

**1965  
AEROSPACE FACTS  
AND FIGURES**

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AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

# AEROSPACE FACTS AND FIGURES · 1965

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## FOREWORD

This thirteenth annual edition of *Aerospace Facts and Figures* is designed, as in the past, as a standard reference work to provide information on the aerospace industry for the use of management in government and industry, legislators, writers and editors, analysts and students.

The aerospace industry in 1964 recorded its highest sales in history—\$20.7 billion—for aircraft, missiles, spacecraft and supporting equipment.

The most notable feature of the aerospace industry, however, is not its impressive sales. It is rather its unique capacity to manage, to bring from concept to operation, the most complicated equipment and equipment systems man has ever devised. To this end, the aerospace industry must and does work at the frontiers of the nation's technology, and these frontiers are advancing at an unprecedented rate.

The industry must vigorously exploit technological opportunities to meet the challenge of an adequate national defense, and to lead in space exploration. Added to this is the need to develop the ability to shift with changing requirements which has become a basic competitive imperative. The record of accomplishment continues to demonstrate that the industry can and does adjust rapidly and effectively to both technological advance and quantum changes.

The industry must assume responsibility for tasks in which little more is specified than the desired capability, whether it be a spacecraft to reach the moon or a commercial transport with Mach 3 speed. Further it must predict, and has done so with remarkable accuracy, the





length of time and the amount of funds required for such assignments.

The statistical measurements of this industry in 1964 are detailed in the several chapters of this book. Increases were recorded in almost every category. Production of both military and civil aircraft advanced over the previous year. The sales of commercial transports approached the high levels achieved when the airlines first started their major re-equipment program with turbine-powered aircraft.

Utility aircraft showed an increase of almost 30 per cent in net billings. Helicopter production also gained significantly; and, perhaps more worthy of note, today there are 79 different types of Vertical Take-off and Landing (VTOL) aircraft.

Aerospace exports again exceeded \$1 billion, and government plans to make U. S. financing fully competitive with that available from other countries should provide a strong stimulus to an increase of exports in the future.

Space expenditures by all government agencies increased 26 per cent, more than compensating for the decline in government expenditures for missiles.

A key indicator of future aerospace trends is the amount expended for research and development. The level of spending in this category—the starting point of all new hardware—reached nearly \$9 billion.

KARL G. HARR, JR.  
*President*  
*Aerospace Industries Association*

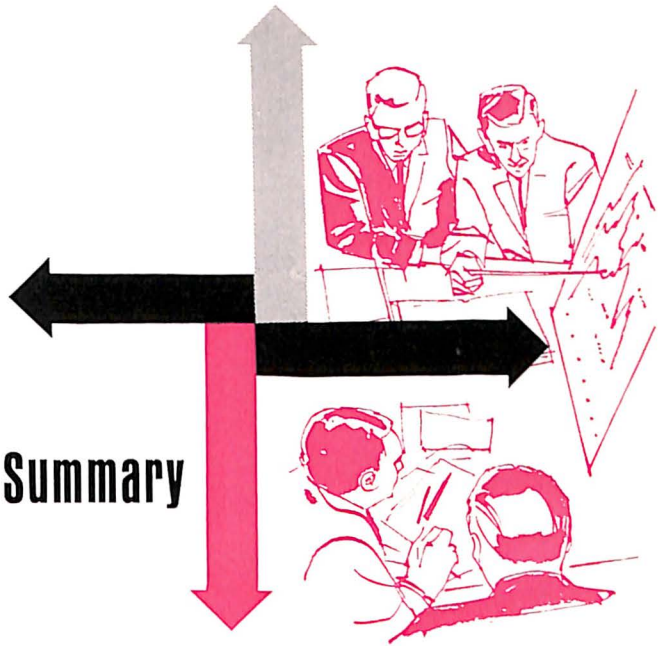


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## Aerospace Summary



A billion dollar increase in sales of space hardware, coupled with a \$250 million gain in aircraft sales, more than offset a decline in missile sales and the aerospace industry in 1964 recorded its highest sales in history—\$20.7 billion.

This compares with sales of \$20.1 billion in 1963. The breakout of sales for 1964, in round numbers, includes: aircraft, \$8.8 billion; missiles, \$5.3 billion; and space vehicles, \$4.7 billion.

Sales for 1965 are estimated at \$20.6 billion with aircraft and space vehicles increases again off-setting the anticipated decline in missile sales.

The pattern of a low rate of earnings by aerospace companies, as a percentage of sales, continued; however, a slight gain from 2.3 per cent in 1963 to 2.6 per cent was made in 1964. The earnings of all manufacturing companies averaged 5.2 per cent.

Employment in the aerospace industry declined to approximately 1,117,000 workers compared with 1,174,000 in 1963. Total employment was divided almost equally between salaried and production workers. Production workers have declined about 120,000 from a high in recent years of 673,000 in 1959. Today the aerospace industry accounts for a 6.5 per cent of all manufacturing employment.

AEROSPACE FACTS AND FIGURES, 1965

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

Year Ending Decem- ber 31	Total Gross National Product	SALES OF			AEROSPACE SALES AS PER CENT OF		
		Manufac- turing Industries	Durable Goods Industry	Aero- space Industry	GNP	Manu- factur- ing In- dustries	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

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	Contribution to GNP by		Aerospace Contribution as Per Cent of	
		Manufac- turing Industries	Aerospace Industry	GNP	Manufac- turing Industries
1960	\$502.6	\$139.7	\$ 8.9	1.8%	6.4%
1961	518.7	139.9	9.5	1.8	6.8
1962	556.2	153.5	10.6	1.9	6.9
1963	583.9	160.4	10.8	1.8	6.7
1964	628.4	173.9	11.1	1.8	6.4

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" 1964. Aerospace Industries Association estimates, based on latest available information.



## AEROSPACE SUMMARY

The aerospace payroll in 1964 amounted to more than \$8.6 billion, which is 8.3 per cent of all manufacturing payrolls.

A study by the National Science Foundation shows that there were 348,700 scientists and engineers employed by all manufacturing industries in 1964 and that the aerospace industry employed 105,900 of this total. This was 30.4 per cent of the total of all industries. Employment of aerospace scientists and engineers reached a peak in 1964, but the 1964 increase was small.

The Gross National Product in 1964 reached a high of \$628.4 billion with the aerospace industry contributing \$11.1 billion of the total. The industry's contribution was 1.8 per cent of total GNP, and 6.4 per cent of all manufacturing industries.

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	20,129	8,512	6,003	3,774	1,830
1964 <sup>E</sup>	20,716	8,760	5,311	4,761	1,883
1965 <sup>E</sup>	20,597	9,249	4,426	5,050	1,872

NOTE: Includes military and nonmilitary sales and research, development, test, and evaluation.  
<sup>E</sup> Estimate.

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

AEROSPACE FACTS AND FIGURES, 1965

In another important area of the economy—exports—the aerospace industry made an important contribution. For the seventh time in the past nine years aerospace exports exceeded \$1 billion with \$1.2 billion reported for 1964. Increases were made in such categories as commercial transports, rotary wing aircraft and general aviation aircraft.

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 <sup>a</sup>		Non- government <sup>b</sup>	
		Department of Defense	National Aeronautics and Space Adminis- tration		
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	20,129	14,191	2,614	1,485	1,830
1964 <sup>E</sup>	20,716	13,241	3,550	2,042	1,883
1965 <sup>E</sup>	20,597	11,966	3,951	2,808	1,872

<sup>E</sup> Estimate.  
<sup>a</sup> Sales of aerospace products and services to DOD and NASA are estimated to be equal to expenditures of these agencies for aerospace products and services. Data for calendar years were obtained by adding the data for the two fiscal years concerned and dividing the total by two.  
<sup>b</sup> Sales of civil aircraft, aircraft engines, and parts; includes some sales to the government.  
 Source: Aerospace Industries Association estimates, based on latest available information.

## AEROSPACE SUMMARY

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

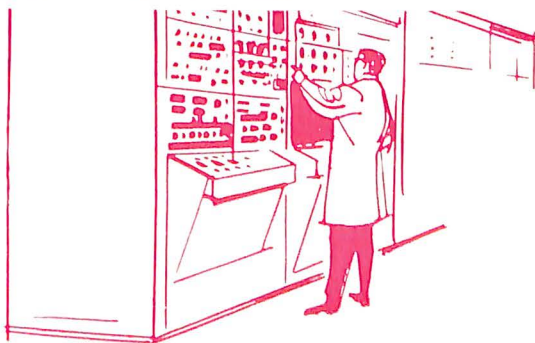
Year Ending June 30	Federal Expenditures (Millions of Dollars)				AEROSPACE as Per Cent of	
	TOTAL FEDERAL	Total, National Defense	NASA Space Activities	TOTAL AERO- SPACE PRODUCTS AND SERVICES	Total Federal	Total National Defense and NASA
1948	\$33,791	\$11,983	N.A.	\$ 891	2.6%	7.4%
1949	40,057	13,988	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	17,939	18.4	30.7
1965 <sup>E</sup>	97,481	52,160	4,900	16,654	17.1	29.2
1966 <sup>E</sup>	99,687	51,578	5,100	16,348	16.4	28.8

NOTE: "National Defense" includes the military budget of the Department of Defense and Atomic Energy Commission. Amounts from Trust Funds are not included. "Space Research" includes research and development activities and administrative operations and construction of facilities of NASA. NASA construction (at \$406 million in FY 1966) is not included in "Total aerospace products and services."

N.A.—Not available.

<sup>E</sup> Estimate.

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





AEROSPACE FACTS AND FIGURES, 1965

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

	Year Ending June 30		
	1961	1962	1963
TOTAL .....	\$44,676	\$48,205	\$49,973
Military Personnel .....	12,085	13,032	13,000
Active Forces .....	10,651	11,530	11,386
Reserve Forces .....	648	607	599
Retired Pay .....	786	894	1,015
Operation and Maintenance .....	10,611	11,594	11,874
PROCUREMENT .....	13,095	14,532	16,632
AIRCRAFT .....	5,898	6,400	6,309
MISSILES .....	2,972	3,442	3,817
Ships .....	1,801	1,906	2,522
Ordnance, Vehicles, & Related Equipment .....	675	1,137	1,665
Electronics and Communications .....	1,042	1,139	1,427
Other procurement .....	707	508	892
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION .....	6,131	6,319	6,376
AIRCRAFT .....	547	624	544
MISSILES .....	3,025	2,777	2,241
ASTRONAUTICS .....	518	749	946
Other .....	2,041	2,169	2,645
Military Construction .....	1,605	1,347	1,144
Family Housing .....	—	—	427
Civil Defense .....	—	90	203
Military Assistance .....	1,449	1,390	1,721
AIRCRAFT .....	265	206	262
MISSILES .....	154	161	183
Other .....	1,030	1,023	1,276
Other .....	(300)	(99)	(1,404)

(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		
	1964	1965 <sup>E</sup>	1966 <sup>E</sup>
TOTAL .....	\$51,245	49,300	\$49,000
Military Personnel .....	14,195	14,820	14,800
Active Forces .....	12,312	12,666	12,584
Reserve Forces .....	674	774	706
Retired Pay .....	1,209	1,380	1,510
Operation and Maintenance .....	11,932	12,220	12,160
PROCUREMENT .....	15,351	13,275	13,220
AIRCRAFT .....	6,053	5,543	5,516
MISSILES .....	3,577	2,635	2,311
Ships .....	2,078	1,818	1,948
Ordnance, Vehicles, & Related Equipment .....	1,597	1,383	1,638
Electronics and Communications .....	1,264	1,087	924
Other procurement .....	782	809	883
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION .....	7,021	6,700	6,400
AIRCRAFT .....	939	902	921
MISSILES .....	2,352	2,058	1,849
ASTRONAUTICS .....	1,284	1,140	1,057
Other .....	2,446	2,600	2,573
Military Construction .....	1,026	1,000	920
Family Housing .....	580	630	660
Civil Defense .....	107	125	110
Military Assistance .....	1,485	1,200	1,100
AIRCRAFT .....	} 218	358	397
MISSILES .....			
Other .....	1,267	842	703
Other .....	(452)	(670)	(370)

N.A.—Not available.

<sup>E</sup> Estimate.

NOTE: Data in parentheses are minus figures.

Source: Department of Defense, Reports "FAD 500, 502, 503," 25 January 1965.

## AEROSPACE FACTS AND FIGURES, 1965

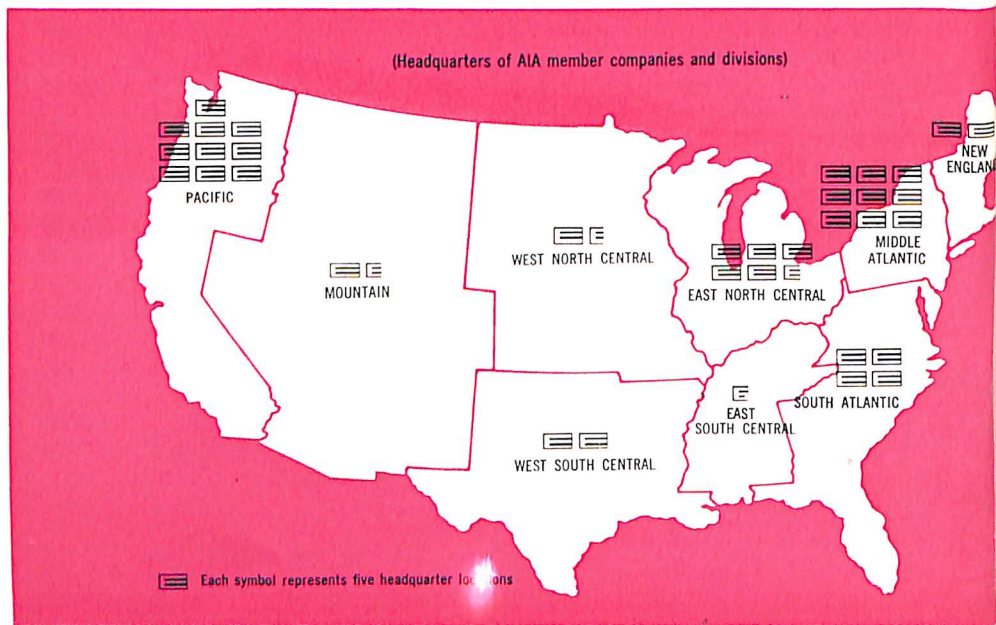
### DEPARTMENT OF DEFENSE AEROSPACE EXPENDITURES Fiscal Years 1960 to Date (Millions of Dollars)

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 <sup>b</sup>	12,636	8,178	358	4,100
1966 <sup>b</sup>	12,051	7,827	397	3,827

<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.

<sup>b</sup>Sources: Department of Defense Reports "FAD 500, 502, 503," 25 January 1965" and Department of Defense "Military Assistance Facts" annually, page 11.

### LOCATION OF AEROSPACE COMPANIES



Source: Aerospace Industries Association Membership.



ACTIVE MILITARY FORCES OF THE UNITED STATES,  
1961 to Date

	Actual, June 30, 1961	Actual, June 30, 1964	Estimated	
			June 30, 1965	June 30, 1966
Military personnel (in thousands):				
Army .....	858	972	963	953
Navy .....	627	667	674	685
Marine Corps .....	177	190	190	193
Air Force .....	820	856	829	809
Total, Department of Defense .....	2,482	2,685	2,656	2,640
Selected military forces:				
Strategic retaliatory forces:				
Intercontinental ballistic missiles (squadrons):				
Minuteman .....	—	12	16	17
Titan .....	—	12	6	6
Atlas .....	4	13	—	—
Polaris submarines .....	5	22	29	38
Strategic bombers (wings):				
B-52 .....	13	14	14	13½
B-58 .....	1	2	2	2
B-47 .....	20	10	5	—
Continental air and missile defense forces:				
Manned fighter interceptor squadrons ...	42	40	39	34
Interceptor missile squadrons (BOMARC)	7	8	6	6
Army air defense missile battalions <sup>a</sup> ...	49½	26½	23½	23½
General purpose forces:				
Army divisions (combat ready) .....	11	16	16	16
Army surface-to-surface missile battalions	42½	38	38	38
Army air defense missile battalions .....	26¾	31¾	32¾	33¾
Army special forces groups .....	3	7	7	7
Warships:				
Attack carriers .....	15	15	15	15
Antisubmarine warfare carriers .....	9	9	9	9
Nuclear attack submarines .....	13	19	23	31
Other .....	328	322	329	323
Amphibious assault ships .....	110	133	135	140
Carrier air groups (attack and ASW) ...	28	28	28	28
Marine Corps divisions/aircraft wings ...	3	3	3	3
Air Force tactical forces squadrons .....	93	112	117	119
Airlift and sealift forces:				
Airlift aircraft (squadrons):				
C-130 through C-141 .....	16	34	38	41
C-118 through C-124 .....	35	27	19	16
Troopships, cargo ships, and tankers ...	99	99	99	99
Active aircraft inventory (all programs):				
Army .....	5,564	6,338	6,899	7,624
Navy .....	8,793	8,391	8,250	8,241
Air Force .....	16,905	15,380	14,411	13,706
Commissioned ships in fleet (all programs) .	819	859	880	899

<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 FACTS AND FIGURES, 1965

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	16,327	9,072	1,096	6.7	12.1
1962	16,859	9,493	1,177	7.0	12.4
1963	17,065	9,625	1,174	6.9	12.2
1964 <sup>E</sup>	17,304	9,849	1,117	6.5	11.3

<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 Decem- ber 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- plov- 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

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 SUMMARY



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	146	826	5.5
1959	17,438	770	108	662	4.4
1960	20,349	1,330	480	850	6.5
1961	20,717	1,209	266	943	5.8
1962	21,359	1,436	255	1,181	6.7
1963	22,922	1,240	191	1,049	5.4
1963	25,987	1,212	211	1,001	4.7

<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, 1965

Total,  
Federal Expenditures  
\$97.5 billion



Total  
National Defense  
and Space  
Expenditures  
\$57.1 billion



Total,  
Procurement, and  
Research and Development  
(DOD and NASA)  
\$24.8 billion



For statistical data on which this chart is based, see Federal Expenditures for Selected Functions and for Aerospace Products and Services, Page 9.  
Department of Defense, Total Expenditures for Appropriation Group, Pages 10-11.



