AVIATION FACTS and FIGURES

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AVIATION FACTS AND FIGURES 1959

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FOREWORD

Production of manned aircraft remains the aerospace industry's major assignment in the defense effort, but development and manufacture of guided missiles for the inventories of the armed services continues to involve an increasingly greater proportion of the industry's workload.

During the past year the industry continued its efforts, begun well before the launching of the first earth satellite, toward development of vehicles and equipment for space exploration. Its vast technological background, acquired in decades of research and development on aircraft, missiles, and their control and guidance systems, put the aircraft industry in an ideal position to develop these newer, extra-atmosphere vehicles. These highly sophisticated aero/spatial platforms include an orbital bomber, a stabilized reconnaissance satellite and a manned rocket-propelled spacecraft.

The companies comprising the Aerospace Industries Association in fact are now developing and producing by far the largest percentage of the new weapons for our military inventories. Of the total dollars being spent on aerial vehicles—aircraft and missiles—at least 85 per cent is contracted to our industry. A large percentage of this money does not stay in our industry's hands but is passed along to the tens of thousands of suppliers and subcontractors who comprise the total defense industry complex.

But any thought that defense spending will be increased in any large degree by the military services must be dispelled. To the contrary, the industry has been informed that in the event of threatened excess of spending it may be necessary to cut back some of its programs to keep within budget limits. These changing

demands in military requirements, and the cutbacks and cancellations during the last twenty-four month period, has brought about a steadily lowering level of production activity. As a result, industry employment declined from some 861,700 in 1957 to 757,500 in early 1958. Employment in the industry is expected to stabilize during 1959 at 750,000.

The introduction of the turbine-powered transport to world commerce has partially offset the changing military requirements. More than 600 turbine aircraft, costing in excess of $3 billion, have been ordered by domestic and foreign airlines. This large-scale re-equipment program, which got under way with the first jet delivery in September 1958, has already begun to accrue benefits: for the airlines—in the form of increased revenues as a result of increased lift capacity; for the U. S. military services—in increased lift capacity available to the Civil Reserve Air Fleet.

A large part of Aviation Facts and Figures is not a work of original research. It represents a compilation of facts gleaned from hundreds of sources in the world of aviation during the past year, which have been considered of importance or interest.

It is hoped that this edition, as those in the past, may serve as a standard aviation 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
May 1959

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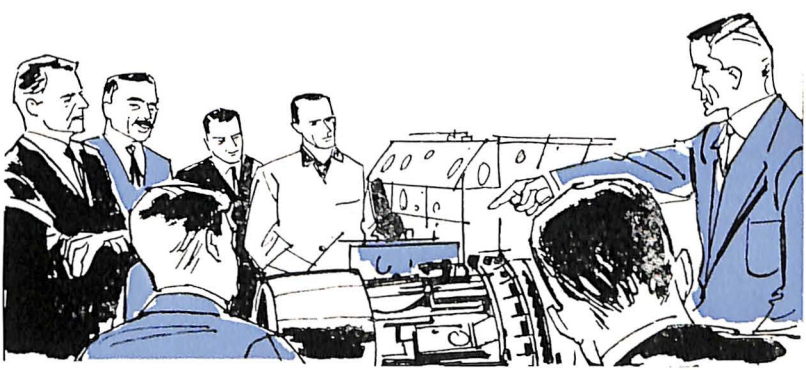
Production and Facilities

I

The year 1958 was a significant milestone in the aircraft and missile manufacturing industry's record of achievement in military and civil aviation. Hardware was delivered that placed five satellites in orbit and the first American turbine-powered transports were delivered to the airlines.

In addition, the industry accelerated its efforts on ballistic missiles and ballistic missile defense. A complete family of other missiles was rounded out for both offense and defense. The performance capabilities of manned aircraft continued to increase. Production began on the first supersonic bombers and supersonic fighters and interceptors were put in the military inventories. Development of an interceptor, and a bomber which will fly at three times the speed of sound, are high priority projects for the aircraft industry.

Although achievements were made in every aspect of aerospace technology by the aircraft industry in 1958, the industry was still faced with economic limitations and will continue to be faced with them in 1959. Raising the national debt ceiling and lifting the defense expenditure ceiling of fiscal 1958 resulted in increased orders for aircraft, missiles and related equipment but expenditures for these weapon systems remained about the same in 1958 as in 1957.



Production of military aircraft continued to drop. An estimated 4,000 units were produced in 1958 compared to 5,600 in 1957. Military orders for aircraft have dropped from 2,145 units in fiscal 1958, to 1,754 in fiscal 1959, to an estimated 1,610 in fiscal 1960. Sales of the manufacturers of military aircraft and parts dropped slightly from $5.6 billion in 1957 to $5.3 billion in 1958. Estimated military piston, turbine and ramjet engine production dropped sharply in 1958 to 8,500 units from 10,700 units in 1957. Sales of engines and parts to military customers were $1.9 billion in 1958 compared to $2.1 billion in 1957. There are no complete statistics available on rocket engine production or sales.

U. S. Aircraft Production
1909 to Date
(Number of aircraft)

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

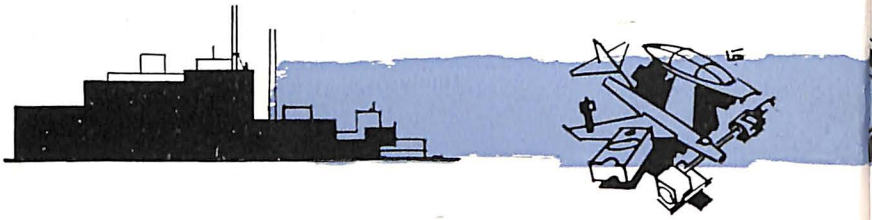
(Continued on next page)

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

Year	TOTAL	Military	Civil
1934	1,615	437	1,178
1935	1,710	459	1,251
1936	3,010	1,141	1,869
1937	3,773	949	2,824
1938	3,623	1,800	1,823
1939	5,856	2,195	3,661
1940	12,813	6,028	6,785
1941	26,289	19,445	6,844
1942	47,675	47,675	—
1943	85,433	85,433	—
1944	95,272	95,272	—
1945	48,912	46,865	2,047
1946	36,418	1,417	35,001
1947	17,739	2,122	15,617
1948	9,838	2,536	7,302
1949	6,137	2,592	3,545
1950	6,293	2,773	3,520
1951	7,923	5,446	2,477
1952	12,811	9,302	3,509
1953	14,760	10,626	4,134
1954	12,129	8,740	3,389
1955	12,852	8,032	4,820
1956	13,319	6,114	7,205
1957	12,346	5,619	6,745
1958	10,860[E]	4,000[E]	6,860

N.A.—Not available.
E Estimate.
Sources: 1, 2, 3, 13, 20

Although the number of civilian aircraft produced increased to 6,860 in 1958 from 6,745 in 1957, commercial sales of aircraft and aircraft engines declined for this period. This was due to a decrease in commercial transport deliveries in the transition from piston-powered transport to turbine-powered transport production. Utility and executive production and sales increased. During 1958, a total of 216 transports were delivered to the airlines compared to 323 in 1957. The backlog of transports on December 31 totaled 595 units, of which only seven were piston-



VALUE OF AIRCRAFT AND PARTS PRODUCED[a]
1914 TO DATE
(Thousands of Dollars)

Year	TOTAL VALUE[b]	Part of Total Which is Added by Manufacture
1914	$ 790	$ 656
1919	14,373	7,246
1921	6,642	4,235
1923	12,945	9,116
1925	12,525	9,655
1927	21,162	13,645
1929	71,153	43,785
1931	40,278	27,177
1933	26,460	18,503
1935	45,347	30,986
1937	149,700	93,144
1939	279,497	183,247
1940 Jul-Dec	370,000	N.A.
1941	1,804,000	N.A.
1942	5,817,000	N.A.
1943	12,514,000	N.A.
1944	16,047,000	N.A.
1945 Jan-Aug	8,279,000	N.A.
1947	1,200,000[E]	954,575
1948 Apr-Dec	1,158,000	N.A.
1949	1,781,000	1,344,068
1950	2,274,000	1,550,551
1951	3,456,000	2,662,993
1952	6,497,000	4,450,602
1953	8,511,000	5,764,300
1954	8,305,000	6,287,620
1955	8,470,000	5,959,573
1956	9,496,000	6,715,810
1957	11,765,000	8,200,000[E]
1958	11,470,000	7,937,000[E]

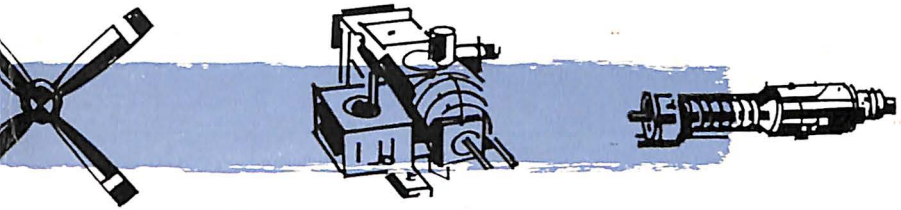
[a] The figures shown beginning with 1947 include other products and services such as missiles, conversions, modifications, and all other products and services produced and performed by manufacturers of complete aircraft, aircraft engines, and propellers.

[b] 1914-1939: Value of Products
1940-1945: Value of Production at August 1943 Unit Cost.
1947-Date: Sales of Manufacturers of Complete Aircraft, Engines, Propellers, and Parts.

E Estimate.

N.A.—Not available.

Sources: 3, 11, 15



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

[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: 15

powered. During the first two months of 1959, turbine transport deliveries totaled 35 compared to 44 during 1958. Production rates of these transports are expected to continue their increase.

Value of net sales reported by manufacturers of complete aircraft, aircraft engines and propellers declined to $11.5 billion in 1958 from $11.8 billion in 1957. However, these sales figures do not record the total impact of defense expenditures. Sales of companies which do not make a complete airplane, engine or propeller are not included.

The value of backlog of orders reported by manufacturers of complete aircraft, aircraft engines, and aircraft propellers as of December 31, 1958, amounted to $13.1 billion. This represents a decrease of 10 per cent below the backlog of orders at the end of the previous year, which amounted to $14.5 billion. The value of backlog reported by these manu-

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	13,062	8,110	2,018	69	2,865

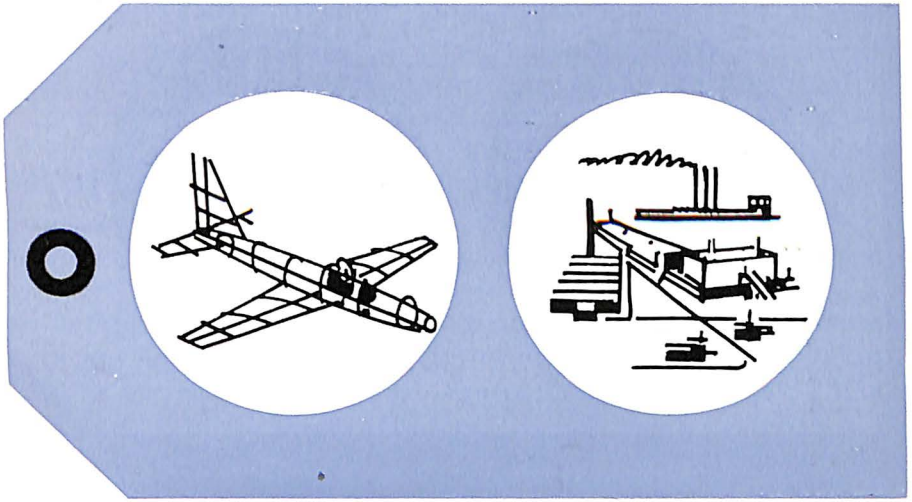
[a] "Other Products and Services" includes missiles, conversions, modifications, and all other products and services not covered under the first three categories as long as they were produced or performed by manufacturers of complete aircraft, aircraft engines, or propellers.

Source: 15

facturers has declined over $5 billion from December 31, 1956, to December 31, 1958.

The types of products being built, methods of building them and the types of facilities required for their development and production were altered by a rate of technological progress to a greater degree in 1958 than in other years. Aircraft and missile manufacturers made radical changes in their organizations in order to cover the broad scope of aircraft, missiles, spacecraft; their powerplants, guidance and related equipments. Industry's capabilities were expanded by product diversification.

The industry with its expanded responsibilities of aircraft, missiles, and spacecraft has been faced with a new requirement for facilities. Facilities, not only for production of the end item, but the intricate research, development and test work which must precede its acceptance are required. At one time, the Government supported to a large extent a facilities expansion and construction program. The Government is still financing facilities construction, but there is an increasing demand that privately-built facilities be utilized. Advancing technology has dictated



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[E]	90.0[E]	16.2
1957	100.4[E]	79.0[E]	21.4
1958	76.5[E]	60.0[E]	16.5

[E] Estimate.
Sources: 1, 13, 20

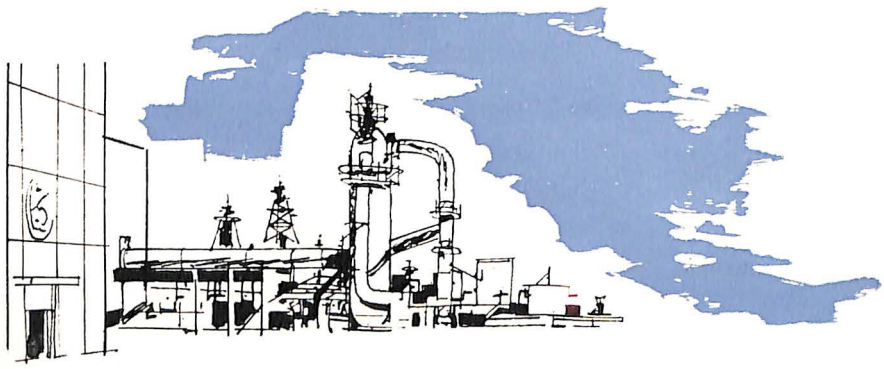
large-scale building programs because existing facilities are not adequate for research, development and production of the new weapons.

Industry finds itself in the paradoxical position of having to finance this new construction at a time when a number of plants designed for earlier weapons are being retired, because it is usually less expensive to build a new facility than to attempt to modify an existing one. A recent report showed that the 12 major aircraft and missile companies reinvested 61 per cent of their earnings in one year in facilities expansion and research and development work compared to 43 per cent of earnings reinvested by other manufacturers. During this same year earnings as a percentage of sales for these 12 major aircraft and missile companies were 2.0 compared to an all manufacturing industry average of 5.2.

