




AEROSPACE FACTS AND FIGURES

'61

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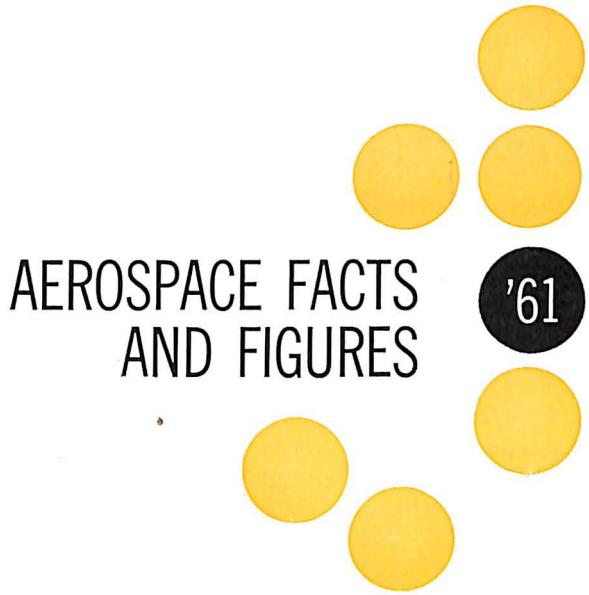
AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.



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FOREWORD

The year 1961 will be marked by future historians as the year of man's first flight into space.

This remarkable achievement culminates many long years of intensive research, testing and development by all facets of the aerospace industry in teamwork with various Government agencies concerned, as well as with many of our great university research laboratories. Today, this same team is hard at work to place a man on the moon—steppingstone to the planets.

While the industry took long strides in its most urgent mission —that of helping to assure U. S. leadership in military strength and in the conquest of space—American prestige was also enhanced by the lengthening of our commanding lead in jet transportation. Today, more than 500 U. S.-manufactured turbine-powered airliners are in service on world airways. Important also during the year were the gains made by both the utility aircraft and helicopter segments of the industry.

A bright spot in the aerospace industry's record for the year has been the increase in exports of both civil and military equipment. During the year 1960, for example, the increase in exports was 73 per cent over the previous year. Significantly, this followed a decline from 1956 through 1959 of more than 27 per cent.

While the accomplishments of the industry in the delivery of its products and in the development of new and better aerospace

systems have been many, the difficulties which beset the aerospace industry have not lessened materially. Total plant area requirements have been halved in the last three years and likely will be halved again in the next three years. There has been high obsolescence in other facilities as the technology of the industry advances. In this regard, the industry alone has had to finance almost $2 billion worth of new facilities in five years.

Paralleling the reduction in floor space requirements has been a dwindling industry employment, especially in the "production" worker categories. From a post-World War II peak in 1957 of some 900,000 employees, the aerospace worker force dropped to 644,000 at year-end 1960.

Users of this edition will note in its pages the effects of such radical changes on the nature and composition of the industry. It should also be noted here that a large part of AEROSPACE FACTS AND FIGURES—1961 is not a work of original research; rather, it is a compilation of facts gleaned from hundreds of sources in the aerospace world during the past year which have been considered of importance and interest.

This ninth edition, as those in the past, is designed to serve as a standard aerospace reference work of value to legislators, administrators, and managers in Government and industry, writers and editors, analysts and students.

ORVAL R. COOK
President
Aerospace Industries Association
June 1961

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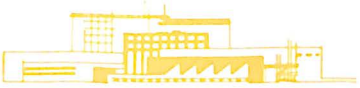

PRODUCTION AND FACILITIES

During the past five years, the aerospace industry has gone through the most profound change in character in modern industrial history. It is not less profound because it is being accomplished with little fanfare and great managerial efficiency. The change actually is an accelerated trend from a production to a research, development and testing industry.

The degree of reorientation is evident in the funds now being provided. In the fiscal year 1962 budget presented to Congress, almost $600 million of R&D funds will be used for space-oriented systems, development and related applied research. If this amount is added to the increased funds requested by the National Aeronautics and Space Administration, the national space program reaches a total of about $1.5 billion.

The impact of this cascading technology has caused a physical change in industry. Paradoxically, the industry has a large amount of excess floor space at a time when it is building new facilities. The reason for this is that in most cases it is less expensive to build a new facility than to convert conventional high-bay plant area to research and development laboratories. At the same time, the aerospace industry today needs and uses half the space it occupied only five years ago and the space now needed will be cut in half again in the next three years. This is the visible effect of our changing industry. Personnel requirements, both in number and type, are following a similar pattern. Technical personnel

in World War II made up about 20 per cent of the total work force; today technical personnel accounts for about 65 per cent.

The production of military aircraft during 1960 continued to drop. An estimated 2,700 units were produced in 1960 compared to 3,000 produced in 1959. Production is expected to decline even further in 1961 and in the more distant future.

Sales of military aircraft and parts dropped 18 per cent, from $4.1 billion in 1959 to $3.3 billion in 1960. Estimated military engine production of piston and turbojet types dropped in 1960 to 6,400 units from 6,800 in 1959. Sales of engines and parts to military customers were

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

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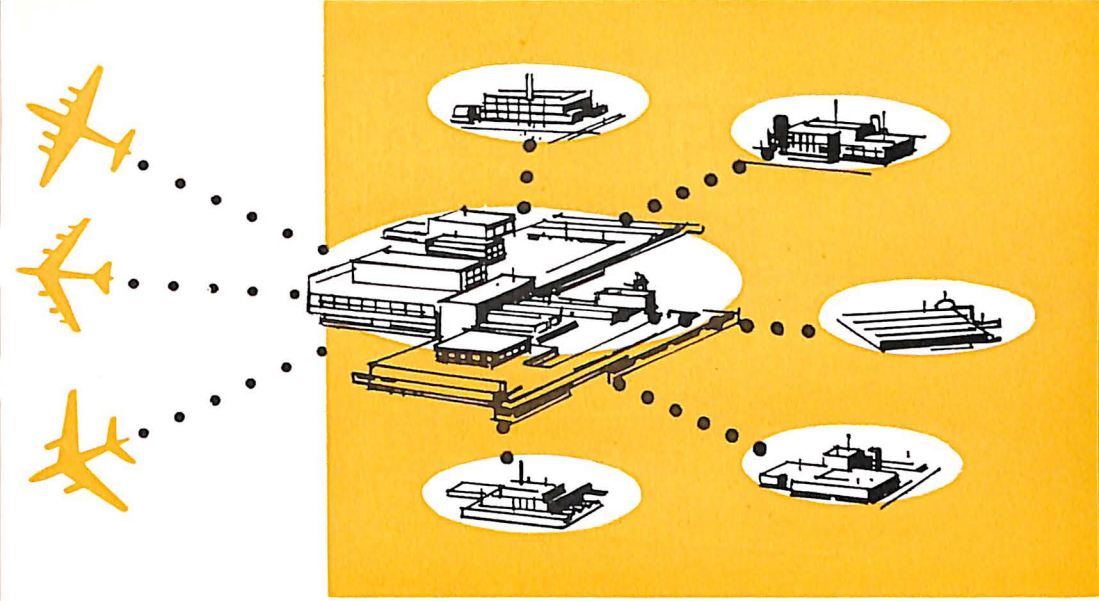
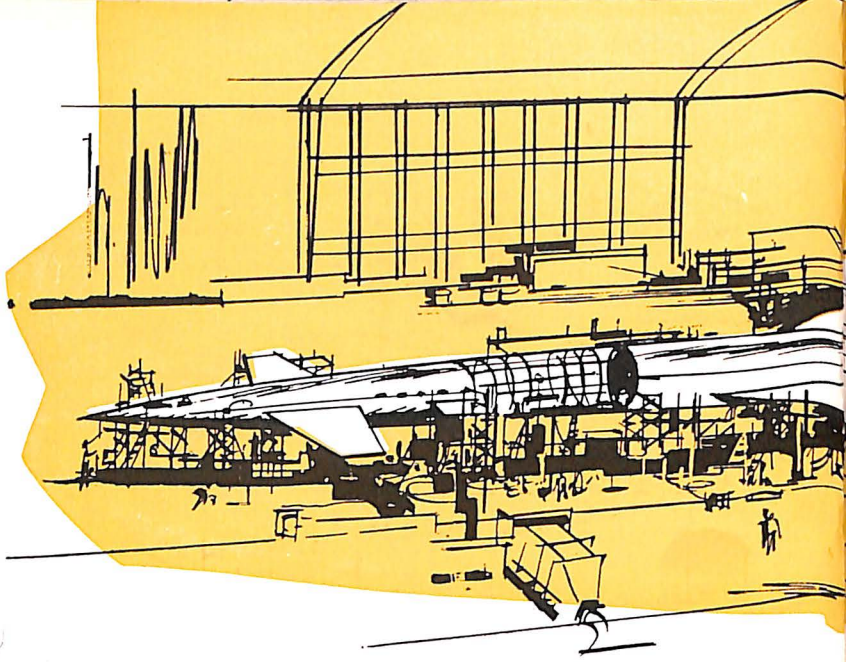


AIRCRAFT PRODUCTION
1909 TO DATE (cont'd)
(Number of Aircraft)

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	11,242[E]	3,000[E]	8,242
1960	10,881[E]	2,700[E]	8,181

N.A.—Not available.
E Estimate.
NOTE: 1950 to date excludes aircraft produced for the Military Assistance Program.
Sources: 1, 2, 3, 12, 17



$913 million in 1960, compared to $1.3 billion in 1959. There are no complete statistics available on missile engine production or sales.

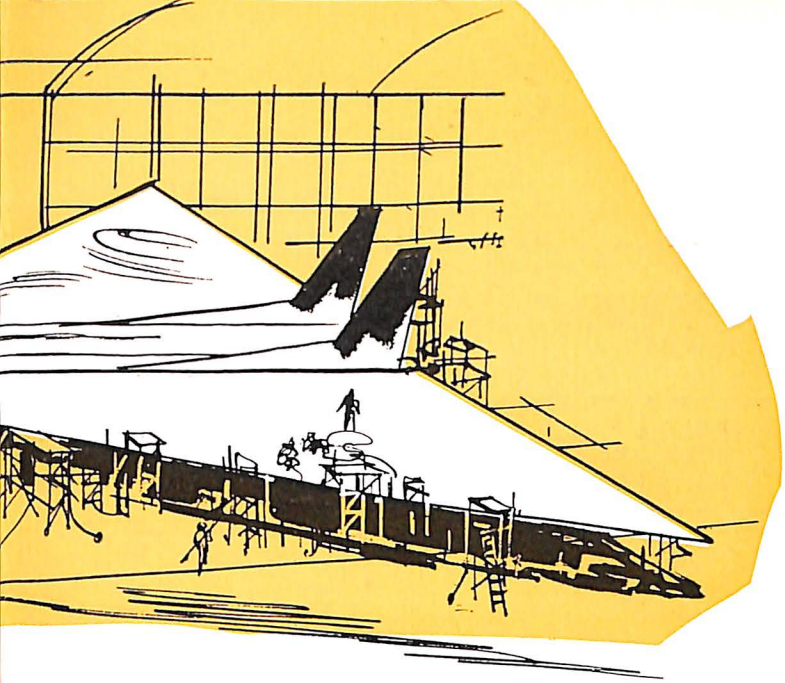
Deliveries of gas turbine-powered transports—and their enthusiastic acceptance by the traveling public—was perhaps the highlight of 1960, with 236 airliners being delivered during the year. By December 31, 1960, a total of 522 of these luxurious transports had been delivered to both foreign and domestic airlines since deliveries began three years ago.

Equally promising has been the increasing acceptance of general aircraft for business and utility purposes. The five-year period, 1955-1960, has marked the production and sale of some 35,000 units, valued at approximately $600 million. In 1960 the general aviation industry made deliveries of 7,588 units having a value of $151 million.

Production of helicopters also continued to gain in 1960. Pointing to the increasing utility of the helicopter across the business market is the fact that the number of commercial helicopter operators in the United States and Canada increased from 160 in 1959 to 193 in 1960, and the number of helicopters in service increased to 705.

Sales of the manufacturers of complete aircraft and engines reached their peak in 1957 and have been staying on a high but slightly declining level of about 11 billion dollars. However, the composition of sales is undergoing a rather drastic change. Military aircraft sales, which made up half of the total sales in 1957, have slipped to about one third of the total. Military engine sales have been cut in less than half during the same period; military propeller sales also declined by about half.

The decline in the military aircraft, engine, and propeller business was almost entirely made up by a substantial growth in sales of civil



AIRFRAME WEIGHT PRODUCTION, 1939 TO DATE

Year	Weight in Millions of Pounds (Excluding Spares)		
	TOTAL	Military	Civil
1939	12.5[E]	10.1	2.4[E]
1940	27.8[E]	23.1	4.7[E]
1941	86.1[E]	81.4	4.7[E]
1942	275.8	275.8	—
1943	654.2	654.2	—
1944	961.1	961.1	—
1945	541.1	539.4	1.7
1946	38.4	12.9	25.5
1947	29.3	11.4	17.9
1948	35.2	25.1	10.1
1949	37.0	30.3	6.7
1950	41.9	35.9	6.0
1951	55.2	50.2	5.0
1952	116.6	107.3	9.3
1953	148.4	138.0	10.4
1954	140.9	130.4	10.5
1955	124.5	114.3	10.2
1956	106.2	90.0	16.2
1957	101.2	79.4	21.8
1958	82.8	66.1	16.7
1959	73.1[E]	50.0[E]	23.1
1960	75.2[E]	47.0[E]	28.2

[E] Estimate.
Sources: 1, 12, 17

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

Year	Total	Aircraft and Parts			Aircraft Engines and Parts			Aircraft Propellers and Parts			Other Products and Services[b]
		Total	U.S. Military	Other	Total	U.S. Military	Other	Total	U.S. Military	Other	
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

[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

aircraft and engines and by a doubling of the sales of missiles and other products and services. These relatively new products of the industry accounted for less than 20 per cent of 1957 sales. By 1960 they made up more than 40 per cent.

BACKLOG

The steady decline in the backlog of the aerospace companies was halted and reversed during 1960. As of December 31, 1960, the companies had orders on their books for $12.5 billion, compared to $12.1 billion on December 31, 1959. The backlog for military aircraft slipped further from $4.4 billion to $4.1 billion. However, the military engine order backlog increased from $1 billion to $1¼ billion. Most important was a $700 million increase in orders for missiles and other products and services, bringing this component to almost 40 per cent of the total backlog of $12½ billion.

The commercial backlog declined slightly during the past year as

deliveries of the turbine-powered airline transports increased. The backlog of piston-powered transports has virtually disappeared.

BACKLOG OF ORDERS REPORTED BY MANUFACTURERS OF COMPLETE AIRCRAFT, ENGINES AND PROPELLERS, 1948 TO DATE
(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

[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

VALUE OF PRODUCTION OF THE AEROSPACE INDUSTRY[a]
1914 TO DATE
(Thousands 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	10,033	5,041
1959	11,255	N.A.	N.A.
1960	10,997	N.A.	N.A.

[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, 3, 8, 13

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

Year	TOTAL	Military		Civil	
1917–1919	N.A.	44,453		N.A.	
1926	N.A.	842		N.A.	
1927	N.A.	1,397		N.A.	
1928	3,252	2,620		632	
1929	7,378	1,861		5,517	
1930	3,766	1,841		1,925	
1931	3,776	1,800		1,976	
1932	1,898	1,085		813	
1933	1,980	860		1,120	
1934	2,736	688		2,048	
1935	2,965	991		1,974	
1936	4,237	1,804		2,433	
1937	6,084	1,989		4,095	
1938	N.A.	N.A.		3,800[E]	
1939	11,172	N.A.		N.A.	
1940	30,167[E]	22,667		7,500[E]	
1941	64,681[E]	58,181		6,500[E]	
1942	138,089	138,089		—	
1943	227,116	227,116		—	
		Recipr.	Jet	Recipr.	Jet
1944	256,911	256,789	122	—	—
1945	111,650[E]	108,442	1,208	2,000[E]	—
1946	43,407	1,680	905	40,822	—
1947	20,912	2,683	1,878	16,351	—
1948	14,027	2,495	2,493	9,039	—
1949	11,972	2,981	5,009	3,982	—
1950	13,675	3,122	6,239	4,314	—
1951	20,867	6,471	9,816	4,580	—
1952	31,041	8,731	16,928	5,382	—
1953	40,263	13,365	20,251	6,647	—
1954	26,959	7,868	13,572	5,519	—
1955	21,108	3,874	9,595	7,639	—
1956	21,869	2,982	7,388	11,499	—
1957	22,087	2,557	8,633	10,859	38
1958	18,767	1,496	6,523	10,233	515
1959	19,336[E]	800[E]	6,000[E]	11,152	1,384
1960	18,926[E]	600[E]	5,800[E]	10,891	1,635

N.A. Not available.
[E] Estimate.
Sources: 1, 3, 12, 17

Shipments of Civil Engines
1953 to Date

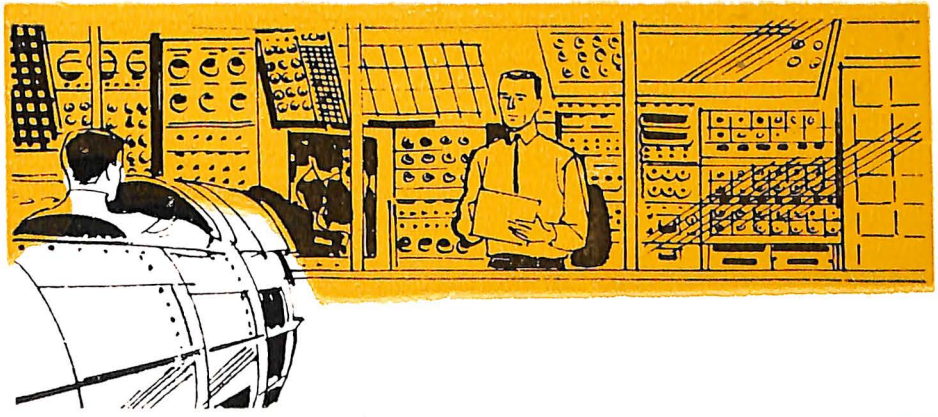
Manufacturer and Engine Designation[a]	1953	1954	1955	1956	1957	1958	1959	1960
Total	6,125	5,358	7,398	11,204	10,817	10,251	12,259	12,159
Recipro.	6,125	5,358	7,398	11,204	10,779	9,736	10,875	10,524
Jet	—	—	—	—	38	515	1,384	1,635
Allison Division General Motors								
282	—	—	—	—	—	242	604	576
Continental								
205	89	147	163	87	145	77	16	56
246	345	78	41	22	24	15	23	20
252	367	210	279	627	879	829	1,348	840
253	715	561	811	1,736	811	1,734	953	1,252
267	85	423	500	433	31	36	36	9
275	760	990	1,712	2,524	2,733	2,181	2,816	3,207
298	—	—	—	—	—	—	713	469
Other	21	17	12	20	24	23	8	20
General Electric								
308	—	—	—	—	—	18	90	212
1E5	—	—	—	—	—	—	—	66
Lycoming								
223	141	2	6	7	8	2	8	111
295	—	—	—	—	123	561	906	1,247
229	1,869	969	127	132	44	95	113	80
274	94	618	2,309	3,011	2,631	2,023	2,021	1,452
275	—	213	591	909	842	419	308	271
286	—	—	—	2	250	768	1,044	701
284	—	—	—	—	—	—	247	294
304	—	—	—	—	—	—	—	115
1E1-10	—	—	—	—	—	—	—	233
Other	370	217	143	443	315	167	53	107
Pratt & Whitney Division								
230	52	44	26	21	5	6	1	—
231, 264	847	350	157	316	456	315	3	6
290	—	—	—	—	35	232	275	172
291	—	—	—	—	3	23	410	523
1E8	—	—	—	—	—	—	—	63
1E9	—	—	—	—	—	—	—	23
Other	2	—	—	—	—	—	5	—
Wright Aeronautical								
243	—	2	1	—	68	51	6	N.A.
259	1	1	5	23	157	129	202	34
272	455	516	483	315	323	22	—	N.A.
287	—	—	32	576	910	283	26	N.A.
289	—	—	—	—	—	—	24	N.A.
Other	2	—	—	—	—	—	—	N.A.

[a] Type Certificate Number.
N.A.—Not available.
Source: 1

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, 1940	13.1	9.6	3.0	.5
Jan. 1, 1941	25.5	17.9	6.5	1.1
Jan. 1943	117.1	77.5	31.8	5.2
Dec. 1943	175.0	110.4	54.2	6.8
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, 1952	122.8	82.3	38.4	2.1
June 30, 1953	135.8	91.1	42.1	2.6
Sept. 30, 1954	127.5	91.0	33.7	2.8
Dec. 31, 1955	131.3	96.5	32.1	2.7
Dec. 31, 1956	138.4	101.5	34.1	2.8
Sept. 30, 1957	141.5	103.5	35.2	2.8
Dec. 31, 1958	137.8	103.1	31.6	3.1
Sept. 30, 1959	126.8	93.6	30.0	3.2
Dec. 31, 1960	146.9[a]	107.0[a]	36.7	3.2

[a] Includes missile and aircraft airframes.
Sources: 1, 3, 17



MILITARY AVIATION

The progress of military aviation towards space has been the natural development and extension of speed, altitude, and range. The aerospace industry, throughout the fifty-eight years of powered flight, has worked mightily to provide the military services with aircraft of continually increasing performance which would enable the military airman to fly higher, faster and farther. To do this has required great advances in propulsion systems, improved structures and more efficient aerodynamic characteristics. Suffice it to say that military aviation has been approaching the space age since man first flew.

Today, missiles are being phased into military operational units as rapidly as is feasible. Past expenditures and those programmed for the next fiscal year for the major procurement and production of missiles, indicate the scope of increasing military dependence upon missiles for both strategic and tactical applications. At the same time, however, military procurement of aircraft still accounts for some 14.5 per cent of total defense expenditures. While there is no question that missiles will eventually take over a major role in the Nation's offensive and defensive forces, manned combat aircraft with their proven capability will remain the backbone of U. S. aerospace power for many years hence.

Aircraft and Missile Procurement:

Total procurement expenditures of the Defense Department have been kept steady on a level around $14 billion for the last 4 years and are expected to stay on this level in the fiscal year ending June 30, 1962. During this period, however, aircraft procurement dropped from $8.8 billion to $6.1 billion while missile procurement increased from $2.4 billion to $4.0 billion. Ships, electronic equipment and other items make up the rest of the procurement expenditures.

From fiscal year 1961 to 1962, the changes in aircraft and missile procurement expenditures are expected to be small. There will be a small increase in payments by the U. S. Treasury for both.

When it comes to new obligational availability, however, which measures the total volume of obligations which the Defense Department may incur because of new congressional appropriations or reappropriations and of transfers, the picture changes: aircraft procurement is expected to drop from $5.3 billion to $5.1 from 1961 to 1962, while missiles are expected to increase from $3.5 billion to $4.0 billion in the same period.

Military Assistance:

Total expenditures for military assistance in 1962 are estimated at

$1.75 billion, compared to $1.70 billion in 1961. Requests for new obligational authority for this purpose are estimated at $1.8 billion, identical with the 1961 figure.

Deliveries of aircraft and missiles by the Air Force and Navy will make up about $300 million of military assistance orders in 1962, compared with $340 million in 1961, according to the 1962 Budget.

Aircraft Procurement:

The 1962 Air Force budget envisages the procurement of 473 new

COMPOSITION OF MILITARY AIR FORCES
FISCAL YEARS 1960-1962

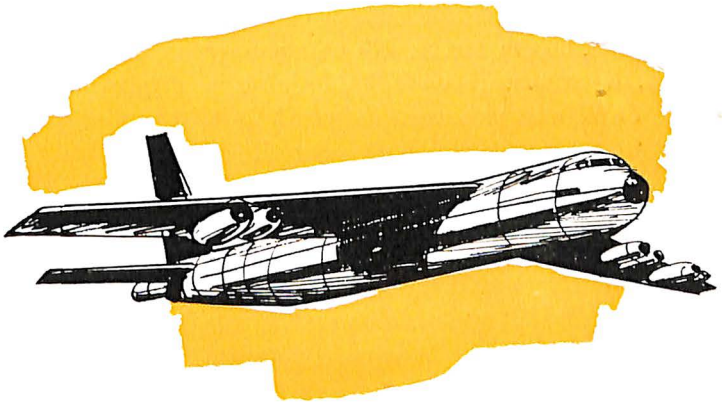
	Actual	Planned	
	June 30, 1960	June 30, 1961	June 30, 1962
Department of the Army:			
Field artillery missile groups (heavy) (Redstone)	3	3	3
Army missile commands	4	4	4
Guided missile battalions (equivalents)	73¾	76¼	67¼
Other antiaircraft battalions	6½	1	—
Separate surface-to-surface missile battalions	24	26	29
Active aircraft inventory (total)	5,493	5,657	5,736
Helicopters	2,633	2,774	2,841
Fixed-wing	2,860	2,883	2,895
Department of the Navy:			
Attack carrier air groups	16	16	16
Carrier antisubmarine groups[a]	11	11	11
Patrol and warnings squadrons	41	38	37
Marine divisions	3	3	3
Marine air wings	3	3	3
Active aircraft inventory	8,863	8,768	8,401
Department of the Air Force:			
USAF combat wings (total)	96	88	84
Strategic wings	40	37	34
Air defense wings	23	19	19
Tactical wings	33	32	31
USAF combat support flying forces (total)	120	111	107
Air refueling squadrons	65	65	63
MATS air transport squadrons	22	21	19
Other specialized squadrons	33	25	25
Active aircraft inventory	18,712	16,941	16,080

[a] Prior to 1960 the carrier antisubmarine capability was represented by 22 carrier antisubmarine squadrons which have been reorganized into 11 carrier antisubmarine air groups.
Source: 24

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

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

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.
Source: 17



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

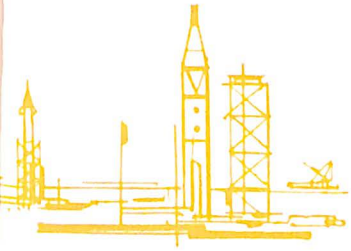
Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
NUMBER							
1950	1,668	219	917	169	326	6	31
1951	2,149	152	1,158	240	517	14	68
1952	3,625	399	1,247	454	1,258	49	218
1953	5,674	489	2,862	578	1,381	165	199
1954	5,226	716	2,729	603	998	172	8
1955	4,115	632	2,346	464	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
FLYAWAY VALUE[a] *(Millions of Dollars)*							
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

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.
Source: 17

aircraft, and in association guided air-to-air rockets, to continue modernization and support of the forces. No new money is requested for B-52's or B-58's. The current rate of KC-135 jet tanker production will be continued for 1962, and procurement of C-130B turboprop and C-141 turbojet transport aircraft will be procured. A substantial number of F-105 fighter bombers are scheduled for procurement in 1962. The Navy aircraft procurement program will include a significant number of A4D's and an increased quantity of A2F's. Also increased will be F4H-1's, as well as a variety of short and long range ASW patrol aircraft and four models of helicopters. Navy will also buy a small number of T-39 jet utility trainers. Army aircraft procurement will include purchase of Mohawks, Caribous, and the Iroquois and Chinook helicopters.

Guided Missiles Procurement:

Work on the four main strategic ballistic missile systems will be continued at high level. Atlas funds (for 13 squadrons) will be considerably less. Funds for Titan will be above 1961. Funding for Minuteman and Polaris funds will be sharply increased. Additional funding will be provided for the Hound Dog air-to-surface missile. No new funding is provided for Bomarc, and Nike-Hercules funding in 1962 will complete financing of that program. Funding is provided for more than 1000 Terrier, Tartar and Talos missiles. Also provided are funds for several thousand Sparrow III, Sidewinder and Falcon missiles. Also funded are a considerable number of Hawk and Redeye missiles, as are a wide variety of other missiles for use in support of the ground forces, such as Bullpup for both Air Force and Navy. First procurement funds for production quantities of Pershing will be provided and an appreciable number of Sergeant missiles also are funded. Purchase of improved Honest John and Little John rockets will largely complete programs for these weapons. A substantial increment of Davy Crockett nuclear rockets, as well as improved guided anti-tank missiles, also will be purchased.



