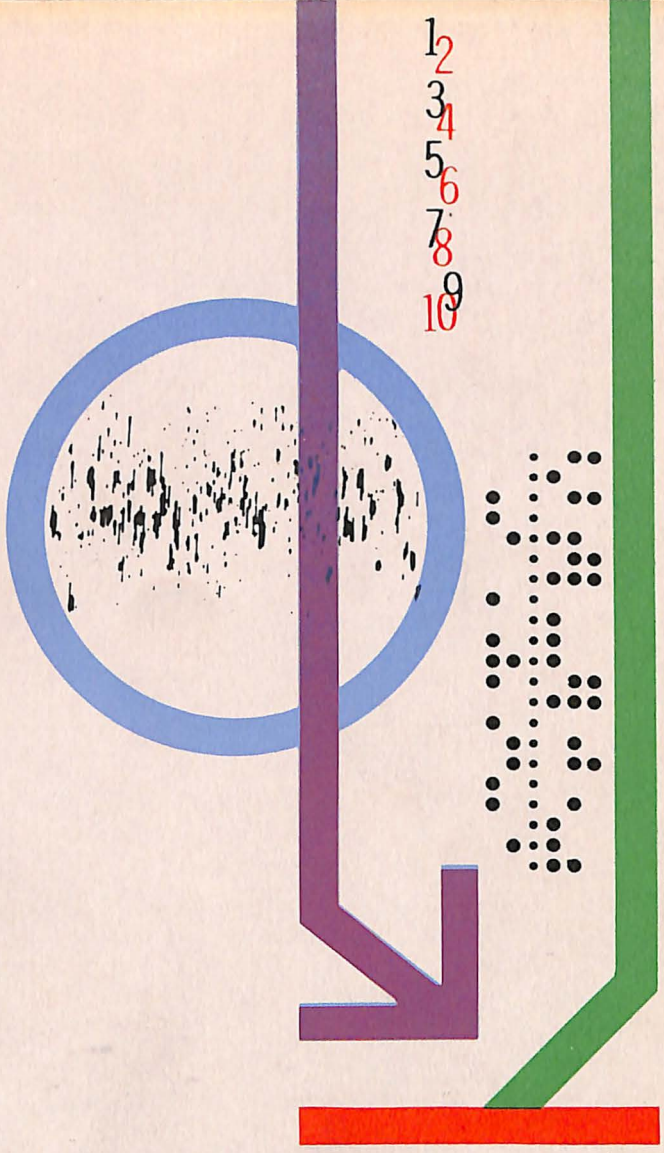

AEROSPACE FACTS AND FIGURES '64

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

AEROSPACE FACTS AND FIGURES

1964

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FOREWORD

The aerospace industry comprises those companies which engage in the research and development and production of aircraft, missiles and spacecraft, their varied propulsion systems and the myriad components—electronic, hydraulic and mechanical—specifically designed for these end products.

Today it represents a phenomenon unique in American industrial history, because for more than a decade the national security requirements of our Government have been totally different from anything that has gone before. For the first time in our history the country has had neither war nor peace.

The efforts of the aerospace industry have been directed toward two national goals: to keep the U. S. defense capability adequate to the challenge, and to acquire and maintain pre-eminence in the new dimension of space exploration.

These goals have meant a change from a production operation to a predominantly research and development operation; a great increase in the variety of products; a tremendous change in the type of facilities and manpower utilized; and the achievement of an extremely high degree of flexibility to meet shifting requirements. Finally, pursuit

of these goals has generated within the industry an unparalleled technological capability as well as the managerial techniques to make this capability quickly responsive.

The aerospace industry is the nation's largest industrial employer with 1,253,000 workers. Sales of $20.6 billion in 1963 were exceeded only by the automotive industry. Exports of aerospace products accounted for 5.4% of the total U. S. exports. This industry accounts for 3.5% of the total Gross National Product, and more than 17% of all federal expenditures.

The 1964 edition of *Aerospace Facts and Figures*, for the first time, measures the entire aerospace industry. These comprehensive statistics are derived in part from data submitted to the Association by member companies and in part from Government statistics that measure segments of the industry. There are separate tables for aircraft, missiles, spacecraft and other industrial activities as well as totals.

The twelfth annual edition of *Aerospace Facts and Figures* is designed as a standard reference work on the industry to provide information to management in Government and industry, legislators, writers and editors, analysts and students.

KARL G. HARR, JR.
President
Aerospace Industries Association

CONTENTS

AEROSPACE SUMMARY

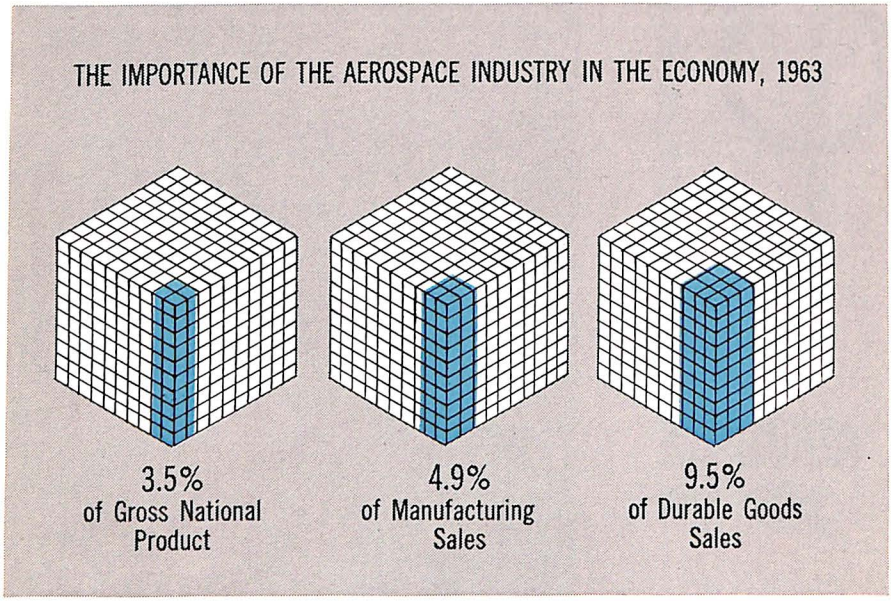
Sales of the aerospace industry in 1963 reached their highest point in 16 years—$20.6 billion—and estimated sales for 1964 will exceed that amount. However, net profit (after taxes) of the aerospace industry as a percentage of sales declined slightly to 2.3 per cent compared with an increase to 4.7 per cent for all manufacturing.

Aerospace sales in 1963 made up 9.5 per cent of durable goods sales, 4.9 per cent of all manufacturing sales and 3.5 per cent of the Gross National Product.

Sales of aircraft and missiles declined in 1963, compared with the previous year, but a $1.6 billion increase in sales of space vehicles along with a slight increase in sales of non-aerospace products, produced an overall gain.

Federal expenditures for aerospace products and services amounted to $16.2 billion in fiscal year 1963. This is expected to increase to $18.3 billion for FY 1964 and decline to $17.0 billion in FY 1965.

Employment in the industry reached 1,253,000 workers in 1963, divided almost equally between salaried (600,000) and production workers (653,000). This is 7.4 per cent of all manufacturing employees. There were 155,300 scientists, engineers and technicians employed in the aero-



Source: Sales of All Manufacturing, Durable Goods, and of Aerospace Industries

SALES OF ALL MANUFACTURING, DURABLE GOODS, AND OF AEROSPACE INDUSTRIES
1959 to Date

(Millions of Dollars)

Year	All Manufacturing Industries	Durable Goods Industries	AEROSPACE INDUSTRY			
			TOTAL	As Per Cent of		
				Manufacturing	Durable Goods	GNP
1959	$362,628	$186,528	$16,640	4.6%	8.9%	3.4%
1960	369,552	189,804	17,326	4.7	9.1	3.4
1961	370,608	186,384	17,997	4.9	9.7	3.5
1962	399,696	206,208	19,162	4.8	9.3	3.5
1963	417,544	216,986	20,557	4.9	9.5	3.5

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.

space industry in 1960, according to the latest available figures from the National Science Foundation.

The aerospace payroll in 1963 was $9.2 billion, a $700 million increase over 1962.

Other aerospace highlights included:

- Exports of aeronautic products in 1963 were valued at $1,240,000,000, 5.4 per cent of the total U. S. merchandise exports. This compares with $1,436,000,000 in 1962.
- Sales of aircraft products in 1963 amounted to $8.8 billion. There were about 1,500 planes produced for the military services while 1,395 multi-engine aircraft, 6,349 single engine aircraft and 411 helicopters were produced for civilian use.
- Sales of missile products and services amounted to $6.0 billion in

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

Year	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	20,557	8,840	6,031	3,836	1,850
1964[E]	20,943	8,608	5,506	4,944	1,885

NOTE: Includes military and nonmilitary sales and research, development, test, and evaluation.
[E] Estimate.
Source: Aerospace Industries Association estimates, based on latest available information.

1963, with an expected decline in sales to $5.5 billion in 1964.

• Sales of space products and services in 1963 are estimated at $3.8 billion, an increase of $1.6 billion over 1962. Sales in 1964 are expected to increase to nearly $5.0 billion, compensating for the decrease in Government expenditures for aircraft and missiles.

• Research and development expenditures for the Department of Defense accounted for the major portion of Federal R&D with expendi-

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

Year	TOTAL SALES	Aerospace Products and Services			Non-aerospace Products and Services[c]
		Government[a]		Non-government[b]	
		Department of Defense	National Aeronautics and Space Administration		
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	20,557	14,565	2,683	1,459	1,850
1964[E]	20,943	13,946	3,712	1,400	1,885

[E] Estimate.
[a] 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.
[b] Sales of civil aircraft, aircraft engines, and parts; includes some sales to the government.
[c] Estimated as 9 per cent of total sales.
Source: Aerospace Industries Association estimates, based on latest available information.

tures expected to reach $7.5 billion in FY 1964, an increase of $600 million over FY 1963. Expenditures for R&D by the National Aeronautics and Space Administration rose $1.8 billion over FY 1963 to an expected level of $4.4 billion for FY 1964.

- The scheduled airlines earned $84 million in 1963, flying 71 million passengers over 50 billion passenger miles, a marked increase in passenger miles of 15 per cent over the previous year.

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	Total, Space Research	Total Aerospace Products and Services	Total Federal	Total National Defense and Space Research
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[E]	98,405	55,297	4,400	18,344	18.6	30.7
1965[E]	97,900	53,979	4,990	16,973	17.3	28.8

NOTE: "National Defense" includes the military budget of the Department of Defense ($49.97 billion for 1963) and Atomic Energy Commission ($2.76 billion for 1963). Amounts from Trust Funds are not included. "Space Research" does not include expenditures for space activities by the Department of Defense.
N.A.—Not available.
[E] Estimate.
Source: "The Budget of the United States Government" (Annually).

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

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

(*Continued on next page*)

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

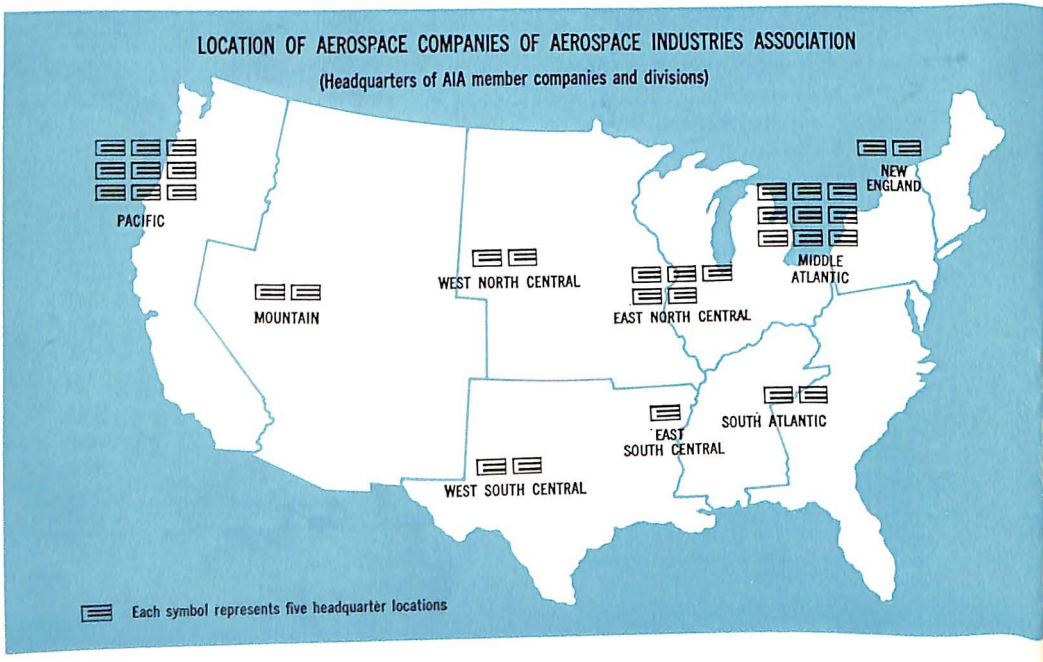
	Year Ending June 30		
	1963	1964[E]	1965[E]
TOTAL	$49,973	$52,300	$51,200
Military Personnel	13,000	14,180	14,660
Active Forces	11,386	12,260	12,523
Reserve Forces	599	696	753
Retired Pay	1,015	1,224	1,384
Operation and Maintenance	11,874	11,870	12,278
PROCUREMENT	16,632	16,337	14,785
AIRCRAFT	6,309	6,554	5,712
MISSILES	3,817	3,506	3,285
Ships	2,522	2,280	2,114
Ordnance, Vehicles, & Related Equipment	1,665	1,899	1,627
Electronics and Communications	1,427	1,357	1,234
Other procurement	892	741	813
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION	6,376	6,943	6,580
AIRCRAFT	544	860	878
MISSILES	2,241	2,182	1,878
ASTRONAUTICS	946	1,360	1,105
Other	2,645	2,541	2,719
Military Construction	1,144	1,107	1,056
Family Housing	427	680	660
Civil Defense	203	150	158
Military Assistance	1,721	1,400	1,200
AIRCRAFT	262	231	181
MISSILES	183	131	29
Other	1,276	1,038	990
Other	(1,404)	(367)	(169)

[E] Estimate.
NOTE: Data in parentheses are minus figures.
Source: Department of Defense, Report FAD 297—21 January 1964.

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	
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[E]	14,824	10,060	362	4,402
1965[E]	13,068	8,997	210[a]	3,861

[E] Estimate.
[a] AIA estimate based on DOD data.
Source: Department of Defense, Reports FAD Numbers 475, 474, 21 January 1964.



Source.: Aerospace Industries Association Membership

Active Military Forces of the United States, 1961 to Date

	Actual, June 30, 1961	Actual, June 30, 1963	Estimated	
			June 30, 1964	June 30, 1965
Selected military forces:				
Strategic retaliatory forces:				
Intercontinental ballistic missiles (squadrons):				
Minuteman	—	2	12	16
Titan	—	7	12	12
Atlas	4	13	13	9
Polaris submarines	5	12	22	32
Strategic bombers (wings):				
B-52	13	14	14	14
B-58	1	2	2	2
B-47	20	13	10	5
Continental air and missile defense forces:				
Manned fighter interceptor squadrons	42	42	40	40
Interceptor missile squadrons (BOMARC)	7	8	8	6
Army air defense missile battalions[a]	49½	31½	26½	23½
General purpose forces:				
Army divisions (combat ready)	11	16	16	16
Army surface-to-surface missile battalions	42½	48½	38	38
Army air defense missile battalions	26¾	31¾	31¾	32¾
Army special forces groups	3	6	7	7
Warships:				
Attack carriers	15	15	15	15
Antisubmarine warfare carriers	9	9	9	9
Nuclear attack submarines	13	16	23	27
Other	328	326	320	325
Amphibious assault ships	110	132	133	135
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	109	110	113
Airlift and sealift forces:				
Airlift aircraft (squadrons):				
C-130 through C-141	16	26	34	38
C-118 through C-124	35	31	27	17
Troopships, cargo ships, and tankers	99	101	99	99
Military personnel (in thousands):				
Army	858	975	972	974
Navy	627	664	670	678
Marine Corps	177	190	190	190
Air Force	820	869	855	839
Total, military personnel	2,482	2,698	2,687	2,681

[a] Decrease reflects phaseout of Nike-Ajax and transfer of Nike-Hercules battalions to Army National Guards.

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

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

Year	All Manufacturing Industries	Durable Goods Industries	Aerospace Industry		
			Total	As Per Cent of	
				Manufacturing	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	17,035	9,659	1,253	7.4	13.0

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
1959 to Date

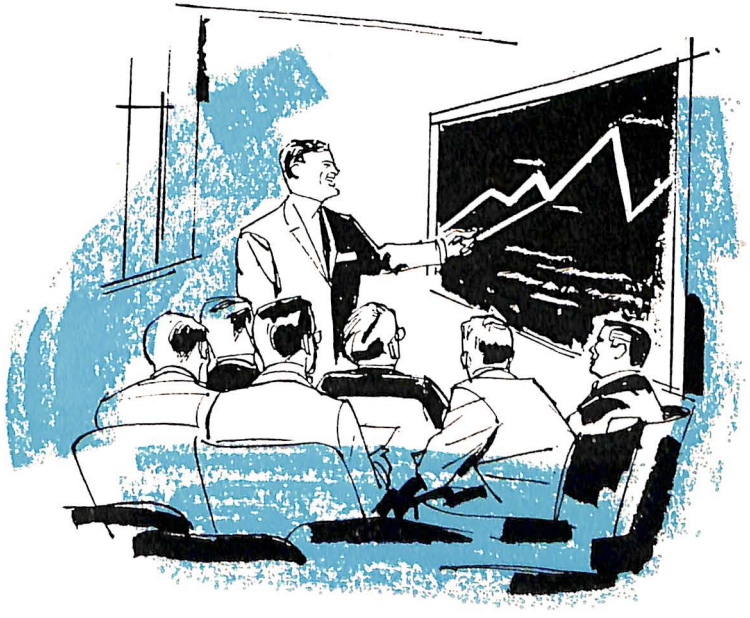
Year	Aerospace Employment			Aerospace Payroll			Aerospace as Per Cent of Total	
	Total	Salaried	Production Worker	Total	Salaried	Production Worker	Manufacturing Employment	Manufacturing Payroll
	(Thousands of Employees)			(Millions of Dollars)				
1959	1,128	455	673	$7,239	$3,598	$3,641	6.8%	8.5%
1960	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	1,253	600	653	9,235	5,260	3,975	7.4	9.4

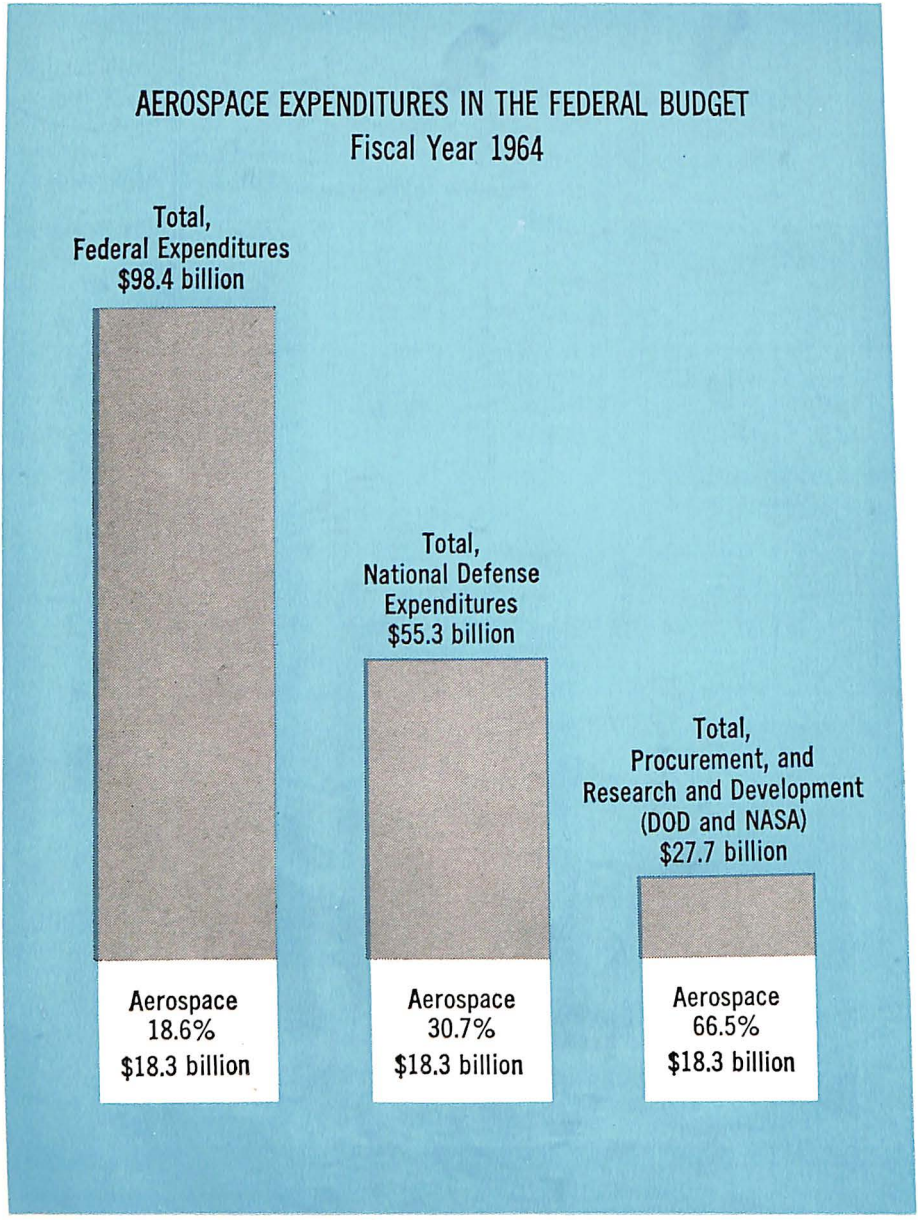
N.A.—Not available.
Sources:
Manufacturing Employment: Bureau of Labor Statistics "Employment and Earnings" (Monthly).
Manufacturing Payroll: Bureau of the Census, "Annual Survey of Manufacturers" (Annually).
Aerospace Employment and Payroll: Aerospace Industries Association, based on latest available information.

SCIENTISTS, ENGINEERS, AND TECHNICIANS
1960 Employment and Projected 1970 Requirements

Industry and Year	TOTAL	Scientists and Engineers	Technicians	Technicians per 100 Scientists and Engineers
	Number in Thousands			
ALL INDUSTRIES				
1960	1,932.4	1,157.3	775.1	67
1970	3,251.0	1,954.3	1,296.7	66
All Manufacturing				
1960	1,033.7	613.5	420.2	68
1970	1,814.2	1,064.9	749.3	70
AIRCRAFT, MISSILES AND SPACECRAFT				
1960	155.3	106.3	49.0	46
1970	301.5	194.5	107.0	55

Source: National Science Foundation, "Scientists, Engineers, and Technicians in the 1960's."





