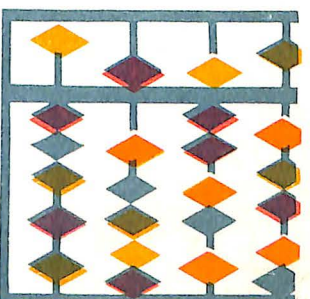
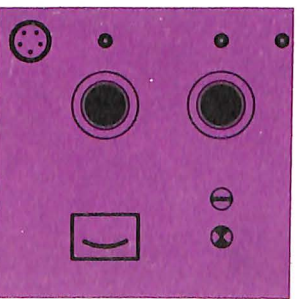
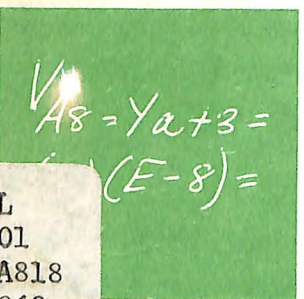
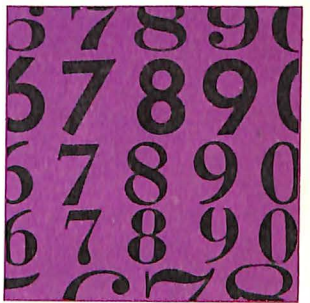
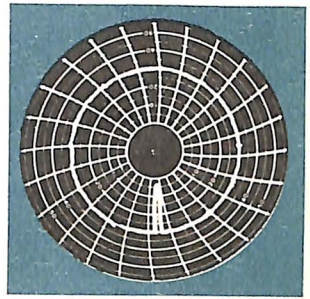
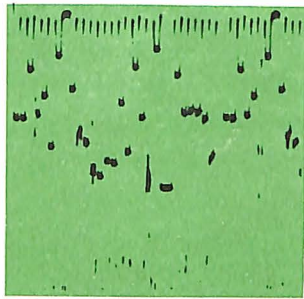
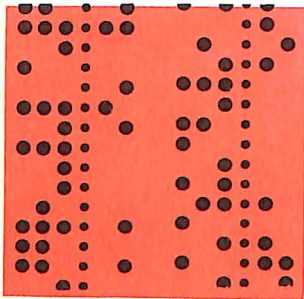


Aerospace Facts and Figures

1963

For Reference

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AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

AEROSPACE FACTS AND FIGURES 1963

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FOREWORD

The U. S. aerospace industry today is furnishing the main impetus to a mounting wave of world-wide technological progress. It is in the process of fulfilling an international challenge to put man on the moon in this decade. At the same time, it is providing a succession of advanced weapon systems to guarantee the survival of a Free World. Finally, it is building highest performance commercial transports, general aviation aircraft and helicopters.

A new industry, its technology has moved at such a surging pace that it has thus far defied accurate statistical measurements. Both realistic definitions of its scope and statistical reporting processes have lagged behind the facts presently available; measurements often are inadequate and outdated.

For example, certain employment, sales, profits, etc. of this new industry are listed by the Government under other industrial classifications such as chemicals, electronics or ordnance.

The statistics carried in the tables of *Aerospace Facts and Figures—1963* come largely from Government sources. They are used since they furnish the only official basis for comparison with other industries.

However, changes in the aerospace industry are challenging Government and industry statisticians to devise measurements better to reflect the scope of the aerospace industry. This effort has already produced some additional statistical elements which present a more realistic contemporary picture.

They indicate that the aerospace industry today is probably the nation's largest manufacturing industry with 1962 sales of about \$19.5 billion, accounting for 3.5 per cent of the Gross National Product, and absorbing nearly 30 per cent of all Government expenditures for national security.

As an employer, the aerospace industry ranks first with an estimated 1,200,000 employees.

Aerospace products rank first in manufactured exports, producing export sales of \$1.4 billion in 1962, which amounted to 6.6 per cent of the value of all U. S. exports.

I am confident that the above figures will be substantiated as the validity of the new measurements is more fully developed and confirmed.

Aerospace Facts and Figures—1963 represents an effort by this Association to furnish an insight into the economics of the aerospace industry. It describes, in tables and text, the industry's accomplishments in research, development, test and production programs of aircraft, missiles, spacecraft and propulsion systems.

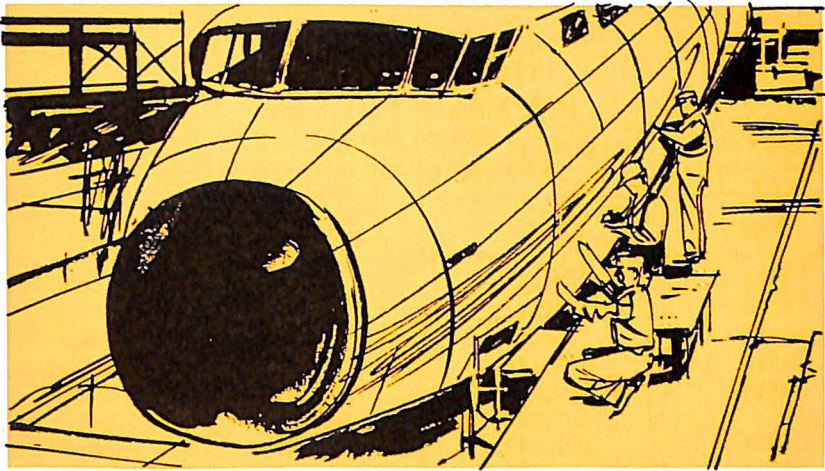
This eleventh edition is designed to serve as a standard reference on the aerospace industry for administrators and managers in Government and industry, writers and editors, legislators and analysts and students.

KARL G. HARR, JR.
President
Aerospace Industries Association

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AIRCRAFT PRODUCTION



Manned aircraft, despite persistent rumors or suggestions of their role as secondary to missiles and spacecraft in sales, in 1962 continued in first place.

Total sales for the entire aerospace industry for 1962 were an estimated \$19.5 billion. Of this total, \$8.6 billion were for aircraft (airframe and engine production, parts manufacture, research and development). In terms of percentages, aircraft accounted for more than 44 per cent of the sales volume. With sales of \$6.5 billion, missile work was in second place with 33.3 per cent, followed by \$2.9 billion for space in third place with 14.9 per cent. In fourth place were non-aerospace sales which amounted to \$1.5 billion and 7.7 per cent.

More detailed figures are available only for 66 top aerospace manufacturers, which are surveyed by the Census. In this survey, net sales of these companies are broken down into aircraft, aircraft engines and parts, missile and space vehicle systems, other aerospace activities, and

AEROSPACE FACTS AND FIGURES, 1963

non-aerospace activities. It is from these figures for 66 companies that the overall estimate is derived. But even among the 66, aircraft and engines proper make up 37.2 per cent. Conversions, modifications, and other sales are included in a miscellaneous aerospace activities total which makes up an additional 14.3 per cent.

There were 27 types of military fixed-wing aircraft in production in early 1963. Eleven were combat-type aircraft, and six were gravity

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

bombers of the attack and fighter bomber variety. In addition, there were 11 military helicopter types in production.

There were 45 types of civil aircraft in production. Most of these are classified as "general aviation" aircraft, the types used in business, agriculture and for sport. The aerospace industry produced approximately 7300 civil aircraft in 1962. The general aviation fleet today totals about 83,000 planes.

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	9,472 ^B	2,000 ^B	7,472
1962	9,333 ^B	2,000 ^B	7,333

N.A.—Not available.

E Estimate.

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

Sources: 1, 2, 3, 12, 17

Commercial turbine-powered aircraft were produced at the rate of 160 planes per year, and although some of the earlier turbojet airliners are being phased out of production, new types, such as short- and medium-range and convertible cargo-passenger aircraft, are helping to fill the gap.

Most of the military aircraft now being built will continue in production through 1963, some of them through 1964 and 1965. The fiscal budget now before Congress provides a good guideline as to the relation between aircraft and missile activity in the industry over the next few years. The 1964 budget request calls for an increase in missile procurement funds—an \$83,000,000 boost to a total of \$4.1 billion. *Yet there is an even greater increase in aircraft procurement money—\$158,000,000 to a total of \$6.5 billion.*

Now a subject of considerable interest is the Department of Defense research program on V/STOL (Vertical Short Take-Off and Landing) aircraft, those which combine the vertical lift characteristics of the helicopter with high performance in forward flight. The military services are experimenting with several types of American-built V/STOL's, and in addition are actively participating in British, French and German programs in this area. Planes of this type can reduce dependence on large airfields and permit operations in remote areas. Successful development of V/STOL's may bring an entire new generation of production aircraft, such as high performance vertical-rising fighters, reconnaissance/strike planes and airborne assault craft.



AIRCRAFT PRODUCTION

AIRFRAME WEIGHT PRODUCTION, 1939 TO DATE

Year	Weight in Millions of Pounds (Excluding Spares)		
	TOTAL	Military	Civil
1939	12.5 ^B	10.1	2.4 ^B
1940	27.8 ^B	23.1	4.7 ^B
1941	86.1 ^B	81.4	4.7 ^B
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	56.9 ^B	35.0 ^B	21.9
1962	55.2 ^B	35.0 ^B	20.2

^B Estimate.
Sources: 1, 12, 17

In 1944, the aircraft industry achieved its wartime production peak, turning out nearly 100,000 military aircraft at a cost of some \$16 billion. In 1962, the aerospace industry was a different industry—even the name had changed. Production of military aircraft was down to some 2,000. Yet the aerospace industry reached sales estimated at \$19.5 billion.

It did reach the new sales peaks because it had developed into fields which barely existed in 1944—missile and space products.

AEROSPACE FACTS AND FIGURES, 1963

In this, and the following chapters, some of the figures will be shown which describe the "old line" activities of the industry as well as the new.

The product change was so rapid that economic statistics could not quite keep up with the pace. Only in the last two years have there been sales and backlog figures for the new missile and space products. Even now, detailed figures are available only for a selected group of major companies.

As both Government and industry solve the statistical problems involved in this rapidly changing industry, old series of data will have to be dropped and replaced by new and refined ones.

BACKLOG OF ORDERS REPORTED BY MANUFACTURERS OF COMPLETE AIRCRAFT,
ENGINES AND PROPELLERS, 1948 TO 1960
(Millions of Dollars)

December 31	Total	Aircraft and Parts	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Products and Services ^a
1948	\$3,104	\$2,094	\$ 786	\$103	\$121
1949	3,010	2,013	749	91	157
1950	5,039	3,102	1,470	145	322
1951	12,665	8,126	3,531	241	767
1952	17,653	11,222	5,172	298	961
1953	16,753	11,604	4,080	218	851
1954	14,852	10,639	2,929	187	1,097
1955	15,702	10,673	3,061	130	1,841
1956	18,350	11,744	4,065	191	2,350
1957	14,531	9,236	2,969	158	2,168
1958	13,171	8,095	2,018	69	2,989
1959	12,120	6,650	1,385	57	4,028
1960	12,496	6,132	1,604	55	4,705

NOTE: Data from 48 companies are included—all companies known to be engaged in the manufacture of complete aircraft, aircraft engines and aircraft propellers in 1960. This series has now been replaced by the more complete one on the next page.

^a "Other Products and Services" includes missiles, conversions, modifications, and all other products and services not covered under the first three categories as long as they were produced or performed by manufacturers of complete aircraft, aircraft engines, or propellers.

Source: 13



AIRCRAFT PRODUCTION



VALUE OF BACKLOG REPORTED BY MANUFACTURERS OF COMPLETE AIRCRAFT,
SPACE VEHICLES, MISSILES, AND SELECTED PARTS
1960, 1961, 1962
AS OF DECEMBER 31
(Millions of Dollars)

Type of Product or Service	1960	1961	1962
TOTAL	\$15,321	\$13,950	\$13,137
United States Government	12,056	11,045	10,567
Other Customers ^a	3,265	2,905	2,570
Complete Aircraft and Parts, Total	6,089	5,669	5,048
U. S. Government	4,066	3,996	3,739
Other Customers	2,023	1,673	1,309
Aircraft Engines and Parts, Total	1,566	1,545	1,528
U. S. Government	1,161	1,088	1,165
Other Customers	405	457	363
Missile and Space Vehicle Systems, En- gines, Propulsion Units and Parts, Total	4,690	3,844	4,045
Missile Systems	3,855	2,881	2,139
Space Vehicle Systems, U. S. Govt., Military	124	360	849
Engines and/or Propulsion Units for Missiles and Space Vehicles (includ- ing Parts), U. S. Govt., Military	467	368	494
Space Vehicle Systems and their En- gines and/or Propulsion Units, U. S. Govt., Nonmilitary	244	235	563
Other Aircraft, Space Vehicle and Mis- sile Activities, Total ^b	2,049	1,783	1,486
U. S. Government	1,495	1,382	998
Other Customers	554	401	448
All Other Products and Services, Total ^c ..	927	1,109	1,030
U. S. Government	765	935	888
Other Customers	162	174	142

NOTE: Data from 66 companies are included. They include the manufacturers of complete aircraft, aircraft engines, propellers as well as the companies producing, assembling, developing or having prime system responsibility for complete missiles, space vehicles, and engines or propulsion units for missiles and space vehicles.

^a Includes some reported values, primarily those associated with subcontracts, shown under "Missile and space vehicle systems, engines, propulsion units and parts," even though such values were reported as U. S. Government orders.

^b Includes all conversions; modifications; site activations; other aerospace products (including drones) and services not included above; and receipts for applied research and development on items such as drones, etc. Receipts for other applied research are included with figures for the respective reporting categories.

^c Includes all nonaircraft, non-space vehicles, and nonmissile products and services; and all basic research.

Source: 13

AEROSPACE FACTS AND FIGURES, 1963

VALUE OF NET SALES REPORTED BY MANUFACTURERS OF COMPLETE AIRCRAFT,
SPACE VEHICLES, MISSILES, AND SELECTED PARTS
1961, 1962

(Millions of Dollars)

Type of Product or Service	1961 TOTAL	1962				
		TOTAL	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Total	\$14,954	\$15,848	\$3,875	\$4,016	\$3,862	\$4,095
U. S. Government	11,531	12,481	3,037	3,060	3,057	3,327
Other Customers ^a	3,423	3,367	838	956	805	768
Complete Aircraft and Parts, Total	4,387	4,386	1,119	1,186	1,004	1,077
U. S. Government	2,945	2,997	744	770	694	789
Other Customers	1,442	1,389	375	416	310	288
Aircraft Engines and Parts, Total	1,455	1,513	382	401	383	347
U. S. Government	1,021	1,130	267	299	295	269
Other Customers	434	383	115	102	88	78
Missile and Space Vehicle Systems, Engines, Propulsion Units and Parts, Total	5,214	5,963	1,423	1,383	1,498	1,659
Missile Systems	3,655	3,699	966	855	899	979
Space Vehicle Systems, U. S. Govt., Military	551	712	155	171	184	202
Engines and/or Propulsion Units for Missiles and Space Vehi- cles (incl. parts) U. S. Govt., Military	796	945	205	245	228	267
Space Vehicle Systems, their En- gines, and/or Propulsion Units, U. S. Govt., Nonmilitary	212	607	97	112	187	211
Other Aircraft, Space Vehicles and Missile Activities, Total ^b	2,669	2,540	648	675	612	605
U. S. Government	1,798	1,788	463	485	435	405
Other Customers	871	752	185	190	177	200
All Other Products and Services, Total ^c	1,229	1,446	303	371	365	407
U. S. Government	788	961	205	249	228	279
Other Customers	441	485	98	122	137	128

NOTE: Data from 66 companies are included. They include the manufacturers of complete aircraft, aircraft engines, propellers as well as the companies producing, assembling, developing or having prime system responsibility for complete missiles, space vehicles, and engines or propulsion units for missiles and space vehicles.

^a Includes some reported values, primarily those associated with subcontracts, shown under "Missile and space vehicle systems, engines, propulsion units and parts," even though such values were reported as U. S. Government orders.

^b Includes all conversions; modifications; site activations; other aerospace products (including drones) and services not included above; and receipts for applied research and development on items such as drones, etc. Receipts for other applied research are included with figures for the respective reporting categories.

^c Includes all nonaircraft, nonspace vehicles, and nonmissile products and services; and all basic research.

Source: 13

AIRCRAFT PRODUCTION

SALES OF MANUFACTURERS OF COMPLETE AIRCRAFT, AIRCRAFT ENGINES, PROPELLERS AND PARTS 1948 TO 1960 (Millions of Dollars)

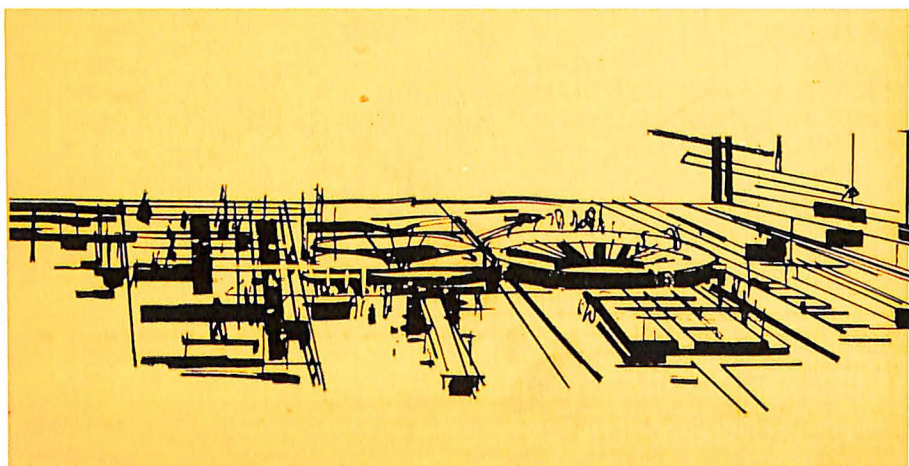
Year	To- TAL	Aircraft and Parts			Aircraft Engines and Parts			Aircraft Propellers and Parts			Other Prod- ucts and Serv- ices ^b
		To- TAL	U.S. Mili- tary	Oth- er	To- TAL	U.S. Mili- tary	Oth- er	To- TAL	U.S. Mili- tary	Oth- er	
1948 ^a	\$1,158	\$ 748	\$ 626	\$122	\$ 265	\$ 222	\$ 43	\$ 48	\$ 36	\$12	\$ 97
1949	1,781	1,098	927	171	508	461	47	62	50	12	113
1950	2,274	1,416	1,255	161	583	519	64	75	62	13	200
1951	3,456	1,883	1,657	226	879	779	100	110	89	21	584
1952	6,497	3,897	3,442	455	1,609	1,440	169	148	122	26	843
1953	8,511	5,179	4,661	518	2,378	2,189	189	203	176	27	751
1954	8,305	5,226	4,626	600	2,062	1,872	190	183	151	32	834
1955	8,470	5,164	4,605	559	1,933	1,728	205	134	112	22	1,239
1956	9,496	5,554	4,740	814	2,035	1,718	317	136	101	35	1,771
1957	11,765	6,772	5,607	1,165	2,527	2,137	390	183	140	43	2,283
1958	11,470	6,319	5,305	1,014	2,179	1,858	321	163	126	37	2,809
1959	11,255	5,458	4,063	1,395	1,676	1,268	408	102	64	38	4,019
1960	10,997	5,099	3,333	1,766	1,330	913	417	98	73	25	4,470

NOTE: Data from 48 companies are included—all companies known to be engaged in the manufacture of complete aircraft, aircraft engines and aircraft propellers in 1960. This series has now been replaced by the more complete one on the preceding page.

^a Total for last three quarters of 1948 only.

^b "Other Products and Services" includes missiles, conversions, modifications, and all other products and services not covered under the first three categories as long as they were produced or performed by manufacturers of complete aircraft, aircraft engines, or propellers.

Source: 13



AEROSPACE FACTS AND FIGURES, 1963

VALUE OF PRODUCTION OF THE AIRCRAFT INDUSTRY
1914 TO 1960
(Millions of Dollars)

Year	Total Value ^a	Part of Total Value Added by Manufacture
1914	\$.8	\$.7
1919	14.4	7.2
1921	6.6	4.2
1923	12.9	9.1
1925	12.5	9.7
1927	21.2	13.6
1929	71.2	43.8
1931	40.3	27.2
1933	26.5	18.5
1935	45.3	31.0
1937	149.7	93.1
1939	279.5	183.2
1940 Jul-Dec	370.0	N.A.
1941	1,804.0	N.A.
1942	5,817.0	N.A.
1943	12,514.0	N.A.
1944	16,047.0	N.A.
1945 Jan-Aug	8,279.0	N.A.

Year	Sales ^b	Total Value ^c	Part of Total Value Added by Manufacture ^d
1947	\$ 1,200 ^e	N.A.	\$ 885
1949	1,781	N.A.	1,202
1950	2,274	N.A.	1,406
1951	3,456	N.A.	2,337
1952	6,497	N.A.	3,728
1953	8,511	N.A.	4,556
1954	8,305	\$10,047	4,904
1955	8,470	8,638	4,671
1956	9,496	9,999	5,565
1957	11,765	12,392	6,453
1958	11,470	10,185	5,127
1959	11,255	10,174	4,805
1960	10,997	8,634	4,246

NOTE: Beginning with 1961, the sales figures of aerospace companies have been refined and expanded. For new series see page 12.

^e Estimate.

^a 1914-1939: Value of Products.

1940-1945: Value of Production at August 1943 Unit Cost.

^b Sales of Manufacturers of Complete Aircraft, Engines, Propellers and Parts. The figures include other products and services such as missiles, conversions and modifications.

^c 1954-date: Value of work done by the aircraft industry plus value of shipments of the aircraft engines and parts and aircraft propellers and parts industries. Shipments of the aircraft equipment industry not included.

^d Aircraft, aircraft engines and parts and propeller and parts industries.

Sources: 1, 8, 8, 18

AIRCRAFT PRODUCTION

SHIPMENTS OF CIVIL ENGINES
1956 TO DATE
(Number of Engines)

Manufacturer and Engine Designation ^a	1956	1957	1958	1959	1960	1961	1962
TOTAL	11,204	10,817	10,251	12,259	12,159	10,663	10,479
Reciprocating	11,204	10,779	9,736	10,875	10,524	9,669	9,921
Jet	—	38	515	1,384	1,635	994	558
Allison Division							
General Motors							
282	—	—	242	604	576	22	—
Continental							
205	87	145	77	16	56	46	51
246	22	24	15	23	20	16	8
252	627	879	829	1,348	840	828	826
253	1,736	811	1,734	953	1,252	987	1,104
267	433	31	36	36	9	12	12
273	2,524	2,733	2,181	2,816	3,207	850	1,006
298	—	—	—	713	469	86	78
3E-1	—	—	—	—	—	1,888	1,974
3E-3	—	—	—	—	—	322	140
Other	20	24	23	8	20	70	43
General Electric							
306	—	—	—	—	—	70	15
308	—	—	18	90	212	—	—
1E5	—	—	—	—	66	185	25
J79-11A	—	—	—	—	—	69	43
Lycoming							
223	7	8	2	8	111	1,241	289
228	—	—	—	—	—	12	7
229	132	44	95	113	80	17	17
274	3,011	2,631	2,023	2,021	1,452	1,128	1,248
275	909	842	419	308	271	122	142
277	—	—	—	—	—	11	5
286	2	250	768	1,044	701	218	1,080
284	—	—	—	247	294	718	95
295	—	123	561	906	1,247	728	1,194
304	—	—	—	—	115	—	—
1E	—	—	—	—	233	—	—
1E4	—	—	—	—	—	122	162
1E7	—	—	—	—	—	90	286
1E10	—	—	—	—	—	—	60
1E11	—	—	—	—	—	65	36
Other	443	315	167	53	107	—	—

(Continued on next page)

AEROSPACE FACTS AND FIGURES, 1963

SHIPMENTS OF CIVIL ENGINES—Continued
1956 TO DATE

Manufacturer and Engine Designation ^a	1956	1957	1958	1959	1960	1961	1962
Pratt & Whitney Aircraft							
230	21	5	6	1	—	—	—
231, 264	316	456	315	3	6	—	—
290	—	35	232	275	172	145	21
291	—	3	23	410	523	46	—
1E8	—	—	—	—	63	357	406
1E9	—	—	—	—	23	97	44
XTF10	—	—	—	—	—	3	1
JT8D	—	—	—	—	—	—	3
Other	—	—	—	5	—	—	—
Wright Aeronautical							
243	—	68	51	6	—	6	—
259	23	157	129	202	34	49	58
272	315	323	22	—	—	—	—
287	576	910	283	26	—	—	—
289	—	—	—	24	—	1	—
Other	—	—	—	—	—	36	—

^a Type certificate number.
Source: 1

UTILIZATION OF FLOOR SPACE
SELECTED AEROSPACE ACTIVITIES,
1947-1961

Year	Percentage Utilized for				
	Total	Manufac- turing	Laboratory and Office	Storage	Other
1947	100.0%	53.5%	21.1%	13.2%	12.2%
1955	100.0	51.7	17.9	14.6	15.8
1961	100.0	39.9	28.4	14.4	17.3

Source: 40

AIRCRAFT PRODUCTION

FLOOR AREA AVAILABLE IN AEROSPACE FACILITIES, 1939 TO DATE (Millions of Square Feet)

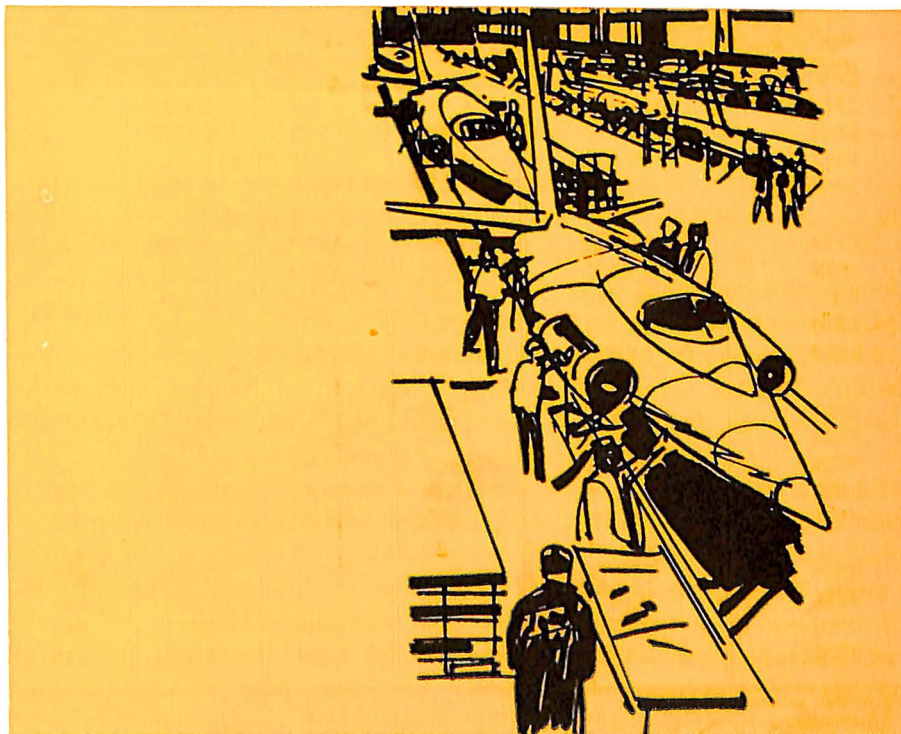
Date	TOTAL	Airframe	Engine	Propeller
Jan. 1, 1939	9.5	7.5	1.7	.3
Jan. 1, 1941	25.5	17.9	6.5	1.1
Jan. 1943	117.1	77.5	31.8	5.2
Dec. 1944	167.4	103.0	54.9	7.9
1947 (estimate)	54.1	39.0	13.5	1.6
1950 (estimate)	63.5	47.5	14.0	2.0
June 30, 1953	135.8	91.1	42.1	2.6
Dec. 31, 1955	131.3	96.5	32.1	2.7
Sept. 30, 1957	141.5	103.5	35.2	2.8
Sept. 30, 1959	126.8	93.6	30.0	3.2
Dec. 31, 1960	148.4 ^a	118.4 ^a	26.8	3.2
June 30, 1961	152.5 ^a	125.5 ^a	24.5	2.5
Dec. 31, 1962 ^b	129.8 ^a	94.5 ^a	33.6 ^c	1.7

^a Includes missile and aircraft airframes.

^b Data are compiled on a revised basis.

^c Includes all types of propulsion, such as rocket, jet and reciprocating engines.

Sources: 1, 3, 17



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

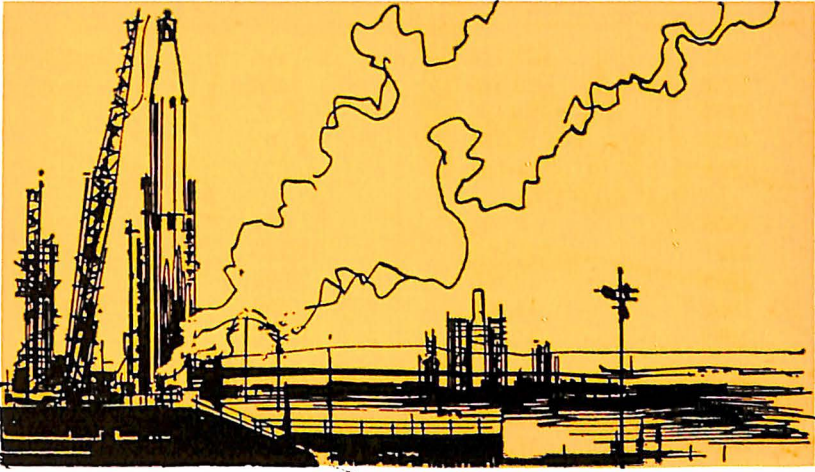
Year	TOTAL	Military		Civil	
1917-1919	N.A.	44,453		N.A.	
1926	N.A.	842		N.A.	
1927	N.A.	1,397		N.A.	
1928	3,252	2,620		632	
1929	7,378	1,861		5,517	
1930	3,766	1,841		1,925	
1931	3,776	1,800		1,976	
1932	1,898	1,085		813	
1933	1,980	860		1,120	
1934	2,736	688		2,048	
1935	2,965	991		1,974	
1936	4,237	1,804		2,433	
1937	6,084	1,989		4,095	
1938	N.A.	N.A.		3,800 ^B	
1939	11,172	N.A.		N.A.	
1940	30,167 ^B	22,667		7,500 ^B	
1941	64,681 ^B	58,181		6,500 ^B	
1942	138,089	138,089		—	
1943	227,116	227,116		—	
		Recipr.	Jet	Recipr.	Jet
1944	256,911	256,789	122	—	—
1945	111,650 ^B	108,442	1,208	2,000 ^B	—
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	15,475	756	2,193	10,891	1,635
1961	14,163 ^B	500 ^B	3,000 ^B	9,669	994
1962	13,979 ^B	500 ^B	3,000 ^B	9,921	558

N.A. Not available.

^B Estimate.

Sources: 1, 3, 12, 17

MISSILES



On the basis of estimates for the entire aerospace industry, sales for research, development, production and test of missile systems amounted to \$6.5 billion (33.3 per cent of the total sales volume) in 1962. The more detailed Census survey of 66 top aerospace manufacturers listed sales of \$3.7 billion during 1962, an increase of \$44 million over the previous year's volume for the same companies. The difference in dollar volume is accounted for by the fact that the larger figure includes propulsion systems and other missile-related work, such as site activations, and includes all companies in the industry.

As in previous years, major emphasis was on production and site activation of intercontinental ballistic missiles. As of the end of the fiscal year 1963 (June 30), all 13 squadrons of Atlas ICBM's, totaling 126 weapons, were in operational status. Six of the planned 12 squadrons of Titan ICBM's, with nine missiles per squadron, were operational and it was expected that the remaining six would become operational by the end of the calendar year 1963. Considerable progress was made on the solid-fueled, silo-sited Minuteman ICBM. The first three squadrons,

AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF DEFENSE
 NEW OBLIGATIONAL AVAILABILITY FOR PRODUCTION AND PROCUREMENT
 TOTAL AND GUIDED MISSILES
 1951 TO DATE
 (Millions of Dollars)

Year Ending June 30	Total Procurement and Production	Guided Missiles	Missiles as Percent of Total
1951	\$23,114	\$ 424	1.8
1952	29,536	468	1.6
1953	21,117	685	3.2
1954	10,588	569	5.4
1955	7,420	234	3.2
1956	9,795	764	7.8
1957	11,294	2,135	18.9
1958	10,983	2,090	19.0
1959	14,304	3,966	27.7
1960	11,701	2,030	17.3
1961	11,716	2,078	17.7
1962	15,746	3,230	20.5
1963 ^B	16,667	3,969	23.8
1964 ^B	16,725	3,880	23.2

Estimate
 Source: 17, 21

totaling 150 missiles, were in place by June 30. It was planned to add another 650 Minuteman ICBM's to the operational force in the fiscal years 1964-65. The 1964 budget calls for another 150 missiles, bringing the total Minuteman force to 950 by 1966.

The Navy had nine submarines equipped with the Polaris Fleet Ballistic Missile and another nine were scheduled for operational deployment by the end of fiscal 1964. The first five subs carry the Polaris A-1, which has a range of 1,200 nautical miles. Subs 6 to 9 have the A-2 version with a 1,500 nautical mile range, and numbers 9 to 18 will also have the A-2. Starting with No. 19, the FBM subs will be equipped with the Polaris A-3, which will have a range of 2,500 nautical miles.

In the year preceding publication of this volume, the following missiles achieved operational status:

Titan II, an advanced version of the basic Titan with 430,000 pounds

MISSILES



DEPARTMENT OF DEFENSE
 NEW OBLIGATIONAL AVAILABILITY FOR MISSILE PROCUREMENT, BY AGENCY
 1951 TO DATE
 (Millions of Dollars)

Year Ending June 30	TOTAL DEFENSE DEPARTMENT	Air Force	Navy	Army
1951	\$ 424	\$ 121	\$130	\$173
1952	468	95	119	253
1953	685	N.A.	N.A.	N.A.
1954	569	N.A.	N.A.	N.A.
1955	234	N.A.	N.A.	N.A.
1956	764	N.A.	N.A.	N.A.
1957	2,135	N.A.	N.A.	N.A.
1958	2,090	N.A.	N.A.	N.A.
1959	3,966	N.A.	N.A.	N.A.
1960	2,030	1,256	382	392
1961	2,078	1,173	553	351
1962	3,230	1,780	878	572
1963 ^B	3,969	2,459	952	558
1964 ^B	3,880	2,177	1,122	581

^B Estimate
 Source: 17, 21

AEROSPACE FACTS AND FIGURES, 1963

of thrust in the first stage, providing a substantial range increase.

Pershing, a selective range Army missile for general support of field units.

Subroc, an underwater-to-air-to-underwater flying torpedo for anti-submarine warfare. (The first operational system was lost with the nuclear attack submarine *Thresher*).

Davy Crockett, a short-range weapon for support of ground troops fired from a vehicle-mounted or man-carried launcher.

