fixed-Wing Aircraft		Rotor- craft <sup>b</sup>	Other <sup>c</sup>			
				Multi- engine	Single-Engine					
				4-place & over	3-place & less					
1954	55,505	1,615	53,890	N.A.	N.A.	N.A.	N.A.	N.A.	6,760	
1955	58,994	1,606	57,388	2,600	17,078	37,278	235	197	6,977	
1956	60,432	1,642	58,790	3,342	19,240	35,654	283	271	6,839	
1957	64,638	1,802	62,886	4,183	22,805	35,291	350	257	7,028	
1958	67,153	1,864	65,289	5,036	23,751	35,809	433	260	6,412	
1959	69,718	1,879	67,839	5,416	26,170	35,440	521	292	6,018	
1960 <sup>d</sup>	70,747	2,020	68,727	6,034	27,301	34,543	525	324	6,426	
1961	78,760	2,211	76,549	7,243	34,829	33,472	634	371	6,881	
1962	82,853	2,221	80,632	8,401	38,206	32,800	798	427	7,715	
1963	86,287	2,166	84,121	9,186	41,120	32,341	967	507	8,084	
1964	87,267	2,179	85,088	9,695	42,657	30,977	1,171	588	8,814	
1965	90,935	2,193	88,742	10,644	45,777	30,367	1,306	648	9,490	
1966	97,743	2,295	95,448	11,874	N.A.	N.A.	1,492	N.A.	9,566	

N.A.—Not available.

<sup>a</sup> Registered, not necessarily in operation. Includes helicopters.

<sup>b</sup> Includes autogiros; excludes air carrier helicopters.

<sup>c</sup> Includes gliders, dirigibles, and balloons.

<sup>d</sup> Excludes approximately 4,000 unclassified active aircraft.

Source: Federal Aviation Agency, "U. S. Active Civil Aircraft by State and County."

AEROSPACE FACTS AND FIGURES, 1966

GENERAL AVIATION, HOURS, AND MILES FLOWN, BY TYPE OF FLYING  
Calendar Years 1931 to Date

Year Ending De- cem- ber 31	Total	Business		Commercial		Instructional		Personal		Other	
		Units	Per- cent	Units	Per- cent	Units	Per- cent	Units	Per- cent	Units	Per- cent
<b>ESTIMATED HOURS FLOWN, Thousands</b>											
1931	1,083	152	14	281	26	307	28	343	32	—	—
1936	1,059	122	12	245	23	380	36	312	29	—	—
1941	4,460	250	6	511	11	2,816	63	883	20	—	—
1946	9,788	1,068	11	943	10	5,996	61	1,686	17	95	1
1950 <sup>b</sup>	9,650	2,750	28	1,500	16	3,000	31	2,300	24	100	1
1951	8,451	2,950	35	1,584	19	1,902	23	1,880	22	135	1
1952	8,186	3,124	38	1,727	21	1,503	18	1,629	20	203	3
1953	8,527	3,626	42	1,649	19	1,248	15	1,846	22	158	2
1954	8,963	3,875	43	1,829	20	1,292	15	1,920	22	47	<sup>a</sup>
1955 <sup>b</sup>	9,500	4,300	45	1,950	21	1,275	13	1,975	21	—	—
1956 <sup>b</sup>	10,200	4,600	45	2,000	20	1,500	15	2,100	20	—	—
1957	10,938	4,864	45	2,013	18	1,864	17	2,109	19	88	1
1958 <sup>c</sup>	12,579	5,699	45	2,365	19	2,150	17	2,109	18	—	—
1959 <sup>c</sup>	12,903	5,699	44	2,365	18	2,043	16	2,796	22	—	—
1960 <sup>c</sup>	13,121	5,699	44	2,365	18	1,828	14	3,172	24	57	<sup>a</sup>
1961 <sup>c</sup>	13,602	5,699	42	2,634	19	1,796	13	3,398	25	75	1
1962 <sup>c</sup>	14,500	5,431	38	3,051	21	2,385	16	3,489	24	144	1
1963 <sup>c</sup>	15,106	5,740	38	3,172	21	2,417	16	3,626	24	151	1
1964 <sup>c</sup>	15,738	5,823	37	3,305	21	2,675	17	3,777	24	156	1
<b>ESTIMATED MILES FLOWN, Thousands</b>											
1931	94,343	13,391	14	26,489	28	25,323	27	29,140	31	—	—
1936	93,320	11,789	13	24,608	26	30,375	33	26,548	28	—	—
1941	346,303	27,439	8	51,082	15	197,128	57	70,654	20	—	—
1946	874,740	121,530	14	107,935	12	478,825	55	156,555	18	9,795	1
1950	1,061,500	339,700	32	180,500	17	286,600	27	244,100	23	10,600	1
1951	975,480	379,845	39	190,480	20	190,195	19	200,265	21	14,695	1
1952	972,055	419,705	43	217,865	22	144,035	15	165,795	17	24,655	3
1953	1,045,346	499,166	48	209,937	20	120,700	11	196,174	19	19,369	2
1954	1,119,295	552,610	49	226,240	20	124,290	11	209,980	19	6,175	1
1955	1,216,000	627,800	52	245,700	20	120,650	10	221,850	18	—	—
1956	1,315,000	672,000	51	247,000	19	158,000	12	238,000	18	—	—
1957	1,426,285	720,800	51	249,400	17	202,375	14	240,950	17	12,760	1
1958 <sup>c</sup>	1,660,109	846,656	51	298,820	18	232,415	14	282,218	17	—	—
1959 <sup>c</sup>	1,716,019	858,010	50	291,723	17	223,082	13	343,204	20	—	—
1960 <sup>c</sup>	1,768,704	880,550	50	299,387	17	193,721	11	387,442	22	7,604	<sup>a</sup>
1961 <sup>c</sup>	1,857,946	887,671	48	332,876	18	203,425	11	425,342	23	8,632	<sup>a</sup>
1962 <sup>c</sup>	1,964,586	934,659	48	366,511	18	256,043	13	387,639	20	19,734	1
1963 <sup>c</sup>	2,048,574	983,315	48	368,743	18	266,315	13	409,715	20	20,486	1
1964	2,180,818	1,046,792	48	392,547	18	283,506	13	436,164	20	21,809	1