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

Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
NUMBER							
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
FLYAWAY VALUE[a] *(Millions of Dollars)*							
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

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.
Source: 17

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

Year	TYPE OF AIRCRAFT						
	TOTAL	Bomber	Fighter	Transport	Trainer	Helicopter	Other
NUMBER							
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
FLYAWAY VALUE[a] *(Millions of Dollars)*							
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

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.
Source: 17

Major Research and Development Effort:

Research, development, test and evaluation funding for Air Force ballistic missiles, new cargo aircraft for MATS and the development of certain Navy aircraft will be emphasized but funded through procurement accounts. Research, development, test and evaluation funding for aircraft is declining but funds are provided for development of a new VTOL transport aircraft prototype, support of the aircraft nuclear propulsion program (although at a lower rate than previous years, as work is to be continued on only one propulsion system). Funding for Dyna-Soar will be at a higher level than in 1961, and the Army will

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

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

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

[E] Estimate.

[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.

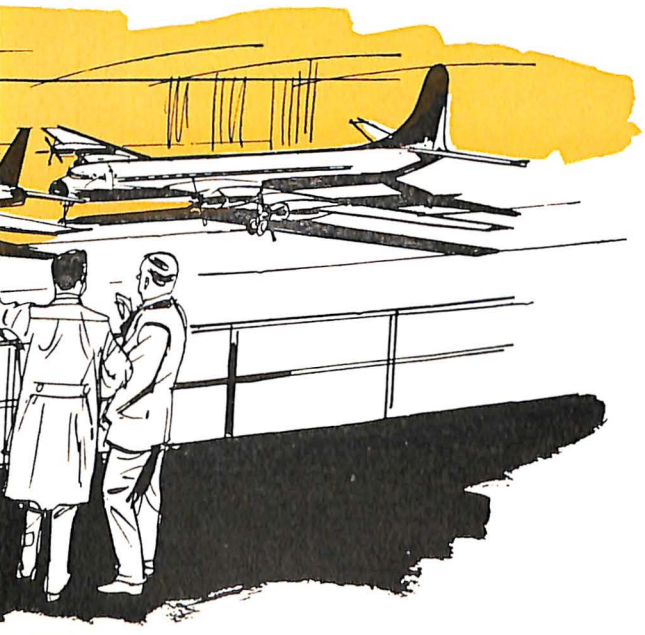
Source: 17

initiate development of a new surveillance aircraft. Development of missiles and related equipment continues to constitute a major portion of research, development, test and evaluation, although funding is at a lower level than in 1961. One quarter billion dollars is provided for Nike-Zeus. Substantial funds are also provided for Pershing, Mauler, a longer range version of the Polaris, the Sky Bolt, Bullpup, and a new highly mobile surface-to-surface missile to support battle groups in the combat area. Military space and satellite development increases in importance, with substantial funds provided for development of Midas, Samos, Advent, Transit, Defender and Discoverer programs.

Organization of Wings, Air Groups:

Air Force: The basic organization unit of the United States Air Force is the "wing." A wing is comprised of a combat group and necessary administrative and service units. The number of airplanes in a wing depends on its mission; for example, a wing of heavy bombers has 45 planes, a medium bomber wing has 45, a light bomber wing 48, a day fighter wing 75, an all-weather fighter squadron 25. The USAF also operates separate squadrons for rescue, support and in-flight refueling. There are 20 aircraft per in-flight refueling squadron. There are 6 to 10 aircraft per air rescue squadron depending on the mission.

Navy: Navy carrier air groups usually are composed of 2 fighter squadrons; 3 attack squadrons; 1 heavy attack squadron or detachment; 4 photo planes; and 6 aircraft early warning (AEW) planes and one detachment of helicopters. Super aircraft carriers of the Forrestal



Class (54,600 tons) have up to 80 or 100 aircraft. Large Midway Class (51,000 tons) carriers have slightly less aircraft, while medium sized carriers of the Essex Class (33,000 tons) have a complement of 70 to 80 aircraft. Antisubmarine squadrons attached to ASW support carriers average 40 aircraft, and shore-based patrol squadrons have a complement of 12 planes each. Marine fighter squadrons are assigned 20 aircraft.

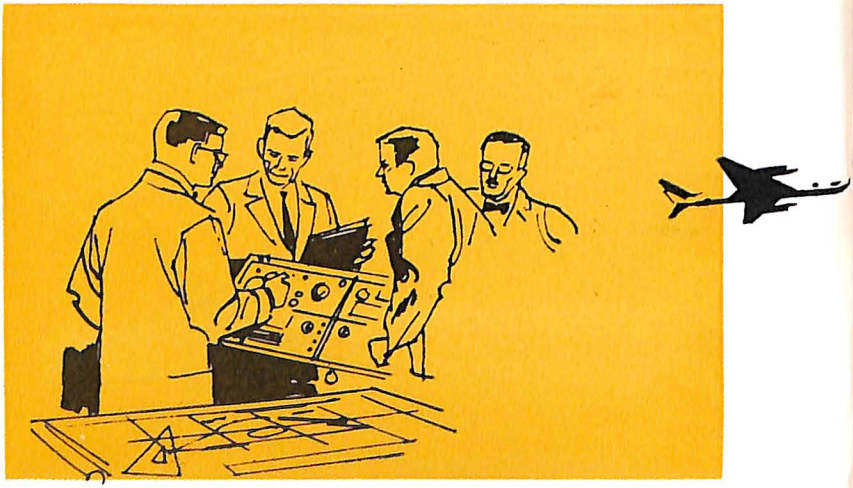
Army: An army detachment currently has 50 aircraft per division, depending on whether it is infantry or armor and is assigned to a division in liaison, reconnaissance, observation, or courier missions. Helicopter companies are light, medium or heavy, depending upon the type of helicopters used. Each company has 22 helicopters. A fixed-wing light transport company has 16 passenger aircraft and is assigned to field Army level.

MATS in FY 1961 had 32 Squadrons in 8 Wings. By the end of FY 1962 MATS will be reduced by 3 Squadrons. In FY 1961 MATS had 10 Squadrons engaged in support functions such as Air Rescue, photographic and charting, Air Weather, etc.

By the end of FY 1962 MATS will have 10 Squadrons engaged in these actions.

Military Aviation Strength

By the end of fiscal 1962, the Air Force is scheduled to have 84 wings, compared to 88 at the end of fiscal 1961. The major reduction during 1961 was effected in air defense wings. The Navy will operate 27 carrier air groups in 1962 and 3 Marine air wings. Army aviation



MILITARY AIRCRAFT IN DEVELOPMENT OR PRODUCTION
(FIXED WING)

Designation	Name	Type	Service	Manufacturer
L-23F	Seminole	Utility	Army	Beech
B-52H	Stratofortress	Bomber	USAF	Boeing
C-135A	Stratolifter	Cargo	USAF	Boeing
KC-135A	Stratotanker	Tanker	USAF	Boeing
U-3B	—	Utility	USAF	Cessna
T-37B	—	Trainer	USAF	Cessna
F8U-2N	Crusader	Fighter	Navy	Chance Vought
B-58A	Hustler	Bomber	USAF	Convair
A4D-2N	Skyhawk	Attack	Navy	Douglas
A4D-5	Skyhawk	Attack	Navy	Douglas
A2F-1	Intruder	Attack	Navy	Grumman
S2F-3	Tracker	Anti-Sub	Navy	Grumman
W2F	Hawkeye	Attack Warning	Navy	Grumman
WF-2	Tracer	Attack Warning	Navy	Grumman
AO-1	Mohawk	Surveillance & Observation	Army	Grumman
F-104G	Starfighter	Fighter	USAF	Lockheed
C-130B	Hercules	Cargo	USAF	Lockheed
SC-130B	Hercules	Search	Coast Guard	Lockheed
C-130E	Hercules	Cargo	USAF	Lockheed
C-140	Jet Star	Cargo	USAF	Lockheed
C-141	Super Hercules	Cargo	USAF	Lockheed
T-40	—	Trainer	USAF	Lockheed
GV-1	Hercules	Cargo	Navy	Lockheed
P2V-7	Neptune	Patrol	Navy	Lockheed
P3V-1	Orion	Patrol	Navy	Lockheed
F4H-1	Phantom II	Fighter	Navy	McDonnell
A3J-1	Vigilante	Attack	Navy	North American
B-70	Valkyrie	Bomber	USAF	North American
T-39A,B	Saberliner	Trainer	USAF	North American
T2J-1	Buckeye	Trainer	Navy	North American
T-38A	Talon	Trainer	USAF	Northrop
F-105D	Thunderchief	Fighter	USAF	Republic
AC-1	Caribou	Cargo	Army	DeHavilland

Source: 17

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[E]	822,900	128,700	2,900	691,300
1962[E]	822,900	126,700	3,230	692,970

[E] Estimate.
[a] As of November 1.
[b] As of November 11.
Sources: 3,5,24

active aircraft inventory is scheduled to include about 6,000 aircraft. At the present time, within the Strategic and Tactical Air Command structures, there is a combined total of 65 air refueling squadrons. By fiscal year end of 1962, these two commands will be operating 63 refueling squadrons.

UNITED STATES ARMY AVIATORS[a] 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

[a] Enlisted personnel statistics not available prior to November 30, 1959, when the number was 10,993.
Source: 7

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[c]	22,903	163,673	4,930
1954	179,783[c]	21,316	147,670	4,725
1955	165,243[c]	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

Sources: 3, 40

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

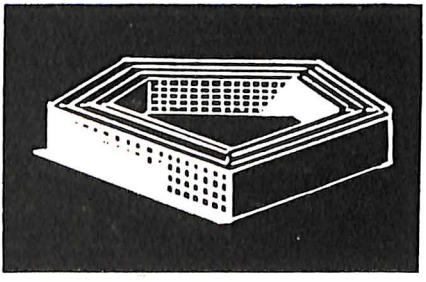
Fiscal Year	U. S. Air Force		Naval Aviation[a]	
	Total Cash Appropriations	Expenditures	Total Cash Appropriations	Expenditures
1899	$ .05	N.A.	$ —	N.A.
1909	.03	N.A.	—	N.A.
1912	.12	N.A.	.03	N.A.
1913	.10	N.A.	.01	N.A.
1914	.17	N.A.	.01	N.A.
1915	.20	N.A.	.01	N.A.
1916	.80	N.A.	1.0	N.A.
1917	18.7	N.A.	3.8	N.A.
1918	785.0	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

(Continued top next page)

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

Fiscal Year	U. S. Air Force		Naval Aviation[a]	
	Total Cash Appropriations	Expenditures	Total Cash Appropriations	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] 829.8 }	1,199.1	906.0	747.9
1949	938.8	1,059.2	588.3	875.1
1950	4,139.4	3,599.9	1,041.5	989.4
1951	15,791.1	6,348.6	3,815.3	1,237.3
1952	22,974.7	12,712.4	5,266.5	2,205.2
1953	22,076.2	15,089.6	4,873.0	3,061.3
1954	11,402.4	15,668.5	2,322.0	3,235.6
1955	11,715.8	16,406.7	2,749.5	2,554.8
1956	15,681.3	16,748.8	1,711.7	2,836.1
1957	17,696.5	18,362.7	2,543.7	3,053.3
1958	17,732.0	18,435.0	2,682.8	3,358.6
1959	18,713.0	19,084.0	2,033.8	2,442.0
1960	18,496.0	19,066.0	1,961.6	2,027.1
1961[E]	17,865.0	18,890.0	2,141.8	2,000.0
1962[E]	17,856.0	19,344.0	2,000.0	2,140.0

NOTE: For details on missiles see separate tables in this and the missiles chapter.
N.A.—Not available.
E Estimate.
[a]Includes "Aircraft and Related Procurement" and "Aircraft and Facilities" until 1960. Beginning with 1961 "Procurement of Aircraft and Missiles."
[b]FY 1949 Construction of Aircraft & Related Procurement appropriation enacted in FY 1948.
Sources: 3, 24



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

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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	74,274	50,363	8,434[c]	11.4	16.7
1954	67,772	46,904	9,497[c]	14.2	20.2
1955	64,570	40,626	9,408[c]	14.6	23.2
1956	66,540	40,641	8,840[c]	13.3	21.8
1957	69,433	43,270	10,502[c]	15.1	24.3
1958	71,936	44,142	11,227[c]	15.6	25.4
1959	80,697	46,426	11,067[c]	13.7	23.8
1960	77,233	45,627	10,277[c]	13.3	22.5
1961[E]	81,369	46,720	10,176[c]	12.5	21.8
1962[E]	84,926	48,172	10,279[c]	12.1	21.3

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
[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, 1961
TOTAL AND AIRCRAFT
(Millions of Dollars)

	Total Procurement	Aircraft	Aircraft as Percent of Total
Defense Department	$11,753	$5,109	43.5
Air Force	6,353	3,479	54.8
Navy	3,679	1,537	41.8
Army	1,721	94	5.5

Source: 17

DEPARTMENT OF DEFENSE
EXPENDITURES 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	$ 3,976	$2,412	60.7
1952	11,478	4,888	42.2
1953	17,297	8,189	47.3
1954	15,957	9,080	56.9
1955	12,838	8,804	68.6
1956	12,227	7,835	64.1
1957	13,488	8,647	64.1
1958	14,083	8,793	62.4
1959	14,409	7,730	53.6
1960	14,312	6,487	45.3
1961[E]	14,311	6,019	42.1
1962[E]	14,862	6,104	41.1

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
Sources: 17, 18

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	6,487	4,629	1,765	93
1961[E]	6,019	4,123	1,755	141
1962[E]	6,104	4,185	1,753	166

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
Sources: 17, 18

DEPARTMENT OF DEFENSE
UNPAID OBLIGATIONS, FEBRUARY 28, 1961
TOTAL AND AIRCRAFT
(Million Dollars)

	Total Procurement	Aircraft	Aircraft as Percent of Total
Defense Department	$15,722	$6,200	39.4
Air Force	6,551	3,426	52.3
Navy	7,227	2,625	36.3
Army	1,944	149	7.7

Source: 20

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

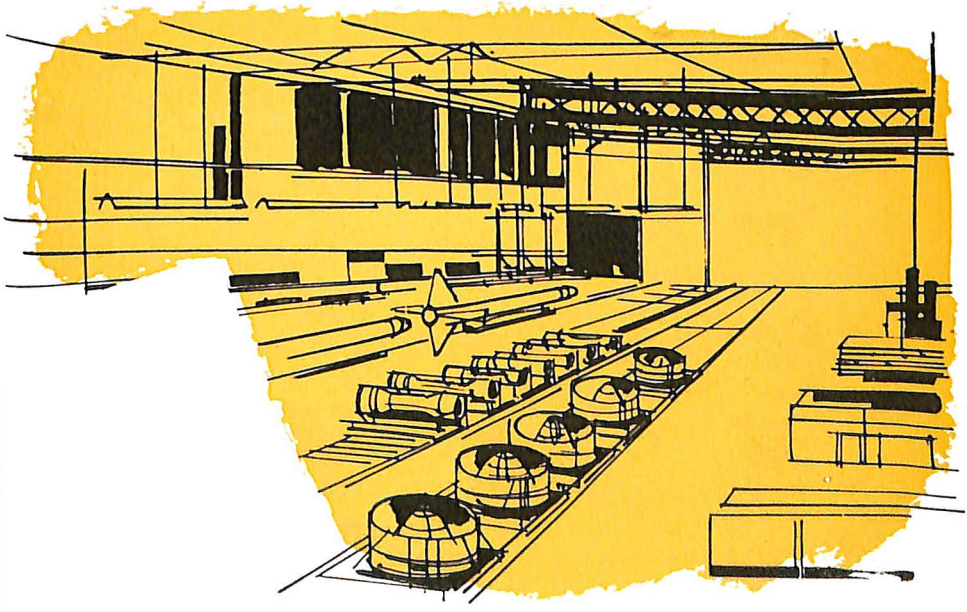
Year Ending June 30	Total Procurement and Production	Aircraft	Aircraft as Percent of Total
1951	$23,114	$ 8,686	37.6
1952	29,536	13,471	45.6
1953	21,117	13,948	66.1
1954	10,588	5,041	47.6
1955	7,420	4,922	66.3
1956	9,795	6,923	70.7
1957	11,294	6,559	58.1
1958	10,983	5,945	54.1
1959[a]	14,304	6,167	43.1
1960[a]	13,105	6,124	46.7
1961[a, E]	13,501	5,293	39.2
1962[a, E]	14,969	5,062	33.8

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
[a] Data are not directly comparable to those for earlier years because of changes in title classifications and in funding.
Sources: 17, 21

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	6,124	4,285	1,739	100
1961[E]	5,293	3,562	1,612	119
1962[E]	5,062	3,287	1,586	190

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
Sources: 17, 21



Brief Glossary of Terms Used In Federal and Military Budgeting and Financial Accounting

Apportionment: 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: An act of Congress authorizing an agency to incur obligations and make payments out of funds held by the Treasury.

Available for Obligation: Total funds available to an agency for obligation including (one) unobligated carryover from prior years' funds, (two) new funds from apportionments and appropriations, (three) anticipated reimbursements, and (four) recoveries of prior years' obligations.

Available for Expenditure: 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.

Expenditures: Payments by cash or check from the Treasury to liquidate obligations. When expenditure totals are reported, refunds, etc. are excluded.

New Obligational Authority: Congressional appropriations and reappropriations.

New Obligational Availability: New obligational authority plus transfers.

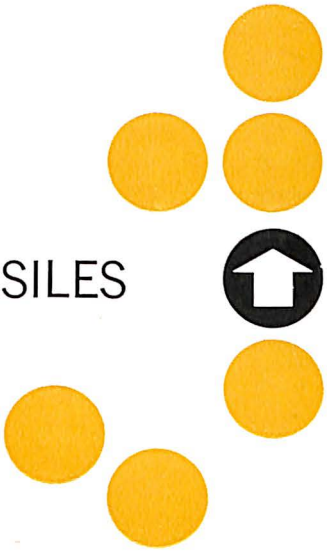
Obligation: An act by an agency of order placed, contract awarded, service received, or similar transaction resulting in the creation of a liability upon the Federal Government to pay money out of the Treasury to the private party for the transaction.

Recoveries of Prior Year Obligations: Cancellation of obligations recorded in previous years without disimbursement of funds. Such recoveries increase the total amount available for obligation in current programs if specifically reapportioned.

Transfer: A transaction which withdraws and decreases amounts available for obligation and expenditure from one appropriation or fund account and increases different appropriation or fund account.

Sources: 17, 24

GUIDED MISSILES



Although manned aircraft remain the backbone of the Nation's forces in-being and constitutes 59 per cent of current military aerospace weapons expenditures, missile spending continues to increase steadily. Production of military aircraft will continue to decline due to their increasing performance capabilities as well as to the steady transition of the missile for military use and for space exploration.

While missiles differ in many respects from conventional aircraft, their design, development and production draw upon the same reservoir of scientific and technical knowledge that brought manned aircraft to their present advanced state. Basically, a guided missile is made up of the same systems as an airplane: airframe, guidance system and power plant. The principle differences are in operational capabilities and characteristics. The main similarity between aircraft and missiles is that the same laws of aerodynamics govern both. The aerospace industry has laboriously accumulated a storehouse of technical knowledge concerning problems and solutions of flight that are being utilized around the clock in various missile programs.

A successful missile program depends upon much more than technical competence, however. The real keystone is the ability to bring together the infinitely complicated systems so that the end result is a weapon that can perform a predetermined task but is economically producible.

One of the knottiest problems continually facing the aerospace indus-

try in the research, design and development of missiles is the need to build the extremely costly and complex facilities required. For example, consider the single facility requirements for the production of a gyro system for control and guidance of a high performance missile.

This gyro assembly must be produced in a facility which has no vibration from other plant operations or from street traffic, which is as clean as a surgical theater because the tiniest dust particle could render it useless, and which is rigidly controlled as to temperature and humidity.

FUNDS AVAILABLE FOR MISSILE DEVELOPMENT AND PRODUCTION
1946 TO DATE
(Millions of Dollars)

Year Ending June 30	ALL MISSILE PROGRAMS	Of this Total		
		Intermediate and Intercontinental Ballistic Missiles	Other Surface to Surface Missiles	All Other Missiles
1946 & prior	$ 70	—	$ 19	$ 51
1947	58	—	20	38
1948	81	—	36	45
1949	98	—	45	53
1950	134	—	65	69
1951	784	$ 1	185	598
1952	1,058	1	239	818
1953	1,166	3	403	760
1954	1,067	14	336	717
1955	1,470	161	398	911
1956	2,270	515	387	1,368
1957	4,470	1,365	603	2,502
1958	5,107	2,077	639	2,391
1959	6,914	2,960	685	3,269
1960[a]	6,634	2,952	509	3,173
1961[b]	6,986	3,448	383	3,155

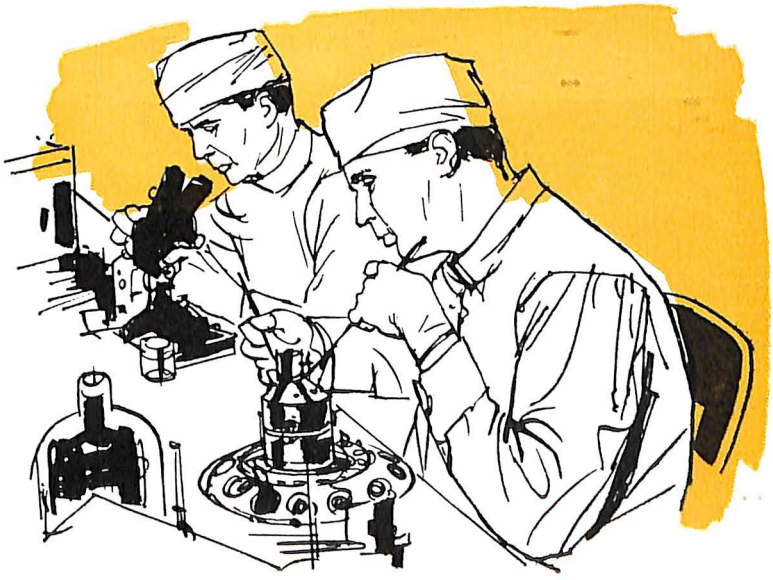
NOTE: The figures shown here differ from other figures in that they include not only the cost of procuring missiles for operational purposes, but also include research, developmental and capital costs involved in bringing this program to an operational status. However, the figures do not include military pay and costs only indirectly associated with the missiles program.

[a] Preliminary.
[b] Projected.
Source: 17

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	13,105	3,240	24.7
1961[E]	13,501	3,520	26.1
1962[E]	14,969	3,962	26.5

Estimate
Sources: 17, 21



Here is what the design engineers of a typical gyro assembly facility had to take into consideration: First, new foundations had to be built to keep the plant absolutely vibration free; plumbing and wiring had to be arranged so maintenance could be handled from spaces between the "clean" rooms; temperature in the assembly rooms had to be constant, with not more than two degrees variation. In this room, normally occupied by four men, the accidental entry of a fifth person would cause a halt to production because of disruption of the rigid temperature system. The interiors of the rooms could have no corners; they had to be rounded off to forestall dust collection. The walls and ceilings had to be covered with a special vinyl plastic which must be washed every other day. Work benches had to be extended from the wall, eliminating leg supports, which are potential dust collectors.

While the missile research and manufacturing facilities dilemma is by no means solved, the industry is moving ahead as rapidly as possible. In just the last five years alone, it has spent some $2 billion in the erection of plants and laboratories geared to the specialized missile/space age.

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	3,240	2,466	382	392
1961[E]	3,520	2,615	553	351
1962[E]	3,962	2,792	633	537

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
Sources: 17, 21

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, FEBRUARY 28, 1961
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	Total Procurement	Guided Missiles	Missiles as Percent of Total
Defense Department	$11,753	$1,984	16.9
Air Force	6,353	1,242	19.5
Navy	3,679	383	10.4
Army	1,721	358	20.8

Source: 20

DEPARTMENT OF DEFENSE
UNPAID OBLIGATIONS, FEBRUARY 28, 1961
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

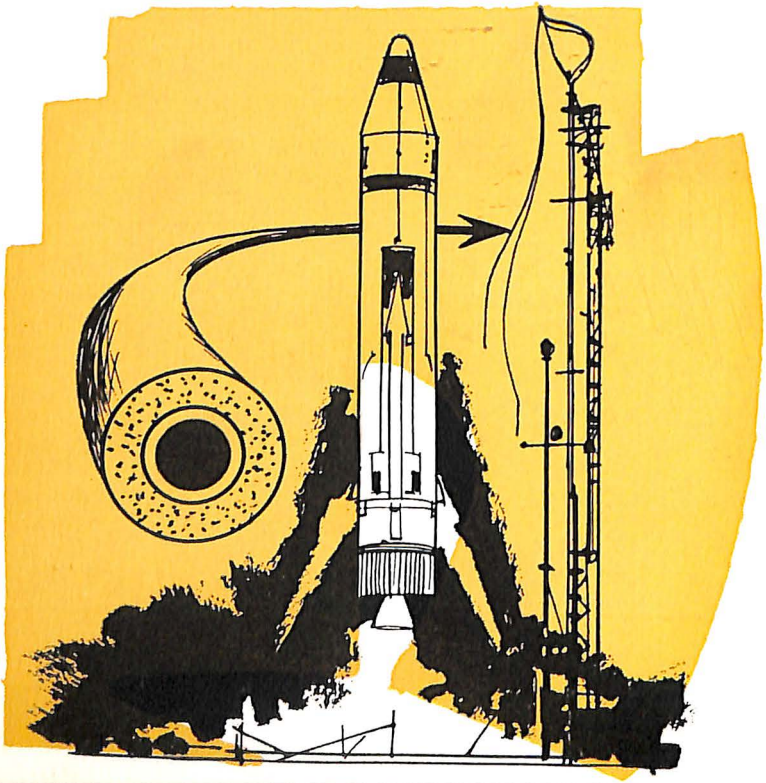
	Total Procurement	Guided Missiles	Missiles as Percent of Total
Defense Department	$15,721	$3,646	23.2
Air Force	6,551	2,032	31.0
Navy	7,227	913	12.6
Army	1,944	700	36.0

Source: 20

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	14,312	3,790	26.5
1961[E]	14,311	4,157	29.0
1962[E]	14,862	4,175	28.1

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
Source: 20



Guided Missiles Procurement:

Work on the four main strategic ballistic missile systems will be continued at high level. Atlas funds (for 13 squadrons) will be considerably less. Funds for Titan will be about the same as in 1961. Funding for Minuteman will be sharply increased. Polaris program funds are about double that of the 1961 level. Additional funding will be provided for the Hound Dog air-to-surface missile. No new funding is provided for Bomarc, and Nike-Hercules funding in 1962 will complete financing of that program. Funding is provided for more than 1000 Terrier, Tartar and Talos missiles. Also provided are funds for several thousand Sparrow III, Sidewinder and Falcon missiles. Also funded are a considerable number of Hawk and Redeye missiles, as are a wide variety of other missiles for use in support of the ground forces, such as Bullpup for both Air Force and Navy. First procurement funds for production quantities of Pershing will be provided and an appreciable number of Sergeant missiles also are funded. Purchase of improved Honest John and Little John rockets will largely complete programs for these weapons. A substantial increment of Davy Crockett nuclear rockets, as well as improved guided anti-tank missiles, also will be purchased.