One missile progressed from developmental to full production status: Shrike, a solid-propelled, anti-radiation missile to be used by both the Air Force and Navy.

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, FEBRUARY 28, 1963
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	Total Procurement	Guided Missiles	Missiles as Percent of Total
Defense Department	\$13,377	\$2,123	15.8
Air Force	4,693	1,149	24.4
Navy	6,298	535	8.5
Army	2,356	439	18.6
Defense Agencies	30	---	---

Source: 20

DEPARTMENT OF DEFENSE
UNPAID OBLIGATIONS, FEBRUARY 28, 1963
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	Total Procurement	Guided Missiles	Missiles as Percent of Total
Defense Department	\$16,350	\$2,984	18.3
Air Force	5,118	1,224	23.9
Navy	8,019	1,006	12.5
Army	3,196	754	23.6
Defense Agencies	17	---	---

Source: 20

MISSILES

DEPARTMENT OF DEFENSE
EXPENDITURES FOR PROCUREMENT AND PRODUCTION
TOTAL AND GUIDED MISSILES
1951 TO DATE
(Millions of Dollars)

Year Ending June 30	Total Procurement and Production	Guided Missiles	Guided Missiles as Percent of Total
1951	\$ 3,976	\$ 21	0.5
1952	11,478	169	1.5
1953	17,297	245	1.4
1954	15,957	417	2.6
1955	12,838	604	4.7
1956	12,227	1,005	8.2
1957	13,488	1,855	13.8
1958	14,083	2,434	17.3
1959	14,409	3,337	23.2
1960	13,334	3,027	22.7
1961	13,095	2,972	22.7
1962	14,532	3,442	23.7
1963 ^E	15,521	3,754	24.2
1964 ^E	16,350	3,658	22.4

^E Estimate
Source: 17

Major new missile programs initiated during the year included :

Sprint, a high-acceleration anti-missile missile to be used as the major component of the Nike X system.

Lance, an Army general support missile with a 30-mile range, carried on a highly mobile launcher.

Walleye, an extremely accurate Navy air-to-ground glide bomb with homing guidance.

There were a number of missile types in advanced stages of development, including : Shillelagh, a lightweight ground support missile for increased firepower against troops, fortifications and armor ; Redeye, a shoulder-fired bazooka-like weapon ; Mauler, a mobile Army air defense missile ; Typhon, an advanced Navy air defense system.

In addition, there were under way a great many projects aimed at improving performance of existing missiles, particularly in bettering the penetrability of long range weapons. Of importance in this area was Project Defender, a program of the Advanced Research Projects

AEROSPACE FACTS AND FIGURES, 1963

Agency aimed at developing scientific and technical knowledge for the design of U. S. defenses against enemy long-range missiles and for increasing penetrability of U. S. weapons. Defender involves a detailed study of ballistic missile flight phenomena, the development and application of new missile defense techniques and studies of advanced missile concepts. The program was budgeted for \$128,000,000 in fiscal 1964.

DEPARTMENT OF DEFENSE
EXPENDITURES FOR GUIDED MISSILE PROCUREMENT, BY AGENCY
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 ^E	3,754	2,427	747	580
1964 ^E	3,658	2,115	943	600

^E Estimate based on 1963 Budget Submission.
Source: 17



MISSILES

MISSILE AND SPACECRAFT EMPLOYMENT, 561 ESTABLISHMENTS, AUGUST 1962

Industry Group in which establishments are classified Industry Group	Number of Reporting Establishments	Missiles and Spacecraft Employment, August 1962		Employment Change (%)	
		Total (000)	Per Cent Distribution	Past Trend	Labor Needs
				Aug. 1961 to Aug. 1962	Aug. 1962 to Feb. 1963
TOTAL	561	711.3	100.0	+16.7 ^a	+4.4 ^b
Aircraft and parts	115	174.4	24.5	+22.8	+1.3
Ordnance and accessories	54	168.0	23.6	+12.6	+2.5
Electrical machinery, equipment and supplies	153	152.9	21.5	+22.4	+9.1
Federal Government	41	79.7	11.2	+7.4	+4.4
Professional scientific and controlling instruments, photographic and optical goods, watches and clocks	37	34.3	4.8	+26.0	+6.2
Miscellaneous business services ^c	35	33.4	4.7	+17.7	+11.7
Miscellaneous engineering, nonprofit educational and scientific research services	17	24.9	3.5	+16.6	+6.4
Machinery, except electrical	39	17.1	2.4	+0.8	-4.1
Chemicals and allied products	13	9.8	1.4	+24.0	+2.1
Other industry groups ..	57	16.8	2.4	-1.8	+3.0

NOTE: All establishments are classified according to their "primary" product. Establishments whose primary products are missiles are classified as "ordnance and accessories."

^a Per cent change is based on establishments reporting data for both 1961 and 1962; plants in matched sample account for 99 per cent of total current employment.

^b Based on estimated manpower needs of establishments with 99 per cent of total current employment in surveyed establishments.

^c Includes commercial research, development and testing laboratories.

Source: 32



MISSILE AND SPACECRAFT EMPLOYMENT,
22 MAJOR LABOR MARKETS,
561 Establishments, August 1962

Area	Missiles and Spacecraft Employment				
	TOTAL (000)	% Change Aug. 1961 to Aug. 1962	% of Non- Agricul- tural Wage and Salary Employ- ment	Area Classifi- cation ^a Aug. 62	% Change in Labor Needs Aug. 1962 to Feb. 1963
TOTAL, U. S.	711.3	+16.7 ^b	1.3	—	+4.4 ^c
Total, 22 Areas	522.8	+19.3	3.2	—	+4.3
Per Cent: 22 Areas of U. S. Total	73.5	—	—	—	—
Los Angeles-Long Beach, Calif.	158.9	+31.8	6.3	C	+10.5
San Jose, Calif.	35.8	+23.7	14.8	C	+20.0
San Diego, Calif.	30.3	+3.8	11.6	D	-25.2
Philadelphia, Pa.	25.4	+21.0	1.7	D	-1.4
New York, N. Y.	25.0	+5.9	0.6	C	+1.8
Boston, Mass.	24.2	+12.2	2.3	C	+8.4
Dayton, Ohio	19.1	+3.3	7.7	C	+4.4
Minneapolis- St. Paul, Minn.	15.9	+25.4	2.7	C	+5.3
Salt Lake City, Utah.	15.4	+41.8	9.9	C	+1.6
Baltimore, Md.	15.3	+11.0	2.5	C	+2.8
San Bernardino- Riverside- Ontario, Calif.	11.2	+36.0	5.7	C	+4.5
Dallas, Texas	11.0	+122.5	2.7	C	+9.2
Washington, D. C.	9.0	+11.3	1.1	B	+6.9
Newark, N. J.	6.4	+13.4	1.0	C	+2.1
Buffalo, N. Y.	6.0	-12.9	1.5	D	+2.4
Seattle, Wash.	^a	^a	^a	C	^a
Sacramento, Calif. . . .	^a	^a	^a	C	^a
Denver, Colo.	^a	^a	^a	C	^a
Paterson-Clifton- Passaic, N. J.	^a	^a	^a	C	^a
St. Louis, Mo.	^a	^a	^a	C	^a
Lawrence-Haverhill, Mass.	^a	^a	^a	D	^a
Milwaukee, Wis.	^a	^a	^a	C	^a

^a "B" classification designates areas of relatively low employment; "C" rating relates to areas of moderate unemployment; "D" listing pertains to areas of relatively substantial unemployment.

^b Per cent change is based on establishments reporting for both 1961 and 1962; matched sample available for plants accounting for over 99 per cent of total current employment.

^c Based on estimated needs of establishments with about 99 per cent of total current employment in surveyed plants.

^d Figures withheld to avoid disclosure of information for individual establishments.
Source: 32

MISSILES

MISSILE AND SPACECRAFT EMPLOYMENT
By REGION AND STATE, AUGUST 1962

Region and Selected States	Number of Reporting Establishments	Missiles and Spacecraft Employment August 1962		Employment Change (%)	
		Total (000)	Per Cent Distribution	Past Trend	Labor Needs
				Aug. 1961 to Aug. 1962	Aug. 1962 to Feb. 1963
TOTAL	561	711.3	100.0	+16.7 ^a	+4.4 ^b
Northeast	170	148.6	20.9	+12.6	+3.1
Massachusetts .	29	47.0	6.6	+13.5	+4.2
New York	53	39.6	5.6	+5.8	+3.1
New Jersey ...	29	28.4	4.0	+12.2	+4.1
Pennsylvania .	37	21.2	3.0	+36.2	+1.2
Connecticut ...	15	6.8	1.0	-11.4	-2.9
North Central ..	98	77.5	10.9	+7.7	+6.1
Ohio	31	31.1	4.4	+12.2	+7.2
Minnesota	9	15.9	2.2	+25.4	+5.3
Missouri	9	10.4	1.5	-6.8	+5.4
Michigan	12	5.9	0.8	-14.0	+6.2
South	94	126.8	17.8	+15.8	+5.1
Florida	19	36.9	5.2	+4.5	+2.2
Maryland	16	27.6	3.9	+10.1	+4.1
Alabama	14	24.7	3.5	+16.6	+6.6
Texas	14	13.6	1.9	+84.7	+7.3
Tennessee	3	6.9	1.0	+26.4	+1.1
North Carolina	6	6.2	0.9	-25.7	+2.1
West	199	358.4	50.4	+21.1	+4.3
California	167	265.0	37.3	+24.4	+6.6
Utah	7	16.7	2.4	+34.2	+2.7
New Mexico ..	7	8.3	1.2	-3.1	+0.8
Arizona	7	5.2	0.7	-4.9	+1.5

^a Per cent change is based on establishments reporting data for both 1961 and 1962; plants in matched sample account for 99 per cent of total current employment.

^b Based on estimated manpower needs of establishments with 99 per cent of total current employment in surveyed establishments.

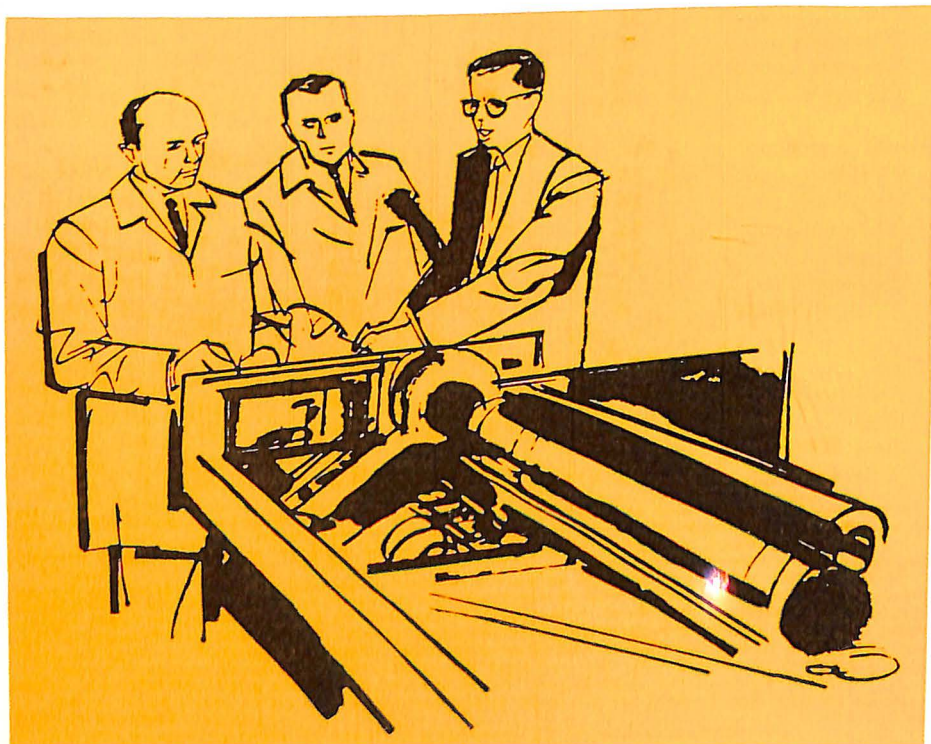
NOTE: Listing includes states with at least 3 establishments and no plant accounting for 80 per cent or more of employment total in reporting establishments to avoid disclosure of individual firm data. In addition, only states with missile employment of 5,000 or more are listed. Three states with large missile and spacecraft employment—Colorado, Washington and Wisconsin—are not listed since this would disclose individual firm data. States are grouped by Census region.

Source: 32

AEROSPACE FACTS AND FIGURES, 1963

DRONES IN PRODUCTION OR DEVELOPMENT

Name and Designation	Service	Prime	Airframe	Power Plant	Guidance
1025/KDB-1	Army	Beech	Beech	McCulloch	Babcock & Summers
KD2B-1	Navy	Beech	Beech	Rocket-dyne	—
KD2R-5	Navy	Northrop-Ventura	—	—	—
QH-50C (DSN-3)	Navy	Gyrodyne	Gyrodyne	Boeing	—
Q-2C/124E	USAF/Navy/Army	Ryan	Ryan	Continental	Lear
USD-2	Army	Aerojet-General	Aerojet	Lycoming	Sperry Rand
USD-1 "Roadrunner," "Redhead"	Army	Radioplane North American	— North American	— Marquardt	— Babcock



MISSILES

NUMBER AND FLYAWAY COST OF MILITARY DRONE PRODUCTION
 BY MILITARY DEPARTMENT AND MODEL
 CALENDAR YEARS 1958-1960

Military Department and Model	1958		1959		1960	
	Number	Est. Cost (\$000)	Number	Est. Cost (\$000)	Number	Est. Cost (\$000) ^a
DEPARTMENT OF DEFENSE—TOTAL	3,873	36,648	4,654	45,921	3,855	87,804
<u>AIR FORCE—TOTAL</u>	<u>813</u>	<u>12,821</u>	<u>1,038</u>	<u>20,178</u>	<u>878</u>	<u>62,974</u>
Q-2A	119	6,827	120	6,884	19	1,090
XQ-2C	2	1,796	12	10,775	2	1,796
Q-4A	2	2,280	—	—	—	—
OQ-19D	690	1,918	906	2,519	702	1,895
Q-2C	—	—	—	—	147	24,640
XQ-4B	—	—	—	—	8	33,553
<u>NAVY—TOTAL</u>	<u>672</u>	<u>17,992^a</u>	<u>500</u>	<u>16,761^a</u>	<u>474</u>	<u>11,409</u>
KDA-1	49	3,103	—	—	—	—
KDA-4	205	12,741	195	11,798	—	—
KDB-1	—	—	223	4,542	353	7,532
KD2R-5	418	2,148	82	421	100	496
Q-2C	—	—	—	—	12	1,358
DSN-1	—	—	—	—	9	2,023
<u>ARMY—TOTAL</u>	<u>2,388</u>	<u>5,835</u>	<u>3,116</u>	<u>8,982</u>	<u>2,503</u>	<u>13,421</u>
OQ-19B	1,255	3,115	2,484	6,684	1,715	5,287
OQ-19D	1,133	2,720	577	1,451	305	767
KDB-1	—	—	55	847	95	1,512
RP-76	—	—	—	—	388	5,855

^aRepresents program costs.

AEROSPACE FACTS AND FIGURES, 1963

SALES OF MISSILES AND ENGINES^a, 1961, 1962
 BY AEROSPACE MANUFACTURERS
 (Millions of Dollars)

Period	Missile Systems		Engines ^a	
	1961	1962	1961	1962
First Quarter	\$ 939	\$ 966	\$191	\$205
Second Quarter	946	855	200	245
Third Quarter	901	899	190	228
Fourth Quarter	869	979	215	267
TOTAL	\$3,655	\$3,699	\$796	\$945

^a Includes engines and/or propulsion units for military space vehicles.
 Source: 13



MISSILES

U. S. MISSILE AND ROCKET PROGRAM

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	Bendix & McDonnell	Ramjet	Sperry	Study
Talos	Navy	Bendix				Operational
Tartar	Navy	General Dynamics	Aerojet	Solid	Raytheon	Operational
Terrier & Advanced Terrier	Navy	General Dynamics	Allegany Ballistic Lab.	Solid	General Dynamics	Operational
Typhon	Navy	Bendix & General Dynamics	McDonnell	Solid	S. D. Hicks & Cameron Iron Works Westinghouse	Evaluation
AIR-TO-AIR						
Falcon	USAF	Hughes	Thiokol	Solid	Hughes Unguided	Operational
Genie MB-1	USAF	Douglas	Aerojet	Solid		Operational
Phoenix	USAF-Navy	General Dynamics	Grumman & Hughes	Solid	Philco & General Electric	Study
Sidewinder 1-C	USAF-Navy	Philco & Motorola	Navy Propellant Plant			Operational
Sparrow III	Navy	Raytheon	Aerojet	Solid	Raytheon	Operational

(Continued on next page)

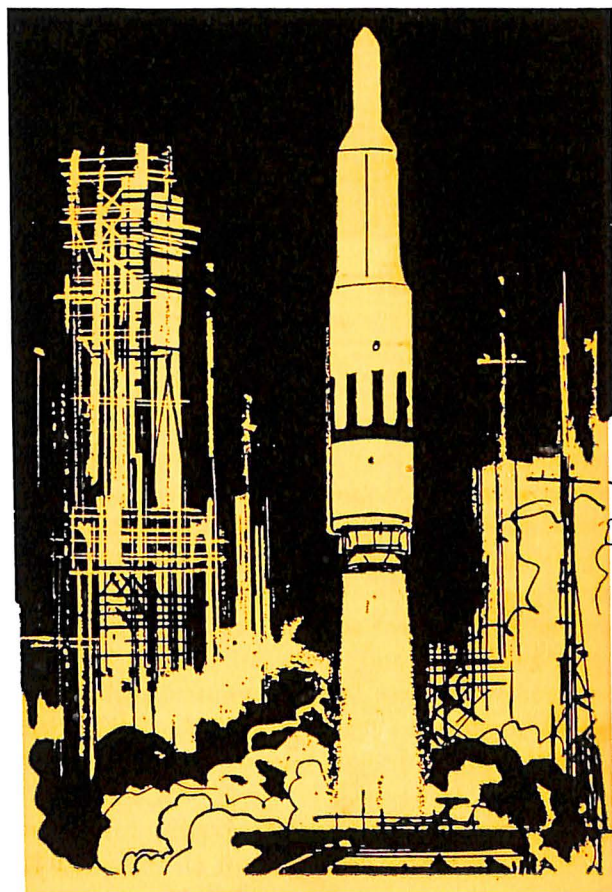
U. S. MISSILE AND ROCKET PROGRAM—continued

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

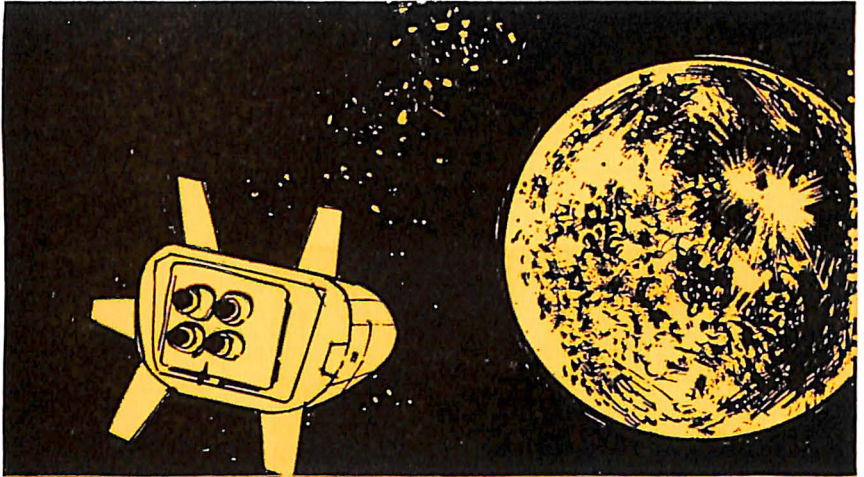
MISSILES

U. S. MISSILE AND ROCKET PROGRAM

Project	Service	Systems Contractor	Propulsion		Guidance Mfr.	Status
			Mfr.	Type		
AIR-TO-SURFACE						
Bullpup	Navy-USAF	Martin	Thiokol	Solid	Maxson Electronics No. American	Operational
Hound Dog	USAF	North American	Pratt & Whitney	Turbojet		Operational
Shrike	Navy	Naval Ordnance Test Station		Solid	Texas Instruments	Development
UNDERWATER-TO-UNDERWATER						
Subroc	Navy	Goodyear	Thiokol	Solid	General Precision	Operational



SPACE PROGRAMS



Estimates place 1962 sales of space systems, including propulsion, site activation, etc., as high as \$2.9 billion—or 14.9 per cent of total aeronautical sales. Detailed statistical data, even for the 66 major aerospace companies, are limited. In 1962, they reported sales of military space vehicle systems (excluding propulsion) of \$712 million, and sales of non military space vehicle systems (including propulsion) of \$607 million. The rest of the sales is estimated to have included propulsion units for military space vehicles, “other” space vehicle activities, and the sales of other companies not included in the 66 major ones.

The two major buying agencies for space systems are the Department of Defense and the National Aeronautics and Space Administration. The expenditures of the Department of Defense for aeronautics will probably amount to about \$1 billion during the fiscal year 1963. NASA will spend approximately \$2.4 billion during the same period, the largest part of it for space activities.

As obligations for NASA alone are climbing at a rapid rate from \$1.5 billion in fiscal year 1962 to \$3 billion in 1963 and an expected \$5

SPACE PROGRAMS

billion in 1964, the development of spacecraft, launch vehicles, guidance systems and propulsion units is expected to climb rapidly.

The years 1962-1963 were marked by rapid progress in manned space flight. The earlier three-orbit Project Mercury flights of astronauts John Glenn (February 20, 1962) and Scott Carpenter (May 24, 1962) were followed by 6- and 22-orbit missions by astronauts Walter Schirra and Gordon Cooper. Schirra was launched October 3 into an orbit with an apogee of 176 miles and a perigee of 100 miles. His six-orbit flight took 9 hours and 13 minutes.

Cooper (Mercury-Atlas 9) was launched May 15 into a 100/166.1-mile orbit with a period of 88.7 minutes. The 22-orbit flight lasted 34 hours and 20 minutes. Cooper's Mercury capsule "splashed" in the Pacific Ocean about 80 miles southeast of Midway Island and he was picked up by the aircraft carrier Kearsarge 36 minutes after touchdown. The Mercury capsule "Faith 7" contained instrumentation for life support, aeromedical monitoring, attitude control systems, telemetry, cameras, drag balloon, flashing beacon, radiation measurement and high frequency antenna experiments. The near-perfect MA-9 mission concluded the Mercury program.

In addition to these manned space flight achievements, the 12-month

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION EXPENDITURES FOR RESEARCH AND DEVELOPMENT 1953 TO DATE (Millions of Dollars)

Year Ending June 30	TOTAL	Conduct of Research and Development	Increase in Research and Development Plant
1953	\$ 78.6	\$49.5	\$29.1
1954	89.5	47.6	41.9
1955	73.8	43.4	30.4
1956	71.1	50.5	20.6
1957	76.0	55.2	20.8
1958	89.2	72.0	17.2
1959	145.5	114.7	30.8
1960	401.0	346.7	54.3
1961	744.3	487.0	98.2
1962	1,257.1	1,142.8	114.3
1963 ^B	2,400.0	2,050.0	350.0
1964 ^B	4,200.0	3,641.0	559.0

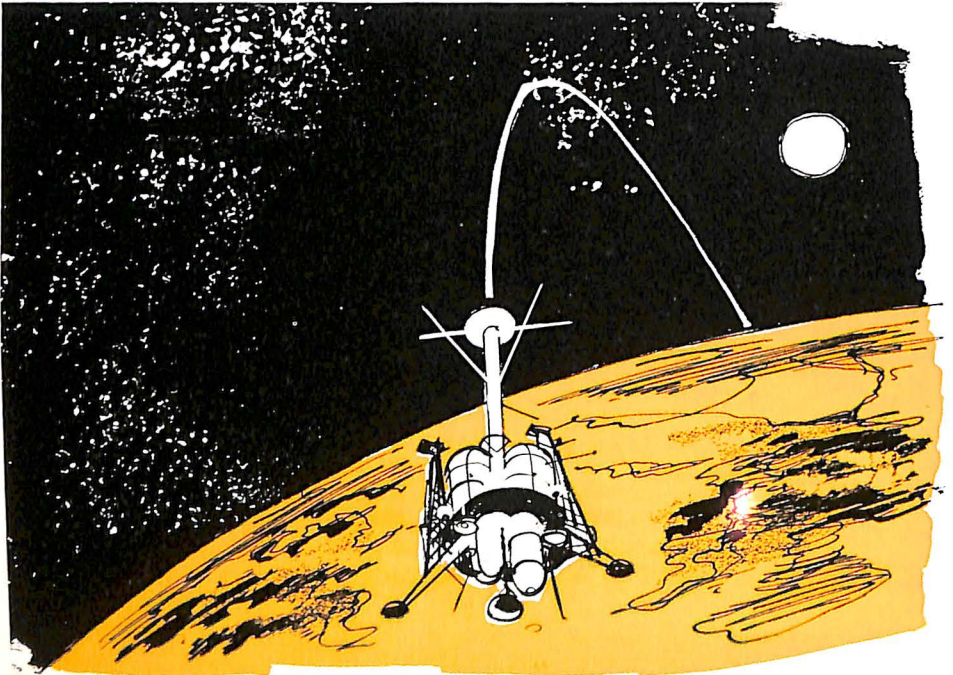
^B Estimate.
Source: 24

period saw the successful launch of a number of unmanned spacecraft. These projects included:

TELSTAR. The world's first commercial communications satellite, Telstar I, was launched July 10 into a 593/3503-mile orbit. The spherical satellite, weighing 170 pounds, conducted a number of successful communications experiments between the U. S., Britain and France, including black and white and color television, telephone, photo facsimile and high and low speed data transmission. Radiation effect caused a breakdown in transmissions on November 23, but Telstar I was restored to operation on January 4, 1963. On May 7, 1963, Telstar II was launched into a 971/10,795-mile orbit.

MARINER. After a July 22 failure of Mariner I, the National Aeronautics and Space Administration on August 26 launched the most significant unmanned spacecraft to date—Mariner II, a 500-pound planetary probe designed to investigate the planet Venus. After a 109-day flight, Mariner II passed within 21,648 miles of the mystery planet on December 14, close enough for its instruments to send back to earth important data on the Venus mass and magnetic field, its temperature and the composition of its upper atmosphere. Mariner II's transmissions continued until January 4, when the spacecraft was 54,300,000 miles from earth.

TIROS. NASA continued its development of meteorological satellites with the launch of Tiros 6 into a 423/444-mile orbit on September 18.



SPACE PROGRAMS

OBLIGATIONS FOR RESEARCH, DEVELOPMENT AND OPERATION Program and Financing (in thousands of dollars)

	Obligations		
	Year ending June 30		
	1962 Actual	1963 Estimate	1964 Estimate
Program by activities:			
Direct:			
1. Manned space flight:			
(a) Spacecraft development and operations	\$216,047	\$766,696	\$1,637,024
(b) Launch vehicle development	463,559	852,903	1,311,089
(c) Supporting programs	17,196	87,515	225,358
2. Space applications:			
(a) Meteorology	39,588	64,679	72,620
(b) Communications	34,114	49,747	55,407
(c) Other applications	653	4,791	7,655
3. Unmanned investigations in space:			
(a) Spacecraft development and operations	291,423	427,424	601,419
(b) Launch vehicle development	95,690	121,673	148,632
4. Space research and technology:			
(a) Launch vehicles and spacecraft	86,419	148,708	193,844
(b) Propulsion and space power	109,221	193,781	267,085
5. Aircraft technology	25,917	44,167	44,826
6. Supporting operations			
(a) Tracking and data acquisition	83,905	160,559	259,959
(b) Facility, training, and research grants	10,824	32,357	56,082
Total direct appropriations to NASA	1,474,556	2,955,000	4,881,000
New obligational authority	1,285,408	2,935,888	4,912,000
Appropriation, obligated	1,285,408	2,935,888	4,912,000

Source: 24

AEROSPACE FACTS AND FIGURES, 1963

Equipped with medium and wide angle cameras, Tiros 6 sent back more than 30,000 cloud cover photos by the end of 1962.

ALOUETTE. A joint U. S.-Canadian project, Alouette was a 320-pound ionospheric research satellite. It was launched September 28 into a 620/638-mile orbit.

EXPLORER. NASA's Explorer series of scientific satellites continued with launches of Explorer 14 (October 2, 1962), Explorer 15 (October 27), Explorer 16 (December 16) and Explorer 17 (April 3, 1963). Numbers 14 and 15 were near duplicates weighing 89 and 98 pounds respectively; they investigated radiation effect on solar cells. Number 16, weighing 222 pounds, had five micrometeorite experiments.

ANNA. A geodetic satellite weighing 350 pounds, Anna 1B was launched October 31 into a 671/728-mile orbit.

RELAY. A NASA communications satellite launched December 13 into a 819/4612-mile orbit, Relay 1 experienced transponder failure initially but cut-in of a second system allowed TV, telephone, radio, teletype, photo facsimile and data relay tests between the U. S., Britain, France and Italy starting January 3.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OBLIGATIONS FOR
CONSTRUCTION OF FACILITIES
Program and Financing (in thousands of dollars)

	Obligations		
	Year ending June 30		
	1962 Actual	1963 Estimate	1964 Estimate
Program by activities:			
Direct:			
1. Manned space flight	\$135,908	\$511,422	\$561,784
2. Space applications .....	.....	.....	2,824
3. Unmanned investigations in space ...	31,799	58,413	35,278
4. Space research and technology	27,052	103,303	81,985
5. Aircraft technology	960	5,302	4,219
6. Supporting operations	21,407	41,560	98,910
Reserved for allocation under repro- graming authority .....	.....	.....	.....
Total direct	\$217,126	\$720,000	\$785,000
New obligational authority	\$325,752	\$737,425	\$800,000
Appropriation adjusted	\$325,752	\$737,425	\$800,000

Source: 24

SPACE PROGRAMS

SALES OF SPACE VEHICLE SYSTEMS, 1961, 1962 BY 66 AEROSPACE MANUFACTURERS (Millions of Dollars)

Quarter of Calendar Year	Space Vehicle Systems			
	Military ^a		Non-Military	
	1961	1962	1961	1962
First Quarter	\$128	\$155	\$32	\$97
Second Quarter	130	171	51	112
Third Quarter	138	184	54	187
Fourth Quarter	155	202	75	211
TOTAL FOR YEAR	\$551	\$712	\$212	\$607

^a Excludes engines and propulsion.
Source: 13

TRANSIT. The prototype of an operational navigation satellite system, Transit 5A was launched December 18 into a 432/455-mile polar orbit.

SYNCOM. A stationary communications satellite (one which remains in a fixed position relative to earth), Syncom I was successfully boosted into a 22,300-mile orbit on February 14, 1963, but telemetry failed when the space propulsion system attempted to direct the satellite into a circular orbit.

In addition to these projects, there were a series of military satellite launches throughout the year about which no information was released other than launch date and orbital plane.

Meanwhile, work progressed on a number of advanced space programs, including three types of manned spacecraft.

GEMINI. A two-man spacecraft designed primarily to research space rendezvous techniques, Gemini was in advanced development. It was scheduled for unmanned tests early in 1964 and first manned launches in late 1964 or early 1965.

APOLLO. A three-man spacecraft for extended earth-orbital operations, a circumlunar mission and eventually a manned landing on the

moon, Apollo was in early hardware status. First parachute drop tests of "boilerplate" capsules were under way.

DYNA-SOAR. A one-man military spacecraft intended primarily for exploration of a wide range of re-entry corridors, the USAF's X-20 Dyna-Soar was in advanced development. It was scheduled for unmanned flights in 1964, manned test in 1965.

Among the more important unmanned spacecraft under development were:

OAD (Orbiting Astronomical Observatory). A 10-foot, octagonal-shaped satellite designed to make telescopic observations of the ultra-violet, infrared and X-ray spectra from a stabilized platform in earth orbit, OAO was scheduled for first launch late in 1963.

OGO (Orbiting Geophysical Observatory). A half-ton, 67-inch earth satellite, OGO will investigate a variety of geophysical areas, such as energetic particles, radio propagation and astronomy, interplanetary dust, magnetic fields, and atmospheric measurements. It was scheduled for first launch late in 1963.

SURVEYOR. A lunar research craft designed for orbiting and landing on the moon, Surveyor was scheduled for first missions in 1964.

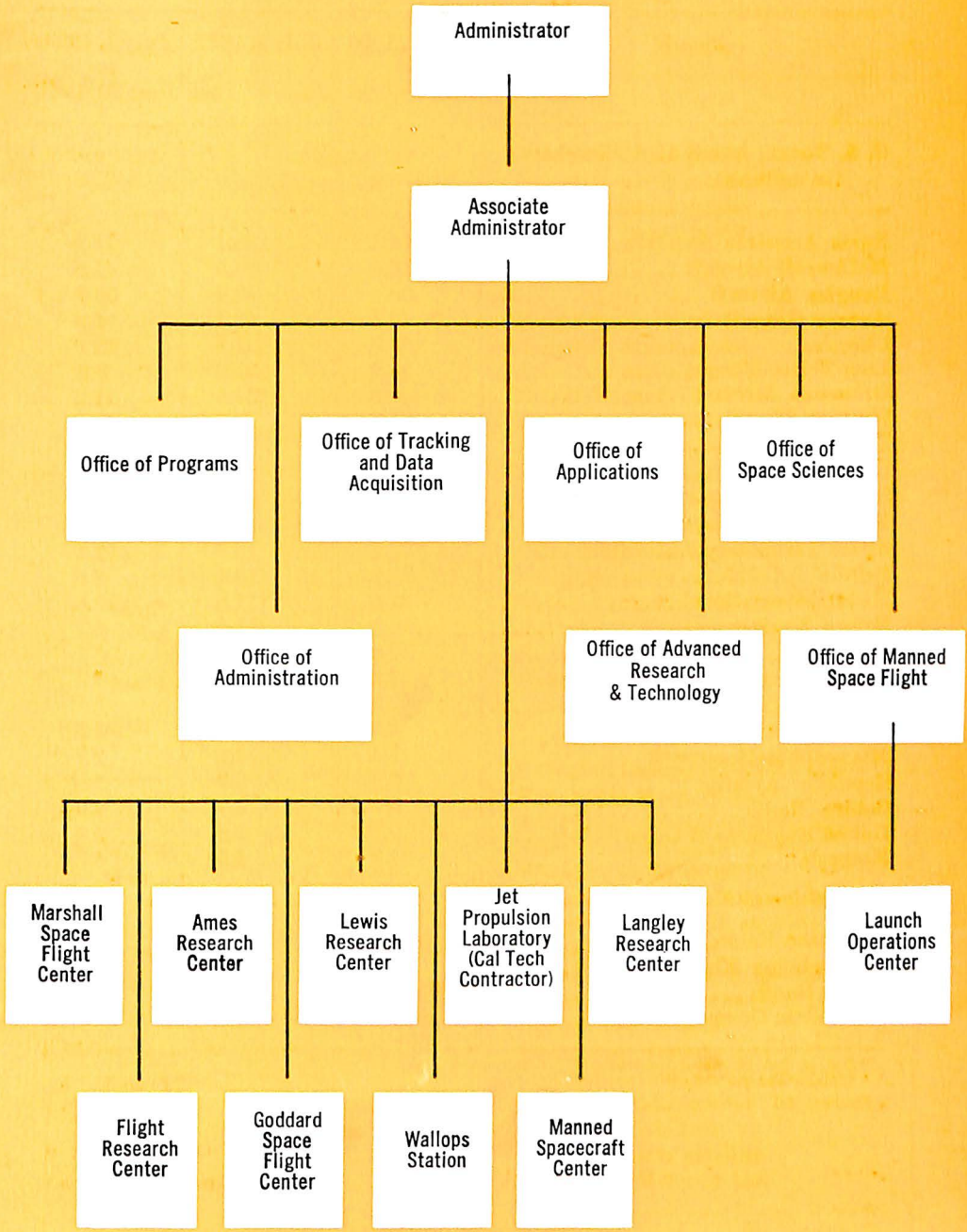
MILITARY COMSAT. A new program initiated in 1963, the Medium Altitude Military Communications Satellite was in study status in mid-1963. The system envisioned will consist of a number of small satellites (20 or more) in random orbits for global coverage.