MATERIALS CONSUMED IN MAKING AIRCRAFT ENGINES, 1958
Per Cent Distribution of Weight of Materials, by Type

Materials	Reciprocating	Jet
Carbon Steel	5.0	26.0
Alloy Steel	58.0	61.0
Aluminum	30.0	7.0
Magnesium	5.0	1.5
Copper and Copper Base Alloys	2.0	—
Titanium	—	3.0
Miscellaneous Metals	—	1.5

NOTE: These weights represent the quantities of sheet, rod, strip, plate, and related mill shapes and forms required to make all of the piece parts in one engine. Thus, the figures include, in addition to the total piece part weights, the scrap, drop-off, etc. Thus basis of recording material weights is unlike that used in "Consumption of Selected Materials by the Aircraft and Parts Industry" published in earlier editions of this book.
Source: 1



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		—
		Reciprocating	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	22,999[E]	3,000[E]	8,500[E]	11,499
1957	21,559[E]	2,500[E]	8,200[E]	10,859
1958	18,733[E]	1,500[E]	7,000[E]	10,233

N.A. Not available.
[E] Estimate.
Sources: 1, 3, 13, 20

SHIPMENTS OF CIVILIAN ENGINES
1953 to Date

Company and Engine Designation[a]	1953	1954	1955	1956	1957	1958
Total	6,215	5,360	7,466	11,290	10,844	10,251
Allison Division General Motors						
282	—	—	—	—	—	242
Continental						
205	89	147	163	87	145	77
246	345	78	41	22	24	15
252	367	210	279	629	879	829
253	715	561	811	1,736	811	1,734
267	85	423	500	433	31	36
273	760	990	1,712	2,524	2,733	2,181
Other	21	17	12	20	24	23
General Electric						
308	—	—	—	—	—	18
Lycoming						
223	141	2	6	7	8	2
295	—	—	—	—	123	561
228	370	217	143	443	315	167
229	1,869	969	127	132	44	95
274	94	618	2,309	3,011	2,631	2,023
275	—	213	591	909	842	419
286	—	—	—	2	250	768
Pratt & Whitney Division						
230	52	44	26	21	5	6
231, 264	847	350	157	316	456	315
290	—	—	—	—	35	232
291	—	—	—	—	3	23
Other	2	—	—	—	—	—
Wright Aeronautical						
243	—	2	1	—	68	51
259	1	1	5	23	157	129
272	455	516	483	315	323	22
287	—	—	32	576	910	283
Other	2	—	—	—	—	—

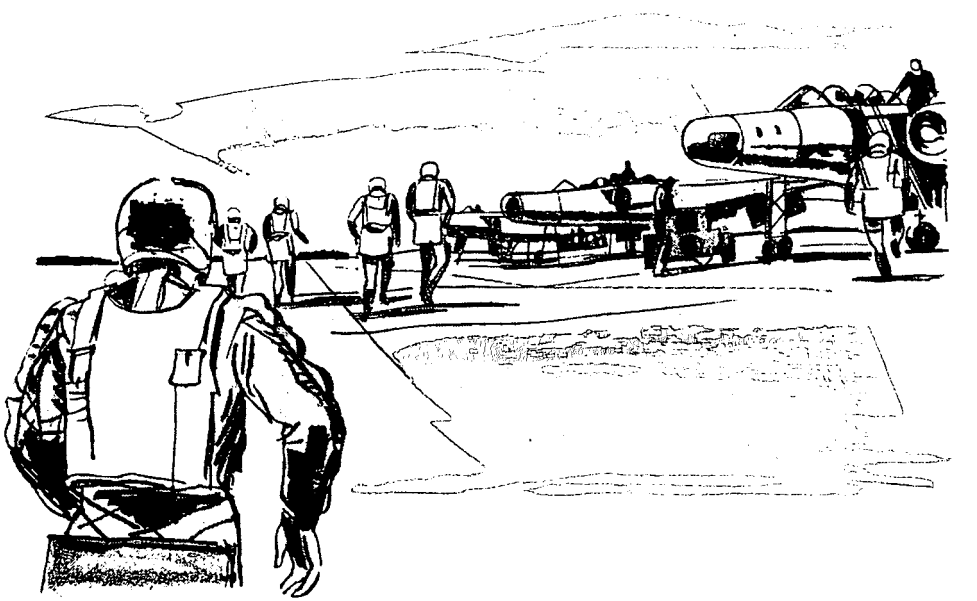
[a]Type Certificate number
Source: 1

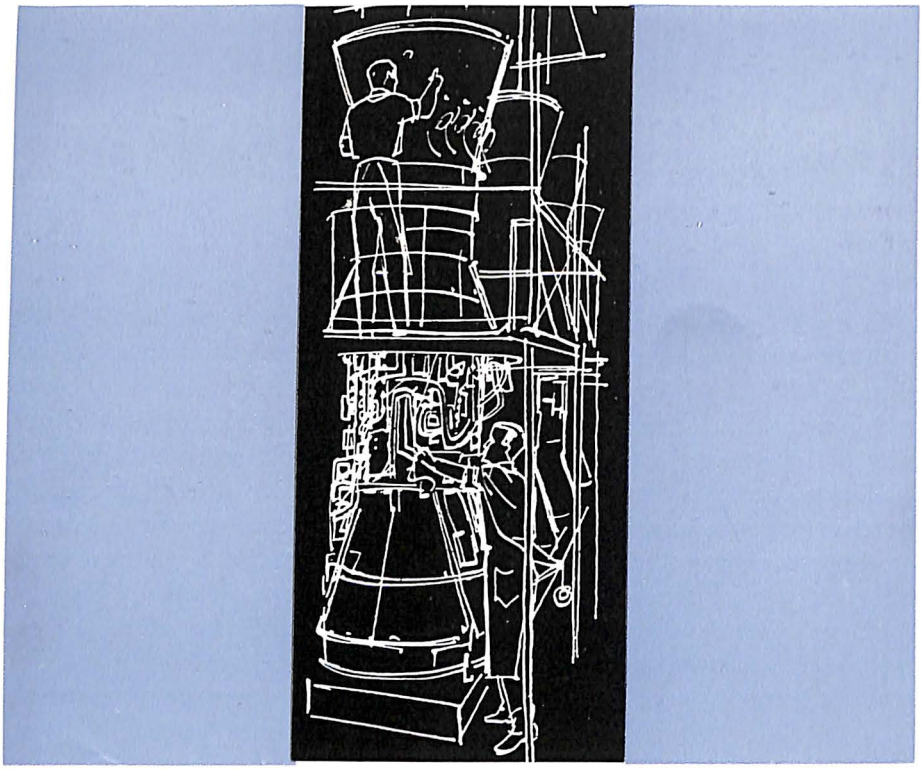
Military Aviation

2

In the judgment of our principal military leaders the manned bomber is still the primary means of delivering the large nuclear weapons in the volume and with the accuracy needed to strike a decisive retaliatory blow. In this respect the United States has a force far superior to that of our principal opponent, both in numbers and in overall combat capability. The United States intends to maintain this superiority during the period ahead as evidenced by the 1960 budget, which includes substantial funds for the procurement of additional intercontinental jet bombers, supersonic medium jet bombers, and the supporting jet tankers.

Also included in the budget are additional funds for air-to-ground "stand-off" missiles which will greatly enhance the capability of our strategic bombers to penetrate enemy defenses. The program to improve the protection and shorten the reaction time of our manned bombers through base dispersal and the construction of alert facilities is now well





FLOOR SPACE OF AIRFRAME, ENGINE AND PROPELLER 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

Sources: 1, 3, 20

COMPOSITION OF MILITARY AIR FORCES

The 1960 budget for the military functions of the Department of Defense provides for military air forces of about the same composition and level planned for the end of the fiscal year 1959.

	Actual	Planned	
	June 30, 1958	June 30, 1959	June 30, 1960
Department of the Army:			
Field artillery missile groups (heavy)	2	3	3
Army missile commands	4	4	4
Guided Missile battalions	65	71	73
Helicopters	2,193	2,467	2,558
Fixed-wing	2,834	2,822	2,805
Active aircraft inventory	5,027	5,289	5,363
Department of the Navy:			
Carrier air groups	17	16	16
Carrier antisubmarine squadrons	22	22	22
Patrol and warning squadrons	39	39	42
Marine air wings	3	3	3
Active aircraft inventory	10,533	9,300	9,200
Jet aircraft as per cent of active aircraft inventory	42	44	47
Department of the Air Force:			
USAF combat wings (including missile wings) TOTAL	117	105	102
Strategic	44	43	43
Air defense	28	27	25
Tactical (including airlift)	45	35	34
USAF combat support forces			
Air refueling squadrons	48	59	63
MATS squadrons	27	27	24
Other specialized squadrons	62	59	59
Active aircraft inventory	22,578	20,358	19,982
Jet aircraft as per cent of active aircraft inventory	62	65	65

Source: 26

advanced with funds appropriated in prior years. Additional funds are included in the 1960 budget to carry on this program as well as for the new ballistic missile early warning system which was started last year. Even if no strategic warning were to be received, this new system is designed to provide that vital period of time needed to get a significant proportion of our bombers into the air and on their way to the targets. These are some of the reasons why our military leaders feel that regard-

less of who might strike the first blow, and regardless of the number of ICBM's an enemy might use against us, this nation will continue to have a retaliatory force sufficient to strike a decisive blow.

Also, naval carrier task forces with their aircraft are capable of delivering nuclear weapons over considerable distances. There are also nuclear capable United States tactical air force and missile units deployed at forward bases in various parts of the world. All of these contribute to our diversified deterrent and retaliatory strength.

During the last three years, there have been rapid changes in the product-mix of aeronautical procurement. These changes will continue into fiscal year 1960. The percentage of the procurement dollar devoted to aircraft will continue to decline in 1960, while the percentage going to missiles continues to increase. Whereas aircraft took 59½¢ of every procurement dollar spent in fiscal year 1957, they will take only 45¢ in fiscal year 1960. Conversely, missiles took a little over 15¢ of the procurement dollar in 1957 and will take about 27¢ in 1960. The proportion of the procurement dollar going for ships will increase from about 6½¢ in 1957 to over 11¢ in 1960, and electronics and communications equipment will go up from 6½¢ to over 7¢. The proportion of the procurement dollar going for ammunition and for production equipment and facilities will continue to decline.

In addition to our retaliatory strength, we must have defenses capable of minimizing the damage to the North American continent in the event

the Soviets should choose to launch a surprise air attack. We have joined with the Canadians in the establishment of the North American Air Defense Command, thus achieving integrated operational control of both United States and Canadian forces for the defense of this continent. Great improvements have been made in air warning capabilities and we are pushing hard toward obtaining missiles capable of bringing down enemy bombers or missiles. But, we cannot discard weapons systems of known reliability until the new systems have been proved out. The problem, therefore, involves reconciling military air readiness today with preparing for the readiness of tomorrow. Until we know more, we need to be extremely cautious before we can claim that control of space necessarily means control of the atmosphere, sea, and ground. During

PRODUCTION OF MILITARY AIRCRAFT, BY TYPE
1940 TO DATE
(Number of Aircraft)

Year	Total	Bombers	Fighters	Transports	Trainers	Other[a]
1940	6,028	1,194	1,689	290	2,731	124
1941	19,445	4,119	4,421	532	9,376	997
1942	47,675	12,634	10,780	1,985	17,632	4,644
1943	85,433	29,362	24,005	7,013	19,942	5,111
1944	95,272	35,008	38,895	9,834	7,578	3,957
1945	46,865	16,502	21,578	4,613	1,309	2,863
1946	1,417	132	1,017	93	—	175
1947	2,122	317	909	98	3	795
1948	2,536	563	1,438	61	73	401
1949	2,592	656	1,316	68	87	465
1950	2,773	560	1,502	176	351	184
1951	5,446	510	2,073	271	612	1,980
1952	9,302	1,226	3,739	512	1,425	2,400
1953	10,626	1,243	4,665	784	1,961	1,973
1954	8,740	1,807	3,518	642	1,602	1,171
1955	8,032	1,378	4,021	534	1,438	661
1956	6,114	N.A.	N.A.	N.A.	N.A.	N.A.
1957	5,619	N.A.	N.A.	N.A.	N.A.	N.A.
1958[E]	4,000	N.A.	N.A.	N.A.	N.A.	N.A.

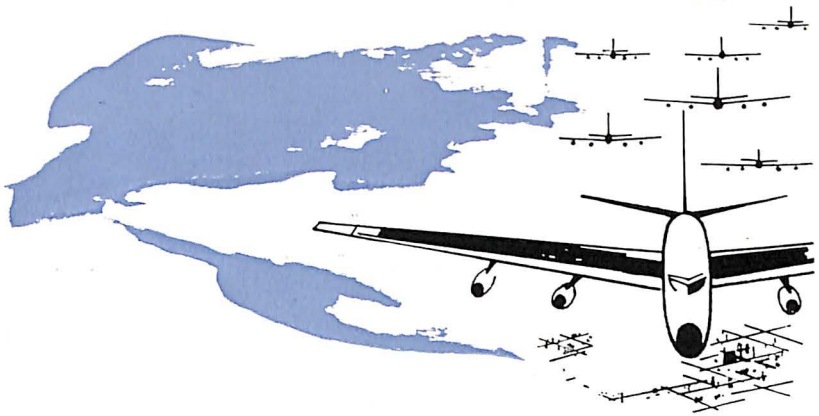
NOTE: Data exclude gliders and targets for entire period and experimental aircraft subsequent to 1949.
[E] Estimate.
[a] "Other" includes helicopter, liaison, observation, utility, search and rescue and basic reconnaissance types; however, reconnaissance versions of bombers and fighters are included with bombers and fighters.
Source: 20

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[E]	90.0	N.A.	N.A.	N.A.	N.A.	N.A.
1957[E]	79.0	N.A.	N.A.	N.A.	N.A.	N.A.
1958[E]	60.0	N.A.	N.A.	N.A.	N.A.	N.A.

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: 20

World War II, in the days of the massive bombing raids, if the defender could levy an attrition rate in the neighborhood of 10 per cent on the attacking bomber force, plans for continuing such attacks became unprofitable. The advent of the nuclear, and later the thermonuclear, bomb has changed all this radically. The tremendous yields of these bombs and warheads, and the damage which they are capable of inflicting, means that attrition philosophies of days past are no longer good enough. It means that this nation must have the military capability to destroy attacking bombers with certainty and at great distances from their objectives.



AVIATION ASPECTS OF DEFENSE SPENDING

Expenditures for aircraft in 1960 are estimated at $6.6 billion, compared to $7.1 billion in 1959; while missiles expenditures will increase to $3.9 billion in 1960, compared to $3.4 billion in 1959. From the standpoint of new obligational availability, new money for aircraft procurement remains practically unchanged between 1959 and 1960; while missile money in this category drops from $4.3 billion in 1959 to $4.0 billion in 1960. In research, development, test and evaluation—a new category which includes some funds previously contained in the pro-

ACTIVE AIRCRAFT INVENTORY[a]
Selected Years, 1940 to Date

Year[b]	TOTAL ACTIVE INVENTORY	Air Force		Navy		Army
		Active Inventory	Operating	Active Inventory	Operating	Active Inventory
1940	N.A.	3,961	N.A.	2,166	N.A.	N.A.
1944	N.A.	72,726	N.A.	36,100	N.A.	N.A.
1950	N.A.	17,337	N.A.	13,412	N.A.	N.A.
1955	40,054	23,694	21,398	12,821	9,761	3,539
1956	42,650	26,760	21,564	12,317	9,687	3,573
1957	42,033	25,969	20,902	11,617	9,421	4,447
1958	38,138	22,578	18,949	10,533	8,424	5,027
1959[E]	34,947	20,358	18,850	9,300	7,595	5,289
1960[E]	34,545	19,982	18,499	9,200	7,200	5,363

[a] Includes helicopters.
[b] 1940-1950: December 31; since then June 30.
Sources: 3, 26

MILITARY AIRCRAFT IN DEVELOPMENT OR PRODUCTION
(FIXED WING)