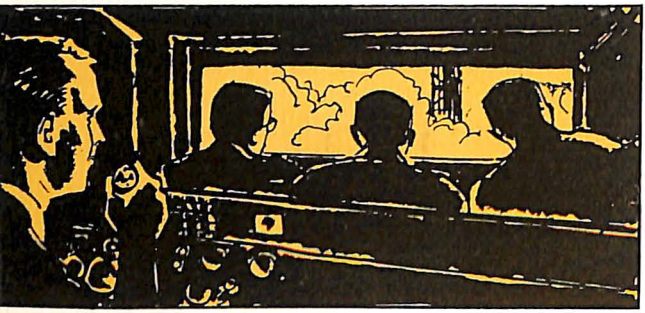
DEPARTMENT OF DEFENSE
EXPENDITURES FOR GUIDED MISSILE PROCUREMENT, BY AGENCY
1951 TO DATE
(Millions of Dollars)

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	3,790	2,785	423	583
1961[E]	4,157	3,283	428	446
1962[E]	4,175	3,126	510	539

[E] Estimate based on 1962 Budget Amendment dated March 28, 1961.
Source: 20

Major Research and Development Effort:

Research, development, test and evaluation of missiles and related equipment continues to constitute a major portion of R,D,T&E, although at a lower level than in 1961. One quarter billion dollars is provided for Nike-Zeus. Substantial funds are also provided for Pershing, Mauler, a longer range version of the Polaris, the Sky Bolt, Bullpup, and a new highly mobile surface-to-surface missile to support battle groups in the combat area. Military space and satellite development increases in importance, with substantial funds provided for development of Midas, Samos, Advent and Transit.



GUIDED MISSILES, EMPLOYMENT BY MAJOR INDUSTRIES
October 1959

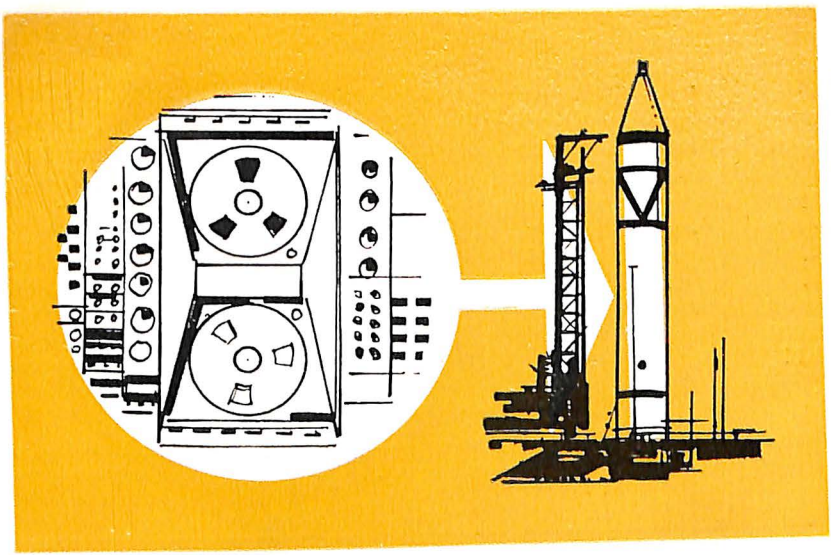
Industry Title	Number of Establishments	Missile Employment (Thousands)	Per Cent of U.S. Total	Per Cent Change from October 1958[a]
TOTAL—ALL INDUSTRIES	363	396.3	100	+16
Aircraft and Parts	118	125.9	32	+ 7
Ordnance and Accessories[b]	33	100.5	25	+23
Electrical Machinery, etc.	82	87.0	22	+24
Miscellaneous Business Services	21	18.4	5	+32
Professional and Scientific Instruments, etc.	22	17.7	4	+14
Federal Government	16	18.6	5	+ 6
Machinery (except Electrical)	24	5.1	1	0
All Others	47	23.1	6	N.A.

N.A.—Not available.
[a] Percent change based on establishments reporting in both years.
[b] In this category are listed plants whose major product does not fall into any other industry. Many of these plants are owned or operated by aircraft companies.
Source: 32

GUIDED MISSILES, EMPLOYMENT IN SELECTED LABOR MARKETS
October 1959

Area of Employment	Number of Establishments	Missile Employment (Thousands)	Per Cent Change from October 1958[a]	Area Total Employment (Thousands)	Missile as Per Cent of Total Employment
TOTAL—UNITED STATES	363	396.3	+16	16,197	2.4
Total—selected areas	162	183.1	+15	3,383	5.4
Los Angeles-Long Beach, Cal.	82	95.1	+ 6	785	12.1
San Diego, Cal.	9	18.6	+50	74	25.2
San Jose, Cal.	6	16.9	+49	64	26.6
Philadelphia, Pa.	17	14.3	+39	533	2.7
Boston, Mass.	12	8.9	+ 2	298	3.0
New York, N. Y.	21	8.9	−21	1,172	.8
St. Louis, Mo.	5	8.0	+63	263	3.0
Baltimore, Md.	7	6.8	+28	169	4.0
Morristown-Dover, N. J.	3	5.6	+25	25	22.8
8 Other Areas[b]	N.A.	75.0	+23	N.A.	N.A.

[a] Percent change based on establishments reporting in both years.
[b] Sacramento, Cal.; Denver, Colo.; Orlando, Fla.; Lawrence, Mass.; Minneapolis, Minn.; Winston-Salem, N. C.; Seattle, Wash.; and Milwaukee, Wis. each employ 5,000 or more employees with a total missile employment of 75,000. Data on Detroit, Mich., not available.
Source: 32



U. S. MISSILE & ROCKET PROGRAM

Project	Service	Systems Contractor	Propulsion		Status
			Manufacturer	Type	
Air-to-Air					
FALCON	Air Force	Hughes	Thiokol	Solid	Operational
GENIE	Air Force	Douglas	Aerojet General	Unguided Rocket	Operational
SIDEWINDER	Navy/AF	GE/Philco	Navy	Solid	Operational
SPARROW III	Navy	Raytheon	Aerojet	Solid	Operational
ZUNI*	Navy	Navy	—	—	Development
Surface-to-Surface					
ATLAS	Air Force	Convair	Rocketdyne	Liquid	Operational
MACE	Air Force	Martin	Thiokol/ Allison	Turbojet	Operational
MATADOR	Air Force (for W. Germany)	Martin	Thiokol/ Allison	Turbojet	Operational
MINUTEMAN	Air Force	Boeing	Thiokol/ Aerojet/ Hercules	Solid	Development
SLAM	Air Force	Chance Vought	Marquardt	Nuclear Ramjet	Study
THOR	Air Force	Douglas	Rocketdyne	Liquid	Operational
TITAN	Air Force	Martin	Aerojet	Liquid	Operational (mid 1961)
CORPORAL	Army	Firestone	Ryan	Liquid	Operational
DAVY CROCKETT	Army	Army	—	Solid	Development
HONEST JOHN	Army	Douglas/ Emerson Electric	Hercules	Solid	Operational
JUPITER	Army	Chrysler	Rocketdyne	Liquid	Operational
LACROSSE	Army	Martin	Thiokol	Solid	Operational
LITTLE JOHN	Army	Sperry	Hercules	Solid	Operational
LOBBER	Army	Convair	—	Solid	Study
MISSILE "A"	Army	Army	—	Solid	Study
PERSHING	Army	Martin	Thiokol	Solid	Operational (late 1961)
REDSTONE	Army	Chrysler	Rocketdyne	Liquid	Operational
SERGEANT	Army	Sperry	Thiokol	Solid	Production
SS-10-11	Army	Nord (France) G.E. (U. S.)	—	—	Operational
SHILLELAGH	Army	Aeronutronics	—	Solid	Development
COBRA	USMC	Daystrom	—	Solid	Evaluation

* Air-to-Air and Air-to-Surface.

U. S. MISSILE & ROCKET PROGRAM—*Continued*

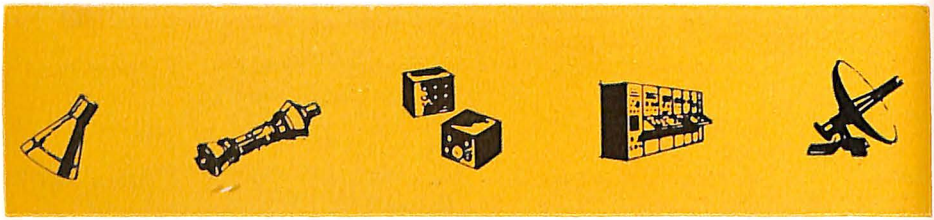
Project	Service	Systems Contractor	Propulsion		Status
			Manufacturer	Type	
POLARIS	Navy	Lockheed	Aerojet General	Solid	Operational
REGULUS I	Navy	Chance Vought	Allison	Turbojet	Operational
SUBROC	Navy	Goodyear	Thiokol	Solid	Development
Air-to-Surface					
HOUND DOG	Air Force	North American	Pratt & Whitney	Turbojet	Operational
SKYBOLT	Air Force	Douglas	Aerojet General	Solid	Development
WAGTAIL	Air Force	Minneapolis-Honeywell	—	Solid	Development
BULLPUP	Navy/AF	Martin	Hercules/ Thiokol	Solid/ Prepkgd.	Operational
ARM	Navy	No Contract	Navy	Solid	Development
Surface-to-Air					
BOMARC A	Air Force	Boeing	Aerojet/ Marquardt	Liquid	Operational
BOMARC B	Air Force	Boeing	Thiokol/ Marquardt	Solid	Development
FABMDS (Mobile Anti Missile)	Army	——	—	—	Study
HAWK	Army	Raytheon	Aerojet General	Solid	Operational
MAULER	Army	Convair	Grand Central	Solid	Development
NIKE-AJAX	Army	Western Electric	Aerojet	Liquid	Operational
NIKE-HERCULES	Army	Western Electric	Hercules/ Thiokol	Solid	Operational
NIKE-ZEUS	Army	Western Electric	Thiokol	Solid	Development
TALOS	Navy	Bendix	Hercules/ McDonnell	Solid/ Ramjet	Operational
REDEYE	Army	Convair	Atlantic Research	Solid	Development
TARTAR	Navy	Convair	Aerojet General	Solid	Operational
TERRIER (advanced)	Navy	Convair	Hercules	Solid	Operational
TYPHON	Navy	APL	—	Ramjet/ Solid	Development

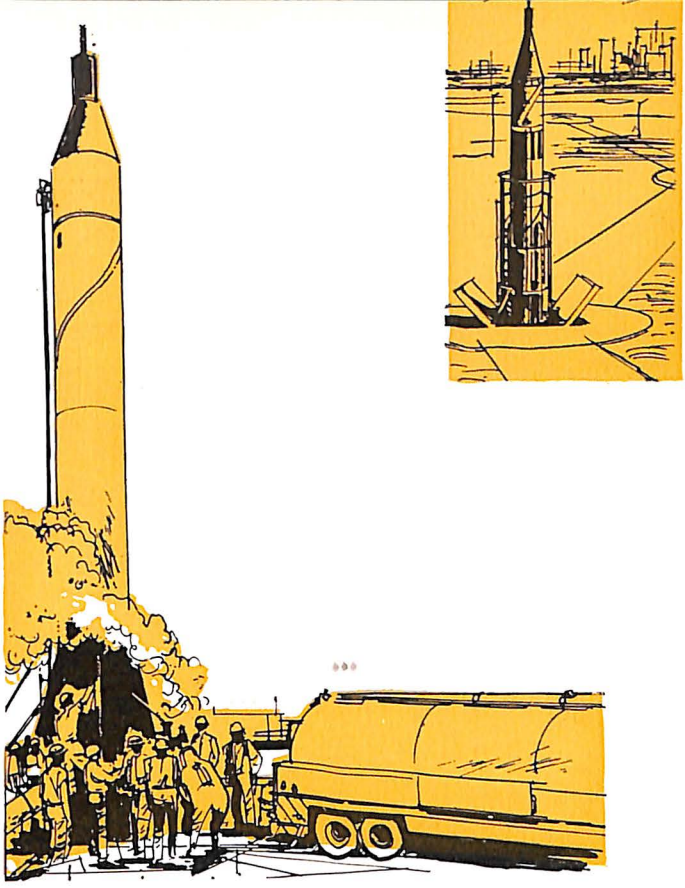
(*Continued on next page*)

U. S. MISSILE & ROCKET PROGRAM—*Continued*

Project	Service	Systems Contractor	Propulsion		Status
			Manufacturer	Type	
Surface-to-Underwater					
ALFA	Navy	Navy/Avco	—	Solid	Operational
ASROC	Navy	Minneapolis-Honeywell	—	—	Operational
SUBROC*	Navy	Goodyear	Thiokol	Solid	Development
TERNE	Navy**	Kongsberg Vapenfabrikk & Arma	—	—	Study
Underwater-to-Underwater					
ASTOR	Navy	Westinghouse	--	ASW	Development
Miscellaneous Types					
QUAIL (bomber decoy)	Air Force	McDonnell	General Electric	Jet	Operational
LAW	Army	No Contract	—	—	Study
M-55 (Poison Gas Rocket)	Army	Norris/ Thermador	—	—	Operational
SEMPER	Marines	No Contract	—	—	Development
LULU (Nuclear Depth Charge)	Navy	Navy/ General Mills	—	—	Operational

* Also Underwater-to-Underwater.
** Purchasing from Norway.
Source: 17

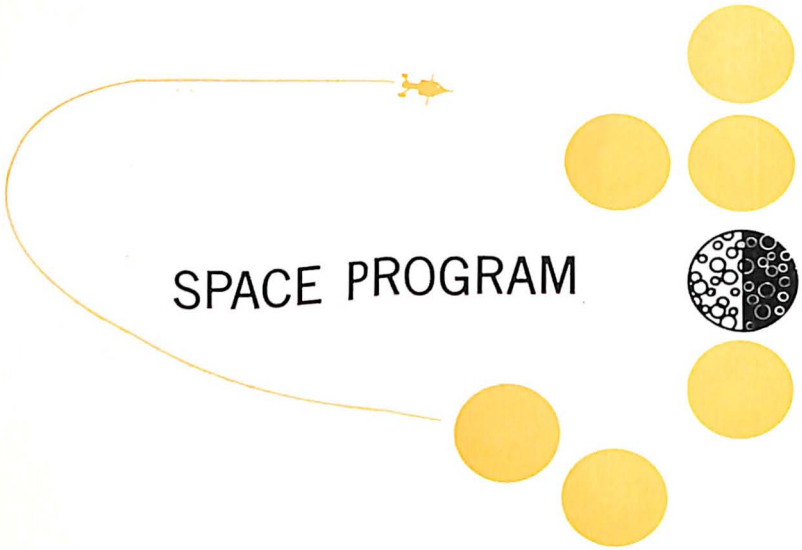




DRONES IN PRODUCTION OR DEVELOPMENT

Name and Designation	Service	Prime	Airframe	Power Plant	Guidance
KDB-1	Navy/Army	Beech	Beech	McCulloch	Babcock & Summers
XKD2B-1	Navy	Beech	Beech	Rocket-dyne	—
KD2R-5	Navy	Radioplane	Radioplane	McCulloch	—
DSN-3	Navy	Gyrodyne	Gyrodyne	Boeing	—
OQ-19B,D	Army/ USAF	Radioplane	Radioplane	McCulloch	Babcock
Q-2C	USAF	Ryan	Ryan	Conti-nental	Lear
SD-2	Army	Rheem	Aerojet	Lycoming	Sperry Rand
SD-5	Army	Fairchild	Fairchild	Pratt & Whitney	
RP-76	Army	Radioplane	Radioplane	Aerojet	Radioplane
"Roadrunner", "Redhead"	Army	North American	North American	Marquardt	Babcock

Source: 17



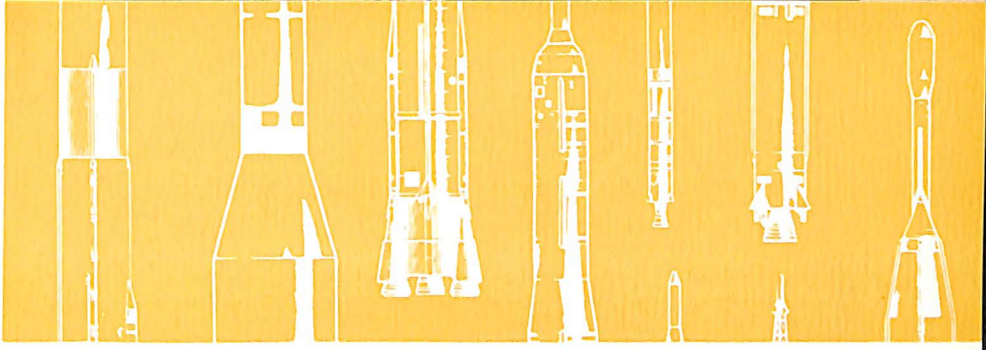
SPACE PROGRAM

During the latter part of 1960 and the early part of 1961, the United States space programs moved at an accelerated rate. The preparatory steps of the previous two years of the American Space Age began to pay dividends. Successful space launchings were more frequent and the ratio of success was also higher as equipment improved in reliability.

In the year following April 1, 1960, the United States successfully launched 20 earth satellites, bringing to 40 the number of successful spacecraft launched since January 31, 1958, when Explorer I went into orbit.

The most spectacular success of the American year occurred on May 5, 1961, when the first U. S. astronaut, Commander Alan B. Shepard, was thrust 115 miles into space in a capsule named "*Freedom 7.*" The flight was a suborbital phase of Project Mercury, a preliminary to orbital missions scheduled for late 1961. Shepard had been preceded into space by a Soviet "cosmonaut" Yuri Gagarin, who made the first manned space flight, a single orbit, on April 12, 1961, in a spacecraft called "*Vostok.*"

The major U. S. experiment in unmanned spaceflight was the first recovery of any object from earth orbit. The object was a capsule ejected from the Discoverer XIII satellite, recovered on August 11, 1960. The U. S. also launched a number of different types of satellites in experiments concerning meteorological, navigation, communication, surveillance



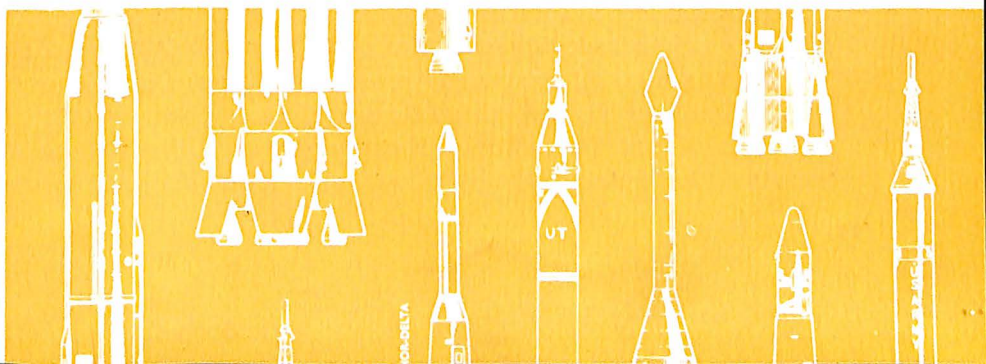
and early warning spacecraft.

From the standpoint of the aerospace industry's responsibilities, manufacture of space hardware was rapidly becoming a more important factor. The industry was building the space hardware for both the civilian and miltary space exploration programs, including rocket power plants and booster systems, space satellites and capsules, guidance and control equipment, telemetry and tracking equipment, ground support equipment, instrumentation and other components. Industry was also extensively engaged in research and development of future space systems.

As a proportion of the total workload, space equipment continued to rank third behind aircraft and missiles, but the intensified launching schedule and preparatory work for later programs combined to provide a significant increase in the man-hours and facilities devoted to space research and production in the industry.

Although the United States lagged in the spectacular areas of space exploration, its diversified, broad-approach program offered promising results for the future. Some indication of the diversity of the U. S. program, which includes a number of experiments not attempted by the Soviet Union, is contained in a brief review of the American launches in the year preceding publication of this volume:

Communications satellites: The National Aeronautics and Space Administration conducted two experiments in the use of satellites as relay points for communications. The first, Echo I, launched on August 12, 1960, was a communication satellite of the passive variety. Messages were transmitted from one point on the surface of the earth to another



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[E]	770.0	678.0	92.0
1962[E]	965.0	834.0	131.0

[E] Estimate.
Source: 24

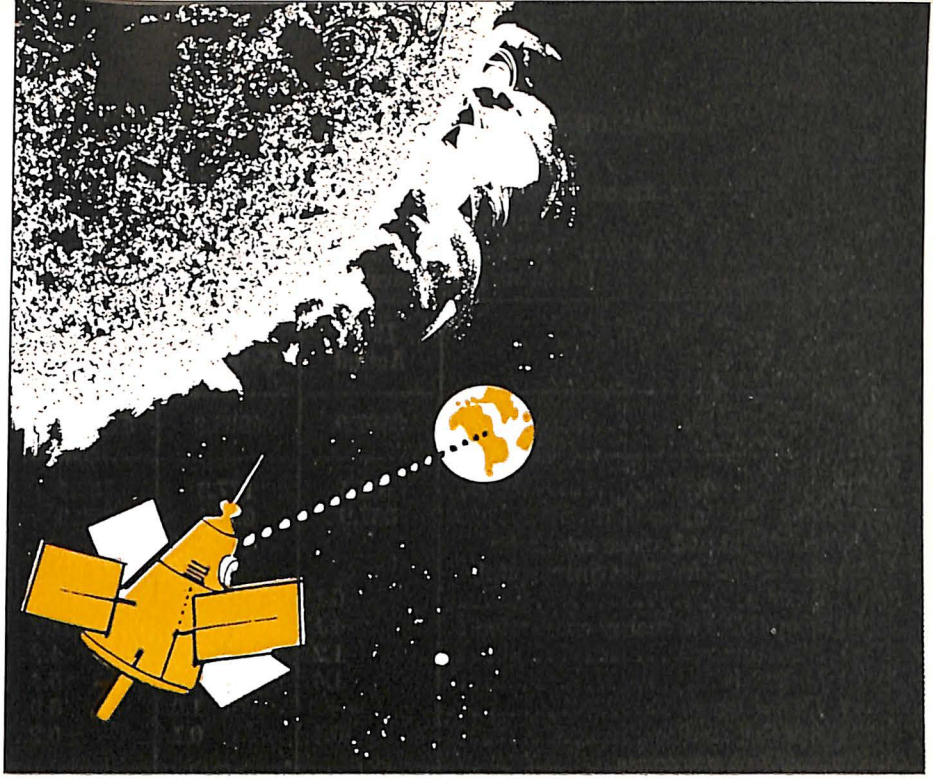
by "bouncing" signals off the satellite. Echo I was also important from the prestige standpoint because it was the first satellite which could be seen by the human eye unaided by optical devices. The satellite was a 100-foot plastic balloon coated with aluminum to reflect sunlight for visibility on earth.

Courier 1B was a delayed-repeater, or active communications satellite, which could receive, store and re-transmit messages. It had five miniature tape recorders, four for teletype messages and one for voice, upon which messages from one point were recorded for later broadcast to another point. Courier 1B went into orbit on October 4, 1960.

Meteorological satellites: The employment of the earth satellite as an aid to improved weather forecasting was tested twice during the year with Tiros I, launched into orbit on April 1, 1960, and Tiros II, which went into space on November 23, 1960. The satellites contained television cameras that took thousands of photos of the earth's cloud cover and relayed them back to earth for analysis. Tiros I, the more successful of the two launches, took 22,952 photos in 78 days, and more than 60% of the photos were of good quality, useful to meteorological research.

The Tiros launches were also NASA projects.

Navigation satellites: Under Navy cognizance, three experiments were made during the year on navigation satellites, designed to provide



a more precise system of navigation for surface ships, submarines and aircraft through the use of the earth satellite. Transit 1B was launched April 13, 1960. Transit 2A on June 22, 1960, and Transit 3B on February 21, 1961. The latter two satellites were unique in that they carried secondary satellites designed for other experiments, chiefly solar radiation tests. On the Transit 2A test, both satellites were placed in orbit. On Transit 3B, the "piggyback" satellite, called Lofti, failed to separate but went into orbit with the Transit package.

Early warning and surveillance satellites: Two projects of military importance were among the year's successful launches. The first was Midas II (Missile Defense Alarm System). Placed in orbit on May 24, 1960, Midas II was equipped with infrared sensors designed to pick up enemy missiles launches and report them back to earth.

An allied type of satellite was Samos II, launching into orbit on January 31, 1961, the third anniversary of the first American earth-orbiting satellite. Samos II was a prototype of a space surveillance system, in which photographic satellites would observe and report on global military activities.

Both programs were under the jurisdiction of the Air Force.

In addition to the above programs, which were experiments in potential application of the satellite, the U. S. launched a number of space-

NATIONAL AERONAUTICAL AND SPACE ADMINISTRATION
OBLIGATIONS
FISCAL YEARS 1960, 1961, 1962
(Millions of Dollars)

	1960 Actual	1961 Estimate	1962 Estimate
TOTAL	$567.0	$965.3	$1,114.9
Salaries and expenses[a]	104.4	177.3	193.4
Research and Development, Total[b]	367.9	624.4	820.0
1. Aeronautical and space research:			
a) Aerodynamics & environmental physics	6.1	9.8	13.5
b) Propulsion & energy conversion	4.1	7.5	11.7
c) Structures	1.2	2.3	4.2
d) Materials	1.4	2.9	5.4
e) Life sciences	—	1.0	6.0
f) Special studies	0.1	0.1	0.2
2. Space flight programs			
a) Scientific investigations in space	73.8	127.7	154.8
b) Satellite applications	7.2	18.9	62.1
c) Manned space flight	69.0	122.6	82.5
d) Launch operations	0.5	5.1	10.3
e) Tracking and data acquisition	10.3	28.4	41.3
3. Space vehicle & supporting development			
a) Vehicle systems	97.9	167.8	204.8
b) Propulsion technology	27.7	65.1	82.1
c) Other development	2.7	16.1	23.8
4. Program direction	1.0	2.0	3.0
5. Obligations for prior year costs	64.9	47.1	114.3
Construction and Equipment[c]	94.7	163.6	101.5

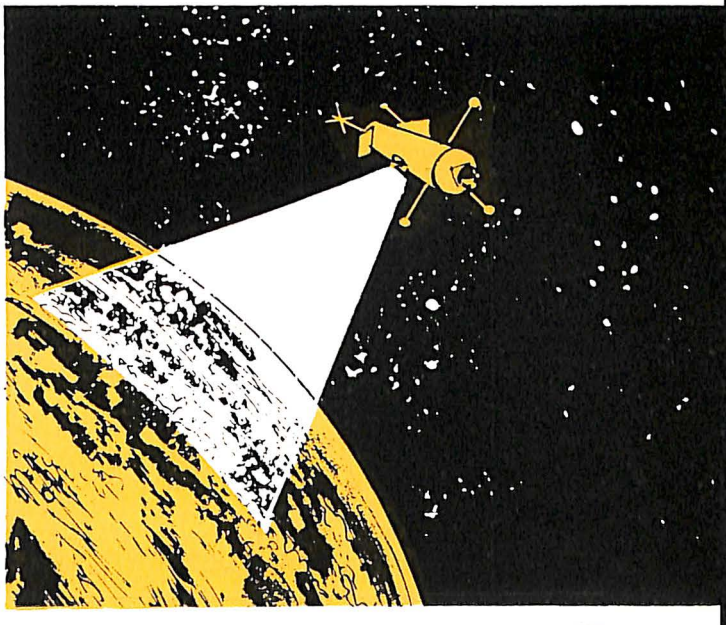
[a] The Budget, 1962, p. 177.
[b] The Budget, 1962, p. 178.
[c] The Budget, 1962, p. 180.
Source: 24

craft in scientific experiments. The most successful of these programs was the Air Force's Discoverer program, designed to achieve short-life orbits primarily for purposes of recovering capsules from orbit. Ten of 15 Discoverer launches were successful during the period April 15, 1960, to April 15, 1961. The most important was Discoverer XIII, launched August 10, 1960. A capsule ejected from Discoverer XIII the following day was successfully recovered in the Pacific Ocean, the first recovery of any object from space orbit. Later in 1960, three more capsules were

recovered; on these occasions the capsules were caught in mid-air by USAF Aircraft. Mid-air recoveries were made with Discoverer XIV (August 19, 1961); Discoverer XVII (November 12, 1960); and Discoverer XVIII (December 7, 1960).