Sources: Federal Expenditures for Selected Functions and for Aerospace Products and Services, Page 9
Department of Defense, Total Expenditures for Appropriation Group, Pages 10-11

U. S. Exports and Exports of Aerospace Products
1948 to Date
(Millions of Dollars)

Year	Total U. S. Exports of Merchandise[a]	Exports of Aerospace Products			
		Total	Commercial 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

[a] Excluding re-exports.
Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).

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

Year	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

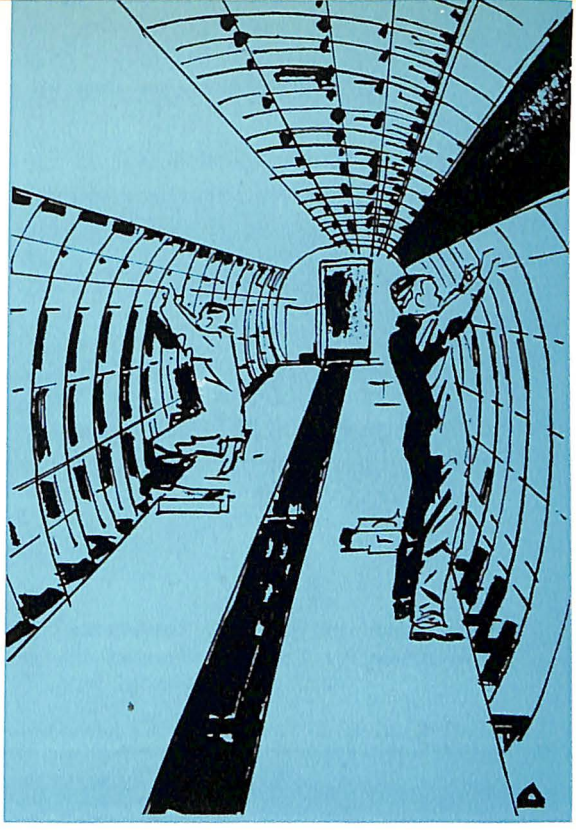
NOTE: Based on reports by 93 members of the International Air Transport Association.
Source: International Air Transport Association.

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

Year	All Manufacturing Corporations (except Newspapers)	Durable Goods	AEROSPACE
1957	4.8%	4.8%	2.9%
1958	4.2	3.9	2.4
1959	4.8	4.8	1.6
1960	4.4	4.0	1.4
1961	4.3	3.9	1.8
1962	4.5	4.4	2.4
1963	4.7	4.5	2.3

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

AIRCRAFT PRODUCTION



The American aerospace industry in 1963 recorded sales totaling $20.6 billion, with manned aircraft still dominant.

Including military and civil sponsorship of research and development activities, the industry's 1963 sales broke down as $8.8 billion for aircraft, $6 billion for missiles and $3.8 billion for space vehicles. Non-aerospace product lines accounted for nearly $1.9 billion in sales.

Projections for 1964 show sales totaling $20.9 billion, including $8.6 billion for aircraft, $5.5 billion for missiles, $4.9 billion for space vehicles and $1.9 billion for non-aerospace products.

The figures above, developed by AIA, exceed the U.S. Government data because they reflect not only the actual hardware delivered to customers but also income from research, development, test and evaluation operations.

According to Census Bureau and Defense Department data, the industry built 9655 aircraft in 1963, including approximately 1500 planes for the military services and 8155 for civil users. Sales by 67 reporting companies resulting from those aircraft deliveries amounted to $5.6 billion, including about $4.2 billion to the U.S. and about $1.5 billion to other customers.

The Census Bureau indicates that at the end of 1963, the manufacturers of aircraft, engines, propellers and parts had a backlog of unfilled orders totaling $6.7 billion, or well over a year of production at current delivery rates.

Of the airframe pounds delivered by the industry in 1963, some 30 million (not counting spares) were for military customers and 16.1 million pounds were accepted by civil users.

Included in the civil shipments were 1,395 multi-engine aircraft, 6,349 single engine aircraft, and 114 helicopters.

For the military services, the aerospace industry had in development

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

Year	Aircraft, Aircraft Engines, Propellers, and Parts	
	Net Sales During Year	Backlog December 31
1948	$1,061[a]	$ 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

[a] 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).

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

Year	Total Aircraft Sales			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[a]	$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	N.A.	N.A.
1962	5,898	4,126	1,772	2,998	1,389	1,130	383	N.A.	N.A.
1963	5,613	4,154	1,459	2,986	1,055	1,168	404	N.A.	N.A.

N.A.—Not available.
[a] Total for the last three quarters of 1948 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).

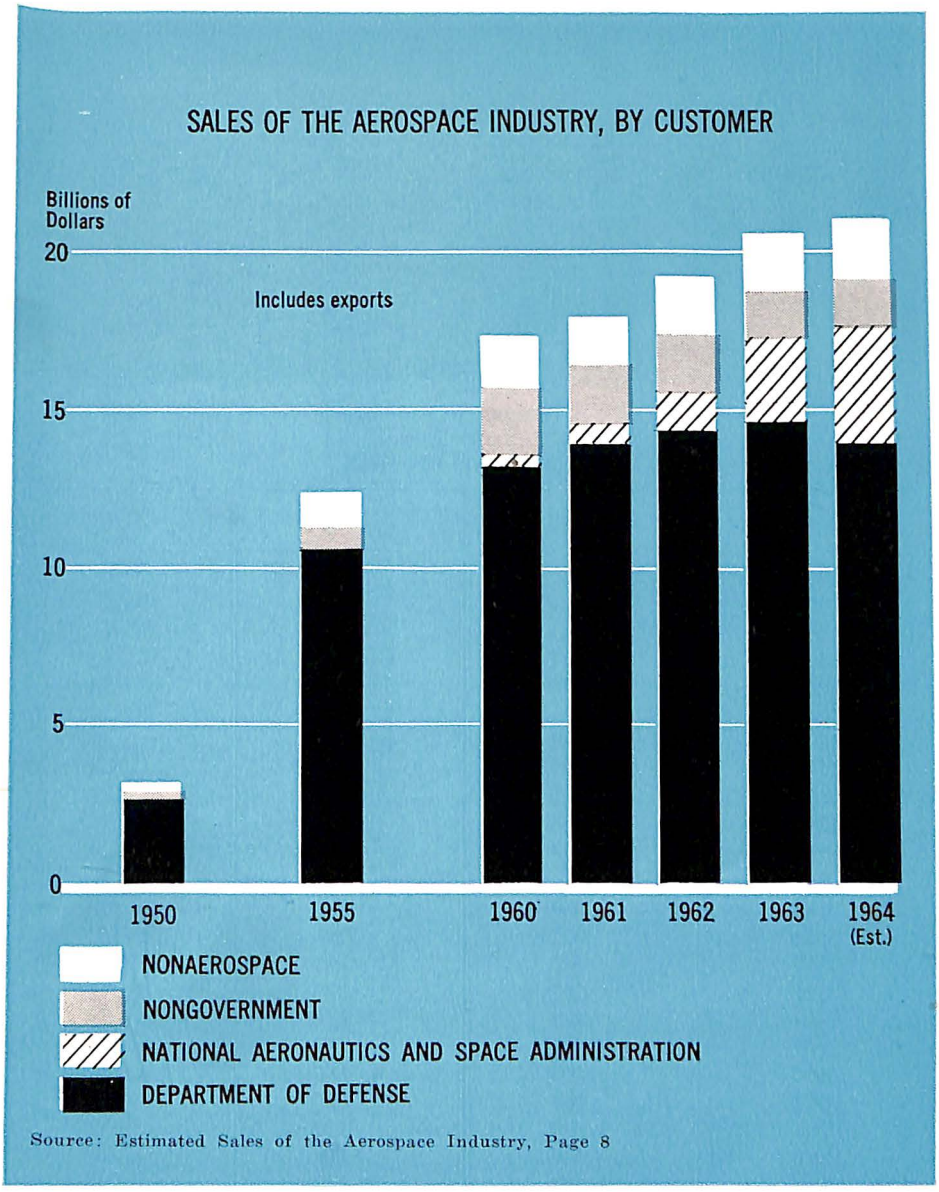
or production one bomber, five attack aircraft, seven cargo planes, five fighter/reconnaissance aircraft, one tanker for refueling of other aircraft, six training planes and four other types with different missions.

The outlook for manned aircraft production in future years remains bright. The military services are studying future uses for airborne missile launchers, huge cargo carriers, advanced interceptors and aircraft designed for counterinsurgency operations. Helicopters and other types of vertically rising aircraft are performing new missions daily in military and civil use. Demand for general aviation aircraft, especially the larger multi-engine types, is constantly expanding. And the world's airlines have expressed their requirements for both a local service airliner to replace the DC-3 and a supersonic transport capable of 2000 miles-per-hour speeds. Orders for about 90 supersonic transports have been placed by airlines with the Federal Aviation Agency, but the SST is not expected to enter airline service until the early 1970's.

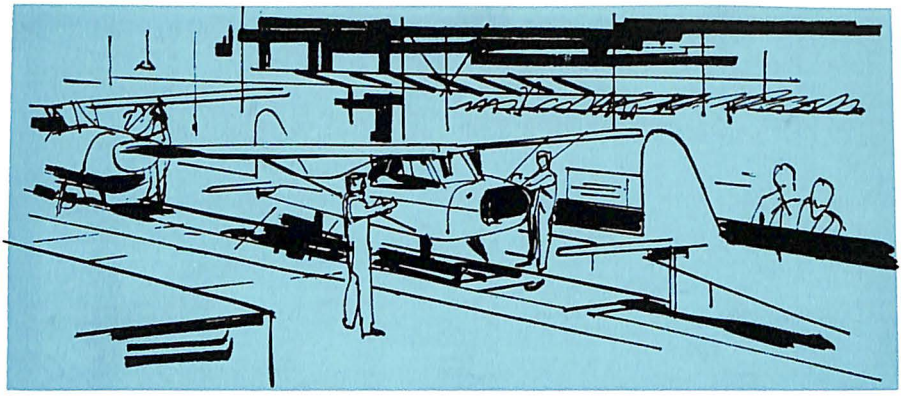
AIRCRAFT BACKLOG OF ORDERS REPORTED BY MANUFACTURERS OF COMPLETE AIRCRAFT, AIRCRAFT ENGINES, PROPELLERS AND PARTS
1948 to Date
(Millions of Dollars)

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	N.A.	N.A.
1962	6,528	4,864	1,664	3,687	1,301	1,177	363	N.A.	N.A.
1963	6,722	4,825	1,897	3,844	1,467	1,081	430	N.A.	N.A.

N.A.—Not available.
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).



Source: Estimated Sales of the Aerospace Industry, Page 8



U. S. AIRCRAFT PRODUCTION
1909 TO DATE
(Number of Aircraft)

Year	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
1909 TO DATE (cont'd)
(Number of Aircraft)

Year	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	8,833[E]	1,500[E]	7,333
1963	9,655[E]	1,500[E]	8,155

N.A.—Not available.
NOTE: 1950 to date excludes aircraft produced for the Military Assistance Program.
[E] Estimate.
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, Directorate for Security Review.

AIRFRAME WEIGHT PRODUCTION, 1939 TO DATE

Year	Weight in Millions of Pounds (Excluding Spares)		
	TOTAL	Military	Civil
1939	12.5[E]	10.1	2.4[E]
1940	27.8[E]	23.1	4.7[E]
1941	86.1[E]	81.4	4.7[E]
1942	275.8	275.8	—
1943	654.2	654.2	—
1944	961.1	961.1	—
1945	541.1	539.4	1.7
1946	38.4	12.9	25.5
1947	29.3	11.4	17.9
1948	35.2	25.1	10.1
1949	37.0	30.3	6.7
1950	41.9	35.9	6.0
1951	55.2	50.2	5.0
1952	116.6	107.3	9.3
1953	148.4	138.0	10.4
1954	140.9	130.4	10.5
1955	124.5	114.3	10.2
1956	106.2	90.0	16.2
1957	101.2	79.4	21.8
1958	82.8	66.1	16.7
1959	74.9	51.8	23.1
1960	64.0	35.8	28.2
1961	51.5	29.6	21.9
1962	50.2[E]	30.0[E]	20.2
1963	46.1[E]	30.0[E]	16.1

[E] Estimate.

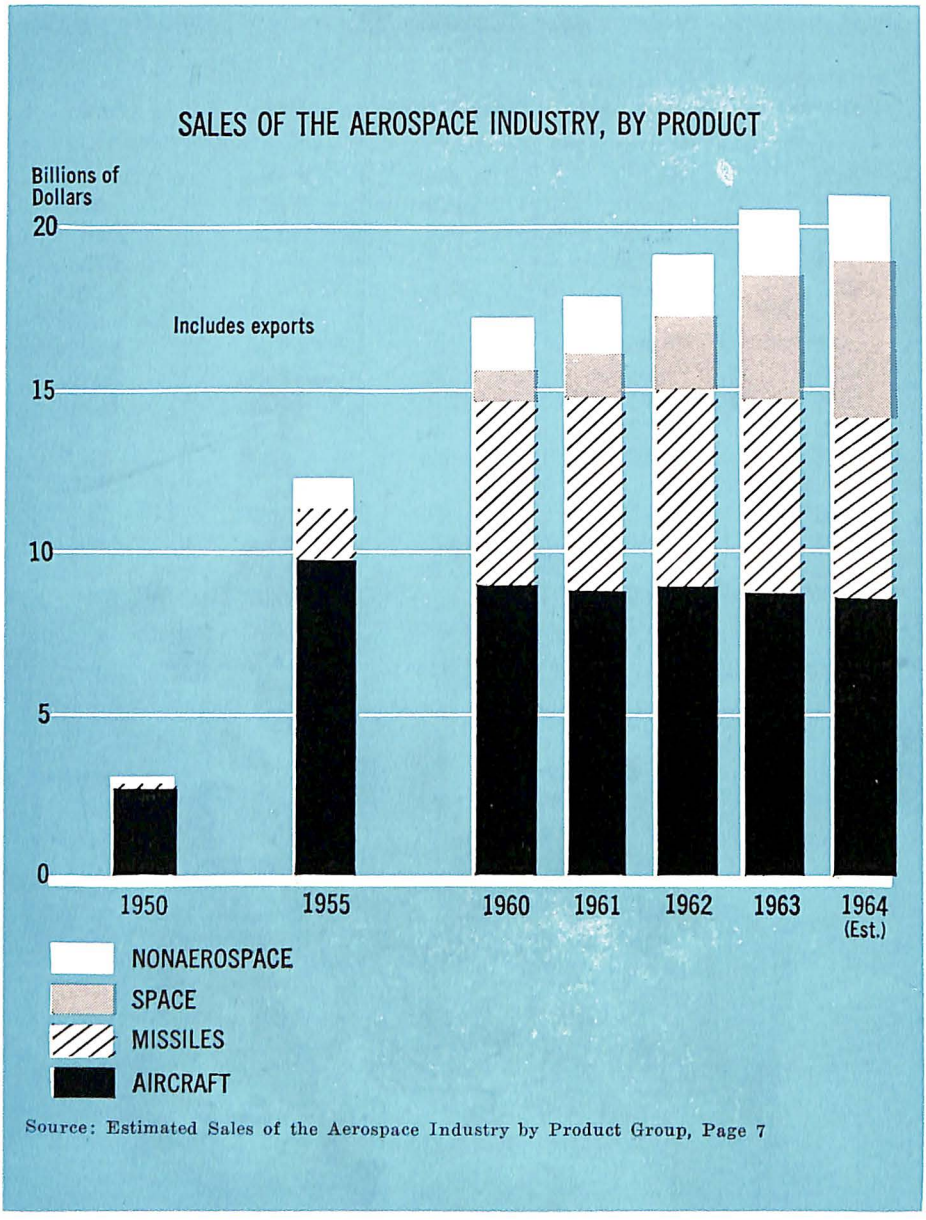
Sources:

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

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[E]	6,554	4,010	2,186	358
1965[E]	5,712	3,460	1,814	438

N.A.—Not available.
[E] Estimate.
Source: Department of Defense, Reports FAD 397, 474, 21 January 1964.



Source: Estimated Sales of the Aerospace Industry by Product Group, Page 7

MILITARY AIRCRAFT AND DRONES IN DEVELOPMENT OR PRODUCTION, 1964
(Fixed Wing)

Type	Designation	Name	Service	Manufacturer
ATTACK				
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	—	Navy	Ling Temco-Vought
BOMBER				
Bomber	XB-70	Valkyrie	USAF	North American
CARGO				
Cargo	C-2A (W2F-COD)	—	Navy	Grumman
Cargo	C-130E	Hercules	USAF	Lockheed
Recon. Cargo	RC-135A/B	Stratolifter	USAF	Boeing
Cargo	C-140	Jet Star	USAF	Lockheed
Cargo	C-141A	Starlifter	USAF	Lockheed
Cargo	CV-2B (AC-1A)	Caribou	Army	DeHavilland
Cargo	CV-7A	Caribou II	Army	DeHavilland
FIGHTER				
Fighter/Recon.	F/RF-4B (F4H-1, 1P)	Phantom II	Navy	McDonnell
Fighter	F-4C/D/E	—	USAF	McDonnell
Recon. Fighter	RF-4C	—	USAF	McDonnell
Fighter	F-105F	Thunderchief	USAF	Republic
Fighter/Recon.	F/RF-111A	TFX	Navy & USAF	General Dynamics
Fighter/Int.	YF-12A	—	USAF	Lockheed
Fighter	F-5A	Freedom Fighter	USAF	Northrop
TANKER				
Tanker	KC-135A	Stratotanker	USAF	Boeing
TRAINER				
Trainer	T-2B (T2J-2)	Buckeye	Navy	North American
Trainer	T-37B	—	USAF	Cessna
Trainer	T-38A	Talon	USAF	Northrop
Trainer	T-39A	Sabreliner	USAF	North American
Trainer	T-39D/E (T3J-2/3)	Sabreliner	Navy	North American
Trainer	Airplane Instrument Trainer	—	Army	
OTHER				
Patrol	P-3A (P3V-1)	Orion	Navy	Lockheed
Surveillance	OV-1 (AO-1)	Mohawk	Army	Grumman
Utility	U-10A (L-28)	—	Army	Helio
Warning	E-2A (W2F-1)	—	Navy	Grumman
DRONE				
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	—	Army	Radioplane
Drone	QH-50C (DSN-3)	—	Navy	Gyrodyne

Source: Department of Defense, Directorate for Security Review.

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

Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
NUMBER							
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
FLYAWAY VALUE[a] *(Millions of Dollars)*							
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[a]	4.395.6	2,448.2	1,061.3	364.2	198.0	229.2	54.7

(*Continued on next page*)

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

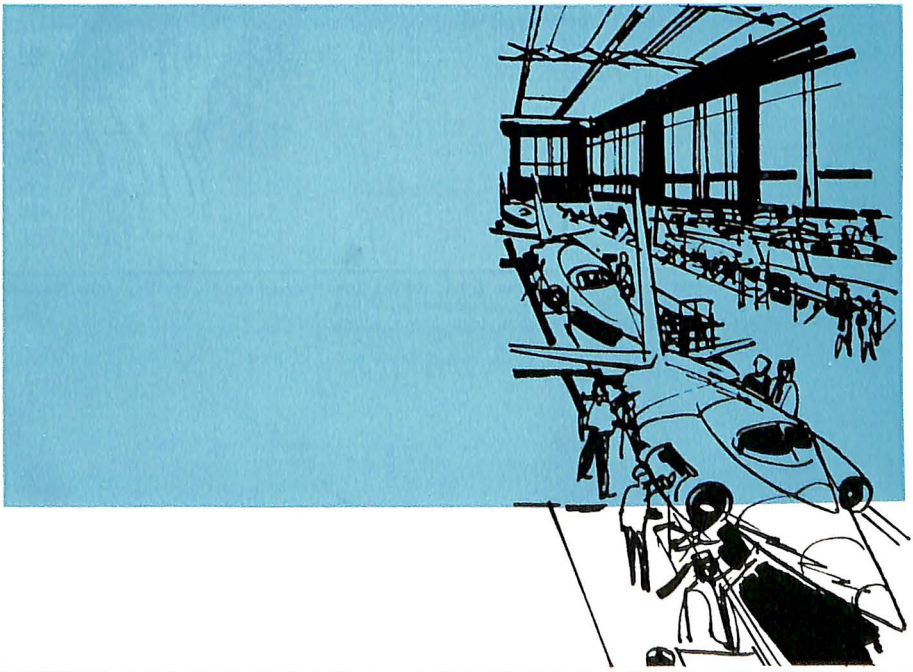
Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
AIRFRAME WEIGHT (Millions of Pounds)							
1950	35.9	16.4	10.2	6.7	1.9	[b]	0.7
1951	50.2	17.0	15.7	11.5	3.1	[b]	2.0
1952	107.3	36.7	31.7	24.6	9.5	[b]	4.8
1953	138.0	44.1	40.7	36.5	11.3	[b]	5.4
1954	130.4	51.8	35.4	31.1	9.6	[b]	2.5
1955	114.3	39.9	43.2	20.9	7.4	[b]	2.9
1956	90.0	38.6	30.6	13.1	3.3	[b]	4.4
1957	79.4	32.7	28.7	9.3	4.2	[b]	4.5
1958	66.1	25.2	18.0	15.9	3.1	[b]	3.9
1959	51.8	18.6	12.9	14.6	3.5	[b]	2.2
1960	35.8	13.6	9.1	9.7	1.1	[b]	2.3
1961	29.6	11.9	6.1	8.3	0.9	[b]	2.4

NOTE: Data exclude gliders and targets.

[a] Values, except for 1961, are based on unit prices in latest production contracts and do not include values of spares, spare parts, and other support equipment. 1961 data includes 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.

[b] Airframe weight of helicopters is included in the "other" category.

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



PRODUCTION OF COMMERCIAL TRANSPORT AIRCRAFT
1955 to Date
(Fixed Wing, Multiple Engine)

Company and Aircraft	1955	1956	1957	1958	1959	1960	1961	1962	1963
TOTAL[a]	113	206	323	216	262	245	231	160	128
Boeing									
707	—	—	—	7	73	68	11	38	28
720	—	—	—	—	—	24	61	30	6
727	—	—	—	—	—	—	—	—	6
Convair									
340	14	—	—	—	—	—	—	—	—
440	—	57	79	21	14	5	—	—	—
880	—	—	—	—	—	15	49	9	12
990	—	—	—	—	—	—	—	22	11
Douglas									
DC-6	14	39	44	65	1	—	—	—	—
DC-7	30	67	123	57	—	—	—	—	—
DC-8	—	—	—	—	21	91	42	22	19
Fairchild									
F-27	—	—	—	25	42	14	8	7	6
Grumman									
Gulfstream	—	—	—	—	—	—	19	17	24
Lockheed									
1049	55	43	42	21	5	—	—	—	—
1649	—	—	35	8	—	—	—	—	—
Electra	—	—	—	12	107	24	21	—	—
Jet Star	—	—	—	—	—	—	14	9	10
130	—	—	—	—	—	4	6	6	6

[a] 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.