## AEROSPACE SUMMARY

### 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

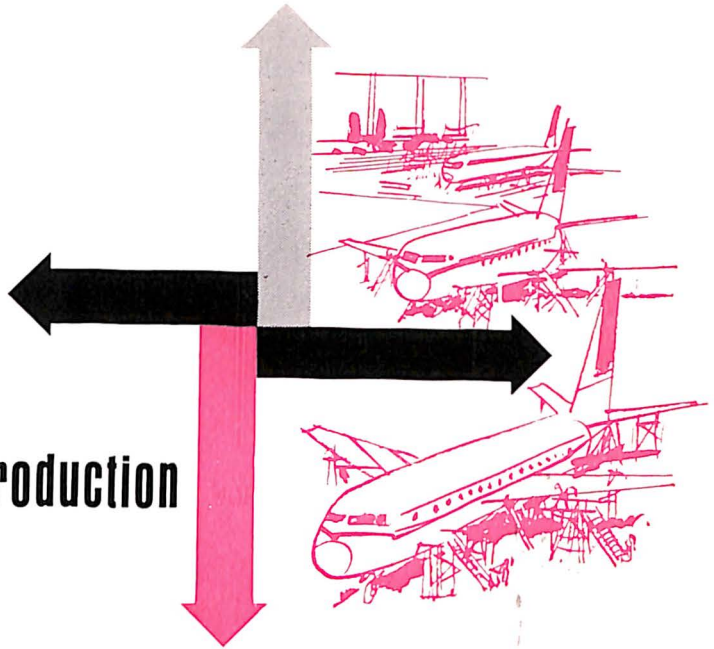
NOTE: Based on reports by 93 members of the International Air Transport Association.  
Source: International Air Transport Association.

### 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

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

## Aircraft Production



Production and sales of manned aircraft continued to dominate the total product mix of the American aerospace industry in 1964. Following a record production year in 1963 when 10,155 aircraft were produced for both military and civil purposes, the aircraft industry produced 12,053 in 1964 including 10,053 airplanes for civilian use, according to the Census Bureau and Department of Defense data.

Based on reports from 67 companies, the dollar value of aircraft deliveries in 1964 totaled more than \$6.4 billion including about \$4.6 billion to the government and \$1.9 billion to other customers.

Census Bureau data reveal that at the end of 1964 the manufacturers of aircraft engines, propellers and parts had a backlog of unfilled orders totaling \$7.8 billion, compared to \$6.7 billion in backlog a year earlier.

Of the estimated 52.9 million airframe pounds delivered by industry in 1964, the military was again estimated to have received 30 million pounds while civil users climbed from 16.1 million pounds in 1963 to 22.9 million pounds in 1964.

The aerospace industry had in development or production for the

## AIRCRAFT PRODUCTION

military services during the year a variety of aircraft including attack aircraft, cargo vehicles, fighter/reconnaissance aircraft, tankers, training planes and specialized aircraft for several different missions. Production of military helicopters climbed significantly during the year although total figures are not released by the Department of Defense. DoD did, however, release production figures for helicopters for 1962, showing 624 of these vehicles produced during that year compared to 393 in 1961.

The initiation of development of several new aircraft during 1964 was indicative of the future role of manned aircraft in the military services. The announcement of the YF-12A and SR-71 interceptor and reconnaissance aircraft was a major highlight of the year. Also, the initiation of development of the giant C-5A cargo aircraft, prototype

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

<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 67 aerospace companies.

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

AEROSPACE FACTS AND FIGURES, 1965

flights of the F-111, further development of the COIN aircraft and the new commercial jets—the Douglas DC-9 and the Boeing 737— were featured. Further study continued during the year on the supersonic transport and a variety of new vertical lift aircraft were in advanced development.

Utility aircraft production by eight AIA member companies rose during 1964, with 9,336 aircraft shipped during the year at a total manufacturers net billing price of \$198,876,000. Aircraft engine production also increased during 1964, with a total of 19,455 engines produced, including an estimated 250 reciprocal engines for the military along with 5,000 jet engines and 13,346 civilian reciprocal engines and 859 jets.

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

Year End- ing 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	b	b
1962	5,898	4,126	1,772	2,998	1,389	1,130	383	b	b
1963	5,613	4,154	1,459	2,986	1,055	1,168	404	b	b
1964	6,428	4,571	1,857	3,506	1,409	1,065	448	b	b

<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 67 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	"	"

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 67 aerospace companies.  
"Included in "Aircraft and Parts."  
Source: Bureau of the Census, "Current Industrial Reports, Series M37D" (Quarterly).



AEROSPACE FACTS AND FIGURES, 1965



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 <sup>Ⓔ</sup>	10,155	2,000	8,155
1964 <sup>Ⓔ</sup>	12,053	2,000	10,053

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

<sup>Ⓔ</sup> Estimate.

N.A.—Not available.

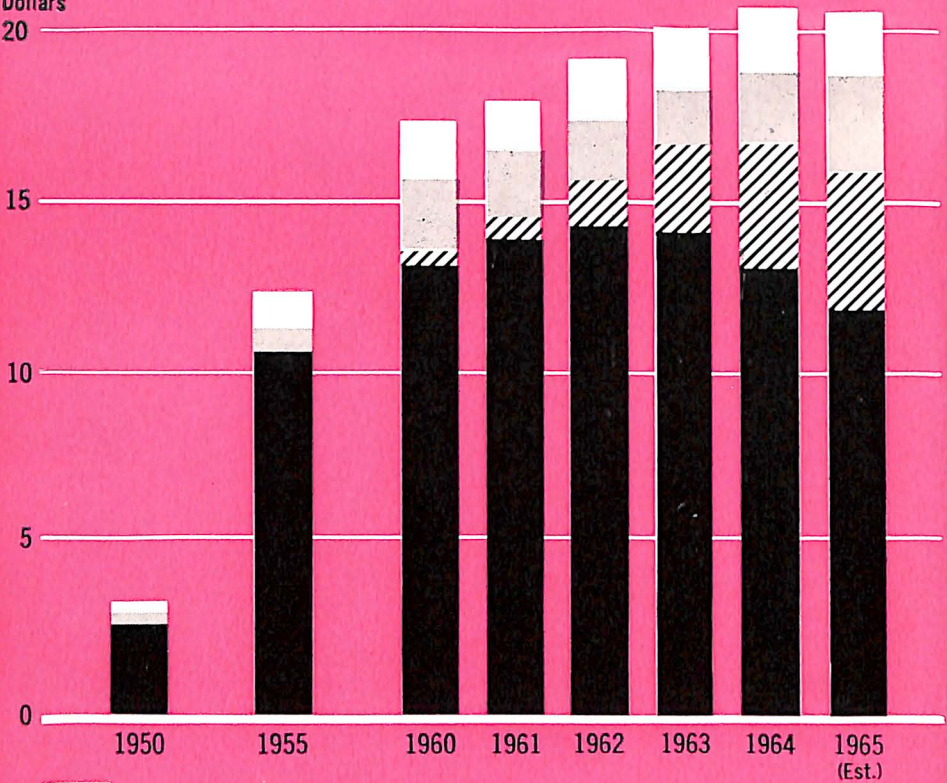
Sources: Aerospace Industries Association, "Aerospace Facts and Figures" (Annually).

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  
20



- 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 <sup>A</sup>	51.5	29.6	21.9
1962	55.8	35.6	20.2
1963	46.1 <sup>B</sup>	30.0 <sup>B</sup>	16.1
1964	52.9 <sup>B</sup>	30.0 <sup>B</sup>	22.9

<sup>B</sup> Estimate.

Sources:

Aerospace Industries Association, "Aerospace Facts and Figures" (Annually).  
Bureau of the Census, "Current Industrial Reports, Series M87G" (Monthly).  
Department of Defense.

AEROSPACE FACTS AND FIGURES, 1965

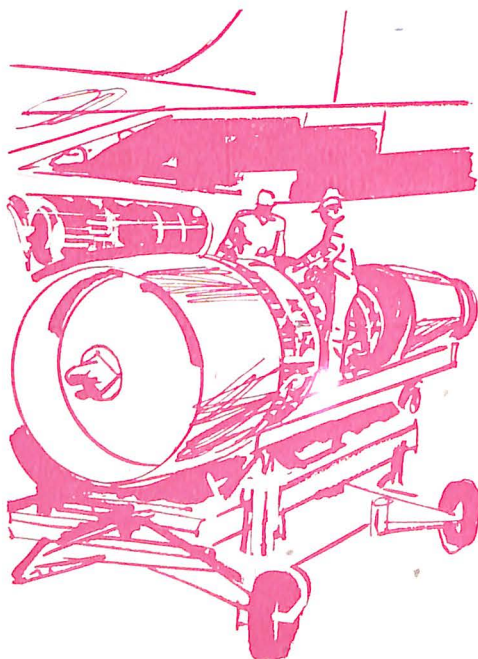
DEPARTMENT OF DEFENSE  
EXPENDITURES FOR AIRCRAFT PROCUREMENT, BY AGENCY  
Fiscal Years 1951 to Date  
(Millions of Dollars)

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 <sup>E</sup>	5,543	3,450	1,721	373
1966 <sup>E</sup>	5,516	3,220	1,950	347

N.A.—Not available.

<sup>E</sup> Estimate.

Source: Department of Defense, Reports "FAD 397, 502," 25 January 1965.



MILITARY AIRCRAFT AND DRONES IN DEVELOPMENT OR PRODUCTION, 1965  
(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 (A2F-1, 1H)	Intruder	Navy	Grumman
Recon. Attack	RA-5C (A3J-3)	Vigilante	Navy	North American
Attack	A-7A	Corsair II	Navy	Ling-Temco-Vought
<b>BOMBER</b>				
Bomber	XB-70	Valkyrie	USAF	North American
<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 (CX-HLS)	—	USAF	Unknown
Cargo	CV-7A	Caribou II	Army	DeHavilland
<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-4B/C	—	USAF	McDonnell
Fighter/Recon.	F/RF-111A/B	TFX	USAF & Navy	General Dynamics
Fighter/Int. Fighter	YF-12A	—	USAF	Lockheed
Fighter	F-5A/B	Freedom Fighter	USAF	Northrop
Fighter	F-104	Starfighter	USAF	Lockheed
<b>TRAINER</b>				
Trainer	TA-4E	Skyhawk	Navy	Douglas
Trainer	T-2B (T2J-2)	Buckeye	Navy	North American
Trainer	T-37B	—	USAF	Cessna
Trainer	T-38A	Talon	USAF	Northrop
Trainer	T-41A	—	USAF	Cessna
<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
<b>DRONE</b>				
Drone	AQM-37A (KD2B-1)	—	Navy	Beech
Drone	BQM-34A (Q-2C)	—	USAF/ Navy	Ryan
Drone	MQM-36A (KD2R-5)	—	Navy	Northrop-Ventura
Drone	MQM-42	Roadrunner	Army	North American
Drone	MQM-57A (USD-1A)	—	Army	Northrop-Ventura
Drone	QH-50C (DSN-3)	—	Navy	Gyrodyne
Drone	Type II	Firebee/ Towbee	Army	Ryan/Hayes

Source: Department of Defense.

AEROSPACE FACTS AND FIGURES, 1965

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

Year Ending Decem- ber 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
<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	2,575.0	1,054.6	385.2	199.7	228.2	54.7
1962 <sup>a</sup>	3,804.6	1,623.1	1,000.6	674.3	193.7	249.0	63.9

(Continued on next page)



## AIRCRAFT PRODUCTION

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

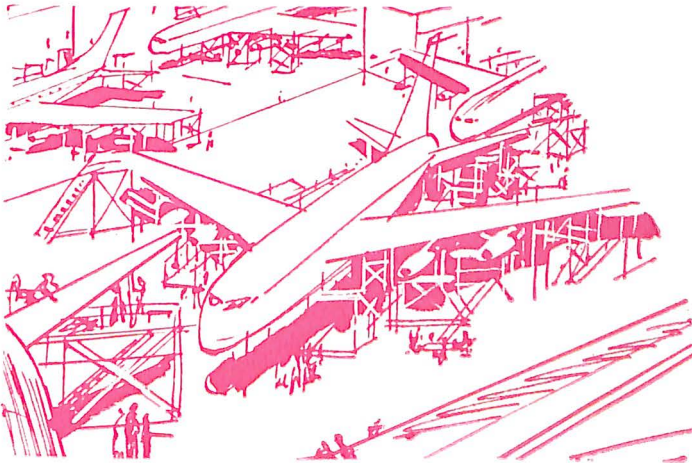
Year Ending Decem- ber 31	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Trans- port	Trainer	Heli- copter	Other
<i>AIRFRAME WEIGHT<sup>a</sup> (Millions of Pounds)</i>							
1950	35.9	16.4	10.2	6.7	1.9	<i>b</i>	0.7
1951	50.2	17.0	15.7	11.5	3.1	<i>b</i>	2.0
1952	107.3	36.7	31.7	24.6	9.5	<i>b</i>	4.8
1953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

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, 1965

PRODUCTION OF COMMERCIAL TRANSPORT AIRCRAFT  
1956 to Date  
(Fixed Wing, Multiple Engine)

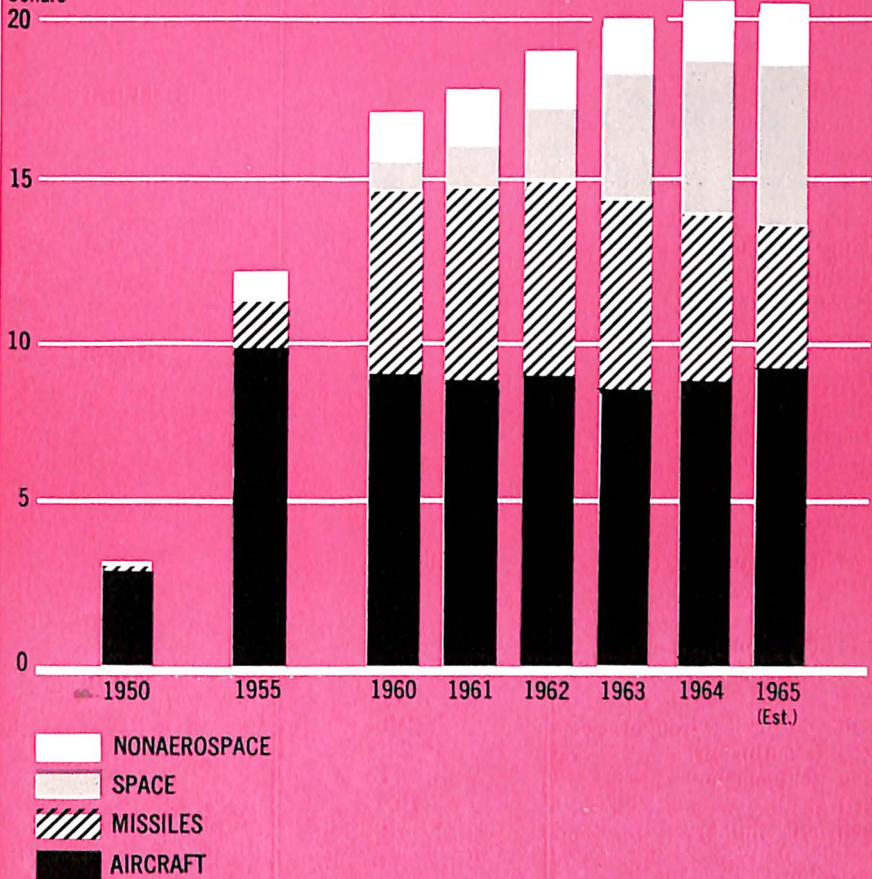
Company and Aircraft	1956	1957	1958	1959	1960	1961	1962	1963	1964
TOTAL <sup>a</sup>	206	323	216	262	245	231	160	134	195
Boeing									
707	—	—	7	73	68	11	38	28	32
720	—	—	—	—	24	61	30	6	6
727	—	—	—	—	—	—	—	6	95
Convair									
340	—	—	—	—	—	—	—	—	—
440	57	79	21	14	5	—	—	—	—
880	—	—	—	—	15	49	9	14	—
990	—	—	—	—	—	—	22	15	—
Douglas									
DC-6	39	44	65	1	—	—	—	—	—
DC-7	67	123	57	—	—	—	—	—	—
DC-8	—	—	—	21	91	42	22	19	20
Fairchild									
F-27	—	—	25	42	14	8	7	6	5
Grumman									
Gulfstream	—	—	—	—	—	19	17	24	26
Lockheed									
1049	43	42	21	5	—	—	—	—	—
1649	—	35	8	—	—	—	—	—	—
Electra	—	—	12	107	24	21	—	—	—
Jet Star	—	—	—	—	—	14	9	10	6
130	—	—	—	—	4	6	6	6	—
Other	—	—	—	—	—	—	—	—	5

<sup>a</sup> Commercial transport totals differ from FAA totals for "transports" because they exclude 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, 1965

PRODUCTION OF UTILITY AIRCRAFT, BY EIGHT MANUFACTURERS, 1964

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
TOTAL	9,336	\$198,876
Aero Commander		
500B .....	39	
560F .....	7	
680F .....	3	
680FP .....	6	\$ 11,973
Grand Commander .....	49	
Pressurized Grand Commander .....	5	
Beech		
King Air 90 .....	9	
H Super 18 .....	57	
Queen Air 80 .....	79	
Queen Air 65 .....	3	
Baron (55) .....	272	54,923
Travel Air (95) .....	42	
Bonanza (35) .....	435	
Debonair (33) .....	100	
Musketeer (23) .....	106	
Cessna		
150 .....	804	
172 (Skyhawk) .....	1,354	
F172 .....	47	
180 .....	146	
182 (Skylane) .....	778	
185 (Skywagon) .....	116	66,818
205 .....	96	
206 (Super Skywagon) .....	240	
210 (Centurion) .....	283	
336 (Skymaster) .....	55	
310 .....	197	
320 (Skynight) .....	72	
Champion		
Traveler DeLuxe (7EC) .....	4	
Tri-Traveler (7EC) .....	7	394
Challenger (GCB) .....	10	
Citabria (7ECA) .....	39	

(Continued on next page)



## AIRCRAFT PRODUCTION

### PRODUCTION OF UTILITY AIRCRAFT, BY EIGHT MANUFACTURERS, 1964—Continued

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
Lake		
LA-4 .....	27	720
Lear—Lear Jet .....	3	N.A.
Mooney		
M-20-C (Mark 21) .....	270	
M-20-D (Master) .....	51	9,569
M-20-E (Super 21) .....	329	
Piper		
Super Cub PA-18-150 .....	119	
Colt PA-22-108 .....	73	
Apache PA-23-235 .....	16	
Aztec PA-23-250 .....	266	
Comanche PA-24-180 .....	17	
Comanche PA-24-250 .....	94	
Comanche PA-24-260 .....	107	
Comanche PA-24-400 .....	85	54,479
Pawnee PA-25-235 .....	498	
Cherokee PA-28-140 .....	548	
Cherokee PA-28-150 .....	37	
Cherokee PA-28-160 .....	42	
Cherokee PA-28-180 .....	494	
Cherokee PA-28-235 .....	362	
Comanche PA-30-160 .....	438	

N.A.—Not available.

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. Aircraft included whose value is not reported have an estimated price of about \$2 million.

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
<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	42,206	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

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 22, 23. Aircraft included whose value is not reported have an estimated price of about \$2 million.