N.A.—Not available.

<sup>a</sup> Less than .05 per cent.

<sup>b</sup> Estimated. No survey was conducted covering the designated year.

<sup>c</sup> Data have been revised using a correction factor based on the 1962 survey of aircraft used in general aviation. 1963 data are based on hours and use reported on aircraft inspection reports using same factor.

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

## AIR TRANSPORTATION

### AIRCRAFT OPERATIONS AT FAA AIRPORT AIR TRAFFIC CONTROL TOWERS Selected Calendar Years, 1950 to Date (Numbers in Millions)

Year Ending Decem- ber 31	TOTAL		General Aviation		Air Carriers		Military	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
1950	16.0	100.0	9.6	60.0	4.0	25.0	2.4	15.0
1955	19.5	100.0	8.5	43.6	6.0	30.8	5.0	25.6
1956	22.0	100.0	10.0	45.5	6.5	29.5	5.5	25.0
1957	25.1	100.0	12.1	48.2	7.1	28.3	5.9	23.5
1958	26.6	100.0	14.0	52.6	7.0	26.3	5.6	21.1
1959	26.9	100.0	15.0	55.8	7.4	27.5	4.5	16.7
1960	25.8	100.0	14.8	57.4	7.2	27.9	3.8	14.7
1961	26.3	100.0	15.5	59.1	7.0	26.5	3.8	14.4
1962	28.2	100.0	17.4	61.7	7.1	25.2	3.7	13.1
1963	31.0	100.0	19.9	64.2	7.4	23.9	3.7	11.9
1964	34.2	100.0	23.0	67.3	7.5	21.9	3.7	10.8
1965	37.9	100.0	26.6	70.2	7.8	20.6	3.5	9.2

NOTE: Aircraft operations are all aircraft arrivals and departures, including both instrument flights and visual flights.

Source: Federal Aviation Agency, Office of Management Services.