Production of Utility Aircraft, 1947 to Date

Year	Total	Aero Commander	Beech	Cessna	Champion	Mooney	Piper	All Other Manufacturers
Number of Aircraft Shipped								
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
Manufacturer's Net Billing Price (Thousands of Dollars)								
1947	$ 57,929	—	13,405	5,976	N.A.	—	7,697	30,851
1948	32,469	—	10,126	6,768	N.A.	—	3,083	12,492
1949	17,731	—	6,177	4,545	N.A.	133	3,244	3,632
1950	19,157	—	6,516	5,506	N.A.	82	3,092	3,961
1951	16,887	—	7,708	3,573	N.A.	45	3,933	1,628
1952	26,159	2,011	9,848	9,220	N.A.	100	4,891	89
1953	34,458	4,260	9,545	12,094	N.A.	91	8,286	182
1954	43,461	4,517	20,056	10,666	N.A.	31	8,070	121
1955	68,258	5,119	24,893	21,880	N.A.	182	16,008	176
1956	103,791	11,183	28,770	38,570	597	741	23,474	456
1957	99,652	9,914	32,110	30,988	1,045	1,095	23,294	1,206
1958	101,939	6,902	27,072	36,897	1,516	1,868	26,548	1,136
1959	129,876	10,626	35,701	45,703	1,521	2,091	33,134	1,100
1960	151,220	11,917	43,061	56,664	1,492	2,781	35,102	203
1961	124,323	11,047	37,072	42,266	690	3,987	28,889	372
1962	136,837	10,846	37,359	50,181	683	5,525	32,142	101
1963	153,415	11,840	38,594	55,662	1,119	7,235	38,540	425

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 page 25.

Source: Aerospace Industries Association, company reports.

PRODUCTION OF UTILITY AIRCRAFT, BY MANUFACTURER, 1963

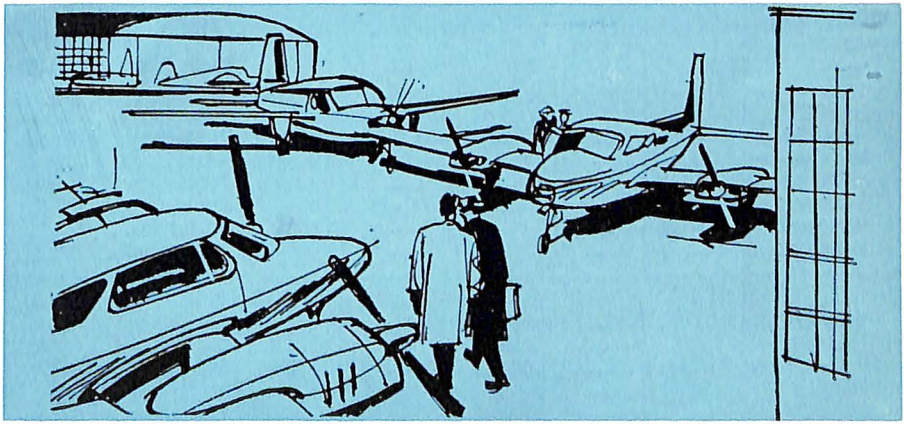
Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
TOTAL	7,569	$153,415
Aero Commander		
500A, B	40	
560F	13	
680F	9	$ 11,840
680FP	16	
Grand Commander	36	
Beech		
Super 18	25	
Queen Air 80	68	
Queen Air 65	14	
Twin Bonanza (50)	12	
Baron (55)	185	38,594
Travel Air (95)	37	
Bonanza (35)	201	
Debonair (33)	132	
Musketeer (23)	387	
Cessna		
150	472	
172	1,114	
P172	32	
175	13	
180	128	
182	642	
185 (Skywagon)	157	55,662
205	353	
206 (Super Skywagon)	61	
210	156	
336 (Skymaster)	140	
310	128	
320 (Skynight)	60	
Champion		
Traveler DeLuxe (7EC)	4	
Tri-Traveler (7FC)	15	
Challenger (7GCB)	38	1,119
Agricultural (7GCBA)	4	
DX'er (7HC)	2	
Lancer (402)	36	

(*Continued on next page*)

PRODUCTION OF UTILITY AIRCRAFT, BY MANUFACTURER, 1963—*Continued*

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
Lake		
LA-4	16	$ 425
Mooney		
M-20C (M-21)	259	
M-20D	101	7,235
M-20E	142	
Piper		
Super Cub PA-18	188	
Colt PA-22	259	
Apache PA-23-235	65	
Aztec PA-23-250	203	
Comanche PA-24-180	33	
Comanche PA-24-250	213	
Pawnee PA-25-150	11	38,540
Pawnee PA-25-235	364	
Cherokee PA-28-150	32	
Cherokee PA-28-160	53	
Cherokee PA-28-180	476	
Cherokee PA-28-235	190	
Comanche PA-230-160	234	

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



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	—	—	Operational	3
			OH-13G		TH-13M		
47G-2	—	—	OH-13H	—	—	Operational	3
47G-2A	—	—	—	—	—	Operational	3
47G-3	—	—	OH-13K	—	—	Operational	3
47G-3B	—	—	OH-13S	—	—	Opr./In Prod.	3
47G-3B1	—	—	—	—	—	Opr./In Prod.	3
47G-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
—	—	—	—	—	UH-13R	R & D	4
204	—	—	UH-1A	—	—	Operational	7
204B	UH-1F	—	UH-1B	UH-1E	—	Opr./In Prod.	9-11
205	—	—	UH-1D	—	—	Production	13
206	—	—	OH-4A	—	—	User Test	4
200	—	—	XV-3A	—	—	R & D	4
207	—	—	—	—	—	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	—	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							
—	X-19	—	X-19	—	X-19	Flight Test	8-12
Gyrodyne							
Model 60	—	—	—	—	QH-50A	Production	Drone
Model 61	—	—	—	—	QH-50B	R & D	Drone
Model 63	—	—	—	—	QH-50C	Production	Drone
Rotorcyc'e	—	—	—	—	YRON-1	Production	1
Rotorcycle	—	—	—	—	YRON-1	Production	1
Rotorcycle	—	—	—	—	XRON-1	Production	1
Hiller							
Hiller-12E	—	—	OH-23G	—	—	Opr./In Prod.	3
Hiller-E4	—	—	OH-23F	—	—	Opr./In Prod.	4
—	—	—	OH-23D	—	—	Operational	3
Hiller-L4	—	—	—	—	—	Production	4
Hiller-L3	—	—	—	—	—	Production	3
Hiller-12E-L	—	—	—	—	—	Production	3
Hiller-1100	—	—	OH-5A	—	—	Development	4

VERTICAL LIFT AIRCRAFT IN PRODUCTION OR DEVELOPMENT, 1964—*Continued*

Company and and Designation	Military Designation					Present Status	Number of Places
	USAF	USCG	USA	USMC	USN		
Hiller-Ten 99	—	—	—	—	—	Development	6
	XC-142A	—	XC-142A	—	XC-142A	Rollout-Fly	32
Hughes Tool Aircraft Div.							
269A	—	—	—	—	—	Opr./In Prod.	2
300	—	—	—	—	—	Opr./In Prod.	3
369	—	—	OH-6A	—	—	Development	4
385	—	—	XV-9A	—	—	Research	2
Kaman							
K-20	—	—	—	—	UH-2	Opr./In Prod.	12
K-600	HH-43A	—	—	OH-43D	UH-43C	Operational	5
K-600-3	HH-43B	—	—	—	—	Opr./In Prod.	12
K-600-3	HH-43F	—	—	—	—	Opr./In Prod.	12
K-600-4	HH-43F	—	—	—	—	Opr./In Prod.	12
Ling-Temco-Vought							
—	XC-142A	—	XC-142A	—	XC-142A	Rollout-Fly	32
Lockheed							
CL-186	—	—	XH-51A	—	XH-51A	R & D	5
Hummingbird	—	—	XV-4A	—	—	R & D	2
Republic							
Alouette II	—	—	—	—	—	Operational	5
Ryan							
—	—	—	XV-5A	—	—	Flight Test	2
—	—	—	XV-8A	—	—	Flight Test	1
—	XC-142A	—	XC-142A	—	XC-142A	Rollout-Fly	32
—	—	—	VZ-3RY	—	VZ-3RY	Flight Test	1
United Aircraft Sikorsky Div.							
S-51	—	—	—	—	—	Operational	4
S-55A	UH-19B	HH-19G	UH-19D	CH-19E	UH-19F	Operational	12
S-55C	H-19A	—	UH-19C	HRS-1	HO4S-1	Operational	12
				HRS-2	HO4S-2		
S-56	—	—	H-37B	H-37C	—	Operational	29
S-58	—	HH-34F	CH-34A	UH-34D	SH-34G	Opr./In Prod.	20
S-58D	—	HH-34F	UH-34C	HUS-1AN	SH-34H	Opr./In Prod.	20
			CH-34C	UH-34C	SH-34J		
			CH-34A	UH-34D			
S-61A	CH-3B	—	—	—	—	Opr./In Prod.	29
S-61B	—	—	VH-3A	VH-3A	RH-3A	Opr./In Prod.	4-15
					SH-3A		
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.	5-73[a]
S-65	—	—	—	CH-53A	—	Dev./In Prod.	—
S-65A	—	—	—	CH-53A		Prototype/ In Prod.	41

[a] Five places is standard but up to 73 persons may be carried by attaching a people pod.
Source: Aerospace Industries Association, company reports.

PRODUCTION OF HELICOPTERS
TOTAL, COMMERCIAL AND MILITARY
1954 to Date

Year	TOTAL	Commercial	Military
1954	562	131	431
1955	590	146	444
1956	915	268	647
1957	1,000	311	689
1958	864	196	668
1959	742	291	451
1960	788	294	494
1961	825	432	393
1962	N.A.	389	N.A.
1963	N.A.	434	N.A.

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

PRODUCTION OF MILITARY HELICOPTERS
1941 to Date

Year	TOTAL[a]	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

[a] The TOTAL includes helicopters bought by the Department of Defense under the Military Assistance Program and for other federal agencies.
Source: Department of Defense, Directorate for Security Review. Data released with a two-year lag for security reasons.

PRODUCTION OF COMMERCIAL HELICOPTERS[a]
(Number of Helicopters)
1955 to Date

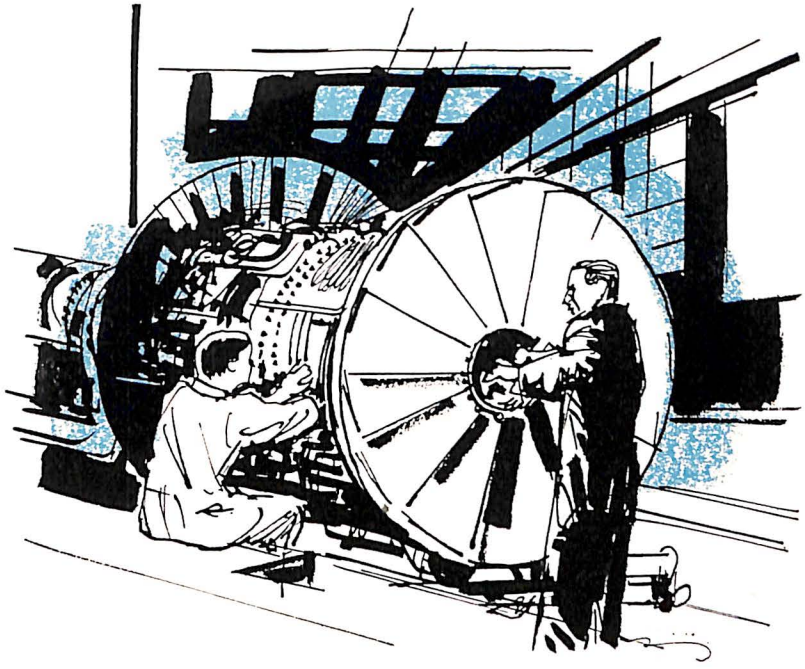
Company and Helicopter	1955	1956	1957	1958	1959	1960	1961	1962	1963
TOTAL	146	268	311	191	276	289	432	389	434[E]
Bell									
47 Series .	84	111	132	99	169[b]	144[b]	177[b]	207[b]	N.A.
Brantley									
B-2	—	—	—	—	15	43	104	N.A.	N.A.
Cessna									
CH-1C ..	—	—	—	—	—	—	14	14	—
Hiller									
12 Series .	16	21	21	12	25	72	99	51[c]	N.A.
Hughes									
269-A ...	—	—	—	—	—	—	19	83	N.A.
Omega									
B12-D1 ..	—	—	—	—	—	—	2	—	N.A.
Sikorsky									
S-55	41	52	38	11	4	1	3	—	N.A.
S-58	5	55	60	22	47	9	8	3	N.A.
S-61	—	—	—	—	—	—	1	4	N.A.
S-62	—	—	—	—	—	7	5	10	N.A.
S-64.....	—	—	—	—	—	—	—	1	N.A.
Vertol									
H-21	—	29	60	35	12	—	—	—	—
V-33	—	—	—	—	—	5	—	—	—
V-44	—	—	—	12	5	8	—	—	—
V-107	—	—	—	—	—	—	—	16	N.A.

N.A.—Not available.
[a] Manufactured by companies reporting to Aerospace Industries Association.
[b] Includes production of two foreign licensees.
[c] Eight months.
Source: Aerospace Industries Association, company reports.

Aircraft Engine Production, 1917 to Date
(Number of Engines)

Year	Total	Military		Civil	
1917–1919	N.A.	44,453		N.A.	
1926	N.A.	842		N.A.	
1927	N.A.	1,397		N.A.	
1928	3,252	2,620		632	
1929	7,378	1,861		5,517	
1930	3,766	1,841		1,925	
1931	3,776	1,800		1,976	
1932	1,898	1,085		813	
1933	1,980	860		1,120	
1934	2,736	688		2,048	
1935	2,965	991		1,974	
1936	4,237	1,804		2,433	
1937	6,084	1,989		4,095	
1938	N.A.	N.A.		3,800[E]	
1939	11,172	N.A.		N.A.	
1940	30,167[E]	22,667		7,500[E]	
1941	64,681[E]	58,181		6,500[E]	
1942	138,089	138,089		—	
1943	227,116	227,116		—	
		Recipr.	Jet	Recipr.	Jet
1944	256,911	256,789	122	—	—
1945	111,650[E]	108,442	1,208	2,000[E]	—
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	15,629[E]	400[E]	4,500[E]	9,921	558
1963	16,695[E]	400[E]	4,500[E]	11,322	473

Note: Jet includes turboprop and turbofan.
N.A.—Not available.
[E] Estimate.
Sources: Aerospace Industries Association, "Aerospace Facts and Figures" (Annually).
Bureau of the Census, "Current Industrial Reports, Series M37G" (Monthly).
Department of Defense, Directorate for Security Review.



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

Year	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

Source: Department of Defense, Directorate for Security Review. Data released with two year lag for security reasons.

Civil Aircraft Engine Production
1956 to Date
(Number of Engines)

Manufacturer and Engine Designation[a]	1956	1957	1958	1959	1960	1961	1962	1963
Total	11,204	10,817	10,251	12,259	12,159	10,663	10,479	11,795
Reciprocating	11,204	10,779	9,736	10,875	10,524	9,669	9,921	11,322
Jet	—	38	515	1,384	1,635	994	558	473
Allison Division General Motors								
282	—	—	242	604	576	22	—	—
Continental								
205	87	145	77	16	56	46	51	45
246	22	24	15	23	20	16	8	5
252	627	879	829	1,348	840	828	826	773
253	1,736	811	1,734	953	1,252	987	1,104	1,210
267	433	31	36	36	9	12	12	8
273	2,524	2,733	2,181	2,816	3,207	850	1,006	902
298	—	—	—	713	469	86	78	21
3E-1	—	—	—	—	—	1,888	1,974	1,595
3E-3	—	—	—	—	—	322	140	133
E-1CE	—	—	—	—	—	—	—	394
E-5CE	—	—	—	—	—	—	—	271
Other	20	24	23	8	20	70	43	52
General Electric								
306	—	—	—	—	—	70	15	—
308	—	—	18	90	212	—	—	—
1E5	—	—	—	—	66	185	25	—
J79-11A	—	—	—	—	—	69	43	12
CJ805-3	—	—	—	—	—	—	—	1
CJ805-23	—	—	—	—	—	—		1
Lycoming								
223	7	8	2	8	111	1,241	289	264
228	—	—	—	—	—	12	7	206
229	132	44	95	113	80	17	17	13
274	3,011	2,631	2,023	2,021	1,452	1,128	1,248	1,578
275	909	842	419	308	271	122	142	169
277	—	—	—	—	—	11	5	3
286	2	250	768	1,044	701	218	1,080	1,508
284	—	—	—	247	294	718	95	—
295	—	123	561	906	1,247	728	1,194	2,070
304	—	—	—	—	115	—	—	—
1E	—	—	—	—	233	—	—	—

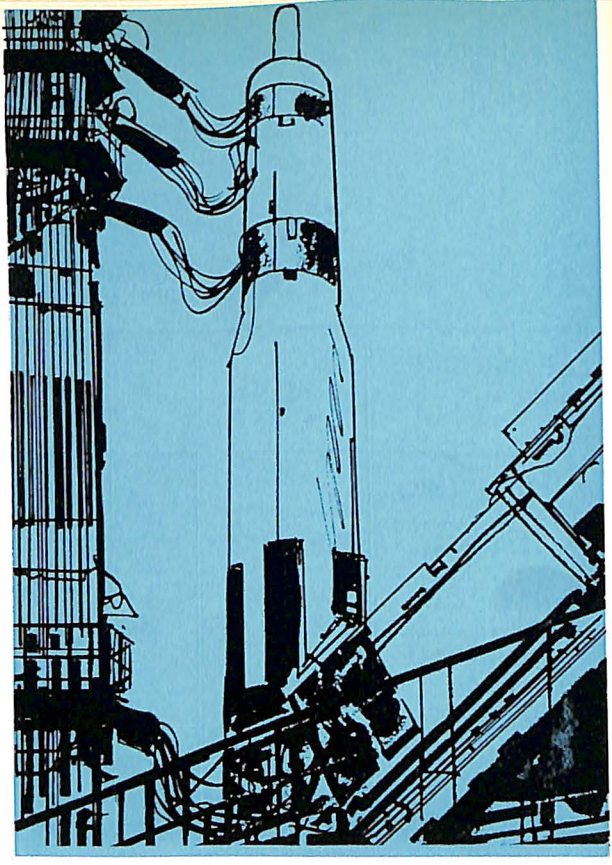
(*Continued on next page*)

CIVIL AIRCRAFT ENGINE PRODUCTION—*Continued*
1956 TO DATE

Manufacturer and Engine Designation[a]	1956	1957	1958	1959	1960	1961	1962	1963
Lycoming—Cont.								
1E4	—	—	—	—	—	122	162	—
1E7	—	—	—	—	—	90	286	—
1E10	—	—	—	—	—	—	60	—
1E11	—	—	—	—	—	65	36	—
Other	443	315	167	53	107	—	—	6
Pratt & Whitney Aircraft								
230	21	5	6	1	—	—	—	—
231, 264	316	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	—
JT8D	—	—	—	—	—	—	3	165
Other	—	—	—	5	—	—	—	—
Wright Aeronautical								
243	—	68	51	6	—	6	—	—
259	23	157	129	202	34	49	58	92
272	315	323	22	—	—	—	—	—
287	576	910	283	26	—	—	—	—
289	—	—	—	24	—	1	—	4
Other	—	—	—	—	—	36	—	—

[a] Type certificate number.
Source: Aerospace Industries Association, company reports.

MISSILE PROGRAMS



Military expenditures for guided missile systems reached a peak and turned downward in 1963 as most of the strategic missiles in the nation's deterrent force became operational.

The Department of Defense, which reported missile procurement spending at $3.8 billion in fiscal year 1963, estimated that expenditures would total $3.5 billion in FY 1964 and nearly $3.3 billion in FY 1965.

In the strategic missile area, plans were under way for phaseout of Atlas D's in FY 1965 and of Atlas E's and Titan I's later. The first 600 Minutemen I's were due to be in place by June 1964 and the figure was scheduled to reach 800 by June 1965. With approval of the Defense Department budget for FY 1965, 200 Minuteman II's were in the procurement program, with first deliveries of the advanced Minuteman II programmed for 1966. The Minuteman II will provide the Air Force with increased range or payload, a smaller circular error of probability, greater flexibility in choosing pre-assigned targets, the capability of being launched by radio from an aircraft and a hardened power supply to pro-

vide better survivability after an attack. Ultimately, the I model will be replaced by the Minuteman II.