In addition to these programs, NASA and the Department of Defense planned continuation of such projects as the Discoverer series of military/scientific satellites (USAF), the Samos observation satellite, the Midas early warning spacecraft, OSO (Orbiting Solar Observatory), Explorer, Syncom, Relay, the lunar-probing Ranger and the planetary probe Mariner.

Among launch vehicles under development were the Saturn I (1,500,000 pounds thrust), Saturn V (7,500,000 pounds thrust), Titan II (430,000 pounds), Titan III (a Titan II core with two 120-inch solid rockets, each developing 1,000,000 pounds thrust), and Centaur (360,000 pounds thrust in the first stage plus two liquid hydrogen engines in an upper stage). The USAF was also sponsoring development of large solid rockets up to 260 inches in diameter and work was under way on a nuclear-powered upper stage under the RIFT (Reactor In Flight Test) project.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

This chart features offices principally concerned with procurement.



Source: U.S. Government Organization Manual—1963

AEROSPACE FACTS AND FIGURES, 1963

SELECTED MAJOR NASA CONTRACTORS
(Listed by rank according to net value of NASA prime contracts
awarded, July 1, 1960-June 30, 1962)

	July 1, 1960 to June 30, 1962	July 1, 1961 to June 30, 1962	July 1, 1960 to June 30, 1961
U. S. TOTAL, ALL NASA CONTRACTS (in millions)	\$1,476.9	\$1,053.6	\$423.3
North American Aviation	274.1	199.1	75.0
McDonnell Aircraft	110.3	68.5	41.8
Douglas Aircraft	99.1	68.4	30.7
Aerojet-General	72.7	66.4	6.3
Chrysler	44.2	31.3	12.9
Ling-Temco-Vought	35.8	27.0	8.8
Grumman Aircraft	35.8	24.6	11.2
Western Electric	35.3	8.7	26.6
United Aircraft	34.1	34.1	"
General Electric	32.2	23.0	9.2
General Dynamics	30.0	27.9	2.1
Radio Corporation of America	28.8	20.2	8.6
Space Technology Laboratory	26.3	13.2	13.1
Bendix	25.9	19.4	6.5
Hayes International	21.3	11.0	10.3
Brown Engineering	18.6	11.9	6.7
Boeing	15.6	15.6	"
International Business Machines	12.6	12.6	"
Hughes Aircraft	9.2	9.2	"
Lockheed Aircraft	8.3	5.0	3.3
Minneapolis-Honeywell	7.4	4.7	2.7
Republic Aviation	6.9	6.9	"
Collins Radio	5.7	3.7	2.0
United Engineers & Constructors	5.6	3.6	2.0
Motorola	4.9	4.9	"
<i>Other Selected Major Contractors</i>			
Thompson Ramo Wooldridge	3.8	3.8	"
Westinghouse Electric	3.4	3.4	"
Sperry Rand	2.2	2.2	"
The Martin Company	1.8	1.8	"

^a Not in list of major contractors for indicated year.

^b Chance Vought only.

Source: 36

SPACE PROGRAMS

U. S. SPACE PROGRAMS
 CHRONOLOGY OF MAJOR NASA LAUNCHINGS
 October 1, 1958 through June 30, 1963

Date	Name	Mission
<u>1958</u>		
Oct 11	Pioneer I	Scientific lunar probe
Oct 22	Beacon	Scientific earth satellite
Nov 8	Pioneer II	Scientific lunar probe
Dec 6	Pioneer III	Scientific lunar probe
<u>1959</u>		
Feb 17	Vanguard II	Scientific earth satellite
Mar 3	Pioneer IV	Scientific lunar probe
April 13	Vanguard	Scientific earth satellite
June 22	Vanguard	Scientific earth satellite
July 16	Explorer	Scientific earth satellite
Aug 7	Explorer VI	Scientific earth satellite
Aug 14	Beacon	Scientific earth satellite
Sept 9	Big Joe	Suborbital Mercury test
Sept 18	Vanguard III	Scientific earth satellite
Oct 4	Little Joe 1	Suborbital Mercury test
Oct 13	Explorer VII	Scientific earth satellite
Oct 28	Shotput I	Suborbital communication test
Nov 4	Little Joe 2	Suborbital Mercury test
Nov 26	Pioneer	Scientific lunar probe
Dec 4	Little Joe 3	Suborbital Mercury test
<u>1960</u>		
Jan 19	Shotput II	Suborbital communications test
Jan 21	Little Joe 4	Suborbital Mercury test
Feb 27	Shotput III	Suborbital communications test
Mar 11	Pioneer V	Scientific deep space probe
Mar 23	Explorer	Scientific earth satellite
April 1	Shotput IV	Suborbital communications test
April 1	Tiros I	Meteorological earth satellite
April 18	Scout	Launch vehicle test
May 13	Echo	Communications earth satellite
May 31	Shotput V	Suborbital communications test
July 1	Scout	Launch vehicle test
July 29	Mercury	Suborbital Mercury test
Aug 12	Echo I	Communications earth satellite
Sept 25	Pioneer	Scientific lunar orbiter
Oct 4	Scout	Launch vehicle test
Nov 3	Explorer VIII	Scientific earth satellite
Nov 8	Little Joe 5	Suborbital Mercury test

(Continued on next page)

AEROSPACE FACTS AND FIGURES, 1963

U. S. SPACE PROGRAMS
 CHRONOLOGY OF MAJOR NASA LAUNCHINGS
 October 1, 1958 through June 30, 1963

Nov 23	Tiros II	Meteorological earth satellite
Dec 4	Explorer	Scientific earth satellite
Dec 15	Pioneer	Scientific lunar orbiter
Dec 19	Mercury	Suborbital Mercury test
<u>1961</u>		
Jan 31	Mercury	Suborbital Mercury test
Feb 16	Explorer IX	Scientific earth satellite
Feb 21	Mercury	Suborbital Mercury test
Feb 24	Explorer	Scientific earth satellite
Mar 18	Little Joe 5A	Suborbital Mercury test
Mar 24	Mercury	Vehicle test for Mercury flight
Mar 25	Explorer X	Scientific satellite-probe
April 25	Mercury	Orbital Mercury test
April 27	Explorer XI	Scientific earth satellite
April 28	Little Joe 5B	Suborbital Mercury test
May 5	Freedom 7	Suborbital manned Mercury flight; Shepard flight
May 24	Explorer	Scientific earth satellite
June 30	Explorer	Scientific earth satellite
July 12	Tiros III	Meteorological earth satellite
July 21	Liberty Bell 7	Suborbital manned Mercury flight; Grissom flight
Aug 15	Explorer XII	Scientific earth satellite
Aug 23	Ranger I	Scientific lunar probe
Aug 25	Explorer XIII	Scientific earth satellite
Sept 13	Mercury	Orbital Mercury test
Oct 19	P-21 Probe	Scientific geoprobe
Oct 27	Saturn	Launch vehicle test
Nov 1	Mercury	Orbital Mercury network check
Nov 18	Ranger II	Scientific lunar probe
Nov 29	Mercury	Orbital Mercury test
<u>1962</u>		
Jan 15	Echo (test)	Suborbital communications test
Jan 26	Ranger III	Scientific lunar probe
Feb 8	Tiros IV	Meteorological earth satellite
Feb 20	Friendship 7	Orbital manned Mercury flight; Glenn flight, 3 orbits
Mar 1	Re-entry	28,000 ft/sec re-entry test
Mar 7	OSO I	Scientific earth satellite
Mar 29	P-21A Probe	Scientific geoprobe

(Continued on next page)

SPACE PROGRAMS

U. S. SPACE PROGRAMS CHRONOLOGY OF MAJOR NASA LAUNCHINGS October 1, 1958 through June 30, 1963

April 23	Ranger IV	Scientific lunar lander
April 25	Saturn	Launch vehicle test
April 26	Ariel I	U. S./U. K. scientific earth satellite
May 8	Centaur	Launch vehicle test
May 24	Aurora 7	Orbital manned Mercury flight Carpenter flight, 3 orbits
June 19	Tiros V	Meteorological earth satellite
July 10	Telstar I	Communications earth satellite
July 18	Echo (test)	Suborbital communications test
July 22	Mariner I	Scientific Venus probe
Aug 27	Mariner II	Scientific Venus probe
Aug 31	Re-entry	28,000 ft/sec re-entry test
Sept 18	Tiros VI	Meteorological earth satellite
Sept 28	Alouette	U. S./Canada scientific satellite
Oct 2	Explorer XIV	Scientific earth satellite
Oct 3	Sigma 7	Orbital manned Mercury flight; Schirra flight, 6 orbits
Oct 18	Ranger V	Scientific lunar probe
Oct 27	Explorer XV	Scientific earth satellite
Nov 16	Saturn	Launch vehicle test
Dec 13	Relay	Communications earth satellite
Dec 16	Explorer XVI	Scientific earth satellite
<u>1963</u>		
Feb 14	Syncom	Communications earth satellite
Mar 28	Saturn	Launch vehicle test
April 2	Explorer XVII	Atmospheric structure satellite
May 7	Telstar II	Communications
May 15	Faith 7	Orbital manned Mercury flight; Cooper flight, 22 orbits
June 19	Tiros VII	Weather satellite

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."

Launchings prior to the establishment of the National Aeronautics and Space Administration on October 1, 1958 are not listed. NASA absorbed the Vanguard, Pioneer and Explorer programs under direction of DOD upon establishment of the National Aeronautics and Space Administration. Four successful launches were made by the Department of Defense. They were Explorer I, launched on January 31, 1958; Vanguard I on March 17, 1958; Explorer III on March 26, 1958; Explorer IV on July 26, 1958.

AEROSPACE FACTS AND FIGURES, 1963

MANNED SPACE FLIGHTS

Launch Date	Project	Pilot	Cognizance	Duration
		<u>Suborbital</u>		
May 5, 1961	Mercury-Redstone 3	Alan Shepard	NASA	302 miles
July 21, 1961	Mercury-Redstone 4	Virgil Grissom	NASA	303 miles
		<u>Orbital</u>		
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	NASA	3 Orbits
May 24, 1962	Mercury-Atlas 7	Scott Carpenter	NASA	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	NASA	6 Orbits
May 15, 1963	Mercury-Atlas 9	Gordon Cooper	NASA	22 Orbits
June 14, 1963	Vostok V	Valery Byovskiy	USSR	81 Orbits
June 16, 1963	Vostok VI	Miss Valentina Tereshkova	USSR	48 Orbits

U. S. SPACE PROGRAMS
 CHRONOLOGY OF MAJOR DEPARTMENT OF DEFENSE LAUNCHINGS
 January 31, 1958 through December 18, 1962*

Date	Name	Mission
<u>1958</u>		
Jan 31	Explorer 1	Scientific earth satellite
Mar 17	Vanguard 1	Scientific earth satellite
Mar 26	Explorer III	Scientific earth satellite
July 26	Explorer IV	Scientific earth satellite
Dec 18	Project SCORE	Active communications satellite
<u>1959</u>		
Feb 28	Discoverer 1	Scientific earth satellite
April 13	Discoverer 2	Scientific earth satellite
Aug 13	Discoverer 5	Scientific earth satellite
Aug 19	Discoverer 6	Scientific earth satellite
Nov 7	Discoverer 7	Scientific earth satellite
Nov 20	Discoverer 8	Scientific earth satellite

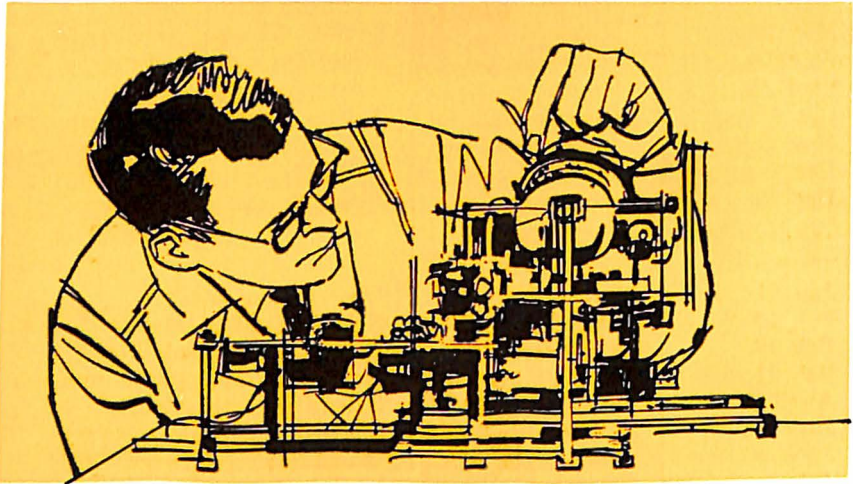
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SPACE PROGRAMS

Date	Name	Mission
<u>1960</u>		
April 13	Transit 1B	Navigation satellite
April 15	Discoverer 11	Scientific earth satellite
May 24	Midas II	Launch detection satellite
Aug 18	Discoverer 14	Scientific; capsule recovery
Sept 13	Discoverer 15	Scientific earth satellite
Oct 4	Courier 1B	Active communications satellite
Nov 12	Discoverer 17	Scientific; capsule recovery
Dec 7	Discoverer 18	Scientific; capsule recovery
Dec 20	Discoverer 19	Scientific earth satellite
<u>1961</u>		
Jan 31	Samos II	Observation satellite
Feb 17	Discoverer 20	Scientific earth satellite
Feb 18	Discoverer 21	Scientific earth satellite
Feb 21	Transit 3B/Lofti	Navigation/ionosphere research
April 8	Discoverer 23	Scientific earth satellite
June 16	Discoverer 25	Scientific; capsule recovery
July 7	Discoverer 26	Scientific; capsule recovery
July 12	Midas III	Launch detection satellite
Aug 30	Discoverer 29	Scientific; capsule recovery
Sept 12	Discoverer 30	Scientific; capsule recovery
Sept 17	Discoverer 31	Scientific earth satellite
Oct 13	Discoverer 32	Scientific; capsule recovery
Oct 21	Midas IV	Launch detection and passive communications experiment
Nov 5	Discoverer 34	Scientific; capsule recovery
Nov 15	Discoverer 35	Scientific; capsule recovery
Nov 15	Transit 4B	Navigation satellite
Nov 15	Traac	Satellite orientation experiment
Dec 12	Discoverer 36	Scientific earth satellite
Dec 12	Oscar	Ham radio package
<u>1962</u>		
Feb 27	Discoverer 38	Scientific; capsule recovery
Nov 13	TRS-1	Radiation data satellite
Dec 18	Transit 5A	Navigation satellite

*Following the launch of Discoverer 38, the Department of Defense adopted a policy of releasing only basic information (date, apogee, perigee, etc.) on military launches; spacecraft are no longer identified, with the exception of unclassified tests like TRS-1 and Transit. About 30 such launches, through the end of fiscal year 1963, are not included in the above table.

RESEARCH AND DEVELOPMENT



The aerospace industry continues to expand company-financed research and development activities, but the bulk of the R&D effort in the U.S. remains sponsored by the Government. Of the \$14.9 billion expected to be spent by the Government in fiscal year 1964 for R&D, better than 61 per cent (nearly \$9.2 billion) will go for "major national security," with companies in the aerospace business handling most of the research work for the U.S. under contract.

The \$9.2 billion spending figure includes \$7.1 billion accounted for by the Department of Defense and \$1.5 billion to be expended by the Atomic Energy Commission. In addition, the National Aeronautics and Space Administration will spend an estimated \$1.2 billion for research on civil space programs (see page 35).

Department of Defense activities include work on 320 sub-activities, involving 1600 different technical projects. These 1600 projects result

RESEARCH AND DEVELOPMENT

in 15,000 technical tasks and tens of thousands of individual contracts and job orders financed by the Research, Development, Test and Evaluation appropriation. Included are the following categories:

1. *Research.* Both basic and applied research are involved. Examples include the Army's work on tropical medicine, Navy's oceanographic

FEDERAL EXPENDITURES FOR RESEARCH AND DEVELOPMENT 1940 TO DATE (Millions of Dollars)

Year Ending June 30	TOTAL	Major National Security	Other
1940	\$ 74	\$ 26	\$ 48
1941	198	144	54
1942	280	211	69
1943	602	472	130
1944	1,377	1,178	199
1945	1,591	1,372	219
1946	918	784	134
1947	898	768	130
1948	853	698	155
1949	1,080	889	191
1950	1,080	871	209
1951	1,298	1,063	235
1952	1,815	1,565	250
1953	3,101	2,832	269
1954	3,148	2,868	280
1955	3,268	2,979	289
1956	3,435	3,104	332
1957	4,460	4,027	433
1958	4,985	4,463	523
1959	5,792	5,048	744
1960	7,742	6,639	1,103
1961	9,291	7,719	1,572
1962	10,348	8,092	2,256
1963 ^D	12,240	8,515	3,725
1964 ^E	14,933	9,168	5,765

^E Estimate.

NOTE: Beginning with 1953, the figures include amounts for the research, development, test and evaluation appropriations; the amounts separately identified for development, test and evaluation in the procurement appropriations; and the amounts directly in support of research, development, test and evaluation in the military construction, shipbuilding, and military personnel appropriations. Research and development facilities are also included.

Source: 24

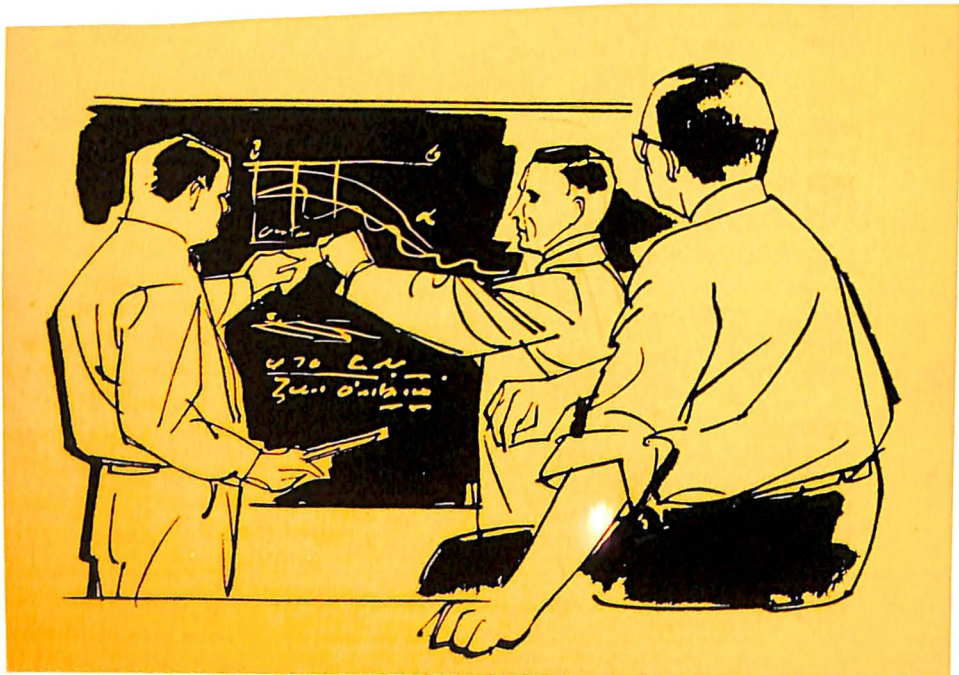
underwater acoustic and arctic research projects and the USAF's study of atmospheric density and gravity gradients up to 500,000 feet.

2. *Exploratory Developments*. Examples include Army applied research on rocket propellants and improved aircraft engines, Navy studies on anti-submarine warfare, USAF activities involving laminar flow control and guidance in space and ARPA's defense efforts against enemy ICBM's.

3. *Advanced Developments*, including the tri-Service V/STOL aircraft, the Army's responsibilities on the Nike-X anti-missile system, Navy work on hydrofoils and acoustic countermeasures and the USAF efforts on DynaSoar, X-15 and the Aerospace Plane.

4. *Engineering Developments*, including the Army's Lance, Zeus and Shillelagh missiles and the light observation and armed escort helicopters, the Navy's research on a regenerative turboprop engine, the Typhon and Sea Mauler missiles and a new ship-based light attack plane and the USAF's activities involving the B-70, the mobile medium-range ballistic missile, Titan III and the Satellite Inspector.

5. *Management and Support*, including \$74 million to operate the Army's White Sands Missile Range, \$173 million for the Navy's Pacific Missile Range and \$249 million for the AF's Atlantic Missile Range at



DEPARTMENT OF DEFENSE
OBLIGATIONS FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION
(Millions of Dollars)

Purpose, budget title, and program	Year ending June 30		
	1962 actual	1963 estimate	1964 estimate
Total, direct obligations for research and development	\$6,808.1	\$7,722.0	\$7,958.2
Conduct of research and development:			
Research, development, test, and evaluation:			
Military sciences	765.5	936.2	978.4 ^a
AIRCRAFT AND RELATED EQUIPMENT	614.5	688.6	753.4
MISSILES AND RELATED EQUIPMENT	2,752.6	2,445.6	2,233.5
MILITARY ASTRONAUTICS AND RELATED EQUIPMENT	784.8	1,247.1	1,277.2
Ships and small craft and related equipment	204.6	212.0	294.2
Ordnance, combat vehicles, and related equipment	202.9	256.0	303.3
Other equipment	526.0	806.2	906.0
Programwide management and support	495.5	480.9	531.0
Emergency fund	—	120.4	150.0
Total, direct obligations, research, development, test, and evaluation	6,346.4	7,193.0	7,427.0
Military personnel	242.2	240.0	247.8
Procurement	109.1	178.1	147.6
Civil Defense	18.0	11.0	40.0
Total, direct obligations for the conduct of research and development	6,715.7	7,622.1	7,862.4
Research and development facilities: Military construction	92.4	99.9	95.8

^a Includes about \$450 million for other than the military departments.
Source: 24

Cape Canaveral. General support funds provide \$158 million for the Army, \$200 million for the Navy and \$679 million for the USAF.

6. *Emergency Fund*, amounting to \$150 million, will enable the Defense Department to transfer sums to the individual service where needed.

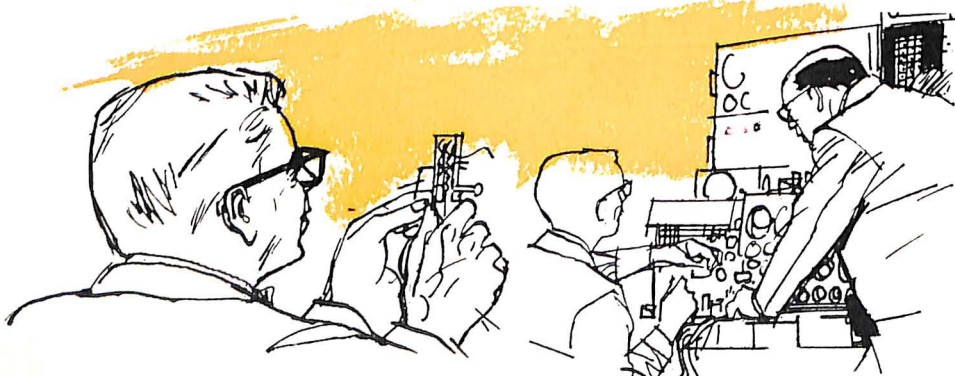
7. *Space* efforts by the military services, totaling \$1.650 billion in FY 1964, account for more than 20 per cent of the Defense Department's Research and Development effort.

AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF DEFENSE
 TOTAL EXPENDITURES, BY APPROPRIATION GROUP
 FISCAL YEARS 1955-1964
 (Millions of Dollars)

	Year ending June 30				
	1955	1956	1957	1958	1959
Military Personnel	\$11,403	\$11,582	\$11,409	\$11,611	\$11,801
Active Forces	10,643	10,665	10,384	10,441	10,545
Reserve Forces	341	439	514	608	615
Retired Pay	419	477	511	562	641
Operation and Maintenance	7,931	8,400	9,487	9,761	10,378
Procurement	12,838	12,227	13,488	14,083	14,409
AIRCRAFT	8,804	7,835	8,647	8,793	7,730
MISSILES	604	1,005	1,855	2,434	3,337
Ships	944	858	842	1,105	1,491
ASTRONAUTICS	—	—	—	—	—
Ordnance, Vehicles, & Related Equipment	1,191	1,260	674	365	399
Electronics and Communications ..	441	660	704	663	720
Other procurement	854	608	767	723	730
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION ..	2,261	2,101	2,406	2,504	2,866
Military Construction	1,715	2,079	1,968	1,753	1,948
Family Housing	—	—	—	—	—
Civil Defense	—	—	—	—	—
Revolving and Management Funds ..	-611	-684	-323	-643	-179
Total	35,531	35,792	38,436	39,070	41,223

(Continued on next page)



RESEARCH AND DEVELOPMENT

DEPARTMENT OF DEFENSE
 TOTAL EXPENDITURES, BY APPROPRIATION GROUPS
 FISCAL YEARS 1955-1964
 (Millions of Dollars)

	Year ending June 30				
	1960	1961	1962	1963	1964
Military Personnel	\$11,738	\$12,085	\$13,032	\$13,100	\$14,255
Active Forces	10,390	10,651	11,530	11,452	12,349
Reserve Forces	654	648	607	638	685
Retired Pay	694	786	894	1,010	1,221
Operation and Maintenance	10,223	10,611	11,594	11,500	11,690
Procurement	13,334	13,095	14,532	15,521	16,350
AIRCRAFT	6,272	5,898	6,400	5,967	6,106
MISSILES	3,027	2,972	3,442	3,754	3,658
Ships	1,744	1,801	1,906	2,279	2,532
ASTRONAUTICS	—	—	—	—	—
Ordnance, Vehicles, & Related Equipment	443	675	1,137	1,604	2,005
Electronics and Communications .	1,093	1,042	1,139	1,332	1,262
Other procurement	755	706	507	585	787
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION ..	4,710	6,131	6,319	6,599	7,120
Military Construction	1,626	1,605	1,347	1,180	1,170
Family Housing	—	—	—	520	670
Civil Defense	—	—	90	210	210
Revolving and Management Funds .	-416	-300	-99	-330	-465
Total	41,215	43,227	46,815	48,300	51,000

^E Estimate

NOTE: Changes in the internal classification of accounts within the Department of Defense have made historical comparisons difficult. The Comptroller of the Department of Defense estimates the expenditures by functional title as if the fiscal year 1963 budget structure had been used throughout. The Research, Development, Test and Evaluation figures do not include expenditures for research and development facilities, nor do they include expenditures financed out of procurement and other appropriations.

This table is based on documents for fiscal year 1963 appropriations. Some tables in this chapter with data for 1961 and earlier have not been adjusted to the current budget structure.

Source: 22



AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF DEFENSE
EXPENDITURES FROM RESEARCH, DEVELOPMENT, TEST AND EVALUATION
APPROPRIATIONS*
(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 ^B	6,599	3,519	1,380	1,300	400
1964 ^B	7,120	3,620	1,500	1,440	560

NOTE: For RDT&E expenditures for aircraft, missiles and astronautics *only*, see page 100.

N.A.—Not available.

^B Estimate.

* Adjusted to make data comparable to current appropriation structure. Does not include RDT&E expenditures from other appropriations.

Source: 10

DEPARTMENT OF THE AIR FORCE
OBLIGATIONS FROM RESEARCH, DEVELOPMENT, TEST AND EVALUATION
APPROPRIATIONS
(Thousands of Dollars)

Program	Year ending June 30		
	1962	1963 ^B	1964 ^B
TOTAL DIRECT OBLIGATIONS	\$3,429,372	\$3,851,168	\$3,790,100
Military sciences	132,838	123,889	127,006
AIRCRAFT AND RELATED EQUIPMENT	475,949	471,586	408,479
MISSILES AND RELATED EQUIPMENT	1,550,824	1,288,053	1,067,622
MILITARY ASTRONAUTICS AND RELATED EQUIPMENT	641,099	147,331	1,215,644
Ordnance, combat vehicles, and related equipment	2,050	1,108	.....
Other equipment	263,128	477,834	526,466
Programwide management and support ...	363,484	341,367	384,583
Reserve for RS-70 .....	.....	.....	60,600

^B Estimate.
Source: 24

RESEARCH AND DEVELOPMENT

DEPARTMENT OF THE ARMY
 OBLIGATIONS FROM RESEARCH, DEVELOPMENT, TEST AND EVALUATION
 APPROPRIATIONS
 (Thousands of Dollars)

Program	Year ending June 30		
	1962	1963 ^B	1964 ^B
TOTAL DIRECT OBLIGATIONS	\$1,336,814	\$1,305,200	\$1,464,200
Military sciences	280,106	212,329	220,144
AIRCRAFT AND RELATED EQUIPMENT	59,265	78,825	80,159
MISSILES AND RELATED EQUIPMENT	505,424	452,223	575,739
MILITARY ASTRONAUTICS AND RELATED EQUIPMENT	102,913	50,796	20,050
Ships and small craft and related equipment	569	1,175	1,182
Ordnance, combat vehicles, and related equipment	112,275	166,244	174,718
Other equipment	207,887	272,538	316,012
Programwide management and support ...	68,375	71,070	76,196

^B Estimate.
 Source: 24

DEPARTMENT OF THE NAVY
 OBLIGATIONS FROM RESEARCH, DEVELOPMENT, TEST AND EVALUATION
 APPROPRIATIONS
 (Thousands of Dollars)

Program	Year ending June 30		
	1962	1963 ^B	1964 ^B
TOTAL DIRECT OBLIGATIONS	\$1,376,175	\$1,481,228	\$1,572,900
Military sciences	150,488	165,657	181,774
AIRCRAFT AND RELATED EQUIPMENT	79,328	138,172	204,183
MISSILES AND RELATED EQUIPMENT	696,318	705,311	590,133
MILITARY ASTRONAUTICS AND RELATED EQUIPMENT	40,095	48,412	41,539
Ships and small craft and related equipment	204,071	210,808	293,008
Ordnance, combat vehicles, and related equipment	88,561	88,633	128,561
Other equipment	54,974	55,846	63,464
Programwide management and support ...	62,340	68,389	70,238

^B Estimate.
 Source: 24

AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1963
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	TOTAL, Research, Development, Test & Evaluation	Guided Missiles	Guided Missiles as Percent of Total
Department of Defense .	\$3,664	\$711	19.4
Air Force	2,059	446	21.7
Navy	556	133	23.9
Army	631	131	20.8
Defense Agencies	418	—	—

Source: 20

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 Re- search and Develop- ment Plant
		Total	Special Nuclear Materials and Weapons	Reactor Devel- opment	Biology, Medicine, Physics	Other Research and Devel- opment	
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 ^a	1,413.0	1,150.0	413.7	469.3	251.3	15.7	263.0
1964 ^b	1,502.6	1,191.8	344.0	527.3	295.6	24.9	310.8

Source: 24

RESEARCH AND DEVELOPMENT

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1963
TOTAL AND AIRCRAFT
(Millions of Dollars)

	TOTAL, Research, Development, Test & Evaluation	Aircraft	Aircraft as Percent of Total
Department of Defense .	\$3,664	\$463	12.6
Air Force	2,059	308	15.0
Navy	556	92	16.5
Army	631	63	10.0
Defense Agencies	418	—	—

Source: 20

DEPARTMENT OF DEFENSE
UNPAID OBLIGATIONS FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1963
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	TOTAL, Research, Development, Test & Evaluation	Guided Missiles	Guided Missiles as Percent of Total
Department of Defense .	\$3,409	\$1,292	37.9
Air Force	1,296	421	32.5
Navy	1,008	528	52.4
Army	828	344	41.5
Defense Agencies	275	—	—

Source: 20

AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF DEFENSE
 UNPAID OBLIGATIONS FROM
 RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
 FEBRUARY 28, 1963
 TOTAL AND AIRCRAFT
 (Millions of Dollars)

	TOTAL, Research, Development, Test & Evaluation	Aircraft	Aircraft as Percent of Total
Department of Defense .	\$3,409	\$343	10.1
Air Force	1,296	206	15.9
Navy	1,008	72	7.2
Army	829	65	7.7
Defense Agencies	275	—	—

Source: 20

FUNDS FOR INDUSTRIAL RESEARCH AND DEVELOPMENT,
 ALL INDUSTRIES AND THE AIRCRAFT AND MISSILES INDUSTRY
 1956 TO DATE
 (Millions of Dollars)

Calendar Year	Total, Research and Development	Aircraft and Missiles		
		Total	Federal Government	Company
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

N.A.—Not available.
 Source: 39

RESEARCH AND DEVELOPMENT

TOTAL AND APPLIED RESEARCH AND DEVELOPMENT IN THE AIRCRAFT AND MISSILES INDUSTRY, BY FUND SOURCE 1957 TO DATE (Millions of Dollars)

Calendar Year	Total Aircraft and Missiles Research and Development Funds			Applied Research and Development Funds		
	Total	Federal Government	Company ^a	Total	Federal Government	Company ^a
1957	\$2,627	\$2,266	\$361	N.A.	N.A.	N.A.
1958	2,662	2,276	386	\$2,636	\$2,260	\$376
1959	3,174	2,769	405	3,142	1,755	387
1960	3,631	3,180	451	3,569	3,150	419
1961	3,957	3,537	420	3,906	3,570	396

^a 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. In 1961 aircraft and missile firms contracted \$7 million in company-financed projects to outside organizations.

Source: 39

TOTAL RESEARCH AND DEVELOPMENT AND BASIC RESEARCH IN THE AIRCRAFT AND MISSILES INDUSTRY, BY FUND SOURCE 1957 TO DATE (Millions of Dollars)

Calendar Year	Total Aircraft and Missiles Research and Development Funds			Basic Research Funds		
	Total	Federal Government	Company ^a	Total	Federal Government	Company ^a
1957	\$2,627	\$2,266	\$361	N.A.	N.A.	N.A.
1958	2,662	2,276	386	\$26	\$16	\$10
1959	3,176	2,769	405	32	14	18
1960	3,631	3,180	451	62	30	32
1961	3,957	3,537	420	51	27	24

N.A.—Not available.