Another achievement of note during the year was the most distant transmission of radio signals from space, accomplished by the space probe Pioneer V. In April, 1960, Pioneer V was more than 22,500,000 miles from earth in a solar orbit (having escaped earth's gravity to orbit the sun for an estimated 100,000 years) and still sending radio signals back to earth. NASA provided project direction for Pioneer V.

Three more satellites of the Explorer series were launched during the year. Explorer VIII contained instrumentation for an investigation of the ionosphere. It was placed in orbit on November 3, 1960. It was followed by Explorer IX, which injected an inflatable sphere into orbit to determine the density of the atmosphere. Explorer IX went into orbit on February 16, 1961. It was a notable launch in that it was the first time an all-solid fuel launching vehicle was employed as a booster (the vehicle was the four-stage Scout). The last launch during the year preceding publication of this volume was that of Explorer X, which went into orbit on March 25, 1961. Explorer X was designed to investigate the shape of the ionosphere and results had not been recorded by press time. Project direction for all three Explorers was supplied by NASA.



SPACE PROGRAM
OBJECTS IN ORBIT
AS OF APRIL 11, 1961
UNITED STATES AND RUSSIAN LAUNCHINGS

Year	Object	Code Name	Source	Launch
1958	Alpha	Explorer I	US	1 Feb 58
1958	Beta 1	Rocket Body	US	17 Mar 58
1958	Beta 2	Vanguard I	US	17 Mar 58
1959	Alpha 1	Vanguard II	US	17 Feb 59
1959	Alpha 2	Rocket Body	US	17 Feb 59
1959	Delta	Explorer VI	US	7 Aug 59
1959	Eta	Vanguard III	US	18 Sep 59
1959	Iota 1	Explorer VII	US	13 Oct 59
1959	Iota 2	Rocket Body	US	13 Oct 59
1960	Alpha	Pioneer V	US	11 Mar 60
1960	Beta 1	Rocket Body	US	1 Apr 60
1960	Beta 2	Tiros I	US	1 Apr 60
1960	Gamma 1	Rocket Body	US	13 Apr 60
1960	Gamma 2	Transit 1B	US	13 Apr 60
1960	Gamma 4	None	US	13 Apr 60
1960	Epsilon 1	Sputnik IV	USSR	15 May 60
1960	Epsilon 3	None	USSR	15 May 60
1960	Epsilon 4	None	USSR	15 May 60
1960	Zeta 1	Midas II	US	24 May 60
1960	Eta 1	Transit 2A	US	22 Jun 60
1960	Eta 2	Greb	US	22 Jun 60
1960	Eta 3	Rocket Body	US	22 Jun 60
1960	Iota 1	Echo I	US	12 Aug 60
1960	Iota 2	Rocket Body	US	12 Aug 60
1960	Iota 3	Metal Object	US	12 Aug 60
1960	Iota 4	Metal Object	US	12 Aug 60
1960	Iota 5	Metal Object	US	12 Aug 60
1960	Nu 1	Courier 1B	US	4 Oct 60
1960	Nu 2	Rocket Body	US	4 Oct 60
1960	Xi 1	Explorer VIII	US	3 Nov 60
1960	Xi 2	Rocket Body	US	3 Nov 60
1960	Xi 3	None	US	3 Nov 60
1960	Pi 1	Tiros II	US	23 Nov 60
1960	Pi 2	Rocket Body	US	23 Nov 60
1960	Pi 4	None	US	23 Nov 60
1961	Alpha 1	Samos II	US	31 Jan 61
1961	Alpha 2	Metal Object	US	31 Jan 61
1961	Gamma 1	Venus Probe	USSR	12 Feb 61
1961	Delta 1	Explorer IX	US	16 Feb 61
1961	Delta 2	Rocket Body	US	16 Feb 61
1961	Delta 3	None	US	16 Feb 61
1961	Delta 4	None	US	16 Feb 61
1961	Epsilon 1	Discoverer XX	US	17 Feb 61
1961	Epsilon 3	None	US	17 Feb 61

OBJECTS IN ORBIT—*Continued*

Year	Object	Code Name	Source	Launch
1961	Epsilon 4	None	US	17 Feb 61
1961	Zeta	Discoverer XXI	US	18 Feb 61
1961	Kappa	Explorer X	US	25 Mar 61
1961	Lambda 1	Discoverer XXIII	US	8 Apr 61
1961	Lambda 2	Capsule	US	8 Apr 61
1961	Lambda 3	None	US	8 Apr 61
1961	Nu 1	Explorer XI	US	27 Apr 61

Sources: 17, 36

DECAYED OBJECTS

Year	Object	Code Name	Source	Launch	Down
1957	Alpha 1	Rocket Body	USSR	4 Oct 57	1 Dec 1957
1957	Alpha 2	Sputnik I	USSR	4 Oct 57	Jan 1958
1957	Beta	Sputnik II	USSR	3 Nov 57	14 Apr 1958
1958	Gamma	Explorer III	US	26 Mar 58	28 Jun 1958
1958	Delta 1	Rocket Body	USSR	15 May 58	3 Dec 1959
1958	Delta 2	Sputnik III	USSR	15 May 58	6 Apr 1960
1958	Epsilon 2	Explorer IV	US	26 Jul 58	23 Oct 1959
1958	Zeta	Atlas	US	18 Dec 58	21 Jan 1959
1959	Beta	Discoverer I	US	28 Feb 59	Mar 1959
1959	Gamma	Discoverer II	US	13 Apr 59	26 Apr 1959
1959	Epsilon 1	Discoverer V	US	13 Aug 59	28 Sep 1959
1959	Zeta	Discoverer VI	US	19 Aug 59	20 Oct 1959
1959	Kappa	Discoverer VII	US	7 Nov 59	26 Nov 1959
1959	Lambda	Discoverer VIII	US	20 Nov 59	8 Mar 1960
1960	Delta	Discoverer XI	US	15 Apr 60	26 Apr 1960
1960	Sigma	Discoverer XVIII	US	7 Dec 60	2 Apr 1961
1961	Epsilon 2	None	US	17 Feb 61	30 Mar-2 Apr 1961
1961	Eta	Transit 3B & Lofti	US	22 Feb 61	30 Mar 1961
1961	Mu 1	Vostok	USSR	12 Apr 61	12 Apr 1961[a]
1961	Mu 2	Rocket Body	USSR	12 Apr 61	16 Apr 1961

[a] USSR announced successful re-entry and recovery of a manned space vehicle.
Sources: 17, 36

RESEARCH AND DEVELOPMENT

The composite of the aerospace industry is changing from one primarily geared to production to an accelerated emphasis on research, development and testing.

The degree of this reorientation is clearly evident. For example, in the fiscal year 1962 budget, almost $600 million of military R&D funds will be used for space-oriented systems, development and related applied research. Adding to this, the funds requested by the National Aeronautics and Space Administration, the total planned allocations exceed $1.5 billion.

Basic research and development programs too, embrace virtually the entire spectrum of the sciences. To keep abreast of the giant strides our aerospace sciences have made, the industry has had to finance several billion dollars worth of new facilities in the past few years. Although this seems to be paradoxical when considering the fact that the industry today has a large amount of excess floor space, actually it is cheaper in many cases to build a new facility than to convert an existing one to the precise needs of specialized research.

In this regard, it is estimated that the aerospace industry in 1964, will require only about one-fourth of the floor space it used a few years ago. Personnel requirements, both in number and type, are following a similar pattern. Technical personnel in World War II made up

about 20 per cent of the total work force; today technical personnel accounts for about 65 per cent.

One of the knottiest problems facing all facets of the manufacturing industry is the virtually perfect degree of reliability required components and accessories in today's aircraft, missiles, spacecraft and their propulsion systems. The malfunction of a single item which may cost less than a quarter of a dollar to produce could easily cause a multi-million dollar missile to abort.

FEDERAL EXPENDITURES FOR RESEARCH AND DEVELOPMENT
(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[E]	8,672	7,059	1,613
1962[E]	9,443	7,426	2,016

[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

The exciting challenge of research and development leading to the manufacture of space exploration devices has not, nevertheless, obscured the great task ahead in aeronautics research and development. The air-breathing engine is far from reaching its ultimate development. Boundary layer control and other new developments dealing with aerodynamics are hotly pursued items of research by the industry. VTOL and STOL designers are still pursuing the elusive answer to the problem that troubled the Wright Brothers—more power and less weight. There are innumerable areas in the field of aeronautics research that are receiving urgent and detailed exploration.

Aerospace companies have unique capabilities to research, design and build reliable vehicles and their power plants to meet Government specifications, that are based on unproven theories, materials that are untried

DEPARTMENT OF DEFENSE-MILITARY FUNCTIONS
TOTAL EXPENDITURES, BY APPROPRIATION GROUP
FISCAL YEARS 1953-1962
(Millions of Dollars)

	FY 1953	FY 1954	FY 1955	FY 1956	FY 1957
Military Personnel	12,179	11,643	11,403	11,582	11,409
Operation and Maintenance	10,028	9,162	7,931	8,400	9,487
Procurement	17,297	15,957	12,838	12,227	13,488
Aircraft	8,189	9,080	8,804	7,835	8,647
Missiles	245	417	604	1,005	1,855
Ships	920	905	944	858	842
Astronautics	—	—	—	—	—
Ordnance, Vehicles, & Related equipment	4,686	3,334	1,191	1,260	674
Electronics and Communications	937	700	441	660	704
Other Equipment	2,320	1,521	854	608	767
RESEARCH, DEVELOPMENT, TEST & EVALUATION	2,148	2,187	2,261	2,101	2,406
Military Construction, Management Funds, and Adjustments	1,957	1,386	1,099	1,480	1,648
TOTAL EXPENDITURES	43,611	40,336	35,532	35,791	38,439

(*Continued on next page*)

and methods that are unknown at the start of the project. This capability has been demonstrated many times in the past in the case of orbiting satellites and in the case of specialized aircraft.

These capabilities require the highest order of industrial know-how. Aerospace companies are in the forefront of industrial management techniques which enable people to function at the most advanced frontiers of science and to translate the work of laboratories into reliable operating aerospace products.

DEPARTMENT OF DEFENSE-MILITARY FUNCTIONS
TOTAL EXPENDITURES, BY APPROPRIATION GROUPS
FISCAL YEARS 1953-1962
(Millions of Dollars)

	FY 1958	FY 1959	FY 1960	FY 1961	FY 1962
Military Personnel	11,611	11,801	11,738	12,253	12,456
Operation and Maintenance	9,761	10,378	10,223	10,437	10,803
Procurement	14,083	14,409	14,312	13,311	14,862
Aircraft	8,793	7,730	6,487	6,019	6,104
Missiles	2,434	3,337	3,790	4,157	4,175
Ships	1,105	1,491	1,744	1,727	1,921
Astronautics	—	—	—	—	—
Ordnance, Vehicles, & Related equipment	365	399	443	628	979
Electronics and Communications	663	720	1,093	1,082	1,096
Other Equipment	723	730	755	699	587
RESEARCH, DEVELOPMENT, TEST & EVALUATION	2,504	2,866	3,732	4,276	4,672
Military Construction, Management Funds, and Adjustments	1,102	1,779	1,210	1,222	1,008
TOTAL EXPENDITURES	39,062	41,233	41,215	42,500	43,800

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 estimate the expenditures by functional title as if the fiscal year 1961 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 budget amendments dated March 28, 1961. Other budget tables in this chapter have not been adjusted to this amendment, which increased RDT&E expenditures for 1961 by $129 million and for 1962 by $284 million above the 1962 Budget document.

Source: 32

Research, Development, Test and Evaluation:

The 1962 Defense budget, as recently revised, estimates expenditures for research, development, test and evaluation at $4.7 billion, compared to $4.3 billion in 1961.

DEPARTMENT OF DEFENSE
EXPENDITURES FROM RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS[a]
(Millions of Dollars)

Year Ending June 30	Department of Defense	Air Force	Navy	Army	Other
1951	758	269	327	162	-
1952	1,165	429	448	288	–
1953	1,411	530	499	382	–
1954	1,385	513	476	396	–
1955	1,391	524	467	400	–
1956	1,491	632	449	410	–
1957	1,687	729	523	435	–
1958	1,742	694	569	476	3
1959	2,859	813	798	539	709
1960	3,732	1,089	767	705	1,171
1961[E]	4,148	1,391	1,120	939	698
1962[E]	4,388	1,618	1,249	1,071	450

[E] Estimate.
[a] Adjusted to make data comparable to current appropriation structure. Does not include RDT&E expenditures from other appropriations.
[b] Unrevised. See table on page 63.
Source: 24

National Research and Development Programs:

Federal expenditures for research and development programs in 1962 are estimated at $9.4 billion, compared to $8.7 billion in 1961. This figure, again, sets a new record in Federal expenditures for this purpose. Of this sum, major national security will receive $7.4 billion, all other programs $2.0 billion. A further breakdown of the national research and development effort indicates that Department of Defense military functions will spend an estimated $6.27 billion, Atomic Energy Commission $1.1 billion, NASA $965 million, HEW $483 million, Agriculture $154 million, National Science Foundation $119 million, other agencies $331 million.

Total research and development obligations and expenditures come not only from research and development appropriations but also from other appropriations, such as procurement, construction, personnel, etc.

This chapter contains some tables (pages 61 and 72) which show the total research and development effort, regardless of the appropriation from which they originate. All other Defense Department tables are limited to data based on research, development, test and evaluation appropriations.

Major Research and Development Effort:

Research, development, test and evaluation funding for Air Force ballistic missiles, new cargo aircraft for MATS and the development of certain Navy aircraft will be emphasized but funded through procurement accounts. Research, development, test and evaluation funding for aircraft is declining but funds are provided for development of a new

VTOL transport aircraft prototype, support of the aircraft nuclear propulsion program (although at a lower rate than previous years as work is to be continued on only one propulsion system). Funding for

DEPARTMENT OF DEFENSE[a]
OBLIGATIONS FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION
(In Millions)

Budget title and program	1960 Actual	1961 Estimate	1962 Estimate
Research, development, test, and evaluation appropriations:			
1. Military sciences	$ 513.3	$ 687.4	$ 623.7
2. Aircraft and related equipment	333.3	403.2	365.6
3. Missiles and related equipment	1,542.1	1,838.9	1,580.5
4. Military astronautics and related equipment	421.4	511.2	584.0
5. Ships and small craft and related equipment	196.4	207.2	171.7
6. Ordnance, combat vehicles, and related equipment	214.8	159.6	153.0
7. Other equipment	519.8	473.3	493.9
8. Programwide management and support	225.6	245.2	243.0
9. Emergency fund	—	140.7	150.0
Total direct obligations, research, development, test and evaluation appropriations	$3,996.7	$4,666.7	$4,365.4
Procurement appropriations:[b]			
1. Aircraft	318.0	477.8	482.0
2. Missiles	1,194.2	1,122.0	896.2
3. Other	16.0	67.0	44.0
Total Development, Test and Evaluation identified in procurement appropriations	$1,528.2	$1,666.8	$1,422.2
Military Personnel appropriations	191.9	199.7	204.7
Total Direct Obligations for Research, Development, Test and Evaluation	$5,686.8	6,533.2	$5,992.3

[a] Includes obligations made by USAF; Navy; Army; Advanced Research Projects Agency; Emergency Fund.
[b] Estimated amounts for items identified as development, test, and evaluation support
Source: 24

the Dyna-Soar will be at a higher level than in 1961, and the Army will initiate development of a new surveillance aircraft. Development of missiles and related equipment continues to constitute a major portion of R,D,T, & E, although funding is at a lower level than in 1961. One quarter billion dollars is provided for Nike-Zeus. Substantial funds are also provided for Pershing, Mauler, a longer range version of the Polaris, the Sky Bolt, Bullpup, and a new highly mobile surface-to-surface missile to support battle groups in the combat area. Military space and satellite development increases in importance, with substantial funds provided for development of Midas, Samos, Advent and Transit.

Civil Space Exploration and Flight Technology:

Expenditures for civil space programs are estimated at $965 million in 1962, compared to $770 million in 1961, and appropriations in the amount of $1.1 billion are requested for 1962, together with a 1961 supplemental of $50 million. Major programs include: more advanced Tiros and Nimbus satellites; continuation of the Mercury system; the Ranger unmanned and lunar exploration program, leading to the Surveyor and Prospector series; and continued development of the Centaur and Saturn launch vehicles.

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

Program	1960	1961[E]	1962[E]
TOTAL DIRECT OBLIGATIONS	$1,072.2	$1,159.0	$1,130.4
Military sciences	149.9	176.0	188.0
Aircraft and related equipment	22.6	35.1	39.7
Missiles and related equipment	474.5	542.4	457.0
Military astronautics and related equipment	----	40.0	57.0
Ships and small craft and related equipment	1.1	.6	.7
Ordnance combat vehicles, and related equipment	108.7	83.9	86.9
Other equipment	213.3	180.7	198.4
Programwide management and support	102.1	100.3	102.7

[E] Estimate.
Source: 24

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

Program	1960	1961[E]	1962[E]
TOTAL DIRECT OBLIGATIONS	$1,392.2	$1,761.0	$1,667.0
Military sciences	89.1	143.0	134.0
Aircraft and related equipment	219.8	262.0	240.0
Missiles and related equipment	386.0	585.0	443.0
Military astronautics and related equipment	343.8	424.0	504.0
Ordnance combat vehicles, and related equipment	13.2	5.0	—[b]
Other equipment	264.0	252.0	257.0
Programwide management and support	76.3	90.0	89.0

[E] Estimate.
Source: 24

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

Program	1960	1961[E]	1962[E]
TOTAL DIRECT OBLIGATIONS	$1,297.9	$1,356.0	$1,253.0
Military sciences	149.4	139.2	138.0
Aircraft and related equipment	90.9	106.1	85.9
Missiles and related equipment	681.6	711.5	680.6
Military astronautics and related equipment	----	28.2	23.0
Ships and small craft and related equipment	195.3	206.6	171.1
Ordnance combat vehicles, and related equipment	92.9	70.8	66.1
Other equipment	42.5	40.6	38.4
Programwide management and support	45.3	53.0	49.9

[E] Estimate.
Source: 24

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1961
TOTAL AND GUIDED MISSILES

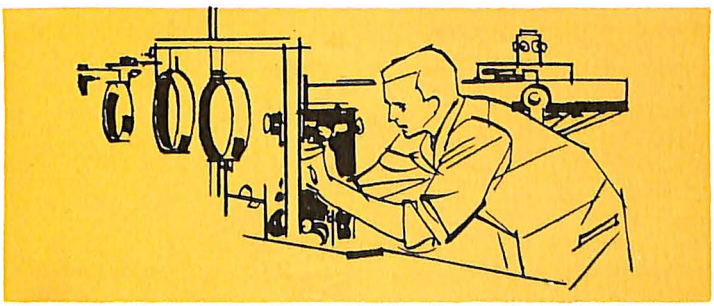
	TOTAL, Research, Development, Test & Evaluation	Guided Missiles	Guided Missiles as Percent of Total
Department of Defense .	$2,098	$344	16.4
Air Force	957	139	14.5
Navy	419	112	26.7
Army	397	93	23.4
Office of Secretary of Defense	326	—	—

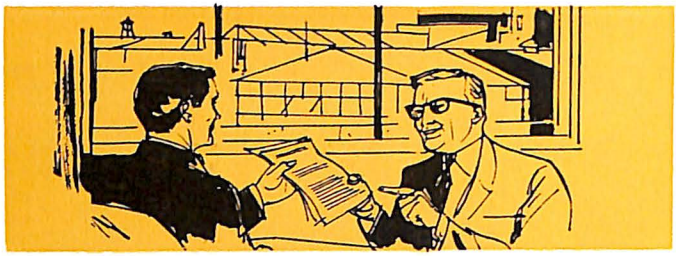
Source: 20

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1961
TOTAL AND AIRCRAFT

	TOTAL, Research, Development, Test & Evaluation	Aircraft	Aircraft as Percent of Total
Department of Defense .	$2,098	$259	12.3
Air Force	957	150	15.7
Navy	419	71	16.9
Army	397	38	9.6
Office of Secretary of Defense	326	—	—

Source: 20





DEPARTMENT OF DEFENSE
UNPAID OBLIGATIONS FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1961
TOTAL AND GUIDED MISSILES

	TOTAL, Research, Development, Test & Evaluation	Guided Missiles	Guided Missiles as Percent of Total
Department of Defense .	$2,646	$1,135	42.9
Air Force	795	113	14.2
Navy	900	590	65.6
Army	805	432	53.7
Office of Secretary of Defense	146	—	—

Source: 20

DEPARTMENT OF DEFENSE
UNPAID OBLIGATIONS FROM
RESEARCH, DEVELOPMENT, TEST AND EVALUATION APPROPRIATIONS
FEBRUARY 28, 1961
TOTAL AND AIRCRAFT

	TOTAL, Research, Development, Test & Evaluation	Aircraft	Aircraft as Percent of Total
Department of Defense .	$2,646	$235	8.9
Air Force	795	143	18.0
Navy	900	67	7.4
Army	805	25	3.1
Office of Secretary of Defense	146	—	—

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 Research and Development Plant
		Total	Production and Weapons	Reactor Development	Biology, Medicine, Physics	Isotopes Development	
1954	$274.3	$229.5	$ 96.0	$ 70.6	$ 62.9	...	$ 44.8
1955	289.8	253.4	92.1	95.4	65.9	...	36.4
1956	385.1	335.5	106.4	155.1	74.0	...	49.6
1957	512.2	419.5	90.1	244.8	84.6	...	92.7
1958	637.0	516.1	110.6	289.6	115.9	...	120.9
1959	877.1	699.8	226.0	325.8	143.5	4.4	177.5
1960	986.3	761.7	223.5	361.7	166.8	9.6	224.6
1961[E]	1,097.7	871.3	247.5	416.2	197.5	10.1	226.4
1962[E]	1,116.5	866.3	247.6	400.8	207.5	10.4	250.2

[e] Estimate
Source: 24

FUNDS FOR INDUSTRIAL RESEARCH AND DEVELOPMENT
ALL INDUSTRIES AND AIRCRAFT INDUSTRY, 1957, 1958, 1959
(Millions of Dollars)

Industry	TOTAL FUNDS			Financed by the Federal Government			Funds for Basic Research		
	1959	1958	1957	1959	1958	1957	1959	1958	1957
TOTAL—ALL INDUSTRIES	$9,439	$8,218	$7,155	$5,421	$4,636	$3,741	$344	$295	$241
Aircraft & Parts	2,973	2,498	2,544	2,544	2,126	2,165	41	20	52
Electrical Equipment	2,227	1,947	1,170	1,550	1,331	717	59	56	38
Motor Vehicles and Other Transportation	863	849	708	249	318	212	7	6	8
Machinery, except Electrical	910	778	688	382	316	260	19	20	17
All Other	2,465	2,146	2,045	696	545	387	218	193	126

Source: 39

RESEARCH AND DEVELOPMENT IN THE AIRCRAFT INDUSTRY, 1957-1959, BY FUND SOURCE AND TYPE OF RESEARCH
(Millions of Dollars)

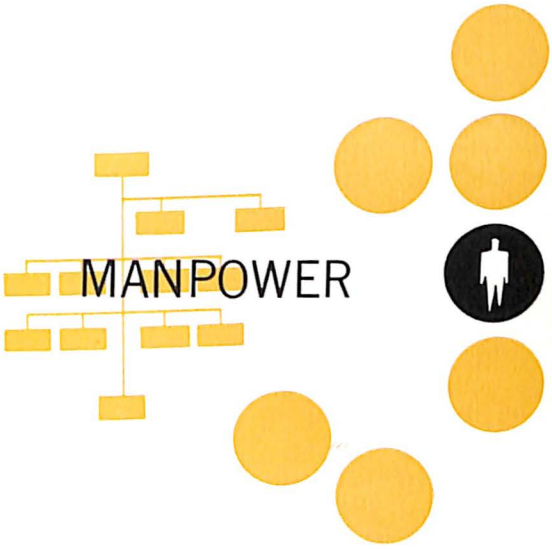
	1957[a]	1958[b]	1959[b]
Funds for R&D Performance, TOTAL	$2,540	$2,498	$2,973
Source of funds:			
Federal Government	2,210	2,126	2,544
Company and other non-Government sources	330	373	429
Type of R&D:			
Basic research	25	20	41
Applied research and development	2,515	2,478	2,932

[a] Revised.
[b] Preliminary.
Source: 39

APPLIED RESEARCH AND DEVELOPMENT IN THE AIRCRAFT INDUSTRY BY PRODUCT FIELD, 1958[a]

Product Field	Amount (Millions of Dollars)
Applied Research and Development Funds, TOTAL	$2,478
Aircraft and Parts	727
Atomic energy	84
Chemicals	17
Electrical and communication equipment and electronic components	327
Guided Missiles	1,183
Machinery	20
Other transportation equipment	19
Primary metals	67
Professional and Scientific instruments	20
Other product fields	14

[a] Comparable data for other years are not available.
Source: 39



Employment in the aerospace industry of production employees engaged in the manufacture of aircraft, missiles, spacecraft, propulsion systems and their components and accessories, continued to decline in 1960, for the third consecutive year. Employment at year's end 1960 amounted to 643,900. Highest point in employment during the year was in January with 693,700 on the rolls. Average during the entire year amounted to 653,400.

Despite a general lowering of the industry's over-all employment needs, there has been a continual recruiting plea for highly trained engineers and scientists. This is quite understandable when considering the fact that research in this industry embraces virtually the entire spectrum of the sciences. The breadth of knowledge required is due to the fact that while aircraft will remain man's principal means of rapid transportation for years to come, the world is nevertheless witnessing a transition from aircraft to missiles and from atmospheric flight to extra-atmospheric flight. Successful accomplishment of these critical transitions can be made only through increasing our knowledge of the sciences, thus building our community of research scientists and engineers.

At the same time the magnitude of some of our aerospace projects, indeed weapons development and production generally, demands a multi-organizational operation. All of the major weapons systems initi-

ated during the past several years have involved two or more major companies, and two or more governmental laboratories. These interrelationships, therefore, are focussing increased attention on the problems of program management, time phasing, prompt decision making and their corollary influence on costs and cost control. Also of great concern to the industry today is the need to develop new approaches and new tech-

SALARIES AND WAGES IN THE AIRCRAFT INDUSTRY
1914 TO DATE
(Thousands of Dollars)

Year	TOTAL	Salaries	Production Workers	
			Wages	Average Weekly Earnings
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[b]	4,720,050	2,044,229	2,675,821	103.02
1959[c]	3,358,712	1,503,730	1,854,982	102.17

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] This line and all following lines include data for aircraft engine manufacturers which are not available for prior years.
[b] Including aircraft equipment, not elsewhere classified, according to the revised Standard Industrial Classification.
[c] Excluding aircraft equipment, not elsewhere classified, according to the revised Standard Industrial Classification.
Source: 10, 11

AIRCRAFT AND TOTAL MANUFACTURING EMPLOYMENT, 1914 TO DATE

Year or Month	Aircraft Employment (in thousands)	Total Manufacturing Employment (in thousands)	Aircraft as Percent of Total Manufacturing Employment
1914	.2	7,514	[a]
1919	4.2	9,837	[a]
1921	2.0	7,557	[a]
1929	18.6	9,660	.2
1933	9.6	6,558	.2
1939	64.0	9,527	.7
Dec. 1941	423.0	13,817	3.1
Nov. 1943	1,342.5	17,858	7.5
Aug. 1945	351.4	15,343	2.2
Including subcontractors			
Dec. 1941	567.0	13,817	4.1
Nov. 1943	2,101.6	17,858	11.8
Aug. 1945	519.9	15,343	3.4
1948	237.7	15,321	1.6
1950	281.8	14,967	1.9
1953	779.1	17,238	4.5
1954	764.1	15,995	4.8
1955	740.5	16,563	4.5
1956	809.3	16,903	4.8
1957	861.7	16,782	5.1
1958	757.6	15,464	4.9
1959	734.9	16,156	4.5
1960	653.4	16,337	3.9

NOTE: 1914 to 1939 data are from the Census Bureau, 1941 to 1945, Civil Aeronautics Administration, 1948 to date, Bureau of Labor Statistics.