The Polaris program continued, with all 41 of the ballistic-missile-firing submarines, capable of launching 656 missiles, due to be on station by June 1967. The first five subs carry the 1200-nautical-mile A-1 Polaris, the 6th through 18th fire the 1500-nautical-mile A-2 and the rest, the

ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
SURFACE-TO-AIR						
Bomarc-A	USAF	Boeing	Aerojet & Marquardt	Ramjet	IBM & Westinghouse	Operational
Bomarc-B	USAF	Boeing	Marquardt & Thiokol	Ramjet	IBM, Westinghouse & Kearfott	Operational
Hawk	Army	Raytheon	Aerojet	Solid	Raytheon	Operational
Mauler	Army	General Dynamics	Lockheed	Solid	Hughes	Development
Nike-Ajax	Army	Western Electric	Thiokol	Solid & Liquid	Western Electric	Operational (Phasing Out)
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				Study
Talos	Navy	Bendix	Bendix & McDonnell	Ramjet	Sperry	Operational
Tartar	Navy	General Dynamics	Aerojet	Solid	Raytheon	Operational
Terrier & Advanced Terrier	Navy	General Dynamics	Allegany Ballistic Lab.	Solid	General Dynamics S. D. Hicks & Cameron Iron Works	Operational
AIR-TO-AIR						
Falcon	USAF	Hughes	Thiokol	Solid	Hughes	Operational
Genie MB-1	USAF	Douglas	Aerojet	Solid	Unguided	Operational
Phoenix	USAF-Navy	General Dynamics	Grumman & Hughes			Study
Sidewinder 1-C	USAF-Navy	Philco & Motorola	Navy Propellant Plant	Solid	Philco & General Electric	Operational
Sparrow III	Navy	Raytheon	Aerojet	Solid	Raytheon	Operational

(*Continued on next page*)

ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION—*Continued*

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
SURFACE-TO-SURFACE						
Atlas	USAF	General Dynamics	No. American	Liquid	GE & American Bosch Arma	Operational
Corporal	Army	Firestone Tire & Rubber	Ryan	Liquid	Gilfillian	Operational
Davy Crockett	Army	Army Weapons Cmd.		Solid		(Phasing Out) Operational
Honest John	Army	Douglas & Emerson Electric	Hercules Powder	Solid	Unguided	Operational (Phasing Out)
Jupiter	USAF	Chrysler Corp.	No. American	Liquid	Ford Instrument	Operational (Phasing Out)
Little John	Army	Emerson Electric	Hercules Powder	Solid	Unguided	Operational (Phasing Out)
Lacrosse	Army	Martin	Thiokol	Solid	Martin & I.T.&T.	Operational (Phasing Out)
Lance	Army	Chrysler & Ling-Temco-Vought		Solid		Study
Mace A-B	USAF	Martin	Thiokol & General Motors	Solid & Turbojet	Goodyear & General Motors	Operational
Matador	USAF	Martin	Allison	Turbojet	AC Sparkplug & Goodyear	Operational (Phasing Out)
MMRBM	USAF	Hughes & Northrop	Thiokol	Solid	General Precision	Development
Minuteman	USAF	Boeing	Thiokol & Aerojet	Solid	No. American	Operational
Pershing	Army	Martin	Thiokol	Solid	Bendix	Operational
TOW	Army	Hughes		Solid		Development
Redstone	Army	Chrysler Corp.	No. American	Liquid	Sperry	Operational (Phasing Out)
Regulus I	Navy	Ling-Temco-Vought	Allison & Aerojet	Turbojet & Solid	Sperry	Operational (Phasing Out)
LASV	USAF	Ling-Temco-Vought	Marquardt	Nuclear Ramjet		Evaluation
Sergeant	Army	Sperry	Thiokol	Solid	Sperry	Operational
Shillelagh	Army	Ford/Aeronutronics	Amco Chemical & Picatinny Arsenal	Solid		Development
Thor	USAF	Douglas	No. American	Liquid	AC Sparkplug	Operational
Titan I	USAF	Martin	Aerojet	Liquid	Bell Telephone & Sperry	Operational
Titan II	USAF	Martin	Aerojet	Liquid	General Motors	Operational
Polaris	Navy	Lockheed	Aerojet	Solid	General Electric, Hughes & MIT	Operational

(*Continued on next page*)

ROCKETS AND MISSILES IN DEVELOPMENT OR PRODUCTION—*Continued*

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
AIR-TO-SURFACE						
Bullpup	Navy-USAF	Martin	Thiokol	Solid	Maxson Electronics	Operational
Hound Dog	USAF	North American	Pratt & Whitney	Turbojet	No. American	Operational
Shrike	Navy	Naval Ordnance Test Station		Solid	Texas Instruments	Development
Zuni	Navy	Naval Ordnance Test	—	Solid	Unguided	Operational
Quail	USAF	McDonnell	General Electric	Turbojet	Guidance Technology, Inc.	Operational
SURFACE-TO-UNDERWATER						
Alpha	Navy	In-House	—	Solid	—	Operational
Asroc	Navy	Minneapolis-Honeywell	Minneapolis-Honeywell	Solid	General Precision	Operational
UNDERWATER-TO-UNDERWATER						
Subroc	Navy	Goodyear	Thiokol	Solid	General Precision	Operational

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

2500-nautical-mile A-3. All of the A-1 submarines will be retrofitted with the A-3, but the Defense Department has deferred a decision on replacing the A-2 with the A-3 for several years.

In the surface-to-air category, the Nike-Hercules system is destined to remain intact. The 195 Bomarc A's, with a 200-mile range, will be phased out in FY 1965 and the 188 Bomarc B's, with a 400-mile range, will be deployed at six bases. Research and tests are continuing on the Nike-Zeus and Nike-X anti-missile missile systems, including the high-acceleration Sprint missile, but production plans for the anti-ICBM's have not been finalized.

Deliveries have started on the man-carried Redeye anti-aircraft missile. The Pershing tactical surface-to-surface ballistic missile continues in production but the FY 1965 budget entails no further procurements of the Hawk and Hercules surface-to-air weapons. Final purchases of the Honest John rocket will be made with FY 1965 money and first orders are being placed for the Shillelagh anti-tank weapon and the Lance,

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

Year	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

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).

a light weight missile for division support which is designed to replace the Honest John and possibly the Little John.

The Navy, meanwhile, is continuing to reorder the Talos, Tartar and Terrier surface-to-air missiles. Despite the cancellation of the Typhon SAM development program a year ago, the Navy is programming for 1965-1969:

a) Further improvements to existing ship-to-air missile systems.
b) A new standard missile to replace Tartar and Terrier.
c) Development of a completely new surface-to-air fleet missile system.

The Navy has also scheduled follow-on purchases of the Sidewinder I-C air-to-air and the Bullpup B air-to-surface missiles in FY 1965 as well as the anti-sub Subroc. The Phoenix air-to-air missile, destined to be carried by the F-111 (TFX) fighter, will be ordered to phase in with F-111 deliveries. First production orders for the TFX come in FY 1965. Sadeye and Gladeye weapon dispensers and Snakeye I 500-pound bombs are all in the Navy's 1965 procurement program.

The Air Force will continue its Mace A and Mace B tactical missile squadrons in Europe and Okinawa, but development work will be continued on a longer-range tactical weapon, the mobile medium range ballistic missile (MMRBM) to fill the gap between the 400-mile Army Pershing and the ocean-spanning ICBM's. Air Force missile orders in FY 1965 include Bullpup B and Bullpup trainer missiles, Snakeyes, Shrike anti-radar missiles and follow-on contracts for the Sparrow III air-to-air missile.

New missiles still in the research and development stage are the Army

TOW anti-tank weapon, an improved Shillelagh, an air defense system to replace Nike-Hercules and Hawk and the Mauler forward area air-defense system. The Navy is evolving a quick reaction anti-submarine warfare weapon with a longer range than the existing Asroc and Walleye, a free-fall bomb to be launched against tactical targets by attack aircraft.

Major strategic missiles being studied are the Minuteman II and MMRBM by the Air Force and an improved Navy Polaris beyond the A-3.

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

Year	Net Sales During Year	Backlog as of Dec. 31
1961	$ 784	$367
1962	1,060	494
1963	1,153	708

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.
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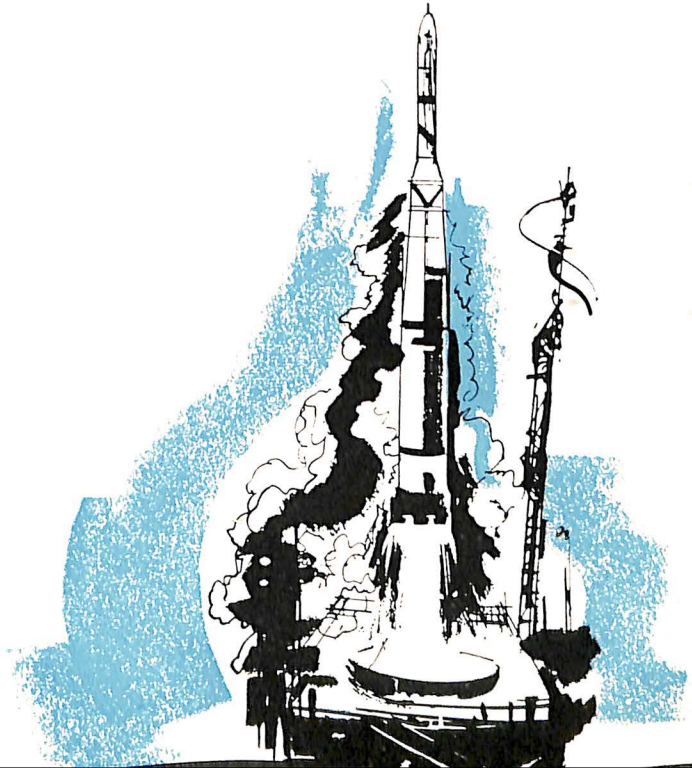


DEPARTMENT OF DEFENSE
EXPENDITURES FOR GUIDED MISSILE PROCUREMENT, BY AGENCY
Fiscal Years 1951 to Date
(Millions of Dollars)

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[E]	3,506	2,118	857	531
1965[E]	3,285	2,050	852	383

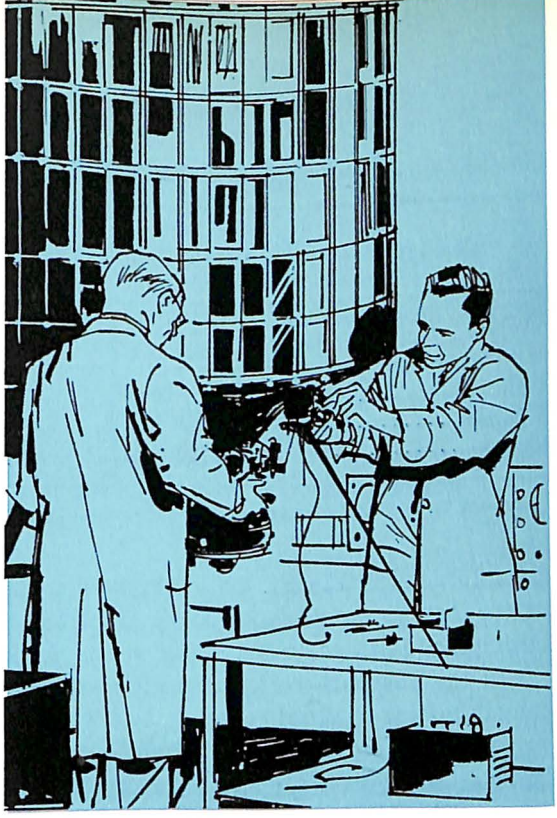
[E] Estimate.
Source: Department of Defense, Directorate for Security Review.

INTERCONTINENTAL BALLISTICS MISSILES PRODUCED FOR THE AIR FORCE
1961 to Date

Year	Weapons Systems in Acquisition December 31	Intercontinental Ballistic Missiles Delivered
1961	4	111
1962	4	186
1963	2	486

Source: Air Force Systems Command, 1963 Annual Report.

SPACE PROGRAMS



Fabrication of hardware for the nation's space programs continued to increase as a percentage of the overall effort of the aerospace industry, as space expenditures by the various Government agencies rose significantly in fiscal year 1964. Early estimates indicated additional increases in fiscal year 1965.

Federal budget estimates released early in 1964 showed that space expenditures for FY 1964 were expected to top the $6 billion level. This represents a major increase over 1963 expenditures of $4.1 billion. The bulk of the increase was to come in the National Aeronautics and Space Administration budget, which contemplated expenditures of $4.4 billion in FY 1964, as opposed to $2.6 billion in the preceding year.

There was also expected to be an increase in Department of Defense space funding, from $1.4 billion in FY 1963 to $1.6 in FY 1964. Slight increases were indicated for the other agencies involved in space research —the Atomic Energy Commission, the U.S. Weather Bureau (Department of Commerce) and the National Science Foundation.

At publication deadline, final FY 1965 budgets for space programs had not been approved. Preliminary estimates supplied by the Bureau of the Budget called for an increase in space expenditures of slightly less

SPACECRAFT IN ORBIT AS OF 31 DECEMBER 1963

Country	TOTAL	Earth Orbit	Solar Orbit
TOTAL	90	81	9
United States	80	75	5
U.S.S.R.	9	5	4
Canada	1	1	–

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

than $590,000,000 in FY 1965 compared with FY 1964. Again, the bulk of the increase would be in NASA funding, with a drop of $35,000,000 anticipated in Department of Defense expenditures.

In the 12-month period preceding publication of this volume, space launches were confined to unmanned systems (the initial man-in-space program, Project Mercury, concluded on May 15, 1963 with the successful 22-orbit flight of astronaut L. Gordon Cooper in Mercury-Atlas 9). Highlights of this period included:

TIROS. NASA's program aimed at development of an operational weather satellite system gained momentum with two additional launches of the Tiros spacecraft. Tiros 7 was launched June 19, 1963 and Tiros 8 went into orbit on December 21, 1963. One of the most productive space programs, Tiros had eight successful launches in as many attempts.

SYNCOM. On July 26, 1963, Syncom 2 became the first spacecraft launched into synchronous orbit (an orbit at approximately 22,300 miles altitude with the spacecraft's orbital velocity coordinated with the earth's rotational speed so that the satellite remains over a given longitude). A second generation "comsat" of the active-repeater type, Syncom 2 successfully carried out a number of communications experiments.

EXPLORER. NASA continued to gain data from this series of scientific satellites with launches of Explorer 18 (November 27, 1963) and Explorer 19 (December 19, 1963). Explorer 18, also known as the Interplanetary Monitoring Platform, was designed to investigate the earth's magnetic field and to determine the effect of solar winds and cosmic rays on the magnetosphere. Explorer 19 involved launch of a large inflatable sphere and measurements of high altitude air density and drag.

RELAY. The second Relay satellite was successfully launched Janu-

ary 21, 1964. Relay is a 172-pound, octagon-shaped active-repeater communications satellite.

ECHO. A 135-foot diameter "rigidized" balloon, Echo 2 is a communications satellite of the passive, or "bounce," variety, in which the balloon serves as an in-space reflector for sending signals from one point on earth to another. It was launched January 25, 1964.

GEMINI. The first unmanned test of the two-man Gemini capsule was successfully carried out on April 8, 1964.

FIRE. The first Project Fire spacecraft was launched on a 5,200-mile suborbital flight from Cape Kennedy to Ascension Island on April 14, 1964. Project Fire is a study of temperatures and other conditions occurring when a spacecraft re-enters the atmosphere at speeds of 25,000 miles per hour, the approximate speed of a vehicle re-entering after a lunar voyage. The 200-pound Fire spacecraft made a successful 32-minute flight and relayed to earth more than 100,000 measurements during its brief re-entry.

MILITARY PROGRAMS. The military services continued to launch unmanned payloads at the rate of about one per week, in tests aimed at development of observation, early warning, inspection, detection and other spacecraft. Most of the payloads were classified. Among the un-

CHRONOLOGY OF MANNED SPACE FLIGHTS

Launch Date	Project	Pilot	Nation	Duration
Suborbital				
May 5, 1961	Mercury-Redstone 3	Alan Shepard	USA	302 miles
July 21, 1961	Mercury-Redstone 4	Virgil Grissom	USA	303 miles
Orbital				
April 12, 1961	Vostok 1	Yuri Gagarin	USSR	One Orbit
Aug 6, 1961	Vostok 2	Gherman Titov	USSR	17 Orbits
Feb 20, 1962	Mercury-Atlas 6	John Glenn	USA	3 Orbits
May 24, 1962	Mercury-Atlas 7	Scott Carpenter	USA	3 Orbits
Aug 11, 1962	Vostok 3	Andreyan Nikolayev	USSR	64 Orbits
Aug 12, 1962	Vostok 4	Pavel Popovich	USSR	48 Orbits
Oct 3, 1962	Mercury-Atlas 8	Walter Schirra	USA	6 Orbits
May 15, 1963	Mercury-Atlas 9	Gordon Cooper	USA	22 Orbits
June 14, 1963	Vostok V	Valery Byovsky	USSR	81 Orbits
June 16, 1963	Vostok VI	Miss Valentina Tereshkova	USSR	48 Orbits

Source: National Aeronautics and Space Administration.

classified launches were the Vela Hotel satellite designed for detection of nuclear blasts in space (two of the 500-pound spacecraft were launched October 17, 1963) and the SECOR geodetic satellite, launched January 19, 1964.

LAUNCH VEHICLES. Progress was made during the year on new high-thrust launch vehicles for the space program. Centaur, consisting of a 360,000-pound thrust Atlas rocket topped by two liquid hydrogen engines in a second stage, was successfully test flown for the first time on November 27. The first flight test of a complete Saturn I vehicle (1,500,000 pounds thrust in the basic stage, plus six liquid hydrogen engines in the upper stage) achieved success on January 29, 1964. The Gemini-Titan II launch vehicle (430,000 pounds thrust) was successfully tested on the unmanned Gemini firing of April 8, 1964.

NEW PROGRAMS. Late in 1963, the Department of Defense initiated a new man-in-space program. Called MOL (Manned Orbiting Laboratory), it is designed for long-duration military experiments. The spacecraft, to be launched by a Titan III-C booster, will consist of a modified Gemini B capsule plus a large laboratory canister. It was tentatively scheduled for first launch in 1967.

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	–	–
TOTAL	179	65	6	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, 1963."

New unmanned projects initiated by NASA during the year include:

Bios, a 1,000-pound spacecraft designed to orbit biological payloads for as long as 30 days. NASA planned to launch six such spacecraft at 90-day intervals, starting in 1965.

Meteoroid Detection Satellite, a 3,400-pound spacecraft for investigation of meteoroid frequency, size, energy and hazard potential. Two such spacecraft will be orbited, the first late in 1964.

Advanced Technology Satellite, a 600-pound spacecraft designed to test communications and meteorological systems in synchronous orbit. Five launches are planned, the first in 1966.

Lunar Orbiter, an 800-pound spacecraft to orbit the moon and take high-resolution photographs as a preliminary to a manned lunar landing. Ten flights are scheduled, beginning in 1966.

Chronology of Major United States Space Launchings
1961 to March 1964

Date	Designation	Purpose
1961		
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
1962		
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

(*Continued on next page*)

CHRONOLOGY OF MAJOR UNITED STATES SPACE LAUNCHINGS—*Continued*
1961 to March 1964

April 26	Ariel I	U. S./U. K. scientific earth satellite
May 8	Centaur	Launch vehicle test
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
1963		
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
1964		
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

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.

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

Year Ending June 30	TOTAL	National Aeronautics and Space Administration[a]	Department of Defense	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[E]	6,221	4,400	1,583	238
1965[E]	6,782	4,990	1,548	244

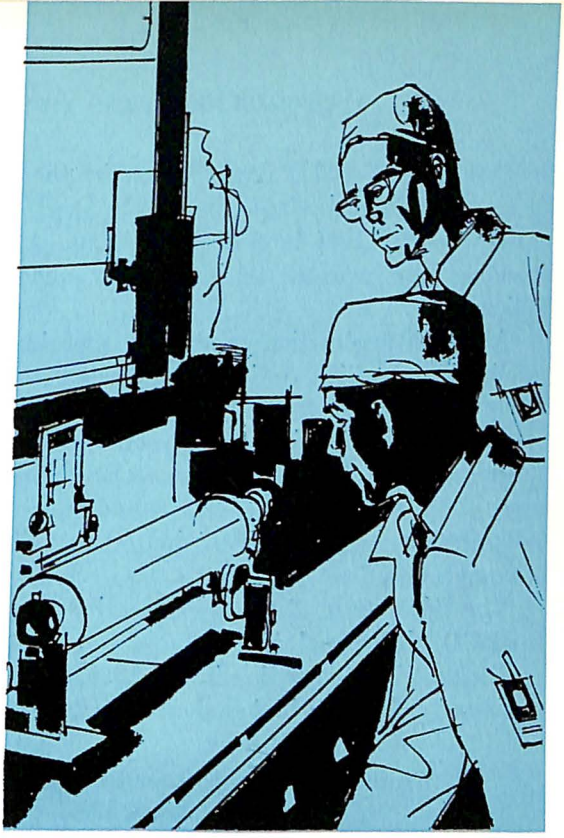
NOTE: Most of the activities of the National Aeronautics and Space Administration are classified as Research and Development. See chapter on Research and Development for additional tables.
[E] Estimate.
[a] Includes amounts for aircraft technology, amounting to $45-50 million per year in 1963 and thereafter.
Source: Bureau of the Budget.

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

Year	Net Sales During Year			Backlog, December 31		
	TOTAL	Military[a]	Non-military	TOTAL	Military[a]	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

NOTE: Based on data from 67 companies engaged in the manufacture of aerospace products.
[a] 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 and rockets.
Source: Bureau of the Census, "Current Industrial Reports, Series M37D" (Quarterly).

RESEARCH AND DEVELOPMENT



The trend toward increased emphasis on research and development in aerospace manufacturing activities continued during 1963-64. No longer a prelude to production of an item, research and development is now an integral part of systems fabrication, starting in the "thinking" stage and following through the various stages until the end product is in service with the using agency.

Aerospace firms again expanded company-financed R&D work but, as in previous years, the bulk of the effort went into Government-sponsored projects. Since companies engaged in aerospace work handle most of the Government R&D program under contract, an indication of the magnitude of the industry's effort is found in Government R&D funding data.

Bureau of the Budget estimates for the fiscal year 1964 show a sharp increase over fiscal 1963 in overall Federal R&D expenditures. Total anticipated expenditures of $14.88 billion in FY 1964 represent an increase of $2.9 billion.

As in previous years, R&D programs for the Department of Defense accounted for the major portion of the expenditures. DOD spending was expected to reach $7.45 billion, an increase of approximately $600,-

000,000 over FY 1963. Expenditures by the National Aeronautics and Space Administration rose even more sharply, by $1.85 billion to an anticipated FY 1964 level of $4.4 billion. Atomic Energy Commission spending was expected to increase by almost $200,000,000, to $1.54 billion.

Although final action on the FY 1965 budget was still pending at publication deadline, estimates indicated another increase in overall Government R&D expenditures. Approval of the Federal budget as requested by the Administration would bring an increase of $404,000,000 to a record high of $15.287 billion. A decrease of $343,000,000 in Department of Defense R&D spending would be more than compensated by a $590,000,000 rise in the NASA budget and slight increases in AEC and other agencies.

The R&D effort of the aerospace industry is concentrated on work for DOD, NASA and AEC.

Planned DOD spending in FY 1965 totals $7.1 billion. The types of projects involved are broken down into four major categories:

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	1,257	1,283	1,021
1963	11,983	6,849	2,552	1,335	1,247
1964[E]	14,883	7,450	4,400	1,543	1,490
1965[E]	15,287	7,107	4,990	1,557	1,633

NOTE: Includes military personnel, procurement, civil functions, and some other items not included in other tables in this chapter.
[E] Estimate.
Source: "The Budget of the United States Government" (Annually).

DEPARTMENT OF DEFENSE
EXPENDITURES FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION[a]
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[E]	6,943	3,623	1,487	1,373	460
1965[E]	6,580	3,237	1,458	1,365	520

NOTE: For RDT&E expenditures for aircraft, missiles and astronautics *only*, see page 62.
N.A.—Not available.
[E] Estimate.
[a] Adjusted to make data comparable to current appropriation structure. Does not include RDT&E expenditures from other appropriations.
Sources: Department of Commerce, Bureau of the Census, "Census of Manufactures."
"The Budget of the United States Government" (Annually).