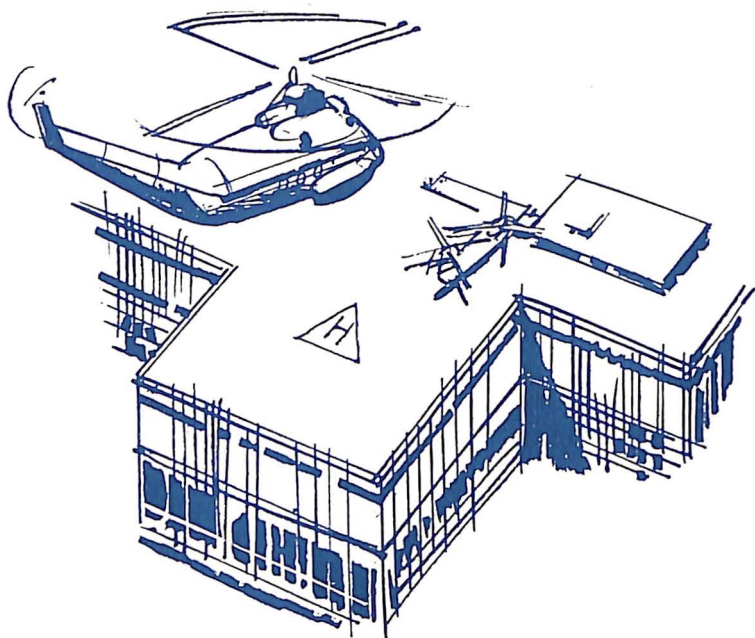
### ACTIVE AIRMAN CERTIFICATES HELD 1955 to Date

Year as of Jan. 1	Pilots						Non- pilots	Other
	TOTAL	Stu- dents	Private	Com- mercial	Airline	Other		
1955	349,729	71,969	184,595	80,346	12,129	690	140,199	64,263
1956	298,076	80,494	132,525	72,957	11,774	326	148,335	71,307
1957	259,567	96,124	96,864	54,545	11,173	861	155,121	62,927
1958	309,212	98,498	124,799	70,813	13,964	1,138	149,274	74,682
1959	354,365	103,456	140,573	93,126	15,840	1,370	157,424	88,079
1960	359,875	107,815	139,804	93,815	16,950	1,491	167,074	91,259
1961	348,062	99,182	138,869	89,904	18,279	1,828	169,598	94,723
1962	352,860 <sup>B</sup>	93,973	144,312 <sup>B</sup>	92,976 <sup>B</sup>	19,155 <sup>B</sup>	2,444 <sup>B</sup>	175,287 <sup>B</sup>	98,257 <sup>B</sup>
1963	365,971	95,870	149,755	96,047	20,032	4,267	181,982	101,793
1964	378,700	105,298	152,209	96,341	20,269	4,583	186,304	83,800
1965	440,239	120,743	175,574	117,626	21,572	4,724	195,396	116,600

<sup>B</sup> Estimate.

Source: Federal Aviation Agency, Office of Management Services.

## VERTICAL LIFT AIRCRAFT



Twelve of the fifteen member companies of the Vertical Lift Aircraft Council report 87 models in operation, production, development and research. Of these, 64 models are in operation and production, ranging in size from 1 place to 72 places, and 23 models are in research and development. These include tilt-propeller, the tilt-wing and flap, and fan-type VTOL aircraft such as the fan-in-wing, lift fan, tilt-duct, ducted fan, stowed and stopped rotor designs being developed for the military.

Notable during 1965 was the active interest and support of the larger trunk airlines in the operation of the scheduled helicopter airlines. The three scheduled helicopter carriers—Los Angeles Airways, Inc., San Francisco-Oakland Helicopter Airlines, Inc. and New York Airways, Inc.—reported resulting increased passenger loads. Chicago Helicopter Airways cancelled scheduled service, pending the predicted re-opening of Chicago's Midway Airport.

There is a continuing increase in the use of helicopters by corporations as executive transports, in agriculture as aerial applicators and as a building tool for construction. The traffic copter, more and more an accepted public service, is now operated in 22 cities across the country. Philadelphia's "Go Patrol" is an outstanding example. Its two helicopters, with four supporting emergency equipped squad cars, are used in radio broadcasts.

## AIR TRANSPORTATION

Recognition of the helicopter's multi-mission capabilities was made with the formation of the Army's First Cavalry (Airmobile) Division, now engaged in Vietnam operations. The division, trained and equipped to be completely air transportable, has established the armed helicopter as a prime army weapon.

The Marine Corps in Vietnam used helicopters as close support vehicles, performing the Marine's concept of vertical envelopment. In the Navy, helicopters are carrier based, for standby sea rescue and to transport personnel and supplies.

Air Force helicopters demonstrate the rotary-wing unique fire-fighting capability. In addition, both Air Force and Coast Guard helicopters continue to perform their proven rescue role.