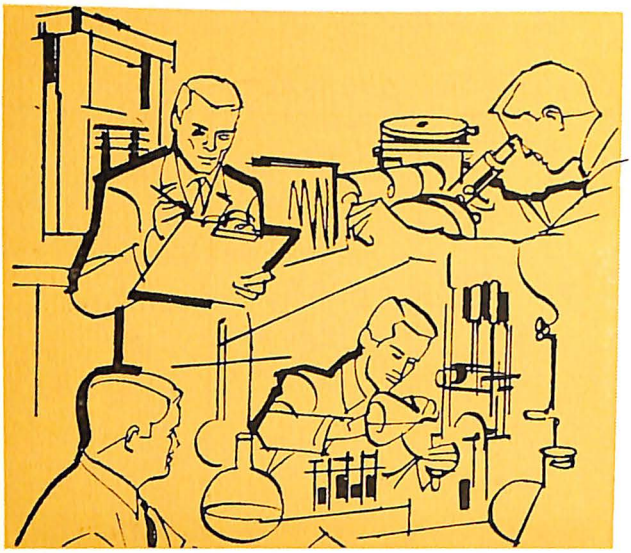
[a] Less than .05 percent.

Sources: 3, 34

niques to bear on all aspects of management of the industry. There is urgent need to increase management capabilities and administrative techniques to efficiently exploit the scientific, technical and productive capabilities of the aerospace industrial complex.

Another factor involved in the industry's dwindling manpower requirements is that, as it moves deeper into the missile and spacecraft era, the need for higher quality skills is inevitably increasing with two declining employment conditions manifest. First, less airframe pounds are required per missile; second, although missiles demand a higher sale price per pound than aircraft, it takes about 30 per cent less man-years production for the same dollar volume of sales.

Because of the increasing pressures for these varied skills, a wide



range of measures is being taken by the industry to motivate, encourage, and in many cases, finance young people of talent in pursuing higher education in engineering, sciences and various areas of management. In addition, most of the aerospace companies provide extensive in-plant training programs to raise employee skill levels.

Employees are also encouraged to attend local schools in order to gain additional and more current knowledge needed for them to perform more effectively in their vocational field. In operation, the aerospace companies and local schools cooperate in the establishment of training programs. Employees taking approved courses are reimbursed in whole or in part

SCIENTISTS AND ENGINEERS IN THE AIRCRAFT AND PARTS INDUSTRY
1959, 1957 AND 1954[a]

Type of Scientist and Engineer	Number Employed					
	TOTAL			Research and Development		
	1959	1957	1954	1959	1957	1954
TOTAL, ALL TYPES	94,900	84,900	48,500	60,400	56,700	27,600
Engineers	83,100	66,000	41,100	51,100	44,800	22,500
Metallurgists	1,300	900	700	1,000	600	400
Chemists	2,600	1,600	1,000	1,900	1,100	700
Physicists	4,000	1,900	1,200	3,700	1,500	1,000
Mathematicians	3,300	2,200	900	2,500	1,600	800
Other[b]	600	12,300	3,500	200	7,200	2,200

NOTE: Distribution by type may not add to total because of rounding.
Data for 1954 collected on slightly different basis from that for 1957.
[a] As of January
[b] The decline in "Other Scientists and Engineers" reflects increasing specificity of classification by reporting companies, and inclusion in one of the above general categories of occupations, uniquely defined by each reporting company.
Source: 38

for costs, tuition, books, etc. Called the Tuition Refund Plan, most companies stipulate that the student must enroll for a course directly related to his work or to a more responsible job to which the employee may logically be promoted.

Because of the high quality of skills demanded in its products, wages of aerospace industry employees are among the highest of all U. S. industry manufacturing employees. The hourly earnings in the aerospace industry continued to increase during 1960, climbing from an annual average of $2.62 in 1959, to $2.70 in 1960. Corresponding average weekly wages have increased from the 1959 annual average of $106.63 to $110.16 in 1960. By February 1961, hourly earnings had increased to $2.76 and weekly earnings to $114.82.

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY, 1939 TO DATE
(Thousands of Employees)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	63.2	45.1	11.3	N.A.	N A.
1940	148.6	101.8	31.4	N.A.	N.A.
1941	347.1	234.6	75.3	N.A.	N.A.
1942	831.7	549.6	192.0	N.A.	N.A.
1943	1,345.6	882.1	314.9	N.A.	N.A.
1944	1,296.6	815.5	339.7	N.A.	N.A.
1945	788.1	489.9	210.9	N.A.	N.A.
1946	237.3	159.0	49.9	N.A.	N.A.
1947	239.3	158.5	50.1	7.8	23.0
1948	237.7	158.0	48.6	7.7	23.3
1949	264.1	175.3	53.5	8.2	27.0
1950	281.8	188.4	55.8	8.3	29.3
1951	463.6	313.3	90.8	10.8	48.8
1952	660.7	425.9	138.8	14.5	81.6
1953	779.1	472.4	174.7	17.7	114.2
1954	764.1	470.0	159.4	15.8	118.9
1955	740.5	466.6	147.1	13.8	113.0
1956	809.3	494.4	167.1	16.9	130.9
1957	861.7	522.3	179.1	20.5	139.8
1958	757.6	457.2	152.6	18.3	129.5
1959	734.9	435.0	146.3	14.4	139.2
1960	653.4	379.7	134.0	12.3	127.4
1961 Feb.	644.7	365.4	140.0	12.5	126.8

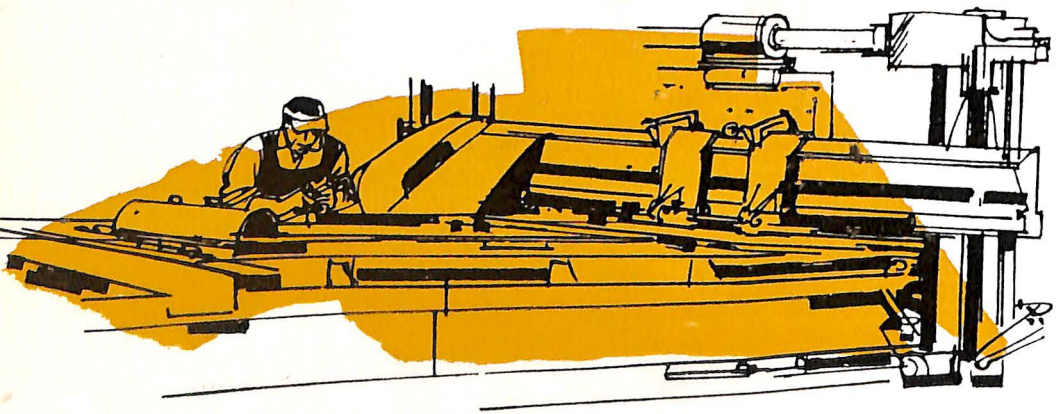
N.A.—Not available.
Source: 34

PRODUCTION WORKERS IN THE AIRCRAFT AND PARTS INDUSTRY 1939 TO DATE

(Thousands of Production Workers)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	49.2	34.5	9.5	N.A.	N.A.
1940	117.0	78.4	26.6	N.A.	N.A.
1941	275.9	181.9	65.2	N.A.	N.A.
1942	669.0	429.5	168.8	N.A.	N.A.
1943	1,080.4	685.0	279.8	N.A.	N.A.
1944	1,006.9	609.8	291.4	N.A.	N.A.
1945	585.0	356 7	165.5	N.A.	N.A.
1946	159.5	111.8	34.1	N.A.	N.A.
1947	175.1	116.1	36.6	5.1	17.2
1948	173.6	116.1	35.0	5.1	17.3
1949	194.7	130.8	38.6	5.5	19.8
1950	206.4	138.9	40.0	5.5	22.1
1951	341.9	232.3	63.7	7.6	38.3
1952	483.5	311.6	98.8	10.4	62.7
1953	568.7	343.0	124.7	13.3	88.0
1954	541.4	331.4	109.1	11.2	89.7
1955	506.6	319.4	95.3	9.4	82.6
1956	537.4	326.8	105.3	11.3	94.0
1957	563.6	340.9	111.3	13.9	97.5
1958	479.3	291.5	89.9	12.2	85.7
1959	451.1	268.1	86.5	9.1	87.4
1960	381.2	221.1	77.6	7.0	75.5
1961					
Feb.	366.0	203.5	82.4	7.2	72.9

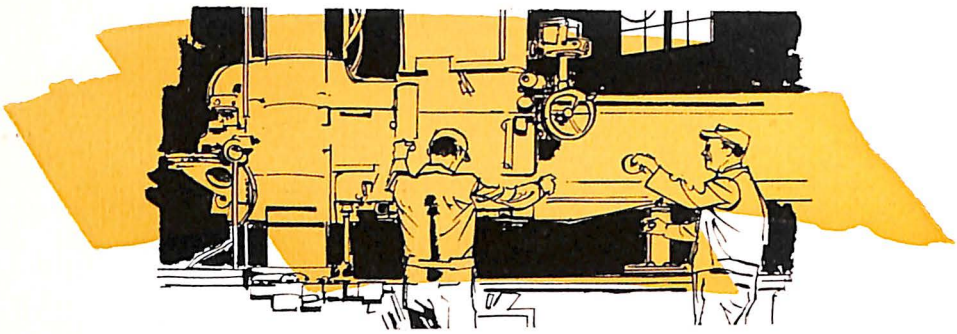
N.A.—Not available.
Source: 34



AVERAGE WEEKLY EARNINGS IN AIRCRAFT AND PARTS PLANTS
1939 TO DATE
(Includes Overtime Premiums)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	$36.93	N.A.	N.A.
1940	N.A.	N.A.	38.82	N.A.	N.A.
1941	N.A.	N.A.	47.65	N.A.	N.A.
1942	N.A.	N.A.	60.14	N.A.	N.A.
1943	N.A.	N.A.	61.24	N.A.	N.A.
1944	N.A.	N.A.	62.68	N.A.	N.A.
1945	N.A.	N.A.	55.34	N.A.	N.A.
1946	N.A.	N.A.	55.66	N.A.	N.A.
1947	$54.98	$53.99	56.30	$59.68	$56.50
1948	61.21	60.21	63.40	62.13	63.59
1949	63.62	62.69	65.24	66.83	68.08
1950	68.39	67.15	71.40	73.90	70.81
1951	78.40	75.78	85.81	89.17	78.66
1952	81.70	79.66	86.92	92.25	81.22
1953	83.80	82.19	87.29	85.90	85.17
1954	85.07	85.07	85.06	82.35	85.70
1955	89.62	89.40	88.97	90.47	90.49
1956	95.99	94.89	96.90	96.93	98.01
1957	96.76	95.65	98.23	97.76	99.78
1958	101.91	101.40	102.62	96.87	103.09
1959	106.63	106.13	109.03	102.75	107.59
1960	110.16	110.43	111.79	110.34	108.67
1961					
Feb.	114.82	113.71	118.44	118.90	113.02

N.A.—Not available.
Source: 34



AVERAGE HOURLY EARNINGS IN AIRCRAFT AND PARTS PLANTS
1939 TO DATE
(Includes Overtime Premiums)

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	$0.83	N.A.	N.A.
1940	N.A.	N.A.	.83	N.A.	N.A.
1941	N.A.	N.A.	1.00	N.A.	N.A.
1942	N.A.	N.A.	1.21	N.A.	N.A.
1943	N.A.	$1.16[E]	1.26	N.A.	N.A.
1944	N.A.	1.22[E]	1.31	N.A.	N.A.
1945	N.A.	1.22[E]	1.28	N.A.	N.A.
1946	N.A.	1.28[E]	1.34	N.A.	N.A.
1947	$1.38	1.36	1.41	$1.44	$1.41
1948	1.49	1.47	1.55	1.57	1.55
1949	1.57	1.55	1.60	1.63	1.61
1950	1.64	1.62	1.70	1.73	1.70
1951	1.79	1.75	1.89	1.93	1.80
1952	1.90	1.87	1.98	2.05	1.88
1953	2.00	1.99	2.03	2.05	1.99
1954	2.08	2.08	2.09	2.09	2.08
1955	2.17	2.17	2.17	2.18	2.17
1956	2.28	2.27	2.28	2.27	2.29
1957	2.36	2.35	2.39	2.35	2.37
1958	2.51	2.51	2.54	2.38	2.49
1959	2.62	2.64	2.64	2.47	2.58
1960	2.70	2.72	2.72	2.56	2.67
1961					
Feb.	2.76	2.76	2.80	2.66	2.73

N.A.—Not available.
E Estimate.
Source: 34

TOTAL WAGES PAID IN THE AIRCRAFT AND PARTS INDUSTRY, BY GEOGRAPHICAL DIVISIONS AND SELECTED STATES—1954 TO 1959

In Millions of Dollars

Geographical Divisions and Selected States	1954	1955	1956	1957	1958	1959
TOTAL	$3762.6	$3893.0	$4568.7	$5103.9	$4823.0	$4947.5
New England	312.6	333.6	422.9	478.6	434.5	438.3
Massachusetts	44.8	46.6	52.2	56.6	59.2	63.2
Connecticut	256.3	280.7	363.2	410.7	363.3	367.6
Me., N.H., Vt., R.I.	11.5	6.3	7.5	11.3	12.0	7.5
Middle Atlantic	625.6	545.5	577.0	578.9	512.1	490.6
New York	387.2	342.1	351.3	362.1	349.1	333.5
New Jersey	133.2	123.0	143.6	139.7	100.2	96.2
Pennsylvania	105.2	80.4	82.1	77.1	62.8	60.9
East North Central	661.9	644.6	705.9	775.1	651.9	638.6
Ohio	328.2	344.4	373.5	413.4	372.5	407.4
Indiana	145.8	150.2	170.7	179.1	154.1	147.8
Illinois	85.2	83.6	102.1	104.0	70.6	37.8
Mich., Wisc.	102.7	66.4	59.6	78.6	54.7	45.6
West North Central	311.9	309.3	353.3	440.6	418.8	415.8
Missouri	110.5	105.8	125.1	171.8	178.8	186.8
Kansas	188.7	187.2	207.5	249.7	226.2	217.0
Minn., Iowa, N.D., S.D., Neb.	12.7	16.3	20.7	19.1	13.8	12.0
South Atlantic	208.6	247.2	292.4	291.0	298.0	314.5
Maryland	133.9	153.3	181.0	172.2	157.1	146.6
Del., D.C., Va., W.Va.	1.6	1.7	2.4	2.8	3.8	4.3
N.C., S.C., Ga., Fla.	73.1	92.2	109.0	116.0	137.1	163.6
East South Central (Ky., Tenn., Ala., Miss.)	25.7	24.8	33.9	41.6	53.1	45.0
West South Central (La. Okla., Tex.)	258.8	277.4	341.6	369.7	365.2	336.6
Mountain	35.1	34.9	66.8	92.8	107.2	154.3
Arizona	19.6	26.0	41.8	45.1	37.7	44.5
Mont., Idaho, Wyo., Colo., N.Mex., Utah, Nev.	5.5	7.9	25.0	47.7	69.5	109.8
Pacific	1332.4	1475.7	1774.9	2035.6	1982.2	2113.8
California	1153.9	1275.7	1532.2	1694.3	1582.3	1693.5
Wash., Ore.	178.5	100.0	242.7	341.3	399.9	420.3

[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.

NOTE: Corresponding data for the years 1947 through 1953 may be found in "Aviation Facts and Figures," 1959 and 1960 editions.

Source: 32

AVERAGE EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY
BY GEOGRAPHICAL DIVISIONS AND SELECTED STATES—1954 TO 1959[a]

Geographical Divisions and Selected States	1954	1955	1956	1957	1958	1959
TOTAL	761,964	745,424	818,107	890,326	782,057	754,533
New England	67,040	66,672	77,848	87,496	76,592	71,462
Massachusetts	8,762	8,977	9,092	9,898	9,161	9,180
Connecticut	55,349	46,269	67,169	75,219	65,037	60,865
Me., N.H., Vt., R.I.	2,929	1,426	1,587	2,379	2,394	1,417
Middle Atlantic	122,622	103,372	103,841	101,039	82,728	74,201
New York	73,406	61,648	59,387	61,211	54,400	48,282
New Jersey	27,409	24,979	27,868	24,993	16,675	15,445
Pennsylvania	21,807	16,745	16,586	14,835	11,653	10,474
East North Central	132,207	121,821	123,489	131,615	103,660	94,851
Ohio	68,062	66,192	66,018	69,954	58,353	60,217
Indiana	29,212	28,554	30,645	31,204	25,508	22,556
Illinois	16,353	14,965	16,956	17,382	10,855	5,271
Mich., Wisc.	18,580	12,110	9,870	13,075	8,944	6,807
West North Central	67,577	64,016	68,684	83,501	74,867	69,306
Missouri	23,517	21,456	23,363	32,225	31,793	30,149
Kansas	41,463	39,308	41,350	47,861	40,710	37,269
Minn., Iowa, N.D., S.D., Neb.	2,597	3,252	3,971	3,415	2,364	1,888
South Atlantic	45,044	49,535	54,496	53,099	49,734	49,380
Maryland	29,227	30,339	33,691	32,072	26,822	23,820
Del., D.C., Va., W.Va.	386	408	539	615	590	571
N.C., S.C., Ga., Fla.	15,431	18,788	20,266	20,412	22,322	24,989
East South Central (Ky., Tenn., Ala., Miss.)	6,411	5,803	7,541	9,016	9,785	8,509
West South Central (La. Okla., Tex.)	53,176	54,003	63,203	66,585	60,756	52,267
Mountain	4,876	6,614	11,101	15,552	16,052	22,196
Arizona	3,857	5,030	7,149	7,743	5,756	6,192
Mont., Idaho, Wyo., Colo., N.Mex., Utah, Nev.	1,018	1,584	3,952	7,809	10,296	16,004
Pacific	263,011	273,588	307,904	342,423	307,883	312,361
California	225,407	234,022	263,020	279,168	240,997	244,670
Wash., Ore.	37,604	39,566	44,884	63,255	66,886	67,691

[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.

NOTE: Corresponding data for the years 1947 through 1953 may be found in "Aviation Facts and Figures," 1959 and 1960 editions.

Source: 32

WOMEN EMPLOYEES IN THE AIRCRAFT INDUSTRY, 1942 TO DATE

Date	Number (thousands)	Percent
Jan. 1942	23.1	5.0
Nov. 1943	486.1	36.7
Oct. 1947	28.5	11.8
Sept. 1949	33.3	12.5
Sept. 1950	36.2	12.4
Sept. 1951	88.6	17.7
Sept. 1952	117.9	18.0
Sept. 1953	133.4	17.6
Sept. 1954	132.3	16.6
Oct. 1955	118.4	15.7
Oct. 1956	135.4	15.6
Oct. 1957	134.7	15.9
Oct. 1958	112.9	14.8
Oct. 1959	108.3	15.1
Oct. 1960	97.1	15.3

Sources: 3, 34

LABOR TURNOVER IN THE AIRCRAFT AND PARTS INDUSTRY, 1950 TO DATE
(Rates per 100 Employees per Year)

Date	Total		Aircraft (Airframes)		Aircraft Engines and Parts		Aircraft Propellers and Parts		Other Aircraft Parts and Equipment	
	Accessions	Separations	Accessions	Separations	Accessions	Separations	Accessions	Separations	Accessions	Separations
1950	62.8	33.8	67.2	37.1	48.2	21.3	32.0	17.6	59.6	27.6
1951	94.8	50.0	97.5	52.4	86.9	39.6	52.7	27.6	89.6	44.5
1952	63.1	45.9	64.1	49.0	60.1	40.8	49.1	25.1	65.3	41.3
1953	47.5	42.7	47.2	42.7	47.4	43.2	33.2	28.3	52.7	47.8
1954	28.2	31.8	28.2	29.5	21.6	36.3	13.1	41.7	33.0	37.1
1955	33.1	29.6	38.0	27.4	30.7	28.8	22.7	38.2	43.3	52.5
1956	41.9	28.5	40.8	26.6	41.1	28.3	43.3	20.9	49.5	48.9
1957	30.1	42.5	31.0	42.0	21.9	38.6	32.9	25.8	41.9	63.8
1958	26.6	31.2	25.8	28.5	27.3	34.6	10.9	42.0	39.0	43.9
1959	24.1	37.4	21.4	36.9	26.4	37.2	29.5	37.3	50.1	49.1
1960	25.5	35.3	22.2	32.0	34.7	41.8	22.3	29.0	37.7	53.6

Source: 34

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]	[b]	15.3	1.6
1941	10.4	1.4	[b]	[b]	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.

N.A.—Not available.

[a] The 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.

[b] Included with "Aircraft."

Source: 35

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

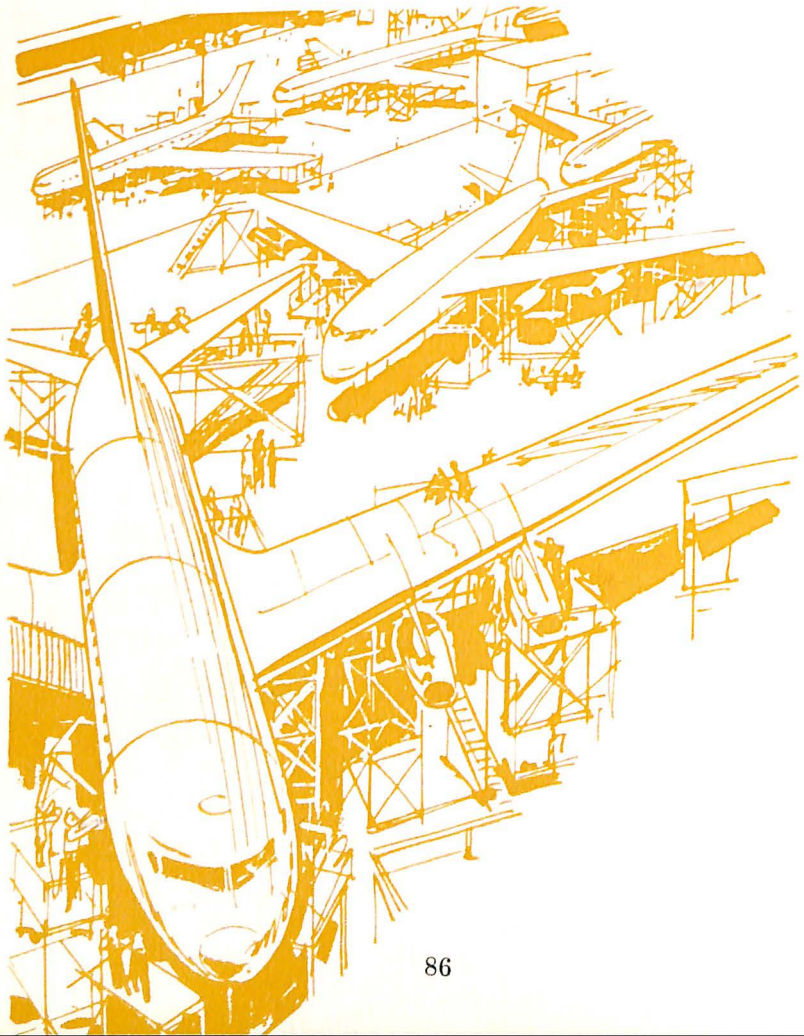
Year	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
1927–1933	4	1,153	18,965
1934	4	3,207	111,048
1935	1	1,700	6,800
1936	—	—	—
1937	6	9,390	90,964
1938	N.A.	N.A.	N.A.
1939	2	1,263	85,419
1940	3	6,270	36,402
1941	29	28,422	112,549
1942	15	6,584	12,416
1943	60	52,481	130,112
1944	103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

N.A.—Not available.
Source: 33

WORK STOPPAGES IN SELECTED INDUSTRIES, 1959

Industry	Number of Strikes	Number of Workers Involved	Man-Days Idle in Year
All Manufacturing Corporations	2,043	1,280,000	55,500,000
AIRCRAFT AND PARTS	26	21,700	312,000
Primary Iron and Steel	63	16,100	590,000
Petroleum Refining	13	17,400	543,000
Motor Vehicles and Equipment	54	31,500	367,000
Electrical Machinery	96	48,100	820,000

Source: 33



The aerospace industry, for the past four years, has been caught up in what might be labeled "a profitless prosperity." While its sales volume has remained virtually constant, the industry's earnings have dropped more than 50 per cent during that period.

The dollar volume of sales during 1960 was $12,974 million, $106 million higher than they totaled in 1957. But earnings dropped sharply during that period from $377 million in 1957 to $185 million in 1960, During the same period, earnings as a percentage of sales dropped from 2.9% to 1.4%, and earnings as a percentage of net worth fell from 16.7% to 7.3%.

Aerospace earnings, which for many years have not matched the rates experienced by other manufacturing corporations, now have sunk until they are approximately one-third of the average manufacturing rate. While aerospace firms' earnings totaled 1.4% of sales in 1960, the average for all manufacturing concerns was 4.4% of sales. The return to aerospace firms fell far below the petroleum refining business, with earnings of 9.9%; the motor vehicles and equipment industry, 5.9%; the electrical machinery business, 3.5%; and the primary iron and steel business, 5.1%.

The research and development climate of the age also has contributed to the squeeze on earnings for aerospace firms. Until recently, the success

BALANCE SHEET COMPARISONS, AEROSPACE COMPANIES
1956 TO DATE
(Millions of Dollars)

	1956	1957	1958	1959	1960
Assets:					
Current Assets					
Cash	$ 433	$ 446	$ 443	$ 358	$ 363
U. S. Government Securities	83	49	79	91	102
Total Cash and U. S. Govt. Securities	$ 516	$ 495	$ 522	$ 449	$ 465
Receivables (total)	1,351	1,558	1,538	1,658	1,718
Inventories (gross)	3,421	3,593	3,218	3,440	3,425
Other current assets	53	74	70	104	82
Total Current Assets	$5,341	$5,720	$5,348	$5,651	$5,690
Total Net Plant	679	974	1,036	1,092	1,195
Other Non-Current Assets	97	121	120	164	229
Total Assets	$6,118	$6,816	$6,503	$6,906	$7,113
Liabilities:					
Current Liabilities					
Short term loans	380	759	645	718	745
Advances by U.S. Govt.	1,855	1,735	1,374	1,409	1,346
Trade accounts and notes payable	695	807	852	1,001	955
Federal income taxes accrued	348	364	277	196	165
Instalments due on long term debt	15	19	18	37	25
Other current liabilities	700	606	533	538	654
Total current liabilities	3,993	4,290	3,699	3,899	3,890
Long Term Debt	202	253	444	541	645
Other Non-Current Liabilities	16	17	20	20	32
Total Liabilities	$4,211	$4,560	$4,163	$4,460	$4,567
Stockholder's Equity:					
Capital Stock	658	841	902	977	1,154
Earned Surplus and Reserves	1,249	1,417	1,438	1,468	1,394
Total Net Worth	$1,907	$2,258	$2,340	$2,445	$2,548
Total Liabilities and Stockholders' Equity	$6,118	$6,816	$6,503	$6,906	$7,113
Net Working Capital	$1,348	$1,430	$1,649	$1,752	$1,800

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

of our military services was dependent to a great extent upon the industry's great productive capacity. In those years, it was "hats off" to production capabilities. But this salutation has given way to a fervent search for new ideas, which have become the most important commodity industry has to offer today.

Long production runs no longer provide the basis for aerospace income as volume production has been replaced by developmental programs requiring new and ever-changing facilities. These facilities include not only special test and laboratory equipment for research and development, but highly specialized production equipment needed to design, develop, test and produce today's missile, aircraft and space equipment.