^a 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. In 1961 aircraft and missile firms contracted \$7 million in company-financed projects to outside organizations.

Source: 39

DEPARTMENT OF DEFENSE—EXPENDITURES FOR
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION
FISCAL YEARS 1961-1964
(Millions of Dollars)

	Expenditures			
	Year ending June 30			
	1961	1962	1963 ^E	1964 ^E
RESEARCH, DEVELOPMENT, TEST, & EVALUATION—TOTAL	\$6,131	\$6,319	\$6,599	\$7,120
Army	1,207	1,280	1,300	1,440
Navy	1,435	1,364	1,380	1,500
Air Force	3,300	3,493	3,519	3,620
Defense Agencies	189	181	400	560
Military Sciences—Total	507	616	940	952
Army	154	213	242	236
Navy	125	140	150	160
Air Force	106	92	191	147
Defense Agencies	122	171	357	409
Aircraft—Total	547	624	754	695
Army	26	41	57	75
Navy	90	89	145	190
Air Force	432	494	552	430
Missiles—Total	3,025	2,777	2,261	2,245
Army	554	518	484	530
Navy	803	721	654	625
Air Force	1,668	1,539	1,123	1,090
Ships—Total	209	191	199	251
Army	—	1	1	1
Navy	209	190	198	250
Astronautics—Total	518	749	1,036	1,237
Army	13	109	68	33
Navy	14	36	43	43
Air Force	428	596	922	1,160
Defense Agencies	64	9	3	1
Ordnance, Vehicles & Related Equipment—Total	212	227	234	301
Army	116	136	145	180
Navy	84	88	85	120
Air Force	12	4	4	1
Other Equipment—Total	561	497	714	801
Army	254	200	235	304
Navy	61	58	50	53
Air Force	246	239	429	444
Program-Wide Management & Support—Total	551	637	421	488
Army	91	64	68	81
Navy	49	42	55	59
Air Force	408	529	298	348
Defense Agencies	3	2	—	—
Emergency Fund	—	—	40	150

^E Estimate

NOTE: All data are adjusted for comparability with FY 1964 appropriation structure.

Source: 18

RESEARCH AND DEVELOPMENT

DEPARTMENT OF DEFENSE—MILITARY FUNCTIONS
 NEW OBLIGATIONAL AUTHORITY BY FUNCTIONAL TITLE
 FISCAL YEARS 1962, 1963, 1964
 (Millions of Dollars)

	Year ending June 30		
	1962	1963 ^E	1964 ^E
MILITARY PERSONNEL	\$13,098	\$13,356	\$14,435
Active Forces	11,545	11,599	12,494
Reserve Forces	633	718	706
Retired Pay	920	1,029	1,235
OPERATION AND MAINTENANCE	11,759	11,446	11,792
PROCUREMENT	15,746	16,667	16,725
Aircraft	5,646	5,882	6,040
Missiles	3,230	3,969	3,880
Ships	2,967	2,939	2,310
Astronautics	—	—	—
Ordnance, Vehicles, & Related Equipment ..	1,830	1,959	2,160
Electronics and Communications	1,375	1,176	1,444
Other procurement	697	742	892
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION	6,402	7,008	7,262
MILITARY CONSTRUCTION	972	1,190	1,232
FAMILY HOUSING	—	597	734
CIVIL DEFENSE	257	173	300
REVOLVING AND MANAGEMENT FUNDS	—	—	—
TOTAL—NEW OBLIGATIONAL AVAILABILITY	48,234	50,426 ^b	52,481 ^b
Transfers from prior year balances	—388	—465	—300
TOTAL—NEW OBLIGATIONAL AUTHORITY ..	\$47,846	\$49,961 ^a	\$52,181 ^a

^E Estimate
 NOTE: Amounts include estimated comparability adjustments not supportable by accounting records.

^a Includes amounts proposed for separate transmittal.

Source: 17

MANPOWER



An analysis of several statistical sources reveals that during 1962 the aerospace industry employed an average of more than 1,200,000 persons.

Because the industry has changed so rapidly and because so many technical skills have been poured into the overall aerospace effort, precise figures on employment are not yet available.

One of the main reasons for this absence of more exact statistics is that many statisticians continue to measure "industries" by their old-time descriptions, such as "aircraft," "electrical machinery," etc. As a result, the manpower of many missile firms may even be listed under "ordnance!"

Despite this situation it is nevertheless possible to offer a reasonably close approximation of aerospace industry employment as of year end 1962.

Aircraft	500,000 employees
Missiles	416,000 employees
Spacecraft	195,000 employees
Non-aerospace products	93,000 employees
	<hr/>
	1,204,000 employees

MANPOWER

Allowing that there are some statistical imponderables, one point should be made: Government statistics remain bound to pre-Space Age categories and do not adequately embrace the thousand and one other activities which have been created in this ever-burgeoning technology.

As the following tables will disclose there were no dramatic shifts in work forces during 1962.

It will be readily seen that there was a continuing decline in the number of production workers. Bureau of Labor Statistics records show a rise in average weekly earnings in aircraft and parts plants.

In one table that appears in the following pages in this edition for the first time ("Manpower Composition, 1947 and 1961") the trend toward an increasing number of salaried persons, in contrast with hourly-paid employees, has shown a remarkable increase.

In the frequently discussed area of the utilization of engineers and

AEROSPACE EMPLOYMENT IN 561 MAJOR ESTABLISHMENTS, AUGUST 1962

Type of Activity	Employment August 1962 (000)	Employment Change (%)	
		Past Trend	Labor Needs
		Aug. 1961 to Aug. 1962 ^a	Aug. 1962 to Feb. 1963
Total, MISSILES AND SPACECRAFT ^b	711.3	+16.7	+4.4 ^c
Missiles and spacecraft within aircraft industry	174.4	+22.8	+1.3
Missiles and spacecraft in industries other than aircraft ..	536.9	+14.9	+5.4
Total, aircraft ^{b, d}	579.7	+6.7	+0.3
AIRCRAFT, excluding missiles and spacecraft	405.3	+1.0	-0.1
TOTAL, missiles, spacecraft, and aircraft (unduplicated count)	1,116.6	+10.5	+2.8

^a Per cent change is based on establishments reporting data for both 1961 and 1962; plants in matched sample account for 99 per cent of total current employment.

^b The employment totals for each of the two categories designated add to more than the overall unduplicated total shown (1,116,600) since each category includes missile and space craft employment within the aircraft and parts industry (174,400).

^c Represents estimated manpower needs of establishments with 99 per cent of total current employment in surveyed plants.

^d Category is comparable to "Aircraft and Parts Industry" as defined by the Standard Industrial Classification Code. This industry designation, when used in the survey, does not include plants in which the principal product is missiles and spacecraft even though such plants may be operated by firms associated with aircraft production.

Source: 32

scientists a sample of one major aerospace company symbolizes how the industry applies its engineering-scientific talents.

The rise in technical personnel compared to hourly workers carries out a predictable trend since there has been for many years an incessant demand for more highly skilled personnel to serve this most complex industry.

A study by the Stanford Research Institute of Menlo Park, Calif. presented aerospace manpower composition.

The survey showed that in 1947 hourly employees in the industry amounted to 77.5 per cent of the total work force. Salaried employees represented 22.5 per cent of the total and engineers and scientists 10.2 per cent of the salaried employees.

By 1961 these proportions had become: hourly employees 54.4 per cent of the force; salaried employees 45.6 per cent. Of the latter figure



MANPOWER

SALARIES AND WAGES IN THE AIRCRAFT INDUSTRY
1914 TO DATE

Year	TOTAL	Salaries	Production Workers	
			Wages	Average Weekly Earnings
(Thousands of Dollars)				
1914	\$ 196	\$ 61	\$ 135	\$15.45
1919	6,908	2,001	4,907	26.63
1921	3,235	1,033	2,202	30.36
1923	6,160	1,638	4,522	29.97
1925	N.A.	N.A.	4,222	30.06
1927	9,146	2,289	6,857	29.82
1929	31,448	9,524	21,924	28.66
1931	N.A.	N.A.	15,481	30.16
1933	13,824	3,516	10,308	25.36
1935	21,475	6,582	14,893	25.16
1937	46,867	13,514	33,353	26.72
1937 ^a	N.A.	N.A.	43,827	27.74
1939	108,286	30,798	77,488	30.56
1947	703,693	227,396	476,297	54.98
1949	956,189	311,821	644,368	63.62
1950	1,132,017	371,773	760,244	68.39
1951	2,102,913	642,821	1,460,092	78.40
1952	3,140,534	1,003,510	2,137,024	81.20
1953	3,941,133	1,301,268	2,639,847	83.80
1954	4,048,811	1,423,511	2,625,300	85.07
1955	4,153,201	1,584,834	2,568,367	89.72
1956	4,882,071	1,937,243	2,944,828	95.99
1957	5,377,000	2,212,000	3,165,000	101.48
1958	4,720,050	2,044,229	2,675,821	103.02
1959	4,693,678	2,045,705	2,647,973	108.82
1960	4,653,495	2,225,351	2,428,144	112.07
1961 ^b	4,956,723	2,537,507	2,419,216	116.03
1961 ^c	6,868,891	3,258,162	3,610,729	112.97
1962 ^{a, b}	7,639,200	3,746,200	3,893,000	117.14

NOTE: This table is based upon Census Bureau data which go back to an earlier period than the other data on compensation which are based on Bureau of Labor Statistics publications.

N.A.—Not available.

^a Estimate.

^b This line and all following lines include data for aircraft engine manufacturers which are not available for prior years.

^c Aircraft industry only.

^d Aircraft and guided missiles industries combined.

Sources: 10 and 11

AEROSPACE FACTS AND FIGURES, 1963

16.3 per cent were engineers and scientists. This 16.3 per cent was found to be six times as great as the all-industry average of 2.8 per cent.

Increasingly, the aerospace industry has been drawing upon its higher-skilled talents for roles in management, supervisory assignments, procurement expertness and the vast number of other specializations which have grown up in the wake of the tremendous requirements placed upon the industry.

AIRCRAFT AND TOTAL MANUFACTURING EMPLOYMENT, 1914 TO DATE

Year or Month	Aircraft Employment (in thousands)	Total Manufacturing Employment	Aircraft as Per Cent of Total Manufacturing Employment
1914	0.2	7,514	^a
1919	4.2	9,837	^a
1921	2.0	7,557	^a
1929	18.6	9,660	0.2
1933	9.6	6,558	0.2
1939	62.3	9,722	0.6
Dec. 1941	502.8	14,036	3.5
Nov. 1943	1,458.6	18,074	8.1
Sep. 1945	325.9	13,645	2.4
1948	237.7	15,582	1.5
1950	283.1	15,241	1.9
1953	795.5	17,549	4.5
1954	782.9	16,314	4.8
1955	761.3	16,882	4.5
1956	837.3	17,243	4.9
1957	895.8	17,174	5.2
1958	783.6	15,945	4.9
1959	755.4	16,667	4.5
1960	673.8	16,762	4.0
1961 ^b	668.9	16,268	4.1
1961 ^c	994.8	16,268	8.7
1962 ^b	707.3	16,750	4.2
1962 ^{c, E}	1,055.4	16,750	8.8

NOTE: 1914 to 1932 data are from the Census Bureau, 1939 to date the data are from the Bureau of Labor Statistics unless otherwise noted.

^E Estimate.

^a Less than 0.5 per cent.

^b Aircraft industry, according to BLS.

^c Aircraft and guided missiles industry combined, according to Census; this figure excludes many employees working in aerospace establishments classified in other industries.

Sources: 8, 11, 84

MANPOWER

SCIENTISTS AND ENGINEERS IN THE AIRCRAFT AND PARTS INDUSTRY 1954 TO 1960

Year	TOTAL	Engi- neers	Metal- lurgists	Chemists	Physi- cists	Mathe- maticians	Other
<i>Total Number Employed</i>							
1954 ^a	48,500	41,100	700	1,000	1,200	900	3,500
1957	84,900	66,000	900	1,600	1,900	2,200	12,300
1959	94,900	83,100	1,300	2,600	4,000	3,300	600
1960	101,500	84,400	1,400	2,800	5,500	3,800	3,600
<i>Research and Development</i>							
1954 ^a	27,600	22,500	400	700	1,000	800	2,200
1957	56,700	44,800	600	1,100	1,500	1,600	7,200
1959	60,400	51,100	1,000	1,900	3,700	2,500	200
1960	64,600	52,900	1,100	2,000	5,200	3,100	300

^a Data are on slightly different basis from those for later years.

Source: 39

ENGINEERS AND SCIENTISTS Distribution in One Major Aerospace Company, 1962

Organizational Function	Per Cent of All Scientists and Engineers in Function Named	Scientists and Engineers as Per Cent of Total Employees in Function Named
General Administration	0.2%	0.7%
Research and Engineering	14.4	49.7
Development	45.8	50.0
Development Test	20.8	33.3
Manufacturing	8.7	8.0
Procurement	—	0.2
Quality Assurance	8.2	20.7
Customer Service	1.3	39.9
All Functions	100.0	25.8

Source: 40

AEROSPACE FACTS AND FIGURES, 1963

CHANGE IN MANPOWER COMPOSITION, 1947 AND 1961
Selected Aerospace Activities

Employment Category	1947	1961
TOTAL EMPLOYEES	100.0%	100.0%
Hourly Employees	77.5	54.4
Salaried Employees	22.5	45.6
Engineers and Scientists	10.2	16.3
Technicians	2.9	6.1

Source: 40

WOMEN EMPLOYEES IN THE AIRCRAFT INDUSTRY^a
1942 TO DATE

Date	Number (thousands)	Per Cent of Total Employment
Jan. 1942	23.1	2.8
Nov. 1943	486.1	33.3
Oct. 1947	28.5	12.3
Sept. 1949	33.3	12.5
Oct. 1950	37.3	11.9
Oct. 1951	86.5	17.0
Oct. 1952	125.7	17.3
Oct. 1953	136.6	16.9
Oct. 1954	121.6	16.0
Oct. 1955	115.8	15.1
Oct. 1956	135.6	15.5
Oct. 1957	132.4	15.3
Oct. 1958	116.3	14.8
Oct. 1959	111.3	15.1
Oct. 1960	100.3	15.3
Oct. 1961	99.1	14.7
Oct. 1962	104.3	14.5

Sources: 3, 34

^a Based on the narrow definition of the aircraft industry.

MANPOWER

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY,^a 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 ^B
1940	148.6	101.8	31.4	15.4 ^B
1941	347.1	234.6	75.3	37.2 ^B
1942	831.7	549.6	192.0	90.1 ^B
1943	1,345.6	882.1	314.9	148.6 ^B
1944	1,296.6	815.5	339.7	141.4 ^B
1945	788.1	489.9	210.9	87.3 ^B
1946	237.3	159.0	49.9	28.4 ^B
1947	239.3	158.5	50.1	30.7 ^B
1948	237.7	158.0	48.6	31.1 ^B
1949	264.2	175.3	53.6	35.3 ^B
1950	283.1	188.4	57.0	37.7 ^B
1951	467.8	313.3	95.0	59.5 ^B
1952	670.6	425.9	148.6	96.1 ^B
1953	795.5	472.4	191.2	131.9 ^B
1954	782.9	470.0	178.2	134.7 ^B
1955	761.3	466.6	168.0	126.7 ^B
1956	837.3	494.4	194.9	148.0 ^B
1957	895.8	519.0	213.2	163.6 ^B
1958	783.6	448.5	184.3	150.8
1959	755.4	425.1	182.0	148.3
1960	673.8	371.4	170.5	131.9
1961	668.9	361.5	182.6	124.4
1962	707.3	389.0	197.3	121.0
1963				
Feb.	726.4	392.5	211.4	122.5

^B Estimate.

Source: 34

^a Based on the narrow definition of the aircraft industry.

AEROSPACE FACTS AND FIGURES, 1963

AVERAGE HOURLY EARNINGS IN AIRCRAFT AND PARTS PLANTS^o
 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	2.65
1961	2.78	2.78	2.81	2.71
1962	2.87	2.87	2.90	2.82
1963 Feb.	2.93	2.92	2.97	2.88

N.A.—Not available.

Source: 34

^o Based on the narrow definition of the aircraft industry.

MANPOWER

AVERAGE WEEKLY EARNINGS IN AIRCRAFT AND PARTS PLANTS^a
 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	109.45
1961	115.09	114.54	116.90	113.55
1963	120.25	120.25	120.35	119.29
1962				
Feb.	122.47	122.06	123.26	121.25

N.A.—Not available.

Source: 34

^a Based on the narrow definition of the aircraft industry.

**AVERAGE EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY
By GEOGRAPHICAL DIVISION AND SELECTED STATES—1956 TO DATE^a**

Geographical Divisions and Selected States	1956	1957	1958	1959	1960	1961
TOTAL	818,107	890,326	782,057	754,533	668,914	625,095 ^b
New England	77,848	87,496	76,592	71,462	71,313	75,346
Massachusetts	9,092	9,898	9,161	9,180	8,546	9,493
Connecticut	67,169	75,219	65,037	60,865	61,291	64,012
Me., N.H., Vt., R.I.	1,587	2,379	2,394	1,417	1,476	1,841
Middle Atlantic	103,841	101,039	82,728	74,201	71,554	71,321
New York	59,387	61,211	54,400	48,282	45,159	44,168
New Jersey	27,868	24,993	16,675	15,445	15,458	14,946
Pennsylvania	16,586	14,835	11,653	10,474	10,937	12,207
East North Central ..	123,489	131,615	103,660	94,851	77,846	69,932
Ohio	66,018	69,954	58,353	60,217	49,997	41,722
Indiana	30,645	31,204	25,508	22,556	18,124	17,821
Illinois	16,956	17,382	10,855	5,271	4,304	4,896
Mich., Wisc.	9,870	13,075	8,944	6,807	5,421	5,493
West North Central ..	68,684	83,501	74,867	69,306	62,197	57,311
Missouri	23,363	32,225	31,795	30,149	27,420	24,026
Kansas	41,350	47,861	40,710	37,269	33,193	31,177
Minn., Iowa., N.D., S.D., Neb.	3,971	3,415	2,364	1,888	1,584	2,108
South Atlantic	54,496	53,099	49,734	49,380	40,616	31,072
Maryland	33,691	32,072	26,822	23,820	16,228	3,668
Del., D.C., Va., W.Va.	539	615	590	571	497	507
N.C., S.C.						2,016
Georgia	20,266	20,412	22,322	24,989	23,891	11,288
Florida						13,593
East South Central ..	7,541	9,016	9,785	8,509	5,303	5,031
Alabama	7,541	9,016	9,785	8,509	5,303	4,102
Ky., Tenn., Miss. ..						929
West South Central ..	63,203	66,585	60,756	52,267	44,724	43,468
Texas	63,203	66,585	60,756	52,267	44,724	39,051
Ark., La., Okla. ...						4,417
Mountain	11,101	15,552	16,052	22,196	27,211	17,664
Arizona	7,149	7,743	5,756	6,192	14,164	5,167
Utah ^c .....	...	...	...	...	...	8,663
Mont., Idaho, Wyo., Colo., N.Mex., Nev.	3,952	7,809	10,296	16,004	13,047	3,834
Pacific	307,904	342,423	307,883	312,361	268,150	253,916
California	263,020	279,168	240,997	244,670	209,830	191,050
Washington ^d .....	...	...	...	...	...	62,252
Ore., Alaska, Hawaii	44,884	63,255	66,886	67,691	58,320 ^b	614

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: 32

**TOTAL WAGES PAID IN THE AIRCRAFT AND PARTS INDUSTRY,
BY GEOGRAPHICAL DIVISION AND SELECTED STATES—1956 TO DATE^a
In Millions of Dollars**

Geographical Divisions and Selected States	1956	1957	1958	1959	1960	1961
TOTAL	\$4568.7	\$5103.9	\$4823.0	\$4947.5	\$4585.0	\$4493.4^b
New England	422.9	478.6	434.5	438.3	458.5	499.7
Massachusetts	52.2	56.6	59.2	63.2	63.8	70.8
Connecticut	363.2	410.7	363.3	367.6	386.2	417.6
Me., N.H., Vt., R.I.	7.5	11.3	12.0	7.5	8.5	11.3
Middle Atlantic	577.0	578.9	512.1	490.6	495.1	556.4
New York	351.3	362.1	349.1	333.5	328.8	380.5
New Jersey	143.6	139.7	100.2	96.2	99.6	99.5
Pennsylvania	82.1	77.1	62.8	60.9	66.7	76.4
East North Central ..	705.9	775.1	651.9	638.6	548.4	514.2
Ohio	373.5	413.4	372.5	407.4	353.6	316.1
Indiana	170.7	179.1	154.1	147.8	125.6	125.8
Illinois	102.1	104.0	70.6	37.8	30.4	34.5
Mich., Wisc.	59.6	78.6	54.7	45.6	38.8	37.8
West North Central ..	353.3	440.6	418.8	415.8	389.5	374.9
Missouri	125.1	171.8	178.8	186.8	178.1	161.1
Kansas	207.5	249.7	226.2	217.0	200.2	197.6
Minn., Iowa, N.D., S.D., Neb.	20.7	19.1	13.8	12.0	11.2	16.2
South Atlantic	292.4	291.0	298.0	314.5	269.0	215.3
Maryland	181.0	172.2	157.1	146.6	105.1	24.3
Del., D.C., Va., W.Va.	2.4	2.8	3.8	4.3	4.3	4.2
N.C., S.C.						11.8
Georgia	109.0	116.0	137.1	163.6	159.6	83.6
Florida						91.4
East South Central ..	33.9	41.6	53.1	45.0	29.6	28.2
Alabama	33.9	41.6	53.1	45.0	29.6	23.3
Ky., Tenn., Miss. ..						4.9
West South Central ..	341.6	369.7	365.2	336.6	299.0	299.1
Texas	341.6	369.7	365.2	336.6	299.0	273.1
Ark., La., Okla.						26.0
Mountain	66.8	92.8	107.2	154.3	197.1	125.3
Arizona	41.8	45.1	37.7	44.5	42.3	39.4
Utah ^c .....	...	...	...	...	...	59.2
Mont., Idaho, Wyo., Colo., N.Mex., Nev.	25.0	47.7	69.5	109.8	154.8	26.7
Pacific	1774.9	2035.6	1982.2	2113.8	1898.8	1880.2
California	1532.2	1694.3	1582.3	1693.5	1500.1	1429.9
Washington .....	...	...	...	...	...	446.2
Ore., Alaska, Hawaii	242.7	341.3	399.9	420.3	398.7	4.1

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 those 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: 32

AEROSPACE FACTS AND FIGURES, 1963

PRODUCTION WORKERS IN THE AIRCRAFT AND PARTS INDUSTRY^a
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 ^b
1940	118.0	79.2	26.5	12.3 ^b
1941	278.3	183.8	65.0	29.5 ^b
1942	674.8	433.9	168.3	72.6 ^b
1943	1,090.5	692.1	278.8	119.6 ^b
1944	1,016.0	616.3	290.3	109.4 ^b
1945	591.0	360.5	164.9	65.6 ^b
1946	167.5	113.1	34.0	20.4 ^b
1947	176.7	117.4	36.5	22.8 ^b
1948	175.2	117.4	34.9	22.9 ^b
1949	196.6	132.2	38.6	25.8 ^b
1950	209.4	140.4	40.8	28.2 ^b
1951	348.4	234.8	66.5	47.1 ^b
1952	495.4	315.0	105.5	74.9 ^b
1953	586.2	346.8	136.1	103.3 ^b
1954	560.2	335.1	121.6	103.5 ^b
1955	525.5	322.5	108.5	94.5 ^b
1956	561.0	330.3	122.5	108.2 ^b
1957	591.4	342.4	132.1	116.9 ^b
1958	499.4	287.6	107.5	104.3
1959	462.6	260.8	103.7	98.2
1960	392.5	215.8	94.9	81.9
1961	378.4	199.3	101.8	78.0
1962	389.3	206.6	107.5	75.2
1963				
Feb.	391.2	201.4	113.6	76.2

^b Estimate.
^a Based on the narrow definition of the aircraft industry.
Source: 34

MANPOWER

LABOR TURNOVER IN THE AIRCRAFT AND PARTS INDUSTRY, 1958 TO DATE^a (Rates per 100 Employees per Year)

Date	TOTAL		Aircraft (Airframes)		Aircraft Engines and Parts		Other Aircraft Parts and Equipment	
	Acces- sions	Sepa- rations	Acces- sions	Sepa- rations	Acces- sions	Sepa- rations	Acces- sions	Sepa- rations
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

^a Based on the narrow definition of the aircraft industry.
Source: 34



AEROSPACE FACTS AND FIGURES, 1963

WORK-INJURY RATES FOR THE AIRCRAFT AND ALL MANUFACTURING INDUSTRIES
1939 TO DATE

Year	Aircraft Industry		Aircraft Parts Industry		All Manufacturing	
	Injury-Frequency Rates ^a	Severity Rates ^a	Injury-Frequency Rates ^a	Severity Rates ^a	Injury-Frequency Rates ^a	Severity Rates ^a
1939	12.9	1.9	b	b	14.9	1.4
1940	15.8	1.3	b	1	15.3	1.6
1941	10.4	1.4	b	5	18.1	1.7
1942	11.4	0.7	9.5	0.9	19.9	1.5
1943	9.7	0.7	11.7	0.8	20.0	1.4
1944	8.8	0.6	10.1	0.6	18.4	1.4
1945	9.4	1.2	10.6	1.7	18.6	1.6
1946	5.2	0.8	13.7	2.1	19.9	1.6
1947	4.8	0.7	11.1	0.6	18.8	1.4
1948	4.9	0.8	10.2	0.8	17.2	1.5
1949	4.3	1.0	9.2	1.0	14.5	1.4
1950	4.0	0.9	5.9	0.6	14.7	1.2
1951	4.5	0.6	7.1	0.9	15.5	1.3
1952	3.7	0.3	6.7	0.4	14.3	1.3
1953	3.8	0.6	6.3	0.5	13.4	1.2
1954	3.2	0.7	5.8	0.5	11.9	1.0
1955	2.8	0.3	4.8	0.3	12.1	0.6
1956	2.6	0.2	4.7	0.2	12.0	0.7
1957	2.7	0.3	3.8	0.3	11.1	0.8
1958	2.9	0.3	4.1	0.3	10.9	0.8
1959	2.7	N.A.	4.1	N.A.	11.9	N.A.
1960	2.1	N.A.	4.3	N.A.	11.3	N.A.
1961	2.0	N.A.	4.7	N.A.	11.0	N.A.
1962	1.9	N.A.	4.7	N.A.	11.4	N.A.

N.A. Not available

Note: Based on the narrow definition of the aircraft industry.

^aThe injury frequency rate is the average number of disabling work injuries for each million employee-hours worked.

The severity rate is the average number of days lost as a result of disabling work injuries for each 1,000 employee-hours worked. The computations of days lost include standard time charges for fatalities and permanent disabilities.

^bIncluded with "Aircraft."

Source: 85

MANPOWER

WORK STOPPAGES IN THE AIRCRAFT AND PARTS INDUSTRY^a
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

N.A.—Not available.

^a Based on the narrow definition of the aircraft industry.

Source: 33

AEROSPACE FACTS AND FIGURES, 1963

WORK STOPPAGES IN SELECTED INDUSTRIES, 1961

Industry	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
All Manufacturing Corporations	1,677	897,000	9,780,000
AIRCRAFT AND PARTS ^a	14	2,440	35,600
Primary Iron and Steel	31	16,000	162,000
Petroleum Refining	9	14,500	310,000
Motor Vehicles and Equipment	62	272,000	2,240,000
Electrical Machinery	46	10,940	169,000

^a Based on the narrow definition of the aircraft industry.
Source: 33



FINANCE



Earnings of the aerospace industry, as a percentage of sales, rose over the 2 per cent mark during 1962, the first time this has occurred since 1958. Major reason for the increase in profits to 2.4 per cent, compared with 1.8 per cent in 1961 was the virtual completion of write-offs for turbojet transports.

The net profit, after taxes, for 51 aerospace companies amounted to \$360 million compared with \$257 million in 1961. This is the largest amount earned by these companies since 1957.

A comprehensive economic study of the aerospace industry was completed in May 1963 by the Stanford Research Institute. SRI utilized several statistical techniques to obtain valid comparisons of the aerospace industry with other industries. The number of companies surveyed by SRI is substantially less than those covered by aerospace firms in U. S. Government statistics. However, the SRI sampling was sufficiently broad for accuracy, but specific figures may differ slightly from the Government reports.

The study divides the last 15 years into three 5-year periods. These

AEROSPACE FACTS AND FIGURES, 1963

BALANCE SHEET COMPARISONS, 51 AEROSPACE COMPANIES
1957 TO DATE
(Millions of Dollars)

	1957	1958	1959	1960	1961	1962
Assets:						
Current Assets						
Cash	\$ 446	\$ 443	\$ 358	\$ 363	\$ 417	\$ 395
U. S. Government Securities	49	79	91	102	58	46
Total Cash and U. S. Govt. Securities	\$ 495	\$ 522	\$ 449	\$ 465	\$ 475	\$ 441
Receivables (total)	1,558	1,538	1,658	1,718	1,906	1,981
Inventories (gross)	3,593	3,218	3,440	3,425	3,470	3,580
Other current assets	74	70	104	82	112	133
Total Current Assets	\$5,720	\$5,348	\$5,651	\$5,690	\$5,963	\$6,135
Total Net Plant	974	1,036	1,092	1,195	1,420	1,509
Other Non-Current Assets ...	121	120	164	229	305	257
Total Assets	\$6,816	\$6,503	\$6,906	\$7,113	\$7,688	\$7,901
Liabilities:						
Current Liabilities						
Short term loans	759	645	718	745	700	698
Advances by U.S. Govt. ...	1,735	1,374	1,409	1,346	1,308	1,338
Trade accounts and notes payable	807	852	1,001	955	1,005	1,037
Federal income taxes accrued	364	277	196	165	186	265
Instalments due on long term debt	19	18	37	25	24	32
Other current liabilities ...	606	533	538	654	822	769
Total current liabilities ..	4,290	3,699	3,899	3,890	4,045	4,139
Long Term Debt	253	444	541	645	806	783
Other Non-Current Liabilities	17	20	20	32	28	37
Total Liabilities	\$4,560	\$4,163	\$4,460	\$4,567	\$4,879	\$4,959
Stockholder's Equity:						
Capital Stock	841	902	977	1,154	1,291	1,318
Earned Surplus and Reserves	1,417	1,438	1,468	1,394	1,517	1,625
Total Net Worth	\$2,258	\$2,340	\$2,445	\$2 548	\$2,808	\$2,943
Total Liabilities and Stockholders' Equity	\$6,816	\$6,503	\$6,906	\$7,113	\$7,688	\$7,901
Net Working Capital	\$1,430	\$1,649	\$1,752	\$1,800	\$1,918	\$1,996

NOTE: Includes 51 companies which filed reports with the Securities and Exchange Commission. Source: 41.

FINANCE

are 1947-1951, a period of low production following World War II; 1952-1956, covering the Korean War and the aftermath; 1957-1961, covering a shift from volume production of aircraft to a growth in missile production, and research and development contracting. During this 15-year period, 89 per cent of the total sales of the companies surveyed was to the Government.

Highpoints of the financial study are:

- In the last 15 years, 22 companies surveyed spent \$2.1 billion of their earnings for plants and equipment. The expenditures for these facilities, above annual depreciation and amortization charges, absorbed more than one-third of the net profits earned by the 22 firms. Dependence on Government-financing for facilities has decreased appreciably during this period.



AEROSPACE FACTS AND FIGURES, 1963

- Research and development contracts, coupled with limited production, have brought about an increase in cost-plus-fixed-fee contracting. This is due to the great difficulties in estimating with accuracy costs of these programs. In 1949, only 26 per cent of the sales to the Government were "cost plus" types; by 1961 they had increased to 58 per cent.

- Research and development expenditures for 11 aerospace firms surveyed increased from \$100 million in 1947 to more than \$2.1 billion in 1961. Company financing of R & D amounted to 6 per cent of the total; however, this required 12.5 per cent of the before-taxes income of these companies.

- Disallowances and other costs not recoverable on Government contracts have grown sharply. Interest on borrowed money is the most important cost item not allowed by the Government. Interest paid by 12 companies surveyed on this item amounted to only \$1 million in 1950; however this increased to \$26 million in 1961, which was about 8 per cent of the operating profit.

- The long-run profit of the aerospace industry is below that of other major manufacturing concerns. The SRI study considers the rate of return on total assets the best measure for comparing the results of businesses with different financial structures. This measure is less influenced by the method of financing than is either return on net worth or return on total capital.

Here is the result of the Stanford comparison:

RETURN ON TOTAL ASSETS^a

Years	Weighted Average ^b		Median ^c	
	Aerospace ^d	Other Mfg. ^e	Aerospace ^d	Other Mfg. ^e
1947-51	4.9%	11.1%	5.0%	11.2%
1952-56	9.1%	9.8%	9.7%	8.6%
1957-61	5.0%	8.1%	7.1%	7.3%
1947-61	6.3%	9.3%	7.4%	8.3%

^aThe "return on total assets" is the product of "assets earnings margins" and "turnover of total assets." The "assets earnings margin" is the number of cents earned (before interest cost but after income taxes) out of each sales dollar. The "turnover of total assets" is the dollars of sales realized per dollar of total assets.

^bThe weighted average is calculated by assigning a numerical weight to each figure, based on its relative importance. The figure is then multiplied by the frequency with which it occurs. All such products are added and then divided by the total number of items. In the aerospace industry, the weighted average is heavily influenced by a few large firms.

^cThe median is the middle observation or that value above which half the observations lie and below which half of the observations lie (when arranged according to size).

^d19 aerospace companies in continuous operation whose sales to the Government amounted to 60 or more per cent of their total sales.

^eThe other manufacturing companies consisted (in 1961) of 104 large manufacturing companies not included among the aerospace companies.

Source: 40

FINANCE

The Stanford study concluded that "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."

The reasons for this doubt are that facility funding by the Government and the rate of progress payments have been reduced, with the industry expected to fill the gap out of reserves, profits and other sources. Furthermore, the industry faces the risk associated with Government dominance of the market as well as the cost of maintaining adequate know-how and continuously obsolescing facilities.