Designation	Name	Type	Service	Manufacturer
RL-26D	----	Liaison	Army	Aero Design
L-23D	Seminole	Command	Army	Beech
T-34A	Mentor	Trainer	Navy, USAF	Beech
B-52F, G	Stratofortress	Bomber	USAF	Boeing
KC-135A	Stratotanker	Tanker	USAF	Boeing
T-37A	----	Trainer	USAF	Cessna
L-19E	Bird Dog	Observation	Army	Cessna
L-27A		Adm/Cargo	USAF	Cessna
F8U-IP, 2N	Crusader	Fighter	Navy	Chance Vought
F-102	Delta Dagger	Fighter	USAF	Convair
F-106A, B	Delta Dart	Fighter	USAF	Convair
B-58A	Hustler	Bomber	USAF	Convair
F4D	Skyray	Fighter	Navy	Douglas
A3D, -2P, -2Q, -2T	Skywarrior	Attack	Navy	Douglas
A4D - 2N	Skyhawk	Attack	Navy	Douglas
B-66B	Destroyer	Bomber	USAF	Douglas
RB-66B, C				
WB-66D				
C-133A	----	Cargo	USAF	Douglas
C-123B	Provider	Cargo	USAF	Fairchild
A2F	----	Attack	Navy	Grumman
F9F-8, -8P	Cougar	Fighter	Navy	Grumman
F11F-1	Tiger	Fighter	Navy	Grumman
S2F-1	Tracker	Anti-submarine	Navy	Grumman
TF-1	Trader	Cargo/utility	Navy	Grumman
W2F	----	Patrol	Navy	Grumman
WF-2	Tracer	Patrol	Navy	Grumman
WV-2	Super Constellation	Anti-submarine	Navy	Lockheed
GV-1	----	Tanker	Navy	Lockheed
F-104C, D	Starfighter	Fighter	USAF	Lockheed
C130A, B	Hercules	Cargo	USAF	Lockheed
RC-130A	----	Recon	USAF	Lockheed
T-33A	Shooting Star	Trainer	USAF	Lockheed
P2V-7	Neptune	Patrol	Navy	Lockheed
P3V	----	Patrol	Navy	Lockheed
T2V-1	----	Trainer	Navy	Lockheed
P6M-2	Sea Master	Minelayer	Navy	Martin
P5M-2	Marlin	Patrol	Navy	Martin
F3H-2N	Demon	Fighter	Navy	McDonnell
F4H-1	----	Fighter	Navy	McDonnell
F101B	Voodoo	Fighter	USAF	McDonnell

(*Continued top of next page*)

MILITARY AIRCRAFT IN DEVELOPMENT OR PRODUCTION—*Continued*
(FIXED WING)

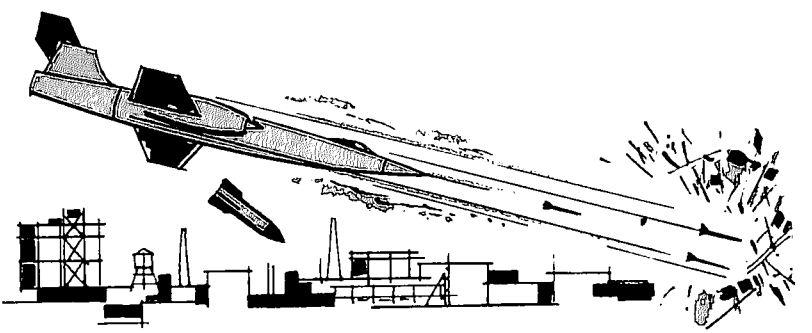
Designation	Name	Type	Service	Manufacturer
RF-101C	Voodoo	Fighter	USAF	McDonnell
A3J-1	Vigilante	Attack	Navy	North American
B-70	—	Bomber	USAF	North American
F-100D, F	Super Sabre	Fighter	USAF	North American
F-108	—	Fighter	USAF	North American
T-39	Saberliner	Trainer	USAF	North American
T2J-1	—	Trainer	Navy	North American
T38A	—	Trainer	USAF	Northrop
F-105B, D, E	Thunderchief	Fighter	USAF	Republic

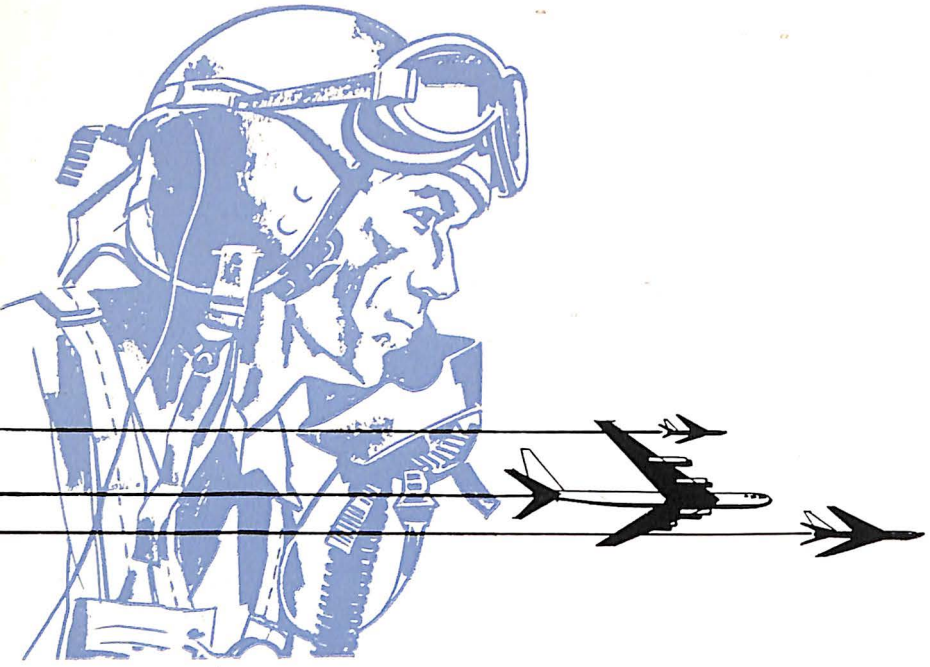
Source: 20

curement category—the estimated obligations for aircraft are expected to change from $950 million in 1959 to $1.2 billion in 1960; while those for missiles are expected to drop from $2.6 billion in 1959 to $2.5 billion in 1960.

By the end of fiscal 1960, the Air Force is scheduled to have 102 wings, compared to 105 at the end of fiscal 1959 and 117 at the end of fiscal 1958. The major reduction during 1960 will be effected in air defense tactical wings. The Navy will operate 16 carrier air groups in 1960, while carrier antisubmarine squadrons and Marine air wings are scheduled to remain at 22 and 3, respectively. Army aviation active aircraft inventory is scheduled to increase slightly from 5,289 to 5,363. At the present time, within the Strategic and Tactical Air Command structures, there is a combined total of 59 air refueling squadrons. By fiscal year end 1960 these two commands will be operating 63 refueling squadrons.

The Military Air Transport Service currently includes 27 squadrons





comprising 9 wings. By fiscal year end 1960, however, MATS will be reduced by three squadrons. There are 59 other specialized squadrons within the Air Force structure comprising communications, air rescue, etc.

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

HELICOPTER INVENTORY
1955 TO DATE

June 30	TOTAL[E]	Army	Navy[a,E]	Air Force[E]
1955	2,268	1,188	650	430
1956	2,556	1,456	700	400
1957	3,061	1,901	800	360
1958	3,423	2,193	900	330
1959	3,567	2,267	1,000	300

[a] Includes Marine Corps.
[E] Estimate.
Source: 20

PERSONNEL IN THE UNITED STATES AIR FORCE, 1912 TO DATE

As of June 30	TOTAL	Officers	Aviation 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[c]	764,609
1957	919,835	140,563	2,706[d]	776,566
1958	871,156	132,939	2,485[e]	735,759

N.A.—Not available.
[a] As of November 1.
[b] As of November 11.
[c] This category includes a total of 263 Air Force Cadets not shown in previous years.
[d] This category includes 504 Air Force Academy Cadets.
[e] This category includes 1,169 Air Force Cadets.
Sources: 3, 6

NAVAL AVIATION PERSONNEL[a], 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[b]	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[d]	165,243[c]	21,352	133,424	4,885
1956[e]	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

[a] Navy and Marine.
[b] Pilots as of Aug. 31; others as of October 31.
[c] Includes non-pilots in flying status and formerly designated pilots.
[d] As of January 1.
[e] As of November 30, 1956.
Sources: 3, 45

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; 2 attack squadrons; 1 heavy attack squadron or detachment; 4 photo planes; and 4 aircraft early warning (AEW) planes. Super aircraft carriers of the Forrestal Class (60,000 tons) have up to 80 or 120 aircraft. Large Midway Class (55,000 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 light and escort carriers average about 22 aircraft, and shore-based patrol squadrons have a complement of 12 planes each. Marine fighter squadrons are assigned 24 aircraft.

Army: An Army detachment currently has 26 to 28 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 21 helicopters. A fixed-wing group has 21 basic 1½ ton, 11-passenger aircraft and is assigned to field Army level.

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	19,956	13,346	66.9
1954	10,432	4,470	42.8
1955	7,149	4,403	61.6
1956	9,653	6,241	64.7
1957	11,737	6,303	53.7
1958	11,399	5,726	50.2
1959[E]	15,325	6,345	41.4
1960[E]	14,398	6,353	44.1

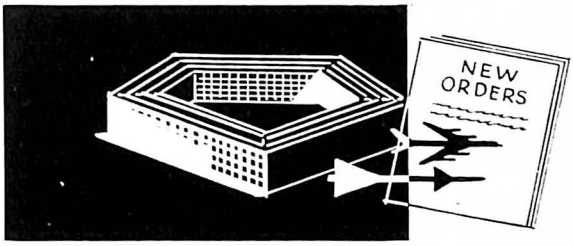
[E] Estimate.
Source: 23

Total Federal Expenditures and Expenditures for Military Aircraft and Guided Missiles 1922 to Date

(Dollar Figures in Millions)

Fiscal Year	Total Federal Expenditures	Total Military Expenditures[a]	Expenditures for Aircraft and Missiles[b]	Percent Aircraft and Missiles of Total Federal	Percent Aircraft and Missiles of Military
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
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	51,830	7,712[c]	10.4	14.9
1954	67,772	47,872	8,839[c]	17.6	18.5
1955	64,570	42,089	8,755[c]	13.6	20.8
1956	66,540	41,825	8,314[c]	12.5	19.9
1957	69,433	44,414	10,073[c]	14.5	22.7
1958	72,936	44,142	10,089[c]	15.4	25.1
1959[E]	80,871	46,120	10,295[c]	12.7	22.3
1960[E]	77,030	45,805	10,090[c]	13.1	22.0

[E] Estimate.
[a] Includes stockpiling Mutual Defense, and Atomic Energy.
[b] Includes related items.
[c] Procurement and Production, military functions only.
Sources: 3, 17, 21, 26



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	13,346	10,202	3,119	25
1954	4,470	3,080	1,276	114
1955	4,403	2,480	1,923	..
1956	6,241	5,480	761	..
1957	6,303	4,821	1,483	..
1958	5,726	4,190	1,536	..
1959[E]	6,345	4,535	1,680	130
1960[E]	6,353	4,558	1,725	70

[E] Estimate.
Source: 23

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1959
TOTAL AND AIRCRAFT
(Millions of Dollars)

	Total Procurement and Production	Aircraft	Aircraft As Percent of Total
Defense Department	$13,499	6,519	48.3
Air Force	7,261	4,097	56.4
Navy	4,702	2,291	48.7
Army	1,531	132	8.6
Office of Secretary of Defense	8	—	—

Source: 22

Appropriations and Expenditures for Military Aviation 1899 to Date

(Millions of Dollars)

Fiscal Year	U. S. Air Force		Naval Aviation*	
	Total Cash Appropriations	Expenditures	Total Cash Appropriations	Expenditures
1899	$ .05	N.A.	$ —	N.A.
1909	.03	N.A.	—	N.A.
1912	.12	N.A.	.03	N.A.
1913	.10	N.A.	.01	N.A.
1914	.17	N.A.	.01	N.A.
1915	.20	N.A.	.01	N.A.
1916	.80	N.A.	1.0	N.A.
1917	18.7	N.A.	3.8	N.A.
1918	735.0	N.A.	61.5	N.A.
1919	952.3	N.A.	220.4	N.A.
1920	28.1	N.A.	25.7	N.A.
1921	35.1	$ 30.9	20.0	N.A.
1922	25.6	23.1	19.1	$ 14.3
1923	13.1	18.1	14.8	14.2
1924	12.6	11.0	14.7	14.3
1925	13.5	11.7	15.7	15.5
1926	15.9	14.9	18.2	18.1
1927	15.3	16.8	22.4	22.0
1928	21.1	19.4	20.3	19.8
1929	28.9	23.3	32.3	32.1
1930	34.9	28.1	31.6	31.1
1931	38.9	38.7	32.1	31.0
1932	31.9	33.0	31.2	31.7
1933	25.7	22.1	25.4	31.2
1934	31.0	17.6	29.8	15.5
1935	27.9	20.5	32 1	17.2
1936	45.6	32.2	40.8	20.5
1937	59.6	41.3	38.9	27.5
1938	58.9	51.1	51.6	59.8
1939	71.1	83.4	48.2	47.9
1940	186.6	108.5	111.8	50.8
1941	2,173.6	605.9	453.0	193.6
1942	23,049.9	2,555.2	6,190.0	993.1
1943	11,317.4	9,392.4	5,258.0	3,966.4

(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[E]	18,717.0	18,993.0	2,878.0	3,121.0
1960[E]	18,682.0	18,675.0	1,950.3	2,236.5

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" only.
[b]FY 1949 Construction of Aircraft & Related Procurement appropriation enacted in FY 1948.
Sources: 3, 26

DEPARTMENT OF DEFENSE
UNEXPENDED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1959
TOTAL AND AIRCRAFT
(Million Dollars)

	Total Procurement and Production	Aircraft	Aircraft As Percent of Total
Defense Department	$28,921	$13,382	46.3
Air Force	15,660	9,020	57.6
Navy	10,554	4,220	40.0
Army	2,700	142	5.3
Office of Secretary of Defense	7	—	—

Source: 22

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

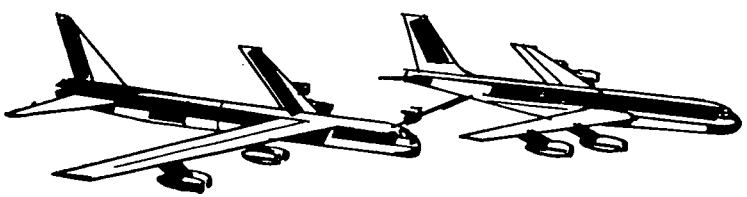
Year Ending June 30	Total Procurement and Production	Aircraft	Aircraft as Percent of Total
1951	$ 3,976	$2,412	60.7
1952	11,478	4,888	42.2
1953	17,123	7,417	43.3
1954	15,958	8,335	52.2
1955	12,997	8,037	61.8
1956	12,182	7,146	58.6
1957	13,649	7,978	59.5
1958	14,677	8,448	57.6
1959[E]	14,234	7,117	50.0
1960[E]	14,596	6,589	45.1

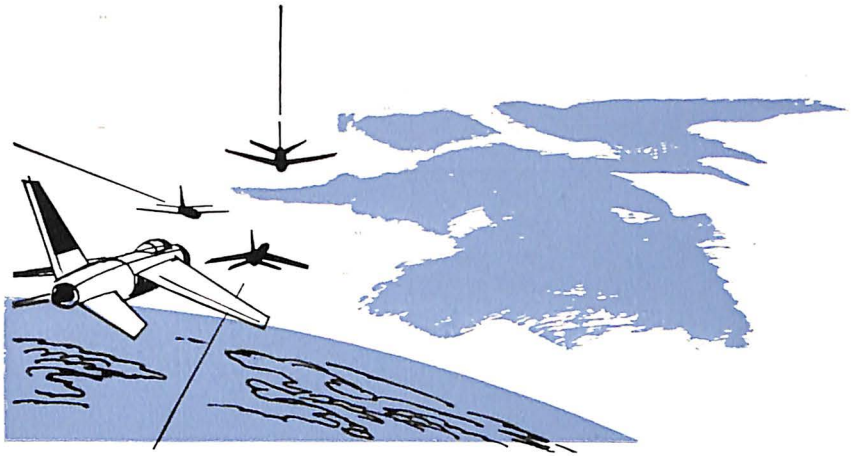
Source: 21

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	7,417	5,586	1,735	95
1954	8,335	6,254	1,998	83
1955	8,037	6,295	1,676	67
1956	7,146	5,181	1,831	134
1957	7,978	5,817	1,996	166
1958	8,448	6,084	2,207	157
1959[E]	7,117	5,030	1,972	115
1960[E]	6,589	4,669	1,778	143