Because of the specialized equipment which must be constantly changed, no other industry sustains as high an obsolescence rate in its facilities. New facilities built and acquired during recent years amounted to several billion dollars in value, and the bulk of the financing has come from private investors and from earnings, rather than the Government.

A combination of the foregoing factors has created aerospace management's principal problem—the acquisition of funds to finance operations

INCOME ACCOUNTS, 51 AEROSPACE COMPANIES, 1958 TO DATE
(Millions of Dollars)

	1956	1957	1958	1959	1960
Net Sales	$11,011	$12,868	$12,575	$12,488	$12,974
Net Profit from Operations	745	809	664	451	386
Total Income before Federal Income Taxes	733	791	636	411	333
Provision for Federal Income Taxes	386	414	329	215	148
Net Profit after Taxes	347	377	307	196	185

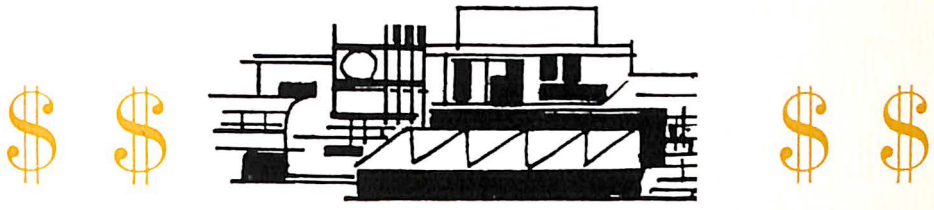
Source: 41

and at the same time provide the research, testing and productive facilities, as well as the basic research and development that is needed to exploit for defense purposes all the advances in the sciences.

The financial structure of the industry is designed to meet the requirements of the national defense establishment in the most efficient, economical, and conservative manner possible under the unique circumstances established by Government procurement regulations. To do this, the companies are capitalized for the purpose of providing the liquidity necessary to support an inescapable high level of mercantile and bank credit; furnishing the working capital and financial strength to support a high contractual level of developmental operations at a low level of manufacturing, and avoiding over-capitalization for the recurrent periods of low military appropriations and subsequently shrunken operations.

Avoiding over-capitalization is essential in an industry where volume may fluctuate widely from year to year. It played an important part in the wholesale bankruptcy in the aviation industry following World War I.

As an example of the problems inherent in the current Government-industry relationship, the Department of Defense obligated $16,217 million for research and development programs during 1958-1960. During the same period, it cancelled 14 major contracts for which it had already obligated $2,133 million. Almost the entire amount of these cancelled obligations involved contracts with AIA members.



Since the industry must avoid over-capitaization, it has been neither feasible nor practical for it to acquire a capital structure capable of financing a much larger portion of the substantial facilities and working capital requirements for high level military production. Nevertheless, it has invested vast amounts in inventories, receivables and facilities. The increased volume of business since 1950 would have required an increased investment without regard to DOD policies, but much of the

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

Source: 41

FINANCIAL RATIOS, 51 AEROSPACE COMPANIES, 1956 TO DATE

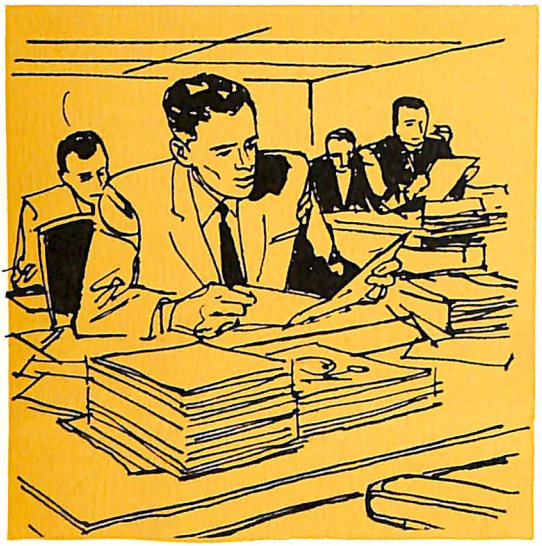
Year	Net Federal Taxes as a Per Cent of Total Inome	Net Profit as a Per Cent of Sales
1956	52.3	3.2
1957	52.3	2.9
1958	51.7	2.4
1959	52.3	1.6
1960	44.4	1.4

Source: 41

increased investment has been caused by those policies, with the result that the financial condition of the industry has greatly weakened.

Additional capital cannot be obtained under short-term conditions, and long-term capital is difficult to obtain since it is being used to finance existing business rather than creating new business with the benefit of additional earnings from such new business.

It is therefore obvious that if the squeeze on aerospace earnings continues, changes will have to be made in the capitalization of the industry.



NET INCOME AS A PERCENT OF SALES
(After Taxes)

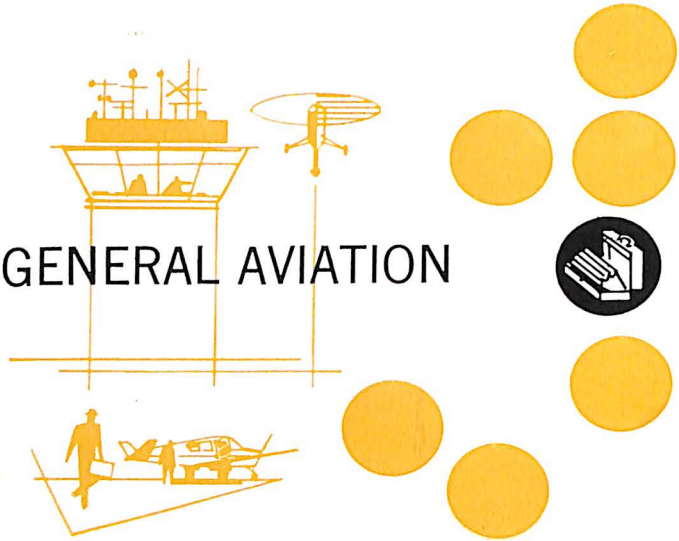
Industry	1954	1955	1956	1957	1958	1959	1960
Total Manufacturing Corporations	4.5	5.4	5.2	4.8	4.2	4.5	4.4
AIRCRAFT AND PARTS	3.4	3.8	3.1	2.9	2.4	1.5	1.4
Primary Iron and Steel	5.3	7.2	6.7	6.6	5.4	4.8	5.1
Petroleum Refining	10.6	11.1	11.5	10.6	9.5	9.9	9.9
Motor Vehicles and Equipment	5.3	6.9	5.2	5.4	4.0	5.0	5.9
Electrical Machinery	4.5	4.4	3.8	4.2	3.8	4.9	3.5

Source: 41

SELECTED MAJOR DEFENSE CONTRACTORS
(Listed by rank according to net value of military prime contracts awarded, 1950-1960)

	July 1, 1950 to June 30, 1960	July 1, 1959 to June 30, 1960	July 1, 1958 to June 30, 1959	July 1, 1957 to June 30, 1958	World War II
U. S. TOTAL, ALL CONTRACTS (in Billions)	$207.9	$15.4	$16.7	$16.2	$193.3[E]
Company	Per Cent of Total				
20 Largest Defense Contractors					
Boeing Airplane	5.5	6.5	7.0	13.1	1.5
General Dynamics	4.5	8.2	9.7	8.5	[a]
General Electric	4.0	6.3	5.5	4.8	1.9
General Motors	3.8	1.4	1.3	1.7	7.9
United Aircraft[b]	3.6	3.4	3.2	4.1	2.2
North American Aviation	3.5	5.9	6.1	4.0	1.6
Lockheed	3.3	6.9	5.4	4.7	1.9
Douglas	3.0	2.6	4.1	3.2	2.5
American Telephone and Telegraph	2.3	3.0	2.9	4.1	1.5
Republic Aviation	1.6	1.7	1.7	1.6	.7
Martin	1.5	3.9	3.1	2.5	1.3
Curtiss Wright	1.4	.5	.4	1.3	4.1[a]
Sperry Rand	1.3	1.9	2.4	2.3	.9[a]
McDonnell	1.2	1.3	2.4	2.2	N.A.
Hughes Aircraft	1.2	2.3	3.0	2.9	N.A.
Bendix	1.2	1.6	1.6	1.3	1.1
Westinghouse Electric	1.1	1.7	1.4	1.7	.8
Grumman Aircraft	1.1	1.6	1.8	1.5	.8
Radio Corporation of America	1.0	2.6	1.2	2.4	.3
International Business Machines	.9	1.9	1.7	1.9	N.A.
Other Selected Major Contractors					
Northrop	.9	.9	.9	1.7	.1
Raytheon	.8	2.1	2.4	1.5	N.A.
General Tire and Rubber	.5	1.6	1.2	1.0	N.A.
Chance Vought	.4	.9	[c]	2.2	[a]
Fairchild Engine	.4	.2	.2	.6	.2
Bell Aircraft	.4	.4	.3	.5	.7

N.A.—Not available.
[E] Estimate.
[a] Major change in corporate composition or product during period.
[b] Does not include Chance Vought
[c] Not included in the 100 largest defense contractors.
Sources: 17, 43



GENERAL AVIATION

Manufacturers sales of business and utility aircraft during 1960 reached a record high of more than $150 million, corresponding to a retail value of about $200 million. Despite the great progress which has been achieved during the past ten years, the decade which has just begun presents a potential which is almost without limit. A compendium of the views of industry leaders suggests that the industry will double its volume in the next five years, and double it again by 1970.

According to the Federal Aviation Agency, the active fleet of general civil aircraft during 1960 totaled approximately 70,000, representing an increase since 1955 of about 10,000 aircraft. When considering the fact that the entire fleet of active commercial airliners totals only some 2,000 craft, it becomes apparent that the business and private use of civil aviation has come of age.

Experience of business and utility aircraft users during the past decade has laid a solid foundation for future growth. User emphasis has swung from the smaller trainer and sport types to the heavier single and twin-engine aircraft. During this same period, general aviation has become the largest user of the Nation's airports and airways, and will impose ever-increasing demands on the Nation's aviation facilities.

Hourly use, which is a measure of the activity of the general aviation fleet, reached an estimated 12,000,000 hours during 1960. Federal studies

predict that general aviation's[a] flying hours will have reached 20,000,000 by 1975. The greatest percentage of general aviation's hourly use is, and continues to occur, in the business flying category. The small aircraft for business use has become a regular fixture, and increasingly more businessmen and corporations are discovering the advantages of general aircraft.

There are nearly one million corporations in the United States, about 350,000 of which are engaged in some form of manufacturing, and the manufacturing industry operates about 40 per cent of all of the presently active, business-use aircraft. Over 200,000 of these one million corporations have assets of $250,000 or more. As nearly as can be estimated today, the active general aircraft fleet engaged in fields of business and industry totals some 30,000 planes. Many companies already operate fleets of aircraft. Though some of the larger corporations have limited their plane ownership to airline types, used more or less exclusively by their top executives, the industry believes it is only a question of time until these corporations learn that smaller, less expensive aircraft can be efficiently utilized by all branches of these corporate operations. Add

[a] General Aviation: All civil flying except that of the airlines.

UTILITY AIRCRAFT, FACTORY SHIPMENTS, 1960
(As reported to Aerospace Industries Association by selected manufacturers)

Manufacturer and Model	Complete Aircraft[a] Number	Manufacturers Net Billing Price (Thousands of Dollars)
Aero Commander		
500A,B,C,	69	
560E	13	
680E,F	70	$ 11,917
720	3	
Beech		
18	81	
Debonair	238	
Bonanza	345	
Twin Bonanza	87	
Baron	23	43,061
Queen Air	66	
Travel Air	122	
CallAir		
A-5	9	
A-6	4	88
Cessna		
150	354	
172	1,015	
175	501	
180	283	
182	667	56,664
210	610	
310B,C	290	
Champion		
Traveler	33	
Tri Traveler	72	
Sky Trac	14	
Challenger	83	1,492
DX'er	19	
Tri Con	27	
Lake Aircraft		
LA-4	5	115
Mooney		
Mark 20	172	2,781
Piper		
Super Cub	329	
Tri-Pacer	446	
Apache	102	
Aztec	329	35,102
Comanche 180	275	
Comanche 250	469	
Pawnee	363	
TOTAL	7,588	$151,220

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

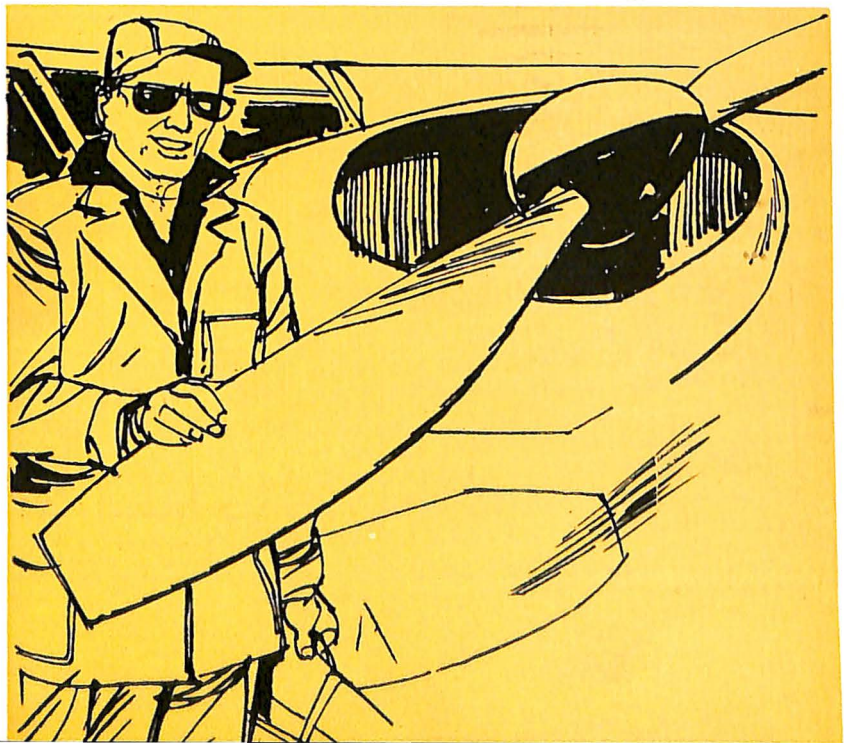
NOTE: The totals shown here may vary from FAA figures because they are based on selected reports only.

Source: 1

to this large corporate market tens of thousands of independent businessmen, sales representatives, executives of smaller firms and professional people whose operations require extensive travel, and the market potential becomes enormous indeed.

To reach this market the industry already has a big advantage in its established distributor and dealer organizations which provide widespread good service. Though the industry has spent a great deal of time and literally many millions of dollars in developing an excellent marketing and service organization, extensive expansion and improvement of the facilities of aircraft dealers is occurring all over the country. In addition, the basic manufacturing industry has made extensive additions to its plant and research facilities, and continues to do so. Other factors contributing to the continuing industry growth are constantly-improved production techniques, better cost control, broadening of leasing and financing plans, and an expanding export market.

General aviation's total flying hours exceed the annual airline hours at least three times. Business-use hours, alone, are in excess of the airline flying hours. In fact, general aviation has in many ways become the largest feeder-airline in the Nation. As a result, there is an ever-growing partnership between general aviation and the airlines. The scheduled airlines provide service to about 600 places in the Nation,



whereas there are ten times as many airports. Because smaller business aircraft are able to reach all of the Nation's airports, general aviation is able to feed more and more traffic to and from off-airline points, thus making more of the Nation practically air accessible for business and industrial users of air transportation. Therefore, the small plane and the rapidly growing air taxi industry which utilizes small general air-

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

Year	TOTAL	Aero Design	Beech	Cessna	Champion	Mooney	Piper	All Other Manufacturers
NUMBER OF AIRCRAFT SHIPPED								
1947	15,594	—	1,288	2,390	N.A.	—	3,464	8,452
1948	7,037	—	746	1,631	N.A.	—	1,479	3,181
1949	3,405	—	341	857	N.A.	74	1,278	855
1950	3,386	—	489	1,134	N.A.	51	1,108	604
1951	2,302	—	429	551	N.A.	26	1,081	215
1952	3,058	39	414	1,373	N.A.	49	1,161	22
1953	3,788	69	375	1,434	N.A.	37	1,839	34
1954	3,071	67	579	1,200	N.A.	14	1,191	52
1955	4,434	72	680	1,746	N.A.	32	1,870	34
1956	6,738	154	724	3,235	162	79	2,329	55
1957	6,118	139	788	2,489	217	107	2,300	78
1958	6,414	97	694	2,926	296	160	2,160	79
1959	7,689	148	893	3,588	274	182	2,530	74
1960	7,588	155	962	3,720	248	172	2,313	18
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

[a] The 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

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	[a]	N.A.	N.A.	545	—
1930	15,280	[a]	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[b]

N.A.—Not available.
[a] Airline Transport Rating became effective May 5, 1932.
[b] Preliminary.
Sources: 3, 25

craft are bringing about a revolution in air transportation.

Though it is difficult to arrive at exact figures because of the extremely diverse nature of general aircraft use, the annual contribution to the Nation's economy is now estimated to be substantially more than a billion dollars annually, including the sale of new aircraft, fuel, oil, parts, supplies, maintenance and related services, such as wages paid to mechanics, airport attendants, and professional pilots engaged by corporate aircraft users. For examples: FAA estimated that 249,000,000 gallons of fuel and 4,000,000 gallons of oil were consumed in general aviation during 1959.

This is a direct contribution to the national economy. The indirect contribution, resulting from improved efficiency and productivity gained by the business and industrial and agricultural users, must be very large indeed.

A principal contributor to industry growth is the general aircraft electronic-communication industry. The availability of fine navigation-communication equipments and electronic devices of a size, weight, de-

HOURS FLOWN IN UTILITY AIRCRAFT, 1931 TO DATE
(Thousands of Hours)

Year	Total Hours	Business[a]		Commercial[b]		Instructional		Pleasure		Other[c]	
		Hours	Percent	Hours	Percent	Hours	Percent	Hours	Percent	Hours	Percent
1931	1,083	152	14	281	26	307	28	343	32	—	—
1932	877	130	15	215	25	223	25	309	35	—	—
1933	795	129	16	200	25	198	25	268	34	—	—
1934	846	121	14	207	24	217	26	301	36	—	—
1935	954	132	14	229	24	292	31	301	31	—	—
1936	1,059	122	12	245	23	380	36	312	29	—	—
1937	1,173	156	13	227	19	432	37	358	31	—	—
1938	1,478	188	13	254	17	577	39	459	31	—	—
1939	1,922	246	13	332	17	755	39	589	31	—	—
1940	3,200	314	10	387	12	1,529	48	970	30	—	—
1941	4,460	250	6	511	11	2,816	63	883	20	—	—
1942	3,786	270	7	473	12	2,680	71	363	10	—	—
1946	9,788	1,068	11	943	10	5,996	61	1,686	17	95	1
1947	16,334	1,966	12	1,279	8	10,353	63	2,616	16	120	1
1948	15,130	2,576	17	1,066	7	8,701	58	2,606	17	181	1
1949	11,031	2,615	24	1,449	13	4,187	38	2,732	25	48	([d])
1950[e]	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	([d])
1955[e]	9,500	4,300	45	1,950	21	1,275	13	1,975	21	—	—
1956[e]	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
1959[e]	11,700	5,300	45	2,200	19	2,000	17	2,200	19	—	—

[a] Includes flying for corporate or executive purposes as well as flying by individuals, including farmers and ranchers, on personal business.
[b] Includes contract, charter, industrial and commercial agricultural flying.
[c] Testing, experimental, ferrying, etc.
[d] Less than ½ of 1 percent.
[e] Data estimated from trend since no formal survey was conducted for this year.
NOTE: This table excludes all aircraft operated by the scheduled airlines. Data for war years are not available.
Source: 25

pendability and cost to make them especially suitable and useful for small aircraft, plays an important part in the growth which is occurring in general aviation. Such equipment adds greatly to the utility of the aircraft and complements the air traffic control system and navigation aids maintained by the Federal Government.

The business uses of small aircraft are now so diversified as to be almost impossible to list—manufacturing activities of all kinds, banking

and finance, merchandising, public utilities, road building, and construction, are just a few.

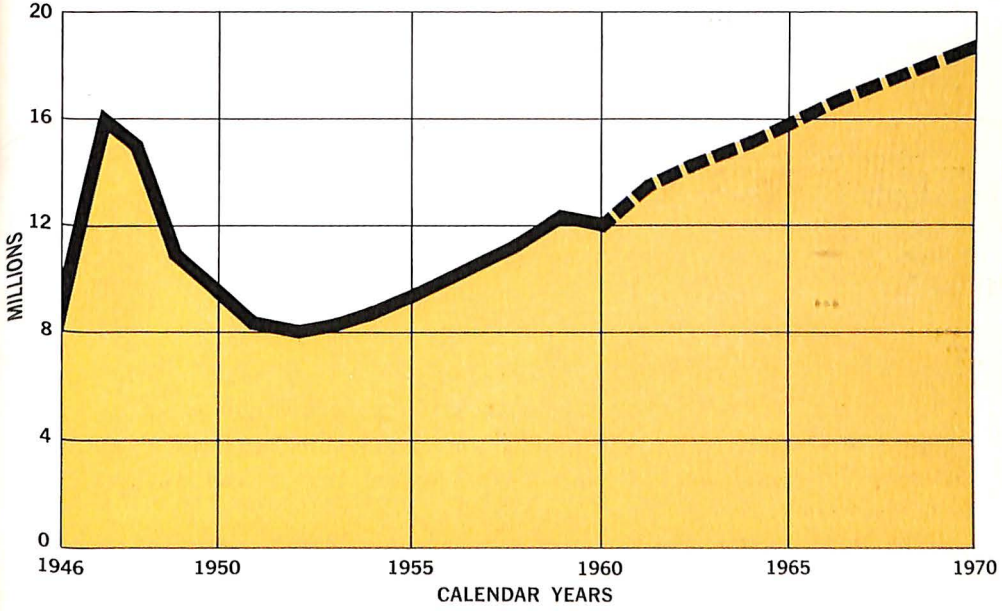
Such uses are concerned with the small airplane as a means of rapid transportation. It has also become a tool of business and industry. Oil and other kinds of geophysical exploration have been greatly aided by the use of small aircraft. Remote construction and survey crews can be supplied by air. Oil and gas transportation and the transmission of electric power require an ever-increasing network of power and pipe lines, which must be surveyed and constantly patrolled. Small aircraft make it possible to do this quickly and efficiently.

General aviation is an important adjunct to agriculture, ranching, and forestry, both as a means of transportation and a tool. Examples are: cattle counts; soil erosion surveys; patrolling and mending fences; quick transportation to remote sections of a large ranch or between scattered farm and ranch operations; and, transportation to town and to market places. In forestry, vast forest preserves can be patrolled and surveyed in a manner previously totally impossible.

But the most dramatic agricultural and forestry use is in the dispensing of chemical dusts and sprays. The most recent FAA data (1957) recorded that 61,000,000 acres were treated with 650,000,000 pounds of

GENERAL AVIATION FLYING HOURS

REPORTED 1946-1960—PROJECTED 1961-1970



U. S. Active Civil Aircraft, by Type and by States
As of January 1, 1960

State	Total active aircraft	Air Carrier (scheduled and irregular)	General Aviation		
			Multi-engine	4-Place and Over Single Engine	All Other
Alabama	679	11	57	247	364
Alaska	1,208	50	71	416	671
Arizona	1,065	0	83	431	551
Arkansas	859	0	45	264	550
California	8,761	120	681	3,428	4,532
Colorado	1,033	46	70	431	486
Connecticut	536	0	44	186	306
Delaware	228	7	35	86	100
District of Columbia	374	71	126	69	108
Florida	2,352	120	268	826	1,138
Georgia	965	88	65	344	468
Hawaii	109	22	10	12	65
Idaho	689	0	25	306	358
Illinois	3,791	207	331	1,716	1,537
Indiana	1,889	14	145	876	854
Iowa	1,626	0	65	771	790
Kansas	1,790	0	96	866	828
Kentucky	529	0	44	272	213
Louisiana	1,160	1	138	362	659
Maine	371	0	8	134	229
Maryland	624	0	43	233	348
Massachusetts	912	34	72	312	494
Michigan	2,728	13	249	1,132	1,334
Minnesota	2,036	86	97	690	1,163
Mississippi	718	0	37	177	504
Missouri	1,663	202	108	661	692
Montana	985	1	44	385	555
Nebraska	1,174	0	66	447	661
Nevada	356	23	45	124	164
New Hampshire	176	0	11	53	112
New Jersey	1,274	15	131	481	647
New Mexico	726	0	58	374	294
New York	3,334	607	364	927	1,436
North Carolina	1,171	22	95	444	610
North Dakota	675	0	7	169	499
Ohio	3,109	1	364	1,257	1,487
Oklahoma	1,511	0	188	615	708
Oregon	1,393	2	117	605	669
Pennsylvania	2,495	1	271	980	1,243
Rhode Island	132	2	15	44	71
South Carolina	408	0	23	164	221

U. S. Active Civil Aircraft, by Type and by States—*Continued*
As of January 1, 1960

State	Total active aircraft	Air Carrier (scheduled and irregular)	General Aviation		
			Multi-engine	4-Place and Over Single Engine	All Other
South Dakota	779	0	9	261	509
Tennessee	816	16	85	345	370
Texas	6,187	136	796	2,400	2,855
Utah	442	0	23	193	226
Vermont	97	0	7	26	64
Virginia	863	61	60	285	457
Washington	1,737	34	56	635	1,012
West Virginia	368	0	27	154	187
Wisconsin	1,323	0	120	479	724
Wyoming	401	0	26	164	211
U. S. Total	70,627	2,013	6,021	27,259	35,334
Puerto Rico	66	7	9	27	23
Virgin Islands	2	0	2	0	0
Other	52	0	2	15	35
Total	70,747	2,020	6,034	27,301	35,392

Source: 25

dry chemicals and 95,000,000 gallons of liquids; almost a million flight hours were chalked up; and, these activities were a substantial increase over previous years.

The industry is investigating a wide variety of small turbine engines. Though the availability of practical turbine power suitable for small aircraft seems closer today than it did a year ago, there is still much developmental work to be done. New and somewhat different designs will make their appearance with the advent of turbine power, and turbine-powered aircraft in the light twin-class, presently under study and development, will probably become available before 1965. Piston-powered aircraft, constantly being improved, will continue to dominate the volume general aircraft market in the next decade.