Research. Described by Secretary McNamara as "the realm of ideas and theory from which advanced devices and inventions eventually emerge," this category involves both basic and applied research in such fields as the physical and environmental sciences, mathematics, psychology, sociology, biology and medical sciences.

Exploratory Developments. This category includes research toward solution of military problems short of actual "hardware" development. Examples include: Army, studies toward new propulsion systems for aircraft, applied research in rocket propellants and improved arms and armor defeating projectiles; Navy, detection of underwater, surface and air targets, communications, missile propellants, guidance systems and countermeasures; Air Force, space-related studies, new propulsion systems for hypersonic aircraft, V/STOL aircraft, laminar flow control, new materials and structures, techniques related to reconnaissance, communi-

cations and command and control; Advanced Research Projects Agency, studies of ballistic missile flight phenomena and studies of R&D support for remote area conflict.

Advanced Developments. Projects which have progressed to experimental hardware status, examples of which are: Army, V/STOL aircraft, new surveillance aircraft, heavy lift helicopters and antitank weapons; Navy, a variety of antisubmarine warfare projects, COIN (counter-insurgency) aircraft, defense against sub-launched weapons and research on "air cushion" ships; Air Force, advanced ballistic missiles, avionics for tactical aircraft, and hypersonic aircraft research.

Engineering Developments. This category includes development programs being engineered for service use, such as: Army, the Nike-Zeus/Nike-X anti-missile system, Mauler, Lance and Tow Missile systems, combat surveillance equipment, communications and electronic equipment, and a new light observation helicopter; Navy, the regenerative turboprop engine for ASW (anti-submarine warfare) aircraft, the Walleye free-fall bomb, a new medium-range air-to-surface missile and a new, quick-reaction ASW weapon; Air Force, conclusion of the B-70 program, the Medium Range Ballistic Missile, advanced manned strategic systems of increased penetrability, and a heavy logistic support aircraft.

Major NASA R&D programs include the Gemini and Apollo manned spacecraft, the Ranger, Surveyor and Lunar Orbiter moon probes, the large observatory spacecraft (Orbiting Solar Observatory, Orbiting Geo-

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 FUNCTIONS	AEROSPACE				Other
		TOTAL	Aircraft	Missiles	Astronautics	
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[E]	6,943	4,402	860	2,182	1,360	2,541
1965[E]	6,580	3,861	878	1,878	1,105	2,719

[E] Estimate.
Source: Department of Defense, Report FAD 475, 21 January 1964.

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

Year	TOTAL, RESEARCH AND DEVELOPMENT	AEROSPACE[a]		
		Total	Federal Government Funds	Company Funds
1956	$ 6,598	$2,182	N.A.	N.A.
1957	7,725	2,627	$2,266	$361
1958	8,363	2,662	2,276	386
1959	9,609	3,174	2,769	405
1960	10,507	3,631	3,180	451
1961	10,872	3,957	3,537	420
1962	11,560	4,199	3,787	412

N.A.—Not available.
[a] Includes companies primarily engaged in the manufacture of aircraft and parts, SIC 372, and the manufacture of ordnance and accessories, including complete missiles and space vehicles, SIC 19. Does not include companies normally engaged in the manufacture of electronics or instruments.
Source: National Science Foundation.

physical Observatory and Orbiting Astronomical Observatory), the Mariner Mars probe, continuing work on communications and weather satellites, and the Saturn family of launch vehicles. Details of other NASA programs and military space programs are contained in Chapter VIII.

The aerospace-related portion of the Atomic Energy Commission's R&D program (anticipated expenditures of $1.56 billion in FY 1965) includes several types of SNAP (System for Nuclear Auxiliary Power) generators and reactors for electrical power, the Kiwi series of reactors for space launch vehicle propulsion, and the Tory 2C reactor for missile propulsion.

INDUSTRIAL RESEARCH AND DEVELOPMENT IN AEROSPACE, BY TYPE OF RESEARCH AND FUND SOURCE[a]
1958 to Date
(Millions of Dollars)

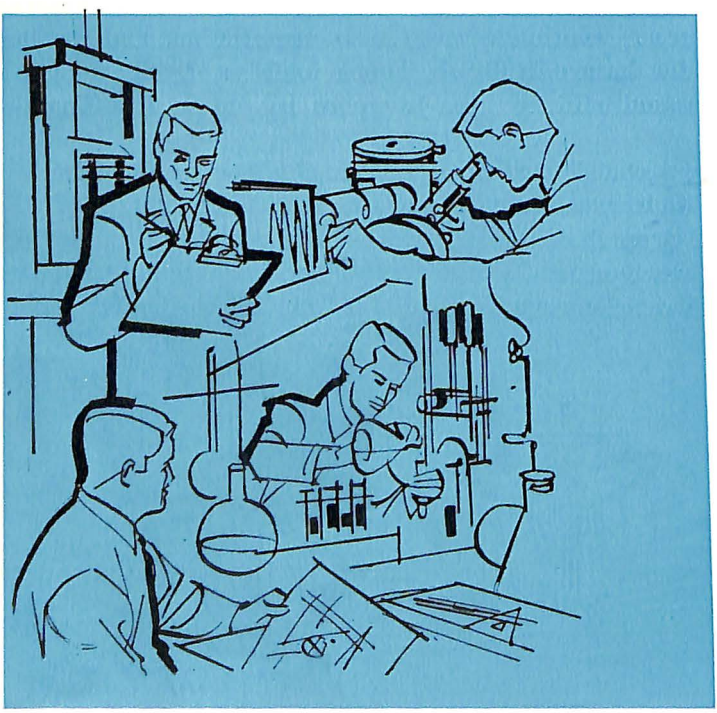
Year	Total Aerospace	Applied Research and Development Funds			Basic Resaerch Funds		
		Total	Federal Government	Company[b]	Total	Federal Government	Company
1958	$2,662	$2,636	$2,260	$376	$26	$16	$10
1959	3,174	3,142	1,755	387	32	14	18
1960	3,631	3,569	3,150	419	62	30	32
1961	3,957	3,906	3,510	396	51	27	24
1962	4,199	4,130	N.A.	N.A.	69	N.A.	N.A.

N.A.—Not available.

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

[b] Includes all funds for research and development performance except those from the Federal Government and company-financed research and development contracted to outside organizations such as educational and non-profit research institutions.

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



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	Administrative 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[E]	4,400	3,520	475	405
1965[E]	4,990	3,905	520	565

[E] Estimate.
Source: "The Budget of the United States Government" (Annually).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, EXPENDITURES BY PROGRAM
Fiscal Years, 1963 to Date
(Millions of Dollars)

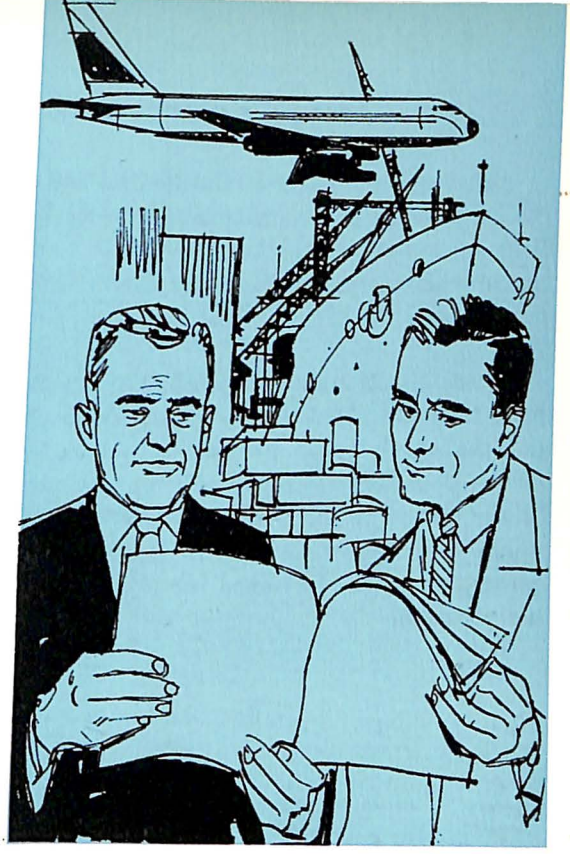
Program	Year Ending June 30		
	1963	1964[E]	1965[E]
TOTAL	$2,552	$4,400	$4,990
Manned space flight	1,533	2,898	3,370
Unmanned investigation in space	484	645	670
Meteorology, communications and other space applications	90	105	97
Space research and technology	272	444	454
Aircraft technology	37	45	51
Supporting operations	136	263	348

[E] Estimate.
Source: National Aeronautics and Space Administration, Budget Operations Division, Office of Programming, letter of 27 March, 1964.

ATOMIC ENERGY COMMISSION
EXPENDITURES FOR RESEARCH AND DEVELOPMENT
1954 TO DATE
(Millions of Dollars)

Year Ending June 30	TOTAL	Conduct of Research and Development					Increase in Research and Development Plant
		Total	Special Nuclear Materials and Weapons	Reactor Development	Biology, Medicine, Physics	Other Research and Development	
1954	$274.3	$229.5	$ 96.0	$ 70.6	$ 62.9	...	$ 44.8
1955	289.8	253.4	92.1	95.4	65.9	...	36.4
1956	385.1	335.5	106.4	155.1	74.0	...	49.6
1957	512.2	419.5	90.1	244.8	84.6	...	92.7
1958	637.0	516.1	110.6	289.6	115.9	...	120.9
1959	877.1	699.8	226.0	325.8	143.5	4.4	177.5
1960	986.3	761.7	223.5	361.7	166.8	9.6	224.6
1961	1,104.1	843.0	240.0	399.9	192.4	10.7	261.1
1962	1,283.4	1,029.2	400.6	396.7	217.9	14.0	254.2
1963	1,335.3	1,077.8	351.7	462.4	247.9	15.7	257.6
1964[E]	1,543.1	1,236.7	437.9	508.3	268.6	21.9	306.4
1965[E]	1,556.9	1,242.1	420.9	497.9	302.0	21.3	314.8

[E] Estimate.
Source: "The Budget of the United States Government" (Annually).



EXPORTS

For the sixth time in eight years, aeronautical products sold abroad exceeded the billion-dollar mark. With 1963 exports estimated to be $1.24 billion, the nation's aerospace industry acounted for 5.4 per cent of all manufactured goods exported by the U. S.

Included in the $1.24 billion export figure were $191 million in commercial transports; $26.9 million in general aviation aircraft; about $3.6 million in power plants; and $9.8 million in helicopters.

Actually, the amount of U. S. aerospace goods and services acquired by foreign nations during 1963 substantially surpassed the $1.24 billion figure. The aforementioned Commerce Department's export statistics excluded:

1. Aeronautical and space products furnished to foreign government under the Mutual Defense Assistance Programs.
2. Space equipment supplied to foreign governments by U. S. manufacturers under the cognizance of the National Aeronautics and Space Administration which total $16 million during the 1961-1963 period.
3. Income acquired by American aerospace companies abroad as a result of licensing agreements, investments in foreign manufacturing firms and earnings under technical assistance contracts.

AIA considers that a total aerospace export figure of $2 billion (including military and commercial products) is not totally unrealistic for 1970 and beyond. Estimates made by Defense Department officials concerned with international security affairs indicate that military products may account for exports of $1 to $1.5 billion a year between now and 1971.

About 40 per cent of this military export potential would be equipment for ground forces; some 35 per cent would be for foreign air forces; and the remaining 25 per cent would be equipment for naval forces. DOD officials believe that the U. S. aerospace industry can participate "significantly" in this potential market. The DOD estimate of a foreign military market totaling $1 to $1.5 billion annually is in addition to aerospace materiel furnished friendly nations under the various military aid programs.

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

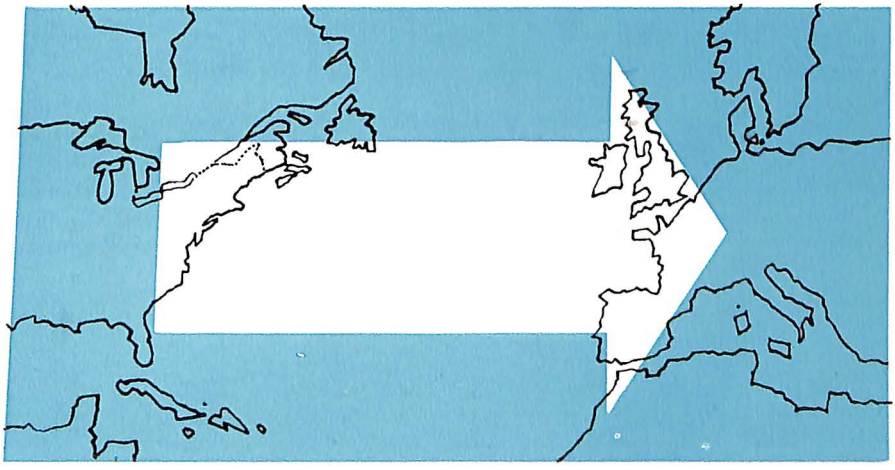
Year	TOTAL AEROSPACE PRODUCTS	Transports	Utility	Engines	Rotary Wing	Other and Under Security Restrictions
1948	$ 153.6	$ 37.4	$ 4.2	$0.3	$ 1.9	$ 109.8
1949	283.0	22.2	2.8	0.1	1.2	256.6
1950	242.4	40.4	2.2	0.3	0.9	198.6
1951	301.4	13.2	3.7	0.5	0.9	283.1
1952	603.2	18.2	5.6	0.9	1.4	577.1
1953	880.6	79.2	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

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

EXPORTS OF NEW PASSENGER TRANSPORTS
1948 to Date

Year	TOTAL		3,000–14,999 lbs airframe weight		15,000–29,999 lbs airframe weight		30,000 lbs & over airframe weight	
	Number	Value (Millions)	Number	Value (Millions)	Number	Value (Millions)	Number	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	[a]	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

[a] Less than $500,000.
Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).

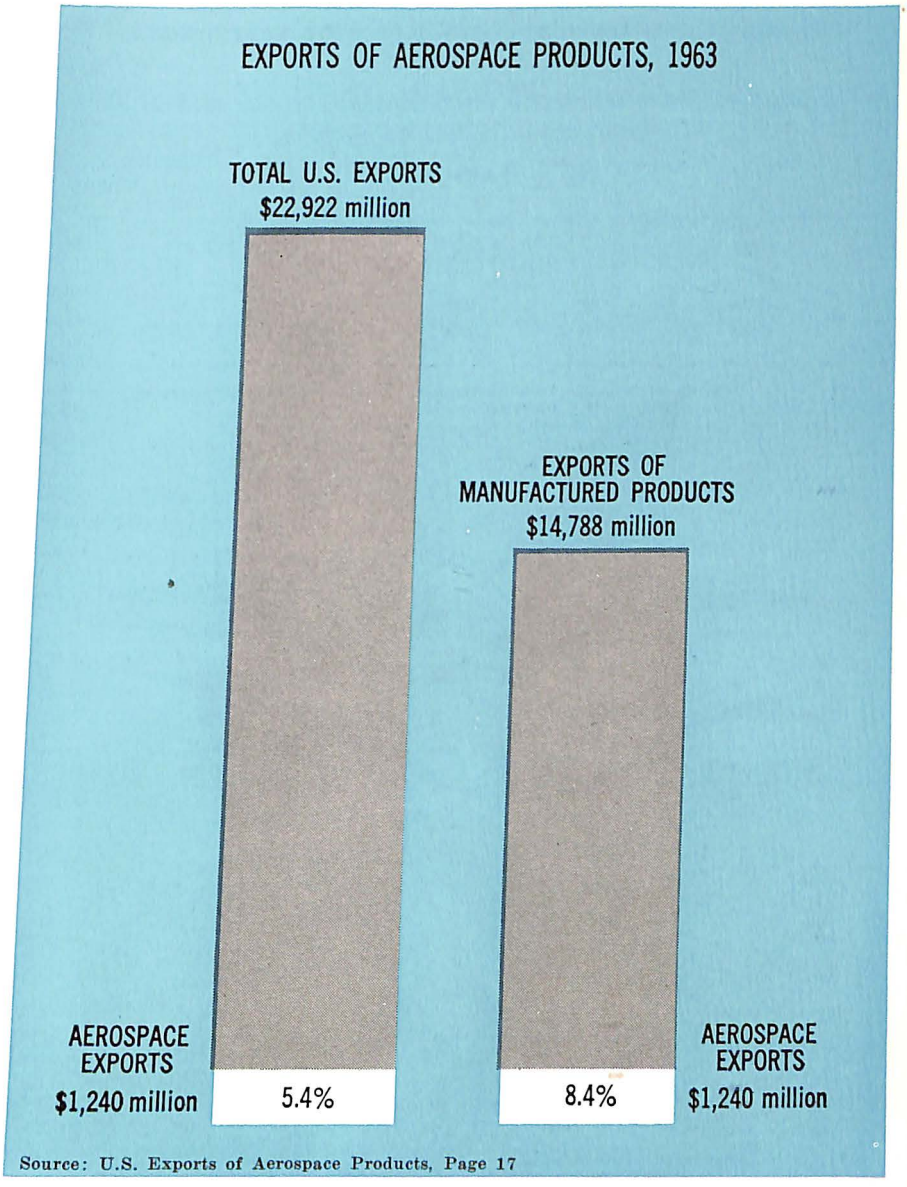


Moreover, AIA believes, the NASA cooperative program with 91 foreign nations and two multi-nation organizations in Europe will inevitably result in increasing exports of sounding rockets, payloads, electronic equipment, communications ground terminals, test facilities, solar cells, power and telemetry packs and other space hardware. Potential customers include the 91 nations with whom NASA has working agreements, as well as the European Launcher Development Organization (ELDO) and the European Space Research Organization (ESRO).

EXPORTS OF NEW UTILITY, PERSONAL, AND LIAISON PLANES
1948 to Date

Year	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

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



Source: U.S. Exports of Aerospace Products, Page 17

EXPORTS OF LIGHT TRANSPORTS AND UTILITY AIRCRAFT BY SELECTED U. S. MANUFACTURERS
1960 to Date

Year	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

NOTE: Data based on exports for Aero Commander, Beech, Cessna, and Piper of new civil aircraft under 20,000 pounds, empty airframe weight.
Source: Aerospace Industries Association, company reports.

EXPORTS OF LIGHT TRANSPORTS AND UTILITY AIRCRAFT, BY SELECTED U. S. MANUFACTURERS, BY DESTINATION, 1963

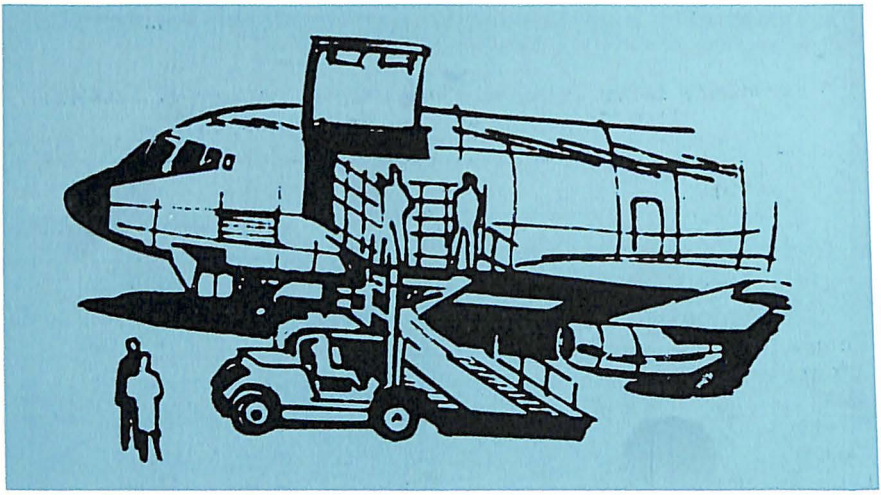
Total and Destination	Number	Value (Thousands of Dollars)
TOTAL	1,579	$35,060.6
Europe	420	11,548.0
Africa	178	3,374.9
Asia	79	2,283.0
Oceania	188	2,689.4
Canada	145	2,510.1
Latin America	509	11,591.3
Not distributed by area	60	1,063.1

NOTE: Data based on exports for Aero Commander, Beech, Cessna, and Piper 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 Ending September 30	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
TOTAL[a]	16,396	14,559	1,837

[a] October 6, 1949 to September 30, 1963.
Source: Department of Defense, Directorate for Security Review.



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

Year	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

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

U. S. EXPORTS OF NEW AIRCRAFT ENGINES[a] FOR CIVILIAN AIRCRAFT, 1948 TO DATE

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

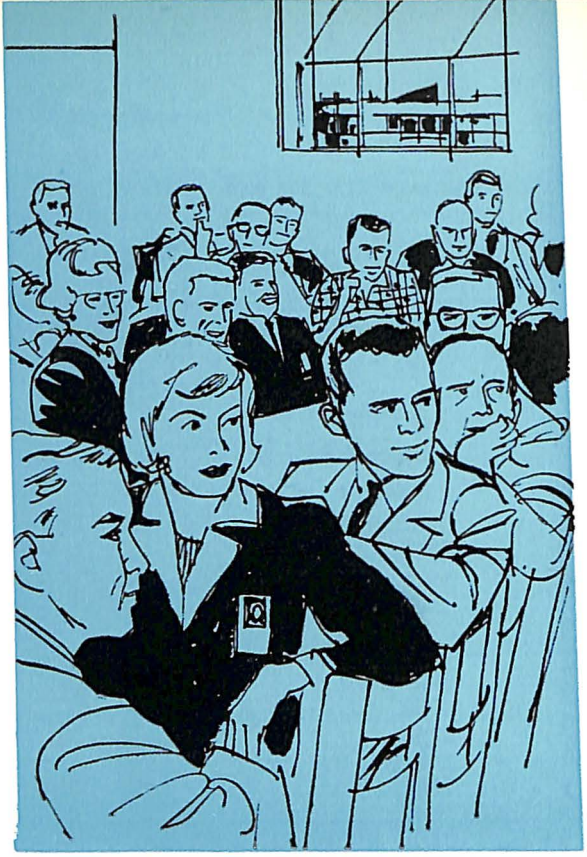
[a] Under 400 h.p.; data for exports of engines of 400 h.p. and over withheld for "security reasons."
[b] Under 250 hp.
Source: Bureau of the Census, "U. S. Exports of Domestic & Foreign Merchandise, Report FT 410" (Monthly).

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

Year	TOTAL	Aircraft[a]	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[b]	95,290	26,831	4,675	63,784

[a] Aircraft includes new and used airplanes, seaplanes, and amphibians.
[b] 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" (Monthly).