[E] Estimate.
Source: 21





USAF Aircraft Engine Inventory

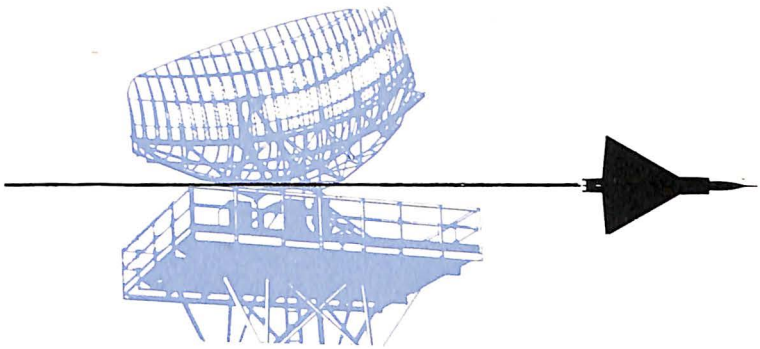
Engine Type & Model	January 1957	January 1958	January 1959
J-33	7,537	7,064	5,834
J-35	6,898	5,096	3,237
J-47	29,174	26,974	24,098
J-48	824	712	297
J-57	6,182	10,260	13,450
J-65	5,955	4,257	3,856
J-69	—	682	917
J-71	741	889	883
J-73	818	817	730
J-75	—	49	236
J-79	—	212	514
R-985	3,604	3,082	2,483
R-1300	2,286	2,319	2,002
R-1340	1,823	1,051	659
R-1820	2,241	1,667	1,220
R-1830	5,885	5,419	5,044
R-2000	3,587	3,370	2,933
R-2600	3,265	3,206	2,275
R-2800	8,427	6,842	5,092
R-3350	7,555	4,365	3,785
R-4360	15,911	14,644	13,497
T-34	—	192	309
T-56	—	1,238	1,553
Others	6,233	3,846	3,853
Total	118,946	108,253	98,739

Note: Inventory includes all engines, inactive and active, in use and awaiting repair and ready for installation.
Source: 5

U. S. Navy Aircraft Engine Inventory

Engine Type and Model	January 1957	January 1958	January 1959
J-33	1,960	1,926	1,689
J-34	3,666	3,353	2,764
J-44	—	101	313
J-48	2,678	2,781	2,783
J-57	883	1,601	1,831
J-65	1,621	2,339	2,410
J-69-2	—	14	22
J-71	218	486	623
T-58-GE-2	—	12	10
O-335	227	240	208
O-435	266	153	59
O-470	548	787	763
R-760-8	96	98	96
R-975-46	454	410	399
R-985-AN	2080	1,261	916
R-985-14B	1,901	1,973	2,063
R-1300	425	423	435
R-1340	3,191	2,862	210
R-1820	3,694	4,400	4,193
R-1830	3,180	1,970	745
R-2000	1,173	1,120	1,085
R-2800	7,884	4,857	1,354
R-3350	7,202	7,195	6,856
R-4360	491	324	237
Total	43,838	40,686	32,064

Note: Inventory includes all engines, inactive and active, in use and awaiting repair and ready for installation with the exception of two engine models for which inventory data is classified.
Source: 45



U. S. Army Aircraft Engine Inventory

Engine Type and Model	January 1958	January 1959
H-RJ2B	6	4
O-335-3	1	4
O-335-4	83	57
O-335-5	692	1,175
O-335-6	504	750
O-360-C2B	—	2
O-435-17	241	305
O-435-23	147	461
O-470-7	34	—
O-470-11	2,003	2,557
O-470-15	121	408
O-480-A, B, C, G	38	54
O-480-1	170	391
O-526-A	—	13
O-580-A1A	4	3
P-ALOUSE	—	5
R-1300-3	232	229
R-1340-AN	82	230
R-1340-57	88	92
R-1820-84	432	690
R-1820-103	320	510
R-2000-4	—	82
R-2800-54	48	183
R-755	67	115
R-975-46	101	3
R-985	505	691
T-53	—	22
Total	5,919	9,036

Note: Inventory includes all engines, serviceable and unserviceable.
Source: 8

Guided Missiles

3

Slowly but surely, missiles are taking over the functions of more conventional weapons systems. For example, ballistic missiles soon to be operational will be able to destroy enemy targets 1,500 miles away within minutes after the decision is made to attack. This is beyond the capability of any manned aircraft now operational or under development.

From an austere beginning in missilry—less than fifteen years ago—the aerospace industry has made astounding progress. The progress has not come about by accident or through the leisurely efforts of a few people. To the contrary, it has resulted from the concentrated work of the nation's best scientists and engineers of industry, the military, and our great universities.

Today, for example, there are more than one hundred thousand people directly involved in our surface-to-surface missile program. What the number is for all missile programs is not known, but without question it is truly large.

Similarly, the national expenditure for guided missile development and production has risen by corresponding leaps and bounds. The total money obligated on missiles during 1947 was $58 million. The annual obligation had risen to slightly more than $1 billion in 1952. Five years later, the 1957 figure was $4.5 billion. The total for 1958 was about $5.7 billion and in 1959 approximately $7.2 billion was obligated. The estimate for FY 1960 is $6.8 billion, and it is interesting to note that the projected sum for 1960 is more than 100 times as great as it was in 1947.

Through the efforts of the aerospace industry, thus far the using military services have placed *24* operational missile systems of all types in the hands of our armed forces. These include eleven surface-to-surface systems, five surface-to-air systems, five air-to-air systems and three air-to-surface systems. While no intercontinental ballistic missiles are presently operational, it will not be long before they are. Currently there are two operational intermediate range missiles. These are THOR and JUPITER.

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

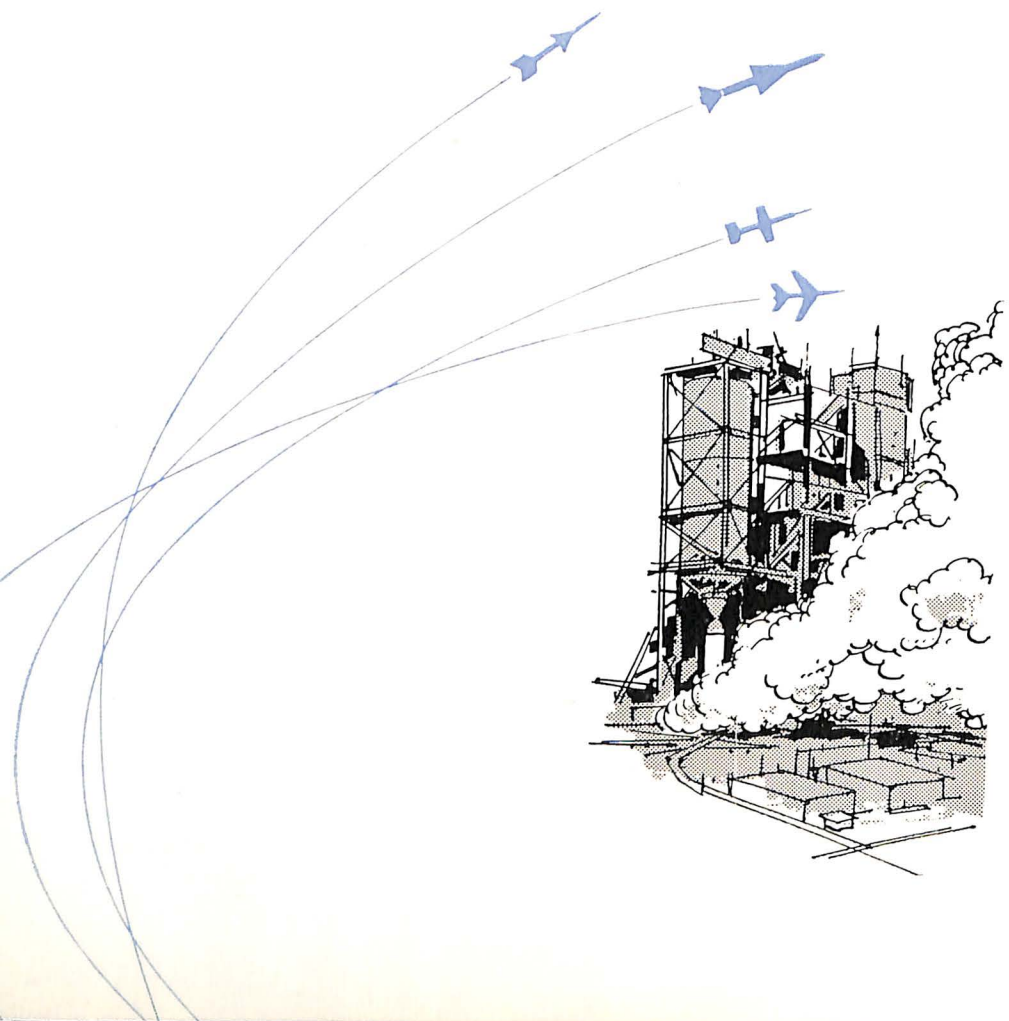
Year Ending June 30	TOTAL DEFENSE DEPARTMENT	Air Force	Navy	Army
1951	$ 424	$ 121	$130	$173
1952	468	95	119	253
1953	896	414	181	301
1954	748	364	159	225
1955	345	219	126	—
1956	938	700	238	—
1957	2,322	1,970	352	—
1958	2,313	1,890	402	20
1959[E]	4,345	2,938	735	672
1960[E]	3,961	2,624	703	634

[E] Estimate.
Source: 23

The average guided missile contains approximately 300,000 parts. Failure of a single part which might cost but a few cents could mean the failure of a multimillion dollar missile system. The missile, once it leaves its launching site, must function perfectly.

As a result, guided missiles have been developed in keeping with the "weapon system" concept. For example, the best guided missile in the world would be utterly useless unless every part of the system to make it work is available, and *does* work. The system includes early-warning networks, search radars, effective communications, ground control, logistics systems and facilities and so on. Thus, these new weapons are not only costly and highly complicated of themselves but their related systems equipment needs are also extremely complicated and costly.

To encompass this great new field, the United States aerospace indus-



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	5,707	2,077	639	2,391
1959[a]	7,212	2,966	726	3,520
1960[b]	6,817	2,376	287	3,494

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: 20

try has had to revolutionize its manufacturing methods. Equipment of the type carried in guided missiles is subjected to fantastic environmental conditions. Accelerations, vibrations, heat, stresses and strains are of an order never encountered by any other device created by man. These environmental conditions required by weapons for the missile age have led the aerospace industry to manufacturing methods, assembly, and testing techniques that are completely new.

The shift in air power emphasis from manned aircraft to missiles is having a profound effect on the aerospace industry and the nation. A typical ballistic missile today costs about $100 per pound, not includ-

ing the warhead. This means, simply stated, that they cannot be stored around the nation like stacks of cordwood against a future need. Hence, mass production of these weapons, as we think of mass production in terms of planes, guns and artillery pieces, is not practical.

One manufacturer designs and builds the propulsion system; another, the guidance system; and a third produces the nose cone. The prime contractor for the airframe builds the airframe itself, then assembles all of the subsystems into the final weapon, integrates their controls, and makes any necessary changes for configuration compatibility. Also, in flight tests he is responsible for quality control and for the actual firing.

Each contractor has his own network of supporting subcontractors. In the aggregate, there are now about 200,000 subcontractors producing various parts and components for these missiles.

The advent of the missile into the U.S. air power arsenal is also having a marked effect on the facilities for test and manufacture as the industry moves further into the missile era. The industry requires, on an increasing scale, newer and more accurate types of machine tools. In addition, and of equal importance, new brick and mortar is required to provide missile development and production facilities in areas where missiles can be tested. In large part, facilities now used by the aerospace

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	19,956	896	4.5
1954	10,432	748	7.2
1955	7,149	345	4.8
1956	9,653	938	9.7
1957	11,737	2,322	19.8
1958	11,399	2,313	20.3
1959[E]	15,325	4,345	28.6
1960[E]	14,398	3,961	27.5

[E] Estimate.
Source: 23

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	295	81	95	119
1954	504	176	141	187
1955	718	305	176	238
1956	1,168	641	195	333
1957	2,095	1,417	264	414
1958	2,737	1,668	345	724
1959[E]	3,360	2,356	417	587
1960[E]	3,922	2,661	566	695

[E] Estimate.
Source: 22

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	17,123	295	1.7
1954	15,958	504	3.2
1955	12,997	718	5.5
1956	12,182	1,168	9.6
1957	13,649	2,095	15.3
1958	14,677	2,737	18.6
1959[E]	14,234	3,360	23.6
1960[E]	14,596	3,922	26.9

[E] Estimate.
Source: 22

industry were built for the production of large aircraft with high tails and broad wings. The manufacture of missiles requires more than simply space. The temperature must be controlled; contamination of the air by dust and other minute particles must be eliminated. Manufacture, for example, of delicate guidance systems requires a precision production technique exceeding that of any other industry. The switch from manned aircraft to missile production is knotty, involving company facility investments, labor responsibilities and many other problems. Needless to say, it is being given concentrated attention by both industry and Government.

DEPARTMENT OF DEFENSE
UNEXPENDED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1959
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	Procurement and Production	Guided Missiles	Missiles as Percent of Total
Defense Department	$28,921	$6,192	21.4
Air Force	15,660	3,922	25.0
Navy	10,554	1,108	10.5
Army	2,700	1,162	43.0
Office of Secretary of Defense	7	—	—

Source: 22

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1959
TOTAL AND GUIDED MISSILES
(Millions of Dollars)

	Total Procurement and Production	Guided Missiles	Missiles as Percent of Total
Defense Department	$13,499	$2,710	20.1
Air Force	7,261	1,706	23.5
Navy	4,702	474	10.1
Army	1,532	530	34.6
Office of Secretary of Defense	5	—	—

Source: 22

U. S. Missiles

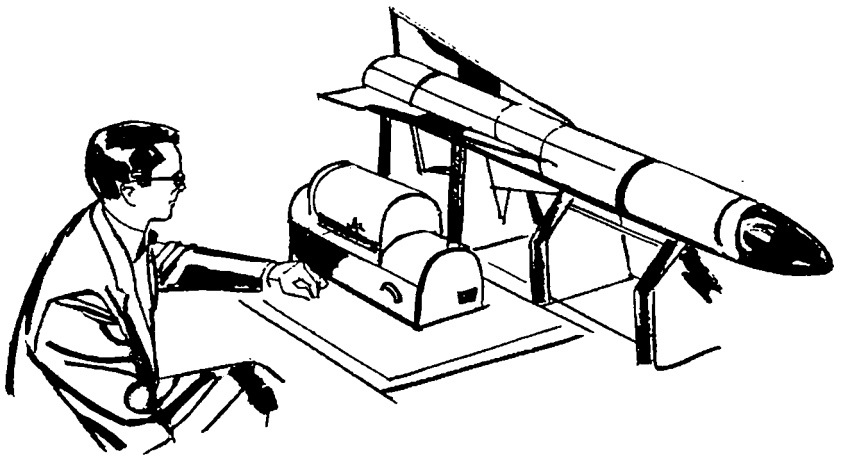
	Service	Prime	Airframe	Powerplant	Guidance
			Air-to-Air		
Eagle	Navy	Bendix	Grumman	—	Bendix
Falcon	USAF	Hughes	Hughes	Thiokol	Hughes
Genie	USAF	Douglas	Douglas	Aerojet/ Thiokol	
Sidewinder	Navy	Philco/ General Electric			Philco/General Electric
Sparrow III	Navy	Raytheon	Raytheon	Aerojet	Raytheon Kearfoot
			Air-to-Surface		
Bullpup	Navy	Martin	Martin	Aerojet Thiokol	Martin
Corvus	Navy	Temco	Temco	Thiokol	W. L. Maxson/ Texas Instr.
Hound Dog	USAF	North American	North American	Pratt & Whitney	North American
Quail (Decoy)	USAF	McDonnell	McDonnell	General Electric	
Zuni	Navy				
			Air-To-Underwater		
Able	Navy	AVCO			
Asroc	Navy	Minn.- Honeywell			
Subroc	Navy	Goodyear	Goodyear	Thiokol	Kearfoot Librascope
Snark	USAF	Northrop	Northrop	Pratt & Whitney/ Aerojet	Northrop
Thor	USAF	Douglas	Douglas	North American	AC Spark Plug
Titan	USAF	Martin	Martin	Aerojet	Bell Tel/ARMA/ Sperry
			Surface-to-Air		
Bomarc	USAF	Boeing	Boeing	Marquardt/ Aerojet/ Thiokol	Westinghouse
Hawk	Army	Raytheon	Northrop	Aerojet	Raytheon
Mauler	Army	—	—	—	—
Nike-Ajax	Army	Western Electric	Douglas	Aerojet/ Hercules	American Tel. & Tel.