Source: Aerospace Industries Association, company reports.

## VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1965

Company and Civil Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
Bell Aerosystems							
—	X-22A	—	X-22A	—	X-22A	Development	8
—	X-14A	—	X-14A	—	X-14A	Flight Test	2
Bell Helicopter							
47G	—	—	OH-13E OH-13G OH-13H	—	— TH-13M	Operational	3
47G-2	—	—	—	—	—	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	—	—	In Prod.	2
47G-2A1	—	—	—	—	—	Operational	3
47G-4	—	—	—	—	—	Opr./In Prod.	3
47J	UH-13J	HH-13Q	—	—	UH-13F	Operational	4
47J2	—	—	—	—	—	Operational	4
47J2-A	—	—	—	—	—	Opr./In Prod.	4
—	—	—	—	—	UH-13R	R & D	4
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 compound helicopter	—	—	R & D	2
205	—	—	UH-1D	—	—	Production	13
200	—	—	XV-3A	—	—	R & D	4
207	—	—	—	—	—	R & D	2
Sioux Scout	—	—	—	—	—	R & D	2
Boeing Vertol Div.							
B-V/PD-14	—	—	—	—	HUP	Operational	6
B-V42	CH-21A	—	—	—	—	Operational	22
B-V43	—	—	CH-21C	—	—	Operational	22
B-V44	—	—	—	—	—	Operational	21
B-V107	—	—	—	CH-46A Sea Knight	—	Opr./In Prod.	27
B-V107-II	—	—	—	—	—	Opr./In Prod.	27
BV/114	—	—	CH-47A	—	—	Opr./In Prod.	36
B-V/76	—	—	—	—	—	R & D	2
Curtiss-Wright VTOL Systems Group							
Model 200	X-19 (Tri-Service)	—	—	—	—	Flight Test	8-12
Fairchild-Hiller							
Hiller-12E	—	—	OH-23G	—	—	Opr./In Prod.	3
Hiller-12E4	—	—	OH-23F	—	—	Opr./In Prod.	4
Hiller-L4	—	—	—	—	—	Opr./In Prod.	4

(Continued on next page)

## VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1965—Continued

Company and Civil Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
Hiller-SL4	—	—	—	—	—	Opr./In Prod. 12E Conversion Kit	4
Hiller-L3	—	—	—	—	—		3
Hiller-SL3	—	—	—	—	—	12E Conversion Kit	3
—	—	—	OH-23D	—	—	Operational Army Eval.	3
Hiller-1100	—	—	OH-5A	—	—		4
Hiller-Ten 99	—	—	—	—	—	Development Flight Test	6
—	XC-142	—	XC-142 (Vought, Hiller, Ryan)	—	XC-142		3 crew 32 pass.
Gyrodyne							
Model 60	—	—	—	—	QH-50A	Production	Drone
Model 61	—	—	—	—	QH-50B	R & D	Drone
Model 63	—	—	—	—	QH-50C	Production	Drone
Rotorcycle	—	—	—	—	YRON-1	Production	1
Rotorcycle	—	—	—	—	YRON-1	Production	1
Rotorcycle	—	—	—	—	Solar 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
369	—	—	OH-6A	—	—	Development	4
385	—	—	XV-9A	—	—	Research	2
Kaman							
K-20	—	—	—	—	UH-2 Seasprite	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 HH-43F Huskie	—	—	—	—	Opr./In Prod.	12
Ling-Temco-Vought							
—	XC-142A	—	XC-142A (Vought, Hiller, Ryan)	—	XC-142A	Flight Test	3 crew 32 pass.
Lockheed							
Hummingbird	—	—	XV-4A	—	—	Development R & D	2
CL-186	—	—	XH-51A	—	XH-51A		5
Republic							
Alouette II	—	—	—	—	—	Operational	5
Ryan							
—	—	—	XV-5A	—	—	Flight Test	1-2
—	—	—	XV-8A	—	—	Flight Test	1
—	XC-142A	—	XC-142A (Vought, Hiller, Ryan)	—	XC-142A	Flight Test	3 crew 32 pass.
—	—	—	VZ-3RY	—	VZ-3RY	Flight Test (NASA)	1



VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1965—Continued

Company and Civil Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
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	H04S-1 H04S-2	Operational	12
S-56	—	—	CH-37A CH-37B	CH-37C	HR2S-1W	Operational	36
S-58C & D	—	HH-34F	CH-34A CH-34C	UH-34E UH-34D VH-34D	SH-34G SH-34H SH-34J	Operational	20
S-61A	CH-3B	—	—	—	—	Opr./In Prod.	28
S-61B	—	—	VH-3A	VH-3A	RH-3A SH-3A	Opr./In Prod.	ASW-4 VIP-15
S-61L	—	—	—	—	—	Operational	31
S-61N	—	—	—	—	—	Opr./In Prod.	29-31
S-61R	CH-3C	—	—	—	—	Opr./In Prod.	28-33
S-62A	—	—	—	—	—	Opr./In Prod.	13
S-62C	—	HH-52A	—	—	—	Opr./In Prod.	14
S-64A	—	—	CH-54A	—	—	Opr./In Prod.	5-79 with pod
S-65	—	—	—	CH-53A	—	Dev./In Prod.	41
S-65A	—	—	—	CH-53A	—	Prototype/ In Prod.	41

<sup>a</sup> Five places is standard but up to 79 persons may be carried by attaching a people pod.  
Source: Aerospace Industries Association, company reports.

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

Year Ending December 31	TOTAL	Commercial	Military
1954	562	131	431
1955	590	146	444
1956	915	268	647
1957	1,000	311	689
1958	859	191	668
1959	728	277	451
1960	781	287	494
1961	825	432	393
1962	1,013	389	624
1963	N.A.	434	N.A.
1964	N.A.	545	N.A.

N.A.—Not available.  
Source: Aerospace Industries Association, company reports.  
Department of Defense.

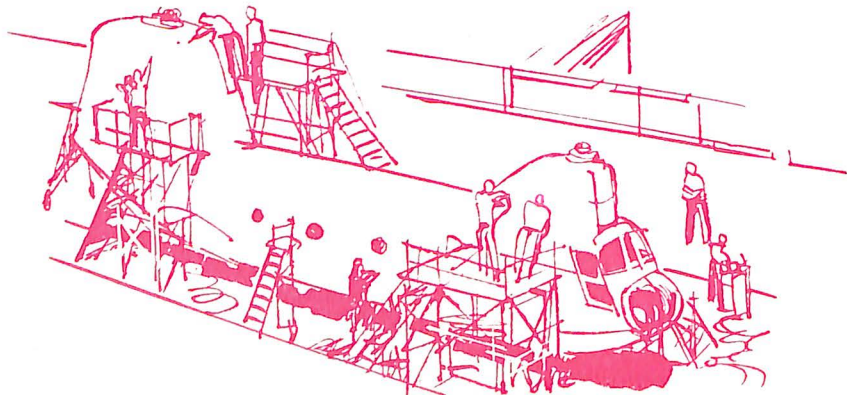
AEROSPACE FACTS AND FIGURES, 1965

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	393	42	187	137
1962	624	33	208	313

<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\*  
(Number of Helicopters)  
1956 to Date

Company and Helicopter	1956	1957	1958	1959	1960	1961	1962	1963	1964
<b>TOTAL</b>	<b>268</b>	<b>311</b>	<b>191</b>	<b>277</b>	<b>287</b>	<b>432</b>	<b>380</b>	<b>434</b>	<b>545</b>
Bell 47 Series .	111	132	99	169 <sup>b</sup>	144 <sup>b</sup>	177 <sup>b</sup>	207 <sup>b</sup>	N.A.	N.A.
Brantley B-2 .....	—	—	—	15	43	104	N.A.	N.A.	N.A.
Cessna CH-1C ..	—	—	—	—	—	14	14	—	—
Hiller 12 Series .	21	21	12	25	72	99	51 <sup>c</sup>	N.A.	N.A.
Hughes 269-A ...	—	—	—	—	—	19	83	N.A.	N.A.
Omega B12-D1 ..	—	—	—	—	—	2	—	N.A.	N.A.
Sikorsky S-55 .....	52	38	11	4	1	3	—	N.A.	N.A.
S-58 .....	55	60	22	48	10	8	3	N.A.	N.A.
S-61 .....	—	—	—	—	—	1	4	N.A.	N.A.
S-62 .....	—	—	—	—	4	5	10	N.A.	N.A.
S-64 .....	—	—	—	—	—	—	1	N.A.	N.A.
Vertol H-21 .....	29	60	35	12	—	—	—	—	N.A.
V-33 .....	—	—	—	—	5	—	—	—	N.A.
V-44 .....	—	—	12	5	8	—	—	—	N.A.
V-107 .....	—	—	—	—	—	—	7	N.A.	N.A.

N.A.—Not available.

\* Manufactured by companies reporting to Aerospace Industries Association.

<sup>b</sup> Includes production of two foreign licensees.

<sup>c</sup> Eight months.

Source: Aerospace Industries Association, company reports.

AEROSPACE FACTS AND FIGURES, 1965

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

Year Ending December 31	TOTAL	Military		Civil	
		Recipr.	Jet	Recipr.	Jet
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	17,045	250	5,000	11,322	473
1964	19,455	250	5,000	13,346	859

NOTE: Jet includes turboprop and turbofan.

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.



## AIRCRAFT PRODUCTION

### MILITARY AIRCRAFT ENGINE PRODUCTION Calendar Years 1950 to Date (Number of Engines)

Year Ending December 31	TOTAL	Jet	Turboprop	Turbofan	Recipro- cating
1950	9,361	5,589	650	—	3,122
1951	16,287	9,520	296	—	6,471
1952	25,659	16,912	16	—	8,731
1953	33,616	20,181	70	—	13,365
1954	21,440	13,381	205	—	7,868
1955	13,469	9,333	261	—	3,875
1956	9,849	6,532	654	—	2,663
1957	11,087	8,104	554	—	2,429
1958	8,121	6,135	534	—	1,452
1959	4,626	3,421	544	—	661
1960	3,674	2,025	724	168	756
1961	5,172	2,821	1,251	683	417
1962	5,441	3,162	1,740	298	241

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



AEROSPACE FACTS AND FIGURES, 1965

CIVIL AIRCRAFT ENGINE PRODUCTION  
 Calendar Years 1957 to Date  
 (Number of Engines)

Manufacturer and Engine Designation <sup>a</sup>	1957	1958	1959	1960	1961	1962	1963	1964
TOTAL .....	10,817	10,251	12,259	12,159	10,663	10,479	11,795	14,205
Reciprocating ....	10,779	9,736	10,875	10,524	9,669	9,921	11,322	13,346
Jet .....	38	515	1,384	1,635	994	558	473	859
Allison Division								
General Motors								
282 .....	—	242	604	576	22	—	—	—
Continental								
205 .....	145	77	16	56	46	51	45	30
246 .....	24	15	23	20	16	8	5	5
252 .....	879	829	1,348	840	828	826	773	918
253 .....	811	1,734	953	1,252	987	1,104	1,210	1,368
267 .....	31	36	36	9	12	12	8	8
273 .....	2,733	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
3E-3 .....	—	—	—	—	322	140	133	1,284
E-1CE .....	—	—	—	—	—	—	—	141
E-2CE .....	—	—	—	—	—	—	—	52
E-3CE .....	—	—	—	—	—	—	—	92
E-5CE .....	—	—	—	—	—	—	394	983
E-7CE .....	—	—	—	—	—	—	271	42
Other .....	24	23	8	20	70	43	52	11
General Electric								
306 .....	—	—	—	—	70	15	—	—
308 .....	—	18	90	212	—	—	—	—
1E3 .....	—	—	—	—	—	—	—	25
1E5 .....	—	—	—	66	185	25	—	—
J79-11A .....	—	—	—	—	69	43	12	—
CJ805-3 .....	—	—	—	—	—	—	1	—
CJ805-23 .....	—	—	—	—	—	—	1	—
Lycoming								
223 .....	8	2	8	111	1,241	289	264	67
228 .....	—	—	—	—	12	7	206	230
229 .....	44	95	113	80	17	17	13	11
274 .....	2,631	2,023	2,021	1,452	1,128	1,248	1,578	2,068
275 .....	842	419	308	271	122	142	169	121
277 .....	—	—	—	—	11	5	3	—

(Continued on next page)

AIRCRAFT PRODUCTION

CIVIL AIRCRAFT ENGINE PRODUCTION—*Continued*

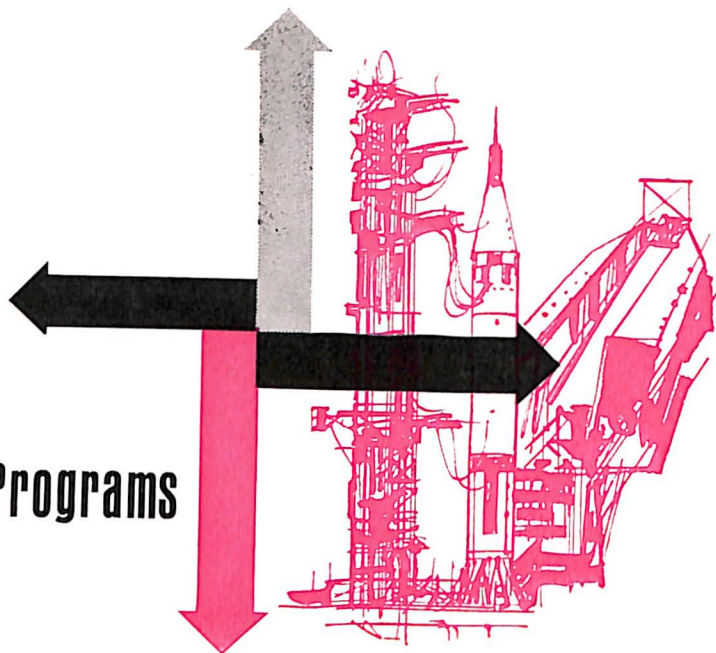
Calendar Years 1957 to Date

Manufacturer and Engine Designation <sup>a</sup>	1957	1958	1959	1960	1961	1962	1963	1964
<b>Lycoming—Cont.</b>								
286 .....	250	768	1,044	701	218	1,080	1,508	1,729
284 .....	—	—	247	294	718	95	—	—
295 .....	123	561	906	1,247	728	1,194	2,070	2,749
304 .....	—	—	—	115	—	—	—	—
1E .....	—	—	—	233	—	—	—	—
1E4 .....	—	—	—	—	122	162	—	—
1E7 .....	—	—	—	—	90	286	—	—
1E10 .....	—	—	—	—	—	60	—	—
1E11 .....	—	—	—	—	65	36	—	—
1E15 .....	—	—	—	—	—	—	—	152
Other .....	315	167	53	107	—	—	6	—
<b>Pratt &amp; Whitney Aircraft</b>								
230 .....	5	6	1	—	—	—	—	—
231, 264 .....	456	315	3	6	—	—	—	—
290 .....	35	232	275	172	145	21	5	—
291 .....	3	23	410	523	46	—	—	—
1E8 .....	—	—	—	63	357	406	251	—
1E9 .....	—	—	—	23	97	44	38	—
XTF10 .....	—	—	—	—	3	1	—	—
JT3D .....	—	—	—	—	—	—	—	337
JT8D .....	—	—	—	—	—	3	165	410
JT12 .....	—	—	—	—	—	—	—	87
Other .....	—	—	5	—	—	—	—	—
<b>Wright Aeronautical</b>								
243 .....	68	51	6	—	6	—	—	—
259 .....	157	129	202	34	49	58	92	3
272 .....	323	22	—	—	—	—	—	—
287 .....	910	283	26	—	—	—	—	—
289 .....	—	—	24	—	1	—	4	—
Other .....	—	—	—	—	36	—	—	—

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

Source: Aerospace Industries Association, company reports.

## Missile Programs



The total sales of missile and booster systems in 1964 continued the decline started in 1963. Spending in 1964 totaled \$5.3 billion.

The year was marked by the phase-out of 126 operational Atlas D's, E's and F's, and 54 Titan I's scheduled to be removed from the inventory by the end of FY 1965. There are now 54 Titan II hard-site silo configurations and 800 Minuteman ICBM's. An additional 200 Minuteman II's, authorized in FY 1965, will feature improved penetration aids, re-entry systems and greater payload capacity over wider ranges. Though not now scheduled for a specific phase-out date, the Minuteman I will ultimately be replaced by Minuteman II missiles.

A new Polaris-family strategic missile, the Poseidon, was announced during FY 1965.

This fourth generation weapon system, formerly known as the B-3, received \$10 million under FY 1965 budgeting, and has been supplemented by an additional appropriation request for \$35 million. The estimated cost of the Poseidon program as now envisioned (a 19-boat force) is about \$2 billion, including missile development, ship retrofitting and production costs. The 41-boat Polaris FBM submarine fleet is scheduled to be operational by June 1967. Thirty-five boats have now been



## MISSILE PROGRAMS

completed and the remaining six are under construction.

Phase-out of the Polaris A-1 missile system will be completed by the end of FY 1965 with all five of the original FBM submarines which accommodated this missile scheduled to be retrofitted to accommodate the A-2 missile system with its 1500-nautical-mile range. When the entire fleet is operational, 13 FBM submarines will be equipped with the A-2 while the remaining 28 boats will be equipped with the 2500-nautical-mile range A-3 system.

A new combination strategic-and-air defense missile, the AADS-70, began its initial funding during FY 1965 with \$5 million allotted for early development. The AADS-70 (Army Air Defense System—1970), a surface-to-air weapon, has been under study for several years. Additional funds are being sought in the FY 1966 budget to continue this development.

In the surface-to-air category, the Nike-Hercules system continues to be operational with four batteries scheduled for deployment overseas. The Hawk Missile now deployed in Europe, the Far East and most recently in South Viet Nam, is undergoing an \$11 million improvement program to give the missile system a capability to engage tactical ballistic missiles. All Bomarc A batteries will be phased out by the end of FY 1965 but the remaining eight Bomarc B bases will remain in the inventory in the U. S. and Canada. Anti-ICBM systems such as Nike-Zeus, Nike X, Sprint, and HIBEX are being studied.

Other missile developments during the year include funds to start development of a new short-range attack missile, the SRAM. The first

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	2,585	1,921

NOTE: Based on data from 67 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, Series M37D" (Quarterly).