### HELICOPTER SCHEDULED AIRLINES Available Service and Utilization Calendar Years 1952 to Date (In Thousands)

Year Ending Dec 31	Passengers Carried	Revenue Ton-Miles Flown	Revenue Passenger- Miles Flown	Revenue Plane-Miles Flown
1952	—	75	—	632
1953	1	127	26	1,007
1954	8	151	183	1,074
1955	29	193	628	1,152
1956	64	281	1,585	1,318
1957	153	449	3,275	1,604
1958	230	594	4,885	1,675
1959	366	856	7,477	1,899
1960	490	1,054	9,475	2,219
1961	430	963	8,604	2,157
1962	359	897	8,192	1,518
1963	458	1,317	12,510	1,462
1964	608	1,668	16,003	1,976
1965	718	1,948	18,811	1,984

Source: Civil Aeronautics Board.

AEROSPACE FACTS AND FIGURES, 1966

HELICOPTER SCHEDULED AIRLINES  
Revenue Ton-Mile Traffic Carried  
Calendar Years 1952 to Date  
(In Thousands)

Year Ending Dec 31	TOTAL TON-MILES	Passenger	U. S. Mail	Express	Freight	Excess Baggage
1952	75	—	75	—	—	—
1953	127	2	125	—	2	—
1954	151	18	116	13	4	—
1955	193	59	97	32	5	—
1956	281	146	91	36	7	1
1957	449	314	91	34	7	3
1958	594	468	84	33	6	3
1959	856	717	87	41	7	4
1960	1,054	911	91	40	7	5
1961	963	818	94	40	7	5
1962	897	778	65	44	6	3
1963	1,317	1,189	74	44	6	5
1964	1,668	1,520	92	45	6	6
1965	1,948	1,787	84	60	10	6

Source: Civil Aeronautics Board.

HELICOPTER PILOTS  
As of 1 January 1965

Type	TOTAL	Helicopter Only	Helicopter and Airplane	Other
TOTAL .....	9,542	1,055	8,305	182
Private .....	527	143	367	17
Commercial .....	8,743	767	7,811	165
Airline Trans- port Rating ...	272	145	127	—

Source: Federal Aviation Agency, Statistical Department.

AIR TRANSPORTATION

CIVIL AIRPORTS AND HELIPORTS  
Selected Years, 1927 to Date

Year As of January 1	Civil Airports	Civil Heliports <sup>a</sup>
1927	1,036	—
1930	1,782	—
1940	2,331	—
1950	6,484	—
1960	6,426	—
1961	6,881	327
1962	7,715	487
1963	8,084	720
1964	8,814	797
1965	9,490	1,000
1966	9,566	N.A.

<sup>a</sup> Includes United States, Canada and Puerto Rico.

Sources: Civil Airports: Federal Aviation Agency, "FAA Statistical Handbook of Aviation" (Annually).

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

CIVIL HELICOPTER OPERATORS AND HELICOPTERS OPERATED  
1960 to Date

Year as of February 1	TOTAL Number	Users		
		Commercial	Companies and Executives	Government Agencies <sup>a</sup>
<b>CIVIL HELICOPTER OPERATORS</b>				
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
<b>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

NOTE: Includes United States and Canada.

<sup>a</sup> Federal, state and local governments.

Source: Aerospace Industries Association, company reports.



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## EXPLANATION OF TERMS AND ABBREVIATIONS

- Accessions:** new hires and rehires by industrial employer. Cumulated for a calendar month or year and expressed as a rate per 100 employees on the payroll.
- Aerospace Industry:** the industry primarily engaged in the manufacture of aircraft, guided missiles, spacecraft—i.e., all air and space vehicles.
- AIA:** Aerospace Industries Association, formerly Aircraft Industries Association.
- Air Carriers:** see Airlines
- 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. Part 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:** the commercial system of air transportation. Consists of scheduled domestic and (US) international air carriers, supplemental and other carriers.
- Airplane:** see Aircraft.
- Appropriation (Federal Budget):** an act of Congress authorizing an agency to incur obligations and make payments out of funds held by the Treasury.
- Astronautics:** the art and science of designing, building and operating manned or unmanned objects through space. Part of the aerospace industry.
- Backlog:** the sales value of orders accepted (supported by legal documents) that have not yet passed through the sales account.
- Ballistic Missile:** a missile which becomes a free-falling body in the latter stages of its flight through the atmosphere.
- Booster:** a propelling device used to add power to a vehicle in flight.
- Decayed Objects:** spacecraft and components which have been destroyed by friction burning on re-entry into the atmosphere, including unprotected spacecraft returning from orbit and launch vehicle components dropping earthward after attaining high velocities.
- Development:** the process or activity of working out a basic design, idea, or piece of military equipment (see also Research).
- DOD:** Department of Defense.
- Drone:** A pilotless aircraft remotely controlled.
- Earnings:** see Net Income.
- Evaluation:** determination of technical suitability of material, equipment or a system.
- Expenditures (Federal Budget):** payments by cash or check from the Treasury to liquidate obligations. When expenditure totals are reported, refunds, etc., are excluded.