MANPOWER



Employment in the aerospace industry, the nation's largest manufacturing employer, during 1963 reached its highest point in five years with 1,253,000 workers. Aerospace workers made up 7.4 per cent of all manufacturing employees and 13 per cent of all durable goods employees.

The trend in employment toward fewer production workers and more scientists, engineers, technicians and administrative personnel is evident in a statistical analysis prepared by AIA. The study shows that in 1959 total employment was 1,128,000 of which 673,000 were production workers and in 1963 there were 1,253,000 employees of which 653,000 were production workers. Manufacturers of complete missiles and space vehicles showed an employment increase from 82,000 in 1959 to 179,000 in 1963, but the number of production workers accounted for only 31,000 out of a total increase of 97,000 workers.

The National Science Foundation has projected requirements for scientists and engineers in 1970 and compared the requirement with the number employed in 1960. There were 613,500 engineers and scientists employed in manufacturing industries in 1960, of which 106,300 were in the aerospace industry. By 1970, NSF estimates there will be 1,064,900

scientists and engineers in manufacturing industries, of which 194,500 will be in aerospace assignments.

The NSF study also shows that there were 420,200 technicians in manufacturing industries with 49,000 employed in aerospace tasks. By 1970, this will increase to 749,300 with 107,000 in the aerospace industry.

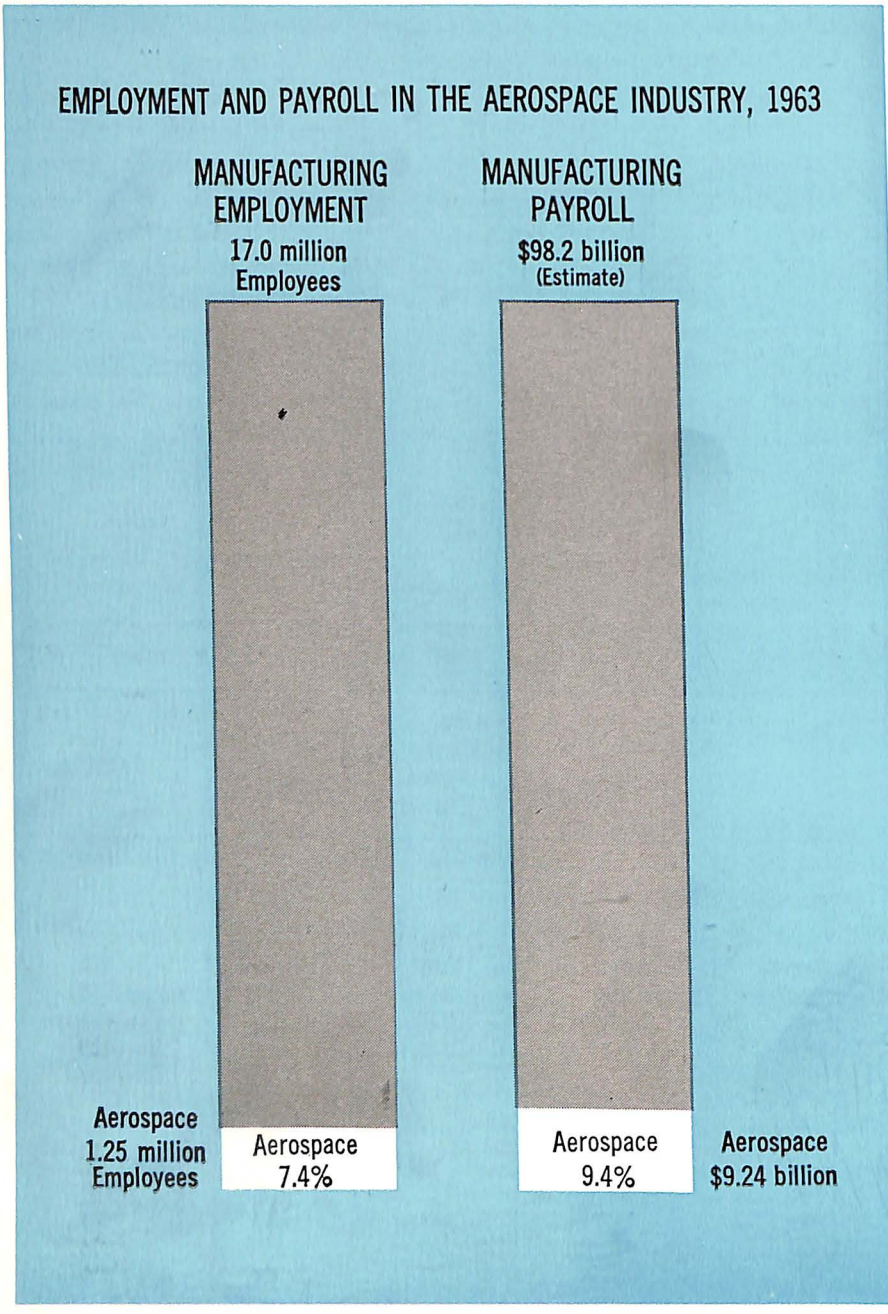
Average hourly earnings of production workers in the aerospace industry in 1963 increased to $2.85, compared with $2.78 in the previous year and $2.55 in 1959. Average weekly earnings increased in 1963 to $117.07 compared with $115.30 in 1962 and $104.03 in 1959.

The aerospace industry has continued to conduct special training courses to upgrade the skills of workers whose jobs were eliminated because of technological advances. Today there are a substantial number of workers utilizing skills that did not exist five years ago.

ESTIMATED AEROSPACE EMPLOYMENT, TOTAL AND PRODUCTION WORKERS
1959 to Date

Year	Total Aerospace	Plants Manufacturing Primarily		
		Complete Missiles & Space Vehicles	Aircraft & Parts	Other Aerospace Products
TOTAL EMPLOYMENT (thousands)				
1959	1,128	82	748	298
1960	1,074	107	646	321
1961	1,096	141	619	336
1962	1,177	171	635	371
1963	1,253	179	649	425
PRODUCTION WORKERS (thousands)				
1959	673	33	458	182
1960	607	42	377	188
1961	597	54	352	191
1962	619	64	351	205
1963	653	64	356	233

NOTE: Components may not add to total due to rounding.
Sources: Aircraft and Parts: Bureau of Labor Statistics "Employment and Earnings" (Monthly).
Complete Missiles and Space Vehicles and Other Aerospace Products: Aerospace Industries Association, based on latest available information.



Sources: Employment in All Manufacturing, Durable Goods, and Aerospace Industries, Page 14
Estimated Employment and Payroll in the Aerospace Industry, Page 14

SCIENTISTS AND ENGINEERS, BY OCCUPATION
1960 Employment and Projected 1970 Requirements
(Number in Thousands)

Industry and Year	Total	Engineers	Scientists					
			Total	Chemists	Physicists	Metallurgists	Mathematicians	Other
ALL INDUSTRIES								
1960	1,157.3	822.0	335.3	103.5	29.9	14.5	31.4	156.0
1970	1,954.3	1,374.7	579.6	169.5	59.3	24.4	65.1	261.3
All Manufacturing								
1960	613.5	472.8	140.7	72.4	15.2	11.9	10.1	31.1
1970	1,064.9	823.8	241.1	115.1	31.3	19.9	22.5	52.3
AIRCRAFT, MISSILES AND SPACECRAFT								
1960	106.3	88.3	18.0	3.0	5.8	1.4	4.0	3.8
1970	194.5	155.6	38.9	5.4	12.6	2.6	10.1	8.2

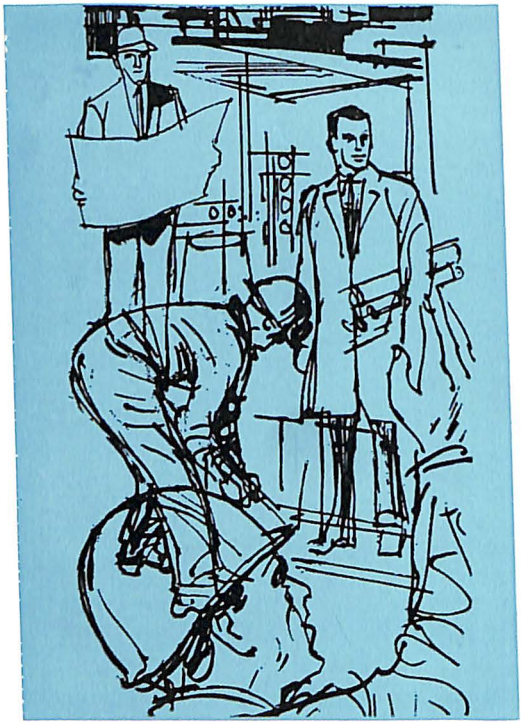
Source: National Science Foundation, "Scientists, Engineers, and Technicians in the 1960's."

AVERAGE HOURLY EARNINGS OF PRODUCTION WORKERS IN THE AEROSPACE INDUSTRY
1959 to Date

Year	Total Aerospace	Plants Manufacturing Primarily		
		Complete Missiles & Space Vehicles	Aircraft & Parts	Other Aerospace Products
1959	$2.55	$2.61	$2.62	$2.36
1960	2.61	2.69	2.70	2.42
1961	2.69	2.81	2.77	2.52
1962	2.78	2.86	2.87	2.58
1963	2.85	2.94	2.95	2.66

NOTE: Average hourly earnings for total aerospace is a weighted average of SIC 192, representing plants manufacturing complete missile and space vehicles; SIC 372, representing plants manufacturing aircraft and parts; and SIC 3662, representing plants manufacturing other aerospace products.

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



AVERAGE WEEKLY EARNINGS OF PRODUCTION WORKERS IN THE AEROSPACE INDUSTRY
1959 to Date

Year	TOTAL AEROSPACE	Plants Manufacturing Primarily		
		Complete Missiles & Space Vehicles	Aircraft & Parts	Other Aerospace Products
1959	$104.03	$108.05	$106.63	$ 96.76
1960	106.20	110.29	110.43	96.80
1961	110.72	115.49	114.68	102.06
1962	115.30	116.69	119.97	106.30
1963	117.07	120.25	122.43	108.00

NOTE: Average weekly earnings for total aerospace is a weighted average of SIC 192, representing plants manufacturing complete missile and space vehicles; SIC 372, representing plants manufacturing aircraft and parts; and SIC 3662, representing plants manufacturing other aerospace products.

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

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY
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[E]
1940	148.6	101.8	31.4	15.4[E]
1941	347.1	234.6	75.3	37.2[E]
1942	831.7	549.6	192.0	90.1[E]
1943	1,345.6	882.1	314.9	148.6[E]
1944	1,296.6	815.5	339.7	141.4[E]
1945	788.1	489.9	210.9	87.3[E]
1946	237.3	159.0	49.9	28.4[E]
1947	239.3	158.5	50.1	30.7[E]
1948	237.7	158.0	48.6	31.1[E]
1949	264.2	175.3	53.6	35.3[E]
1950	283.1	188.4	57.0	37.7[E]
1951	467.8	313.3	95.0	59.5[E]
1952	670.6	425.9	148.6	96.1[E]
1953	795.5	472.4	191.2	131.9[E]
1954	782.9	470.0	178.2	134.7[E]
1955	761.3	466.6	168.0	126.7[E]
1956	837.3	494.4	194.9	148.0[E]
1957	895.8	519.0	213.2	163.6[E]
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	649.4	334.5	210.7	104.2
1964				
Feb.	641.6	334.4	205.4	101.8

[E] 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.

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

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[E]
1940	118.0	79.2	26.5	12.3[E]
1941	278.3	183.8	65.0	29.5[E]
1942	674.8	433.9	168.3	72.6[E]
1943	1,090.5	692.1	278.8	119.6[E]
1944	1,016.0	616.3	290.3	109.4[E]
1945	591.0	360.5	164.9	65.6[E]
1946	167.5	113.1	34.0	20.4[E]
1947	176.7	117.4	36.5	22.8[E]
1948	175.2	117.4	34.9	22.9[E]
1949	196.6	132.2	38.6	25.8[E]
1950	209.4	140.4	40.8	28.2[E]
1951	348.4	234.8	66.5	47.1[E]
1952	495.4	315.0	105.5	74.9[E]
1953	586.2	346.8	136.1	103.3[E]
1954	560.2	335.1	121.6	103.5[E]
1955	525.5	322.5	108.5	94.5[E]
1956	561.0	330.3	122.5	108.2[E]
1957	591.4	342.4	132.1	116.9[E]
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	355.8	176.1	112.6	67.1
1964				
Feb.	358.0	183.6	109.0	65.4

[E] Estimate.

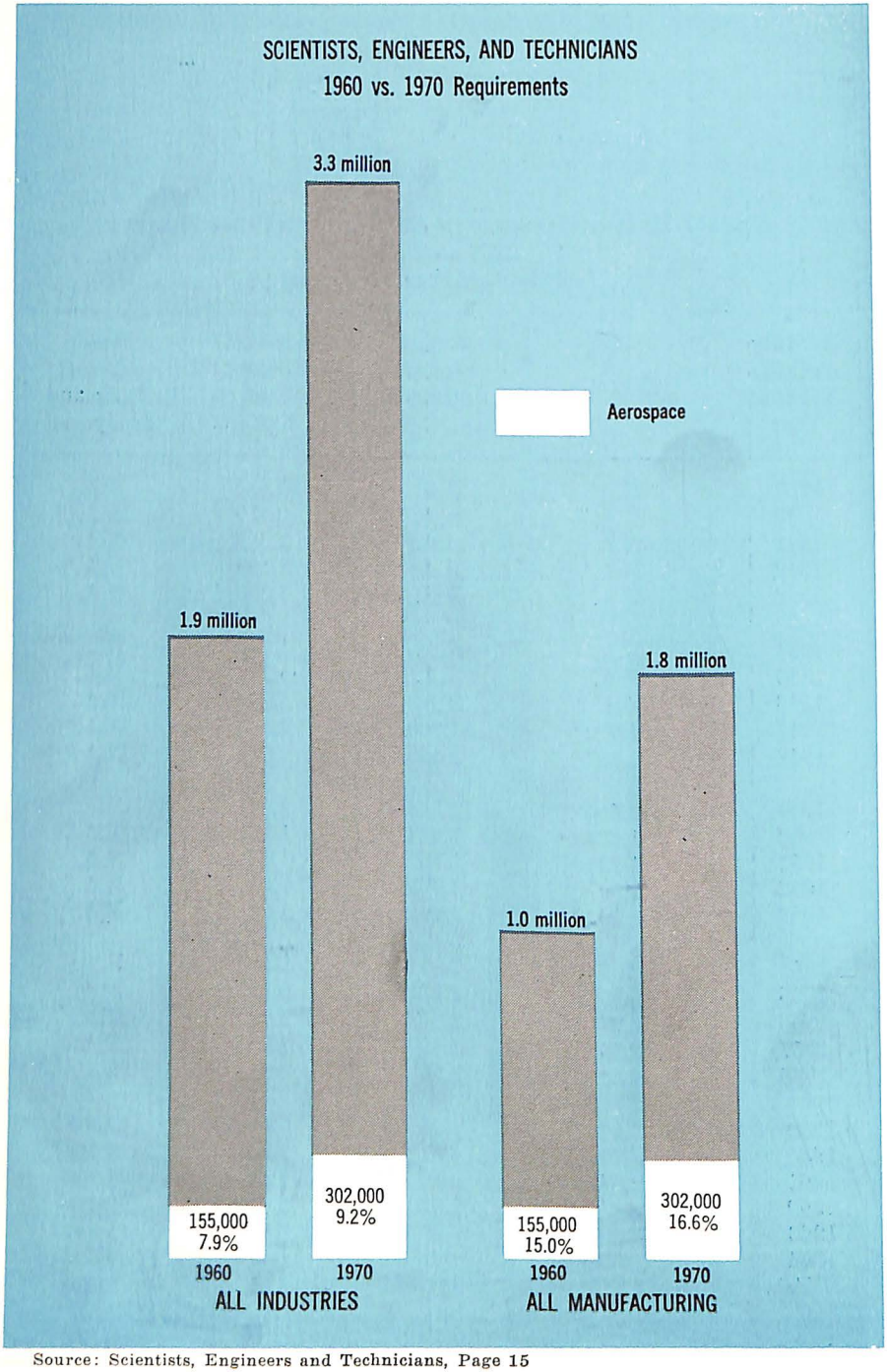
NOTE: The above figures include substantial missile and spacecraft employment in recent years. They do not however, represent total aerospace employment, estimates for which appear in preceding tables in this chapter.

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

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				
Feb.	3.01	3.00	3.05	2.97

N.A.—Not available.
Source: Bureau of Labor Statistics, "Employment and Earnings," (Monthly).



Source: Scientists, Engineers and Technicians, Page 15

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

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	$ 36.05	N.A.
1940	N.A.	N.A.	37.62	N.A.
1941	N.A.	N.A.	47.78	N.A.
1942	N.A.	N.A.	58.38	N.A.
1943	N.A.	N.A.	59.33	N.A.
1944	N.A.	N.A.	60.75	N.A.
1945	N.A.	N.A.	57.48	N.A.
1946	N.A.	N.A.	54.22	N.A.
1947	$ 54.74	$ 54.13	54.67	N.A.
1948	60.97	60.36	61.52	N.A.
1949	63.34	62.85	63.31	N.A.
1950	68.10	67.15	69.31	N.A.
1951	77.96	75.95	83.07	N.A.
1952	81.27	79.85	84.20	N.A.
1953	83.38	81.99	84.77	N.A.
1954	84.66	85.28	82.62	N.A.
1955	89.21	89.84	86.48	N.A.
1956	95.57	95.11	94.30	N.A.
1957	96.35	95.88	95.65	N.A.
1958	101.25	101.66	99.65	$100.53
1959	106.63	105.86	108.50	106.34
1960	110.43	110.03	112.20	109.30
1961	114.68	114.26	116.62	113.40
1962	119.97	119.97	120.77	118.72
1963	122.43	121.84	123.49	122.67
1964				
Feb.	123.11	121.80	124.14	125.33

N.A.—Not available.
Source: Bureau of Labor Statistics, "Employment and Earnings," (Monthly).

Average Employment in the Aircraft and Parts Industry By Geographical Division and Selected States—1957 to Date[a]

Geographical Divisions and Selected States	1957	1958	1959	1960	1961	1962
Total	890,326	782,057	754,533	668,914	625,095[b]	633,024[b]
New England	87,496	76,592	71,462	71,313	75,346	76,762
Massachusetts	9,898	9,161	9,180	8,546	9,493	9,023
Connecticut	75,219	65,037	60,865	61,291	64,012	65,693
Me., N.H., Vt., R.I.	2,379	2,394	1,417	1,476	1,841	2,046
Middle Atlantic	101,039	82,728	74,201	71,554	71,321	74,476
New York	61,211	54,400	48,282	45,159	44,168	44,034
New Jersey	24,993	16,675	15,445	15,458	14,946	16,017
Pennsylvania	14,835	11,653	10,474	10,937	12,207	14,425
East North Central	131,615	103,660	94,851	77,846	69,932	70,107
Ohio	69,954	58,353	60,217	49,997	41,722	39,893
Indiana	31,204	25,508	22,556	18,124	17,821	18,592
Illinois	17,382	10,855	5,271	4,304	4,896	6,100
Mich., Wisc.	13,075	8,944	6,807	5,421	5,493	5,522
West North Central	83,501	74,867	69,306	62,197	57,311	60,047
Missouri	32,225	31,795	30,149	27,420	24,026	27,153
Kansas	47,861	40,710	37,269	33,193	31,177	31,805
Minn., Iowa., N.D., S.D., Neb.	3,415	2,364	1,888	1,584	2,108	1,089
South Atlantic	53,099	49,734	49,380	40,616	31,072	34,551
Maryland	32,072	26,822	23,820	16,228	3,668	3,640
Del., D.C., Va., W.Va.	615	590	571	497	2,523	1,210
N.C., S.C.					2,016	
Georgia	20,412	22,322	24,989	23,891	11,288	14,396
Florida					13,593	15,305
East South Central	9,016	9,785	8,509	5,303	5,031	7,498
Alabama					4,102	6,404
Ky., Tenn., Miss.	9,016	9,785	8,509	5,303	929	1,094
West South Central	66,585	60,756	52,267	44,724	43,468	41,237
Texas					39,051	36,158
Ark., La., Okla.	66,585	60,756	52,267	44,724	4,417	5,079
Mountain	15,552	16,052	22,196	27,211	17,664	21,956
Arizona	7,743	5,756	6,192	14,164	5,167	5,451
Utah[c]	...	...	...	...	8,663	11,695
Mont., Idaho, Wyo., Colo., N.Mex., Nev.	7,809	10,296	16,004	13,047	3,834	4,810
Pacific	342,423	307,883	312,361	268,150	253,916	246,349
California	279,168	240,997	244.670	209,830	191,050	172,413
Washington[d]	...	...	...	...	62,252	73,326
Ore., Alaska, Hawaii	63,255	66,886	67,691	58,320[b]	614	610

Note: Corresponding data for the years 1947 through 1954 may be found in "Aerospace Facts and Figures," 1959, 1960 and 1961 editions.

[a] 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.

[b] Includes Puerto Rico.

[c] Until 1961, Utah was included with Montana, Idaho, Wyoming, Colorado, New Mexico, and Nevada.

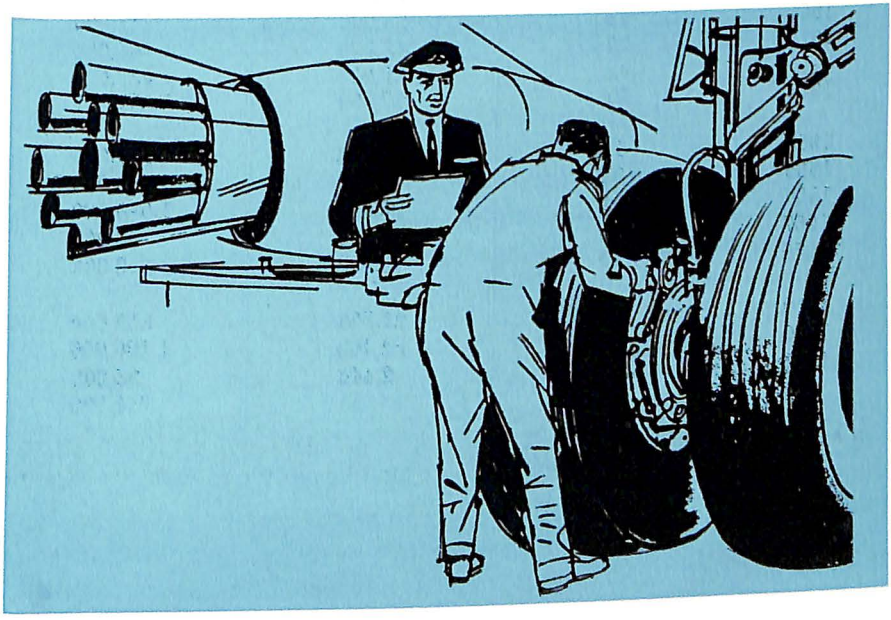
[d] Until 1961, Washington was included with Oregon, Alaska, and Hawaii.