AEROSPACE FACTS AND FIGURES, 1965

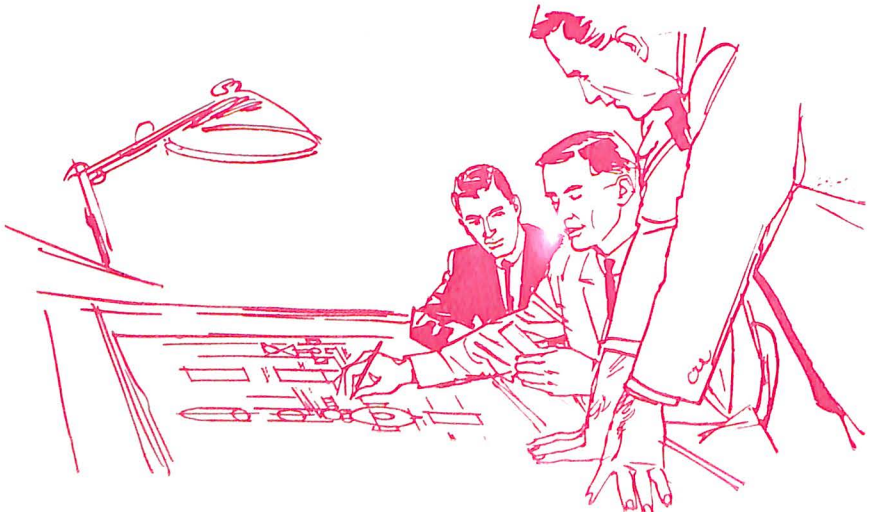
big procurement of Shillelagh missiles, totaling \$61 million, is being sought in FY 1966 funds, along with \$4.7 million to complete RDT&E on the system. No procurement increases are scheduled for the Pershing tactical surface-to-surface missile during FY 1966, but DoD plans to increase the numbers of launchers for all battalions now stationed in Europe. Redeye, the man-carried anti-aircraft missile, will continue accelerated procurement during FY 1966. Also, a new missile family for tactical air defense, Chaparral, is now in late development. Chaparral is designed to be mounted on ground vehicles as a fast reaction front line weapon.

The Navy has begun an improvement program on its Terrier, Talos and Tartar surface-to-air missiles and has undertaken the development of a new standardized missile which will be accommodated by both

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	708
1964	850	557

NOTE: Based on data from 67 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).



## MISSILE PROGRAMS

Tartar and Terrier launchers aboard ship. In addition to this, the Navy has already spent over \$8 million on its new Advanced Surface Missile System (ASMS) and is expected to spend another \$12 million during FY 1966.

During the year, the Navy continued to procure Sidewinder air-to-air missiles at a rate which should carry through the end of FY 1966. The air-to-air Phoenix missile system continued in development during the year. Other Navy missile procurements during the year included Bullpup B, the ASW MK-44 torpedo, Subroc and Asroc.

Procurement has also been completed on the Sparrow III missile system for the Navy with the purchase made during FY 1964. With transfers of the missile from Navy stockpiles, the Air Force will have a full inventory of the air-to-air system.

### 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 <sup>F</sup>	2,635	1,590	772	273
1966 <sup>F</sup>	2,311	1,460	590	261

N.A.—Not available.

<sup>F</sup> Estimate.

Source: Department of Defense.

AEROSPACE FACTS AND FIGURES, 1965

ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
<b>SURFACE-TO-AIR</b>						
AADS-70	Army	Hughes & RCA	—	—	—	Early development
ASMS	Navy	Raytheon	—	—	—	Early development
Bomarc-B	USAF	Boeing	Marquardt & Thiokol	Ramjet	IBM, Westinghouse & Kearfott	Operational
Chapparral	Army	Philco, Motorola	—	—	—	Early development
Hawk	Army	Raytheon	Aerojet	Solid	Raytheon	Operational
HIBEX	Army	Boeing	—	Solid	—	Early development
Mauler	Army	General Dynamics	Lockheed	Solid	Hughes	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
<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
SRAM	USAF	—	—	—	—	Early 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>SURFACE-TO-SURFACE</b>						
ASBD Atlas	Navy USAF	— General Dynamics	— No. American	— Liquid	— GE & American Bosch Arma	Study Operational (Phasing out)
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	Study
Little John	Army	Emerson	Hercules Thiokol & General Motors	Solid	Unguided	Operational
Mace A-B	USAF	Martin	Thiokol & General Motors	Solid & Turbojet	Goodyear & General Motors	Operational
MAW	Army	McDonnell, Sperry Rand	Thiokol	Solid	Sperry Rand	Early development
Minuteman	USAF	Boeing	Aerojet Thiokol	Solid	No. American	Operational
Pershing Polaris	Army Navy	Martin Lockheed	Thiokol Aerojet	Solid Solid	Bendix General Electric, Hughes, MIT	Operational Operational
Poseidon	Navy	—	—	—	—	Early development
Sergeant Shillelagh	Army Army	Sperry Ford/Aerotonutronics	Thiokol Amco Chemical & Picatinny Arsenal	Solid Solid	Sperry Clary, Whittaker	Operational Operational
Titan I	USAF	Martin	Aerojet	Liquid	Bell Telephone & Sperry General Motors	Operational (Phasing out)
Titan II	USAF	Martin	Aerojet	Liquid	Sperry General Motors	Operational
TOW	Army	Hughes	—	Solid	—	Development

*(Continued on next page)*



AEROSPACE FACTS AND FIGURES, 1965

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	—	—	—	Early development
Bullpup	Navy-USAF	Martin	Thiokol	Solid	Maxson Electronics	Operational
DSM	USAF	—	—	—	—	Study
Hound Dog	USAF	North American	Pratt & Whitney	Turbojet	No. American	Operational
Shrike	Navy	Naval Ordnance Test Station	—	Solid	Texas Instruments	Operational
Quail (GAM-72)	USAF	McDonnell	General Electric	Turbojet	Guidance Technology, Inc.	Operational
Zuni	Navy	Naval Ordnance Test	—	Solid	Unguided	Operational
<b>SURFACE-TO-UNDERWATER</b>						
Alpha Asroc	Navy Navy	In-House Honeywell	— Honeywell	Solid Solid	— General Precision	Operational Operational
<b>UNDERWATER-TO-UNDERWATER</b>						
Subroc	Navy	Goodyear	Thiokol	Solid	General Precision	Operational

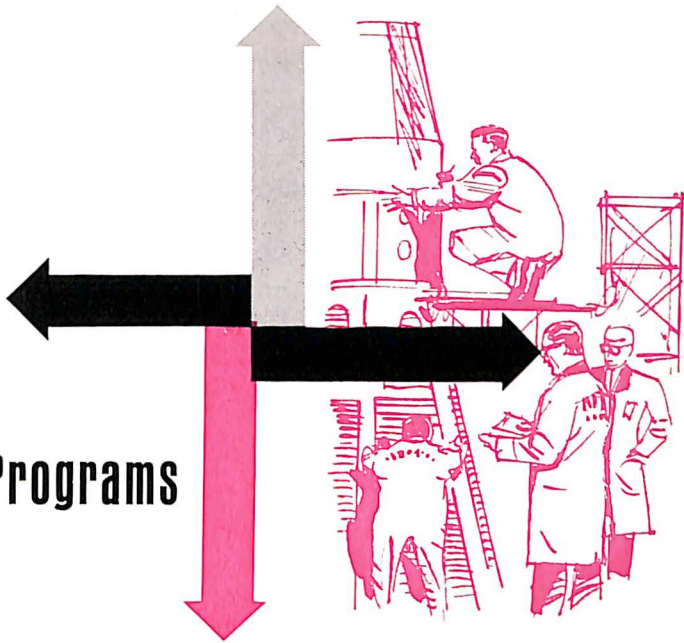
Source: Aerospace Industries Association, based on latest available information.

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

Source: Air Force Systems Command, 1964 "Annual Report."

## Space Programs



The expenditures for U. S. space programs by the National Aeronautics and Space Administration, Department of Defense and other government agencies increased significantly during fiscal year 1965 and are estimated to rise even more during FY 1966.

Space expenditures during FY 1965 by all agencies are estimated at \$6.7 billion with NASA spending \$4.9 billion. This compares with space expenditures of \$6.0 billion by all agencies in FY 1964 and an estimated \$7 billion in FY 1966. Of these totals, the major part is for products of the aerospace industry. The rest is for construction of facilities, administrative, and other costs.

During a twelve-month period, 30 major space launches were conducted, not including the continuous series of unmanned payloads launched by the military services. The initial manned orbital flight of the two-man Gemini capsule marked the resumption of U. S. manned spaceflights. Remarkable close-up photographs of three areas of the lunar surface marked a highly successful conclusion to the Ranger program, while Mariner 3 telemetered back valuable data about the Venusian atmosphere. Mariner 4, following a 7½ month journey to Mars, is

AEROSPACE FACTS AND FIGURES, 1965

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

Program	Year Ending June 30		
	1964	1965 <sup>B</sup>	1966 <sup>F</sup>
TOTAL	\$4,171	\$4,900	\$5,100
Manned space flight . . . . .	2,768	3,085	3,386
Unmanned investigation in space .	641	693	703
Meteorology, communications and other space applications . . .	112	110	107
Other research, technology, and supporting operations . . . . .	650	1,012	904

<sup>B</sup> Estimate.

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

scheduled to send back the first photographs of the Red Planet. The world's first commercial communications satellite, the synchronous orbit Early Bird, initiated the era of commercial space communications. Highlights of the year included:

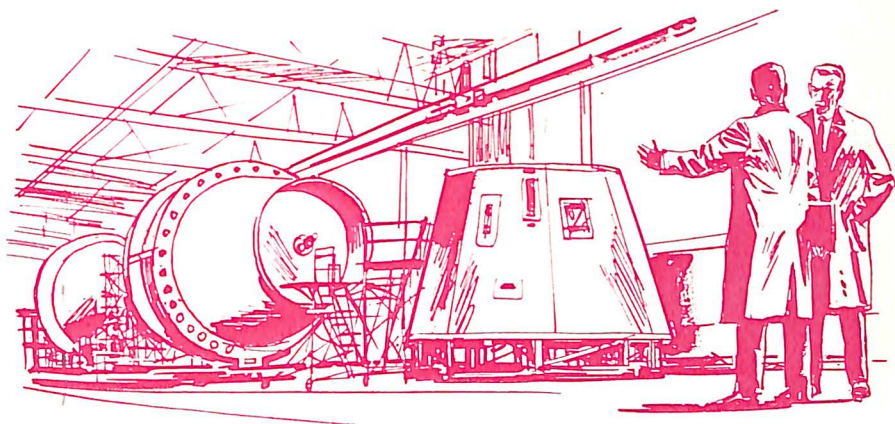
**MARINER.** On November 5, 1964, Mariner was launched by NASA on a space probe mission to study the planet Venus. It later successfully transmitted data concerning the density, temperature and pressures present in the Venusian atmosphere. On November 28, 1964, Mariner 4 was launched on a mission to photograph and televise pictures of the Martian surface.

**SYNCOM.** On August 19, 1964, Syncom II was launched into synchronous orbit (approximately 22,300 miles altitude) and active-repeater type communications experiments were successfully conducted. Later, the satellite was moved to another location over the Pacific ocean where, at its synchronous altitude, it was used to television live pictures of the Olympic games in Tokyo.

**EXPLORER.** Six more Explorer satellites were launched during the year, bringing the total number of these scientific satellites to 26. Explorer 21 (IMP B) was launched on October 3, 1964, to measure the magnetic fields of the earth. Six days later, Explorer 22 (S-66), sent aloft to conduct ionospheric research, successfully conducted the first experiment in space using a laser. On November 6, and again twice on November 21, 1964, Explorers 23, 24 and 25 were launched to study



## SPACE PROGRAMS



micrometeoroids, radiation and air density. Explorer 26, designed to study energetic particles, was launched on December 21. All Explorers worked well within the planned parameters established by NASA.

TIROS. NASA's attempt to provide optimum weather satellite coverage of the surface of the earth continued with a launch of Tiros IX, the initial cartwheel weather satellite, on January 22, 1965. This was the ninth successful weather satellite sent aloft in as many attempts.

GEMINI. The three-orbit mission of GT-3 on March 23, 1965 marked not only the initial two-man orbital spaceflight successfully carried out by the United States, but also resulted in the first attempt by the free world to fly a spacecraft in orbit, successfully changing the orbital path of the spacecraft from an elliptical orbit to a circular one by use of small thrust rockets.

SPACECRAFT IN ORBIT AS OF 1 APRIL 1965

Country	TOTAL	Earth Orbit	Space Probes
TOTAL .....	151	138	13
United States .....	125	118	7
U.S.S.R. ....	22	16	6
U.S./Canada .....	1	1	—
U.S./U.K. ....	2	2	—
U.S./Italy .....	1	1	—

Source: National Aeronautics and Space Administration, "Satellite Situation Report."

AEROSPACE FACTS AND FIGURES, 1965

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 Byovskoy	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	USSR	"
Mar 23, 1965	GT-3	Alexei Leonov Virgil I. Grissom John W. Young	USA	3 Orbits

Source: National Aeronautics and Space Administration.  
 " Actual number in doubt.

RANGER. The most significant space launch and mission from a standpoint of scientific accomplishment were the successful performances of Ranger VII, VIII and IX in photographing and telemetering television pictures of the lunar surface. Ranger VII, launched July 28, 1964, transmitted over 4,000 photographs of the lunar surface during the terminal minutes of its 63-hour journey. Ranger VIII, launched February 17, added another 7,000 pictures of another lunar location and Ranger IX, launched March 21, 1965, concluded the program with still another successful lunar photographic mission. Scientists state that the pictures obtained from Rangers VII, VIII and IX have advanced man's knowledge of the lunar surface by a factor of better than 1,000.



## SPACE PROGRAMS

**MILITARY PROGRAMS.** The military services, primarily the Air Force, continued to launch unmanned payloads during the year in tests aimed at research and development of spacecraft for observation from space, early warning, inspection and detection. Prime launch vehicles for these tests continue to be the Thor, the thrust augmented Thor and the Atlas standard space launch vehicle. Multiple payloads continue to be launched on many military space missions.

**LAUNCH VEHICLES.** The new generation of booster systems continued to be tested during the year with three Centaur launches and three launches of the Saturn I. While Centaur AC-5, launched March 2, 1965, blew up on the pad, the liquid hydrogen fueled Centaur stage was not at fault. Centaur AC-3, launched June 30, 1964, and Centaur AC-4 launched December 11, 1964, further proved the feasibility of liquid hydrogen upper stage booster technology. Saturn continued its uninterrupted string of successes, featuring the SA-7 launch on September 18, 1964 of the Apollo boilerplate command module into earth orbit and the launch of the Pegasus meteoroid detection satellite on February 16, 1965.

**NEW PROGRAMS.** The initial commercial communications satellite, which is operated by the Communications Satellite Corporation, was launched on April 6, 1965. This synchronous orbit satellite, Early Bird, provided both telephone and television communications of remarkable quality.

UNITED STATES SPACE LAUNCHINGS  
1957 through 1963

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	-
<b>TOTAL</b>	248	73	10	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, 1964."

## AEROSPACE FACTS AND FIGURES, 1965

CHRONOLOGY OF MAJOR UNITED STATES SPACE LAUNCHINGS  
1961 to April 1965

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)

SPACE PROGRAMS

CHRONOLOGY OF MAJOR UNITED STATES SPACE  
LAUNCHINGS—*Continued*  
1961 to April 1965

May 24	Aurora 7	Orbital manned Mercury flight Carpenter flight, 3 orbits
June 19	Tiros V	Meteorological earth satellite
July 10	Telstar I	Communications earth satellite
July 18	Echo (test)	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 Monitor	Atmospheric structure satellite
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)



AEROSPACE FACTS AND FIGURES, 1965

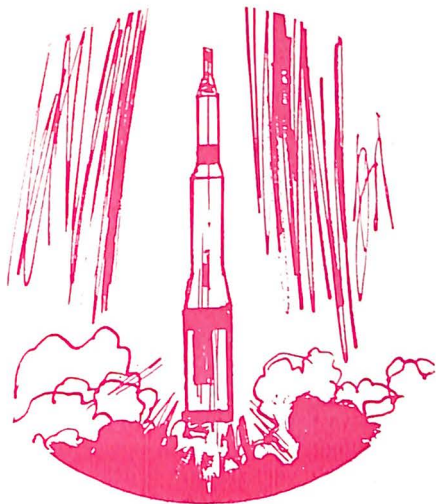
CHRONOLOGY OF MAJOR UNITED STATES SPACE  
LAUNCHINGS—Continued  
1961 to April 1965

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

NOTE: This chronology of major NASA space programs includes the successful, partially successful, and unsuccessful launchings of all vehicles larger than sounding rockets. It does not include military space programs, or launchings by the military "under NASA direction."

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 <sup>d</sup>	6,719	4,900	1,570	249
1966 <sup>e</sup>	6,958	5,100	1,610	248

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> Includes amounts for aircraft technology, amounting to \$45-50 million per year in 1963 and thereafter.

<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, 1965

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	1,841	1,003	838	1,610	854	756
1964	2,222	732	1,490	1,611	391	1,220

NOTE: Based on data from 67 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 46.

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

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 <sup>E</sup>	4,900	3,782	524	594
1966 <sup>E</sup>	5,100	4,120	406	574

<sup>E</sup> Estimate.

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



## Research and Development

Increased emphasis on research and development in aerospace manufacturing activities continued during 1964. R&D is now an integral part of weapon and space systems acquisition from concept to delivery of the operational hardware. In order to keep management techniques equal to the task of directing technology, new systems, such as configuration management, have been devised. Basically, this is a method for defining hardware for contracting and controlling subsequent changes.

During the year, company-financed R&D expanded in scope as competition for contracts placed strong demands on in-house technological capability. A major share of government-sponsored R&D is also conducted by the aerospace industry.

The total research and development effort of the federal government has reached a plateau at \$15.5 billion. While expenditures doubled between FY 1960 and 1965, the increase from 1964 to 1965 was only \$680 million; for the next fiscal year, the increase is expected to slow down further to \$90 million.

While the Department of Defense spending continued to account for the major portion of federal R&D expenditures, DoD's total R&D budget of \$7.5 billion for FY 1964 is estimated to drop \$300 million in FY 1965, and anticipated spending in FY 1966 will be curtailed another \$340 mil-



lion. NASA budgeted \$3.3 billion for R&D expenditures in FY 1964, with \$3.8 billion estimated for FY 1965 and an estimate of \$4.1 billion for FY 1966.

Total NASA expenditures, including the money for construction of facilities and for administrative operations, are expected to grow from \$4.2 billion in FY 1964 to \$4.9 billion in FY 1965 and \$5.1 billion in FY 1966.

R&D work by the aerospace industry continues to be concentrated on projects for the Department of Defense and NASA.

DOD spending for R&D breaks down into four basic categories.

*Research.* This category, still encompassing both basic and applied study of advanced concepts and innovations with no direct applicability to specific projects, involves such areas as biosciences, physical and natural sciences, psycho-socio-economic theories, medical sciences and mathematics.