INCOME ACCOUNTS, 51 AEROSPACE COMPANIES, 1957 TO DATE
(Millions of Dollars)

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

Source: 41

COMPOSITION OF CURRENT ASSETS, 1956 TO DATE, 51 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

Source: 41

FINANCE

FINANCIAL RATIOS, 51 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

Source: 41

NET INCOME AS PER CENT OF SALES, 1955 TO DATE (After Taxes)

Industry	1955	1956	1957	1958	1959	1960	1961	1962
Total Manufacturing Corporations	5.4	5.2	4.8	4.2	4.5	4.4	4.3	4.6
51 Aerospace Co.'s ..	3.8	3.1	2.9	2.4	1.6	1.4	1.8	2.4
Primary Iron and Steel	7.2	6.7	6.6	5.4	4.8	5.1	4.6	3.9
Petroleum Refining . . .	11.1	11.5	10.6	9.5	9.9	9.9	10.1	9.6
Motor Vehicles and Equipment	6.9	5.2	5.4	4.0	5.0	5.9	5.5	6.9
Electrical Machinery .	4.4	3.8	4.2	3.8	4.9	3.5	2.3	3.8

Source: 41

AEROSPACE FACTS AND FIGURES, 1963

SELECTED MAJOR DEFENSE CONTRACTORS
(Listed by rank according to net value of military
prime contracts awarded, 1950-1962)

	July 1, 1950 to June 30, 1962	July 1, 1961 to June 30, 1962	July 1, 1960 to June 30, 1961	July 1, 1959 to June 30, 1960	July 1, 1958 to June 30, 1959	World War II
U. S. TOTAL, ALL CONTRACTS (Millions)	\$275,913.9	\$25,588.4	\$22,693.1	\$20,995.0	\$25,312.0	\$193,300 ^b
Company	Millions of Dollars					Per Cent
Boeing	\$13,441.9	\$1,132.8	\$ 919.8	\$1,008.7	\$1,166.5	1.5%
General Dynamics ...	12,470.2	1,196.6	1,920.1	1,260.2	1,616.3	N.A.
General Electric ...	10,173.3	975.9	874.6	963.1	914.0	1.9
North American Av.	9,484.0	1,032.5	1,197.4	907.7	1,018.1	1.6
Lockheed	9,407.3	1,419.3	1,175.2	1,070.8	898.5	1.9
United Aircraft	8,861.8	662.7	625.5	517.4	538.2	2.2
General Motors	8,665.4	449.0	281.8	218.7	210.7	7.9
Douglas	6,810.1	365.6	307.4	404.9	676.4	2.5
American Telephone and Telegraph	5,718.1	467.7	550.6	466.8	476.5	1.5
Martin	4,707.2	802.7	691.8	596.7	524.0	1.3
Republic Aviation ..	3,960.5	332.8	295.7	265.1	280.5	0.7
Sperry Rand ^a	3,651.1	465.6	408.0	296.0	403.2	0.9
McDonnell	3,175.4	310.9	219.9	195.0	403.5	N.A.
Curtiss-Wright	3,171.0	144.6	69.8	70.4	66.9	4.1
Hughes Aircraft ...	2,996.0	243.2	331.2	349.1	494.0	N.A.
Bendix	2,965.1	285.9	266.8	239.4	271.3	1.1
Westinghouse Electric Radio Corp. of	2,750.8	246.0	307.7	257.6	238.0	0.8
America	2,732.8	339.6	392.3	405.8	199.7	0.3
Grumman Aircraft ..	2,730.2	303.6	238.0	239.3	300.2	0.8
Raytheon	2,436.1	406.6	304.9	323.4	392.6	N.A.
<i>Other Selected Major Contractors</i>						
International Busi- ness Machines	2,392.9	155.5	333.0	290.0	276.9	N.A.
Northrop	2,168.3	152.5	155.6	139.8	145.0	0.1
Gen. Tire & Rubber ..	1,769.3	366.1	290.2	243.2	206.8	N.A.
Textron ^a	1,061.2	117.4	65.8	61.1	56.4	0.7
Fairchild	986.6	35.0	39.8	25.9	41.2	0.2
Thiokol	714.2	178.3	210.0	131.2	101.7	N.A.
Ling-Temco-Vought ^a	358.1	133.4	46.8	61.9	39.8	N.A.

N.A.—Not available.

^b Estimate.

^a Major change in corporate composition or product.

Sources: 17, 43

MILITARY



As part of its program to build up and maintain a second strike force—a system which would enable the U. S. to absorb the first attack and still be able to destroy the enemy's military potential—the Department of Defense is planning a mixed force of manned bombers and missiles at least through 1968.

Most important components of this strategic capability are the 14 wings of B-52's (630 aircraft), two wings of supersonic B-58's (80 aircraft), the hundreds of B-47's still in service and the various types of ballistic missiles.

Already deployed are 13 Atlas ICBM squadrons (126 missiles), although this Strategic Air Command missile is being replaced in its "soft" configuration by "hardened" Atlases in underground silos. The first six Titan I squadrons (54 missiles) are already in place and the remaining 54 Titans are scheduled to be deployed by the end of calendar 1963. By the end of FY 1963, 150 Minuteman missiles were on station, with the subsequent 800 scheduled for delivery at the rate of one a day.

MILITARY

Another vital part of the U. S. strategic system is the Polaris submarine concept. Of the 41 Polaris subs to be built (656 missiles), nine (carrying 144 missiles) are already at sea and nine more will be patrolling undersea waters by June 30, 1964.

To augment or succeed existing strategic systems, the Pentagon is also sponsoring extensive research work on a mobile medium-range ballistic missile to fill the gap between the 400-mile-range Pershing and the 2500-mile-range Polaris as well as on an even longer-range Polaris.

DEPARTMENT OF DEFENSE
NUMBER AND FLYAWAY VALUE OF MILITARY AIRCRAFT PRODUCED,
1950 TO DATE

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

NOTE: Aircraft produced for the Military Assistance Program are excluded.
^a Values are estimated based on unit prices in latest production contracts; values of spares, spare parts, and other support equipment are excluded. Data released to AIA with a two-year lag.
Source: 17

AEROSPACE FACTS AND FIGURES, 1963

SUMMARY OF COMPOSITION OF MAJOR ACTIVE ARMED FORCES
1962-1964

Description	Actual	Estimate	
	June 30, 1962	June 30, 1963	June 30, 1964
Military personnel (in thousands) :			
Army	1,066	980	975
Navy	666	664	670
Marine Corps	191	190	190
Air Force	883	869	860
Total, Department of Defense	2,806	2,703	2,695
Military forces:			
Army :			
Divisions	16 ^a	16	16
Armored cavalry regiments	5	4	4
Brigades	1	5	8
Battle groups (infantry)	9	8	....
Missile commands	3	2	2
Special forces groups	4	6	6
Missile battalions	95¼	97¼	82¼
Aircraft inventory—active	5,648	6,065	6,373
Navy :			
Commissioned ships in fleet	(900)	(859)	(873)
Warships	397	384	395
Other	503	475	478
Carrier air groups	30	28	28
Patrol and warning squadrons	53	35	35
Marine divisions	3	3	3
Marine air wings	3	3	3
Aircraft inventory—active	9,176	8,807	8,860
Air Force :			
USAF combat wings	97	87	88
USAF combat support flying forces (squadrons)	141	133	135
Aircraft inventory—active	16,591	15,567	15,446

^a Excludes two National Guard divisions in active status.
Source: 24

MILITARY

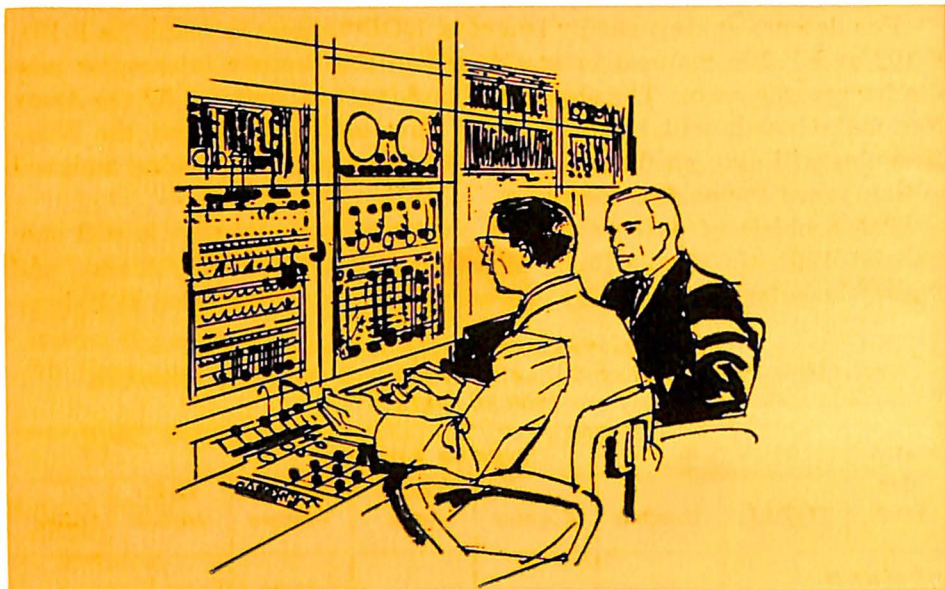
For defense against enemy bombers, DOD expects to retain its F-101, F-102 and F-106 manned interceptors and the Bomarc interceptor missile for several years. The obsolete Nike-Ajax, now manned by the Army National Guard, will be phased out this coming year but the Nike-Hercules will stay on duty for years to come, gradually being assigned to the Guard for on-site operation.

The problem of defense against enemy ballistic missiles is still substantial. Ballistic Missile Early Warning Stations at Clear, Alaska, and Thule, Greenland, are already operating and the third station at Fyings-

DEPARTMENT OF THE AIR FORCE
 NUMBER AND FLYAWAY VALUE OF AIR FORCE AIRCRAFT PRODUCED,
 1950 TO DATE

Calen- dar Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Trans- port	Trainer	Heli- copter	Other
<i>NUMBER</i>							
1950	1,668	219	917	169	326	6	31
1951	2,149	152	1,158	240	517	14	68
1952	3,625	399	1,247	454	1,258	49	218
1953	5,674	489	2,862	578	1,381	165	199
1954	5,226	716	2,729	603	998	172	8
1955	4,115	632	2,346	464	578	82	13
1956	2,515	605	1,166	326	354	62	2
1957	2,467	318	1,494	216	343	16	80
1958	1,792	167	906	235	402	2	80
1959	1,230	133	553	215	298	28	3
1960	885	90	439	133	163	57	3
<i>FLYAWAY VALUE^a (Millions of Dollars)</i>							
1950	763.7	340.7	183.6	174.4	44.4	1.1	19.5
1951	1,220.5	527.6	334.1	255.6	71.0	2.1	30.1
1952	2,379.4	1,023.0	434.3	617.7	239.0	9.7	55.7
1953	3,411.9	1,273.8	1,184.1	626.6	235.2	39.4	52.8
1954	4,236.9	1,663.9	1,621.2	713.9	203.0	30.9	4.0
1955	3,671.8	1,551.3	1,393.0	578.3	104.8	43.3	1.1
1956	3,661.5	1,736.0	1,343.3	511.0	48.1	22.9	0.2
1957	3,829.5	1,622.7	1,478.6	671.4	48.2	4.2	4.4
1958	3,540.3	1,395.7	1,322.9	761.7	55.4	0.5	4.1
1959	3,662.8	1,462.2	1,328.3	759.5	98.8	14.0	0.1
1960	2,136.6	790.6	871.8	371.1	79.7	23.2	0.2

NOTE: Aircraft produced for the Military Assistance Program are excluded.
^a Values are estimated based on unit prices in latest production contracts; values of spares, spare parts, and other support equipment are excluded. Data released to ATA with a two-year lag.
 Source: 17



dale, England, will be in service in FY 1964. But the Nike-Zeus anti-missile missile is still not authorized for production. Zeus and a new missile, Sprint, are being studied as part of an advanced Nike-X contra-missile system.

The Defense Department's General Purpose Forces include most of the Army's combat units, almost all Navy units, all Marine Corps units and the USAF tactical aircraft.

Army missiles in service include Hercules, Hawk, Lacrosse, SS-10, SS-11 and Entac. The liquid-fuel Redstone and Corporal ballistic missiles are to be gradually replaced by the solid-fuel Pershing and Sergeant. The last "buys" of Little John and Sergeant are being made with FY 1964 money.

New Army aircraft to be procured in FY 1964 number 1600 and include the Iroquois and Chinook helicopters, the Mohawk observation plane and the Caribou transport and a large number of helicopter and fixed-wing trainers.

Navy and Marine Corps aircraft procurement in FY 1964 amounts to nearly 700, including the F-4B, A-4E, A-6A, A-5C, RF-4B, S-2E, SH-3A, P-3A, C-2A, CH-46A, CH-53A and the UH-1E. Aside from Polaris, Navy missile purchases in FY 1964 will include Sparrow III, Sidewinder 1-C, Bullpup A and B, and Marine Corps Hawks.

Tactically, the USAF will continue to fly F-100's, F-105's and small numbers of F-84F's and B-57's, as well as RF-101's and RB-66's for

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reconnaissance. New planes to be procured in FY 1964 include the F-4C and the RF-4C, with the F-111 scheduled for production for both the Navy and USAF in the later 1960's. The Mace A and B tactical missiles will remain in service.

USAF airlift aircraft continuing in the inventory include the C-124 and C-133, C-130 and C-123. New procurement involves additional C-130E's and the jet-powered C-141. Research and development studies will continue on new transports with vertical or short take-off and landing (V/STOL) characteristics.

DEPARTMENT OF THE NAVY
NUMBER AND FLYAWAY VALUE OF NAVY AIRCRAFT PRODUCED,
1950 TO DATE

Calendar Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
<i>NUMBER</i>							
1950	979	341	560	7	25	39	5
1951	1,374	350	779	31	41	143	30
1952	2,164	794	870	25	105	353	17
1953	2,315	667	1,096	135	129	245	43
1954	2,367	1,090	782	23	405	46	21
1955	2,260	721	782	49	533	128	47
1956	1,966	559	750	36	424	152	45
1957	1,816	555	579	8	476	193	5
1958	1,485	509	576	36	158	204	2
1959	1,117	378	369	—	266	101	3
1960	820	381	156	10	105	147	21
<i>FLYAWAY VALUE^a (Millions of Dollars)</i>							
1950	376.7	205.7	156.1	4.1	3.3	4.6	2.9
1951	439.5	162.9	225.0	22.9	7.2	21.1	0.4
1952	740.5	311.7	317.4	30.2	17.1	63.9	0.2
1953	1,276.7	525.4	488.4	164.9	18.4	62.5	17.1
1954	1,451.6	741.5	465.8	140.5	58.3	34.3	11.2
1955	1,199.7	462.5	514.4	74.4	61.6	74.4	12.4
1956	1,314.5	466.9	644.1	26.0	67.4	78.0	32.1
1957	1,354.3	540.9	607.9	4.8	121.3	68.3	11.3
1958	1,727.9	761.5	783.7	20.2	84.0	73.9	4.6
1959	1,355.2	603.9	501.2	—	117.3	98.3	34.5
1960	1,152.7	716.1	237.2	44.4	50.3	94.9	9.8

NOTE: Aircraft produced for the Military Assistance Program are excluded.

^a Values are estimated based on unit prices in latest production contracts; values of spares, spare parts, and other support equipment are excluded. Data released to AIA with a two-year lag.

Source: 17

AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF THE ARMY
NUMBER AND FLYAWAY VALUE OF ARMY AIRCRAFT PRODUCED,
1950 TO DATE

Calendar Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
<i>NUMBER</i>							
1950	35	—	—	—	—	15	20
1951	1,532	—	—	—	—	192	1,340
1952	1,342	—	—	—	—	559	783
1953	989	—	—	—	—	463	526
1954	496	—	—	—	—	155	341
1955	289	—	—	—	—	200	89
1956	722	—	—	—	—	430	292
1957	915	—	—	—	—	450	465
1958	801	—	—	—	—	435	366
1959	487	—	—	—	—	322	165
1960	352	—	—	—	—	284	68
<i>FLYAWAY VALUE^a (Millions of Dollars)</i>							
1950	0.9	—	—	—	—	0.6	0.3
1951	24.3	—	—	—	—	6.4	17.9
1952	42.1	—	—	—	—	27.8	14.3
1953	34.3	—	—	—	—	22.5	11.8
1954	26.5	—	—	—	—	16.8	9.7
1955	56.4	—	—	—	—	51.5	4.9
1956	99.3	—	—	—	—	83.7	15.6
1957	101.1	—	—	—	—	84.1	17.0
1958	97.1	—	—	—	—	81.6	15.5
1959	83.0	—	—	—	—	50.8	32.2
1960	95.0	—	—	—	—	54.8	40.2

NOTE: Aircraft produced for the Military Assistance Program are excluded.
^a Values are estimated based on unit prices in latest production contracts; values of spares, spare parts, and other support equipment are excluded. Data released to AIA with a two-year lag.
 Source: 17

MILITARY



AIRFRAME WEIGHT OF MILITARY AIRCRAFT PRODUCED
FOR DEPARTMENT OF DEFENSE BY TYPE
1940 TO DATE
(Weight in Millions of Pounds, Excluding Spares)

Calendar Year	Total	Bombers	Fighters	Transports	Trainers	Other ^a
1940	23.1	9.2	5.5	2.5	5.6	.3
1941	81.4	40.9	16.4	3.8	18.1	2.2
1942	275.8	162.5	48.8	18.2	39.3	7.0
1943	654.2	423.0	121.8	55.5	47.1	6.8
1944	961.1	609.2	215.5	113.6	19.1	3.7
1945	539.4	331.1	124.7	75.5	3.4	4.7
1946	12.9	3.9	5.6	2.4	—	1.0
1947	11.4	3.3	4.5	2.5	—	1.1
1948	25.1	13.2	9.2	1.6	.4	.7
1949	30.3	18.0	8.7	2.4	.5	.7
1950	35.9	16.4	10.2	6.7	1.9	.7
1951	50.2	17.0	15.7	11.5	3.1	2.9
1952	107.3	36.7	31.7	24.6	9.5	4.8
1953	138.0	44.1	40.7	36.5	11.3	5.4
1954	130.4	51.8	35.4	31.1	9.6	2.5
1955	114.3	39.9	43.2	20.9	7.4	2.9
1956	90.0	38.6	30.6	13.1	3.3	4.4
1957	79.4	32.7	28.7	9.3	4.2	4.5
1958	66.1	25.2	18.0	15.9	3.1	3.9
1959	51.8	18.6	12.9	14.6	3.5	2.2
1960	35.8	13.6	9.1	9.7	1.1	2.3

NOTE: Data exclude gliders and targets for entire period and experimental aircraft subsequent to 1949.

^a "Other" includes helicopter, liaison, observation, utility, search and rescue and basic reconnaissance types; however, reconnaissance versions of bombers and fighters are included with bombers and fighters.

Source: 17

AEROSPACE FACTS AND FIGURES, 1963

MILITARY AIRCRAFT IN DEVELOPMENT OR PRODUCTION
(FIXED WING)

Designation	Name	Type	Service	Manufacturer
U-8 (L-23)	Seminole	Utility	Army	Beech
U-8F (L-23F)	Queenaire	Trainer	Navy	Beech
RC-135A/B	Stratolifter	Cargo	USAF	Boeing
KC-135A/B	Stratotanker	Tanker	USAF	Boeing
F-111A	TFX	Fighter	USAF	Gen. Dynamics
T-37B	—	Trainer	USAF	Cessna
F-8E (F8U-2NE)	Crusader	Fighter	Navy	Chance Vought
A-4C (A4D-2N)	Skyhawk	Attack	Navy	Douglas
A-4E (A4D-5)	Skyhawk	Attack	Navy	Douglas
A/EA-6A (A2F-1, 1H)	Intruder	Attack	Navy	Grumman
S-2E (S2F-38)	Tracker	Anti-Sub	Navy	Grumman
E-2A (W2F-1)	Hawkeye	Attack Warning	Navy	Grumman
OV-1 (AO-1)	Mohawk	Surveillance & Observation	Army	Grumman
F-104G	Starfighter	Fighter	USAF	Lockheed
HC/C-130E	Hercules	Cargo	USAF	Lockheed
C-140	Jet Star	Cargo	USAF	Lockheed
C-141A	Super Hercules	Cargo	USAF	Lockheed
C-130E (GV-2U)	Hercules	Cargo	Navy	Lockheed
P-3A (P3V-1)	Orion	Patrol	Navy	Lockheed
F/RF-4B (F4H-1, 1P)	Phantom II	Fighter	Navy	McDonnell
F/RF-4B/C (F110, RF110A)	—	Fighter	USAF	McDonnell
A-5A/B/D (A3J-1,2,3)	Vigilante	Attack	Navy	North American
B-70	Valkyrie	Bomber	USAF	North American
T-39A,B	Saberliner	Trainer	USAF	North American
T-39D (T3J-1)	Saberliner	Trainer	Navy	North American
T-2B (T2J-2)	Buckeye	Trainer	Navy	North American
T-38A	Talon	Trainer	USAF	Northrop
F-105D/F	Thunderchief	Fighter	USAF	Republic
CV-2B (AC-1A)	Caribou	Cargo	Army	DeHavilland
U-10A/B (L-28)	Helio Courier	Light Support	USAF	Helio
C/TC-4B (G-159)	Gulfstream	Cargo	Navy	Grumman
—	Fan-in-Wing	Surveillance	Army	General Electric Ryan
—	Hummingbird	Surveillance	Army	Lockheed

Source: 17

MILITARY

U S. MILITARY AIRCRAFT ENGINE ACCEPTANCES
CALENDAR YEARS 1951 TO DATE

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
TOTAL U.S. MILITARY	16,287	25,659	33,616	21,440	13,469	9,849	11,087	8,121	4,626	3,674
Jet	9,520	16,912	20,181	13,367	9,333	6,532	8,104	6,135	3,421	2,025
J-33	1,800	2,243	2,488	1,188	514	95	106	20	—	—
J-34	1,442	1,177	316	—	—	40	76	99	139	80
J-44	—	—	—	—	—	—	181	320	55	—
J-48	269	1,121	1,414	496	131	318	214	60	24	—
J-52	—	—	—	—	—	—	—	5	36	220
J-57	16	75	113	739	1,918	3,876	5,391	4,000	1,957	565
J-60	—	—	—	—	—	—	—	—	1	29
J-69	—	—	—	—	32	235	542	652	538	487
J-75	—	—	—	—	—	27	70	209	293	256
J-79	—	—	—	—	2	102	302	460	309	174
J-85	—	—	—	—	—	—	2	32	69	214
J-65	16	42	1,331	3,308	3,252	1,135	798	137	—	—
J-71	—	4	54	130	388	507	422	135	—	—
J-83	—	—	—	—	—	—	—	6	—	—
J-35	2,220	4,282	2,192	1,300	507	—	—	—	—	—
J-40	—	—	7	51	61	—	—	—	—	—
J-46	—	1	88	515	265	—	—	—	—	—
J-47	3,755	7,967	12,141	5,204	1,871	191	—	—	—	—
J-73	—	—	37	436	392	6	—	—	—	—
J-42	—	—	—	—	—	—	—	—	—	—
J-67	2	—	—	—	—	—	—	—	—	—
Turbo-Fan	—	—	—	—	—	—	—	—	—	168
TF-33	—	—	—	—	—	—	—	—	—	168
Turbo-Prop	296	16	70	205	261	654	554	534	544	724
T-33	295	—	—	—	—	—	—	—	2	—
T-34	1	2	24	17	87	73	52	103	63	49
T-53	—	—	—	—	—	—	—	40	165	339
T-56	—	—	6	31	165	580	481	371	260	234
T-58	—	—	—	—	—	1	21	20	54	96
T-40	—	14	39	152	2	—	—	—	—	—
T-49	—	—	1	5	7	—	—	—	—	—
Recipro- cating	6,471	8,731	13,365	7,868	3,875	2,663	2,429	1,452	661	756
O-435	—	118	224	—	4	96	217	298	327	189
O-480	—	—	—	—	—	30	230	285	66	57
O-470	1,951	1,187	760	477	435	377	143	173	—	—
O-335	600	1,112	528	25	95	137	13	—	—	—
O-526	—	—	—	—	—	—	4	—	—	—
O-525	—	—	—	—	—	—	9	—	—	—
O-425	—	99	33	—	—	—	—	—	—	—
O-190	—	—	—	—	—	—	—	—	—	—
O-205	—	14	—	—	—	—	—	—	—	—
R-1340	—	—	—	—	—	—	7	22	—	—
R-1820	205	533	1,344	1,240	1,035	1,160	1,191	506	155	418
R-3350	681	1,544	3,511	1,901	1,022	547	198	87	113	93
R-1300	290	497	1,618	188	118	77	201	11	—	—
R-2800	322	486	1,187	1,052	529	239	216	70	—	—
R-4360	2,329	2,897	3,910	2,933	637	—	—	—	—	—
R-975	86	244	250	52	—	—	—	—	—	—
R-2180	7	—	—	—	—	—	—	—	—	—

Source: 17

AEROSPACE FACTS AND FIGURES, 1963

PRODUCTION OF MILITARY ASSISTANCE AND COAST GUARD AIRCRAFT
BY TYPE AND MODEL, CALENDAR YEAR 1960

<u>Military Assistance—Total</u>	<u>85</u>
Bombers	<u>36</u>
S-2A (S2F-1)	36
Fighters	<u>29</u>
F-104	29
Transports	<u>4</u>
C-130	4
Helicopters	<u>6</u>
CH-21 (H-21/44)	6
Other Models	<u>10</u>
U-6 (L-20)	10
<u>U. S. Coast Guard—Total</u>	<u>2</u>
Transport	<u>2</u>
HC-130G (SC-130B)	2

Source: 17

UNITED STATES ARMY AVIATORS ON ACTIVE DUTY, 1950 TO DATE

As of June 30	Total Number
1950	1,050
1951	1,372
1952	1,933
1953	2,227
1954	2,528
1955	3,097
1956	4,166
1957	5,050
1958	5,611
1959	5,984
1960	6,365
1961	6,531
1962	7,099

Source: 17

MILITARY

UNITED STATES AIR FORCE PERSONNEL, 1912 TO DATE

As of June 30	TOTAL	Officers	Cadets	Airmen
1912 ^a	51	12	—	39
1914	122	18	—	104
1916	311	63	—	248
1918 ^b	195,023	20,708	—	174,315
1920	9,050	969	—	8,081
1922	9,642	958	113	8,571
1924	10,547	884	119	9,544
1926	9,674	954	142	8,578
1928	10,549	1,055	280	9,214
1930	13,531	1,499	378	11,654
1932	15,028	1,659	325	13,044
1934	15,861	1,545	318	13,998
1936	17,233	1,593	328	15,312
1938	21,089	2,179	342	18,568
1940	51,165	3,361	1,894	45,910
1941	152,125	10,611	8,627	132,887
1942	764,415	55,956	50,213	658,246
1943	2,197,114	205,874	99,672	1,891,568
1944	2,372,292	333,401	82,647	1,956,244
1945	2,282,259	381,454	16,764	1,884,041
1946	455,515	81,733	7	373,775
1947	305,827	42,745	53	263,029
1948	387,730	48,957	1,338	337,435
1949	419,347	57,851	1,860	359,636
1950	411,277	57,006	2,186	352,085
1951	788,381	107,099	2,476	678,806
1952	973,474	128,401	6,782	838,291
1953	977,593	130,769	9,157	837,667
1954	947,918	129,752	9,072	809,094
1955	959,946	137,149	4,384	818,413
1956	909,958	142,093	3,256	764,609
1957	919,835	140,563	2,706	776,566
1958	871,156	132,939	2,458	704,562
1959	840,435	131,602	4,271	735,759
1960	814,752	129,689	4,397	680,666
1961	821,151	128,793	2,801	689,557
1962	884,025	134,908	2,934	746,183
1963 ^E	868,931	132,963	2,860	733,108
1964 ^E	860,000	133,000	2,860	724,140

^E Estimate.

^a As of November 1.

^b As of November 11.

Sources: 17, 24

AEROSPACE FACTS AND FIGURES, 1963

UNITED STATES NAVY AND MARINE CORPS AVIATION PERSONNEL, 1941 TO DATE

Year as of June 30	TOTAL	Pilots	Enlisted Aviation Rates	Aviation Ground Officers
1941	23,148	6,300	14,848	2,000
1944	299,968	47,276	228,356	24,336
1950	91,298	12,978	76,349	1,971
1951	162,214	18,287	139,838	4,089
1952	194,730	20,944	168,486	5,300
1953	196,813*	22,903	163,673	4,930
1954	179,783*	21,316	147,670	4,725
1955	165,243*	21,352	133,424	4,885
1956	204,388	23,740	175,588	5,060
1957	212,684	23,101	181,847	7,736
1958	202,884	23,214	172,777	6,893
1959	191,077	22,593	161,931	6,553
1960	182,654	21,808	153,385	7,461
1961	188,707	21,957	158,633	8,117
1962	210,711	22,922	178,472	9,317

Source: 17



MILITARY

APPROPRIATIONS AND EXPENDITURES FOR MILITARY AVIATION
1899 TO DATE
(Millions of Dollars)

Fiscal Year	U. S. Air Force		Naval Aviation	
	Total Cash Appropriations	Expenditures	Total Cash Appropriations ^a	Expenditures
1899	\$.05	N.A.	\$ —	N.A.
1909	.03	N.A.	—	N.A.
1912	.12	N.A.	.03	N.A.
1913	.10	N.A.	.01	N.A.
1914	.17	N.A.	.01	N.A.
1915	.20	N.A.	.01	N.A.
1916	.80	N.A.	1.0	N.A.
1917	18.7	N.A.	3.8	N.A.
1918	735.0	N.A.	61.5	N.A.
1919	952.3	N.A.	220.4	N.A.
1920	28.1	N.A.	25.7	N.A.
1921	35.1	\$ 30.9	20.0	N.A.
1922	25.6	23.1	19.1	\$ 14.3
1923	13.1	18.1	14.8	14.2
1924	12.6	11.0	14.7	14.3
1925	13.5	11.7	15.7	15.5
1926	15.9	14.9	18.2	18.1
1927	15.3	16.8	22.4	22.0
1928	21.1	19.4	20.3	19.8
1929	28.9	23.3	32.3	32.1
1930	34.9	28.1	31.6	31.1
1931	38.9	38.7	32.1	31.0
1932	31.9	33.0	31.2	31.7
1933	25.7	22.1	25.4	31.2
1934	31.0	17.6	29.8	15.5
1935	27.9	20.5	32.1	17.2
1936	45.6	32.2	40.8	20.5
1937	59.6	41.3	38.9	27.5
1938	58.9	51.1	51.6	59.8
1939	71.1	83.4	48.2	47.9
1940	186.6	108.5	111.8	50.8
1941	2,173.6	605.9	453.0	193.6
1942	23,049.9	2,555.2	6,190.0	993.1
1943	11,317.4	9,392.4	5,258.0	3,966.4

AEROSPACE FACTS AND FIGURES, 1963

APPROPRIATIONS AND EXPENDITURES FOR MILITARY AVIATION
1899 TO DATE—Continued
(Millions of Dollars)

Fiscal Year	U. S. Air Force		Naval Aviation	
	Total Cash Appropriations	Expenditures	Total Cash Appropriations ^a	Expenditures
1944	23,656.0	13,087.7	4,583.7	4,490.1
1945	1,610.7	11,357.4	2,539.6	5,166.0
1946	.5	2,519.4	795.0	1,065.7
1947	1,200.0	854.3	770.8	749.1
1948	608.1 } ^b	1,199.1	906.0	747.9
	829.8 }			
1949	938.8	1,059.2	588.3	875.1
1950	4,139.4	3,599.9	1,034.7	999.9
1951	15,855.6	6,348.7	3,815.3	1,238.0
1952	22,975.1	12,716.0	5,266.5	2,228.4
1953	22,076.4	15,087.1	4,853.0	3,110.1
1954	11,419.4	15,668.5	2,322.0	3,296.7
1955	11,637.1	16,406.7	2,755.0	2,553.4
1956	15,517.0	16,748.8	1,717.8	2,737.1
1957	17,696.5	18,362.7	2,543.7	3,053.3
1958	17,732.2	18,435.4	2,682.8	3,358.6
1959	18,712.6	19,084.2	2,890.0	3,323.3
1960	18,495.9	19,066.2	1,961.6	2,027.1
1961	17,884.3	19,778.2	2,141.8	2,069.1
1962 ^E	19,591.8	20,500.4	2,680.9	2,620.0
1963 ^E	19,757.5	19,913.9	3,065.0	2,660.0

NOTE: For details on missiles see separate tables in this and the missiles chapter.

N.A.—Not available.

E Estimate.

^aIncludes "Aircraft and Related Procurement" and "Aircraft and Facilities" until 1960. Beginning with 1961 "Procurement of Aircraft and Missiles."

^bFY 1949 Construction of Aircraft & Related Procurement appropriation enacted in FY 1948.

Sources: 3, 17, 24

EXPENDITURES FOR AIRCRAFT, MISSILES AND ASTRONAUTICS ^a
(Millions of Dollars)

Year Ending June 30	U.S. Air Force		U.S. Navy		U.S. Army	
	Procurement	RDT&E	Procurement	RDT&E	Procurement	RDT&E
1962	\$6,514	\$2,629	\$2,695	\$846	\$634	\$668
1963 ^E	6,011	2,597	2,862	842	818	609
1964 ^E	5,784	2,680	3,108	858	813	638

^E Estimate.

^a New series comprises the procurement expenditures and the research, development, test and evaluation (RDT&E) expenditures of the three services for aircraft, missiles and astronautics.

Source: 18

MILITARY

TOTAL FEDERAL EXPENDITURES AND EXPENDITURES FOR MILITARY
 AIRCRAFT AND GUIDED MISSILES
 1922 TO DATE
 (Dollar Figures in Millions)

Fiscal Year	Total Federal Expenditures	Total National Security Expenditures ^a	Expenditures for Aircraft and Missiles ^b	Percent Aircraft and Missiles of Total Federal	Percent Aircraft and Missiles of National Security
1922	\$ 3,373	\$ 935	\$ 6	.2	.6
1923	3,295	730	7	.2	1.0
1924	3,049	689	10	.3	1.5
1925	3,063	717	10	.3	1.4
1926	3,098	677	12	.4	1.8
1927	2,974	688	14	.5	2.0
1928	3,103	732	22	.7	3.0
1929	3,299	791	29	.9	3.7
1930	3,440	839	31	.9	3.7
1931	3,652	832	31	.8	3.7
1932	4,535	834	29	.6	3.5
1933	3,864	784	25	.6	3.2
1934	6,011	706	13	.2	1.8
1935	7,010	924	23	.3	2.5
1936	8,666	1,147	44	.5	3.8
1937	8,177	1,185	58	.7	4.9
1938	7,239	1,240	67	.9	5.4
1939	8,707	1,368	68	.8	5.0
1940	8,998	1,799	205	2.3	11.4
1941	12,711	6,252	587	4.6	9.4
1942	32,297	22,905	2,915	9.0	12.7
1943	76,179	63,414	10,072	13.2	15.9
1944	93,744	75,976	12,828	13.7	16.9
1945	100,405	80,357	11,521	11.5	14.3
1946	60,703	43,151	1,649	2.7	3.8



AEROSPACE FACTS AND FIGURES, 1963

**TOTAL FEDERAL EXPENDITURES AND EXPENDITURES FOR MILITARY
AIRCRAFT AND GUIDED MISSILES
1922 TO DATE**
(Dollar Figures in Millions)

Fiscal Year	Total Federal Expenditures	Total National Security Expenditures ^a	Expenditures for Aircraft and Missiles ^b	Percent Aircraft and Missiles of Total Federal	Percent Aircraft and Missiles of National Security
1947	39,289	14,769	593	1.5	4.0
1948	33,791	11,983	703	2.1	5.9
1949	40,057	13,988	1,248	3.1	8.9
1950	39,617	13,009	1,705	4.3	13.1
1951	44,058	22,444	2,433 ^c	5.5	10.8
1952	65,408	45,963	5,057 ^c	7.7	11.0
1953	74,120	50,442	8,434 ^c	11.4	16.7
1954	67,537	46,986	9,497 ^c	14.1	20.2
1955	64,389	40,695	9,408 ^c	14.6	23.1
1956	66,224	40,723	8,840 ^c	13.3	21.7
1957	68,966	43,360	10,502 ^c	15.2	24.2
1958	71,369	44,234	11,227 ^c	15.7	25.4
1959	80,342	46,491	11,067 ^c	13.8	23.8
1960	76,539	45,691	9,299 ^c	12.1	20.4
1961	81,515	47,494	8,870 ^c	10.9	18.7
1962	87,787	51,103	9,842 ^c	11.2	19.2
1963 ^E	94,311	53,004	9,721 ^c	10.3	18.3
1964 ^E	98,802	55,433	9,764 ^c	9.9	17.6

^E Estimate.