(*Continued next page*)

U. S. MISSILES—*Continued*

	Service	Prime	Airframe	Powerplant	Guidance
Nike-Hercules	Army	Western Electric	Douglas	Thiokol/ Hercules	American Tel. & Tel.
Nike-Zeus	Army	Western Electric	Douglas	Grand Cen./ Thiokol	American Tel. & Tel./Sanders
Redeye	Army	Convair		—	
Talos	Navy	Bendix	McDonnell	McDonnell/ NPP Indian Head	Sperry-Bendix
Tartar	Navy	Convair	Convair	Hercules NPP Indian Head	Convair/Sperry
Surface-to-Surface					
Atlas	USAF	Convair	Convair	North American	General Electric/ Burroughs
Corporal	Army	Firestone/ Gilfillan	Firestone	Ryan	Gilfillan
Honest John	Army	Emerson	Douglas	Hercules	
Jupiter	Army/ AF	Chrysler	Chrysler	North American	Ford Instrument
Lacrosse	Army	Martin	Martin	Thiokol	Federal Tel. Lab.
Little John	Army	Emerson	Emerson	Hercules	
Mace	USAF	Martin	Martin	Allison	Goodyear/AC Spark Plug
Matador	USAF	Martin	Martin	Allison	Martin
Minuteman	USAF		Boeing	Aerojet/ Thiokol/ Hercules	North American
Pershing	Army	Martin	Martin	Thiokol	Bendix
Polaris	Navy	Lockheed	Lockheed	Aerojet	General Electric
Redstone	Army	Chrysler	Reynolds Metals	North American	Ford Instrument
Sergeant	Army	Sperry	Sperry	Thiokol	Sperry

Source: 20



DRONES IN PRODUCTION OR DEVELOPMENT

Name	Designation	Service	Prime	Airframe	Powerplant	Guidance
Firebee	KDA-4	Navy	Ryan	Ryan	Fairchild	Ryan
Firebee	Q-2A	USAF	Ryan	Ryan	Continental	Ryan
Firebee	Q-2C	USAF	Ryan	Ryan	Continental	Ryan
Kingfisher	Q-5	Army	Lockheed	Lockheed	Marquardt	Lockheed
Swallow	SD-4	Army	Republic	Republic	Pratt & Whitney	Republic
Teal	XKDT-1	Navy	Temco	Temco	Astrodyne	Temco
	SD-2	Army	Rheem	Rheem	Lycoming	Sperry Rand
	SD-5	Army	Fairchild	Fairchild	Pratt & Whitney	
	KDB-1	Navy	Beech	Beech	McCulloch	Babcock & Summers
	XQ-4, A	USAF	Radioplane	Radioplane	Westinghouse	Radioplane
	RP-76	Army	Radioplane	Radioplane	Aerojet-General	Radioplane
	RP-77D	Army	Radioplane	Radioplane	Boeing	Radioplane
	USD-1	Army	Radioplane	Radioplane	McCulloch	Sperry Rand
	OQ-19	Army/USAF	Radioplane	Radioplane	McCulloch	Babcock Radio Engrg

Source: 20

Space Programs

4

For a number of years, the aircraft manufacturing industry has been undergoing a transition of its workload. From an industry devoted purely to aircraft manufacture up to the time of World War II, it moved into the missile field in the years following the war, the new assignment increasing in proportion to the total workload with every passing year.

This was a logical progression. Although missiles differ in some respects from atmospheric aircraft, the two products share a wide area of similarity, and the storehouse of knowledge accumulated in years of civil and military aircraft development provided an extremely valuable foundation for missile progress.

With the advent of the Space Age, the industry inherited a new responsibility—the manufacture of vehicles and equipment for the exploration of space. Again, the progression was natural, because space vehicles share with the aircraft and the missile a basic set of components: a structure, a power plant, a method of guidance and a payload.

The similarities are marked in early space projects. The first Earth satellites and lunar probes were boosted into space by vehicles originally designed as guided missiles, modified for the space assignment. The X-15 research vehicle, which will carry man to a point where more than 99% of Earth's atmosphere lies below, qualifies as a spacecraft, but in external appearance it looks remarkably like a modern jet fighter.

As man moves farther into space, there will be a wider divergence between industry's three separate but closely interrelated responsibilities. Space vehicles will involve radical changes in the shape of the frame or structure, new types of propulsion and advanced methods of navigation and guidance.

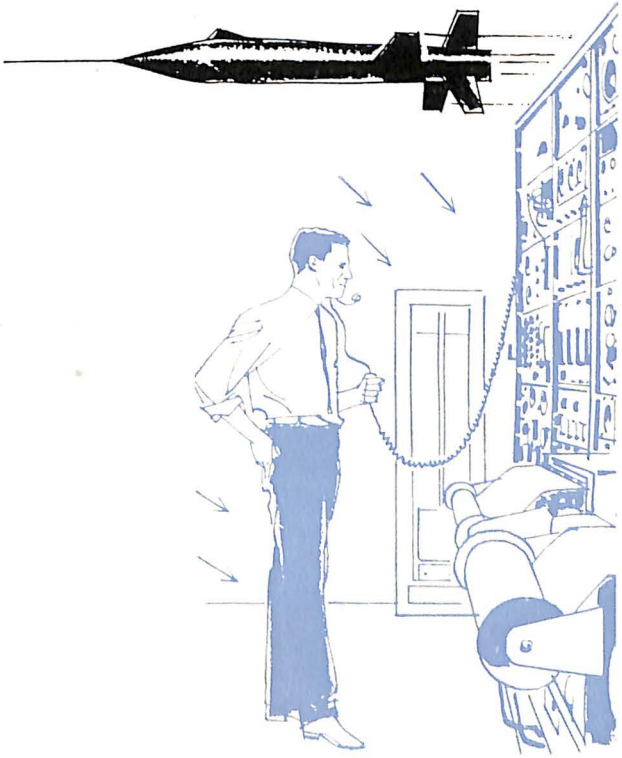
Although the member companies of the aerospace industry are already very active in all fields of space activity, the infant space age has not yet produced a significant impact insofar as total output is concerned. It appears, however, that space work will reach significant

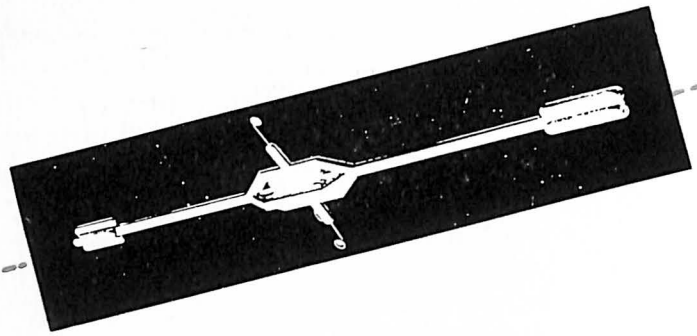
proportions in a relatively short period of time, although it is too early to predict what proportion of the total it will eventually become. Aircraft and missile production, research and development will continue to occupy the major portion of industry's attention for a long time.

Industry's role in the space research effort involves two parallel programs, one aimed at peaceful exploration of space in quest of knowledge about the universe which can be translated into benefits to man on Earth, the other for military purposes. Man's technological progress has made it apparent that an adequate defense system must embrace space weaponry as well as defense within the atmosphere, and the military is already active in that area.

These parallel objectives as yet represent only a small portion of the total budget for aircraft, missile and space research, development and production, but they are gaining momentum.

Space exploration as a civil project is handled by the National Aeronautics and Space Administration. NASA's program contemplates obligations of $330,000,000 during the fiscal year 1960 for research and development activities in space exploration. This represents an increase over fiscal 1959 of close to 50%, but the 1960 figure is not really indica-





tive of the effort to come. It involves, in a number of cases, initial funding for long term projects which will increase sharply as development status advances.

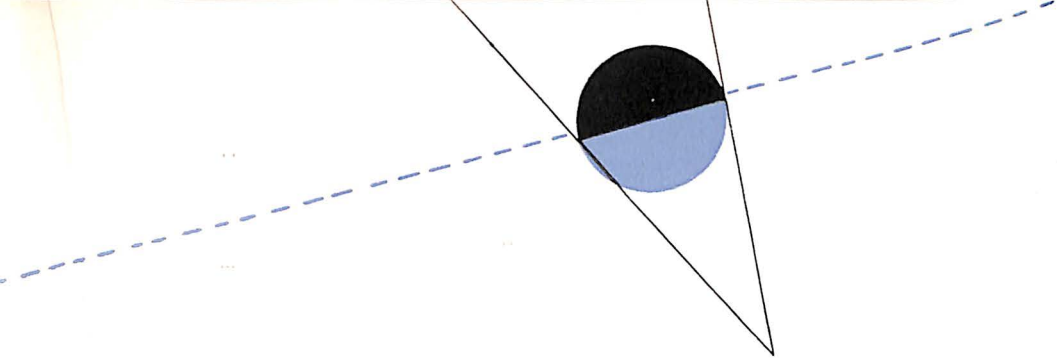
Military space projects are supervised by the Advanced Research Projects Agency and the Directorate of Research and Engineering of the Department of Defense. For military astronautics and related equipment, DOD plans to obligate $307,000,000 during fiscal 1960, actually a decrease from the previous year, but this is not a reflection of reduced activity. The decrease resulted from the transfer of certain projects from Defense to NASA.

In addition, the military services will handle certain space projects which are included in neither the NASA or DOD appropriations. Thus, space funding already runs into the hundreds of millions of dollars, and it appears probable that it will top the billion mark in the following fiscal year, if it does not reach that figure through supplemental 1960 appropriations.

Space research in the United States, then, is a team effort on the part of Government and industry. The Government participation is broken down into two separate but intertwined programs, and the aerospace industry is a member of both the civilian and military teams.

Space projects will not involve production of equipment in the immediate future. The industry's effort will lie in research and development and in construction of prototypes and limited numbers of satellites, lunar and planetary probes, manned vehicles and the supporting equipment for the various projects.

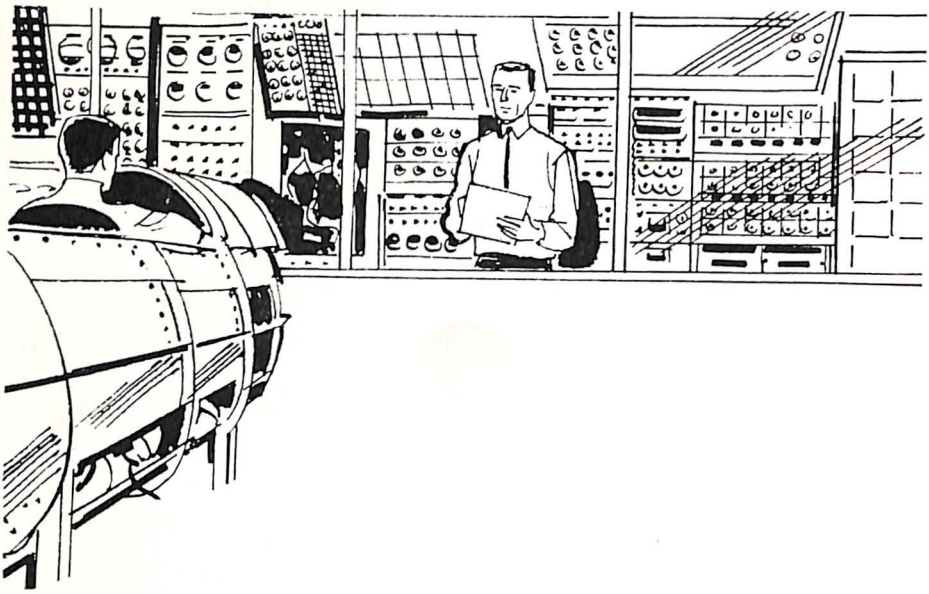
Later requirements are not clearly defined, but one thing appears inevitable: the order of complexity for vehicles designed to explore



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND DEVELOPMENT PROGRAMS
Fiscal Years 1959 and 1960
(Millions of Dollars of Contracts)

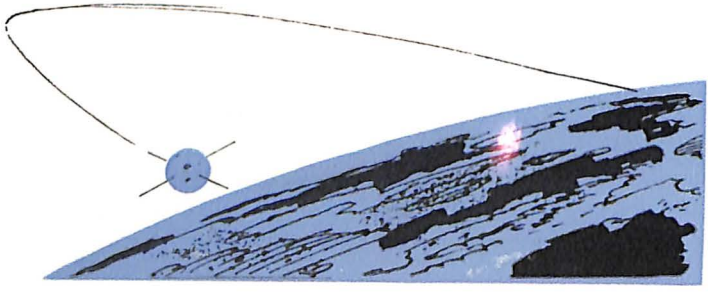
Programs	1959	1960
TOTAL, RESEARCH AND DEVELOPMENT	$225.4	$333.1
Aircraft, missile, and spacecraft research:		
Support of NASA plant	0.6	16.7
Support of Jet Propulsion Laboratory plant	8.2	8.2
Research contracts	5.5	8.2
Scientific investigations in space:		
Sounding rockets	5.0	10.0
Earth satellites	43.8	61.8
Lunar probes	20.0	24.0
Deep-space probes	16.0	22.5
Vanguard program	25.5	–
Satellite applications investigations:		
Meteorology	3.4	15.0
Communications	4.7	13.0
Space operations technology:		
Manned space flight	58.4	70.0
Space rendezvous techniques	–	3.0
Space propulsion technology:		
Solid fuel rockets	0.7	3.0
High-energy fuel rockets	7.0	17.0
1-million-pound thrust single-chamber engine	120.	30.2
Nuclear rocket engines	8.5	8.0
Space engines	0.3	3.0
Auxiliary power units	0.5	3.0
Space systems technology:		
Advanced vehicle systems	0.5	1.5
Booster recovery systems	0.5	1.5
Orbiting space laboratories	–	2.0
Supporting activities:		
Tracking and data acquisition	4.3	11.5

NOTE: Includes direct appropriations to NASA and transfers to NASA from Air Force, Advanced Research Projects Agency, Navy, Army.
Source: 47



space will increase over the already high degree involved in manufacture of today's automated weapons and high-performance manned aircraft. This will compound the industry's task of maintaining cost levels.