*Exploratory developments.* This is the initial basic step of the R&D principle toward applicability of any one or a series of research thesises toward solution of a given military problem area. This does not, however, include any production of R&D hardware. Examples are: *Army.* Principles of mid-air missile interception, mathematical principles for use in tactical warfare study, rocket propellant studies, materials usage for armored vehicles, methods for utilization of new armament concepts. *Air Force.* Guidance system theories, re-entry concepts, spatial medicine techniques, novel approaches to space reconnaissance, nuclear detection, communications, bionics, structural dynamics, electronic countermeasures, and the Manned Orbiting Laboratory. *Navy.* The complete spectrum of anti-submarine warfare theories subjected to new approaches, techniques, and methods within those techniques. *Advanced Research Proj-*



RESEARCH AND DEVELOPMENT

*ects Agency.* Definition studies of re-entry theory, multiple payloads, missile flight phenomena and basic warfare concepts.

*Advanced Developments.* This category includes applied R&D theory that has been advanced to the status of applicability to experimental hardware. Examples of this include: reconnaissance aircraft and satellites, varieties of anti-submarine warfare projects, underwater sub-launched systems with long-range capabilities, limited warfare weapons, advanced strategic and tactical missiles, anti-tank concepts, new ground-based communications and early warning systems and a variety of aircraft configurations.

*Engineering Developments.* When a project reaches the status where full development for service use has been defined, it has reached the Research and Development, Test and Evaluation status. In this category, systems and partial subsystems are put through exhaustive procedures to determine optimum performance characteristics through tests on actual engineering hardware. Examples of this are: The Nike-X

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

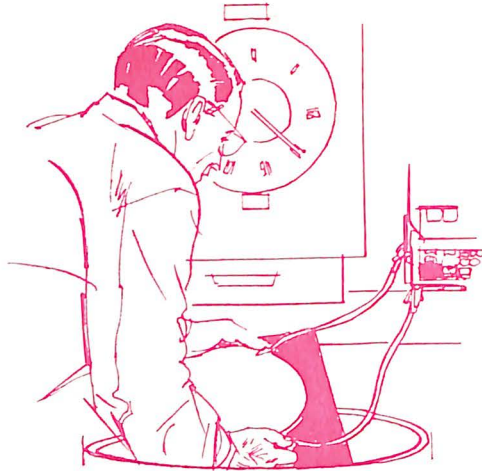
Year Ending June 30	TOTAL	Department of Defense	National Aeronautics and Space Administration	Atomic Energy Commission	Other
1954	\$ 3,148	\$2,487	\$ 90	\$ 383	\$ 188
1955	3,308	2,630	74	385	219
1956	3,446	2,639	71	474	262
1957	4,462	3,371	76	657	358
1958	4,990	3,664	89	804	433
1959	5,803	4,183	145	877	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 <sup>E</sup>	15,355	7,222	4,900	1,569	1,664
1966 <sup>B</sup>	15,445	6,880	5,100	1,557	1,908

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

<sup>E</sup> Estimate.

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

AEROSPACE FACTS AND FIGURES, 1965



DEPARTMENT OF DEFENSE  
 EXPENDITURES FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION<sup>a</sup>  
 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 <sup>b</sup>	6,675	3,350	1,450	1,400	475
1966 <sup>c</sup>	6,370	3,140	1,395	1,375	460

NOTE: For RDT&E expenditures for aircraft, missiles and astronautics *only*, see page 62. Emergency fund of \$30 million for 1966 not included.

N.A.—Not available.

<sup>b</sup> Estimate.

<sup>c</sup> Adjusted to make data comparable to current appropriation structure. Does not include RDT&E expenditures from other appropriations.

Sources: Department of Defense, Report "FAD 503," 25 January 1965



RESEARCH AND DEVELOPMENT

family of anti-ICBM missiles, including the Sprint and HIBEX concepts of point-to-point high-acceleration missile interception, Lance, TOW, Mauler, and Shillelagh systems for anti-tank warfare, the "Eye" series of limited warfare weapons, the XB-70 mach 3 aircraft program, navigation satellites, the Titan III booster system, military communications satellites, the Vela series of nuclear detection devices in space, on the surface and underground and large solid rocket propulsion.

NASA programs still in R&D status include Apollo, Gemini, the orbiting geophysical and astronomical satellite series, weather satellites, Surveyor, Pioneer, Lunar Orbiter, planetary space probes (the Mariner series), major space booster programs such as Saturn IB and V, Titan II, the thrust-augmented Thor and the Explorer series of scientific satellites.

The Atomic Energy Commission's R&D program, as related to aerospace, continued to emphasize work on Systems for Nuclear Auxiliary Power (SNAP), generation of electrical power by nuclear reaction, nuclear space launch vehicle propulsion concepts and missile propulsion theories.

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 <sup>D</sup>	6,700	4,100	902	2,058	1,140	2,600
1966 <sup>D</sup>	6,400	3,827	921	1,849	1,057	2,573

<sup>D</sup> Estimate.

Source: Department of Defense, Report "FAD 503," 25 January 1965.

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	11,544	4,140	3,676	463
1963 <sup>b</sup>	12,723	4,835	4,371	464

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.

<sup>b</sup> Preliminary.

Source: National Science Foundation.

INDUSTRIAL RESEARCH AND DEVELOPMENT IN AEROSPACE, BY TYPE  
OF RESEARCH AND FUND SOURCE<sup>a</sup>  
1958 to Date  
(Millions of Dollars)

Year	TOTAL AERO- SPACE	Applied Research and Development Funds			Basic Research Funds		
		Total	Federal Govern- ment	Com- pany <sup>b</sup>	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	<sup>b</sup>	<sup>b</sup>
1962	4,140	4,085	N.A.	N.A.	55	N.A.	N.A.
1963 <sup>c</sup>	4,835	4,775	N.A.	N.A.	60	N.A.	N.A.

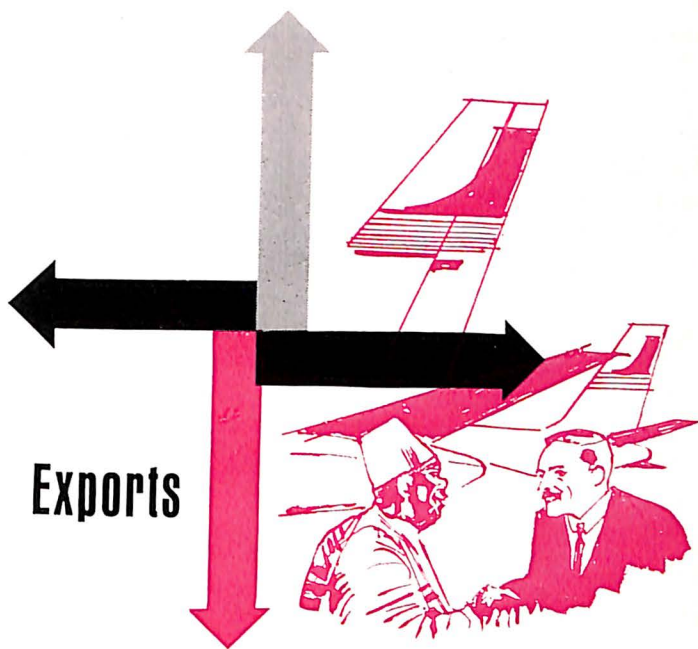
N.A.—Not available.

<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.

<sup>b</sup> Revised source data for 1961 are not available.

<sup>c</sup> Preliminary.

Source: National Science Foundation.



For the seventh time in the past nine years, aeronautical products sold abroad exceeded the billion dollar mark and gains were registered in several key product categories. Total aerospace exports amounted to \$1,212,000,000.

Among the more significant increases in dollar values were passenger transports, utility aircraft, rotary wing and engine exports.

For example, after a steady decline in dollar value of transport aircraft sales since 1960, transactions in this product area showed an increase of approximately \$20 million during 1964. Small gains were made in all three airframe weight categories.

Rotary wing aircraft sales, as reported by the Census Bureau, increased to \$14.6 million, almost 50 per cent above 1963 exports, representing the highest level this segment of the export market has achieved since the end of World War II.

Sales of utility aircraft—categorized as all those utilized in flying activities under 3,000 pounds of airframe weight—were up to \$33.3 million. Again, increases were scored in both classifications, three-place or less and four-place or more.

Small engine sales also showed significant increases, both in total units



delivered and in dollar value of those deliveries. The former climbed from less than 1,300 units to nearly 1,700 and dollar values moved up from \$3.6 million to \$5.3 million—the highest point since 1957.

The amount of U.S. aerospace goods and services acquired by foreign nations during 1964 were actually higher than the \$1.21 billion reported. For example, the statistics reported here exclude:

- Aeronautical and space products furnished to foreign governments under Mutual Defense Assistance Programs (MDAP).
- Space equipment supplied to foreign governments under the cognizance of the National Aeronautics and Space Administration.
- Income acquired by aerospace companies abroad as a result of licensing agreements, investments in foreign manufacturing firms and earnings under technical assistance contracts.
- Aerospace generated exports of such items as aircraft inner tubes and tires, airborne transmitters and transceivers, electronic detection and navigational apparatus and aircraft type spark plugs.

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

Year Ending Dec 31	TOTAL AERO- SPACE PRODUCTS	Trans- ports	Utility	Engines	Rotary Wing	Other and Under Security Restrictions
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	971.5	146.4	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	1,208.8	266.4	27.5	4.4	6.8	903.7
1962	1,435.5	254.9	23.1	4.5	8.8	1,144.2
1963	1,240.1	191.0	26.9	3.6	9.8	1,008.8
1964	1,212.4	211.0	33.3	5.3	14.6	948.2

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



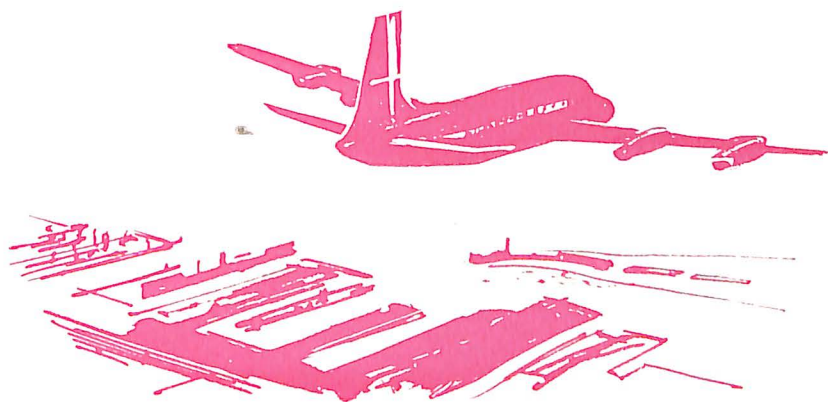
EXPORTS

EXPORTS OF NEW PASSENGER TRANSPORT AIRCRAFT  
Calendar Years 1948 to Date

Year End- ing 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	87.0
1954	110	93.0	29	2.0	7	4.0	74	70.4
1955	95	81.2	39	2.5	5	2.4	51	76.3
1956	151	132.9	64	4.7	2	.8	85	124.4
1957	203	179.3	94	7.7	9	6.9	100	164.7
1958	127	146.4	36	3.5	9	5.6	82	137.3
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	266.4	64	7.7	4	3.5	52	255.2
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

° Less than \$500,000.

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



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

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

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

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

NOTE: Data based on exports for Aero Commander, Beech, Cessna, 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 are sold by the entire utility aircraft industry shown in the table above, the inclusion of the light transports accounts for the higher value of the exports.

Source: Aerospace Industries Association, company reports.

## EXPORTS

### EXPORTS OF LIGHT TRANSPORTS AND UTILITY AIRCRAFT, BY SELECTED U. S. MANUFACTURERS, BY DESTINATION, CALENDAR YEAR 1964

Total and Destination	Number	Value (Thousands of Dollars)
TOTAL	1,775	\$44,118.4
Europe .....	461	13,297.1
Africa .....	239	5,036.7
Asia .....	78	2,828.9
Oceania .....	232	3,732.1
Canada .....	189	3,568.6
Latin America .....	547	15,107.9
Not distributed by area ...	29	547.1

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

### 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	622	511	111
TOTAL <sup>a</sup>	17,018	15,070	1,948

NOTE: The value of these exports are, with minor exceptions, excluded from the total aerospace exports shown on page 68.

<sup>a</sup> October 6, 1949 to December 31, 1964.

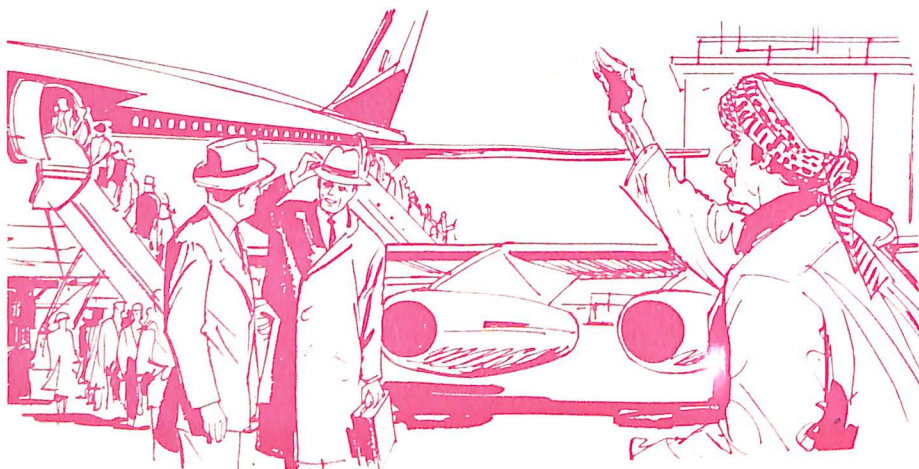
Source: Department of Defense.

AEROSPACE FACTS AND FIGURES, 1965

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

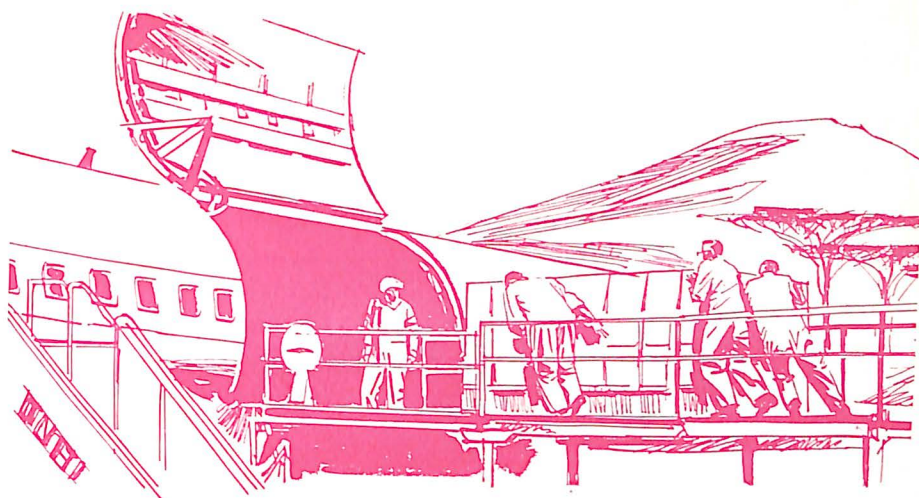
Year Ending Dec 31	Rotary Wing Aircraft		Used Aircraft		Other	
	Number	Value (Millions)	Number	Value (Millions)	Number	Value (Millions)
1948	47	\$1.9	202	\$ .7	.....	.....
1949	31	1.2	252	.6	.....	.....
1950	38	.9	262	.9	.....	.....
1951	28	.9	300	.9	.....	.....
1952	37	1.4	303	1.5	.....	.....
1953	98	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

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





EXPORTS



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

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
		3,635
1963	1,292	
1964	1,677	5,257

<sup>a</sup> Under 400 h.p.; data for exports of engines of 400 h.p. and over withheld for "security reasons."

<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, 1965

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

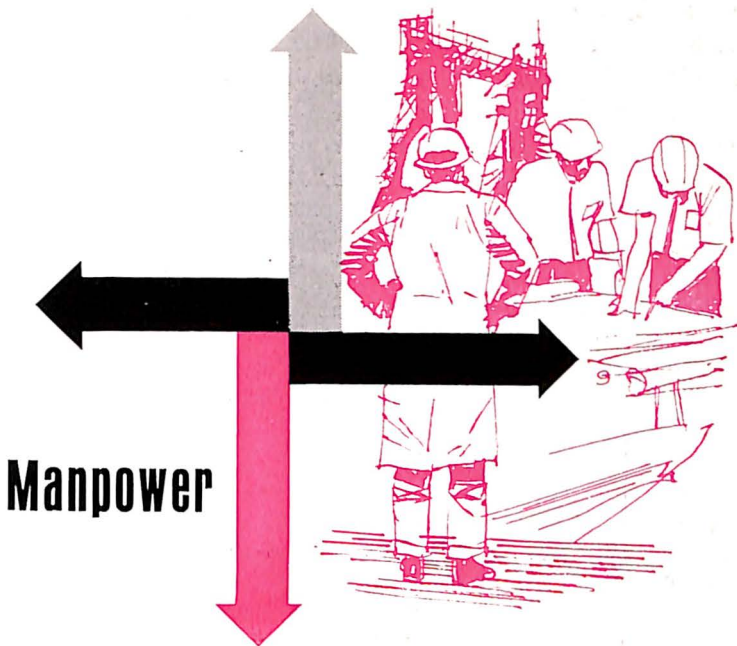
Year Ending Dec 31	TOTAL	Aircraft <sup>a</sup>	Aircraft Engines	Aircraft Parts, N.E.C.
1955	\$32,096	\$14,415	\$1,265	\$16,416
1956	86,790	55,594	2,300	28,896
1957	52,671	15,476	1,639	35,556
1958	78,560	32,715	5,991	39,854
1959	68,066	16,273	7,510	44,283
1960	60,901	6,841	7,388	46,672
1961	151,667	82,821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

<sup>a</sup> Aircraft includes new and used airplanes, seaplanes, and amphibians.

<sup>b</sup> Due to a change in the tariff classifications, import data for aircraft parts for January to August, which amounted to \$47,061,000, are on a different basis from the data for September to December, which amounted to \$16,722,000.

Source: Bureau of the Census, "U. S. Imports of Merchandise for Consumption, Report FT 110, 125" (Monthly).





The aerospace industry experienced a decline of approximately 5 per cent during 1964 after a period of level employment in 1963. However, it remained the nation's largest manufacturing employer with approximately 1,117,000 persons on its payrolls. Additionally, its workers represented 6.5 per cent of all manufacturing and 11.3 per cent of durable goods employees in the United States.

The total decline was about equally distributed between two general categories—salaried and production workers. The former includes scientists, engineers, technicians and administrative personnel. Thus, for the first time in more than a decade, 1964 figures showed a reduction in this employment category. Despite this, the total remained more than 10,000 above the level that had existed as recently as 1959.