^a Includes stockpiling, Mutual Defense, and Atomic Energy.

^b Includes related items.

^c Procurement and Production, military functions only.

Sources: 3, 16, 17, 24

DEPARTMENT OF DEFENSE

UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, FEBRUARY 28, 1963
TOTAL AND AIRCRAFT
(Millions of Dollars)

	Total Procurement	Aircraft	Aircraft as Percent of Total
Defense Department	\$13,377	\$4,900	36.6
Air Force	4,693	2,914	62.1
Navy	6,298	1,819	28.9
Army	2,355	167	7.1
Defense Agencies	31	—	—

Source: 20

MILITARY

DEPARTMENT OF DEFENSE

NEW OBLIGATIONAL AVAILABILITY FOR PRODUCTION AND PROCUREMENT,

TOTAL AND AIRCRAFT

1951 TO DATE

(Millions of Dollars)

Year Ending June 30	Total Procurement and Production	Aircraft	Aircraft as Percent of Total
1951	\$23,114	\$ 8,686	37.6
1952	29,536	13,471	45.6
1953	21,117	13,948	66.1
1954	10,588	5,041	47.6
1955	7,420	4,922	66.3
1956	9,795	6,923	70.7
1957	11,294	6,559	58.1
1958	10,983	5,945	54.1
1959 ^a	14,304	6,167	43.1
1960 ^a	11,701	5,929	50.7
1961 ^a	11,716	4,998	42.7
1962 ^a	15,746	5,646	35.6
1963 ^{a, B}	16,667	5,882	35.3
1964 ^{a, B}	16,725	6,040	36.1

^B Estimate.

^aData are not directly comparable to those for earlier years because of changes in title classifications and in funding.

Source: 17

DEPARTMENT OF DEFENSE

UNPAID OBLIGATIONS, FEBRUARY 28, 1963

TOTAL AND AIRCRAFT

(Millions of Dollars)

	Total Procurement	Aircraft	Aircraft as Percent of Total
Defense Department	\$16,350	\$5,067	31.0
Air Force	5,118	2,751	53.8
Navy	8,019	2,030	25.3
Army	3,196	287	9.0
Defense Agencies	18	—	—

Source: 20

AEROSPACE FACTS AND FIGURES, 1963

DEPARTMENT OF DEFENSE
 NEW OBLIGATIONAL AVAILABILITY FOR AIRCRAFT PROCUREMENT, BY AGENCY
 1951 TO DATE
 (Millions of Dollars)

Year Ending June 30	Total Defense Department	Air Force	Navy	Army
1951	\$8,686	\$ 6,247	\$2,304	\$135
1952	13,471	10,091	3,335	44
1953	13,948	N.A.	N.A.	N.A.
1954	5,041	N.A.	N.A.	N.A.
1955	4,922	N.A.	N.A.	N.A.
1956	6,923	N.A.	N.A.	N.A.
1957	6,559	N.A.	N.A.	N.A.
1958	5,945	N.A.	N.A.	N.A.
1959	6,167	N.A.	N.A.	N.A.
1960	5,929	4,090	1,739	100
1961	4,998	3,267	1,612	119
1962	5,646	3,658	1,830	243
1963 ^E	5,882	3,562	2,105	215
1964 ^E	6,040	3,559	1,959	522

N.A.—Not available.

^E Estimate.

Source: 24

DEPARTMENT OF DEFENSE
 EXPENDITURES FOR AIRCRAFT PROCUREMENT, BY AGENCY
 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 ^E	5,967	3,675	2,115	268
1964 ^E	6,106	3,669	2,165	273

N.A.—Not available.

^E Estimate.

Source: 17

MILITARY

**DEPARTMENT OF DEFENSE AIRCRAFT DESIGNATIONS
BASIC MISSION AND TYPE SYMBOLS**

Letter	Mission	Letter	Mission
A	Attack	P	Patrol
B	Bomber	S	Antisubmarine
C	Cargo/Transport	T	Trainer
E	Special Electronic Installation	U	Utility
F	Fighter	*V	VTOL and STOL
*H	Helicopter	X	Research
K	Tanker	*Z	Airship
O	Observation		

**Type symbols*

ATTACK SERIES

Current	Former	Service	Manufacturer
A-1E	AD-5	Navy	Douglas
EA-1E	AD-5W	Navy	Douglas
EA-1F	AD-5Q	Navy	Douglas
A-1G	AD-5N	Navy	Douglas
A-1H	AD-6	Navy	Douglas
A-1J	AD-7	Navy	Douglas
A-2A	AJ-1	Navy	North American
YA-3A	Y/A3D-1	Navy	Douglas
A-3A	A3D-1	Navy	Douglas
YEA-3A	Y/A3D-1Q	Navy	Douglas
EA-3A	A3D-1Q	Navy	Douglas
YRA-3A	Y/A3D-1P	Navy	Douglas
A-3B	A3D-2	Navy	Douglas
EA-3B	A3D-2Q	Navy	Douglas
YRA-3B	Y/A3D-2P	Navy	Douglas
RA-3B	A3D-2P	Navy	Douglas
TA-3B	A3D-2T	Navy	Douglas
YA-4A	Y/A4D-1	Navy	Douglas
A-4A	A4D-1	Navy	Douglas
YA-4B	Y/A4D-2	Navy	Douglas
A-4B	A4D-2	Navy	Douglas
YA-4C	Y/A4D-2N	Navy	Douglas
A-4C	A4D-2N	Navy	Douglas
A-4E	A4D-5	Navy	Douglas
YA-5A	Y/A3J-1	Navy	North American
A-5A	A3J-1	Navy	North American
A-5B	A3J-2	Navy	North American
A-5C	A3J-3	Navy	North American
A-6A	A2F-1	Navy	Grumman
EA-6A	A2F-1H	Navy	Grumman

AEROSPACE FACTS AND FIGURES, 1963

BOMBER SERIES

Current	Former	Service	Manufacturer
VB-26B	Same	AF	Douglas
B-26B	Same	AF	Douglas
TB-26B	Same	AF	Douglas
B-26C	Same	AF	Douglas
B-26C	GB-26C	AF	Douglas
RB-26C	Same	AF	Douglas
TB-26C	Same	AF	Douglas
UB-26J	JD-1	Navy	Douglas
DB-26J	JD-1D	Navy	Douglas
TB-29A	Same	AF	Boeing
B-45C	Same	AF	North American
RB-45C	Same	AF	North American
B-47B	Same	AF	Boeing
DB-47B	Same	AF	Boeing
TB-47B	Same	AF	Boeing
WB-47B	Same	AF	Boeing
B-47E	Same	AF	Boeing
EB-47E	E-47E	AF	Boeing
RB-47E	Same	AF	Boeing
RB-47E	R-47E	AF	Boeing
EB-47H	ER-47H	AF	Boeing
RB-47H	Same	AF	Boeing
RB-47H	R-47H	AF	Boeing
RB-47K	Same	AF	Boeing
RB-47K	R-47K	AF	Boeing
TB-50D	Same	AF	Boeing
WB-50D	Same	AF	Boeing
RB-50F	Same	AF	Boeing
KB-50	Same	AF	Boeing
KB-50K	Same	AF	Boeing
B-52A	Same	AF	Boeing
B-52B	Same	AF	Boeing
B-52C	Same	AF	Boeing
B-52D	Same	AF	Boeing
B-52E	Same	AF	Boeing
B-52F	Same	AF	Boeing
B-52G	Same	AF	Boeing
B-52H	Same	AF	Boeing
B-57A	Same	AF	Martin
RB-57A	Same	AF	Martin
B-57B	Same	AF	Martin
RB-57B	Same	AF	Martin
B-57C	Same	AF	Martin
TB-57C	Same	AF	Martin

MILITARY

BOMBER SERIES

Current	Former	Service	Manufacturer
RB-57D	Same	AF	Martin
RB-57D	Same	AF	Martin
B-57E	Same	AF	Martin
TB-57E	Same	AF	Martin
B-58A	Same	AF	GD/Ft. Worth
YRB-58A	Same	AF	GD/Ft. Worth
TB-58A	Same	AF	GD/Ft. Worth
RB-66A	Same	AF	Douglas
RB-66B	Same	AF	Douglas
RB-66C	Same	AF	Douglas
B-66D	Same	AF	Douglas
WB-66D	Same	AF	Douglas
B-66E	Same	AF	Douglas
XB-70A	XB-70	AF	North American

CARGO/TRANSPORT SERIES

Current	Former	Service	Manufacturer
C-45G	Same	AF	Beech
C-45H	Same	AF	Beech
RC-45H	Same	AF	Beech
TC-45H	Same	AF	Beech
RC-45J	SNB-5P	Navy	Beech
TC-45J	SNB-5	Navy	Beech
C-46A	Same	AF	Curtiss
C-46D	Same	AF	Curtiss
TC-46D	Same	AF	Curtiss
C-47A	Same	AF	Douglas
C-47H	R4D-5	Navy	Douglas
EC-47H	R4D-5Q	Navy	Douglas
HC-47A	SC-47A	AF	Douglas
LC-47H	R4D-5L	Navy	Douglas
RC-47A	Same	AF	Douglas
SC-47H	R4D-5S	Navy	Douglas
TC-47H	R4D-5R	Navy	Douglas
VC-47A	Same	AF	Douglas
VC-47H	R4D-5Z	Navy	Douglas
C-47J	R4D-6	Navy	Douglas
EC-47J	R4D-6Q	Navy	Douglas
LC-47J	R4D-6L	Navy	Douglas
SC-47J	R4D-6S	Navy	Douglas
TC-47J	R4D-6R	Navy	Douglas

AEROSPACE FACTS AND FIGURES, 1963

Current	Former	Service	Manufacturer
VC-47J	R4D-6Z	Navy	Douglas
VC-47B	Same	AF	Douglas
C-47D	Same	AF	Douglas
EC-47D	AC-47D	AF	Douglas
HC-47D	SC-47D	AF	Douglas
RC-47D	Same	AF	Douglas
TC-47D	Same	AF	Douglas
VC-47D	Same	AF	Douglas
C-47E	Same	AF	Douglas
TC-47K	R4D-7	Navy	Douglas
C-54A	Same	AF	Douglas
VC-54N	R5D-1Z	Navy	Douglas
C-54P	R5D-2	Navy	Douglas
VC-54P	R5D-2Z	Navy	Douglas
C-54D	Same	AF	Douglas
C-54Q	R5D-3	Navy	Douglas
EC-54D	AC-54D	AF	Douglas
HC-54D	SC-45D	AF	Douglas
TC-54D	Same	AF	Douglas
VC-54D	Same	AF	Douglas
VC-54Q	R5D-3Z	Navy	Douglas
RC-54V	R5D-3	Navy (C.G.)	Douglas
C-54E	Same	AF	Douglas
C-54R	R5D-4R	Navy	Douglas
EC-54U	R5D-4	Navy (C.G.)	Douglas
C-54G	Same	AF	Douglas
C-54S	R5D-5	Navy	Douglas
VC-54G	Same	AF	Douglas
VC-54S	R5D-5Z	Navy	Douglas
C-54M	Same	AF	Douglas
C-54T	R5D-5R	Navy	Douglas
C-97A	Same	AF	Boeing
C-97C	Same	AF	Boeing
C-97D	Same	AF	Boeing
VC-97D	Same	AF	Boeing
KC-97F	Same	AF	Boeing
KC-97G	Same	AF	Boeing
C-97J	Same	AF	Boeing
C-117A	Same	AF	Douglas
C-117D	R4D-8	Navy	Douglas
LC-117D	R4D-8L	Navy	Douglas
VC-117A	Same	AF	Douglas
VC-117D	R4D-8Z	Navy	Douglas
C-117B	Same	AF	Douglas
VC-117B	Same	AF	Douglas
C-117C	Same	AF	Douglas

MILITARY

Current	Former	Service	Manufacturer
C-118A	Same	AF	Douglas
C-118B	R6D-1	Navy	Douglas
VC-118A	Same	AF	Douglas
VC-118B	R6D-1Z	Navy	Douglas
C-119J	MC-119	AF	Fairchild
C-119C	Same	AF	Fairchild
C-119F	R4Q-2	Navy	Fairchild
C-119G	Same	AF	Fairchild
C-119J	Same	AF	Fairchild
C-121A	Same	AF	Lockheed
C-121C	Same	AF	Lockheed
C-121J	R7V-1	Navy	Lockheed
TC-121C	Same	AF	Lockheed
EC-121K	WV-2	Navy	Lockheed
YEC-121K	Y/WV-2	Navy	Lockheed
RC-121D	Same	AF	Lockheed
WC-121N	WV-3	Navy	Lockheed
RC-121E	Same	AF	Lockheed
VC-121E	Same	AF	Lockheed
C-121G	Same	AF	Lockheed
EC-121H	Same	AF	Lockheed
EC-121L	WV-2E	Navy	Lockheed
EC-121M	WV-2Q	Navy	Lockheed
C-123B	Same	AF	Fairchild
C-123H	Same	AF	Fairchild
C-124A	Same	AF	Douglas
TC-117D	R4D-8T	Navy	Douglas
C-124C	Same	AF	Douglas
C-130A	Same	AF	Lockheed
C-130A	GC-130A	AF	Lockheed
RC-130A	Same	AF	Lockheed
C-130B	Same	AF	Lockheed
C-130F	GV-1U	Navy	Lockheed
HC-130B	SC-130B	AF	Lockheed
HC-130G	SC-130B	Navy (C.G.)	Lockheed
KC-130F	GV-1	Navy	Lockheed
LC-130F	C-130BL	Navy	Lockheed
C-130D	Same	AF	Lockheed
C-130E	Same	AF	Lockheed
HC-130E	SC-130E	AF	Lockheed
C-131A	Same	AF	GD/Convair
VC-131A	Same	AF	GD/Convair
C-131B	Same	AF	GD/Convair
C-131D	Same	AF	GD/Convair
C-131F	R4Y-1	Navy	GD/Convair

AEROSPACE FACTS AND FIGURES, 1963

Current	Former	Service	Manufacturer
C-131E	Same	AF	GD/Convair
C-131G	R4Y-2	Navy	GD/Convair
C-133A	Same	AF	Douglas
C-133B	Same	AF	Douglas
RC-135A	Same	AF	Boeing
C-135A	Same	AF	Boeing
KC-135A	Same	AF	Boeing
C-135B	Same	AF	Boeing
VC-137A	Same	AF	Boeing
VC-137C	Same	AF	Boeing
C-140A	Same	AF	Lockheed
C-140B	Same	AF	Lockheed
VC-140B	Same	AF	Lockheed
C-140C	UV-1	Navy	Lockheed
C-141A	Same	AF	Lockheed
XC-142A	Same	AF	Vought-Hiller-Ryan

After the 142A Series design numbers for cargo aircraft will start over with 1A. Following are new assignments made under new series of numbers:

C-1A	TF-1	Navy	Grumman
EC-1A	TF-1Q	Navy	Grumman
C-2A	New	Navy	Grumman

SPECIAL ELECTRONIC INSTALLATION SERIES

Current	Former	Service	Manufacturer
E-1B	WF-2	Navy	Grumman
E-2A	W2F-1	Navy	Grumman

FIGHTER SERIES

Current	Former	Service	Manufacturer
F-80C	Same	AF	Lockheed
F-84F	Same	AF	Republic
RF-84F	Same	AF	Republic
F-84G	Same	AF	Republic
F-86D	Same	AF	North American
F-86F	Same	AF	North American
F-86H	Same	AF	North American

MILITARY

Current	Former	Service	Manufacturer
F-86L	Same	AF	North American
F-89D	Same	AF	Northrop
F-89H	Same	AF	Northrop
F-89J	Same	AF	Northrop
F-100A	Same	AF	North American
F-100C	Same	AF	North American
DF-100C	Same	AF	North American
F-100D	Same	AF	North American
F-100F	Same	AF	North American
DF-100F	Same	AF	North American
F-101A	Same	AF	McDonnell
YRF-101A	Same	AF	McDonnell
RF-101A	Same	AF	McDonnell
F-101B	Same	AF	McDonnell
TF-101B	Same	AF	McDonnell
F-101C	Same	AF	McDonnell
RF-101C	Same	AF	McDonnell
F-101F	Same	AF	McDonnell
TF-101F	Same	AF	McDonnell
F-102A	Same	AF	GD/Convair
TF-102A	Same	AF	GD/Convair
YF-102C	Same	AF	GD/Convair
F-104A	Same	AF	Lockheed
CF-104A	Same	AF	Lockheed
F-104B	Same	AF	Lockheed
F-104C	Same	AF	Lockheed
F-104D	Same	AF	Lockheed
F-104G	Same	AF	Lockheed
RF-104G	Same	AF	Lockheed
TF-104G	Same	AF	Lockheed
F-104J	Same	AF	Lockheed
TF-104J	Same	AF	Lockheed
F-105B	Same	AF	Republic
F-105D	Same	AF	Republic
F-106A	Same	AF	GD/Convair
F-106B	Same	AF	GD/Convair
YF-106C	Same	AF	GD/Convair
F-111A	TFX	AF	GD/Convair
F-111B	TFX	Navy	GD/Convair-Grumman

After the F-111 design numbers for fighter aircraft will start over with -1. Following are new assignments made under new series of numbers:

AEROSPACE FACTS AND FIGURES, 1963

Current	Former	Service	Manufacturer
F-1C	FJ-3	Navy	North American
DF-1C	FJ-3D	Navy	North American
MF-1C	FJ-3M	Navy	North American
DF-1D	FJ-3D2	Navy	North American
YF-1E	Y/FJ-4	Navy	North American
F-1E	FJ-4	Navy	North American
YAF-1E	YFJ-4B	Navy	North American
AF-1E	FJ-4B	Navy	North American
F-2C	F2H-3	Navy	McDonnell
F-2D	F2H-4	Navy	McDonnell
YF-3B	Y/F3H-2	Navy	McDonnell
F-3B	F3H-2	Navy	McDonnell
MF-3B	F3H-2M	Navy	McDonnell
F-3C	F3H-2N	Navy	McDonnell
F-4A	F4H-1F	Navy	McDonnell
F-4B	F4H-1	Navy	McDonnell
RF-4B	F4H-1P	Navy	McDonnell
F-4C	F-110A	AF	McDonnell
RF-4C	RF-110A	AF	McDonnell
F-5A	N-156	AF	Northrop
F-5B	N-156	AF	Northrop
YF-6A	Y/F4D-1	Navy	Douglas
F-6A	F4D-1	Navy	Douglas
YF-7A	Y/F2Y-1	Navy	GD/Convair
YF-8A	Y/F8U-1	Navy	Chance Vought
F-8A	F8U-1	Navy	Chance Vought
DF-8A	F8U-1D	Navy	Chance Vought
QF-8A	F8U-1KD	Navy	Chance Vought
YRF-8A	Y/F8U-1P	Navy	Chance Vought
RF-8A	F8U-1P	Navy	Chance Vought
TF-8A	F8U-1T	Navy	Chance Vought
F-8B	F8U-1E	Navy	Chance Vought
YF-8C	Y/F8U-2	Navy	Chance Vought
F-8C	F8U-2	Navy	Chance Vought
YF-8D	Y/F8U-2N	Navy	Chance Vought
F-8D	F8U-2N	Navy	Chance Vought
YF-8E	Y/F8U-2NE	Navy	Chance Vought
F-8E	F8U-2NE	Navy	Chance Vought
DF-9E	F9F-5KD	Navy	Grumman
F-9F	F9F-6	Navy	Grumman
DF-9F	F9F-6D	Navy	Grumman
QF-9F	F9F-6K	Navy	Grumman
QF-9G	F9F-6K2	Navy	Grumman
F-9H	F9F-7	Navy	Grumman
F-9J	F9F-8	Navy	Grumman
YAF-9J	Y/F9F-8B	Navy	Grumman

MILITARY

Current	Former	Service	Manufacturer
AF-9J	F9F-8B	Navy	Grumman
YTF-9J	Y/F9F-8T	Navy	Grumman
TF-9J	F9F-8T	Navy	Grumman
RF-9J	F9F-8P	Navy	Grumman
F-10A	F3D-1	Navy	Douglas
F-10B	F3D-2	Navy	Douglas
EF-10B	F3D-2Q	Navy	Douglas
MF-10B	F3D-2M	Navy	Douglas
TF-10B	F3D-2T2	Navy	Douglas
YF-11A	Y/F11F-1	Navy	Grumman
F-11A	F11F-1	Navy	Grumman

HELICOPTER SERIES

Current	Former	Service	Manufacturer
UH-1	HU-1	Army	Bell
UH-1A	HU-1A	Army	Bell
UH-1B	HU-1B	Army	Bell
UH-1D	HU-1D	Army	Bell
UH-1E	HU-1E	Navy	Bell
UH-1F	HX-1	AF	Bell
UH-2A	HU2K-1	Navy	Kaman
UH-2B	HU2K-1U	Navy	Kaman
YSH-3A	Y/HSS-2	Navy	Sikorsky
SH-3A	HSS-2	Navy	Sikorsky
VH-3A	HSS-2Z	Navy	Sikorsky
OH-4A	HO-4	Army	Bell
OH-5A	HO-5	Army	Hiller
OH-6A	HO-6	Army	Hughes
OH-13E	H-13E	Army	Bell
OH-13G	H-13G	Army	Bell
OH-13H	H-13H	Army	Bell
UH-13H	H-13H	AF	Bell
UH-13J	H-13J	AF	Bell
OH-13K	H-13K	Army	Bell
TH-13L	HTL-4	Navy	Bell
TH-13M	HTL-6	Navy	Bell
TH-13N	HTL-7	Navy	Bell
UH-13P	HUL-1	Navy	Bell
HH-13Q	HUL-1G	Navy (C.G.)	Bell
UH-13R	HUL-1M	Navy	Bell
UH-19B	H-19B	AF	Sikorsky
HH-19B	SH-19B	AF	Sikorsky
UH-19C	H-19C	Army	Sikorsky
UH-19D	H-19D	Army	Sikorsky

AEROSPACE FACTS AND FIGURES, 1963

Current	Former	Service	Manufacturer
CH-19E	HRS-3	Navy	Sikorsky
UH-19F	HO4S-3	Navy	Sikorsky
HH-19G	HO4S-3G	Navy (C.G.)	Sikorsky
CH-21A	H-21A	AF	Boeing-Vertol
CH-21B	H-21B	AF	Boeing-Vertol
CH-21B	H-21B	Army	Boeing-Vertol
HH-21B	SH-21B	AF	Boeing-Vertol
CH-21C	H-21C	Army	Boeing-Vertol
OH-23B	H-23B	Army	Hiller
OH-23C	H-23C	Army	Hiller
OH-23D	H-23D	Army	Hiller
OH-23F	H-23F	Army	Hiller
UH-25B	HUP-2	Navy	Boeing-Vertol
UH-25C	HUP-3	Navy	Boeing-Vertol
XH-33A	Same	AF	Sikorsky
CH-34A	H-34A	Army	Sikorsky
CH-34C	H-34C	Army	Sikorsky
LH-34D	HYS-1L	Navy	Sikorsky
YSH-34G	Y/HSS-1	Navy	Sikorsky
SH-34G	HSS-1	Navy	Sikorsky
UH-34D	HUS-1	Navy	Sikorsky
VH-34D	HUS-1Z	Navy	Sikorsky
UH-34E	HUS-1A	Navy	Sikorsky
HH-34F	HUS-1G	Navy (C.G.)	Sikorsky
SH-34H	HSS-1F	Navy	Sikorsky
YSH-34J	Y/HSS-1N	Navy	Sikorsky
SH-34J	HSS-1N	Navy	Sikorsky
CH-37A	H-37A	Army	Sikorsky
CH-37B	H-37B	Army	Sikorsky
CH-37C	HR2S-1	Navy	Sikorsky
XH-40A	Same	AF	Bell
NH-41A	YH-41	Army	Cessna
UH-41A	H-41	AF	Cessna
HH-43A	H-43A	AF	Kaman
HH-43B	H-43B	AF	Kaman
UH-43C	HUK-1	Navy	Kaman
OH-43D	HOK-1	Navy	Kaman
CH-46A	HRB-1	Navy	Boeing-Vertol
XCH-46B	HX/H-2	AF	Boeing-Vertol
CH-46C	HC-1A	Army	Boeing-Vertol
CH-47A	HC-1B	Army	Boeing-Vertol
QH-50A	DSN-1	Navy	Gyrodyne
QH-50B	DSN-2	Navy	Gyrodyne
QH-50C	DSN-3	Navy	Gyrodyne
XH-51A	New	Navy	Lockheed
CH-53A	New	USMC	Sikorsky

MILITARY

OBSERVATION SERIES

Current	Former	Service	Manufacturer
O-1A	L-19A	Army	Cessna
O-1B	OE-1	Navy	Cessna
O-1C	OE-2	Navy	Cessna
TO-1D	TL-19D	Army	Cessna
O-1E	L-19E	Army	Cessna

NOTE: Future new observation aircraft will be designated starting with Design No. -2A.

PATROL SERIES

Current	Former	Service	Manufacturer
P-2D	P2V-4	Navy	Lockheed
P-2E	P2V-5F	Navy	Lockheed
DP-2E	P2V-5FD	Navy	Lockheed
EP-2E	P2V-5FE	Navy	Lockheed
SP-2E	P2V-5FS	Navy	Lockheed
P-2F	P2V-6	Navy	Lockheed
MP-2F	P2V-6M	Navy	Lockheed
TP-2F	P2V-6T	Navy	Lockheed
P-2G	P2V-6F	Navy	Lockheed
YP-2H	Y/P2V-7	Navy	Lockheed
P-2H	P3V-7	Navy	Lockheed
SP-2H	P2V-7S	Navy	Lockheed
LP-2J	P2V-7LP	Navy	Lockheed
YP-3A	Y/P3V-1	Navy	Lockheed
P-3A	P3V-1	Navy	Lockheed
QP-4B	P4Y-2K	Navy	GD/Convair
P-5A	P5M-1	Navy	Martin
SP-5A	P5M-1S	Navy	Martin
TP-5A	P5M-1T	Navy	Martin
P-5B	P5M-2	Navy	Martin
SP-5B	P5M-2S	Navy	Martin

ANTI-SUB SERIES

S-2A	S2F-1	Navy	Grumman
YS-2A	Y/S2F-1	Navy	Grumman
TS-2A	S2F-1T	Navy	Grumman
S-2B	S2F-1S	Navy	Grumman
S-2C	S2F-2	Navy	Grumman
RS-2C	S2F-2P	Navy	Grumman

AEROSPACE FACTS AND FIGURES, 1963

Current	Former	Service	Manufacturer
S-2D	S2F-3	Navy	Grumman
S-2E	S2F-3S	Navy	Grumman

TRAINER SERIES

T-1A	T2V-1	Navy	Lockheed
YT-2A	Y/T2J-1	Navy	North American
T-2A	T2J-1	Navy	North American
T-2B	T2J-2	Navy	North American
T-28A	Same	Navy	North American
T-28A	Same	AF	North American
T-28B	Same	Navy	North American
T-28B	Same	AF	North American
DT-28B	T-28BD	Navy	North American
T-28C	Same	Navy	North American
T-29A	Same	AF	GD/Convair
VT-29A	Same	AF	GD/Convair
T-29B	Same	AF	GD/Convair
VT-29B	Same	AF	GD/Convair
T-29C	Same	AF	GD/Convair
VT-29C	Same	AF	GD/Convair
T-29D	Same	AF	GD/Convair
VT-29D	Same	AF	GD/Convair
ET-29C	AT-29C	AF	GD/Convair
T-33A	Same	AF	Lockheed
DT-33A	Same	AF	Lockheed
RT-33A	Same	AF	Lockheed
WT-33A	Same	AF	Lockheed
T-33B	TV-2	Navy	Lockheed
DT-33B	TV-2D	Navy	Lockheed
DT-33C	TV-2KD	Navy	Lockheed
T-34B	Same	Navy	Cessna
YT-34B	Same	Navy	Cessna
T-34A	Same	AF	Cessna
T-37A	Same	AF	Cessna
T-37B	Same	AF	Cessna
T-38A	Same	AF	Cessna
YT-38A	Same	AF	Cessna
T-39A	Same	AF	Cessna
T-39B	Same	AF	Cessna
T-39D	T3J-1	Navy	North American

UTILITY SERIES

U-1A	Same	Army	de Havilland
U-1B	UC-1	Navy	de Havilland
U-2A	Same	AF	Lockheed
U-3A	Same	AF	Cessna
U-3B	Same	AF	Cessna

Current	Former	Service	Manufacturer
U-4A	Same	AF	Aero Commander
U-4B	Same	AF	Aero Commander
U-6A	L-20A	AF	de Havilland
U-6A	L-20A	Navy	de Havilland
U-6A	L-20A	Army	de Havilland
U-7A	L-21	AF	Piper
U-8D	L-23D	Army	Beech
RU-8D	RL-23D	Army	Beech
U-8E	L-23E	Army	Beech
U-8F	L-23F	Army	Beech
U-9B	L-26B	Army	Aero Commander
U-9C	L-26C	Army	Aero Commander
RU-9D	RL-26D	Army	Aero Commander
U-10A	L-28A	AF	Helio
U-11A	UO-1	Navy	Piper
HU-16A	SA-16A	AF	Grumman
HU-16B	SA-16B	AF	Grumman
HU-16C	UF-1	Navy	Grumman
LU-16C	UF-1L	Navy	Grumman
TU-16C	UF-1T	Navy	Grumman
HU-16D	UF-2	Navy	Grumman
HU-16E	UF-2G	Navy (C.G.)	Grumman

VTOL & STOL SERIES

OV-1A	AO-1A	Army	Grumman
OV-1B	AO-1B	Army	Grumman
OV-1C	AO-1C	Army	Grumman
CV-2A	AC-1	Army	de Havilland
CV-2B	AC-1A	Army	de Havilland
XV-3A	None	Army	Bell
XV-4A	VZ-10	Army	Lockheed
XV-5A	VZ-11	Army	GE/Ryan
XV-6A	VZ-12	Army	Hawker
CV-7A	AC-2	Army	de Havilland

RESEARCH SERIES

X-15A	X-15	AF	North American
X-19A	X-19	AF	Curtiss Wright
X-20A	X-20	AF	Boeing
X-21A	X-21	AF	Northrop
X-22A	X-22	AF	Bell

AIRSHIP SERIES

EZ-1B	ZPG-2W	Navy	Goodyear
SZ-1B	ZPG-2	Navy	Goodyear
EZ-1C	ZPG-3W	Navy	Goodyear

AIR TRANSPORTATION



The scheduled U.S. airlines attained new records in passenger and cargo operations in 1962.

Modernization of their air fleets, including a larger number of more efficient and faster jet aircraft, made a significant contribution to the carriers' achievements. Equally important were improvements on the ground, such as electronic reservation techniques.

On revenues of \$3.4 billion, the carriers earned \$54.5 million for a return of 1.6 per cent. The profit level was low, but it was a strong comeback from losses of \$37.8 million the year before.

The 1,873 aircraft operated by the airlines in 1962 topped the billion mark in miles flown. They transported 63 million passengers for a combined total of more than 43.7 billion passenger miles.

Eyeing a vast and relatively untapped source of revenue in air cargo, the carriers moved forward with strong sales campaigns. The results: Freight ton miles rose 22.5 per cent; Air express, 14.3 per cent; Air mail, 12.7 per cent, and First-class mail, which is hauled over selected routes when space in planes is available, 16.4 per cent.

AIR TRANSPORTATION

Altogether, cargo traffic of more than 1.3 billion ton miles accounted for revenue of \$362 million. With deliveries of first all-cargo jet freighters scheduled in 1963, the air cargo market outlook is excellent.

Nineteen-sixty-two was the fifth year of the civil jet age. But it was a year in which the jet air transports really took command. The pure jets and turboprops made up less than a third of the total fleets of the U.S. airline industry, but they accounted for three-quarters of all passenger miles flown.

Their role will continue to grow as carriers take delivery of 181

SHIPMENTS OF COMMERCIAL TRANSPORT AIRCRAFT
1954 TO DATE
(Fixed Wing-Multiple Engine)

Company and Aircraft	1954	1955	1956	1957	1958	1959	1960	1961	1962
TOTAL^a	191	113	206	323	216	262	245	231	160
Boeing									
707	—	—	—	—	7	73	68	11	38
720	—	—	—	—	—	—	24	61	30
Convair									
340	61	14	—	—	—	—	—	—	—
440	—	—	57	79	21	14	5	—	—
880	—	—	—	—	—	—	15	49	9
990	—	—	—	—	—	—	—	—	22
Douglas									
DC-6	41	14	39	44	65	1	—	—	—
DC-7	48	30	67	123	57	—	—	—	—
DC-8	—	—	—	—	—	21	91	42	22
Fairchild									
F-27	—	—	—	—	25	41	14	8	7
Grumman									
Gulfstream	—	—	—	—	—	—	—	19	17
Lockheed									
1049	41	55	43	42	21	5	—	—	—
1649	—	—	—	35	8	—	—	—	—
Electra	—	—	—	—	12	107	24	21	—
Jet Star	—	—	—	—	—	—	—	14	9
130	—	—	—	—	—	—	4	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: 1

more turbine-powered aircraft in 1963 and 1964. While the 600-mile-an-hour, four-engine, long-range jet liners symbolize the progress of air travel, the need is apparent for short- and medium-range aircraft to extend and fully utilize the potential of jets in speed, comfort, efficiency and economy. Hence, one U.S. aerospace manufacturer has a three-engine jet airliner in the flight-testing stage and others are working on twin jets for corporate use.