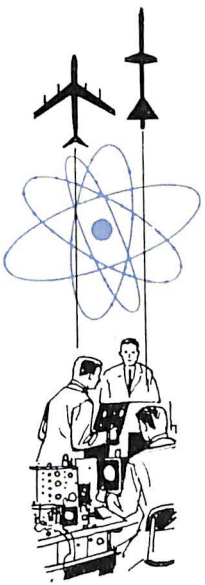
The major responsibility of the aerospace industry will be to provide the hardware and technological know-how for space conquest, and to maintain a technological lead over the Soviet Union, for the necessity of leading the way in this new field has been clearly demonstrated, whether the goal be scientific knowledge or application of such knowledge to advanced weaponry. It is a challenge that will compound industry's problems and tax to the utmost the ingenuity of its management, its scientists and engineers. Despite the enormity of the task, the aerospace industry is eager to accept it.



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[E]	153.0	128.0	25.0
1960[E]	280.0	245.0	35.0

Source: 26



Research and Development

5

Research and development has a direct bearing on national survival, for no single weapon system in the American arsenal has the capability, if independently relied upon, to deter aggression. The objective of the United States aircraft, missile and spacecraft industry, the military services, the Government and private research agencies, working in close harmony, has been to maintain technical superiority.

In business terms, the impact of this effort is severe. As military aeronautical weapons requirements demand ever higher performing systems new procurement patterns are being developed. For instance, with technology proceeding so rapidly, the military are not ordering large quantities of individual aircraft or missiles to the same degree as in the past. Long production runs are on the way out. Short runs will probably be the scheme of things to come.

The inevitable result is a rise in the cost per unit, since design, engineering and administrative overhead must be distributed over fewer numbers. The cost of these vast weapon systems is already very great. To site a few examples: the military services are spending well over one billion dollars per year on ballistic missile development; USAF strategic jet bombers, plus their tankers, cost about $125 million per month to buy; and some of the nation's new fighter aircraft cost six million dollars each.

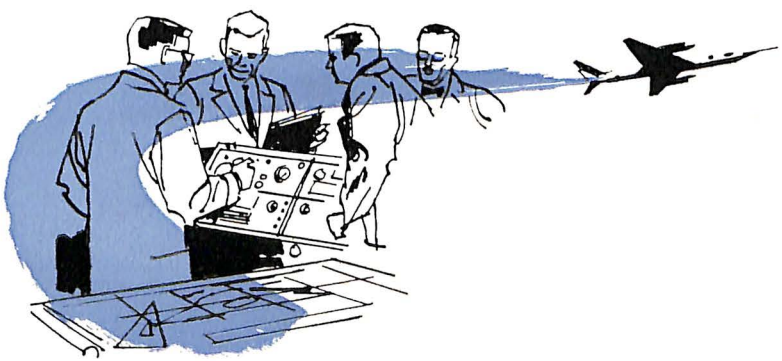
In past world wars this nation had time to mobilize its resources. But, with the complexity of forms of aggression, coupled with the destructiveness made possible by modern technology, the need for an ever-readiness with weapons and forces-in-being is clearly apparent.

Unlike ordinary businesses, the aerospace industry must be prepared for the "Christmas rush" every day, without knowing when—or whether—it will come. There is almost no limit to what the military/industry team *could* spend if it followed every course that scientists and strategists can think up. Since obviously the military cannot have *everything,* it is presented with the Herculean task of choosing which systems to try and how hard to push them.

FEDERAL EXPENDITURES FOR RESEARCH AND DEVELOPMENT[a]
(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	2,100	1,830	270
1954	2,085	1,806	279
1955	2,085	1,804	281
1956[b]	2,538	2,202	336
1957[b]	3,027	2,596	431
1958[b c]	3,498	2,988	510
1959[b c E]	4,841	4,108	732
1960[b c E]	5,484	4,572	912

[E] Estimate.
[a] Includes increase of "Research and Development Plant" ($304 million in 1957).
[b] Includes pay and allowances of military personnel.
[c] Figures for "Total" and "National Security" include figures previously classified as "procurement." An additional $2 billion in support of "research and development" continues to be financed from "procurement" funds.
Source: 26



The Federal Government supports about half of the research and development of the nation, but private industry finances much of the remainder. In the ten years following the end of World War II, the aircraft industry invested more than $1 billion of its earnings in research and development programs and facilities for aircraft and missiles, and by 1961 at the present rate will have invested in excess of another $1 billion.

Research and development plays a significant part in impelling economic growth as well as in improving our defense capabilities. The beneficial effects of research and development upon the economy are such that the millions of dollars expended annually on military research and development ultimately have an impact on civilian economy. Examples of gains to the civilian economy are numerous. These include jet aircraft for civilian travel, and the electronic computer, with its wide variety of industrial and commercial uses. The research and development programs of the aircraft and missile industry have supported development of innumerable materials. Many applications of aluminum and magnesium stem directly from this industry. Interest in tungsten-carbine and other materials of high heat resistance have come out of this development effort. There have also been many improvements to communications that have contributed to commercial radio and television, better flight safety and navigation.

DEPARTMENT OF DEFENSE
ESTIMATED OBLIGATIONS FOR CONDUCT OF RESEARCH, DEVELOPMENT, TEST AND EVALUATION
(In Millions)

Budget title and program	1958 actual	1959 estimate	1960 estimate
Research, development, test, and evaluation appropriations:			
1. Military sciences	$334.4	$360.3	$371.9
2. Aircraft and related equipment	442.5	472.6	487.3
3. Missiles and related equipment	904.3	1,341.8	1,437.6
4. Military astronautics and related equipment	17.4	345.9	309.1
5. Ships and small craft and related equipment	132.1	158.7	167.7
6. Ordnance, combat vehicles, and related equipment	179.1	188.8	235.0
7. Other equipment	323.6	379.9	430.8
8. Programwide management and support	135.1	137.8	133.0
9. Emergency fund and expired accounts	34.2	136.1	150.0
Total direct obligations, research, development, test, and evaluation appropriations	2,502.7	3,521.9	3,722.4
Procurement appropriations:[a]			
1. Aircraft	221.5	476.4	729.9
2. Missiles	1,367.3	1,253.7	1,062.3
3. Other	67.2	91.6	51.2
Total direct obligations, procurement appropriations	1,656.0	1,821.7	1,843.4
Military personnel appropriations	188.5	196.9	194.5
Total direct obligations	4,347.2	5,540.5	5,760.3

[a] Estimated amounts for items identified as development, test, and evaluation support.
Source: 26

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

Program	1958	1959[E]	1960[E]
TOTAL DIRECT OBLIGATIONS	$923.4	$1,028.8	$1,102.1
Military sciences	119.2	131.9	145.0
Aircraft and related equipment	263.4	330.8	348.5
Missiles and related equipment	304.7	325.6	317.8
Military astronautics and related equipment	4.2	14.2	2.2
Ordnance, combat vehicles, and related equipment	14.2	7.9	14.5
Other equipment	139.3	146.2	202.9
Programwide management and support	78.4	72.2	71.2

[E] Estimate.
Source: 26

The emphasis placed by the Department of Defense on research and development has constantly increased. Expenditures for defense research and development have almost doubled from the end of the Korean conflict to those estimated for fiscal 1960—about $1.4 billion was spent in fiscal 1953, and an estimated $2.6 billion will be spent in fiscal 1960. These expenditures, however, do not take into account the entire research

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

Program	1958	1959[E]	1960[E]
TOTAL DIRECT OBLIGATIONS	$728.4	$981.4	$968.8
Military sciences	91.2	82.4	89.2
Aircraft and related equipment	119.1	111.5	114.6
Missiles and related equipment	277.3	481.5	448.4
Ships and small craft and related equipment	131.7	158.4	167.5
Ordnance, combat vehicles, and related equipment	68.8	91.1	96.1
Other equipment	40.3	56.5	53.0

[E] Estimate.
Source: 26

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

Program	1958	1959[E]	1960[E]
TOTAL DIRECT OBLIGATIONS	$801.3	$948.3	$1,046.5
Military sciences	124.0	132.3	119.7
Aircraft and related equipment	60.0	30.3	24.1
Missiles and related equipment	321.1	454.7	543.3
Ships and small craft and related equipment	0.4	0.3	0.2
Ordnance, combat vehicles, and related equipment	96.2	89.7	124.4
Other equipment	144.0	177.3	175.0
Programwide management and support	55.6	63.7	59.8

[E] Estimate.
Source: 26

and development program of the Department of Defense during this period. A large portion of the test and evaluation program has been financed by procurement money. Supporting activities, such as military personnel and military construction, are not included.

In the presentation of the fiscal 1960 defense budget to Congress, the budget structure was changed and research and development expanded to better reflect the costs of test and evaluation. It was not possible to transfer all test and evaluation funds from the procurement accounts, but substantial portions were transferred. In this expanded Research, Development, Test and Evaluation for the Defense Department, direct obligations show an increase of over a billion dollars in three years—$2.5 billion in fiscal 1958 to an estimated $3.7 billion in fiscal 1960. *Prior years are not completely comparable.* Aircraft, missiles, military astronautics and related equipment account for 60 per cent of this fiscal year estimate of $3.7 billion.

The narrowly defined Defense accounting for research and development in the past did not present a comprehensive picture of the vast, complicated nature of the programs. Development depends directly on research; and, in turn, test depends on development, and evaluation on test. The magnitude of the overall program, when added to those of the Atomic Energy Commission and the National Aeronautics and Space Administration is tremendous. It clearly reflects the combined efforts

of the military, research agencies, and the industry for continued technological superiority in the aerospace era.

The aerospace industry is becoming increasingly aware of a number of problems in the management of research and development. In Government, and in the industry, intensive thought is being applied to the planning, the administration and manpower for control of programs in the technological fields of aerospace research and development. This broad area has many facets, ranging all the way from gathering statistics and analytical assessment to problems of selection among aerospace projects and achieving the proper balance between support of basic research, applied research and development.

American industry concerned with defense contracts generally, and the aerospace industry particularly, is aware that new knowledge is essential to future progress, and that a strong military and a strong industrial technology must rest on a base of fundamental science. The Defense Department has, in the past two years, strengthened its policy with respect to basic research and has substantially increased its level of support. This increase amounts to about 30 per cent more than was originally planned for the current year. The increase will be continued next year and, it is hoped, in the succeeding years for budgets not yet prepared.

DEPARTMENT OF DEFENSE
EXPENDITURES FOR RESEARCH AND DEVELOPMENT
(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[E]	2,355	755	716	519	365
1960[E]	2,594	725	779	547	543

[E] Estimate.
Source: 26

DISTRIBUTION[a] OF THE
FEDERAL RESEARCH AND DEVELOPMENT DOLLAR
Fiscal Year 1958

Within Federal Government	44 cents
To Profit Organizations	38 cents
To Educational Institutions	15 cents
Other	3 cents
	100 cents

[a] Based on obligations.
Source: 45

SCIENTISTS AND ENGINEERS IN INDUSTRY, JANUARY 1957

	All Occupations[a]	Engineers	Chemists	Metallurgists	Physicists	Mathematicians	Other[b]
TOTAL EMPLOYMENT OF SCIENTISTS AND ENGINEERS							
All Industries	738,000	528,200	72,000	10,800	12,100	12,400	71,800
Aircraft	84,900	66,000	1,600	900	1,900	2,200	12,200
Percent in Aircraft	11.4	12.5	2.2	8.3	15.7	17.7	17.0
In Research and Development Activities							
All Industries	227,700	154,900	32,700	4,300	7,100	4,100	18,700
Aircraft	56,700	44,800	1,100	600	1,500	1,600	7,100
Percent in Aircraft	24.9	28.9	33.9	14.0	21.1	39.0	38.0
PERCENTAGE INCREASE IN SCIENTISTS AND ENGINEERS JAN. 1954 TO JAN. 1957							
All Industries	30.1	27.0	16.1	14.3	59.5	91.4	67.2
Aircraft	75.0	60.5	59.5	34.3	58.7	104.1	257.4
In Research and Development Activities							
All Industries	45.8	49.2	19.8	26.5	50.0	70.2	81.0
Aircraft	105.4	98.9	58.6	40.4	48.8	101.1	224.5

[a] Includes Earth Scientists and Life Scientists.
[b] Includes Scientists and Engineers classified as "Administrators."
Source: 43

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.

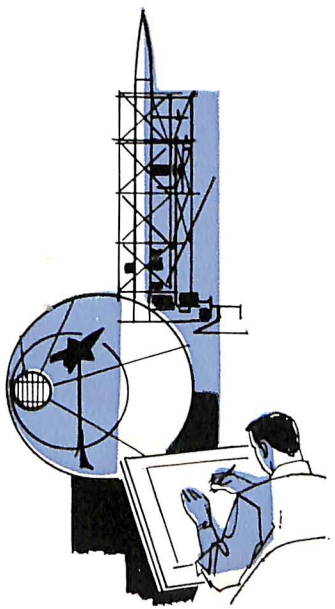
Transfer: A transaction which withdraws and decreases amounts available for obligation and expenditure from one appropriation or fund account and increases different appropriation or fund account.

Source: 20, 26

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[E]	790.3	617.6	104.3	350.3	160.2	2.8	172.7
1960[E]	845.6	651.9	85.5	379.6	182.7	4.1	193.7

Source: 26



Manpower

6

Employment in the aerospace industry declined generally during 1958. In January of the year employment in the industry stood at 762,400, but by May it had dropped to 742,800. During the last half of the year, however, the employment picture brightened somewhat, gaining steadily to 767,400 in December 1958. In February 1959, employment once more began to drop—falling by month's end to 756,600. It is expected to level out at about this average figure for the remainder of the year.

Despite reductions in the industry's employee force during the year, there remained a critical shortage of skilled manpower. The reason is simple. Modern air weapons have become so complicated that the need for unskilled and semi-skilled employees is dropping, while the need for higher skills is increasing at a greater rate. This will continue. As the aircraft industry moves deeper into the missile era, the need for engineering and highly skilled personnel will increase.

The "cold" war in which the United States finds itself has been characterized as an arms race. In a restricted sense of the word there

is some degree of truth in this analysis. Without doubt, the Soviet Union is deliberately creating a potent military force that can have only one purpose: aggression. It *has* to be classed as a potential offensive machine, since no other world power has in any way threatened to attack the USSR.

This continual up-grading of their offensive, and free world defensive, forces has resulted in the second aspect of the "cold" war—the technological challenge. Essentially, this is a brain-power competition. If this nation wishes to retain its democratic way of life, then its scientists and engineers must demonstrate greater creative ability than their Soviet counterparts in their communistic environment. Nowhere in our American defense industry does this situation manifest itself more than in the aerospace industry.

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	757.5	15,464	4.9

[a] Less than .05 percent.

Sources: 3, 39

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	757.5	456.8	152.7	18.3	129.7
1959					
Feb.	756.6	455.3	148.8	14.9	137.6

N.A.—Not available.
Source: 39

Which nation is "leading"—USSR or the United States—is a matter of serious conjecture. In certain areas of hardware production—aircraft, for instance—our nation has a decided edge. In the missile area it appears that the Soviets may be somewhat ahead of the United States.

Currently, because of the quality of skills demanded in the manufacture of its aeronautical products, aerospace industry employee wages are among the highest weekly wages for all manufacturing employees.

The fine performance of the piston engine, of jet propulsion, the turbo-propeller engine and the spectacular new engine forms of rocket propulsion have revolutionized transportation. Further refinements in these fields will demand still higher skills of the men and women who

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	479.2	291.3	89.9	12.2	85.8
1959					
Feb.	472.5	286.8	88.8	9.7	87.2

N.A.—Not available.
Source: 39

design and build them. The same is true in aircraft electronics manufacturing. Achievements in electronics are coming so fast that their significance is largely lost. But, continued gains in this field of aeronautics similarly place their demand for greater talent and ever greater scientific knowledge and skills.