Indicative of the technological nature of the industry, however, is the fact that employment of scientists and engineers continued to increase, although more slowly than in the past. At the close of 1964, more than 105,900 employees in this classification were on aerospace industry payrolls, slightly more than the previous year.

With the decline in total employment, aerospace payrolls in 1964 also were lower than during the previous 12 months. In 1964, \$8.598 billion

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was paid by the industry to all employees. A year earlier, this total was \$8.833 billion. Industry payrolls still represented 8.3 per cent of the nation's total manufacturing payroll outlay.

However, individual employees were receiving higher pay. For example, average weekly earnings of all aircraft production workers reached a high of \$125.36 in 1964, an increase of nearly \$3.00. This trend was led by aircraft engines and parts employees who averaged \$127.31.

Hourly averages in aircraft plants also increased from an overall \$2.95 in 1963 to \$3.05 in 1964. Aircraft engines and parts workers received the highest average wage at \$3.09 per hour.

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

Monthly Average for the Year	TOTAL AEROSPACE	AIRCRAFT <sup>a</sup>		MISSILES AND SPACE <sup>b</sup>		OTHER <sup>d</sup>
		TOTAL (Including Propulsion)	Propulsion	TOTAL Missiles and Space	Communication 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	426	109	543	166	148
<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	238	58	241	72	73

<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 Economic Data Service estimates.



## MANPOWER

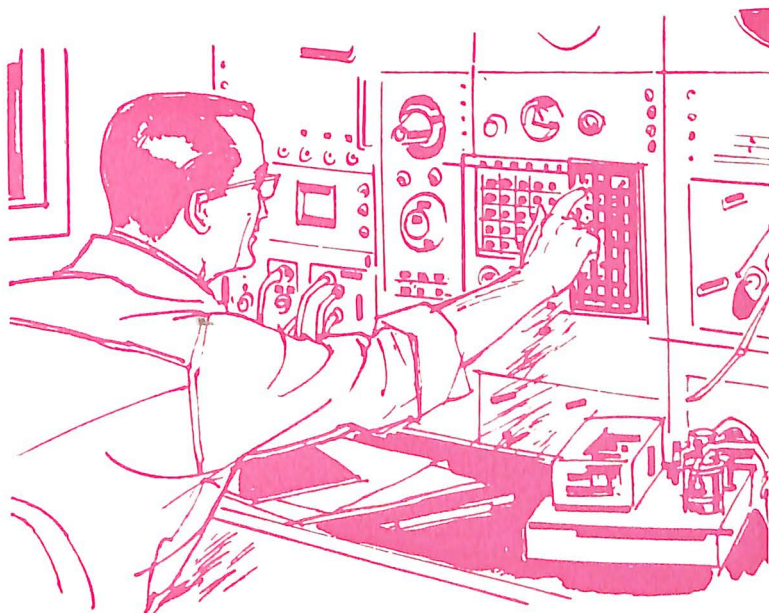
### RESEARCH AND DEVELOPMENT—SCIENTISTS AND ENGINEERS— TOTAL AND AEROSPACE 1957 to Date

As of January	TOTAL Scientists and Engineers in Industry	Aerospace Scientists and Engineers	Aerospace as a Per Cent of Total
1957	224,000	61,100	27.3
1958	238,400	61,000	25.6
1959	262,600	68,600	26.1
1960	286,300	77,300	27.0
1961	306,100	84,800	27.7
1962	319,800	94,000	29.4
1963	339,400	105,200	31.0
1964 <sup>B</sup>	348,700	105,900	30.4

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

<sup>B</sup> Estimate.

Source: National Science Foundation, "Reviews of Data on Research and Development," December, 1964.



AEROSPACE FACTS AND FIGURES, 1965

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				
Feb.	590.6	310.9	181.2	98.5

<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 180,000 employees in the aircraft and parts industry worked on missiles and spacecraft in 1964.

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				
Feb.	330.8	169.4	96.2	65.2

<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 100,000 production workers in the aircraft and parts industry worked on missiles and spacecraft in 1964.

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

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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				
Feb.	3.11	3.12	3.14	3.03

NOTE: The production workers surveyed include substantial missile and spacecraft employment. See NOTE page 79.

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)

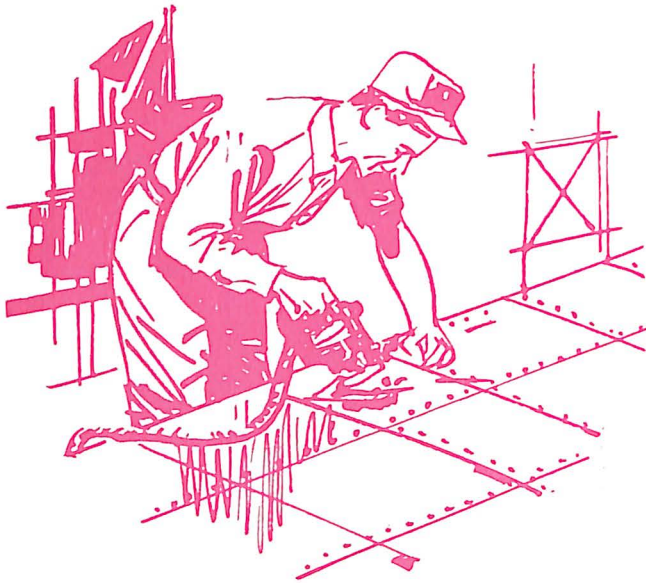
Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	\$ 36.05	N.A.
1940	N.A.	N.A.	37.62	N.A.
1941	N.A.	N.A.	47.78	N.A.
1942	N.A.	N.A.	53.38	N.A.
1943	N.A.	N.A.	59.33	N.A.
1944	N.A.	N.A.	60.75	N.A.
1945	N.A.	N.A.	57.48	N.A.
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				
Feb.	128.13	126.05	131.25	128.17

NOTE: The production workers surveyed include substantial missile and spacecraft employment. See NOTE page 79.

N.A.—Not available.

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

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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
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

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	1958	1959	1960	1961	1962	1963
TOTAL .....	782,057	754,533	668,914	625,095 <sup>b</sup>	633,024 <sup>b</sup>	633,875 <sup>b</sup>
New England .....	76,592	71,462	71,313	75,346	76,762	77,531
Massachusetts .....	9,161	9,180	8,546	9,493	9,023	9,407
Connecticut .....	65,037	60,865	61,291	64,012	65,693	66,338
Me., N.H., Vt., R.I.	2,394	1,417	1,476	1,841	2,046	1,786
Middle Atlantic .....	82,728	74,201	71,554	71,321	74,476	82,771
New York .....	54,400	48,282	45,159	44,168	44,034	50,644
New Jersey .....	16,675	15,445	15,458	14,946	16,017	14,848
Pennsylvania .....	11,653	10,474	10,937	12,207	14,425	17,279
East North Central ..	103,660	94,851	77,846	69,932	70,107	69,023
Ohio .....	58,353	60,217	49,997	41,722	39,893	39,724
Indiana .....	25,508	22,556	18,124	17,821	18,592	19,677
Illinois .....	10,855	5,271	4,304	4,896	6,100	4,110
Mich., Wis. ....	8,944	6,807	5,421	5,493	5,522	5,512
West North Central ..	74,867	69,306	62,197	57,311	60,047	63,029
Missouri .....	31,793	30,149	27,420	24,026	27,153	33,449
Kansas .....	40,710	37,269	33,193	31,177	31,805	28,840
Minn., Iowa., N.D., S.D., Neb. ....	2,364	1,888	1,584	2,108	1,089	740
South Atlantic .....	49,734	49,380	40,616	31,072	34,551	36,265
Maryland .....	26,822	23,820	16,228	3,668	3,640	3,094
Del., D.C., Va., W.Va., N.C., S.C.	590	571	497	4,539	1,210	1,842
Georgia .....	22,322	24,989	23,891	11,288	14,396	17,064
Florida .....				13,593	15,305	14,265
East South Central ..	9,785	8,509	5,303	5,031	7,498	8,561
Alabama .....	} 9,785	} 8,509	} 5,303	4,102	7,435	7,435
Ky., Tenn., Miss. ...				929	1,094	1,126
West South Central ..	60,756	52,267	44,724	43,468	41,237	6,045
Texas .....	} 60,756	} 52,267	} 44,724	39,051	36,158	40,310
Ark., La., Okla. ...				4,417	5,079	34,265
Mountain .....	16,052	22,196	27,211	17,664	21,956	20,926
Arizona .....	5,756	6,192	14,164	5,167	5,451	5,252
Utah <sup>c</sup> .....	...	...	...	8,663	11,695	12,047
Mont., Idaho, Wyo., Colo., N.Mex., Nev. ....	10,296	16,004	13,047	3,834	4,810	3,627
Pacific .....	307,883	312,361	268,150	253,916	246,349	235,459
California .....	240,997	244,670	209,830	191,050	172,413	170,634
Washington <sup>d</sup> .....	...	...	...	62,252	73,326	64,204
Ore., Alaska, Hawaii .....	66,886	67,691	58,320 <sup>b</sup>	614	610	621

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 (SIC 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.

Source: Department of Labor, Bureau of Employment Security.

AEROSPACE FACTS AND FIGURES, 1965

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

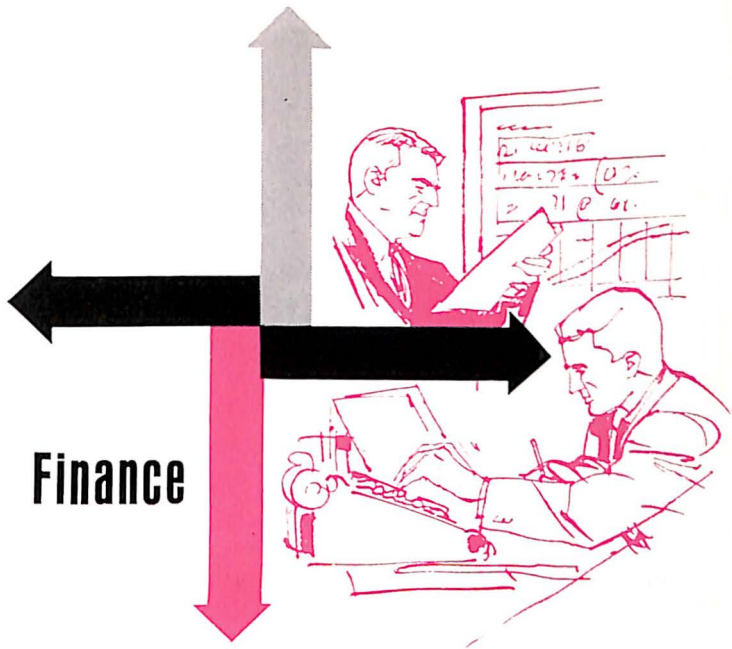
Year Ending December 31	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
1927-1933	4	1,153	18,965
1934	4	3,207	111,048
1935	1	1,700	6,800
1936	—	—	—
1937	6	9,390	90,964
1938	N.A.	N.A.	N.A.
1939	2	1,263	85,419
1940	3	6,270	36,402
1941	29	28,422	112,549
1942	15	6,584	12,416
1943	60	52,481	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

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.





Earnings of aerospace companies, as a percentage of sales, remained at their traditional low, but showed a slight increase from 2.3 per cent during 1963 to 2.6 per cent in 1964. This compares with an all manufacturing average of 5.2 per cent.

The increase was largely due to a Department of Defense policy and assisted by the cost reduction programs within individual companies. The 1964 financial data reflect the first full year of operation under the DoD policy.

Late in 1963, the Armed Services Procurement Regulation (ASPR) was revised to reflect DoD's new profit approach for industry:

"It is the policy of the Department of Defense to utilize profit to stimulate efficient contract performance. Profit generally is the basic motive of business enterprise. The government and defense contractors should be concerned with harnessing this motive to work for more effective and economical contract performance. Negotiation of very low profits, the use of historical averages or the automatic application of a predetermined percentage of the total estimated cost of a product, does *not* provide the motivation to accomplish much performance. Furthermore, low average profit rates on defense contracts overall are detrimental

to the public interest. Effective national defense in a free enterprise economy requires that the best industrial capabilities be attracted to defense contracts. These capabilities will be driven away from the defense market if defense contracts are characterized by low profit opportunities."

Cost reduction efforts enter into every facet of aerospace manufacturing, from concept and design to test and production. The effort extends into the plants of thousands of subcontractors, suppliers and vendors that furnish subsystems, materials and services to these major contractors. AIA member companies accomplished savings of nearly a billion dollars during a period ending in mid-1964.

Despite the fact that the aerospace industry sells approximately 85 per cent of its products and services to government customers, it is a highly competitive, free enterprise industry. This factor is clearly reflected in its financial reporting for the year.

For example, a high percentage of net profit is retained in the industry and reinvested. To stay competitive, new capital is a constant requirement and, to remain a free enterprise, ability to obtain financing in the open market, from other than the government, is essential.

The combination of the industry's consistently low earning rate and these heavy demands for capital and for corporate funding of advanced research continue to pose problems for the aerospace industry.

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

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."

BALANCE SHEET COMPARISONS, 50 AEROSPACE COMPANIES  
1959 to Date  
(Millions of Dollars)

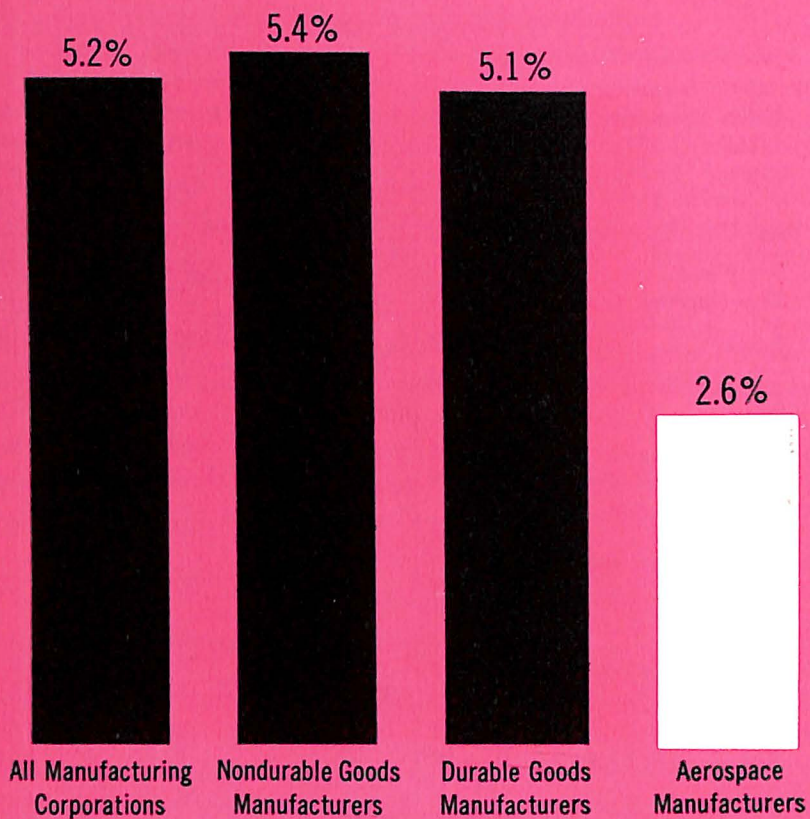
	1959	1960	1961	1962	1963	1964
<b>Assets:</b>						
<b>Current Assets</b>						
Cash .....	\$ 358	\$ 363	\$ 417	\$ 395	\$ 435	\$ 415
U. S. Government Securities	91	102	58	46	39	74
<b>Total Cash and U. S. Govt. Securities .....</b>	<b>\$ 449</b>	<b>\$ 465</b>	<b>\$ 475</b>	<b>\$ 441</b>	<b>\$ 474</b>	<b>\$ 489</b>
Receivables (total) .....	1,658	1,718	1,906	1,981	1,847	1,695
Inventories (gross) .....	3,440	3,425	3,470	3,580	3,936	3,876
Other current assets .....	104	82	112	133	174	193
<b>Total Current Assets ....</b>	<b>\$5,651</b>	<b>\$5,690</b>	<b>\$5,963</b>	<b>\$6,135</b>	<b>\$6,431</b>	<b>\$6,253</b>
Total Net Plant .....	1,092	1,195	1,420	1,509	1,575	1,591
Other Non-Current Assets ...	164	229	305	257	278	341
<b>Total Assets .....</b>	<b>\$6,906</b>	<b>\$7,113</b>	<b>\$7,688</b>	<b>\$7,901</b>	<b>\$8,284</b>	<b>\$8,185</b>
<b>Liabilities:</b>						
<b>Current Liabilities</b>						
Short term loans .....	718	745	700	698	461	388
Advances by U.S. Govt. ...	1,409	1,346	1,308	1,338	1,674	1,725
Trade accounts and notes payable .....	1,001	955	1,005	1,037	1,072	928
Federal income taxes accrued .....	196	165	186	265	255	239
Instalments due on long term debt .....	37	25	24	32	28	38
Other current liabilities ...	538	654	822	769	756	770
<b>Total current liabilities ..</b>	<b>\$3,899</b>	<b>\$3,890</b>	<b>\$4,045</b>	<b>\$4,139</b>	<b>\$4,246</b>	<b>\$4,088</b>
Long Term Debt .....	541	645	806	783	835	816
Other Non-Current Liabilities	20	32	28	37	42	47
<b>Total Liabilities .....</b>	<b>\$4,460</b>	<b>\$4,567</b>	<b>\$4,879</b>	<b>\$4,959</b>	<b>\$5,123</b>	<b>\$4,951</b>
<b>Stockholder's Equity:</b>						
Capital Stock .....	977	1,154	1,291	1,318	1,354	1,339
Earned Surplus and Reserves	1,468	1,394	1,517	1,625	1,808	1,895
<b>Total Net Worth .....</b>	<b>\$2,445</b>	<b>\$2,548</b>	<b>\$2,808</b>	<b>\$2,943</b>	<b>\$3,162</b>	<b>\$3,234</b>
<b>Total Liabilities and Stock- holders' Equity .....</b>	<b>\$6,906</b>	<b>\$7,113</b>	<b>\$7,688</b>	<b>\$7,901</b>	<b>\$8,284</b>	<b>\$8,185</b>
<b>Net Working Capital .....</b>	<b>\$1,752</b>	<b>\$1,800</b>	<b>\$1,918</b>	<b>\$1,996</b>	<b>\$2,185</b>	<b>\$2,166</b>

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."



**NET PROFIT AFTER TAXES, 1964**  
(as a Per Cent of Sales)



Source: Net profit as a Per Cent of Sales for Manufacturing Corporations, Page 17.