There was dramatic proof during the year of the value to national defense of a modern, ready fleet of commercial airliners. Responding swiftly to the Cuban crisis, the carriers flew 202 aircraft on special military flights and expanded their MATS airlift capacity. The airlines also moved 853,000 pounds of medical supplies in the Bay of Pigs prisoner exchange and flew most of the prisoners out of Cuba.

Airline money spent in equipment and training of personnel is immense. Maintaining their aircraft is a \$3 million daily item for carriers. A single project currently under way—the installation of distance measuring equipment for greater reliability in navigation—is costing the airlines upwards of \$20 million.

All this is geared, directly or indirectly to a primary goal: maximum safety. A steady decline in fatality rates reflects the success of this all-



AIR TRANSPORTATION

AIRCRAFT IN OPERATION BY CERTIFICATED ROUTE AIR CARRIERS^a
AS OF JANUARY 1, 1941 TO DATE

Aircraft Make and Model	1941	1959	1960	1961	1962	1963
TOTAL	411	1,895	1,850	1,867	2,104	2,047
Turbo-Jet	—	6	84	202	319	397
Boeing 707	—	6	66	91	94	117
Boeing 720	—	—	—	22	76	99
Convair 990	—	—	—	—	—	15
Convair 880	—	—	—	14	39	45
Douglas DC-8	—	—	18	75	93	101
Sud Caravelle	—	—	—	—	17	20
Turbo-Prop	—	90	213	227	261	262
Armstrong-Whitworth Argosy	—	—	—	—	7	5
Canadair CL-44	—	—	—	—	9	21
Convair 540	—	—	1	4	5	—
Fairchild F-27	—	10	34	42	44	46
Lockheed 188	—	—	96	107	126	123
Vickers Viscount	—	80	82	74	70	67
Four-Engine Piston	21	974	869	777	789	700
Boeing 307	8	—	—	—	—	—
Boeing 314	8	—	—	—	—	—
Boeing 377	—	32	21	3	—	—
Douglas DC-4	—	76	62	52	52	23
Douglas DC-6, 6A, 6B	—	362	325	301	289	258
Douglas DC-7, 7B, 7C	—	252	220	217	227	210
Lockheed 049	—	53	42	—	33	9
Lockheed 749	—	59	62	75	52	51
Lockheed 1049	—	111	109	104	112	115
Lockheed 1649	—	29	28	25	24	33
Martin 130	1	—	—	—	—	—
Sikorsky S-42B	4	—	—	—	—	—
Sikorsky VS 44	—	—	—	—	—	1
Two-Engine Piston	390	803	661	636	712	666
Boeing 247D	27	—	—	—	—	—
Convair 240	—	76	49	51	47	50
Convair 340	—	133	122	117	115	120
Convair 440	—	31	36	31	32	31
Curtiss C-46	—	87	30	42	104	98
Douglas DC-2	3	—	—	—	1	1
Douglas DC-3	325	330	305	276	301	261
Grumman G-21	—	18	15	24	18	17

(Continued on next page)

AEROSPACE FACTS AND FIGURES, 1963

AIRCRAFT IN OPERATION BY CERTIFICATED ROUTE AIR CARRIERS^a
AS OF JANUARY 4 (Continued)

Aircraft Make and Model	1941	1959	1960	1961	1962	1963
Lockheed 10	18	—	—	—	—	—
Lockheed 18	16	7	—	—	—	—
Martin 202	—	26	19	15	17	17
Martin 404	—	95	85	80	68	68
Sikorsky S-43	1	—	—	—	—	—
Other	—	—	—	—	9	3
Single-Engine Piston .	—	—	—	—	4 ^b	2
Cessna 180	—	—	—	—	—	2
Helicopters	—	22	23	25	19	20
Bell B-47D, G	—	4	5	5	1	1
Boeing V-44B	—	5	5	5	5	1
Boeing V-107	—	—	—	—	—	4
Sikorsky S-51	—	2	2	2	1	—
Sikorsky S-55	—	6	5	5	5	5
Sikorsky S-58	—	5	6	7	7	5
Sikorsky S-61	—	—	—	—	—	4
Sikorsky S-62	—	—	—	1	—	—

RECAPITULATION BY NUMBER OF ENGINES AND BY TYPE

TOTAL	411	1,895	1,850	1,867	2,104	2,047
Fixed Wing	411	1,873	1,827	1,842	2,085	2,027
Four-Engine	21	1,060	1,131	1,160	1,303	1,293
Turbo-Jet	—	6	84	202	302	377
Turbo-Prop	—	80	178	181	212	216
Piston	21	974	869	777	789	700
Twin-Engine	390	813	696	682	778	732
Turbo-Jet	—	—	—	—	17	20
Turbo-Prop	—	10	35	46	49	46
Piston	390	803	661	636	712	666
Single Engine	—	—	—	—	4	2
Piston	—	—	—	—	4	2
Helicopter	—	22	23	25	19	20
Piston	—	22	23	24	14	8
Turbine	—	—	—	1	5	12

^a Aircraft of the U. S. Certificated Route Air Carriers engaged in domestic and international operations as of the beginning of each year. Aircraft not in air carrier operations, such as those used for crew training and general utility purposes, and aircraft held for disposal are excluded.

^b Breakdown not available.

Source: 25

AIR TRANSPORTATION

out safety program. Two decades ago, there were 3.92 fatalities per 100 million passenger miles on U.S. airlines. In 1961, the rate was 0.30; last year, 0.27—third lowest in history.

Despite the relatively healthy look of industry financial figures, there were old problems and new challenges to the preeminent world position of the nation's commercial aviation. Competition from abroad continued to mount. A decade ago, U.S. carriers held a dominant 70 per cent of the passenger market between the United States and foreign countries. By last year, their share had dropped to barely half—despite the fact that six out of every ten passengers were American citizens.

A factor affecting U.S. domestic trunk carriers was the shift from first-class to coach travel, with its lower revenue yield. In the last 10 years, the percentage of passengers riding coach increased from 19.4 per cent to 65.6 per cent.

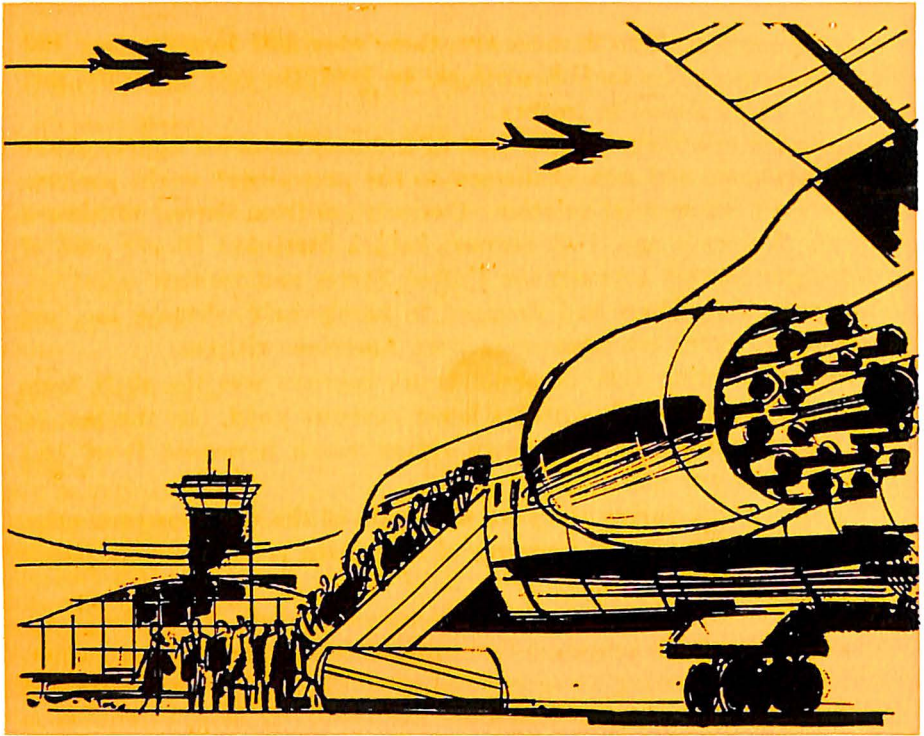
Passenger fares during the year were part of the vigorous promotion by the carriers, who offered a variety of fare plans to induce more people to travel by air.

Federal Aviation Agency Administrator Najeeb E. Halaby announced details of the proposed Government/industry supersonic transport program. Assuming Congressional support, the Government would provide 75% of the development costs for the U. S. SST, estimated at \$700,000,000 to \$1 billion; industry would be expected to provide the balance. The Government would be reimbursed by some method of royalty to be paid by air carriers purchasing the planes. The program would get under way with a design competition to be concluded about February 1964.

Halaby called for a plane with the "optimum safety-speed-economy combination," estimating the speed at "something well above Mach 2" and the range at about 4,000 statute miles. He said the prototype should be test-flying within three years after conclusion of the design competition and the SST should be available for passenger service before the end of 1970.

Administrator Halaby stated: "SST will be the standard bearer of international transportation in the 70's and 80's after it has entered service. It will be a valuable, productive machine, a generator of world travel, business and understanding."

AIR TRANSPORTATION



EMPLOYMENT, WAGES, AND AVERAGE ANNUAL EARNINGS IN THE TRANSPORTATION INDUSTRY, 1961

	ALL INDUSTRY	ALL TRANSPOR- TATION	Air Trans- porta- tion (Com- mon Car- rier)	Rail- roads	High- way Trans- porta- tion	Water, Pipe- line, and Other Trans- porta- tion
Full-Time Equivalent Employees (Thous- ands).....	57,575	2,366	167	814	1,056	329
Wages and Salaries (Million Dollars).....	\$278,821	\$14,396	\$1,197	\$5,200	\$5,954	\$1,995
Average Annual Earn- ings per Full Time Employee.....	\$ 4,843	\$6,065	\$7,168	\$6,388	\$5,613	\$6,149

Source: 9

AIR TRANSPORTATION

DEVELOPMENT OF WORLD CIVIL AIR TRANSPORT^a
(Revenue Traffic, Scheduled Services, International and Domestic)
1919 TO DATE
(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.	130	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	1,000	42	22,000	625	160
1953	1,195	52	28,500	710	185
1955	1,425	68	38,000	890	255
1956	1,580	77	44,000	1,015	275
1957	1,760	85	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	1,495	415
1961	1,940	111	72,500	1,700	490
1962	2,030	123	80,500	2,005	545

N.A.—Not available.

^a Excludes China (mainland) and the USSR.

Source: 29

DEVELOPMENT OF UNITED STATES CIVIL AIR TRANSPORT
Certificated Route Air Carriers
(Scheduled Services—International and Domestic)
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

^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: 8

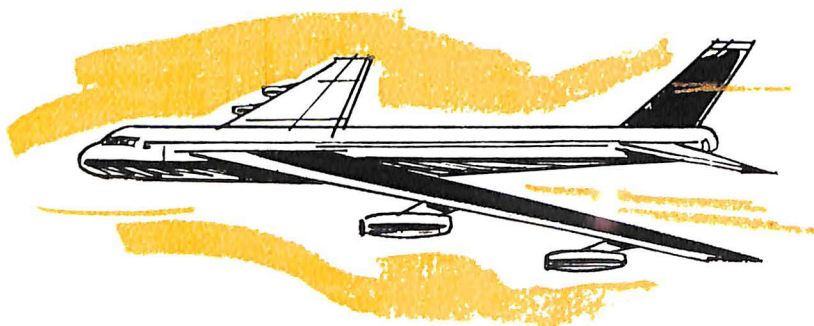
AEROSPACE FACTS AND FIGURES, 1963

U. S. DOMESTIC AND INTERNATIONAL SCHEDULED AIRLINES
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	5,698	10,138.0

NOTE: Passenger originations only.
N.A.—Not available.
Source: 8



AIR TRANSPORTATION

AIR VS. RAILROAD PASSENGER TRAVEL 1937 TO DATE (Passenger Miles in Billions)

Year	Domestic Air Carriers			Railroads (excluding Commutation)		
	TOTAL	Scheduled	Non-Scheduled	TOTAL	Pullman	Coach
1937	.4	.4	—	21.6	9.2	12.4
1938	.5	.5	—	18.5	8.3	10.2
1939	.7	.7	—	19.6	8.5	11.1
1940	1.1	1.1	—	20.7	8.2	12.5
1941	1.4	1.4	—	26.2	10.1	16.1
1942	1.4	1.4	—	50.0	19.1	30.9
1943	1.6	1.6	—	83.8	25.9	57.9
1944	2.2	2.2	—	91.7	28.3	63.4
1945	3.4	3.4	—	86.7	27.3	59.4
1946	5.9	5.9	—	59.7	20.7	39.0
1947	6.1	6.1	—	41.2	13.5	27.7
1948	6.0	6.0	—	36.5	12.2	24.3
1949	6.9	6.8	.1	30.8	10.5	20.3
1950	8.0	8.0	^a	26.6	9.2	17.4
1951	10.7	10.6	.1	29.4	9.9	19.5
1952	12.7	12.6	.1	29.1	9.3	19.8
1953	14.9	14.8	.1	27.2	8.2	19.0
1954	17.0	16.8	.2	25.0	7.3	17.7
1955	20.1	19.9	.2	24.2	6.9	17.3
1956	22.9	22.4	.5	23.7	6.6	17.1
1957	26.3	25.4	.9	21.0	5.2	15.9
1958	26.1	25.4	.7	18.4	4.2	14.2
1959	29.8	29.3	.5	17.6	3.8	13.8
1960	31.1	30.6	.5	17.0	3.6	13.4
1961	31.6	31.1	.5	16.2	3.3	12.9
1962	34.3	33.6	.7	16.4 ^F	3.2 ^E	13.2 ^E

^a Less than 50 million passenger miles.

^F Estimate.

Sources: 8, 30

AEROSPACE FACTS AND FIGURES, 1963

THE TEN LEADING PASSENGER TRANSPORT COMPANIES
(Millions of Passenger Miles^a)

1962	1954
United Air Lines 7,848	Pennsylvania Railroad 3,447
American Airlines 6,359	American Airlines 3,372
Trans World Airlines 4,425	United Air Lines 3,135
Eastern Air Lines 3,521	New York Central System 3,041
Delta Air Lines 2,744	Eastern Air Lines 2,847
Pennsylvania Railroad 1,865	Trans World Airlines 2,611
Atchison, Topeka & Santa Fe Railway System 1,697	Atchison, Topeka & Santa Fe Railway System 1,948
National Airlines 1,516	Union Pacific Railroad Com- pany 1,459
New York Central System 1,490	Southern Pacific Company 1,342
Northwest Airlines 1,441	New York, New Haven & Hart- ford Railroad Company 1,274

^a Excludes commuters and multiple ride passengers.
NOTE: Data do not include foreign operations of the airlines.
Sources: 8, 30

AVERAGE REVENUE PER PASSENGER-MILE, 1926 TO DATE
(Cents)

Year	AIRLINES		RAILROAD		INTER- CITY BUS
	Domestic Scheduled	Domestic Non- Scheduled	Coach (Excluding Commuter)	Parlor Car and Sleeping Car ^a	
1926	12.0	—	3.35	N.A.	2.96
1937	5.6	—	1.80	N.A.	1.73
1947	5.1	—	2.02	2.74	1.70
1952	5.55	3.20	2.53	3.35	2.02
1953	5.45	3.20	2.53	3.38	2.06
1954	5.39	N.A.	2.50	3.35	2.08
1955	5.35	N.A.	2.47	3.31	2.06
1956	5.32	N.A.	2.56	3.39	2.13
1957	5.30	N.A.	2.71	3.68	2.29
1958	5.63	N.A.	2.76	3.75	2.43
1959	5.87	N.A.	2.77	3.84	2.59
1960	6.08	N.A.	2.80	3.88	2.70
1961	6.28	N.A.	2.86	3.96	2.69
1962	6.42	N.A.	2.84 ^b	3.98 ^b	2.71 ^b

^a Revenue figures cover railroad passenger tickets only, exclude space charges for parlor and sleeping cars.

N.A.—Not available.

^b Estimate.

Sources: 1, 3, 25, 30, 37

AIR TRANSPORTATION

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

	TOTAL	Domestic Air Carriers	Railroads ^a	Buses	Automobiles
<i>Billions of Passenger-Miles</i>					
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	31.1	20.3	19.7	692.0 ^B
1962	787.4	33.6	19.8	21.0	713.0 ^B
<i>Per Cent</i>					
1916	100.0	^b	100.0	^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	4.3	2.5	2.7	90.5

N.A.—Not available.

^B Estimate.

^a Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.

^b Negligible.

Sources: 1, 7, 8, 30, 37

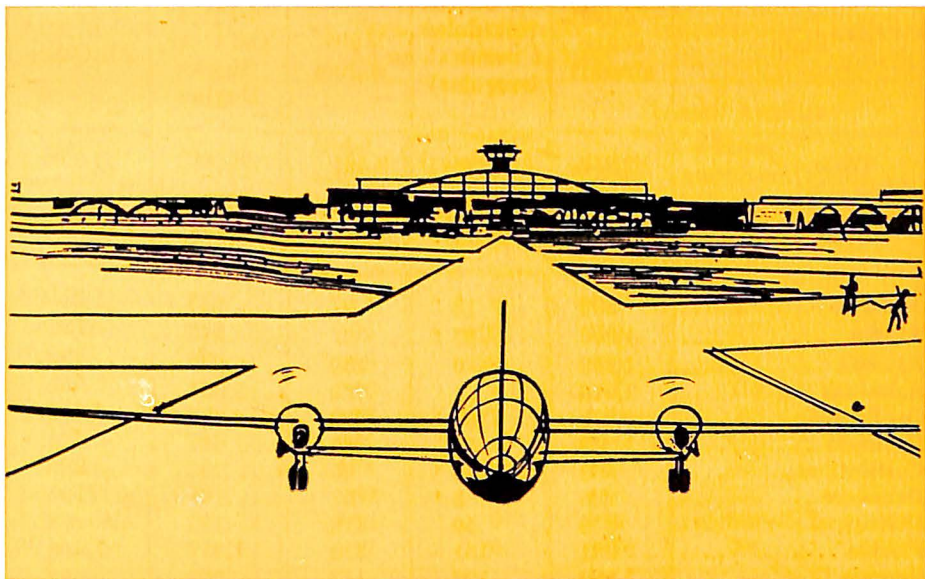
TRANSPORTATION ACCIDENT DEATH RATES
(Deaths per 100,000,000 Passenger-Miles)
1946 TO DATE

Year	Domestic Airlines	Railroads	Buses	Cars and Taxis
<i>Passenger Death Rates</i>				
1946	1.2	0.18	0.19	2.5
1947	3.2	0.16	0.21	2.3
1948	1.3	0.13	0.18	2.9
1949	1.3	0.08	0.23	2.7
1950	1.1	0.58	0.18	2.9
1951	1.3	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	0.13	2.6
1958	0.43	0.27	0.24	2.3
1959	0.69	0.05	0.17	2.3
1960	1.01	0.16	0.11	2.2
1961	0.38	0.10	0.15	2.2
1962	0.35	N.A.	N.A.	N.A.
<i>Total Death Rates^a</i>				
1946	1.8	3.2	1.4	4.0
1947	3.4	3.9	1.4	3.7
1948	1.6	4.0	1.2	3.4
1949	1.5	4.0	1.2	4.0
1950	1.3	4.7	1.1	4.2
1951	1.6	4.2	1.1	4.3
1952	0.5	3.4	1.0	4.2
1953	0.7	3.9	0.95	4.1
1954	0.1	3.4	0.82	3.7
1955	0.9	3.7	0.96	3.7
1956	0.7	3.5	0.84	3.6
1957	0.1	3.5	0.7	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	0.79	3.0
1961	0.42	4.0	0.85	2.9
1962	0.40	N.A.	N.A.	N.A.

N.A.—Not available.

^a Includes pedestrians, employees, trespassers, etc.

Source: 38



GENERAL AVIATION

Sales of business and utility aircraft by reporting manufacturers in 1962 amounted to 6,697 units with a retail value of about \$180 million.

General aviation includes all civil flying except that performed by the nation's airlines. General aviation covers transportation of corporate executives, various industrial uses, power and pipe line patrol, geophysical research, instruction in flying skills and commercial activities such as air taxi operations or special charters. Also in the general aviation category are various agricultural, forestry and ranching uses—cattle counts, fence patrol, erosion control, crop dusting and spraying. Transport of business executives remains the largest single segment of general aviation, but non-business transportation and pleasure flying is increasing.

General aviation is the largest single user of the nation's airspace and air traffic control facilities. There are about 83,000 active general aviation aircraft, according to Federal Aviation Agency forecasts, and they flew an estimated 13.3 million hours in 1962. By contrast, the airlines, which operated 2,200 transports, flew about 4.2 million hours.

In 1962, business flying involved 34,000 aircraft flying 5.5 million hours, or about 40 per cent of the general aviation total. Commercial

ACTIVE CIVIL AIRCRAFT, BY TYPE AND BY STATES AND POSSESSIONS
AS OF JANUARY 1, 1962

State	Total active aircraft	Air Carrier (scheduled and irregular)	General Aviation		
			Multi-engine	4-Place and Over Single Engine	All Other
TOTAL	82,853	2,221	8,401	38,206	34,025
U. S. TOTAL	82,682	2,214	8,360	38,131	33,977
Alabama	896	13	97	428	358
Alaska	1,506	57	87	642	720
Arizona	1,332	0	139	638	555
Arkansas	1,016	1	79	381	555
California	10,578	166	932	4,998	4,482
Colorado	1,219	53	95	637	434
Connecticut	589	0	60	233	296
Delaware	265	3	57	99	106
District of Columbia .	372	59	118	122	73
Florida	2,931	151	383	1,317	1,080
Georgia	1,286	105	117	562	502
Hawaii	108	20	13	21	54
Idaho	750	0	38	402	310
Illinois	4,050	296	440	1,957	1,357
Indiana	2,378	25	296	1,220	837
Iowa	1,784	0	103	965	716
Kansas	2,003	0	190	1,109	704
Kentucky	659	0	68	379	212
Louisiana	1,315	0	143	520	652
Maine	381	0	12	158	211
Maryland	725	0	67	330	328
Massachusetts	1,088	35	111	431	511
Michigan	3,157	25	347	1,483	1,302
Minnesota	2,330	94	157	977	1,102
Mississippi	924	0	73	339	512
Missouri	2,052	218	169	927	738
Montana	1,054	3	54	520	477
Nebraska	1,373	0	80	624	669
Nevada	497	25	67	250	155
New Hampshire	218	0	17	94	107
New Jersey	1,587	29	159	715	684
New Mexico	1,013	0	96	650	267
New York	3,729	610	459	1,300	1,360
North Carolina	1,317	21	136	566	594
North Dakota	701	0	16	222	463
Ohio	3,545	2	469	1,677	1,397
Oklahoma	1,796	0	248	832	716
Oregon	1,598	1	157	869	571
Pennsylvania	2,754	1	328	1,228	1,197
Rhode Island	138	0	17	60	61
South Carolina	541	0	48	240	253

AEROSPACE FACTS AND FIGURES, 1963

ACTIVE CIVIL AIRCRAFT, BY TYPE AND BY STATES AND POSSESSIONS—*Continued*
AS OF JANUARY 1, 1962

State	Total active aircraft	Air Carrier (scheduled and irregular)	General Aviation		
			Multi-engine	4-Place and Over Single Engine	All Other
South Dakota	873	0	24	353	496
Tennessee	999	22	129	467	381
Texas	7,038	133	969	3,331	2,605
Utah	546	0	37	319	190
Vermont	128	1	13	43	71
Virginia	944	0	84	413	447
Washington	1,956	43	84	892	937
West Virginia	469	2	58	232	177
Wisconsin	1,665	0	173	698	794
Wyoming	509	0	47	261	201
Outside U. S.	171	7	41	75	48
Puerto Rico	110	7	25	44	34
Virgin Islands	2	0	1	1	0
Other	59	0	15	30	14

Source: 25

flying (2.4 million hours) represented 18 per cent and flight instruction (1.9 million hours) accounted for 15 per cent. The remaining 27 per cent (3.5 million hours) was personal or leisure flying. This pleasure flying increased more than 50 per cent over the past five years and a comparable 50 per cent increase is anticipated in the next half-decade.

Although AIA's Utility Airplane Council does not tabulate data on executive aircraft weighing more than 12,500 pounds, FAA does incorporate them in its statistic of 85,000 aircraft. These planes are essentially identical to those used by the airlines but are fitted with executive interiors. Approximately 2,200 of these airline-type transports are in the general aviation fleet, including some 150 powered by turboprop and jet engines.

FAA studies indicate there are about 8,200 multi-engine planes, 38,000 with single engines capable of carrying four or more and the remaining 35,493 are smaller single-engine aircraft. Most of the planes in the general aviation fleet are equipped to fly under IFR (Instrument Flight Rule) conditions.

AEROSPACE FACTS AND FIGURES, 1963

UTILITY AIRCRAFT, FACTORY SHIPMENTS,^a 1962

(As reported to Aerospace Industries Association by selected manufacturers)

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
Aero Commander		
Model 500A, B	62	
Model 560F	18	\$ 10,846
Model 680F	36	
Model 680FP	5	
Beech		
Super 18	34	
Queen Air 80	61	
Queen Air 65	19	
Twin Bonanza (50)	30	37,359
Baron (55)	163	
Travel Air (95)	30	
Bonanza (35)	202	
Musketeer (23)	134	
MS 760	1	
Debonair (33)	156	
Cessna		
150	331	
172	877	
P172	12	
175	50	
180	122	50,181
182	824	
185	229	
205	165	
210	281	
310	169	
320	64	
Champion		
Traveler (7EC)	6	
Tri Traveler (7FC)	3	
Challenger (7GCB)	75	683
Agricultural (7GCBA)	4	
DX'er (7HC)	3	
Lake Aircraft		
LA-4	5	101
Mooney		
Mark 20	387	5,525

AIR TRANSPORTATION

UTILITY AIRCRAFT, FACTORY SHIPMENTS,^a 1962

(As reported to Aerospace Industries Association by selected manufacturers)

Manufacturer and Model	Complete Aircraft Number	Manufacturers Net Billing Price (Thousands of Dollars)
Piper		
Super Cub PA-18	141	
Colt PA-22	333	
Apache PA-23-160	25	
Apache PA-23-235	19	
Aztec PA-23-250	272	32,142
Comanche PA-24-180	87	
Comanche PA-24-250	293	
Pawnee PA-25-150	73	
Pawnee PA 25-235	224	
Cherokee PA-28-150	97	
Cherokee PA-28-160	410	
Cherokee PA-28-180	165	
TOTAL	6,697	\$136,837

NOTE: The totals shown here may vary from FAA figures because they are based on selected reports only.

^a Excludes aircraft shipped to the military, helicopters and gliders.

Source: 1



AEROSPACE FACTS AND FIGURES, 1963

ANNUAL SHIPMENTS OF UTILITY AIRCRAFT, 1947 TO DATE^a
(As reported to Aerospace Industries Association by selected manufacturers)

Year	TOTAL	Aero Com- mand- er	Beech	Cess- na	Cham- pion	Moon- ey	Piper	All Other Man- ufac- turers
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
MANUFACTURERS 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	3,637	28,889	372
1962	136,837	10,846	37,359	50,181	683	5,525	32,142	101

N.A.—Not available.

^aThe totals shown here may vary from FAA figures because they are based on reports by selected manufacturers only. FAA totals for all civil aircraft including commercial transport aircraft are shown on page 7.

Source: 1

AIR TRANSPORTATION

CERTIFICATED CIVIL PILOTS, STUDENT PILOTS AND FLYING SCHOOLS, 1927 TO DATE

As of December 31	Certificated Airplane Pilots				Student Pilot Approvals During Year	Certified Civil Flying Schools
	TOTAL PILOTS	Airline Transport	Commercial	Private		
1927	1,572	"	N.A.	N.A.	545	—
1930	15,280	"	7,843	7,433	18,398	39
1935	14,805	736	7,362	6,707	14,572	24
1940	69,829	1,431	18,791	49,607	110,938	749
1945	296,895	5,815	162,873	128,207	77,188	964
1951	580,574	10,813	197,900	371,861	45,003	1,625
1952	581,218	11,357	193,575	376,286	30,537	1,280
1953	585,974	12,757	195,363	377,854	37,397	1,093
1954	613,695	13,341	201,441	398,913	43,393	1,035
1955	643,201	13,700	211,142	418,359	44,354	902
1956	669,079	15,295	221,096	432,688	45,036	809
1957	702,519	16,900	237,149	448,470	76,850	814
1958	731,078	18,303	245,541	467,234	58,107	847
1959	758,368	19,364	255,377	483,627	67,618	855
1960	783,232	20,985	262,437	499,810	51,465	843
1961	804,707	22,042	268,707	513,958	57,230	865

N.A.—Not available.

* Airline Transport Rating became effective May 5, 1932.

Sources: 3, 25

TOTAL AIRCRAFT OPERATIONS^a IN THE UNITED STATES AT FAA AIRPORT AIR TRAFFIC CONTROL TOWERS 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

^a Aircraft operations are all aircraft arrivals and departures, including both instrument flights and visual flights.

Source: 26

AEROSPACE FACTS AND FIGURES, 1963

GENERAL AVIATION, HOURS, AND MILES FLOWN,
BY TYPE OF FLYING, 1931 TO DATE

Year	Total	Business		Commercial		Instructional		Personal		Other	
		Units	Per-cent	Units	Per-cent	Units	Per-cent	Units	Per-cent	Units	Per-cent
ESTIMATED HOURS FLOWN, Thousands											
1931	1,083	152	14	281	26	307	28	343	32	—	—
1936	1,059	122	12	245	23	380	36	312	29	—	—
1941	4,460	250	6	511	11	2,816	63	883	20	—	—
1946	9,788	1,068	11	943	10	5,996	61	1,686	17	95	1
1950 ^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	"
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	"
1961	12,650	5,300	42	2,450	20	1,670	13	3,160	25	70	"
1962 ^d	13,300	5,500	41	2,400	18	1,900	14	3,500	27	NA	NA
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	"
1961	1,728,000	827,000	48	316,000	18	182,000	11	395,000	23	8,000	"
1962	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

N.A.—Not available.

^a Less than .05 per cent.

^b Estimated. No survey was conducted covering the designated year.

^c Revised.

^d FAA forecast.

Source: 25

AIRCRAFT PRODUCTION

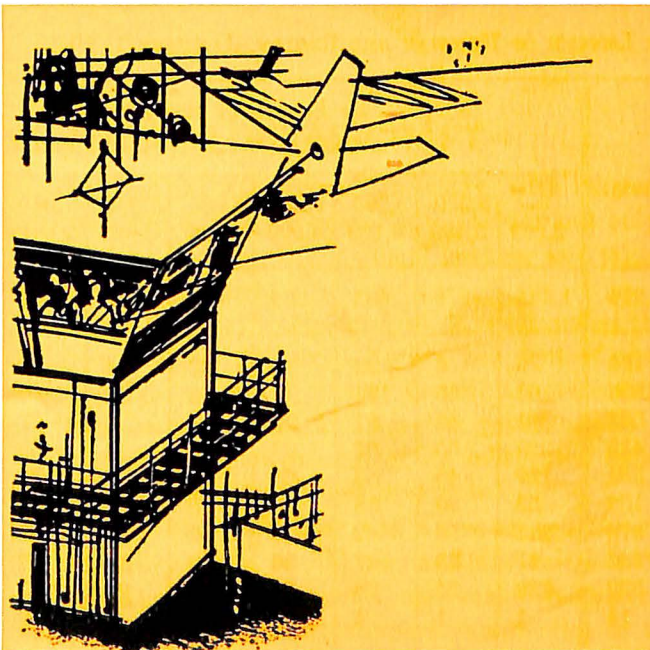
INVENTORY OF CIVIL AIRCRAFT^a, BY YEAR OF MANUFACTURE AS OF JANUARY 1, 1962

Year of Manufacture	Number	Percent of Total
TOTAL	82,853	100.0
1961	4,823	5.8
1960	5,983	7.2
1959	6,544	7.9
1958	5,153	6.2
1957	4,379	5.3
1956	5,035	6.1
1955	3,220	3.9
1954	2,013	2.4
1953	2,472	3.0
1952	2,130	2.6
1951	1,328	1.6
Prior to 1951 ^b	39,773	48.0

^a Number of active civil aircraft, commercial transport and utility, recorded with Federal Aviation Agency.

^b Includes 3,954 for which year of manufacture is unknown.

Source: 25



AEROSPACE FACTS AND FIGURES, 1963

CIVIL AIRCRAFT, 1928 TO DATE
Including Air Carrier Aircraft

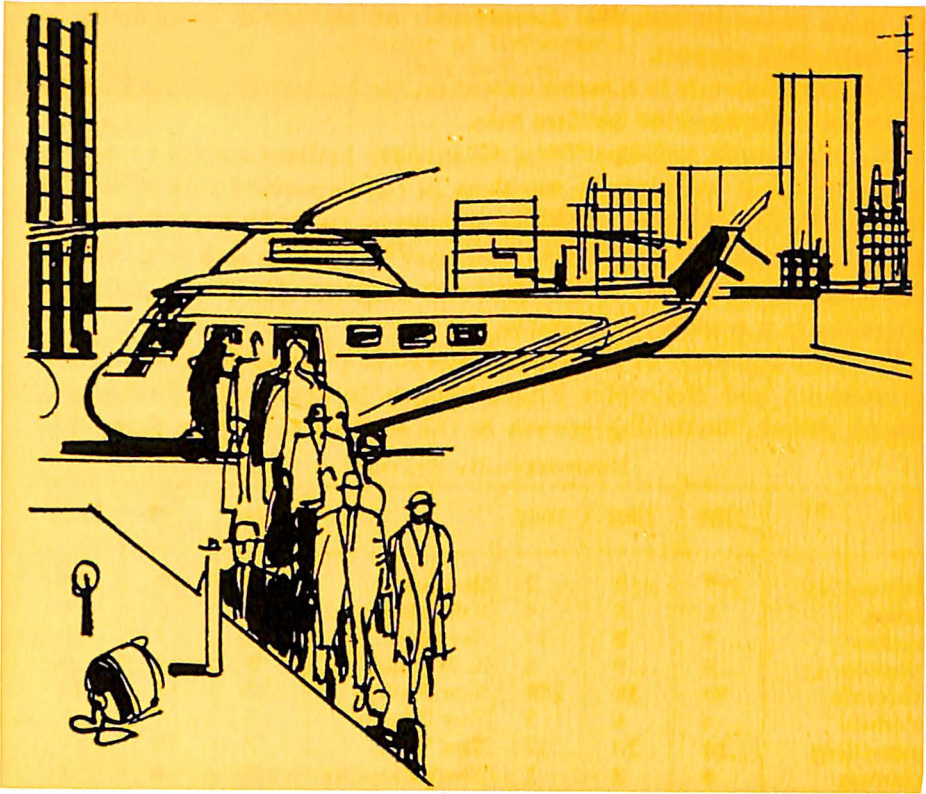
As of January 1	TOTAL	Active	Inactive
1928	2,740	N.A.	N.A.
1932	10,680	N.A.	N.A.
1935	8,322	N.A.	N.A.
1941	26,013	N.A.	N.A.
1951	92,809	60,921	31,888
1952	88,545	54,039	34,506
1955	92,067	58,994	33,073
1956	85,320	60,432	24,888
1957	87,531	64,688	22,843
1958	93,189	67,153	26,036
1959	98,893	69,718	29,175
1960	105,309	70,747	34,562
1961	111,580	78,760	32,820
1962	117,904	82,853	35,051

N.A.—Not available.
Source: 25

PUBLIC AIRPORTS BY LENGTH OF RUNWAY AND REGION, JANUARY 1, 1962

Region	TOTAL	Airports by Length of Runway (in feet)						
		0- 2,999	3,000- 3,499	3,500- 4,199	4,200- 4,999	5,000- 5,899	5,900- 6,999	7,000- & over
TOTAL	3,274	1,345	376	493	224	400	115	321
New England	156	70	9	22	10	22	4	19
Middle Atlantic	335	188	46	31	11	35	2	22
East North Central ..	563	291	85	91	22	37	6	31
West North Central ..	435	209	55	67	23	29	14	38
South Atlantic	381	139	45	53	28	76	9	31
East South Central ..	156	53	20	38	12	18	4	11
West South Central ..	376	118	56	62	42	50	12	36
Mountain	286	47	23	47	36	52	39	42
Pacific	572	229	36	78	39	80	23	87
Other	14	1	1	4	1	1	2	4

Source: 25



VERTICAL LIFT AIRCRAFT

The vertical lift aircraft industry, with 20 years of production experience, has expanded recently to include not only helicopters but also new designs of aircraft capable of landing and taking off without requiring airport runways.