INVENTORY OF CIVIL AIRCRAFT[a], BY YEAR OF MANUFACTURE
As of January 1, 1960

Year of Manufacture	Number	Percent of Total
TOTAL	70,747	100.0
1959	5,596	7.9
1958	4,986	7.0
1957	4,180	5.9
1956	4,902	6.9
1955	3,113	4.4
1954	1,966	2.8
1953	2,457	3.5
1952	2,109	3.0
1951	1,314	1.9
1950	1,998	2.8
Prior to 1950	38,126	53.9

[a] Number of active civil aircraft, commercial transport and utility, recorded with Federal Aviation Agency.
Source: 25

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

N.A.—Not available.
Source: 25

TOTAL AIRCRAFT OPERATIONS[a] IN THE UNITED STATES AT FAA AIR TRAFFIC CONTROL AIRPORT TOWERS
1950 TO DATE
(In Millions)

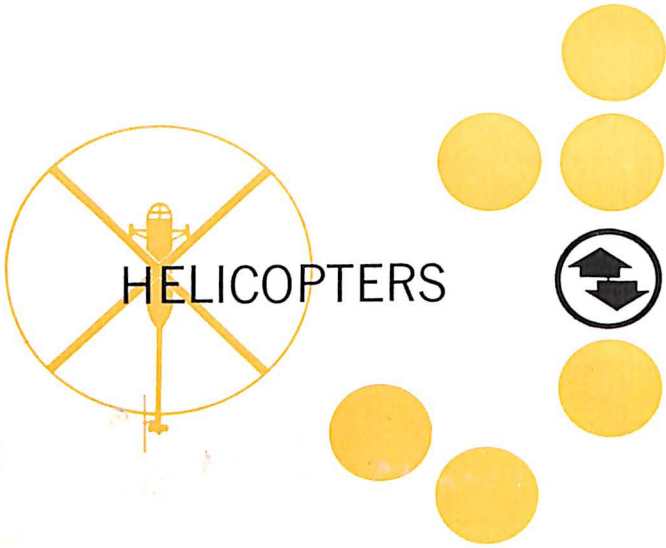
Year	TOTAL		General Aviation		Air Carriers		Military	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
1950	15.9	100.0	9.6	60.2	4.0	25.0	2.4	14.8
1955	19.4	100.0	8.5	43.9	5.9	30.7	4.9	25.4
1956	21.9	100.0	10.0	45.6	6.5	29.6	5.4	24.8
1957	25.0	100.0	12.1	48.4	7.1	28.2	5.9	23.4
1958	26.4	100.0	14.0	52.9	6.9	26.3	5.5	20.8
1959	26.7	100.0	14.9	55.9	7.3	27.3	4.5	16.8
1960	25.6	100.0	14.7	57.6	7.1	27.8	3.8	14.6

[a] Aircraft operations are all aircraft arrivals and departures, including both instrument flights and visual flights.
Source: 26

PUBLIC AIRPORTS BY LENGTH OF RUNWAY AND REGION, JANUARY 1, 1959

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	2,949	1,162	376	435	224	369	110	273
New England	138	55	10	21	11	17	3	21
Middle Atlantic	302	169	43	26	11	29	3	21
East North Central	546	269	85	91	23	35	7	26
West North Central	430	195	58	65	24	30	15	43
South Atlantic	340	115	36	48	33	71	7	30
East South Central	133	51	16	25	13	16	2	10
West South Central	353	100	58	62	44	44	15	30
Mountain	257	31	33	36	27	57	34	39
Pacific	436	167	36	57	36	69	22	49
Other	14	0	1	4	2	1	2	4

Source: 25



The operation of commercial helicopters has become big business. Based on a Helicopter Council survey of the commercial helicopter operators in the United States and Canada, the operators are doing a business conservatively estimated at $50,000,000 annually. The survey revealed the continually expanding utility of the helicopters today. Leading these diversified uses are construction work, oil and mineral exploration, agriculture, powerline and aerial patrols and photography.

There are now 265 commercial helicopter operators using 882 helicopters in the United States and Canada. Of these, 56 operate helicopter flight schools.

During the year, the Council published the first list of Foreign Military, Government and Commercial Helicopter Operators. Based on the information received, there are 212 operators in 62 (excluding Canada) foreign countries operating 1,376 helicopters. In addition, 182 helicopters were on order.

Of the 1,376 helicopters currently in use outside the United States and Canada 1,369 are American built. Of the 182 helicopters on order, 103 will be USA exports. This list is scheduled for revision during 1961.

Indicative of the increasing prestige of the helicopter operator activities is the fact that the Helicopter Association of America, the official organization of the commercial helicopter operators of North and South

America, appointed a full time executive secretary and established a headquarters office in Washington, D. C.

One of the surveys conducted by the Council in 1960 in the field of corporate use of helicopters pointed out the fact that helicopters are moving rapidly into the executive transport picture. Because of their unique flight capabilities for moving executives, key personnel and industrial equipment to the right spot in the minimum amount of time—they're now being dubbed as airborne "executive suites." Industries currently operating their own rotorcraft (or leasing from a commercial operator) include mining, textiles, electrical, radio, gas, oil, construction, food, banking, broadcasting and lumber.

Helicopters have also invaded politics and indeed played an important role during the 1960 presidential campaign. The "helistop" often replaced the "whistle stop" in many areas as candidates of both political parties found helicopters made it possible to keep on schedule and as importantly, to meet the voters in the off-railway and off-airport towns.

President Kennedy, his family and Government officials continue to use the helicopter as an official transport. Visiting foreign dignitaries are now given the red carpet welcome at a temporary, conveniently-located "heliport" instead of at the airport. For example, on his first visit to meet with President Kennedy in Washington, D. C., Great

PRODUCTION OF COMMERCIAL HELICOPTERS[a]
(Number of Helicopters)
1953 to Date

Company and Helicopter	1953	1954	1955	1956	1957	1958	1959	1960
TOTAL	111	131	146	268	311	196	291	294
Bell								
47 Series	59	68	84	111	132	99	169[b]	144[b]
Brantley								
B-2	—	—	—	—	—	—	15	43
Hiller								
12B	34	20	16	—	—	—	—	—
12C	—	—	—	21	21	12	—	—
12E	—	—	—	—	—	—	25	72
Republic								
Alouette	—	—	—	—	—	5	15	5
Sikorsky								
S-55	18	43	41	52	38	11	4	1
S-58	—	—	5	55	60	22	47	9
S-62	—	—	—	—	—	—	—	7
Vertol								
H-21	—	—	—	29	60	35	12	—
V-33	—	—	—	—	—	—	—	5
V-44	—	—	—	—	—	12	5	8

[a] Manufactured by companies reporting to Aerospace Industries Association.
[b] Includes production of two foreign licensees.
Source: 1

Britain's Prime Minister MacMillan arrived by helicopter. He landed on the grounds of the Naval Observatory next door to the British Embassy.

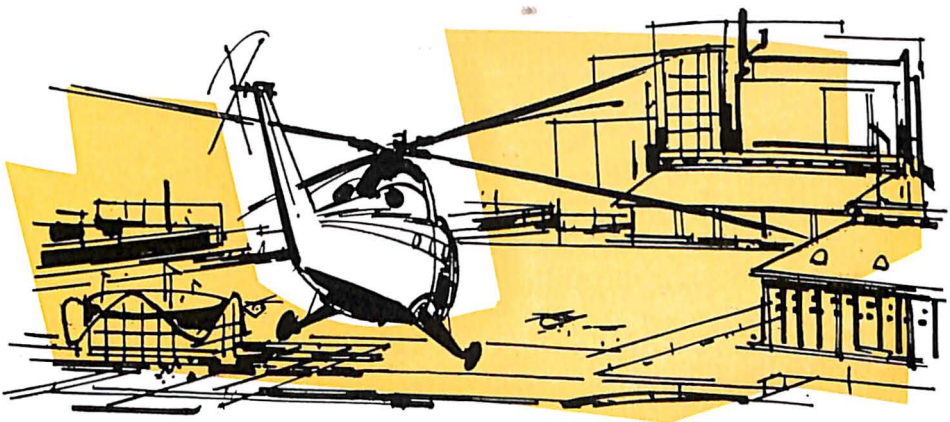
The scheduled opening of the huge new Dulles International Airport at Chantilly, Virginia (30 miles from Washington, D. C.) has focused attention on the lack of a municipal heliport in the Nation's Capital.

The announcement by the Civil Aeronautics Board of an investigation of the pending applications for helicopter service in the Washington, D. C. area further pointed out the need for a heliport facility to serve the community. At the request of the Civil Aeronautics Board, with the cooperation of the Aviation Committee of The Metropolitan Washington

Board of Trade, the National Capital Planning Commission initiated a heliport site survey in the District of Columbia for submission to the Washington District Commissioners for approval and action.

In this connection, it is interesting to note that for the fourth consecutive year, the District Commissioners proclaimed "Helicopter Week" in Washington, D. C. in recognition of the helicopter's service to the community and to the Nation as April 30 to May 6, 1961.

The three scheduled helicopter airlines, Los Angeles Airways, Inc., Chicago Helicopter Airways, Inc. and New York Airways, Inc., continued to set new records in the number of passengers carried during the year. In 1959, the three carriers flew 366,000 passengers, in 1960, they flew an estimated 490,000 passengers, an increase of some 34%.



With the helicopter equipment soon to be available and with their resulting lower operating costs and higher load factors, it is predicted these three airlines shortly will annually number their passengers in the millions.

The Military Services, Army, Navy, Air Force, Marine Corps and Coast Guard, however, remain the heaviest users of helicopters for aerial reconnaissance, fire fighting, in crash rescue, anti-submarine warfare and in the transport of ammunition, supplies and troops.

Of prime importance to the industry was the Army competition for a Light Observation Helicopter. This competition, known as the LOH, was held for the purpose of selecting a four-passenger, turbine-powered helicopter as a replacement for the L-19's, H-13's and H-23's. Early in the spring, 1961, the Army will select two designs and contract for prototypes of each. Following extensive tests and evaluation, a production order of 3,000 of this type will be awarded.

ANNUAL 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	26	6	5	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

[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

Project Hummingbird, a comprehensive study by the Federal Aviation Agency on the use of steep-gradient aircraft in short haul commercial transportation for the next decade, has been completed. The study emphasized helicopter operations, trends and forecasts and has proven to be an extremely useful report for the industry. As part of the general project, a second study, "A Technical Summary and Compilation of Characteristics and Specifications on Steep-Gradient Aircraft," is scheduled for publication by mid-1961.

Two Task Force assignments made by Federal Aviation Agency Administrator Halaby early in 1961 will be important to the helicopter industry. Project *New Horizon,* headed by Fred M. Glass, will report on National Aviation Policy and Lloyd N. Cutler will direct the Task Force to review FAA rule-making and enforcement procedures.

With the complete utility of helicopter flight operations seriously

handicapped by the existence of legal restrictions adopted in the years prior to its development and in connection with fixed wing flight safety needs, the Council continued to campaign for the establishment of city-center heliports throughout the country. To assist in this project, copies of "Legal Aspects of Planning for Urban Heliports," prepared by the Council's legal advisers, were distributed to city planners, state and local governments throughout the Nation.

The cooperation of national groups in behalf of the helicopter industry is evidenced typically by The American Legion's adoption of the following resolution to "Encourage Utilization of Helicopters":

WHEREAS, The helicopter has proved itself a useful and versatile vehicle for both military and peaceful uses; and

WHEREAS, There is need for increased emphasis on the many services the helicopter offers to enhance our way of life;

NOW, THEREFORE, BE IT RESOLVED, By The American Legion in National Convention assembled in Miami Beach, Florida, October 17-20, 1960, does reaffirm the principles and objectives of Resolution

SALES AND BACKLOG OF SIX MAJOR HELICOPTER MANUFACTURERS
1954 TO DATE
(Millions of Dollars)

Year	TOTAL	Military	Civil[a]
Sales			
1954	$307.4	$202.6	$104.8
1955	333.5	260.1	73.4
1956	337.0	283.6	53.4
1957	326.6	248.5	78.1
1958	295.0	243.1	51.9
1959	256.9	202.4	54.5
1960	267.6	226.2	41.4
Backlog December 31			
1954	$677.8	$584.3	$ 93.5
1955	540.1	469.0	71.1
1956	446.6	379.7	66.9
1957	281.1	251.5	29.5
1958	222.4	210.4	12.0
1959	223.7	201.3	22.4
1960	309.2	284.0	25.2

[a] Includes spare parts, subcontracts, etc.
Source: 1

HELICOPTERS IN PRODUCTION AND DEVELOPMENT, 1960

Company	Military Symbol		Civil Designation	Number of Places	Present Status
Bell	H-13H	USA	47G-2	3	Production
	HTL-7	USN			
	—		47G-3	3	Production
	H-13J	USAF	47J-2	4	Production
	HUL-1	USN			
	HUL-1G	USCG			
	HUL-1M	USN	47L	4	Production
	XV-3	USAF	200	2	Development
		USN			
	H-40A	USAF	204	7	Production
	HU-1A	USA			
	HU-1B	USA	204B	10	Production
Boeing-Vertol	H-21D	USA	—	22	Development
	—		105		Development
	VZ-2	USA	V-76	1-2	Development
	—		V-107	25	Development
	—		V-107-II	25	Production
	YHC-1B	USA	V-114	33	Production
	YHC-1A		—	25	Development
Brantley	—		B-2	2	Production
Cessna	—		CH-1C	4	Production
	—		CH-1C[a]	4	Development
Gyrodyne	YRON-1	USN	Rotorcycle	1	Production
Hiller	H-23D	USA	—	3	Production
	—		H-12E	3	Production
	—		H-12E4	4	Production
	YROE-1	USMC	—	1	Development
		USN			
	X-18	USAF	—		Development
Hughes Tool	YHO-2HU	USA	269A	2	Production
Kaman	—		K-16B		Development
	HU2K-1		K-20	12	Development
	—		Kaman/Fairey Rotodyne	65	Development
Omega	—		BS-12D1	5	Production
Republic	—		Alouette II	5	Production
	YHD-1	USA	Djinn	2	Development

HELICOPTERS IN PRODUCTION AND DEVELOPMENT, 1960—*Continued*

Company	Military Symbol		Civil Designation	Number of Places	Present Status
Sikorsky	H-18A	USAF			
	H-19C	USA			
	HRS-1, HRS-2	USMC	S-55C	12	Production
	HO4S-1, HO4S-2	USN			
	HSS-1, HSS-1N	USN			
	H-34A	USA	S-58	20	Production
	HUS-1, HUS-1G	USMC			
	HUS-1A	USN			
	HSS-2	USN	S-61-L	31	Production
	—		S-62	12	Production

[a] Certificated for instrument flight.
Source: 1

No. 639 adopted by the 40th National Convention to the end that we promote and encourage the development and use of helicopters and the passage of necessary ordinances and regulations as will permit their efficient operation.

A directory of "Recipients of Helicopter Awards—1944-1960," prepared by the Council in 1960, was favorably received by the press, industry and cognizant Government agencies. A similar directory of helicopter records is scheduled for publication in 1961.

Noteworthy "Firsts" during 1960 included:

- A rescue helicopter landed and took off from 18,000 feet on Mt. McKinley. The highest landing and take-off ever made by an aircraft of any type.
- First FAA certification of a helicopter for instrument flight.
- Eleven new international helicopter records in categories of speed, climb, altitude and distance over a closed course were made. Five of these records were formerly held by the U.S.S.R.
- The world's first turbine-powered helicopter was delivered to a scheduled airline.
- First flight of first twin-turbine transport helicopter.

HELICOPTER SCHEDULED AIRLINES
Available Service and Utilization
1948 TO DATE
(In Thousands)

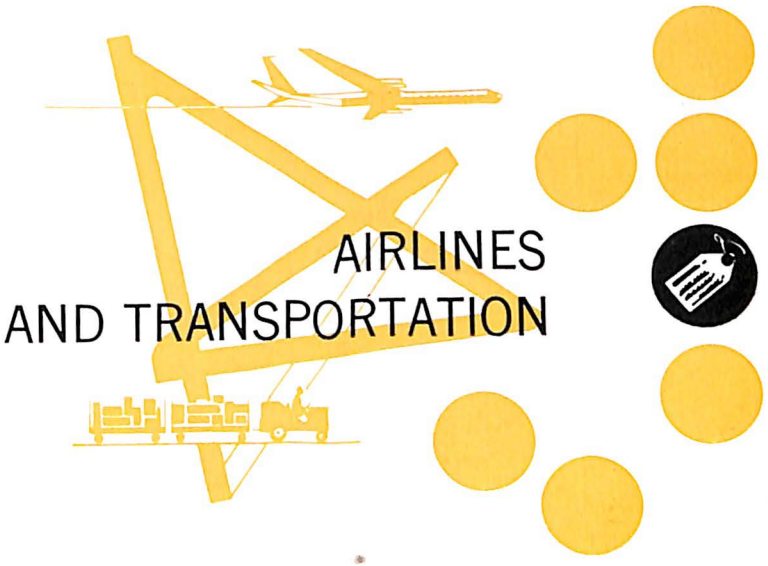
Year	Passengers Carried	Revenue Ton-Miles Flown	Revenue Passenger-Miles Flown	Revenue Plane-Miles Flown
1948	—	28	—	284
1950	—	63	—	668
1952	—	75	—	631
1953	1	129	26	1,006
1954	9	152	183	1,071
1955	28	195	628	1,148
1956	62	277	1,588	1,315
1957	148	448	3,273	1,604
1958	228	591	4,885	1,675
1959	366	855	7,478	1,899
1960	490	1,054	9,475	2,218

Source: 4

HELICOPTER SCHEDULED AIRLINES
Revenue Ton-Mile Traffic Carried
1948 TO DATE
(In Thousands)

Year	TOTAL	Passenger Ton-Miles	U. S. Mail	Express	Freight	Excess Baggage
1948	28	—	28	—	—	—
1950	63	—	63	—	—	—
1952	75	—	75	—	—	—
1953	129	2	123	—	2	2
1954	152	17	115	13	5	2
1955	195	60	96	31	5	3
1956	277	149	89	31	7	1
1957	448	311	92	33	8	1
1958	591[a]	463	83	34	6	2
1959	855[a]	710	87	41	7	3
1960	1,054[a]	902	92	40	6	4

[a] Includes charter flights.
Source: 4



AIRLINES AND TRANSPORTATION

The Nation's airlines in 1960 provided more service, carried more passengers, transported more freight, express and mail, and the operating revenues reached the highest peak in airlines history. At the same time, net profits dropped sharply.

The airlines increased their lead over other forms of public transportation, and domestic low-fare aircoach traffic for the first time exceeded first-class travel during the latter part of the year.

Here is the 1960 record for U. S. domestic and international scheduled airlines:

- 62 million passengers carried in 1960, an increase of 2 million over 1959.
- 226 million ton-miles of U. S. mail in 1960, a significant gain of 20 per cent over the previous year.
- 570 million ton-miles of airfreight, up 73 million over 1959.

The airlines, the Air Transport Association reported in its 1960 Annual report ,provided a record volume of service 765.5 billion available seat-miles—an increase of 6.2 billion over 1959. The passenger load factor—the number of seats filled—was 59.2 per cent of available capability, a slight decrease over the 61.2 per cent reported in 1959.

A significant milestone in air travel was reached in 1960 when turbine-powered aircraft accounted for half of the total passenger miles flown. At the end of 1960 ,the scheduled carriers[a] were operating a fleet

[a] Excluding all-cargo and Alaskan airlines.

SHIPMENTS OF COMMERCIAL TRANSPORT AIRCRAFT
1953 TO DATE
(Fixed Wing-Multiple Engine)

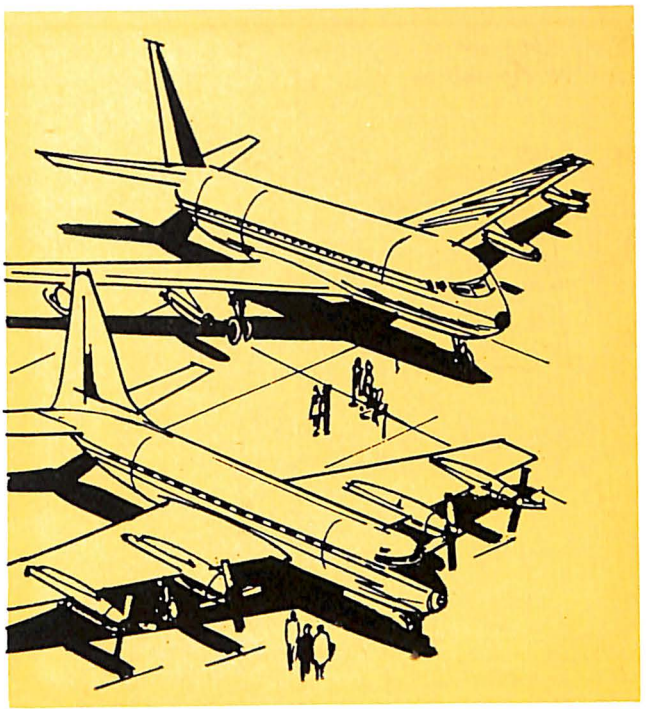
Company and Aircraft	1953	1954	1955	1956	1957	1958	1959	1960
TOTAL[a]	209	191	113	206	323	216	262	241
Boeing								
707	—	—	—	—	—	7	73	68
720	—	—	—	—	—	—	—	24
Convair								
340	101	61	14	—	—	—	—	—
440	—	—	—	57	79	21	14	5
880	—	—	—	—	—	—	—	15
Douglas								
DC-6	69	41	14	39	44	65	1	—
DC-7	11	48	30	67	123	57	—	—
DC-8	—	—	—	—	—	—	21	91
Fairchild								
F-27	—	—	—	—	—	25	41	14
Lockheed								
1049	28	41	55	43	42	21	5	—
1649	—	—	—	—	35	8	—	—
Electra	—	—	—	—	—	12	107	24

[a] Commercial transport totals differ from FAA totals for "transports" because they exclude executive and other transports for other than commercial use.
Source: 1

of 1,750 planes. This included 202 turbojet aircraft and 222 turboprop airliners, about one fourth of the total aircraft in operation.

The airlines industry expects to take delivery of 118 turbojet aircraft and 39 turboprop planes during 1961. There are 19 turbine-powered helicopters on order for delivery in the 1961-62 period.

The turbine-powered airliner has provided a great stimulus to air



travel. The speed, safety and comfort of these new aircraft have attracted thousands of new air travelers.

The efficient management of airlines, coupled with the excellent aircraft they operate, has held the line on increased travel costs. Domestic air passenger fares as measured by average revenue per passenger mile are the same today as they were in 1937. Railroad coach passenger fares, measured in the same way, have increased 55 per cent during the same period.

The airlines have made substantial progress in improving ground services. Last year the domestic carriers handled some 50 million reservations and this is expected to increase to 120 million by 1970. New reservation systems are being installed. One airline has spent about $2,250,000 for a system that instantly tells its agent in almost 100 cities the seat availability up to 6 months ahead on 60,000 different itineraries.

For the first time since 1951 the fatality rate of the scheduled air transport system was more than one per 100,000,000 passenger-miles flown. The 1960 rate, according to the National Safety Council, was 1.01 for every 100,000,000 passenger-miles. This is less than half of the fatality rate for passenger auto travel. But the only satisfactory record

U. S. Scheduled Airlines—Aircraft in Service by Make and Model
as of December 31

Domestic						International[a]					
Aircraft Make and Model	1941	1957	1958	1959	1960	Aircraft Make and Model	1941	1957	1958	1959	1960
Bell											
B47D,G	..	6	6	5	5						
Boeing						Boeing					
247D	27	..	..	..	..	307	3	..	..	..	..
307	5	..	..	..	..	314	8	..	..	..	..
377	..	9	9	6	..	377	..	24	23	15	3
707	..	..	..	48	62	707	..	..	6	18	29
720	..	..	..	..	22						
Convair						Convair					
240	..	99	76	46	51	240	..	1	..	..	..
340	..	134	133	122	117						
440	..	31	31	36	31						
540	..	..	..	1	4						
880	..	..	..	..	14						
Curtiss											
C-46	..	7	7	7	7						
Douglas						Douglas					
DC-3, 3S	280	312	307	282	258	DC-2	3	..	..	..	..
DC-4	..	39	31	25	18	DC-3	45	10	8	14	9
DC-6,A, B	..	267	271	270	261	DC-4	..	28	27	26	22
DC-7	..	169	214	189	179	DC-6A, B	..	68	83	52	36
DC-8	..	..	..	18	56	DC-7	..	38	38	31	37
						DC-8	..	..	..	..	19
Fairchild											
F-27	..	..	10	29	37						
						Grumman					
						G-21	..	1	..	..	..
Lockheed						Lockheed					
10	16	..	..	..	..	10	2	..	..	..	..
18	13	10	7	..	..	18	3	..	..	..	..
L49, 749	..	116	109	98	69						
1049	..	81	89	86	82	1049	..	..	..	..	1
1649	..	25	29	28	25						
188	..	..	..	96	107						
Martin						Martin					
2-0-2	..	25	26	19	15	130	1	..	..	..	..
4-0-4	..	85	95	85	80						
Sikorsky						Sikorsky					
S51	..	2	2	2	2	S42B	4	..	..	..	..
S55	..	12	6	5	5	S43	1	..	..	..	..
S58	..	6	5	6	7						
S62	..	..	..	..	1						
Vertol											
V44B	..	..	5	5	5						
Vickers											
700, 800	..	59	80	82	74						
Total	341	1494	1546	1596	1594		70	170	185	156	156

(Continued on next page)

U. S. SCHEDULED AIRLINES—AIRCRAFT IN SERVICE BY MAKE AND MODEL—*Continued*

Domestic						International[a]					
Aircraft Make and Model	1941	1957	1958	1959	1960	Aircraft Make and Model	1941	1957	1958	1959	1960
Fixed Wing						Fixed Wing					
4-engine turbojet	..	..	..	66	154	4-engine turbojet	..	..	6	18	48
4-engine turboprop	..	59	80	178	181	4-engine turboprop	..	..	..	..	..
2-engine turboprop	..	..	10	30	41	2-engine turboprop	..	..	..	..	..
4-engine piston	5	706	752	702	634	4-engine piston	16	158	171	124	99
2-engine piston	336	703	682	597	559	2-engine piston	54	12	8	14	9
Helicopter						Helicopter					
Piston engine	..	26	22	23	24	Piston engine	..	..	..	..	..
Turbine engine	..	..	..	..	1	Turbine engine	..	..	..	..	..
TOTAL	341	1494	1546	1596	1594		70	170	185	156	156

[a] Excludes certain aircraft in both domestic and international operations.
Source: 25

to the airline industry is a zero fatality rate. They are moving toward this goal. In the period of 1940-44, the average rate was 2.45 fatalities for each 100,000,000 passenger-miles; in the period of 1956-60 this record improved to 0.57.

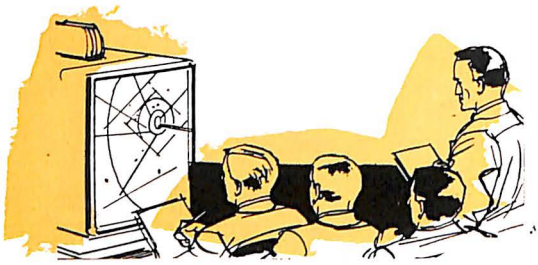
Declining earnings are the number one problem of the carriers. Last year was the fifth consecutive year of depressed earnings.

The Civil Aeronautics Board, the agency responsible for regulation of the airlines, ruled that airline earnings should be equivalent to a 10.5 per cent average return on investment for extended periods. Last year, the carriers earned 2.90 per cent on invested capital, or about $116,000,000 less than required to attain the return.

CAB Chairman Alan Boyd stated: "Today's low (airline) earnings focus attention on another of our immediate problems. Mach 3 (supersonic) is staring us in the face . . . carrier earnings are the only hope for a substantial private enterprise contribution to supersonic development—and the Nation must develop one. Carrier earnings in the years immediately ahead are the only hope that a private enterprise air transport system can absorb the next equipment transition."

The development of the supersonic transport will require a joint Government-industry effort. The extremely high costs make it impossible for a single company or even a combine of several aerospace companies to undertake development.

But as a matter of national prestige, the Nation must move ahead with this program. At least three other foreign nations, including Soviet Russia, are moving ahead in this field.