During 1958, employees of the aerospace industry worked an average of 40.6 hours per week at an average hourly rate of $2.51 for an average weekly wage of $101.91. As of June 1958, 27.3 per cent were employed in the East Coast areas; 32.9 per cent were employed in Central United States areas; and 39.8 per cent were employed in West Coast areas.

The aircraft and parts industry employs about 67 per cent of its total

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	5,375,000[E]	2,200,000[E]	3,175,000[E]	96.76
1958	4,894,000[E]	2,231,000[E]	2,663,000[E]	101.91

N.A.—Not available.
E Estimate.
[a] This line and all following lines include data for aircraft engine manufacturers which are not available for prior years.
Sources: 11, 12

force of 84,900 scientists and engineers in research and development projects, a recent report by the National Science Foundation reveals.

This is the largest number of scientists and engineers assigned to research and development by any major manufacturing industry, and reflects the intensive technological effort of the aircraft and missile industry. In addition, a substantial number of scientists and engineers

listed in the "electrical equipment" category are employed on projects directly relating to aircraft, missile and spacecraft projects.

By categories, the survey shows that 79 per cent of the physicists, 74 per cent of the mathematicians, 73 per cent of the chemists and 58 per cent of other scientists in the aircraft and parts industry are engaged in research and development projects.

The aircraft and parts industry has assigned 62 per cent of a total employment of 51,500 technicians (skilled personnel assisting scientists and engineers) to research and development projects, highest percentage among all industries. Overall, industry employs 27 per cent of a total force of 594,600 technicians in research and development.

AVERAGE WEEKLY HOURS IN AIRCRAFT AND PARTS PLANTS
1939 TO DATE

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.	44.6	N.A.	N.A.
1940	N.A.	N.A.	46.6	N.A.	N.A
1941	N.A.	N.A.	47.6	N.A.	N.A.
1942	N.A.	N.A.	49.7	N.A.	N.A.
1943	N.A.	N.A.	48.6	N.A.	N.A
1944	N.A.	N.A.	47.7	N.A.	N.A.
1945	N.A.	N.A.	43.2	N.A.	N.A.
1946	N.A.	N.A.	41.6	N.A.	N.A.
1947	39.9	39.7	39.9	41.5	40.1
1948	41.0	41.1	40.9	39.7	41.0
1949	40.6	40.5	40.7	41.0	40.0
1950	41.6	41.4	42.1	42.4	41.7
1951	43.8	43.3	45.4	46.2	43.7
1952	43.0	42.6	43.9	45.0	43.2
1953	41.9	41.3	43.0	41.9	42.8
1954	40.9	40.9	40.7	39.4	41.2
1955	41.3	41.2	41.0	41.5	41.7
1956	42.1	41.8	42.5	42.7	42.8
1957	41.0	40.7	41.1	41.6	42.1
1958	40.6	40.4	40.4	40.7	41.4
1959					
Feb.	40.8	40.4	41.1	40.9	41.7

N.A.—Not available.
Source: 39

From January 1954 to January 1957, the period covered by the National Science Foundation survey, the aircraft and parts industry increased its employment of scientists and engineers assigned to research and development projects by 105 per cent, the second largest gain registered by any industry. In all activities, the aircraft and missile industry led other manufacturers in the increase of scientific and engineering personnel with 75 per cent gain from January 1954 to 1957. This compares with an increase by all industries of 30 per cent.

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

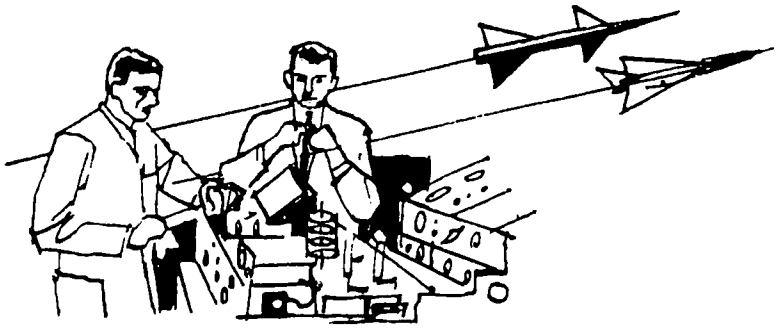
Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	$36.93	N.A.	N.A.
1940	N.A.	N.A.	38.82	N.A.	N.A.
1941	N.A.	N.A.	47.65	N.A.	N.A.
1942	N.A.	N.A.	60.14	N.A.	N.A.
1943	N.A.	N.A.	61.24	N.A.	N.A.
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					
Feb.	105.67	105.04	107.68	99.80	105.50

N.A.—Not available.
Source: 39

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					
Feb.	2.59	2.60	2.62	2.44	2.53

N.A.—Not available.
E Estimate.
Source: 39



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

N.A.—Not available.
Source: 38

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	2.8	N.A.	4.5	N.A.	10.7	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: 40

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY, BY GEOGRAPHICAL DIVISION AND SELECTED STATES—1947 TO 1956

Geographical Divisions and Selected States	1947	1948	1949	1950	1951
TOTAL	227,582	219,445	254,358	273,956	462,194
New England	26,336	25,662	29,142	28,376	41,726
Mass.	440	204	9,108	8,263	9,800
Conn.	25,775	25,458	20,034	20,112	31,530
Me., N.H., Vt., R.I.	121	—	—	1	396
Middle Atlantic	34,549	32,325	35,962	42,643	70,800
New York	18,677	16,789	19,138	24,129	42,239
New Jersey	11,879	11,654	13,881	14,567	22,162
Penna.	3,993	3,882	2,943	3,947	6,399
East North Central	31,674	24,734	25,996	28,443	59,581
Ohio	14,821	9,740	9,990	10,357	24,513
Indiana	12,616	13,767	14,135	16,483	21,856
Illinois	52	46	722	312	7,411
Mich., Wisc.	4,185	1,181	1,149	1,291	5,801
West North Central	10,704	14,076	21,331	23,786	47,194
Missouri	3,486	4,665	7,283	7,277	11,122
Kansas	6,125	8,406	12,972	15,494	34,139
Minn.,Iowa,N.D.,Neb.	1,093	1,005	1,076	1,015	1,933
South Atlantic	17,703	16,080	14,827	14,489	29,421
Maryland	16,761	15,440	14,071	14,081	24,569
Del., Va., W.Va.	784	571	632	282	454
N.C., S.C., Ga., Fla.	158	69	124	126	4,398
East South Central (Ky.,Tenn.,Ala., Miss.)	769	659	599	716	1,100
West South Central (La., Okla., Tex.)	14,358	15,775	22,891	27,052	44,274
Mountain	274	189	230	379	1,819
Arizona	—	—	39	99	1,266
Wyo., Colo., N.Mex., Utah, Nev.	274	189	191	280	553
Pacific	91,215	89,945	103,380	108,072	166,279
California	77,952	74,666	79,337	88,277	138,561
Wash., Ore.	13,263	15,279	24,043	19,795	27,718

NOTE: 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 useability of the data.

Source: 37

EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY, BY GEOGRAPHICAL DIVISION AND SELECTED STATES—1947 TO 1956

Geographical Divisions and Selected States	1952	1953	1954	1955	1956
TOTAL	663,803	774,150	761,964	745,424	818,074
New England	59,722	69,335	67,040	66,672	77,845
Mass.	10,043	10,148	8,762	8,977	9,092
Conn.	46,467	54,623	55,349	56,269	67,166
Me., N.H., Vt., R.I.	3,212	4,564	2,929	1,426	1,587
Middle Atlantic	104,386	127,349	122,622	103,372	103,837
New York	59,955	70,971	73,406	61,648	59,385
New Jersey	31,429	32,272	27,409	24,979	27,867
Penna.	13,002	24,106	21,807	16,745	16,585
East North Central	109,318	146,560	132,207	121,821	123, 484
Ohio	44,602	55,203	68,062	66,192	66,016
Indiana	32,932	33,288	29,212	28,554	30,643
Illinois	12,605	23,103	16,353	14,965	16,956
Mich., Wisc.	19,179	34,966	18,580	12,110	9,869
West North Central	63,962	69,456	67,577	64,016	68,682
Missouri	17,192	24,202	23,517	21,456	23,362
Kansas	44,072	42,320	41,463	39,308	41,348
Minn.,Iowa,N.D.,Neb.	2,698	2,934	2,597	3,252	3,972
South Atlantic	43,118	45,201	45,044	49,535	54,494
Maryland	31,283	30,546	29,227	30,339	33,690
Del., Va., W.Va.	716	741	386	408	538
N.C., S.C., Ga., Fla.	11,119	13,914	15,431	18,788	20,266
East South Central (Ky., Tenn., Ala., Miss.)	3,081	5,141	6,411	5,803	7,540
West South Central (La., Okla., Tex.)	53,018	57,158	53,176	54,003	63,201
Mountain	3,697	6,998	4,876	6,614	11,100
Arizona	2,918	6,108	3,857	5,030	7,149
Wyo., Colo., N.Mex., Utah, Nev.	779	890	1,019	1,584	3,951
Pacific	223,501	246,952	263,011	273,588	307,891
California	193,279	212,648	225,407	234,022	263,009
Wash., Ore.	30,222	34,304	37,604	39,566	44,882

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	10.8[E]	42.0[E]	39.0	43.9

Source: 39

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

Sources: 3, 39

Finance

7

Some 82 per cent of aerospace industry revenues are derived from Government contracts for weapons for the three services. A slightly larger percentage of our research and development efforts are for military purposes. An even higher percentage of the funds the industry is spending for new facilities—new plants, new test centers, new tools—are for military use.*

The companies comprising the Aerospace Industries Association are now developing and producing by far the largest percentage of the new weapons for our military inventories. Of the total dollars being spent on aerial vehicles—aircraft and missiles—at least 85 per cent is contracted to these companies. A large percentage of this money does not stay in the hands of the prime contractor, but is passed along to the tens of thousands of suppliers and subcontractors who comprise the total defense industry complex.

The transition from the weapons of World War II to those now in use, and those that we see coming over the horizon, has created financial

*Data contained in this chapter includes the financial activities of the 12 major airframe companies as shown in their published financial accounts for each of the years through 1958. The data does not include one major airframe producer, now a division of another corporation that does not publish separate financial data for its airframe manufacturing activity. The same applies to tables on pages 76, 79-81 and 84.

problems of a magnitude heretofore unknown in the aircraft industry.

A major problem confronting top management in our industry today is how to acquire the capital needed for new production and test facilities; to finance an ever-increasing amount of inventories and accounts receivable; and to carry on the additional research and development work that will be necessary to exploit fully the rapid advances made during recent years in all of the sciences.

During 1958, more than usual management time and effort was devoted to financing corporate activity in support of the development and production of aircraft and missiles needed by the military services. Financial stringency prevailed at the same time that sales exceeded the

INCOME ACCOUNTS, 12 MAJOR AIRFRAME COMPANIES, 1937 TO DATE
(Millions of Dollars)

Year	Net Sales	Total Income	Total Federal Taxes, net	Net Profit
1937	$ 61.8	$ 3.6	$ 1.3	$ 2.3
1938	88.5	10.1	2.1	8.0
1939	141.0	19.1	4.5	14.6
1940	247.4	45.1	13.3	31.8
1941	812.6	168.7	108.6	60.1
1942	2,788.9	341.8	281.2	60.6
1943	5,209.0	429.8	357.0	72.8
1944	5,766.3	322.1	263.5	58.6
1945	3,965.3	215.1	147.7	67.4
1946	519.0	(37.0)	26.3[cr]	(10.7)
1947	545.0	(115.4)	73.5[cr]	(41.9)
1948	843.4	24.2	21.8	2.4
1949	1,131.7	57.8	21.7	36.1
1950	1,388.2	111.1	48.5	62.6
1951	1,979.3	98.9	68.0	30.9
1952	3,731.1	220.5	138.8	81.7
1953	5,120.1	317.1	200.5	116.6[a]
1954	4,926.8	371.0	188.4	182.6[a]
1955	5,188.1	370.7	191.9	178.8[a]
1956	5,637.1	328.1	171.6	156.5[a]
1957	6,912.7	346.8	180.4	166.4[a]
1958	7,280.9	294.9	152.5	142.4[a]

[a] Subject to renegotiation.
[cr] Credit.
Figures in parentheses indicate loss.
Source: 1

NET PROFIT AS PERCENT OF SALES
1958

NON FERROUS METALS 6.4

PETROLEUM PRODUCTS 8.4

AUTOS AND TRUCKS 4.2

RAILWAY EQUIPMENT 3.5

IRON AND STEEL 6.3

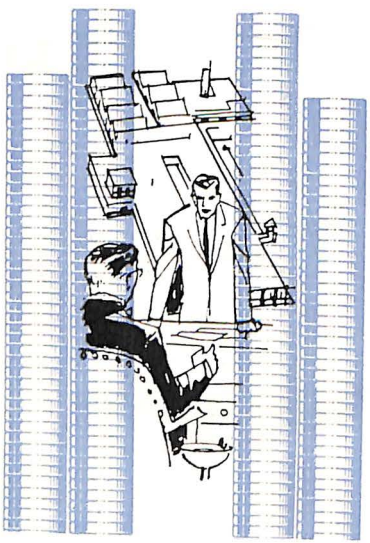
AIRCRAFT AND PARTS 2.6

ALL MANUFACTURING 5.2

previous high of 1957 and exceeded the peak of World War II. Total sales in 1958 of the 12 major airframe companies were $7.3 billion, exceeding the previous high of $6.9 billion in 1957 and the World War II peak of $5.8 billion in 1944.

In contrast to sales rising to record levels, total earnings for the 12 companies fell to $142 million in 1958, from $166 million in 1957. These profit figures, as well as those shown in the tables in this chapter, are overstated as far back as 1953, since they are subject to reduction as a result of renegotiation. The earning rate in 1958 dropped to 2.0¢ per dollar of sales, as compared with 2.4¢ in 1957, 2.8¢ in 1956 and 3.4¢ in 1955.