Of the industry's total output, it is estimated that 90 per cent of the dollar volume is military. Eighty per cent of the helicopters sold are delivered to the U. S. armed forces; the remainder go to commercial operators, corporations and foreign governments.

The helicopter owes most of its substantial technological progress to the demands of military requirements.

Initially the helicopter was a rescue and observation vehicle but as its capability grew so did the military missions which it could serve.

The Army and Marine Corps make extensive tactical uses of the helicopter's close combat support capabilities in new vertical envelopment—techniques encompassing battlefield surveillance, troop carrying

AEROSPACE FACTS AND FIGURES, 1963

and, more recently, with the development of helicopter armament, in close battlefield support.

The Navy depends to a major extent on the helicopter for fulfillment of its vital antisubmarine warfare role.

The Air Force's principal requirements for helicopters are in utility and rescue but it has plans to use them in the important role of missile site support. The helicopter's ability to operate in limited weather from unprepared areas will enable it to transport key people and critical supplies to widely dispersed missile sites and help the Air Force maintain its missiles in a combat-ready status.

The 1963 Directory of Helicopter Operators (Commercial, Executive, Government) and Helicopter Flight Schools in the United States and Canada, reveals continuing growth in the civilian helicopter fleet. The

HELIPORTS—BY STATES

	1960	1961	1962		1960	1961	1962
Alabama	2	2	2	Montana	0	10	14
Alaska	1	3	4	Nebraska	0	2	7
Arizona	0	3	14	Nevada	8	8	11
Arkansas	0	0	1	N. Hampshire	0	1	2
California	69	89	126	New Jersey	18	18	34
Colorado	4	4	7	New Mexico	0	0	4
Connecticut	15	24	17	New York	7	10	23
Delaware	0	2	1	North Carolina	0	0	3
District of Columbia	2	2	2	North Dakota	0	2	4
Florida	4	16	28	Ohio	0	14	15
Georgia	4	6	10	Oklahoma	0	2	3
Hawaii	0	5	3	Oregon	0	0	4
Idaho	1	2	6	Pennsylvania	17	17	25
Illinois	107	108	93	Rhode Island	1	4	3
Indiana	14	16	16	South Carolina	1	1	2
Iowa	1	1	2	South Dakota	0	0	3
Kansas	0	0	1	Tennessee	4	7	11
Kentucky	1	2	2	Texas	14	17	34
Louisiana	22	21	31	Utah	1	2	6
Maine	0	7	10	Vermont	0	0	1
Maryland	6	6	17	Virginia	3	4	5
Massachusetts	1	8	21	Washington	3	5	15
Michigan	5	11	9	West Virginia	1	1	2
Minnesota	3	3	2	Wisconsin	0	7	15
Mississippi	1	1	1	Wyoming	1	1	2
Missouri	4	4	8	Canada	11	22	35
				Puerto Rico	0	4	4
				TOTALS	327	487	720

* Excludes approximately 100 oil rigs in the Gulf of Mexico and more than 225 heliports and approximately 2,500 unimproved heliports of the U.S. Forest Service.

Source: 1

AIRCRAFT PRODUCTION

PRODUCTION OF COMMERCIAL HELICOPTERS*
(Number of Helicopters)
1954 TO DATE

Company and Helicopter	1954	1955	1956	1957	1958	1959	1960	1961	1962
TOTAL	131	146	268	311	196	291	294	432	389
Bell 47 Series .	68	84	111	132	99	169 ^b	144 ^b	177 ^b	207 ^b
Brantley B-2	—	—	—	—	—	15	43	104	N.A.
Cessna CH-1C ..	—	—	—	—	—	—	—	14	14
Hiller 12 Series .	20	16	21	21	12	25	72	99	51 ^c
Hughes 269-A ...	—	—	—	—	—	—	—	19	83
Omega B12-D1 ..	—	—	—	—	—	—	—	2	—
Republic Alouette .	—	—	—	—	5	15	5	—	—
Sikorsky S-55	43	41	52	38	11	4	1	3	—
S-58	—	5	55	60	22	47	9	8	3
S-61	—	—	—	—	—	—	—	1	4
S-62	—	—	—	—	—	—	7	5	10
S-64	—	—	—	—	—	—	—	—	1
Vertol H-21	—	—	29	60	35	12	—	—	—
V-33	—	—	—	—	—	—	5	—	—
V-44	—	—	—	—	12	5	8	—	—
V-107	—	—	—	—	—	—	—	—	16

N.A.—Not available.

* Manufactured by companies reporting to Aerospace Industries Association.

^b Includes production of two foreign licensees.

^c Eight months.

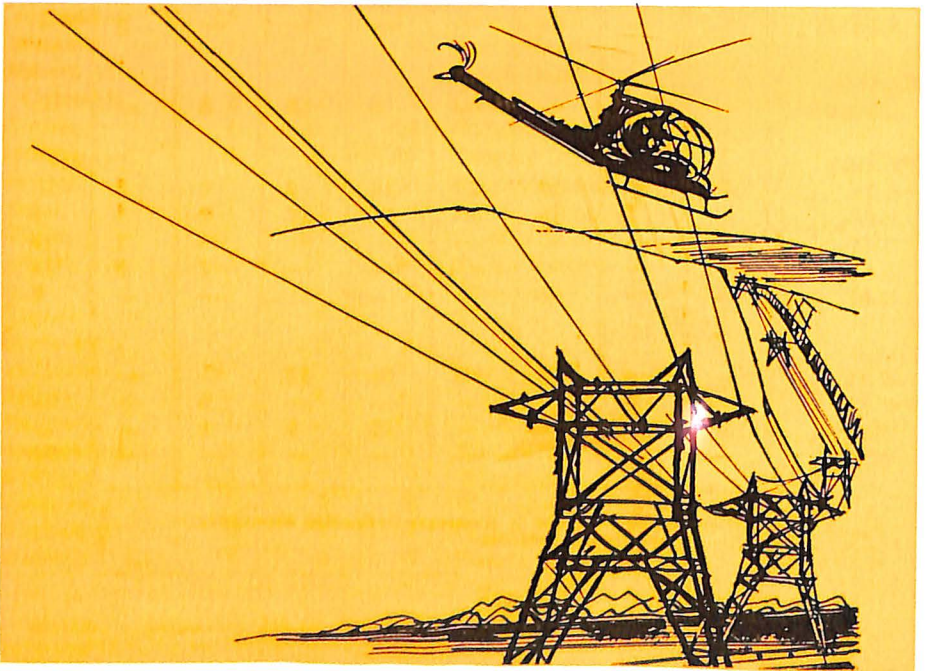
Source: 1

AEROSPACE FACTS AND FIGURES, 1963

1963 edition shows an increase of 20 per cent in the number of operators and a 13.5 per cent increase in the number of helicopters as compared with the 1962 totals. In 1962, there were 588 operators using 1319 helicopters, in 1963, 706 operators are reported and 1497 helicopters listed. (Chart page 145). There are now 106 helicopter flight schools as compared with 85 in 1962.

Another widely distributed annual VLAC publication is the Directory of Heliports-Helistops in the United States, Canada and Puerto Rico. Established heliports-helistops increased nearly 50 per cent over the previous year, with a total of 720 and 39 proposed, according to the 1962 edition. Approximately 660 of today's heliports are ground level and the balance are elevated facilities. For the first time, all 50 states were able to report helicopter landing facilities. Despite the increase in hospital and motel heliports, the Directory also serves to point up the requirements for more city-center heliports (Chart page 142).

In addition to the 720 established facilities, there are approximately 100 oil rigs in the Gulf of Mexico equipped with helistops and the U. S. Forest Service has more than 225 heliports and more than 2,500 unimproved helistops. These are used primarily for fire-fighting operations in the national forests.



AIRCRAFT PRODUCTION

HELICOPTER OPERATORS AND HELICOPTERS OPERATED, 1960 TO DATE

Year	TOTAL	Commercial	Companies and Executives	Government Agencies ^a	Flight Schools
OPERATORS					
1960	368	193	94	31	50
1961	461	265	106	35	55
1962	588	322	145	36	85
1963	706	405	150	45	106
HELICOPTERS OPERATED					
1960	936	705	173	97	...
1961	1,179	882	213	124	...
1962	1,319	994	218	112	...
1963	1,497	1,157	134	122	...

^a Federal, state and local governments.
Source: 1

MILITARY HELICOPTERS IN PRODUCTION OR DEVELOPMENT

Designation	Name	Type	Service	Manufacturer
UH-B/D (HU-1B/D) ..	Iroquois	Utility	Army	Bell
UH-1E (HU-1E)	Iroquois	Utility	Navy	Bell
UH-2A (HU2K-1)	Seasprite	Utility	Navy	Kaman
CH-3B/C ('HX-2)	—	Cargo	Air Force	Sikorsky
HX-2	—	Cargo	Air Force	
SH-3A (HSS-2)	Sea King	Antisubmarine	Navy	Sikorsky
OH-4A/5A/6A (LOH) .	—	Observation	Army	
OH-13/23 (H-13/23) ...	Sioux/Raven	Observation	Army	Bell/Hiller
UH-34D (HUS-1)	Seahorse	Utility	Navy	Sikorsky
HH-43A/B (H-43A/B)	Huskie	Search & Rescue	Air Force	Kaman
CH-46A (HRB-1)	Sea Knight	Cargo	Navy	Vertol Boeing
CH-47A	Chinook	Cargo	Army	Vertol Boeing
XH-48 (HX-1)	—	Cargo	Air Force	
CH-53A (HH-X)	—	Cargo	Navy	Sikorsky

Source: 17

AEROSPACE FACTS AND FIGURES, 1963

VERTICAL LIFT AIRCRAFT IN PRODUCTION AND DEVELOPMENT, 1962

Company	Military Symbol	Civil Designation	No. of Places	Present Status	
Bell	OH-13E } USA }	47G	3	Operational	
	OH-13G } USA }				
	TH-13M } USA }				
	OH-13H } USA }	47G-2	3	Operational	
			47G-2A	3	Operational
	OH-13K } USA }	47G-3	3	Operational	
	OH-13S } USA }	47G-3B	3	Opr/In Production	
			47G-3B1	3	Opr/In Production
			47G-2A1	3	Opr/In Production
	UH-13J } USAF }	47J	4	Operational	
	HH-13Q } USCG }				
	UH-13P } USN }				
	UH-13R } USN }	47J2	4	Opr/In Production	
	UH-1A } USA }	204	4	R & D	
	UH-1B, } USA }	204B	7	Operational	
	UH-1E } USMC }				
UH-1D } USA }	205	13	Production		
OH-4A } USA }	206	4	R & D		
XV-3A } USA }	200	4	R & D		
Boeing-Vertol	CH-21A } USAF }	B-V 42	14	Operational	
	CH-21B } USAF }	B-V-43	20	Operational	
	CH-21C } USA }				
		B-V44	15-19	Operational	
	CH-46A } USMC }	B-V 107-II	25	Opr/In Production	
	CH-47A } USA }	B-V 114	33	Opr/In Production	
UH-25B } USN }		6	Operational		
		B-V 76	2	R & D	
Curtiss-Wright					
Curtiss Division	X-19 (Tri Service)		8-12	Development	
Gyrodyne	QH-50A } USN }	Model 60	Drone	Production	
	QH-50B } USN }	Model 61	Drone	R & D	
	QH-50C } USN }	Model 63	Drone	Production	
	YRON-1 } USN }	Rotorecycle	1	Production	
	YRON-1 } USN }	Rotorecycle	1	Production	
	Solar } XRON } USN }	Rotorecycle	1	Production	
Hiller	OH-23G } USA }	Hiller 12-E	3	Production	
	OH-23F } USA }	Hiller E-4	4	Production	
	OH-23D } USA }		3	Production	
		Hiller L-4	4	Prototype	
Hughes Tool Aircraft Division		269A	2	Production	
	OH-6A } USMC }	369	4	Development	

AIRCRAFT PRODUCTION

VERTICAL LIFT AIRCRAFT IN PRODUCTION AND DEVELOPMENT, 1962 (Continued)

Company	Military Symbol		Civil Designation	No. of Places	Present Status			
Kaman	UH-2A	USN	K-20	12	Opr/In Production			
	HH-43A	USAF						
	OH-43D	USMC	K-600	5	Operational			
	UH-43C	USN						
	HH-43B	USAF	K-600-3	12	Opr/In Production			
Ling-Temco-Vought Chance Vought Corp.	XC-142A (Tri-Service)			3 crew 32 troops	Development			
Lockheed	XH-51A	USA } USN }		2	R & D			
Republic			Alouette II	5	Operational			
Ryan	XV-5A	USA	Ryan Model 143	2	Development			
	VZ-3RY	USA	Ryan Model 92	1	R & D			
United Aircraft Sikorsky Division	UH-19B	USAF }	S-55A	12	Operational			
	HH-19G					USCG		
	UH-19D	USA						
	CH-19E	USMC						
	UH-19F	USN						
	H-19A	USAF }						
	UH-19C	USA }						
	HRS-1, HRS-2	USMC }				S-55C	12	Operational
	HO4S-1, HO4S-2								USN }
	HH-34F	USCG }				S-58	20	Opr/In Production
	CH-34A	USA }						
	UH-34D	USMC }						
	SH-34G	USN }						
	CH-3B	USAF				S-61A	28	Opr/In Production
SH-3A	USN	S-61B	4	Opr/In Production				
		S-61L	31	Operational				
		S-61N	30-32	Opr/In Production				
CH-3C	USAF	S-61R	27-33	Devl/Production				
HH-52A	USCG	S-62A	12	Opr/In Production				
		S-64	5	Opr/In Production				

Source: 1

AEROSPACE FACTS AND FIGURES, 1963

PRODUCTION OF MILITARY HELICOPTERS
1941 to Date

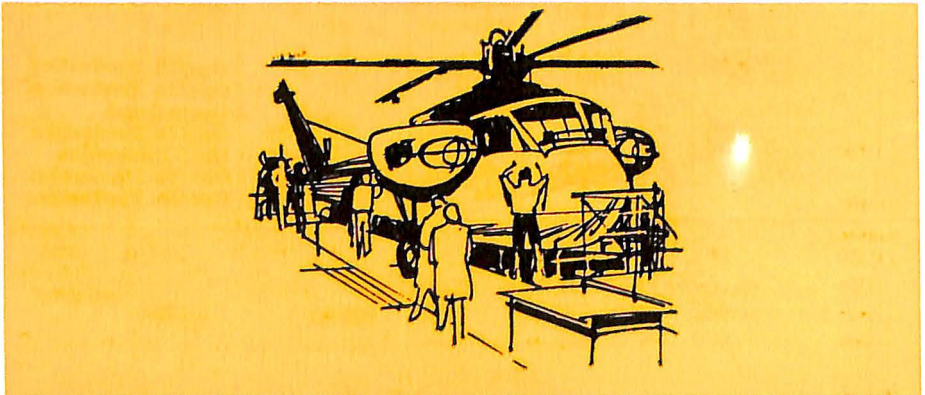
Year	TOTAL ^a	Air Force	Navy	Army ^b
1941	7	7	—	—
1942	—	—	—	—
1943	22	19	3	—
1944	144	120	24	—
1945	275	241	34	—
1946	44	40	4	—
1947	57	36	21	—
1948	153	94	59	—
1949	73	24	43	6
1950	60	6	39	15
1951	360	14	143	192
1952	983	49	353	559
1953	943	165	245	463
1954	431	172	46	155
1955	444	82	128	200
1956	647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

NOTE: Data released to AIA with a two-year lag.

^a The TOTAL column includes, in addition to the aircraft of the Air Force, Navy and Army, aircraft bought by units of the Department of Defense for delivery to foreign countries in the Military Assistance Program, and for delivery to other federal agencies such as the Coast Guard, Federal Aviation Agency, etc.

^b For the years 1941 through 1947, aircraft for the Army Air Corps are included in the historical series for the Department of the Air Force, which was established in 1947.

Source: 17



AIRCRAFT PRODUCTION

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

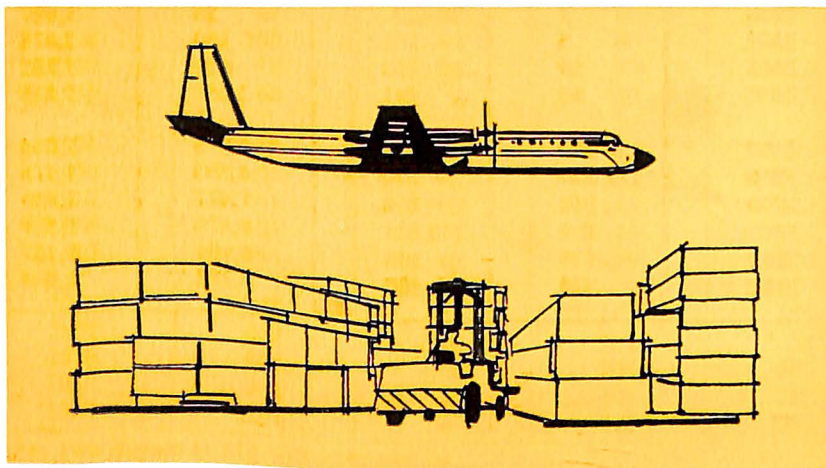
Source: 8

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

Source: 2

EXPORTS



The U. S. aerospace industry in 1962 exported a peacetime record \$1.4 billion of its products, the third consecutive year that aerospace exports have exceeded \$1 billion.

However, the total export figure was larger than this since substantial quantities of equipment are exported on a government-to-government basis, primarily in support of mutual defense assistance programs. The U. S. does not release export statistics for these products.

The 1962 export figure also does not include funds from manufacturing license agreements, manufacturing investments and technical assistance contracts. The 1962 figure of \$1.4 billion is a 16 per cent increase over 1961 exports of \$1.21 billion. Aerospace exports in 1962 represented 6.6 per cent of the nation's total merchandise exports.

The export sales of large turbine-powered transports, which accounted for a substantial amount of the 1962 record, will level off in 1963. The past year was a record for utility aircraft with exports of

EXPORTS

about \$31 million. Helicopter exports showed a modest advance during the year, and engines, parts and accessories continued to provide a significant amount to the export total.

International trade is a prime tool in providing a basis for understanding among nations, and the developing nations of the world are showing evidence of an increasing requirement for U. S. aerospace products. The overseas market potential for helicopters, utility aircraft and other aviation products is becoming more and more apparent.

The outcome of tariff negotiations and the removal of various import restrictions among the nations making up the General Agreements on Trade and Tariff may well serve as a barometer for the decade ahead in the international trade of aerospace products.

There is also the prospect for substantial U. S. exports of boosters, guidance equipment, payloads and related equipment to support space exploration programs now in the preliminary planning stages by several nations. The space era may open up a new segment of international trade.

U. S. TOTAL EXPORTS AND EXPORTS OF AERONAUTIC PRODUCTS
SELECTED YEARS, 1912 TO DATE
(Millions of Dollars)

Year	Total United States Merchandise	Total Aeronautic Products	Percent of total
1912	\$ 2,170.3	\$.1	a
1915-1918	22,176.7	31.5	.14
1921	4,378.9	.5	a
1929	5,157.1	9.1	.18
1939	3,123.3	117.8	3.8
1946	9,500.2	115.3	1.2
1952	15,025.7	603.2	4.0
1953	15,649.0	880.6	5.6
1954	14,948.1	618.9	4.1
1955	15,418.5	727.5	4.7
1956	18,839.7	1,059.3	5.6
1957	20,850.3	1,028.0	4.9
1958	17,892.7	971.5	5.4
1959	17,566.2	769.5	4.4
1960	20,549.7	1,329.5	6.5
1961	20,962.1 ^r	1,208.8	5.8
1962	21,628.3	1,435.5	6.6

^r Revised

^a Less than .05 percent.

Sources: 14, 16

AEROSPACE FACTS AND FIGURES, 1963

EXPORTS OF UTILITY AIRCRAFT^a BY SELECTED U. S. MANUFACTURERS,
1960 TO DATE

(As reported to Aerospace Industries Association by selected manufacturers)

Year	Number	Value (Thousands of Dollars)
1960	1,481	\$27,312.6
1961	1,583	29,789.8
1962	1,458	30,938.7

^a The data shown here may vary from Census Bureau figures because they are based on selected reports only.

Source: I

GREAT BRITAIN

During 1962 the exports of the British aerospace industry totaled \$321,000,000. This was a considerable decline in comparison to 1961 exports of \$417,800,000, 1960 exports of \$398,400,000, and 1959 exports of \$438,200,000. Great Britain exported engines valued at \$185,000,000 in 1962. Canada, the U. S., West Germany, and France were Great Britain's most significant export customers during 1962.

FRANCE

For 1962 France reported total aeronautical sales of \$709,183,000. This was a significant increase over 1961 sales of \$681,000,000. However, aerospace exports of \$300,000,000 for 1962 showed a decline in comparison to total aerospace exports of \$341,000,000 for 1961. For 1960 French aerospace exports amounted to \$230,000,000. France reported a total of 738 civil aircraft units produced during 1962 and, of these, 160 units were exported. The French aerospace labor force totaled 85,000 during 1962.

EXPORTS OF U. S. MANUFACTURED UTILITY AIRCRAFT BY^a DESTINATION, 1962

(As reported to Aerospace Industries Association by selected manufacturers)

Total and Destination	Number	Value (Thousands of Dollars)
TOTAL	1,458	\$ 0,938.7
Europe	302	7,917.5
Africa	174	3,370.7
Asia	91	3,351.0
Oceania	223	2,863.1
Canada and Latin America	668	13,436.4

^a The data shown here may vary from Census Bureau figures because they are based on selected reports only.

Source: I

EXPORTS

JAPAN

A significant increase in the total aeronautical sales of the Japanese aerospace industry was recorded during 1962. Totalling \$99,894,000 during 1962 compared to \$75,475,000 for 1961, this displays substantial growth of Japanese aerospace manufacturing. During 1959 total Japanese aeronautical sales amounted to \$41,000,000. The Japanese aerospace labor force for 1962 totaled approximately 22,000 persons, a modest increase over 1961. Japan reported total civil aeronautical exports for 1962 as \$706,000.

WEST GERMANY

During 1962 Germany exported 202 civil aircraft units valued at \$5,000,000 and imported 254 civil aircraft units valued at \$33,600,000. Production figures of military and civil aircraft and other aerospace equipment are not available from Germany or the other industrial nations due to security regulations. It is anticipated that the West German government will approve and support the development of an aerospace manufacturing complex for the Federal Republic in the near future.

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

^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: 14

EXPORTS OF CIVIL AIRCRAFT, 1948 TO DATE

NEW PASSENGER TRANSPORTS

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	°	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

NEW UTILITY, PERSONAL AND LIAISON PLANES

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	96	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

(Continued on next page)

EXPORTS OF CIVIL AIRCRAFT—Continued

OTHER

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

^a Less than \$500,000.

Source: 14

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
TOTAL ^a	15,940	14,120	1,820

^a October 6, 1949 to September 30, 1962.

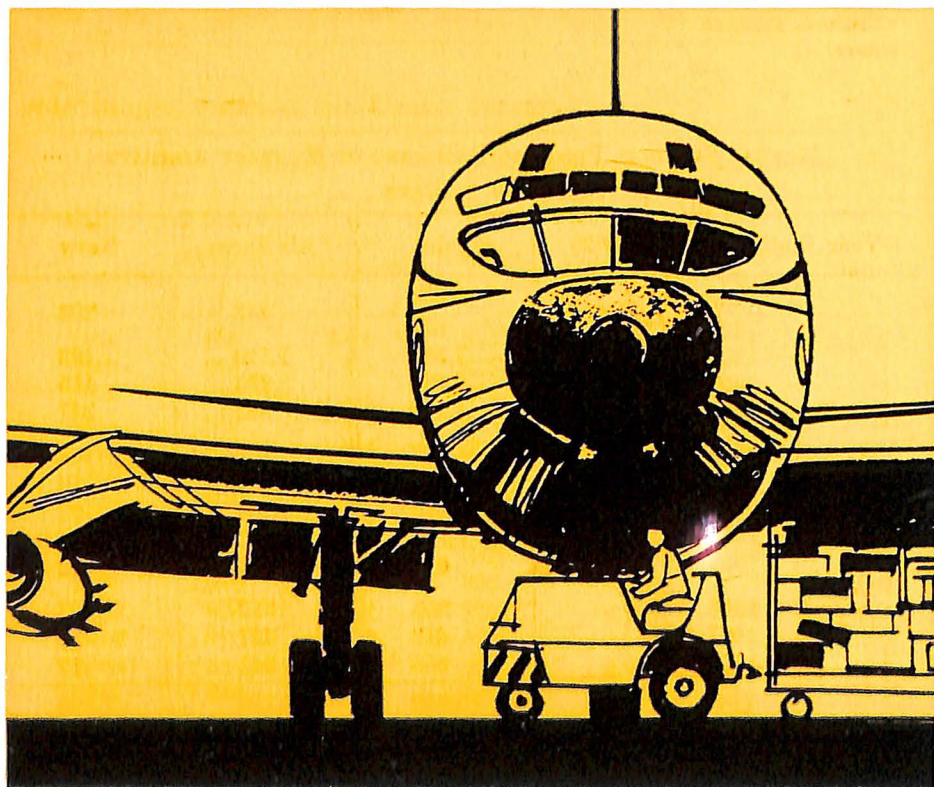
Source: 19

AEROSPACE FACTS AND FIGURES, 1963

VALUE OF UNITED STATES IMPORTS OF AERONAUTIC PRODUCTS,
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

^a Aircraft includes new and used airplanes, seaplanes, and amphibians.
Source: 15



EXPORTS

SHIPMENTS TO FOREIGN AIRLINES OF AIRCRAFT AND PARTS
(INCLUDING ENGINES) BY U. S. MANUFACTURERS
(As reported to AIA by selected manufacturers)

TOTAL AND DESTINATION	TOTAL VALUE \$ 000	AIRCRAFT		PARTS
		Number	Value \$ 000	Value \$ 000
TOTAL				
1955	111,402	54	80,179	31,230
1956	161,487	91	124,545	36,942
1957	212,736	106	169,882	42,854
1958	181,173	90	144,845	36,328
1959	160,854	41	107,965	52,889
1960	549,379	93	461,907	87,472
1961	351,337	57	264,264	87,073
EUROPE AND AFRICA				
1955	45,208	24	37,650	7,558
1956	102,869	73	95,307	7,562
1957	133,131	70	124,886	8,245
1958	85,411	42	79,884	5,527
1959	42,046	11	32,400	9,646
1960	381,677	73	372,053	9,624
1961	132,346	24	122,600	9,746
NEAR EAST, FAR EAST, MIDDLE EAST				
1955	27,990	15	25,279	2,711
1956	14,748	7	12,551	2,187
1957	20,664	14	17,872	2,792
1958	27,662	14	24,933	2,729
1959	71,050	20	64,548	6,502
1960	50,505	12	45,889	4,616
1961	65,057	18	61,735	3,322
CANADA AND LATIN AMERICA^a				
1955	38,203	15	17,249	20,954
1956	43,880	11	16,687	27,193
1957	58,941	22	27,124	31,817
1958	68,101	34	40,029	28,072
1959	47,758	10	11,017	36,741
1960	117,197	8	43,965	13,232
1961	153,934	15	79,929	74,005

^a Includes "not distributed by destination."
Source: 1

AEROSPACE FACTS AND FIGURES, 1963

UNITED KINGDOM: AERONAUTIC EXPORTS, 1924 TO DATE

Annual Average	Million Dollars	Annual	Million Dollars
1924-1928	\$ 5.6	1952	121.6
1929-1933	7.1	1953	182.0
1934-1938	16.3	1954	156.9
1939-1943	33.9	1955	185.3
1944-1948	57.7	1956	292.6
1949-1951	112.3	1957	325.0
		1958	434.2
		1959	438.2
		1960	398.4
		1961	417.8
		1962	321.0

Source: 42

UNITED KINGDOM: EMPLOYMENT AND PRODUCTION IN THE AIRCRAFT MANUFACTURING INDUSTRY 1918 TO DATE

Year	Employment	Value of Production (Million Dollars)
1918	347,112	N.A.
1935	35,890	69.1
1939	355,000	N.A.
1944	1,821,000	N.A.
1948	134,219	455.2
1950	153,600	423.1
1954	238,200 ^a	624.0 ^E
1955	258,300 ^a	N.A.
1956	265,300 ^a	N.A.
1957	257,600 ^b	N.A.
1958	246,600 ^b	N.A.
1959	235,400 ^b	N.A.
1960	292,500 ^b	N.A.
1961	305,500 ^a	N.A.
1962	278,000 ^a	N.A.

N.A.—Not available.

^E Estimate by official British sources.

^a As of end of November.

^b As of end of December.

Sources: 27, 28

EXPORTS

CANADA: AIRCRAFT AND PARTS INDUSTRY, 1935 TO DATE

Year	Number of Plants	Average Number of Employees	Gross Selling Value of Products (Millions of Dollars)
1935	7	294	\$.9
1936	7	416	1.3
1937	8	606	1.7
1938	13	1,617	6.9
1939	13	3,596	12.6
1940	19	10,348	24.2
1941	24	26,661	74.0
1942	42	44,886	137.8
1943	45	69,529	223.7
1944	45	79,572	427.0
1945	38	37,812	253.3
1946	16	11,405	36.2
1947	12	9,374	44.3
1948	11	8,049	45.6
1949	14	10,725	61.1
1950	15	10,549	50.2
1951	23	19,198	111.3
1953	43	38,048	398.7
1954	47	35,095	343.0
1955	52	33,036	354.3
1956	52	35,563	354.5
1957	70	41,616	424.4
1958	75	39,932	462.3
1959	78	28,516	327.5
1960	83	27,056	308.2
1961	79	26,422	325.4

Sources: 6, 23



AEROSPACE FACTS AND FIGURES, 1963

JAPAN: NUMBER OF AIRCRAFT MANUFACTURED, EXPORTED, AND IMPORTED
1952 to Date

Year	Manufactured	Exported	Imported
1952	1	—	66
1953	9	—	68
1954	36	7	28
1955	86	—	12
1956	93	6	19
1957	227	2	17
1958	211	27	13
1959	145	16	N.A.
1960	16	—	31
1961	38	—	54
1962	31	—	—

N.A.—Not available.
Source: 31

ESTIMATES OF AERONAUTICAL ACTIVITIES IN OTHER COUNTRIES^a

Country	Employment (Latest Available Data)	Aeronautical Sales and Trade (Value in Millions of U. S. Dollars)		
		Sales (Total)	Imports (Civil)	Exports (Civil)
Australia	11,400	N.A.	\$ 26	\$ 3
France	85,000	\$709	N.A.	108 ^b
Germany	23,000	N.A.	34	5
Japan	21,800	97	100	°
Netherlands	5,300	N.A.	56	11
Sweden	10,800	N.A.	35	4
Switzerland	2,500	N.A.	N.A.	N.A.

^a As compiled and released by each separate country; years may differ for different items.

^b Total exports, including military aircraft, missiles, and electronic products were about \$300 million.

^c Includes military.

Source: 1

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AEROSPACE FACTS AND FIGURES, 1963

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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.
- 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 Aireraft.
- Apogee:** the position most distant from Earth in the orbit of a satellite or the trajectory of a missile.
- Apportionment (Federal Budget):** a ceiling established by the Bureau of the Budget of amounts available to an agency for obligation or expenditure in an appropriation or fund account for specified time periods, activities, functions, projects, objects, or combinations thereof. The apportioned amount is the limit to the obligations that may be incurred by the agency receiving the apportionment.
- 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.
- Available for Obligation (Federal Budget):** total funds available to an agency for obligation including (1) unobligated carryover from prior years' funds, (2) new funds from apportionments and appropriations, (3) anticipated reimbursements, and (4) recoveries of prior years' obligations.
- Available for Expenditure (Federal Budget):** total funds available to an agency for expenditure. At any one time the total includes unexpended carryover from prior years and new obligational availability. Funds available for expenditure are net of refunds and reimbursements.

- 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.
- G:** the measure of the gravitational pull on any object; 10Gs means a force that is ten times as great as the gravitational pull at the surface of the Earth acting on a body.
- 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.
- 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.

New Obligational Authority (Federal Budget): Congressional appropriations and reappropriations.

New Obligational Availability (Federal Budget): new obligational authority plus transfers.

Obligation (Federal Budget): an act by an agency of order placed, contract awarded, service received, or similar transactions resulting in the creation of a liability upon the Federal Government to pay money out of the Treasury to the private party for the transaction.

Passenger Mile: one passenger moved one mile.

Perigee: the position closest to the Earth in the orbit of a satellite.

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.

Recoveries of Prior Year Obligations (Federal Budget): cancellation of obligations recorded in previous years without disimbursement of funds. Such recoveries increase the total amount available in current program if specifically reapportioned.

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.

Total Obligational Authority (Federal Budget): represents the full cost for a given year of a program scheduled for several years regardless of the year in which the funds are authorized, appropriated, or expended.

Transfer (Federal Budget): a transaction which withdraws and decreases amounts available for obligation and expenditure from one appropriation or fund account and increases a different appropriation or fund account.

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.

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.

Value added by manufacture: Roughly, the value of shipments of manufactured products less material, supplies, fuel, electric energy, and contract work.

VTOL: vertical take-off and landing.

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