## EXPLANATION OF TERMS

**FAA:** Federal Aviation Agency.

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

**Fiscal Year (Federal Budget):** from July 1, to June 30; e.g., the 1965 fiscal year begins on July 1, 1964, and ends June 30, 1965; abbreviated FY.

**Funding:** setting aside funds for a particular purpose.

**FY:** see Fiscal Year.

**General Aviation:** Non-military flying, excluding that of airlines, such as business, instruction and pleasure.

**Guided Missile (official definitions differ):** as used in this volume, an unmanned vehicle moving above the surface of the Earth whose trajectory or flight path to target is capable of being altered by a mechanism. The guided missile industry is part of the aerospace industry.

**Hardened Base:** an area or installation specially prepared to minimize the effects of nuclear explosion.

**Hardware:** term used to designate equipment or supplies made entirely or largely of metal, such as aircraft, man-made satellites, spare parts; does not include food, clothing, and the documents resulting from research, test and evaluation. Often used to designate the finished object in the development of a device.

**Helicopter:** A heavier-than-air aircraft supported in the air by power driven rotors about one or more substantially vertical axes.

**ICBM:** Intercontinental Ballistic Missile, range more than 5000 miles.

**Jet Engine:** a reaction engine that takes in air from outside as an oxidizer to burn fuel and ejects a jet of hot gases backward to create thrust, the gases being generated by the combustion within the engine.

**Labor Turnover:** the gross movement of wage and salary workers into and out of employment in individual manufacturing establishments, cumulated for a calendar month or year and expressed as a rate per 100 employees on the payroll.

**Military Assistance:** see Mutual Security Program.

**Missiles:** see Guided Missiles, Ballistic Missiles.

**Mutual Security Program:** a program of the U.S. Government designed to maintain the 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.

**National Security Expenditures:** expenditures for military functions of the Department of Defense, military assistance, atomic energy, stockpiling and expansion of defense production.

**Net Income:** profit after depreciation, taxes and reserves for taxes, chargeoffs, other reserves, etc., but before dividends; also identified as earnings or net earnings.

**Passenger Mile:** one passenger moved one mile.

**Procurement:** the process whereby Federal Government agencies acquire material, services, and property from industry.

**Profit:** see Net Income.

## EXPLANATION OF TERMS

**R & D:** Research and Development.

**RDT&E:** Research, Development, Test and Evaluation.

**Reciprocating Engine:** an engine in which power is delivered in a back-and-forth movement of a piston or pistons.

**Research:** "Basic research" provides new knowledge and understanding. "Applied research" puts the knowledge gained in basic research to some useful purpose. Applied research is often called development.

**Rocket Engine:** an engine that ejects a jet of hot gases backward to create thrust without taking in air from outside. The gases are derived from combustion of fuels and other materials stored internally.

**Rotocraft:** 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.

**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.

**Separations:** terminations of employment. Terminations may be initiated by the employee (quits) or the employer (layoff, other separations). Both employee and employer actions are accumulated for a calendar month or year and are expressed as a rate per 100 employees on the payroll.

**STOL:** Short take-off and landing.

**Test:** an experiment designed to assess progress in attainment or accomplishment of development objectives.

**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.

**Turbine, Turbo:** a mechanical device or engine that spins in reaction to a fluid flow that passes through or over it. See Jet Engine. Frequently used in "turbo-prop" and "turbo-jet."

**U.K.:** United Kingdom.

**U.S.:** United States.

**USA:** United States Army

**USAF:** United States Air Force.

**USCG:** United States Coast Guard.

**USN:** United States Navy.

**USSR:** Union of Soviet Socialist Republics.

**Utility Aircraft:** an aircraft designed for general purpose work.

**VTOL:** vertical take-off and landing.

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