FINANCE

INCOME ACCOUNTS, 50 AEROSPACE COMPANIES  
1958 to Date  
(Millions of Dollars)

	1958	1959	1960	1961	1962	1963	1964
Net Sales . . . . .	12,575	\$12,488	\$12,974	\$13,954	\$15,206	\$15,313	\$15,403
Net Profit from Operations . . . . .	664	451	386	570	739	695	756
Total Income before Federal Income Taxes . . . . .	636	411	333	521	682	665	748
Provision for Federal Income Taxes . . . . .	329	215	148	264	322	316	351
Net Profit after Taxes	307	196	185	257	360	350	395
Net Profit Retained in Business . . . . .	42	18	20	37	58	54	60

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
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

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."

**MAJOR DEFENSE CONTRACTORS**  
Listed by rank according to net value of military prime  
contracts awarded, 1950-1964  
(Millions of Dollars)

Company	July 1, 1950 to June 30, 1964	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	World War II* (Per Cent)
<b>U. S. TOTAL, ALL CONTRACTS</b>	\$326,911.6	\$25,163.7	\$25,834.0	\$25,588.4	\$22,693.1	100.0%
Boeing . . . . .	\$ 16,379.7	\$ 1,365.2	\$1,356.3	\$1,132.8	\$ 919.8	1.5
General Dynamics . . .	14,490.1	986.7	1,033.2	1,196.6	1,920.1	N.A.
Lockheed . . . . .	12,379.7	1,455.4	1,517.0	1,419.3	1,175.2	1.9
General Electric . . . .	12,087.1	892.6	1,021.2	975.9	874.6	1.9
North American . . . .	11,565.9	1,019.5	1,062.4	1,032.5	1,197.4	1.6
United Aircraft . . . .	10,017.1	625.4	529.9	662.7	625.5	2.2
General Motors . . . .	9,365.2	255.8	444.0	449.0	281.8	7.9
Douglas . . . . .	7,374.4	203.2	361.1	365.6	307.4	2.5
American Telephone and Telegraph . . . .	6,932.3	635.6	578.6	467.7	550.6	1.5
Martin Marietta . . . .	5,950.4	476.4	766.8	802.7	691.8	1.3
McDonnell . . . . .	4,829.8	1,157.4	497.0	310.9	219.9	N.A.
Sperry Rand . . . . .	4,470.5	373.9	445.5	465.6	408.0	0.9
Republic . . . . .	4,224.2	66.9	196.8	332.8	295.7	0.7
Hughes . . . . .	3,597.6	288.7	312.9	243.2	331.2	N.A.
Grumman . . . . .	3,516.3	395.6	390.5	303.6	238.0	0.8
Bendix . . . . .	3,512.8	257.4	290.3	285.9	266.8	1.1
Curtiss-Wright . . . .	3,320.6	51.2	98.4	144.6	69.8	4.1
Westinghouse Electric Radio Corp. of America . . . . .	3,310.3	236.9	322.6	246.0	307.7	0.8
Raytheon . . . . .	3,295.0	233.6	328.6	339.6	392.3	0.3
International Busi- ness Machines . . . .	2,984.0	253.0	294.9	406.6	304.9	N.A.
General Tire & Rubber	2,928.6	332.4	203.3	155.5	333.0	N.A.
Northrop . . . . .	2,568.3	364.4	424.6	366.1	290.2	N.A.
Aveco . . . . .	2,556.1	164.9	222.9	152.5	155.6	0.1
Textron . . . . .	2,453.7	278.7	253.1	323.3	251.6	0.6
Thiokol . . . . .	1,428.7	216.3	151.2	117.4	65.8	0.7
Ling-Temco-Vought . .	1,206.4	253.6	238.6	178.3	210.0	N.A.
	811.5	247.5	205.9	133.4	46.8	N.A.

N.A.—Not available.  
\* 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

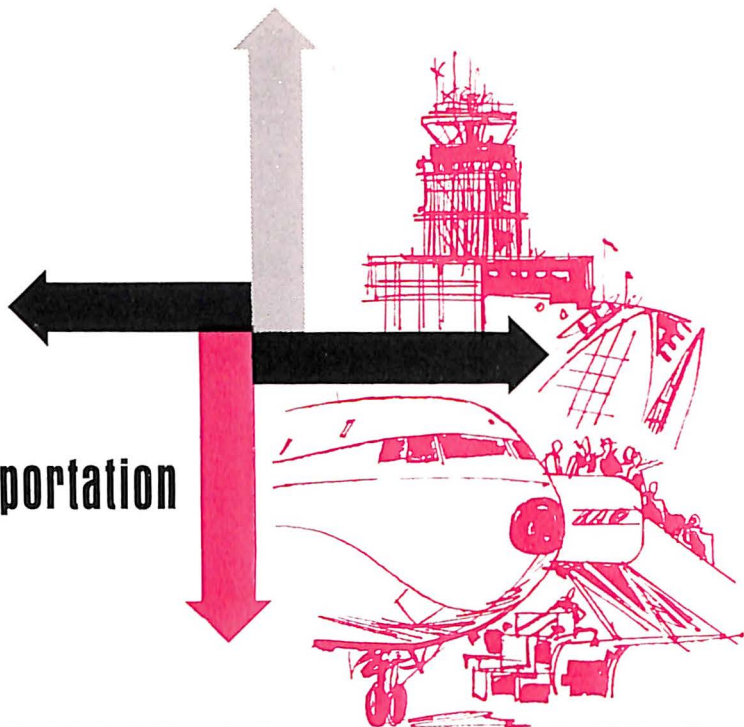
MAJOR NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CONTRACTORS  
 (Listed by rank according to net value of NASA prime contracts  
 awarded, July 1, 1960-June 30, 1964)  
 (Millions of Dollars)

COMPANY	July 1, 1960 to June 30, 1964	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
U. S. TOTAL, ALL CONTRACTS	\$7,259.6	\$3,521.1	\$2,261.6	\$1,053.6	\$423.3
North American .....	\$1,717.1	\$ 917.2	525.8	199.1	75.0
McDonnell .....	571.0	267.6	193.1	68.5	41.8
Douglas .....	509.9	250.3	160.5	68.4	30.7
Aerojet General .....	369.0	135.8	160.5	66.4	6.3
Boeing .....	313.7	197.1	101.0	15.6	"
General Dynamics .....	281.3	148.2	103.1	27.9	2.1
Grumman .....	240.4	156.4	48.2	24.6	11.2
General Electric .....	228.8	143.6	53.0	23.0	9.2
Chrysler .....	219.0	99.4	75.4	31.3	12.9
International Business Machines .....	134.3	85.6	36.1	12.6	"
Radio Corp. of America ....	120.8	49.8	42.2	20.2	8.6
United Aircraft .....	119.7	36.7	48.9	34.1	"
Brown Engineering .....	104.2	41.6	24.1	11.9	6.7
Bendix .....	100.3	41.9	32.5	19.4	6.5
Ling-Temco-Vought .....	84.0	21.5	26.7	27.0	8.8
Lockheed .....	71.0	39.0	23.7	5.0	3.3
Hayes International .....	55.4	18.7	15.4	11.0	10.3
Phileo .....	55.0	35.7	14.9	4.4	"
General Motors .....	52.1	41.9	10.2	"	"
Thompson-Ramo-Wooldridge	45.4	39.0	2.6	3.8	"
Hughes .....	42.4	14.9	18.3	9.2	"
Western Electric .....	35.3	"	"	8.7	26.6
Republic .....	25.2	9.3	9.3	6.9	"
Union Carbide .....	24.5	20.1	"	4.4	"
Raytheon .....	23.4	23.4	"	"	"
Kollsman Instrument .....	19.9	13.6	5.1	1.2	"
Honeywell .....	17.7	7.1	3.2	4.7	2.7
Martin Marietta .....	17.5	8.5	7.2	1.8	"
Sperry Rand .....	17.2	11.8	3.2	2.2	"
Fairechild Stratos .....	16.6	10.4	6.2	"	"
Bellecomm .....	16.1	8.7	6.4	"	"

" 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 had an outstanding year in 1964. On combined domestic and international routes, they flew 82 million passengers over 58 billion passenger-miles, an increase of 14 per cent and 16 per cent respectively over the previous year.

Cargo traffic (freight, mail and express) continued to show strong growth. The industry performed a total of 1.6 billion cargo ton-miles.

During the year, the airlines took delivery of 141 fixed-wing aircraft, 132 of which were turbojet-powered.

In the past 10 years, the cost of property and equipment has quadrupled, representing at the end of 1964 a total investment in excess of \$5 billion. In the two decades since the end of World War II, the airlines have multiplied their investment in property and equipment about 40 times.

The year 1964 marked the emergence of the industry from a long period of low profits as net profits after taxes amounted to \$226.4 million.

As of April 1965, the airlines had on order 429 new turbojet and turboprop aircraft, plus 5 turbine-powered helicopters, representing a dollar volume of \$2.1 billion. This exceeds the \$1.9 billion in orders placed in 1957 at the height of the original transition from piston engine aircraft to jets.



AIR TRANSPORTATION

An additional investment of \$5-\$8 billion in expansion of airline capacity and service is in prospect. Within the next eight or ten years, it is estimated that the U. S. airlines will be operating some 150 to 200 supersonic jets.

Progress in developing new passenger services on the ground to keep pace with improvements in the air was made in 1964.

During the year the airlines continued their campaign to assure that the Federal Aviation Administration's planning standards recognize the needs of smaller communities for low-cost but efficient radio and lighting aids that make possible more reliable air service.

The reliability of turbojet engines was demonstrated during the year by the low incidence of flight delays and cancellations for mechanical reasons. One major airline reported that only 0.6 per cent of all flights were cancelled for mechanical reasons.

Another indicator of jet engine reliability is the present 6200 hours

INVENTORY OF CIVIL AIRCRAFT  
Including Air Carrier Aircraft  
1928 to Date

Year As of January 1	TOTAL	Active	Inactive
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

N.A.—Not available.  
Source: Federal Aviation Agency, "FAA Statistical Handbook of Aviation" (Annually).

between overhauls for a jet engine that first saw airline service in 1959. The best time between overhauls of piston engines in airline service is under 3000 hours.

Major advances were made by the helicopter airlines during the year. Trips which now take an hour or more on the surface can be made by helicopter in under 10 minutes.

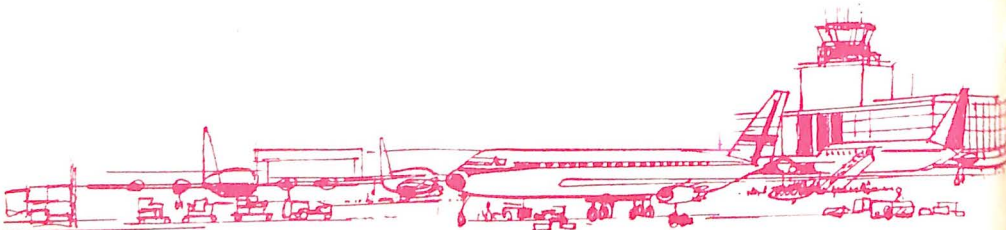
The airlines spent \$150 million in 1964 to stimulate the flow of travel and trade to and from the United States. Eighty per cent of all travelers between the U. S. and overseas foreign countries went by air. Sixty-two per cent of these were U. S. citizens.

A further spur to travel in 1964 were the reduced transatlantic fares. Rates went down as much as 21 per cent from those in effect at the end of 1963—an all-time low.

INVENTORY OF ACTIVE CIVIL AIRCRAFT, BY YEAR OF MANUFACTURE  
AS OF JANUARY 1, 1965

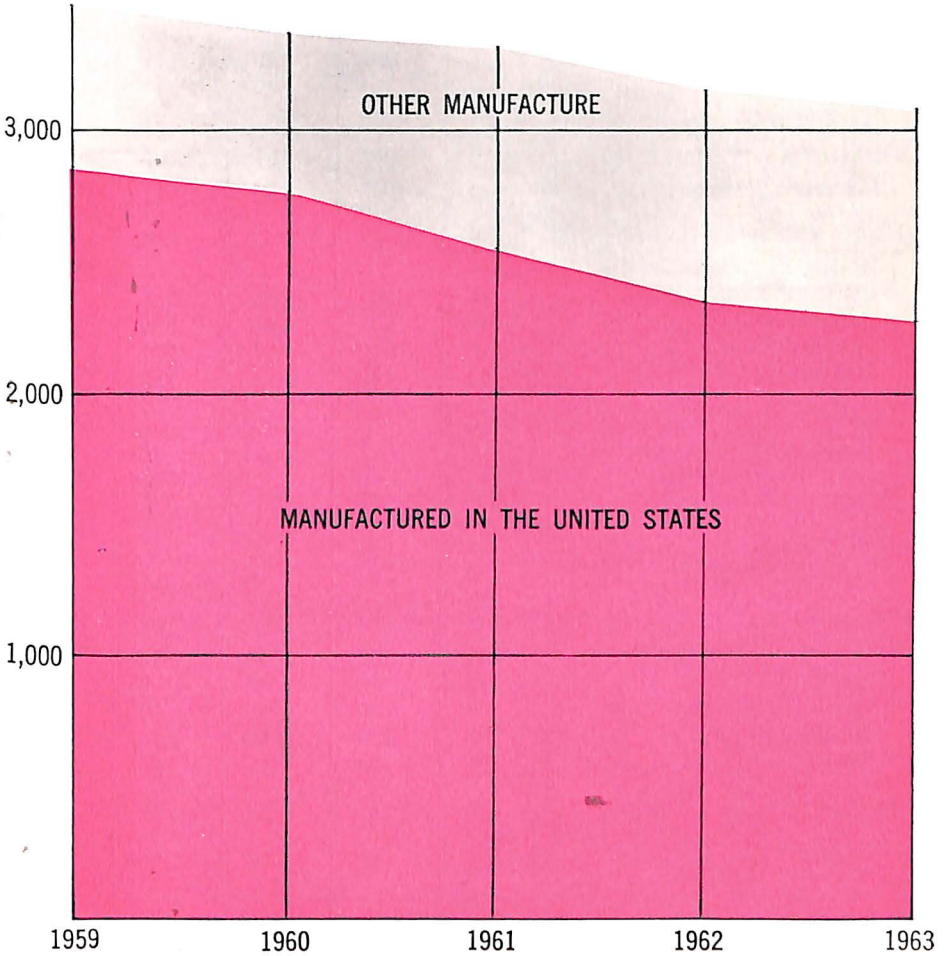
Year of Manufacture	Number	Per Cent of Total
TOTAL	90,935	100.0
1964	7,612	8.4
1963	5,955	6.5
1962	5,082	5.6
1961	4,848	5.3
1960	5,426	6.0
1959	5,897	6.5
1958	4,658	5.1
1957	3,890	4.3
1956	4,528	5.0
1955	2,886	3.2
1954	40,153	44.1

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



AIR TRANSPORTATION

AIRCRAFT IN OPERATION ON WORLD CIVIL AIRLINES  
1959-1963



For statistical data on which this chart is based, see Aircraft in Operation on World Civil Airlines, Number and Percentage Manufactured in the U. S., Pages 17 and 96.

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

	1959	1960	1961	1962	1963
TOTAL MANUFACTURED IN U.S. . . . .	2,868	2,766	2,542	2,345	2,266
<u>4 Engine</u> . . . . .	1,511	1,568	1,505	1,474	1,434
<u>Turbojets</u> . . . . .	97	285	423	517	580
Boeing 707 . . . . .	76	143	150	209	206
Boeing 720 . . . . .	—	23	40	51	55
Boeing 720B . . . . .	—	—	44	25	52
Douglas DC-8 . . . . .	21	110	149	167	183
Convair 880 . . . . .	—	9	40	44	53
Convair 990 . . . . .	—	—	—	21	31
<u>Turboprops</u> . . . . .	108	127	137	137	137
Lockheed Electra . . . . .	108	127	137	137	137
<u>Piston Engine</u> . . . . .	1,306	1,156	945	820	717
Boeing Stratocruiser . . . . .	26	—	—	—	—
Lockheed Constellation . . . . .	412	362	261	206	179
Douglas DC-7 . . . . .	296	276	254	232	178
Douglas DC-6 . . . . .	418	372	316	277	257
Douglas DC-4 . . . . .	154	146	114	105	103
<u>3 Engine</u> . . . . .	—	—	—	—	4
Boeing 727 (turbojet) . . . . .	—	—	—	—	4
<u>2 Engine</u> . . . . .	1,308	1,125	971	833	783
<u>Turboprops</u> . . . . .	17	21	8	7	7
Fairchild F-27 . . . . .	17	21	8	7	7
<u>Piston Engine</u> . . . . .	1,291	1,104	963	826	776
Convair 240, 340, 440 . . . . .	364	321	288	250	228
Martin 202, 404 . . . . .	91	75	40	4	4
Curtiss Commando C-46 . . . . .	60	48	36	36	37
Douglas DC-3 . . . . .	750	634	568	516	479
Other . . . . .	26	26	31	20	28
<u>1 Engine</u> . . . . .	11	37	34	12	18
<u>Helicopters</u> . . . . .	38	36	32	26	27
ALL MANUFACTURERS GRAND TOTAL . . . . .	3,479	3,376	3,319	3,162	3,086
Per Cent of Grand Total Manufactured in U.S. . . . .	82.4	81.9	76.6	74.2	73.4

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



AIR TRANSPORTATION

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	625	160
1953	1,205	52	28,500	720	185
1955	1,425	68	38,000	900	255
1956	1,580	77	44,000	1,020	275
1957	1,760	86	50,500	1,125	295
1958	1,820	87	53,000	1,150	320
1959	1,915	98	60,000	1,320	355
1960	1,920	106	67,500	1,495	415
1961	1,925	111	72,500	1,705	490
1962	2,010	121	80,500	2,015	545
1963	2,120	135	91,500	2,255	590
1964	2,285	154	105,500	2,685	625

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).