Source: Department of Labor, Bureau of Employment Security.

LABOR TURNOVER IN THE AIRCRAFT AND PARTS INDUSTRY
1958 to Date
(Rates per 100 Employees per Year)

Date	TOTAL		Aircraft (Airframes)		Aircraft Engines and Parts		Other Aircraft Parts and Equipment	
	Accessions	Separations	Accessions	Separations	Accessions	Separations	Accessions	Separations
1958	28.3	33.3	26.9	29.8	27.8	35.0	33.8	42.0
1959	27.4	37.9	22.4	36.5	29.1	35.0	39.4	45.0
1960	28.6	39.2	23.4	33.8	35.1	39.5	34.3	53.9
1961	32.6	30.9	31.3	29.3	28.9	24.8	43.2	44.9
1962	35.2	31.3	32.9	29.0	30.5	23.9	49.3	47.9
1963	28.9	29.4	28.6	27.9	24.3	25.0	39.5	42.9

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

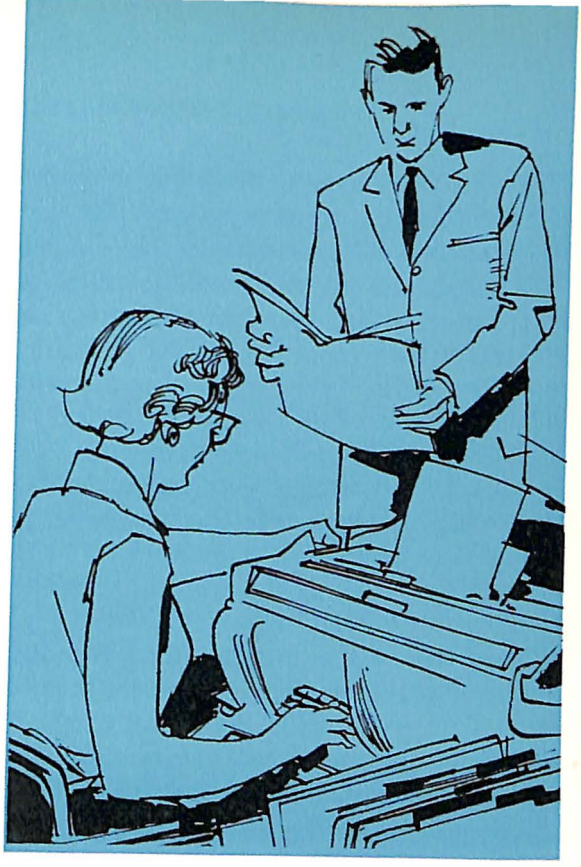


WORK STOPPAGES IN THE AIRCRAFT AND PARTS INDUSTRY
1927—TO DATE

Year	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	35,600
1962	19	23,000	555,000

N.A.—Not available.
Source: Department of Labor, Bureau of Labor Statistics, Division of Wages and Industrial Relations.

FINANCE



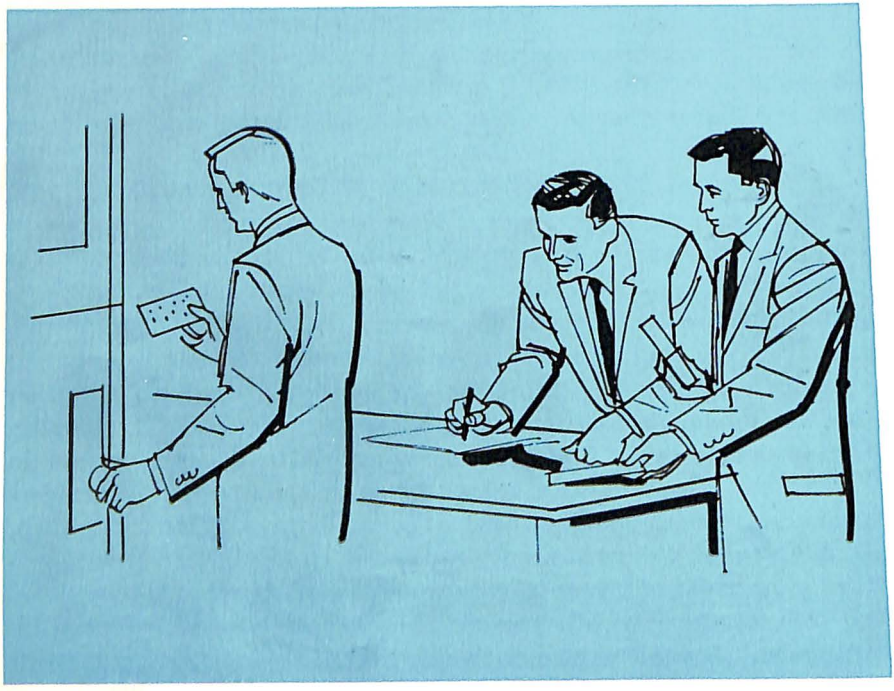
Earnings of aerospace companies, as a percentage of sales, remained low, at 2.3 per cent in 1963, off slightly from the previous 2.4 per cent in 1962, and higher than the recent years when the rate was below 2 per cent.

In August of 1963, the Department of Defense announced a new profit policy which, in the words of the official statement: ". . . recognizes the need to attract the best possible industrial capabilities to national defense and is intended to improve the use of the profit motive as a stimulus for effective and economical contract performance." The revised Armed Services Procurement Regulation, issued at the same time, stated:

"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*—(emphasis in the original) provide the motivation to acomplish 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. Consequently, negotiations aimed merely at reducing costs by reducing profits, with no realization of the function of profits, cannot be condoned. For each contract in which profit is negotiated as a separate element of the contract price, the aim of negotiation should be to employ the profit motive so as to impel effective contract performance by which overall contract costs are economically controlled. To this end, the profit objective must be fitted to the circumstances of the particular procurement, giving due weight to each of the performances, risk, and other factors set forth in this section 3-808 of the Armed Services Procurement Regulations. This will result in a wider range of profits which, in many cases, will be significantly higher than previous norms."

The effects of this new Government policy have not yet been reflected in the published financial statements of the aerospace industry. Nevertheless, the Department of Defense early in 1964 indicated that private investors in aerospace companies will be asked to finance a larger share of the capital facilities that underlie all defense development and pro-



BALANCE SHEET COMPARISONS, AEROSPACE COMPANIES
1958 to Date
(Millions of Dollars)

	1958	1959	1960	1961	1962	1963
Assets:						
Current Assets						
Cash	$ 443	$ 358	$ 363	$ 417	$ 395	$ 435
U. S. Government Securities	79	91	102	58	46	39
Total Cash and U. S. Govt. Securities	$ 522	$ 449	$ 465	$ 475	$ 441	$ 474
Receivables (total)	1,538	1,658	1,718	1,906	1,981	1,847
Inventories (gross)	3,218	3,440	3,425	3,470	3,580	3,936
Other current assets	70	104	82	112	133	174
Total Current Assets	$5,348	$5,651	$5,690	$5,963	$6,135	$6,431
Total Net Plant	1,036	1,092	1,195	1,420	1,509	1,575
Other Non-Current Assets	120	164	229	305	257	278
Total Assets	$6,503	$6,906	$7,113	$7,688	$7,901	$8,284
Liabilities:						
Current Liabilities						
Short term loans	645	718	745	700	698	461
Advances by U.S. Govt.	1,374	1,409	1,346	1,308	1,338	1,674
Trade accounts and notes payable	852	1,001	955	1,005	1,037	1,072
Federal income taxes accrued	277	196	165	186	265	255
Instalments due on long term debt	18	37	25	24	32	28
Other current liabilities	533	538	654	822	769	756
Total current liabilities	$3,699	$3,899	$3,890	$4,045	$4,139	$4,246
Long Term Debt	444	541	645	806	783	835
Other Non-Current Liabilities	20	20	32	28	37	42
Total Liabilities	$4,163	$4,460	$4,567	$4,879	$4,959	$5,123
Stockholder's Equity:						
Capital Stock	902	977	1,154	1,291	1,318	1,354
Earned Surplus and Reserves	1,438	1,468	1,394	1,517	1,625	1,808
Total Net Worth	$2,340	$2,445	$2,548	$2,808	$2,943	$3,162
Total Liabilities and Stockholders' Equity	$6,503	$6,906	$7,113	$7,688	$7,901	$8,284
Net Working Capital	$1,649	$1,752	$1,800	$1,918	$1,996	$2,185

NOTE: Includes companies which filed reports with the Securities and Exchange Commission.
Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

duction. A Department of Defense directive of March 13, 1964 stated that "The Department of Defense will encourage private investment. Where plant expansion is required to perform Defense contracts, it will normally be accomplished through an increase in contractor-owned facilities. Provision of new Government industrial facilities to a contractor will be held to the absolute minimum . . . and the Department of Defense will dispose of surplus facilities."

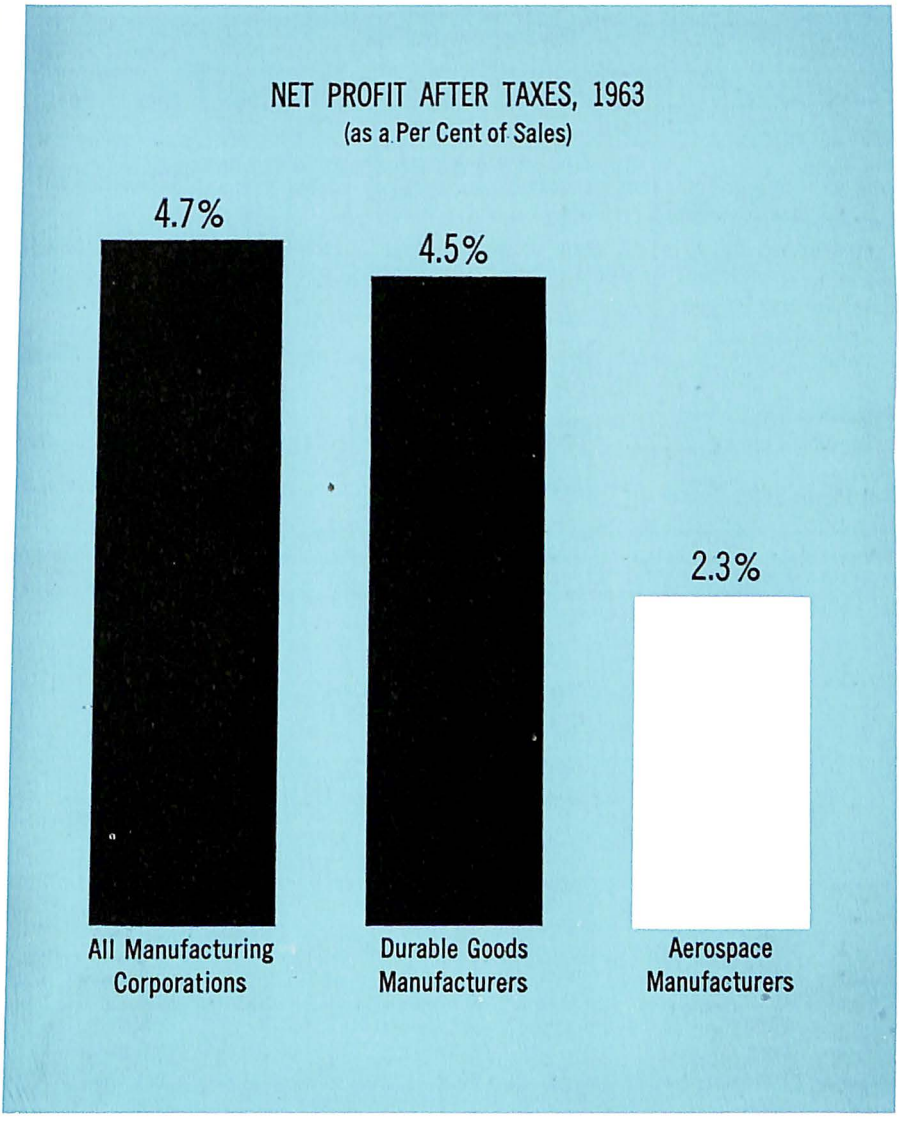
In the special area of general purpose machine tools and production equipment, industry, through private investment funds, is currently furnishing 90 per cent of all the new equipment.

The combination of a consistently low earning rate and heavy demands for capital investment and for corporate funding of advanced research continued to pose a problem for the aerospace industry, as stated in a mid-year report of a comprehensive economic study conducted by Stanford Research Institute. SRI said, "Whether or not the current profit rate is sufficient to assure continuing availability of adequate industrial capability is a question that remains to be answered."

COMPOSITION OF CURRENT ASSETS, 1956 TO DATE, 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

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



Source: Net profit as a Per Cent of Sales for a Selected Group of Manufacturing Corporations, Page 18

Income Accounts, Aerospace Companies
1957 to Date
(Millions of Dollars)

	1957	1958	1959	1960	1961	1962	1963
Net Sales	$12,868	12,575	$12,488	$12,974	$13,954	$15,206	$15,313
Net Profit from Operations	809	664	451	386	570	739	695
Total Income before Federal Income Taxes	791	636	411	333	521	682	665
Provision for Federal Income Taxes	414	329	215	148	264	322	316
Net Profit after Taxes	377	307	196	185	257	360	350

Note: Does not include data for companies which produce aerospace products but are classified in industries other than SIC 372.
Source: Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations."

Financial Ratios, 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

Note: Does not include data for companies which produce aerospace products but are classified in industries other than SIC 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, 1950-1963
(Millions of Dollars)

Company	July 1, 1950 to June 30, 1963	July 1, 1962 to June 30, 1963	July 1, 1961 to June 30, 1962	July 1, 1960 to June 30, 1961	July 1, 1959 to June 30, 1960	World War II[a] (Per Cent)
U. S. TOTAL, ALL CONTRACTS	$301,747.9	$25,834.0	$25,588.4	$22,693.1	$20,995.0	100.0%
Boeing	$14,798.2	$1,356.3	$1,132.8	$ 919.8	$1,008.7	1.5
General Dynamics	13,503.4	1,033.2	1,196.6	1,920.1	1,260.2	N.A.
General Electric	11,194.5	1,021.2	975.9	874.6	963.1	1.9
Lockheed	10,924.3	1,517.0	1,419.3	1,175.2	1,070.8	1.9
North American	10,546.4	1,062.4	1,032.5	1,197.4	907.7	1.6
United Aircraft	9,391.7	529.9	662.7	625.5	517.4	2.2
General Motors	9,109.4	444.0	449.0	281.8	218.7	7.9
Douglas	7,171.2	361.1	365.6	307.4	404.9	2.5
American Telephone and Telegraph	6,296.7	578.6	467.7	550.6	466.8	1.5
Martin Marietta	5,474.0	766.8	802.7	691.8	596.7	1.3
Republic	4,157.3	196.8	332.8	295.7	265.1	0.7
Sperry Rand	4,096.6	445.5	465.6	408.0	296.0	0.9
McDonnell	3,672.4	497.0	310.9	219.9	195.0	N.A.
Hughes	3,308.9	312.9	243.2	331.2	349.1	N.A.
Curtiss-Wright	3,269.4	98.4	144.6	69.8	70.4	4.1
Bendix	3,255.4	290.3	285.9	266.8	239.4	1.1
Grumman	3,120.7	390.5	303.6	238.0	239.3	0.8
Westinghouse Electric	3,073.4	322.6	246.0	307.7	257.6	0.8
Radio Corp. of America	3,061.4	328.6	339.6	392.3	405.8	0.3
Raytheon	2,731.0	294.9	406.6	304.9	324.4	N.A.
International Business Machines	2,596.2	203.3	155.5	333.0	290.0	N.A.
Northrop	2,391.2	222.9	152.5	155.6	139.8	0.1
General Tire & Rubber	2,203.9	424.6	366.1	290.2	243.2	N.A.
Avco Mfg.	2,175.0	253.1	323.3	251.6	156.9	0.6
Textron	1,212.4	151.2	117.4	65.8	61.1	0.7
Thiokol	952.8	238.6	178.3	210.0	131.2	N.A.
Ling-Temco-Vought	564.0	205.9	133.4	46.8	61.9	N.A.

N.A.—Not available.
[a] 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.

MAJOR NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CONTRACTORS
(Listed by rank according to net value of NASA prime contracts awarded, July 1, 1960-June 30, 1963)
(Millions of Dollars)

	July 1, 1960 to June 30, 1963	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 NASA CONTRACTS	$3,738.5	$2,261.6	$1,053.6	$423.3
North American Aviation	799.9	525.8	199.1	75.0
McDonnell	303.4	193.1	68.5	41.8
Aerojet General	233.2	160.5	66.4	6.3
Douglas	232.1	133.0	68.4	30.7
General Dynamics	133.1	103.1	27.9	2.1
Chrysler	119.6	75.4	31.3	12.9
Boeing	116.6	101.0	15.6	[a]
General Electric	85.2	53.0	23.0	9.2
Grumman	84.0	48.2	24.6	11.2
United Aircraft	83.0	48.9	34.1	[a]
Ling-Temco-Vought	72.5	26.7	27.0	8.8
Radio Corporation of America	71.0	42.2	20.2	8.6
Space Technology Laboratories	58.8	32.5	13.2	13.1
Bendix	58.4	32.5	19.4	6.5
International Business Machines	48.7	36.1	12.6	[a]
Brown Engineering	42.7	24.1	11.9	6.7
Hayes International	36.7	15.4	11.0	10.3
Western Electric	35.3	[a]	8.7	26.6
Lockheed	32.0	23.7	5.0	3.3
Hughes Aircraft	27.5	18.3	9.2	[a]
Philco	19.3	14.9	4.4	[a]
Republic	16.2	9.3	6.9	[a]
Minneapolis-Honeywell	10.6	3.2	4.7	2.7
Collins Radio	10.3	4.6	3.7	2.0
Martin Marietta	9.0	7.2	1.8	[a]
Motorola	8.0	3.1	4.9	[a]
Westinghouse Electric	7.2	3.8	3.4	[a]
Thompson-Ramo-Wooldridge	6.4	2.6	3.8	[a]
United Engineers & Constructors	5.6	[a]	3.6	2.0
Sperry Rand	5.4	3.2	2.2	[a]

[a] Not in list of major contractors for indicated year.
Source: National Aeronautics and Space Administration.

AIR TRANSPORTATION

Results of 1963 for U. S. scheduled airlines showed that the economic breakthrough of turbine-powered aircraft in 1962 was genuine.

New management techniques matched the high performance of turbine aircraft, and the airlines earned $84 million last year on total operating revenues of about $3.8 billion.

Profits of $53.8 million the year before followed years of low profits—and a loss of $37.7 million in 1961—after the carriers committed more than their total assets in jet equipment.

Last year, the airlines flew 71 million passengers over 50 billion passenger miles, a solid rise of 15 per cent in passenger miles over the year before.

The carriers placed orders for new twin-engine and three-engine jets. The first of the three-engine jets were placed in airline service in early 1964.

Pursuing their goal of a perfect safety record, the carriers spent $650 million maintaining their aircraft. The result was reflected in an improved safety rate.

Continued investments in new aids to navigation promised to provide

not only safer but more reliable and efficient service for passengers and shippers.

During the year the carriers announced a plan to equip virtually all their aircraft with Radar Beacon transponders, which will bring their total investment in Radar Beacon equipment to about $25 million. The transponders, by replying to interrogators on the ground, will permit air traffic controllers to positively identify airline aircraft on their radarscopes. An automatic altitude reporting feature of the system will eventually be added.

Further progress toward safe all-weather operations and a study with the Federal Aviation Agency seeking to identify causes of delays were also part of the effort to improve reliability and efficiency of national air transportation.

The installation of electronic reservation and flight information systems on the ground made possible smoother, more expeditious handling in 1963 of 140 million reservations and 100 million pieces of baggage.

U. S. international flag carriers, beset by a steady loss in their share

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
1955	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

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

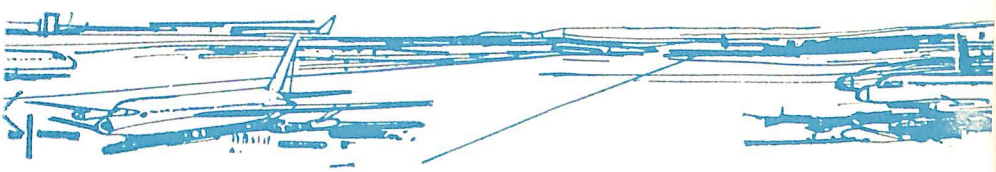
INVENTORY OF ACTIVE CIVIL AIRCRAFT, BY YEAR OF MANUFACTURE
AS OF JANUARY 1, 1964

Year of Manufacture	Number	Per Cent of Total
TOTAL	87,267	100.0
1963	6,409	7.3
1962	5,216	6.0
1961	4,958	5.7
1960	5,523	6.3
1959	6,011	6.9
1958	4,743	5.4
1957	4,030	4.6
1956	4,582	5.3
1955	3,034	3.5
1954	1,857	2.1
Prior to 1953	40,904	46.9

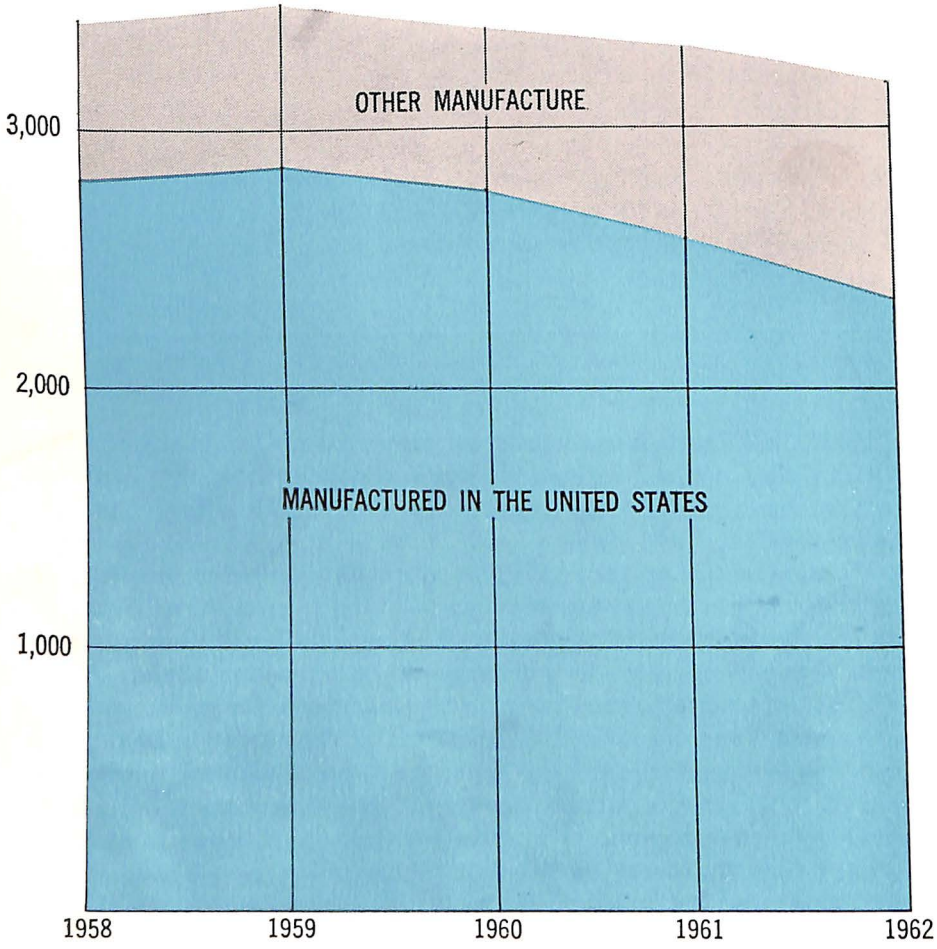
Source: Federal Aviation Agency, "FAA Statistical Handbook of Aviation" (Annually).

of the trans-Atlantic travel market to foreign air carriers in recent years, saw the trend reversed with an increase. Across-the-board fare decreases augured for a rise in trans-Atlantic travel, particularly during the off-season, in 1964.