EMPLOYMENT, WAGES, AND AVERAGE ANNUAL EARNINGS IN THE TRANSPORTATION INDUSTRY, 1959

	ALL INDUSTRY	ALL TRANSPORTATION	Air Transportation (Common Carrier)	Railroads	Highway Transportation	Water, Pipeline, and Other Transportation
Full-Time Equivalent Employees (Thousands)	56,709	2,458	155	923	1,048	332
Wages and Salaries (Million Dollars)	$258,206	$14,184	$1,025	$5,597	$5,636	$1,926
Average Annual Earnings per Full Time Employee	$4,553	$5,771	$6,613	$6,064	$5,378	$5,801

Source: 9

U. S. Domestic and International Scheduled Airlines Passenger Service

Selected Years, 1926 to Date

Year	Domestic		International	
	Passengers Carried[a] (Thousands)	Revenue Passenger-Miles Flown[b] (Millions)	Passengers Carried[c] (Thousands)	Revenue Passenger-Miles Flown[b] (Millions)
1926	6	1.0	N.A.	N.A.
1930	385	85.1	33	18.6
1935	679	316.3	111	46.0
1940	2,523	1,052.2	163	99.8
1945	6,576	3,362.5	476	448.0
1950	17,345	8,002.8	1,676	2,206.4
1951	22,652	10,566.2	2,042	2,599.8
1952	25,010	12,528.3	2,365	3,021.0
1953	28,721	14,760.3	2,699	3,385.6
1954	32,343	16,768.7	2,875	3,749.6
1955	38,025	19,819.0	3,416	4,420.2
1956	41,738	22,361.8	3,949	5,126.1
1957	48,464	25,339.6	4,422[d]	5,769.5
1958	48,128	25,343.4	4,595[d]	5,992.3
1959	54,770	29,343.4	5,148[d]	6,918.5
1960	56,117	30,513.6	5,718[d]	8,159.2

N.A.—Not available.
[a] 1926, 1930: duplicated revenue and non-revenue passengers; 1935, 1940: duplicated revenue passengers; 1945 to date: unduplicated revenue passengers.
[b] 1926, 1930, 1935: includes non-revenue passenger-miles.
[c] 1930, 1935, 1940, 1945: total passengers; 1950 to date: revenue passengers only.
[d] Enplaned passengers. These figures are not comparable to those for previous years.
Source: 25

DEVELOPMENT OF UNITED STATES CIVIL AIR TRANSPORT
(Scheduled Services—International and Domestic)
SELECTED YEARS, 1949 TO DATE

Year	Revenue Miles (Millions) Flown	Passengers Carried (Millions)	Revenue Passenger Miles (Millions)	Cargo Ton-Miles[a] (Millions)	Mail Ton-Miles (Millions)
1949	456	17	8,935	174	61
1951	504	25	13,166	240	86
1953	629	31	18,146	276	97
1955	752	41	24,239	379	139
1956	835	46	27,488	445	148
1957	941	53	31,109	515	156
1958	945	53	31,336	523	172
1959	1,002	60	36,188	497	190
1960	970	62	38,673	580	226

N.A.—Not available.
[a] Includes nonscheduled operations for scheduled combination and all-cargo carriers and noncertificated carriers. For 1958 nonscheduled operations amounted to 140 million cargo ton-miles.
Source: 25

DEVELOPMENT OF FREE WORLD CIVIL AIR TRANSPORT
(Scheduled Services—International and Domestic, Excluding China and USSR)
1919 TO DATE

Year	Miles Flown (Millions)	Passengers Carried (Millions)	Passenger-Miles (Millions)	Cargo-Ton-Miles (Millions)	Mail-Ton-Miles (Millions)
1919	1	N.A.	N.A.	N.A.	N.A.
1929	57	N.A.	132	N.A.	N.A.
1934	101	N.A.	405	N.A.	N.A.
1939	185	N.A.	1,262	N.A.	N.A.
1944	257	N.A.	3,412	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	190
1955	1,425	68	38,000	890	255
1956	1,580	77	44,000	1,015	275
1957	1,760	86	50,500	1,115	295
1958	1,815	87	53,000	1,145	320
1959	1,910	98	60,000	1,315	355
1960	1,975	108	69,000	1,495	410

N.A.—Not available.
Source: 29

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

1960		1954	
American Airlines	6,257	Pennsylvania Railroad	3,447
United Air Lines	5,355	American Airlines	3,372
Trans World Airlines	4,451	United Air Lines	3,135
Eastern Air Lines	4,046	New York Central System	3,041
Pennsylvania Railroad	2,463	Eastern Air Lines	2,847
New York Central System	1,797	Trans World Airlines	2,611
Delta Air Lines	1,772	Atchison, Topeka & Santa Fe Railway System	1,948
Atchison, Topeka & Santa Fe Railway System	1,689	Union Pacific Railroad Company	1,459
Capital Airlines	1,492	Southern Pacific Company	1,342
Union Pacific Railroad Company	1,233	New York, New Haven & Hartford Railroad Company	1,274

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

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

Year	Domestic Air Carriers			Railroads (excluding Commutation)		
	TOTAL	Scheduled	Irregular	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	6.0	5.9	N.A.	59.7	20.7	39.0
1947	6.3	6.1	N.A.	41.2	13.5	27.7
1948	6.3	6.0	N.A.	36.5	12.2	24.3
1949	7.4	6.8	.6	30.8	10.5	20.3
1950	8.8	8.0	.8	26.6	9.2	17.4
1951	11.7	10.6	1.1	29.4	9.9	19.5
1952	13.8	12.5	1.3	29.1	9.3	19.8
1953	16.1	14.8	1.3	27.2	8.2	19.0
1954	17.9[E]	16.8	1.1[E]	25.0	7.3	17.7
1955	20.9[E]	19.8	1.1[E]	24.2	6.9	17.3
1956	23.5[E]	22.4	1.1[E]	23.7	6.6	17.1
1957	26.4[E]	25.3	1.1[E]	21.0	5.2	15.9
1958	26.4[E]	25.3	1.1[E]	18.4	4.2	14.2
1959	30.4[E]	29.3	1.1[E]	17.6	3.8	13.8
1960	31.6[E]	30.5	1.1[E]	17.0	3.6	13.4

E Estimate.
N.A.—Not available.
Sources: 3, 25, 30

INTERCITY PASSENGER TRAFFIC BY AIR, RAILROAD AND BUS[E]
Selected Years, 1916 to Date

	TOTAL	Domestic Air Carriers	Railroads[a]	Buses
Billions of Passenger-Miles				
1916	32.5	[b]	35.2	[b]
1939	32.9	.7	22.7	9.5
1941	44.4	1.4	29.4	13.6
1944	125.3	2.2	95.7	27.4
1948	76.8	6.1	46.0	24.7
1951	73.2	10.5	35.3	27.4
1954	71.7	16.7	29.4	25.6
1955	73.7	19.7	28.5	25.5
1956	75.7	22.3	28.2	25.2
1957	73.1	25.3	26.3	21.5[r]
1958	69.4	25.3	23.3	20.8[r]
1959	71.8	29.3	22.1	20.4
1960	72.2[E]	30.5	21.3	20.4[E]
Percent				
1916	100.0	[b]	100.0	[b]
1939	100.0	2.1	69.0	28.9
1941	100.0	3.2	66.2	30.6
1944	100.0	1.8	76.4	21.8
1948	100.0	7.8	59.9	32.2
1951	100.0	14.3	48.2	37.5
1954	100.0	23.3	41.0	35.7
1955	100.0	26.7	38.7	34.6
1956	100.0	29.5	37.2	33.3
1957	100.0	34.6	36.0	29.4
1958	100.0	36.4	33.6	30.0
1959	100.0	40.8	30.8	28.4
1960	100.0	42.2	29.5	28.3

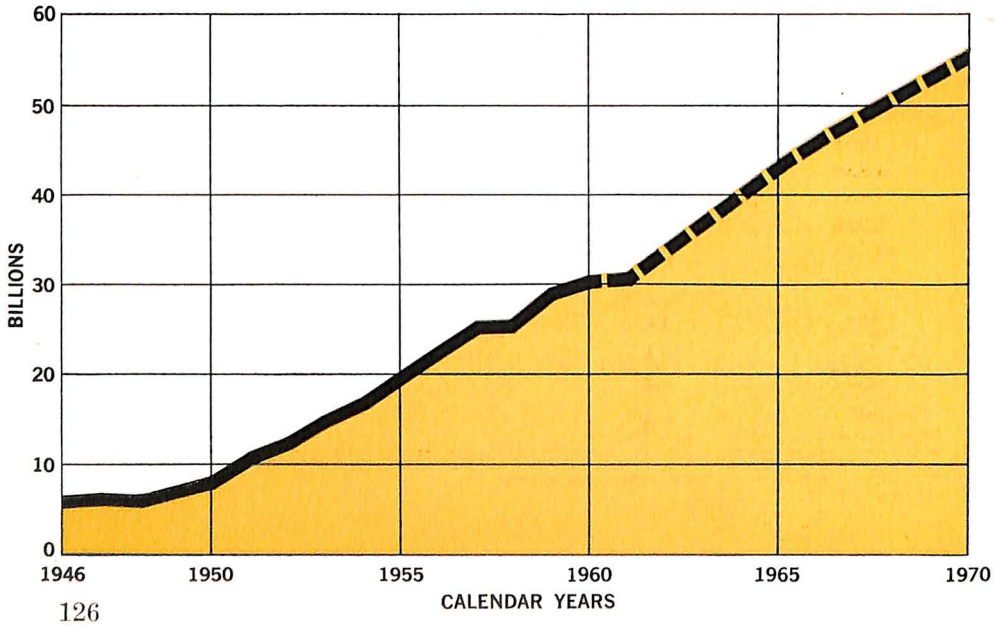
[r] Revised
[E] Estimate
[a] Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.
[b] Negligible.
Sources: 1, 25, 30, 37

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	3.20[E]	2.50	3.35	2.08
1955	5.35	3.20[E]	2.47	3.31	2.06
1956	5.32	3.20[E]	2.56	3.39	2.13
1957	5.30	3.20[E]	2.71	3.68	2.29
1958	5.60	3.20[E]	2.76	3.75	2.43
1959	5.60	3.20[E]	2.77	3.84	2.59
1960	5.60[E]	3.20[E]	2.80	3.88	2.65[E]

[a] Revenue figures cover railroad passenger tickets only, exclude space charges for parlor and sleeping cars.
N.A.—Not available.
[E] Estimate.
Sources: 1, 3, 25, 30, 37

DOMESTIC SCHEDULE REVENUE PASSENGER-MILES
REPORTED 1946-1960—PROJECTED 1961-1970



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

Year	Domestic Airlines	Railroads	Buses	Cars and Taxis
Passenger Deaths				
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	2.3
Total Deaths[a]				
1946	1.8	3.2	1.4	4.0
1947	3.4	3.9	1.4	3.7
1948	1.6	4.0	1.2	3.4
1949	1.5	4.0	1.2	4.0
1950	1.3	4.7	1.1	4.2
1951	1.6	4.2	1.1	4.3
1952	0.5	3.4	1.0	4.2
1953	0.7	3.9	0.95	4.1
1954	0.1	3.4	0.82	3.7
1955	0.9	3.7	0.96	3.7
1956	0.7	3.5	0.84	3.6
1957	0.1	3.5	0.7	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

[a] Includes pedestrians, employees, trespassers, etc.
Source: 38

AVIATION EXPORT AND FOREIGN AVIATION

Aeronautical export of both civil and military aircraft, their related equipment and accessories increased importantly during 1960. Indeed, the exports of the U. S. aerospace industry during the year amounted to more than $1.3 billion, and represented an increase over aeronautical exports during 1959 of 73 per cent.

This record gain was in sharp contrast to other aspects of the U. S. economy becoming increasingly burdened by the flow of dollars out of the country. Sales efforts of the industry, coupled with the free world demand for American-made aerospace products, thus were a major factor in coping with the U. S. gold outflow.

According to the U. S. Bureau of the Census, aviation exports totaling $1,240,216,000 were delivered to 107 free world nations through November of 1960. These nations included 34 countries in the Western hemisphere, 21 in Europe, 27 in the Near and Far East, including Australia and New Zealand, and 25 in Africa.

During the past five years (1956-1960), exports of aeronautical hardware have accounted for 5.5 per cent of all U. S. merchandise exported, and 9.5 per cent of the U. S. aerospace industry's $11 billion annual production during this period. During 1960, aerospace industry exports accounted for approximately 6.5 per cent of all U. S. merchandise exports and 12 per cent of the aerospace industry total sales.

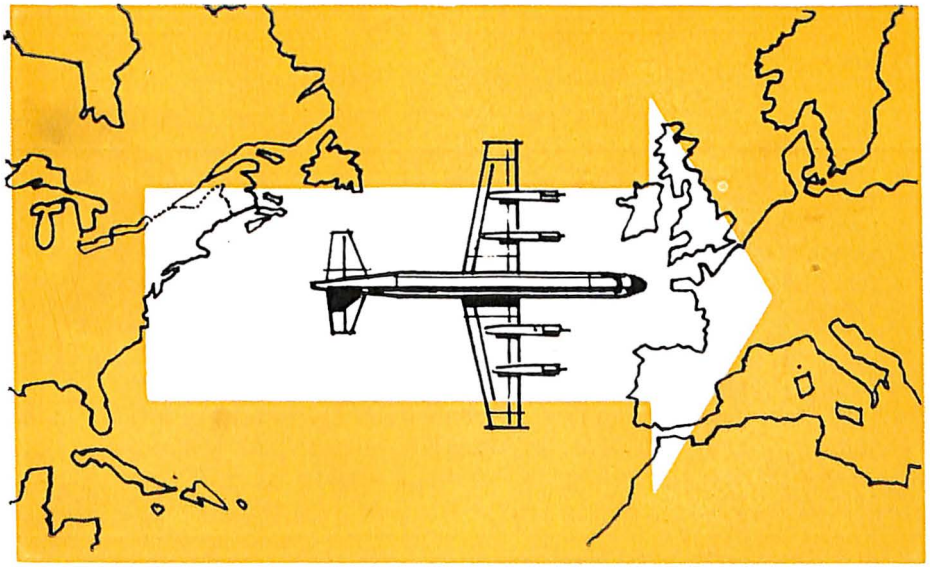
Of particular importance again in 1960 was the continued and in-

creasing trend in licensing arrangements between American aircraft and missile manufacturers and the aeronautical manufacturers of other countries, which became manifest in 1955. American aircraft manufacturers have greatly broadened the scope of their international operations in both production and sales by actually becoming partners with the aeronautical manufacturers of other nations. This trend is notable in Canada, France, Germany, Italy, Japan and Mexico, with similar arrangements under negotiation in other areas abroad. There is a well defined trend by American aviation manufacturers to look to international licensing arrangements to greatly augment their export business. This new concept of international cooperation among aeronautical manufacturers of different nations may well provide the "business breakthrough" required to hurdle the many obstacles to international trade.

Export of American-manufactured business and utility aircraft increased 63% during 1960. This wide acceptance of American-manufactured small planes attests to the diversified and economical utility of this equipment. Indications are that calendar 1961 will prove to be an exceptional export year for U. S. aircraft in this category.

The commercial transport backlog declined slightly during the past year, as deliveries of the turbine-powered airline transports increased. The backlog of piston-powered transports has virtually disappeared.

Deliveries of gas turbine-powered transports to the world airlines continued to gain impetus during 1960. Of the 236 giant airliners rolling



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	[a]	12	12.1
1952	25	18.2	9	.6	1	.6	15	17.0
1953	87	79.2	17	1.3	13	7.5	57	87.0
1954	110	93.0	29	2.0	7	4.0	74	70.4
1955	95	81.2	39	2.5	5	2.4	51	76.3
1956	151	132.9	64	4.7	2	.8	85	124.4
1957	203	179.3	94	7.7	9	6.9	100	164.7
1958	127	146.4	36	3.5	9	5.6	82	137.3
1959	65	107.6	23	2.3	3	1.7	39	103.6
1960	159	480.1	57	6.7	10	9.1	92	464.3

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	306	3.4
1955	749	7.4	296	1.9	453	5.5
1956	966	11.0	340	2.5	626	8.5
1957	1,086	13.1	368	2.5	718	10.6
1958	896	12.1	268	2.2	628	9.9
1959	1,033	14.5	394	3.6	639	10.9
1960	1,528	23.6	374	3.0	1154	20.6

(Continued on next page)

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	.01
1956	55	3.7	534	22.7	1	.002
1957	104	11.9	627	43.2	4	.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	.02

[a] Less than $500,000.

Source: 14

off U. S. production lines during the year, 92 were delivered to foreign flag carriers. Approximately 522 turbojet and turboprop airliners have been delivered to foreign flag carriers and domestic airlines since deliveries began in 1958.

The development and activation of certain international financing organizations of various types two years ago still has not as yet provided much more than indirect assistance to U. S. aviation exporters. The U. S. Export-Import Bank continues to be the leader in the financing of U. S. aircraft to the world's major airlines. It is hoped that the Export-Import Bank may also provide leadership in the development of long-term export credit guarantees for American-manufactured capital equipment.

GREAT BRITAIN

1960 brought further consolidation to Britain's aircraft industry, which during the year recorded an impressive $206.1 million for the export of aero-engines. The total for all British-manufactured aeronautical exports came to $397.9 million in 1960, compared to the $438.3 million total value of aeronautical exports shipped during 1959, a peak year.

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
TOTAL[a]	15,099	13,352	1,747

[a] October 6, 1949 to September 30, 1960.
Source: 19

FRANCE

During 1960, total aircraft industry sales came to approximately $460,000,000; and, of this amount, $230,000,000 in aeronautical products were exported from France. The French aircraft labor force totaled 83,000 during 1960, which was a slight increase over 1959. Export orders booked by the French aeronautical industry in 1960 showed an increase of almost 150% over 1959.

JAPAN

Aeronautical manufacturing in Japan during 1960 totaled $68,930,000, a 67% increase over the $41,341,066 manufactured during 1959. By the end of 1960, there were 18,200 people employed in the Japanese aircraft industry. Aeronautical exports were not significant during 1960. Japanese production of 42 P2V aircraft began in 1960, and two significant manufacturing agreements for the production of U. S.-designed turbine helicopters were approved by the Japanese government.

NETHERLANDS

Production of civil aircraft during 1960 was reported as 25 Fokker (F-27 units) at a value of approximately $16.4 million. Fourteen of these F-27's were exported during the year. The aircraft industry in the Netherlands employed approximately 5,300 persons in 1960, which was

an increase over 1959. A total of 15 new U. S.-manufactured transport aircraft at a value of $55.8 million were imported by the Netherlands during 1960.

WEST GERMANY

During eleven months (January-November) of 1960, the German aircraft industry exported 237 units at a value of $7.4 million. Total production was not reported. However, an estimated figure of a 23,000-person labor force was given for all segments of the German aeronautical manufacturing industry. Germany is a major recipient of aeronautical licensing agreements from American companies.

SWEDEN

Sweden produced a training and observation aircraft for both civil and military purposes, known as the SAAB 91 "Safir." Fifty-one of these planes were sold in 1960 for $1,400,000, of which 37—valued at $1,100,000—were exported. It was reported that approximately 10,000 persons were employed in the aircraft and electronic industry in Sweden during 1960. Military aircraft production is classified and therefore not reported.

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

[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

VALUE OF UNITED STATES IMPORTS OF AERONAUTIC PRODUCTS, 1955 TO DATE
(Thousands of Dollars)

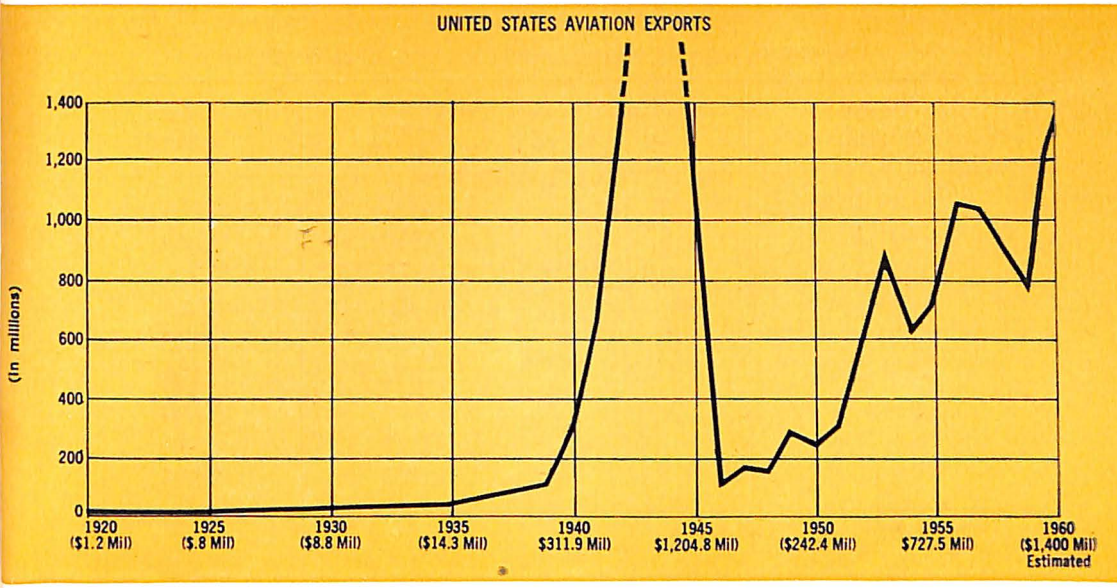
Year	TOTAL	Aircraft[a]	Aircraft Engines	Aircraft Parts, N.E.C.
1955	$32,096	$14,415	$1,265	$16,416
1956	86,790	55,594	2,300	28,896
1957	52,671	15,476	1,639	35,556
1958	78,560	32,715	5,991	39,854
1959	68,066	16,273	7,510	44,283
1960	60,901	6,841	7,388	46,672

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

U. S. EXPORTS OF CIVIL HELICOPTERS
1948 TO DATE

Year	Number	Value in Thousands
1948	47	$1,933
1949	31	1,181
1950	38	984
1951	28	899
1952	37	1,411
1953	98	4,873
1954	74	4,044
1955	66	4,165
1956	55	3,658
1957	104	11,907
1958	67	9,564
1959	63	8,184
1960	82	7,703

Source: 14



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	20,500.0	1,329.5	6.5

[a] Less than .05 percent.
Sources: 14, 16

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	436.0
		1960	397.9

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.

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

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

Sources: 6, 23

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

N.A.—Not available.
Source: 31

ESTIMATES OF AERONAUTICAL ACTIVITIES IN OTHER COUNTRIES[a]

Country	Employment (End of 1960	Aeronautical Sales and Trade (Value in Millions of U. S. Dollars)		
		Sales (Total)	Imports (Civil)	Exports (Civil)
France	83,000	460.0	128.0	135.1
Germany	23,000	N.A.	45.3	7.4
Japan	18,200	68.5	45.3	[b]
Netherlands	5,300	N.A.	56.4	11.5
Sweden	8,500	N.A.	35.0	4.5

[a] As compiled and released by each separate country.
[b] Negligible.
Source: 1

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SOURCES:

1. Aerospace Industries Association
2. Aerospace Industries Association, "Aerospace Year Book" (1960-1), "Aircraft Year Book" (1919-1959)
3. Aerospace Industries Association, "Aerospace Facts and Figures" (1960), "Aircraft Facts and Figures" (1945, 1953, 1955, 1956, 1957, 1958, 1959)
4. Air Transport Association
5. Department of the Air Force
6. Air Industries and Transport Association of Canada, Annual Reports
7. Department of the Army
8. Civil Aeronautics Board
9. Department of Commerce, "Survey of Current Business—National Income"
10. Department of Commerce, Bureau of the Census, "Census of Manufactures," 1958 and earlier
11. Department of Commerce, Bureau of the Census, "Annual Survey of Manufactures" (1949, 1950, 1951, 1952, 1953, 1955, 1956, 1957)
12. Department of Commerce, Bureau of the Census, Current Industrial Reports (1960-1), Facts for Industry (1946-1959), "Complete Aircraft and Aircraft Engines"
13. Department of Commerce, Bureau of the Census, Current Industrial Reports (1960-1), Facts for Industry (1948-1959), "Backlog of Orders for Aircraft Companies," Quarterly
14. Department of Commerce, Bureau of the Census, "U.S. Exports of Domestic & Foreign Merchandise" (Report FT 410)
15. Department of Commerce , Bureau of the Census, "U. S. Imports of Merchandise for Consumption," (Report FT 110)
16. Department of Commerce, Bureau of the Census, "Historical Statistics of the United States, 1789-1945" and "Continuation to 1952"
17. Department of Defense
18. Department of Defense, "Expenditures by Major Budget Category, FY 1960 with Nine Year Comparisons," EFAD 220
19. Department of Defense, International Security Affairs Supply Performance Reports
20. Department of Defense, "Monthly Report on Status of Funds by Functional Title, Department of Defense, FAD 390
21. Department of Defense, "New Obligational Availability by Major Budget Category," EFAD 117
22. Department of Defense, "Order of Magnitude Date on Comparative Expenditures by Functional Title as if 1961 Budget Structure Had Been Adopted Circa 1948," FY 1953-1962, FAD 397, 28 March 1961
23. Dominion Bureau of Statistics, Ottawa, Ontario, Canada
24. Executive Office of the President, Bureau of the Budget, Estimates Division, "Budget of the U. S. Government" (Annual)
25. Federal Aviation Agency, "FAA Statistical Handbook of Aviation" (Annual) (Formerly CAA Statistical Handbook of Civil Aviation)
26. Federal Aviation Agency, "A Study of User Charges for the Domestic Federal Airway System," April 1961
27. H.M. Stationery Office, London, "Ministry of Labour Gazette" (Monthly)
28. H.M. Central Office of Information, London
29. International Civil Aviation Organization, "Air Transport Scheduled Services—International and Domestic" (Annual)
30. Interstate Commerce Commission
31. Society of Japanese Aircraft Constructors
32. Department of Labor, Bureau of Employment Security

33. Department of Labor, Bureau of Labor Statistics, Division of Wages and Industrial Relations.
34. Department of Labor, Bureau of Labor Statistics, "Employment and Earnings" (Monthly) (Formerly "Employment and Payrolls")
35. Department of Labor, Bureau of Labor Statistics, "Work Injuries in the U. S." (Annual)
36. National Aeronautics and Space Administration
37. National Association of Motor Bus Operators
38. National Safety Council, "Accident Facts" (Annual)
39. National Science Foundation
40. Department of the Navy
41. Securities & Exchange Commission—Federal Trade Commission, "Quarterly Financial Report for Manufacturing Corporations"
42. Society of British Aircraft Constructors
43. War Production Board
44. 87th Congress, 1st Session, "Coordination of Information on Current Scientific Research and Development Supported by the U. S. Government." Committee on Government Operations, April 17, 1961, p. 54.

DEFINITIONS AND DESCRIPTIONS

Active Aircraft Inventory: The sum of ready aircraft in the basic aircraft inventory and the inventory of command-support aircraft.

Aerospace Industry: The industry primarily engaged in the production of aircraft, guided missiles, space ships—i.e., all air and space vehicles.

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 winged guided missiles.

Airframe: The structural components of an airplane, excluding engines, accessories and other parts that may be replaced from time to time.

Airplane: See aircraft.

Backlog: The sales value of orders, supported by binding legal documents, that have not yet passed through the sales account.

Drone: A pilotless airplane piloted by remote control.

Guided Missile: An object that is directed to its target while in flight or motion either by a preset or self-reacting device within the missile or by radio command ouside the missile.

Jet Engine: An engine that takes in air from outside for use as a fuel oxidizer and projects a jet of hot gases backward to create thrust, the gases being derived from combustion within the engine.

Military Assistance: A program contributing to the development, maintenance and training of modern military forces, to deter or resist external aggression, combat internal subversion and protect valuable overseas bases in more than 40 countries.

Missiles: See guided missiles.

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

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

Rocket: A missile or pyrotechnic device propelled by hot gases ejected rearward by a motor which, carrying its own oxidizer, is independent of the atmosphere in its operation.

USAF: See United States Air Force.

United States Air Force: Official name of the air arm of the United States military forces. Established by the National Security Act of 1947. In its establishment the Army Air Forces (1941-1947), the Air Corps (1926-1947) and other air units were transferred to it. Between 1920 and 1926, the air arm of the U. S. Army was the Air Service. Before this, there were the Aeronautical Division of the Signal Corps (1907-1914), the Aviation Section of the Signal Corps (1914-1918), and th Division of Military Aeronauties and the Bureau of Aircraft Production which constituted the Air Service between 1918 and 1920.

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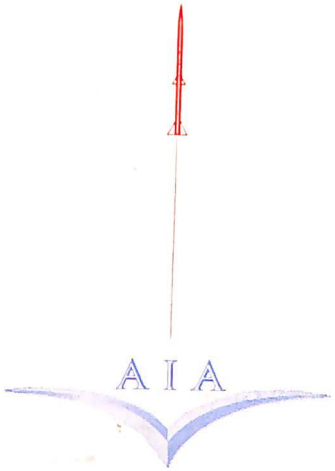

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