AEROSPACE FACTS AND FIGURES, 1965

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

Type of Aircraft, Number of Engines, and Model	January 1, 1965	January 1, 1964	January 1, 1963
<b>TOTAL, AIRCRAFT</b> .....	<b>2,081</b>	<b>2,079</b>	<b>2,047</b>
<b>Total fixed-wing</b> .....	<b>2,061</b>	<b>2,059</b>	<b>2,027</b>
<u>Turbine-powered—total</u> .....	840	699	659
<u>Four engine—total</u> .....	669	626	593
<u>Turbojet—total</u> .....	456	412	377
B-707 .....	160	136	117
B-720 .....	112	104	99
CV-990 .....	19	19	15
CV-880 .....	48	46	45
DC-8 .....	117	107	101
<u>Turboprop, total</u> .....	213	214	216
L-188, 188A .....	126	126	123
V-745 .....	48	49	55
V-810/812 .....	11	11	12
Argosy .....	7	7	5
CL-44 .....	21	21	21
<u>Three engine—total</u> .....	88	—	—
B-727 (turbojet) .....	88	—	—
<u>Twin engine—total</u> .....	79	71	66
Caravelle (turbojet) .....	20	20	20
F-27 (turboprop) .....	54	50	46
G-159 (turboprop) .....	1	1	1
CV-340 (turboprop) .....	4	—	—
<u>Single engine—total</u> .....	4	2	—
PC-6A (turboprop) .....	4	2	—
<u>Piston-powered—total</u> .....	1,221	1,360	1,368
<u>Four engine—total</u> .....	563	645	700
B-377 .....	1	1	—
DC-4 .....	22	24	23
DC-6 .....	234	249	258
DC-7 .....	132	173	210

(Continued on next page)

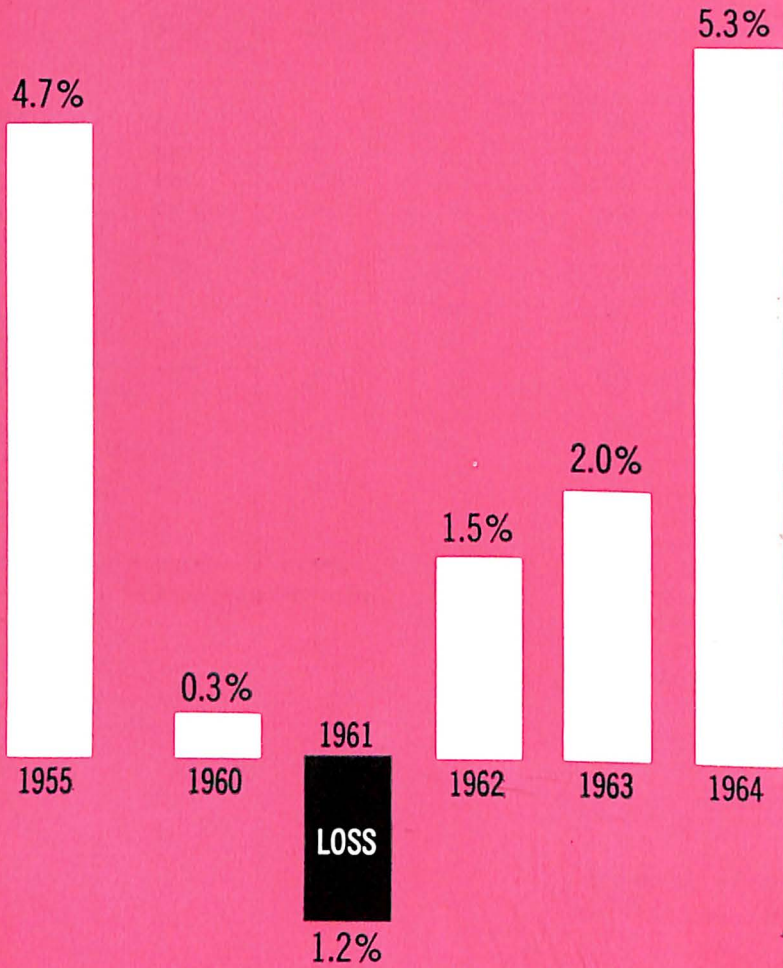
AIR TRANSPORTATION

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, 1965	January 1, 1964	January 1, 1963
<u>Four engine, <i>continued</i> . . . . .</u>			
L-049/149 . . . . .	7	13	9
L-749 . . . . .	43	46	51
L-1049 . . . . .	101	109	115
L-1649 . . . . .	23	30	33
VS-44A . . . . .	—	—	1
<u>Twin engine—total . . . . .</u>	620	662	666
AC-680E . . . . .	1	1	—
CV-28-5ACF . . . . .	3	4	2
CV-240 . . . . .	51	49	50
CV-340/440 . . . . .	154	154	151
CT-50 . . . . .	—	1	—
C-46, 20T . . . . .	88	99	98
C-185 . . . . .	—	—	1
DC-3, 3A . . . . .	204	247	261
DC-2 . . . . .	1	1	1
F-C-82 . . . . .	1	—	—
G-21, 21A . . . . .	20	20	17
G-44A . . . . .	5	4	—
G-SA16 . . . . .	2	2	—
G-T3 . . . . .	2	—	—
M-202A . . . . .	17	16	17
M-404 . . . . .	71	64	68
Single engine—total . . . . .	38	53	2
<u>Total rotary-wing . . . . .</u>	20	20	20
<u>Turbine-powered—total . . . . .</u>	13	12	8
S-61 . . . . .	6	4	4
S-62 . . . . .	3	4	—
V-107 II . . . . .	4	4	4
<u>Piston-powered—total . . . . .</u>	7	8	12
B-47 . . . . .	—	1	1
S-51 . . . . .	1	1	—
S-55 . . . . .	2	2	5
S-58C . . . . .	4	4	5
V-44B . . . . .	—	—	1

Source: Federal Aviation Agency, "FAA Statistical Handbook of Aviation," (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 <sup>E</sup>	31.1	20.3	19.7 <sup>E</sup>	692.0 <sup>E</sup>
1962	794.4 <sup>E</sup>	33.6	19.8	21.3 <sup>E</sup>	719.7 <sup>E</sup>
1963	819.9 <sup>E</sup>	38.5	18.5	21.9 <sup>E</sup>	741.0 <sup>E</sup>
1964	848.3 <sup>E</sup>	44.1	18.5 <sup>E</sup>	22.7 <sup>E</sup>	763.0 <sup>E</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

N.A.—Not available.

<sup>E</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.

UNITED STATES CIVIL AIRLINES  
Selected Calendar Years, 1949 to Date

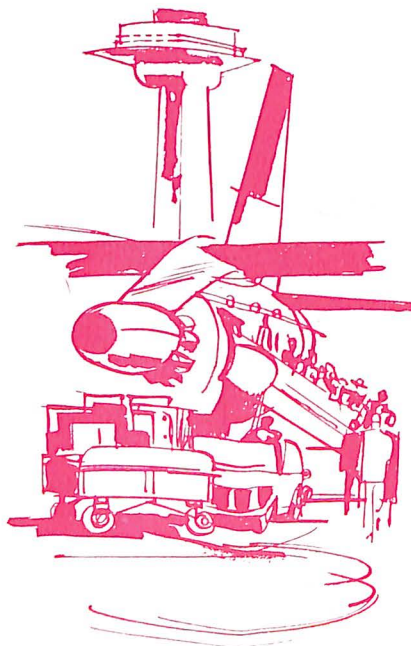
Year Ending Dec 31	Revenue Miles Flown (Millions)	Passengers Carried (Millions)	Revenue Passenger-Miles (Millions)	Cargo Ton-Miles <sup>a</sup> (Millions)	Mail Ton-Miles <sup>b</sup> (Millions)
1949	463	17	8,827	196	66
1951	527	25	13,204	324	92
1953	657	32	18,245	359	106
1955	780	42	24,351	503	150
1956	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	382

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.



## AIR TRANSPORTATION



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

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.

AEROSPACE FACTS AND FIGURES, 1965

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

As of June 30	Total Assets	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

NOTE: Excludes helicopter airlines.

Sources:

Civil Aeronautics Board 1964, "Annual Report."

Civil Aeronautics Board, Research and Statistics Section.

COMMERCIAL JET TRANSPORT AIRCRAFT ON ORDER  
 BY U. S. AIR LINES  
 April 7, 1965

Company and Aircraft	Number	Company and Aircraft	Number
GRAND TOTAL .....	497 <sup>a</sup>	<u>Turboprops</u>	
<u>Turbojets</u>		Total (excluding conversions) .....	27
Total .....	402	Convair 240D .....	(35) <sup>a</sup>
Boeing 707 .....	50	Convair 580 .....	(11) <sup>a</sup>
Boeing 720 .....	6	Nord 262 .....	8
Boeing 727 .....	131	Fairechild FH-227 ...	19
Boeing 737 .....	40	<u>Helicopters</u>	5
Douglas DC-8 .....	28	<u>Supersonic Transports</u> ..	63
Douglas DC-9 .....	84	US. ....	42 <sup>b</sup>
BAC-111 .....	51	Concorde .....	21
Lockheed 300B .....	12		

<sup>a</sup> Conversion from piston to turboprop not included in totals.

<sup>b</sup> Tentative.

Source: Air Transport Association.

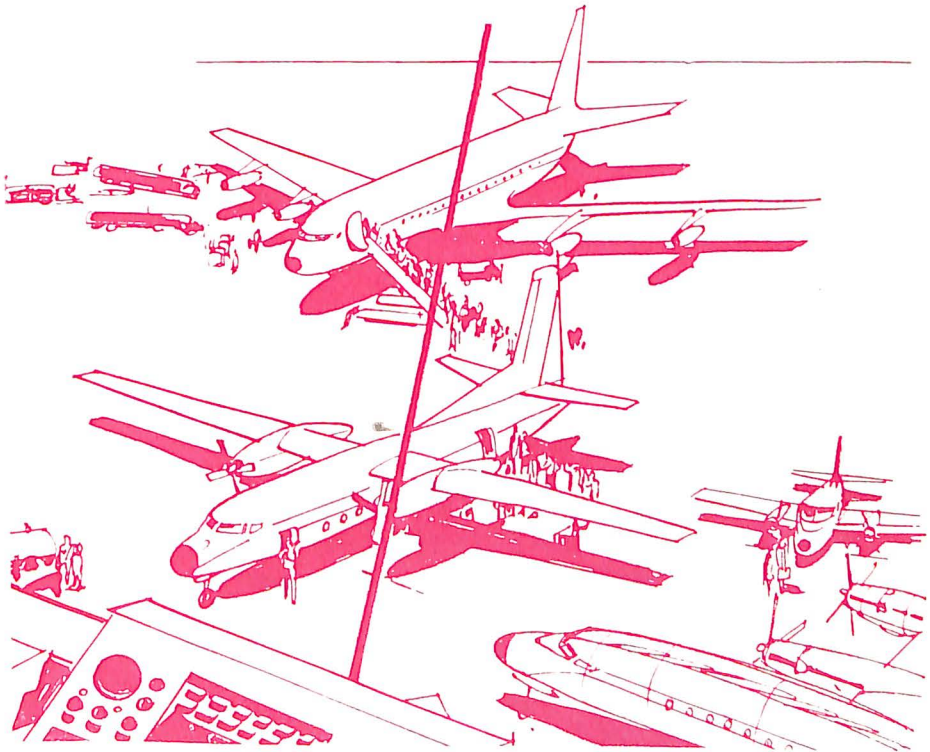


AIR TRANSPORTATION

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

<sup>a</sup> Excludes helicopters.  
 Source: Civil Aeronautics Board.



TRANSPORTATION ACCIDENT DEATH RATES  
(Deaths per 100,000,000 Passenger-Miles)  
Calendar Years 1946 to Date

Year Ending December 31	Domestic Airlines	Railroads	Buses	Cars and Taxis
<i>Passenger Death Rates</i>				
1946	1.2	0.18	0.19	2.5
1947	3.2	0.16	0.21	2.3
1948	1.3	0.13	0.18	2.9
1949	1.3	0.08	0.23	2.7
1950	1.5	0.58	0.18	2.9
1951	1.0	0.43	0.24	3.0
1952	0.35	0.04	0.21	3.0
1953	0.56	0.16	0.18	2.9
1954	0.09	0.08	0.11	2.7
1955	0.76	0.07	0.18	2.7
1956	0.62	0.20	0.16	2.7
1957	0.12	0.07	0.19	2.6
1958	0.43	0.27	0.17	2.3
1959	0.69	0.05	0.21	2.3
1960	0.93	0.16	0.13	2.2
1961	0.38	0.10	0.19	2.1
1962	0.34	0.14	0.11	2.3
1963	0.12	0.07	0.23	2.3
1964	0.15 <sup>b</sup>	N.A.	N.A.	N.A.
<i>Total Death Rates<sup>a</sup></i>				
1946	1.8	3.2	1.4	4.0
1947	3.4	3.9	1.4	3.7
1948	1.6	4.0	1.2	3.4
1949	1.5	4.0	1.2	4.0
1950	1.3	4.7	1.1	4.2
1951	1.6	4.2	1.1	4.3
1952	0.5	3.4	1.0	4.2
1953	0.7	3.9	0.95	4.1
1954	0.1	3.4	0.82	3.7
1955	0.9	3.7	0.96	3.7
1956	0.7	3.5	0.84	3.6
1957	0.1	3.5	0.89	3.4
1958	0.5	4.1	0.87	3.2
1959	0.85	3.3	0.95	3.1
1960	1.04	3.6	0.76	3.0
1961	0.42	3.6	0.84	2.9
1962	0.41	4.0	0.68	3.1
1963	0.16	N.A.	0.78	3.1
1964	0.17	N.A.	N.A.	N.A.

N.A.—Not available.

<sup>a</sup> Includes pedestrians, employees, trespassers, etc.

<sup>b</sup> Preliminary.

Source: National Safety Council, "Accident Facts" (Annually).



## GENERAL AVIATION

General aviation is all civil flying except that of the commercial air carriers. This largest and most rapidly increasing segment of flying continued its growth during 1964 both in the numbers of airplanes and the utilization of the fleet.

Production of 9,336 airplanes valued at manufacturers' net billing price of \$198,876,000 made 1964 a big year in the history of the industry, an increase of 23 per cent over 1963. The seating capacity of this production ranged from single-place agricultural models to business airplanes of ten to twelve seats. Powerplants included piston, turboprop, and turbojet.

There were 1,618 twin-engine models produced, 6,114 single-engine having four or more seats and 1,604 single-engine with less than four seats. Biggest growth was in the single-engine models with larger capacity. This category increased 27 per cent over the previous year. Production in this type amounted to 80 per cent of the total industry production for all classes during 1963.

Utilization of general aviation airplanes increased substantially. The Federal Aviation Agency reports airplane movements only at airports with control towers, which is only 3 per cent of the more than 8,000 airports. During 1964, general aviation movements increased more than 20 per cent over the previous year. General aviation accounted for 67.3 per cent of all airport activity at these airports where movements are recorded. At the remaining airports, general aviation accounts for virtually all the movements. Three of the ten busiest airports in the U. S. have no scheduled airline service.

General aviation flying falls into four basic categories: business travel



AEROSPACE FACTS AND FIGURES, 1965

not for hire, personal travel, commercial, and instruction. The business category alone flies more hours than all the scheduled airlines combined and total general aviation flying exceeds airline hours more than four to one. Commercial activities include air taxi, charter, agricultural application, patrol, and similar activities. Air taxi is the fastest growing single use of general aviation airplanes. Over the past five years, air taxi operations have been increasing at an average of 32 per cent a year.

Not only is general aviation fulfilling the needs of business, personal, and cargo transportation direct from point to point, it is also a major feeder system to the scheduled airlines. One study last year indicated 85 per cent of all general aviation activities at one airport were for airline passenger connections.

The general aviation fleet of active airplanes increased to more than 90,000 last year and traveled in excess of two billion miles.

ACTIVE 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 Carrier <sup>a</sup>	General Aviation Aircraft						
			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

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."



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

Year Ending December 31	Total	Business		Commercial		Instructional		Personal		Other	
		Units	Per- cent	Units	Per- cent	Units	Per- cent	Units	Per- cent	Units	Per- cent
ESTIMATED HOURS FLOWN, Thousands											
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	"
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	"
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
ESTIMATED MILES FLOWN, Thousands											
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	858,610	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	"
1961 <sup>c</sup>	1,857,946	887,671	48	332,876	18	203,425	11	425,342	23	8,632	"
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

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).

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

Year Ending December 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

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>E</sup>	93,973	144,312 <sup>E</sup>	92,976 <sup>E</sup>	19,155 <sup>E</sup>	2,444 <sup>E</sup>	175,287 <sup>E</sup>	98,257 <sup>E</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	4,24	195,396	116,600

<sup>E</sup> Estimate.

Source: Federal Aviation Agency, Office of Management Services.



## VERTICAL LIFT AIRCRAFT

Helicopters continued to perform their versatile roles in 1964.

During the floods in the Northwestern states, military and civilian helicopters in many areas were the only means of transport, performing life-saving rescues and delivering needed supplies.

Helicopters are used as assault transports in Viet Nam and provide increased mobility for ground troops.

More than 5,500 helicopters are in the inventory of the military services. As does the Army, the Marine Corps uses the helicopter as a troop carrier and in close combat support. In Navy service, carrier-based helicopters are on stand-by rescue for airplane landings and take-offs and serve in anti-submarine patrol. In addition to search and rescue, the Air Force employs helicopters to support missile sites and to combat crash fires. The U. S. Coast Guard continues to develop new roles for helicopters in performing its many missions.

The AIA's Directory of Helicopter Operators—Commercial-Executive-Government in the U.S. and Canada lists 860 operators and 2053 helicopters.

Of this total, the Executive list reveals 299 varied industries and business concerns now operate 401 helicopters. For example, plumbing, lumber, steel, mining, sand and gravel, gas, furniture, printing, construction industries as well as ranches and radio stations are using helicopters.

Traffic congestion, a modern dilemma, is being relieved by today's "Helicasters and Trafficopters." In more than fifteen major metropolitan areas across the country, radio stations, police departments and helicopters work together to aid the rush-hour motorists. For example, in Los Angeles the "Airwatch" copter reports the location of traffic jams,

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highway accidents and re-routes the office-bound or home-bound drivers.

The 1964 Directory of Heliports/Helistops in the U.S., Canada and Puerto Rico lists more than two hundred additional established heliports since the 1963 Directory, bringing the total to 1,000.

Of these 1,000 helicopter landing facilities listed, 579 are privately owned and operated. This points to the need for more municipally owned public heliports located in city-centers to permit the use of the helicopter as a short-haul VTOL-type transport.

During the year, the country's first public use rooftop heliport was opened in downtown Los Angeles and the Flying Physicians Association adopted a resolution to encourage the establishment of hospital heliports.

The 1964 Vertical Lift Aircraft Designation Chart reports 79 helicopters or other type VTOL's in production, operation and/or research and development. The production models range in size from one-place to 79-places.

The tilt-propeller, the tilt-wing and flap, and fan-type VTOL's such as the fan-in-wing, lift fan and the tilt-duct and ducted fan are some of the eight design concepts being developed for the military.

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

Source: Civil Aeronautics Board.



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

Source: Civil Aeronautics Board.

U. S. built helicopters established 21 new world altitude and speed records in 1964.

The number of qualified helicopter pilots was increased by nearly 1500 in 1964. In 1963, there were 8,134 helicopter pilots. By the end of 1964 there were 9,542 recorded with the Federal Aviation Agency.

A significant breakthrough in all-weather helicopter capability was the certification of instrument helicopter flight operations for Los Angeles Airways and New York Airways by the Federal Aviation Agency. These two scheduled helicopter airlines operate Sikorsky and Vertol twin-engine turbine transport helicopters.





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>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.

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 Transport Rating ...	272	145	127	—

Source: Federal Aviation Agency, Statistical Department.

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

<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.

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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.
- Silo:** a missile shelter that consists of a hardened vertical hole in the ground with facilities for launching the missile.
- 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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