Thus, even though they have just adjusted to living economically in the subsonic jet age, the carriers were planning to meet the challenge of the supersonic jet age of the Seventies. Proposals for supersonic transports were submitted by three airframe and three engine manufacturers and the Government moved ahead with plans for a design competition. International and domestic U. S. airlines place deposits with the Government establishing their delivery order positions. Technical representatives of these carriers worked closely with the Government and manufacturers in the development program. Their objective was to assist in assuring that the American SST will be a success.



AIRCRAFT IN OPERATION ON WORLD CIVIL AIRLINES
1958-1962



Source: Aircraft in Operation on World Civil Airlines, Number and Percentage Manufactured in the U. S., Page 18

GENERAL AVIATION

General aviation, which includes all civil flying with the exception of commercial air carriers, continued to gain during 1963, both in numbers produced and in utilization.

Manufacturers shipped 7,569 aircraft with a net billing price of $153,415,000. This represents the highest dollar volume in history. In units, 1963 was 13 per cent ahead of the previous year and nearly 100 per cent greater than ten years ago. The year 1963 was one of the most productive periods for new general aviation airplanes since 1947, which was a time of immediate post-war development.

Significant in the dollar growth and indicative of the increasing use of the high performance aircraft is the comparison of growth by types of airplanes. While the growth of the field, 1963 over 1962, was 13 per cent, twin-engine deliveries increased 26 per cent. There were 1,285 twins delivered in 1963. In the single-engine category with four or more seating capacity, the numerical growth was the highest with some 394 more aircraft of this type being produced in 1963 than in 1962. Total deliveries of this type were 4,891. However, because of the higher base figure, the percentage of growth was 8.7 per cent. Single-seat agricultural aircraft aided in the 16 per cent growth rate of the single-engine models with less than four-place seating capacity. Of the 1,393 airplanes of this type produced, 375 were agricultural models. This was 25 per cent more agricultural airplanes than were produced in 1962.

Aircraft of increased performance and capability is reflected in the reports of utilization. There are over 85,000 active general aviation airplanes, of which approximately three out of five are the larger single-engine (four place seating or over) and twin-engine models. While general aviation aircraft operate into and out of more than 8,000 airports, their movements are tabulated at only 274 airports where there are control towers operated by the Federal Aviation Agency.

General aviation now accounts for 64 per cent of all operations (local and itinerant) conducted at airports with towers and virtually all movements at other airports. Out of the 31 million movements reported by these towers, 3.7 million were by military aircraft; 7.4 million were scheduled air carriers; and 19.9 million were general aviation airplanes. The typical general aviation airplane today is well equipped for flight under all but the most severe weather conditions. The FAA reports that in 1963, departures under Instrument Flight Rules (IFR) conditions by these aircraft increased 12 per cent over fiscal 1962.

The use of general aviation airplanes for business travel accounts for approximately 35 per cent of the total flying hours. About 30 per cent of the flight hours is for personal flying and the remaining 12 per cent are commercial and instruction flights.

VERTICAL LIFT AIRCRAFT

The U. S. and Canada have a total of 710 helicopter operators (commercial, executive and government) using 1,767 helicopters, a recent AIA survey shows.

Of these totals, 451 are commercial operators with 1,333 helicopters. These operators offer numerous services such as power and pipe line patrol, crop dusting and spraying, geological survey, mapping, re-seeding, fire control, traffic patrol and air taxi and charter flights.

More than 5,000 helicopters are in the inventory of the military services. The Army and Marine Corps continue to use the helicopter in close combat support for surveillance, troop carrying and close battlefield support. In the Navy, the helicopter continues its proven role in anti-submarine warfare. For the Air Force, helicopters are now used in support of widely dispersed missile sites as well as in the established search and rescue mission. The Coast Guard, pioneer in the use of helicopters by the military, is expanding its fleet of helicopters to perform its mission.

The Army's Air Mobility concept may have civilian application that would further increase the use of helicopters and other type VTOL aircraft as short-haul cargo transports and as a new tool for the building and construction industry. In developing this concept that the helicopter is a substitute, not a supplement to all ground vehicles, the Army is re-designing and adapting combat support supplies to lighter weights and compact size for air transport capability. For example, fuel and water drums, now of rubber or plastic, can be carried in sling loads beneath the helicopter and dropped where required.

AIA's 1963 Directory of Heliports/Helistops in the U. S., Canada and Puerto Rico lists 797 heliports and 66 proposed facilities.

In addition, the U. S. Forest Service, a major helicopter user, maintains 227 heliports and approximately, 2,500 unimproved helistops around the country. The petroleum industry also has equipped more than 100 oil rigs in the Gulf of Mexico with helistops—landing platforms for helicopters.

There has been a notable increase in the number of elevated heliports. This trend may prove a solution to providing city-center heliports, one of the most pressing requirements for short-haul air transportation in metropolitan areas.

There are many different model helicopters currently in production, ranging in size from one-place to 73-place. In addition, VTOL firms are involved in the design and development of propeller-type VTOLs, such as the tilt-propeller, the tilt-wing and flap, and fan-type VTOLs, such as the fan-in-wing and lift fan, and the tilt-duct and ducted fan.

ACTIVE CIVIL AIRCRAFT BY TYPE AND CIVIL AIRPORTS
1954 to Date

Year Jan. 1	Active Civil Aircraft								Airports on Record with FAA
	TOTAL	Total Air Carrier[a]	General Aviation Aircraft						
			TOTAL	Fixed-Wing Aircraft			Rotorcraft[b]	Other[c]	
				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[d]	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	N.A.

N.A.—Not available.
[a] Registered, not necessarily in operation. Includes helicopters.
[b] Includes autogiros; excludes air carrier helicopters.
[c] Includes gliders, dirigibles, and balloons.
[d] Excludes approximately 4,000 unclassified active aircraft.
Source: Federal Aviation Agency, "U. S. Active Civil Aircraft by State and County," January 1963, p. 1.

U. S. Manufactured Aircraft in Operation on World Airlines
1958 to Date

	1958	1959	1960	1961	1962
Total Manufactured in U.S.	2,819	2,868	2,766	2,542	2,345
4 Engine	1,404	1,511	1,568	1,505	1,474
Turbojets	5	97	285	423	517
Boeing 707	5	76	143	150	209
Boeing 720	—	—	23	40	51
Boeing 720B	—	—	—	44	25
Douglas DC-8	—	21	110	149	167
Convair 880	—	—	9	40	44
Convair 990	—	—	—	—	21
Turboprops	9	108	127	137	137
Lockheed Electra	9	108	127	137	137
Piston Engine	1,390	1,306	1,156	945	820
Boeing Stratocruiser	44	26	—	—	—
Lockheed Constellation	426	412	362	261	206
Douglas DC-7	325	296	276	254	232
Douglas DC-6	420	418	372	316	277
Douglas DC-4	175	154	146	114	105
2 Engine	1,384	1,308	1,125	971	833
Turboprops	3	17	21	8	7
Fairchild F-27	3	17	21	8	7
Piston Engine	1,381	1,291	1,104	963	826
Convair 240, 340, 440	384	364	321	288	250
Martin 202, 404	99	91	75	40	4
Curtiss Commando C-46	68	60	48	36	36
Douglas DC-3	799	750	634	568	516
Other	31	26	26	31	20
1 Engine	—	11	37	34	12
Helicopters	31	38	36	32	26
All Manufacturers Grand Total	3,402	3,479	3,376	3,319	3,162
Per Cent of Grand Total Manufactured in U.S.	82.9	82.4	81.9	76.6	74.2

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

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

Year	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	890	255
1956	1,580	77	44,000	1,015	275
1957	1,760	86	50,500	1,115	295
1958	1,820	87	53,000	1,145	320
1959	1,915	98	60,000	1,320	355
1960	1,930	106	67,500	1,485	415
1961	1,940	111	72,500	1,700	490
1962	2,020	121	80,500	2,000	545
1963	2,140	134	90,000	2,280	580

N.A.—Not available.
NOTE: Excludes China (mainland) and the USSR.
Source: International Civil Aviation Organization, "Air Transport Scheduled Services—International and Domestic" (Annually).

COMPOSITION OF U. S. AIR LINE FLEET, BY TYPE OF AIRCRAFT, NUMBER OF ENGINES, AND MODEL: SEPTEMBER 1963 AND 1962
(Number of Aircraft)

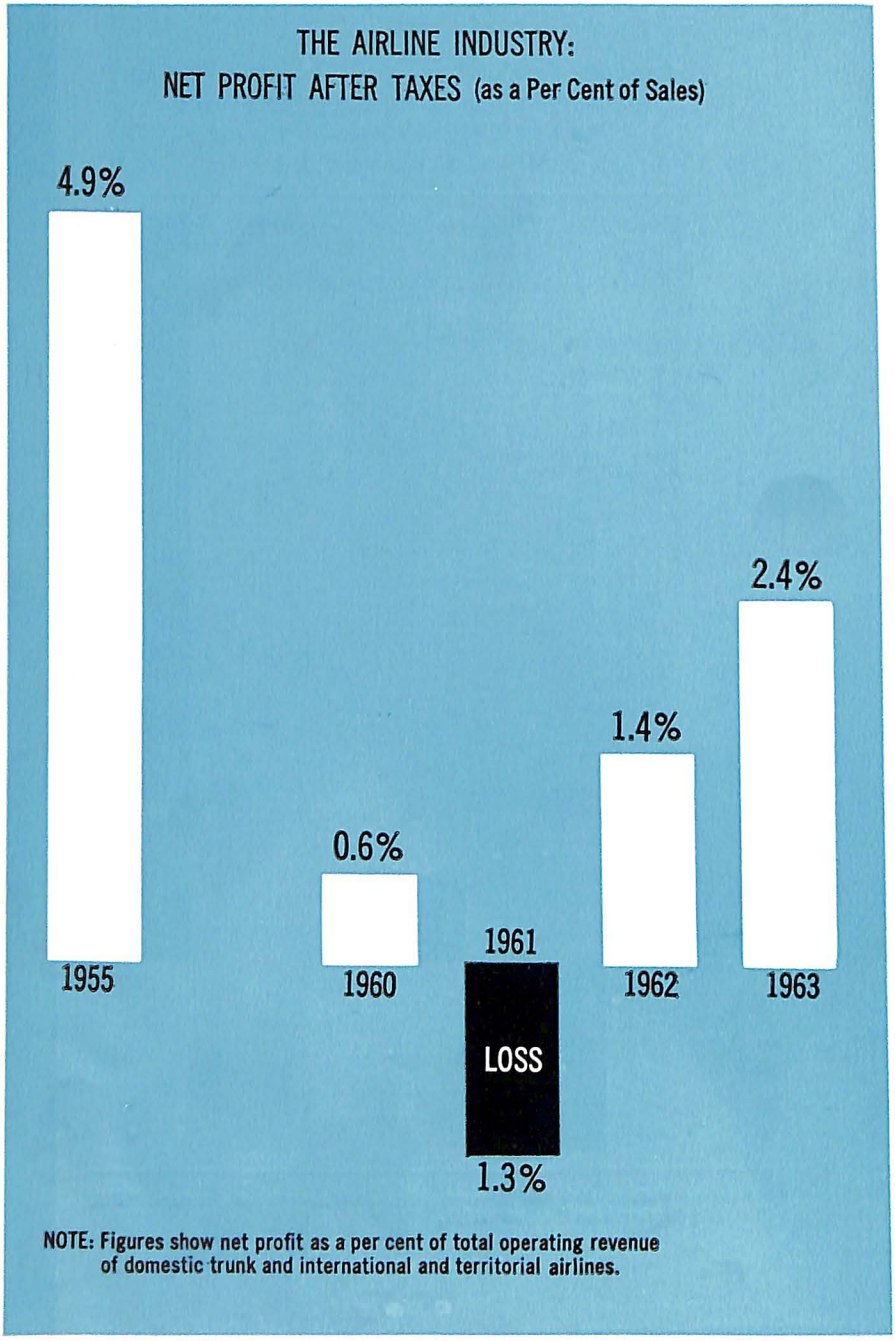
Type of aircraft, number of engines, and model	September 1963	September 1962
TOTAL, AIRCRAFT	2,070	2,090
Total fixed-wing	2,054	2,069
Turbine-powered—total	695	655
Four engine—total	626	589
Turbo-jet—total	404	372
B-707	129	115
B-720	103	99
C-990	19	15
C-880	50	43
DC-8	103	100
Turboprop—total	222	217
L-188, 188A	126	124
V-745	57	57
V-810	11	12
Argosy	7	5
CL-44	21	19
Twin engine—total	69	66
Caravelle (Turbojet)	20	20
F-27 (Turboprop)	49	46
Piston-powered—total	1,359	1,414
Four engine—total	671	731
DC-4	23	32
DC-6	63	66
DC-6A	44	41
DC-6B	147	158
DC-7, 7B	150	173
DC-7C	41	52
L-049	11	15
L-749	50	54
L-1049	14	15

(*Continued on next page*)

COMPOSITION OF U. S. AIR LINE FLEET, BY TYPE OF AIRCRAFT, NUMBER OF ENGINES, AND MODEL: SEPTEMBER 1963 AND 1962—*Continued*
(Number of Aircraft)

Type of aircraft, number of engines, and model	September 1963	September 1962
L-1049C	15	15
L-1049G	42	40
L-1049H	40	45
L-1649A	31	24
VS-44A	—	1
Twin engine—total	674	679
CV-240	50	49
CV-340	122	114
CV-440	33	31
C-46, 20T	100	97
DC-3, 3A	257	265
DC-2	1	1
G-21, 21A	21	17
G-44A	5	—
M-202A	18	18
M-404	63	84
C-28-SACF	4	3
Single engine—total	14	4
C-180	11	2
C-185	2	1
CH-100	1	1
Total rotary-wing	16	21
Turbine-powered—total	8	7
S-61	4	4
V-107-II	4	3
Piston-powered—total	8	14
B-47	1	1
S-58C	4	5
S-55	3	5
V-44B	—	3

Source: Federal Aviation Agency, Office of Management Services, "U.S. Civil Air Carrier Fleet" (Quarterly).



Source: Air Transport Association

Intercity Passenger Traffic By Air Carrier, Railroad, Bus and Automobile
Selected Years, 1916 to Date

	Total	Domestic Air Carriers	Railroads[a]	Buses	Automobiles
Billions of Passenger-Miles					
1916	35.2	[b]	35.2	[b]	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[E]	31.1	20.3	19.7[E]	692.0[E]
1962	794.4[E]	33.6	19.8	21.3[E]	719.7[E]
1963	819.7[E]	38.5	18.5[E]	21.7[E]	741.0[E]
Per Cent					
1916	100.0	[b]	N.A.	[b]	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

N.A.—Not available.
[E] Estimate.
[a] Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.
[b] Negligible.
Sources: Aerospace Industries Association.
Automobile Manufacturers Association, "Automobile Facts and Figures" (Annually).
Civil Aeronautics Board.
Interstate Commerce Commisison.
National Association of Motor Bus Operators.

UNITED STATES CIVIL AIRLINES
Selected Years, 1949 to Date

Year	Revenue Miles Flown (Millions)	Passengers Carried (Millions)	Revenue Passenger-Miles (Millions)	Cargo Ton-Miles[a] (Millions)	Mail Ton-Miles[b] (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	1,345	368

NOTE: Figures represent total scheduled services excluding nonrevenue operations of U.S. international and domestic certificated route air carriers.
[a] Includes freight plus express revenue ton-miles in scheduled and nonscheduled operations.
[b] U. S. mail ton-miles plus foreign mail ton-miles.
Source: Civil Aeronautics Board.

U. S. Domestic and International Airline Passenger Service
Selected Years, 1926 to Date

Year	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

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.

General Aviation, Hours, and Miles Flown, By Type of Flying, 1931 to Date

Year	Total	Business		Commercial		Instructional		Personal		Other	
		Units	Percent	Units	Percent	Units	Percent	Units	Percent	Units	Percent
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[b]	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	[a]
1955[b]	9,500	4,300	45	1,950	21	1,275	13	1,975	21	—	—
1956[b]	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[b]	11,700	5,300	45	2,200	19	2,000	17	2,200	19	—	—
1959[c]	12,000	5,300	44	2,200	18	1,900	16	2,600	22	—	—
1960	12,203	5,300	44	2,200	18	1,700	14	2,950	24	53	[a]
1961	12,650	5,300	42	2,450	20	1,670	13	3,160	25	70	[a]
1963	13,300	5,500	41	2,400	18	1,900	14	3,500	27	282	2
1962	13,450	4,654	35	2,663	20	1,829	12	4,022	30	282	2
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	1,544,000	787,000	51	278,000	18	216,000	14	263,000	17	—	—
1959[c]	1,596,000	798,000	50	279,000	17	205,000	13	314,000	20	—	—
1960	1,645,000	811,000	50	281,000	17	184,000	11	362,000	22	7,000	[a]
1961	1,728,000	827,000	48	316,000	18	182,000	11	395,000	23	8,000	[a]
1962	1,851,000	886,000	48	339,000	18	195,000	11	423,000	23	8,000	[a]
1963	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

N.A.—Not available.
[a] Less than .05 per cent.
[b] Estimated. No survey was conducted covering the designated year.
[c] Revised.
Source: Federal Aviation Agency, "FAA Statistical Handbook of Aviation" (Annually).

Civil Helicopter Operators and Helicopters Operated
1960 to Date

Year as of February 1	Total	Users		
		Commercial	Companies and Executives	Government Agencies[a]
Operators				
1960	318	193	94	31
1961	406	265	106	35
1962	503	322	145	36
1963	600	405	150	45
1964	710	451	212	47
Helicopters Operated				
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

Note: Includes United States and Canada.
[a] Federal, state and local governments.
Source: Aerospace Industries Association, company reports.

Helicopter Scheduled Airlines
Available Service and Utilization
1952 to Date
(In Thousands)

Year	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

Source: Civil Aeronautics Board.

HELICOPTER SCHEDULED AIRLINES
Revenue Ton-Mile Traffic Carried
1952 TO DATE
(In Thousands)

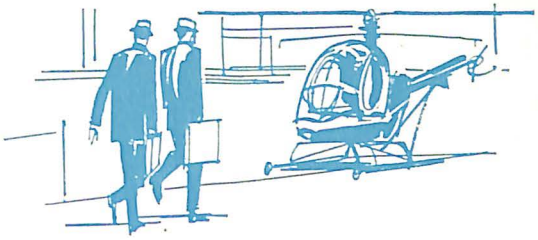
Year	TOTAL TON-MILES	Passenger	U. S. Mail	Express	Freight	Excess Baggage
1952	75	—	75	—	—	—
1953	127	2	125	—	2	—
1954	151	18	116	13	4	—
1955	193	59	97	32	5	—
1956	281	146	91	36	7	1
1957	449	314	91	34	7	3
1958	594	468	84	33	6	3
1959	856	717	87	41	7	4
1960	1,054	911	91	40	7	5
1961	963	818	94	40	7	5
1962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

Source: Civil Aeronautics Board.

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

Year	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

NOTE: Aircraft operations are all aircraft arrivals and departures, including both instrument flights and visual flights.
Source: Federal Aviation Agency, Office of Management Services.



CIVIL AIRPORTS AND HELIPORTS
Selected Years, 1927 to Date

Year As of January 1	Civil Airports	Civil Heliports[a]
1927	1,036	—
1930	1,782	—
1940	2,331	—
1950	6,484	—
1960	6,426	327
1961	6,881	487
1962	7,715	720
1963	8,084	797

[a] 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.

ACTIVE AIRMAN CERTIFICATES HELD
1955 to Date

Year as of Jan. 1	Pilots						Non-pilots	Other
	TOTAL	Students	Private	Commercial	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[E]	93,973	144,312[E]	92,976[E]	19,155[E]	2,444[E]	175,287[E]	98,257[E]
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

[E] Estimate.
Source: Federal Aviation Agency, Office of Management Services.

Transportation Accident Death Rates
(Deaths per 100,000,000 Passenger-Miles)
1946 to Date

Year	Domestic Airlines	Railroads	Buses	Cars and Taxis
Passenger Death Rates				
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	1.01	0.16	0.13	2.2
1961	0.38	0.10	0.19	2.1
1962	0.35	0.14	0.16	2.3
1963	0.11[b]	N.A.	N.A.	N.A.
Total Death Rates[a]				
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	1.16	3.6	0.76	3.0
1961	0.42	4.0	0.84	2.9
1962	0.41	3.6	0.74	3.1
1963	N.A.	N.A.	N.A.	N.A.

N.A.—Not available.
[a] Includes pedestrians, employees, trespassers, etc.
[b] Preliminary.
Source: National Safety Council, "Accident Facts" (Annually).

Public Relations Officials of Member Companies
of the Aerospace Industries Association

Aero Commander, Inc.
Al Balaban
Bethany, Oklahoma

Aerodex, Inc.
Jack Barbee Assoc.
Investment Bldg.
Washington, D. C.

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9190 East Flair Drive
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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 airplane piloted by remote control.

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.

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 1964 fiscal year begins on July 1, 1963, and ends June 30, 1964; 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.

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.

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.

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.

VLAC: the Vertical Lift Aircraft Council of the Aerospace Industries Association.

VTOL: vertical take-off and landing.

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