During the year 1958, the effects of the Department of Defense policy to shift financial responsibilities to industry were felt with increasing intensity, and are reflected in the consolidated balance sheets. The Department of Defense is following a policy of decreasing the Government's financial investment in "work-in-process" by requiring industry to provide increased working capital. Department of Defense policy also is decreasing the Government's investment in brick and mortar, facilities and equipment. Industry was responsible for large financial responsibilities in research, developing and testing programs needed to lay the basis for the aircraft, missiles, spacecraft, power plants and accessories that the military services will need in the next decade. Bank borrowings, both long- and short-term, were again increased to *$689*



BALANCE SHEET COMPARISONS, 12 MAJOR AIRFRAME COMPANIES
1953 TO DATE
(Thousands of Dollars)

	1953	1954	1955	1956	1957	1958
Assets						
Current assets:						
Cash	$ 261,932	$ 295,365	$ 295,506	$ 311,572	$ 233,296	$ 276,048
Securities	5,478	26,437	29,372	—	—	—
Receivables	526,400	461,910	463,848	594,247	792,013	1,046,892
Inventories	583,923	592,056	638,208	874,550	947,721	982,272
Miscellaneous	27,467	12,934	23,040	31,329	40,896	52,582
Total current assets	$1,405,200	$1,388,702	$1,449,974	$1,811,698	$2,013,926	$2,357,794
Total net plant	166,077	186,406	214,077	309,984	431,453	463,576
Investments	9,208	6,278	5,679	5,820	5,842	7,924
Development, etc., expenses	2,202	—	—	—	—	—
Deferred charges	13,644	19,731	19,410	22,604	30,119	23,738
Miscellaneous					7,285	13,513
Total assets	$1,596,331	$1,601,117	$1,689,140	$2,150,106	$2,488,625	$2,866,545
Liabilities						
Current liabilities:						
Payables	$ 544,162	$ 396,217	$ 375,822	635,018	874,693	960,713
Accruals—taxes—renegotiation—refunds due U. S.	406,906	409,039	375,642	347,620	335,246	363,081
Advances—contracts deposits	92,540	121,403	127,246	176,468	126,525	126,281
Reserve	3,458	8,851	12,317	5,078	4,800	8,373
Miscellaneous	8,347	11,112	13,509	27,315	31,303	36,779
Total current liabilities	$1,055,413	$ 946,622	$ 904,536	$1,191,499	$1,372,567	$1,495,227
Bank loans, etc.	8,648	8,589	36,756	73,690	127,804	260,869
Contingency reserve	—	—	—	—	—	—
Capital stock	95,460	125,706	135,499	168,391	178,606	201,440
Capital (paid) surplus	77,181	100,331	110,216	162,056	164,283	197,939
Earned surplus	353,885	415,443	495,861	548,971	638,418	703,187
Miscellaneous	5,744	4,426	6,272	5,499	6,947	7,883
Total liabilities	$1,596,331	$1,601,117	$1,689,140	$2,150,106	$2,488,625	$2,866,545
Net current assets	$ 349,787	$ 442,080	$ 545,438	$ 620,199	$ 641,359	$ 862,567

Source: 1

COMPOSITION OF CURRENT ASSETS, 1937 TO DATE, 12 MAJOR AIRFRAME COMPANIES
(In Percent of Total)

Year	Total Current Assets	Cash and Securities	Inventories	Receivables	Miscellaneous
1937	100.0	17.6	35.2	46.6	.6
1938	100.0	35.1	33.8	30.3	.8
1939	100.0	37.9	48.9	13.1	.1
1940	100.0	46.4	35.7	12.2	5.7
1941	100.0	23.2	52.3	24.4	.1
1942	100.0	25.1	33.8	40.9	.2
1943	100.0	27.6	25.5	45.9	1.0
1944	100.0	26.7	22.7	49.1	1.5
1945	100.0	34.1	13.7	48.9	3.3
1946	100.0	32.9	43.8	23.2	.1
1947	100.0	18.6	54.9	25.6	.9
1948	100.0	23.9	40.1	35.3	.7
1949	100.0	26.8	41.6	30.5	1.1
1950	100.0	23.3	36.2	39.6	.9
1951	100.0	18.4	40.8	39.4	1.4
1952	100.0	17.8	42.4	38.3	1.5
1953	100.0	19.0	41.6	37.5	1.9
1954	100.0	23.1	42.6	33.3	1.0
1955	100.0	22.4	44.0	32.0	1.6
1956	100.0	17.2	48.3	32.8	1.7
1957	100.0	11.6	47.1	39.3	2.0
1958	100.0	11.7	41.7	44.4	2.2

Source: 1

million in 1958. Net worth was increased, exceeding the one billion dollar mark for the first time.

Military contract inventories and accounts receivable required increasing investments of cash, not only as a result of increased volume, but also because of the change in payment terms following the Department of Defense policy changes in 1957. An additional cause of increasing investment of contractor funds is the result of Air Force and Navy Bureau of Aeronautics actually signing contracts and releasing funds long after substantive agreements had been reached. These delays by military buying agencies in completing paperwork have held up industry being able to present bills for amounts due, with the result

that substantial amounts of contractor funds have been tied up for extended periods of time.

Aircraft, missiles, spacecraft, and their engines require extensive basic and applied research, long periods of time to design and develop, and tremendous amounts of in-process inventories. These processes are directed toward products bought solely by the military services, and accordingly not started until contractual arrangements with the buyers have been completed. As is common in other contracting industries, the customer pays for the work being done pursuant to his specifications and orders at progressive stages of completion. Customer financing of work-in-process is particularly necessary in this industry that is called upon to manufacture high unit cost products whose production cycles are often one, two or more years in duration. By paying for work as fast as performed by the contractor, the military services avoid paying the cost

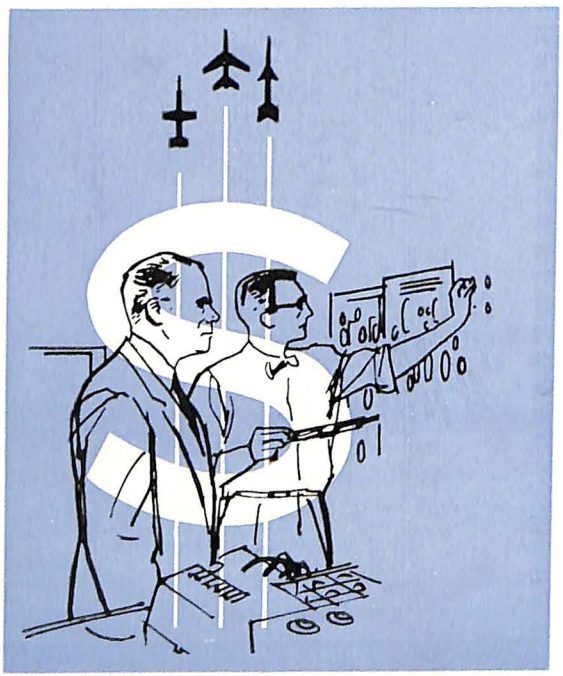
FINANCIAL RATIOS, 12 MAJOR AIRFRAME COMPANIES
1937 TO DATE

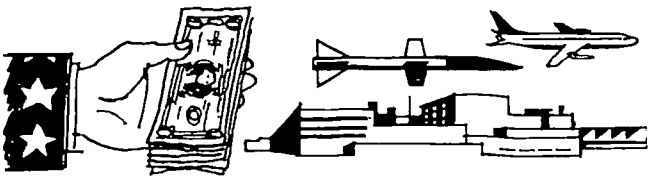
Year	Net Federal Taxes as Percent of Total Income	Net Profit as Percent of Sales
1937	26.5	3.7
1938	21.9	9.1
1939	19.8	10.3
1940	26.9	12.9
1941	59.5	7.4
1942	72.6	2.2
1943	72.0	1.4
1944	71.7	1.0
1945	57.5	1.7
1946	Not applicable	(2.1)
1947	Not applicable	(7.7)
1948	82.3	0.3
1949	37.5	3.2
1950	43.7	4.5
1951	68.6	1.6
1952	62.9	2.2
1953[a]	63.2	2.3
1954[a]	50.8	3.7
1955[a]	51.8	3.4
1956[a]	52.3	2.8
1957[a]	52.0	2.4
1958[a]	51.7	2.0

Figures in parentheses indicate net loss as a percent of sales.
[a] Subject to renegotiation.
Source: 1

of the additional capitalization that would be required by all contractors to finance payrolls and inventories during production cycles exceeding 12 months.

The industry is capitalized to meet the requirements of our defense establishment in the most efficient, economical and conservative manner possible under the circumstances. The companies are capitalized to (1) provide the liquidity necessary to support the inescapable high level of mercantile and bank credit, (2) furnish the working capital and financial strength to support a high level of contractual development and manufacturing operations, and (3) avoid the costly burden of over-capitalization during the prolonged periods of low military procurement appropriations and of low volume production. Avoiding over-capitalization is essential to the aerospace industry where the volume of business of any particular company fluctuates widely over a period of years. Over-capitalization played an important part in the wholesale bankruptcies in the aviation industry following World War I. Of the 17 companies that were producing aircraft and airplane engines in 1918, all 17 had gone through bankruptcies or drastic reorganization prior to 1926.





Selected Major Defense Contractors

(Listed by rank according to net value of military prime contracts awarded, 1950-1958)

	July 1, 1950 to June 30, 1958	July 1, 1957 to June 30, 1958	World War II
U. S. Total, All Contracts, (in Billions)	$181.3	$ 21.8	$193.3[E]
Company	Percent of Total		
20 Largest Defense Contractors			
*Boeing Airplane	5.1	9.8	1.5
General Motors	4.1	1.3	7.9
United Aircraft	3.6	3.0	2.2
General Dynamics	3.6	6.3	[a]
General Electric	3.6	3.6	1.9
*North American Aviation	2.9	3.0	1.6
*Douglas Aircraft	2.8	2.4	2.5
*Lockheed Aircraft	2.7	3.5	1.9
American Telephone & Telegraph	2.1	3.0	1.5
Curtiss-Wright	1.6	1.0	4.1[a]
*Republic Aviation	1.5	1.2	.7
Ford Motor	1.4	.7	3.0
Chrysler	1.4	1.2	1.9
*Martin	1.2	1.8	1.3
Sperry Rand	1.1	1.7	.9[a]
Bendix Aviation	1.0	1.0	1.1
*McDonnell Aircraft	1.0	1.6	N.A.
Westinghouse Electric	.9	1.2	.8
*Grumman Aircraft	.9	1.1	.8
Hughes Aircraft	.9	2.2	N.A.
Other Selected Major Contractors			
*Northrop	.9	1.3	.1
*Fairchild	.5	.5	.2
*Chance Vought	.4	1.7	[a]
*Bell Aircraft	.4	.4	.7

N.A.—Not Available.
* Listed among the 12 major airframe manufacturers.
[E] Estimate.
[a] Major change in corporate composition or product during the period.
[b] Does not include Chance Vought.

Sources: 20, 48

NET PROFIT AS PERCENT OF SALES,
Seven Selected Industries,
1952 TO DATE
(After Taxes)

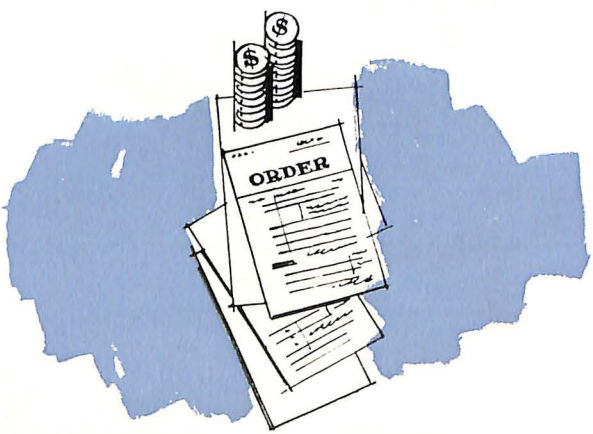
Industry	1953	1954	1955	1956	1957	1958
Nonferrous Metals	6.9	7.3	9.5	10.5	7.9	6.4
Petroleum Products	10.6	10.7	10.6	10.4	9.7	8.4
Autos and Trucks	4.4	6.4	7.4	5.7	5.7	4.2
Railway Equipment	3.3	4.1	4.7	4.4	4.4	3.5
Iron and Steel	5.7	6.0	7.8	7.2	7.4	6.3
AIRCRAFT AND PARTS	2.4	3.8[a]	3.9[a]	3.4[a]	3.0[a]	2.6[a]
Total Manufacturing	5.3	5.9	6.7	6.0	5.9	5.2

[a] Subject to renegotiation.
Source: 28

EXPENDITURES OF 12 MAJOR AIRFRAME COMPANIES
UNDER MILITARY CONTRACTS, 1957 TO DATE
(Dollar Figures in Billions)

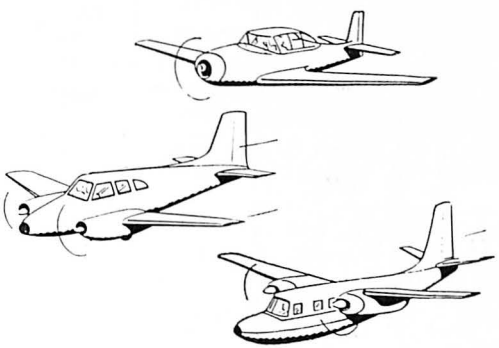
	1957		1958	
	Dollars	Percent	Dollars	Percent
TOTAL	$5.3	100	$5.2	100
Purchases from Small Business	1.0	20	.8	16
Purchases from Large Business	2.1	39	1.8	35
Overhead, Payroll, Etc.	2.2	41	2.5	49

Source: 1



General Aviation

8



General aviation in 1958 continued its record of phenomenal growth which has characterized the utility aircraft industry since the end of World War II.

The general aviation fleet, which includes almost every type of civil aircraft from the small single-engined aircraft to large multi-engined transport types, now exceeds 65,000 units, which last year flew an estimated 11,500,000 hours. This is forty times more aircraft, and three times more flying hours, than the scheduled airlines. It also represents twice as many miles flown.

A large and important factor in the total aviation picture which makes substantial contributions to the national economy, general aviation (all civil flying except that of the scheduled airlines) embraces business, industry, agriculture, air taxi and air cargo services, instruction, geophysical research, survey and patrol, and nonbusiness personal use.

During 1958, ten selected utility aircraft manufacturers shipped 6,414 planes with a retail value of approximately $135,000,000—an increase of 296 units and several million dollars in sales value over 1957 deliveries. This production achievement is particularly significant in view of the general decline of other manufacturing industries in the past year.

A major factor in this growth is the increasing acceptance of the

Production of Civil Airplanes

1937–1945, by Number of Engines and Places

Year	Total Production	By Number of Engines		Landplanes, by Place		
		Single	Multi	1–2	3–5	Over 5
1937	2,289[a]	2,171	118	1,668	460	105
1938	1,823	1,770	53	1,487	258	42
1940	6,785	6,562	167	5,527	1,031	140
1945	2,047	1,946	101	1,929	17	73

1946 to Date, by Type of Use and Number of Places

Year	Total Production	By Type of Use		By Place		
		General[b]	Transports	1–2	3–5	Over 5
1946	35,001	34,568	433	30,766	3,802	433
1948	7,302	7,039	263	3,302	3,737	263
1950	3,520	3,391	129	1,029	2,362	129
1951	2,477	2,279	198	614	1,661	202
1952	3,509	3,057	452	3,056		453
1953	4,134	3,825	309	3,822		312
1954	3,389	3,098	291	2,982		407
1955	4,820	4,575	245	3,586		448
1956	7,205	6,778	427	6,505		700
1957	6,805	6,208	597	5,961		844
1958	6,882	6,522	360	6,367		515

N.A.—Not available.

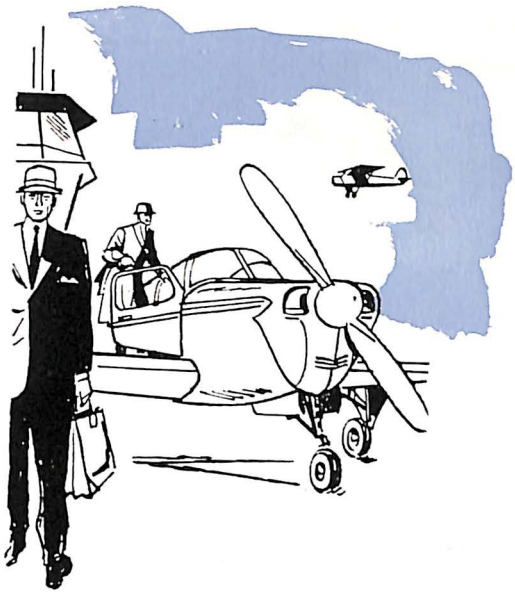
[a] Civil airplane production shown here differs from that on pp 6 & 7. Recent FAA revision of total civil airplane production not yet carried through all breakdowns.

[b] The "General" category conforms closely to the total shipments figures of "Utility Aircraft" on pages 90 and 91.

Sources: 13, 27

small private or corporately-owned aircraft as a means of business transportation. The largest single segment of general aviation flying hours is for business purposes. This was an estimated 5.3 million hours last year. Business flying has increased 150 per cent in the past decade.

During the past five years, both the unit volume and the dollar value of general aircraft shipments have more than doubled. The past five-year period of steady industry growth has also seen the introduction and ready acceptance of a number of new models, including several new models of twin-engined aircraft, sales of which increased from 354 units in 1954 to 870 in 1958. There also has been a trend toward higher horse-



power engines in both single- and twin-engined aircraft, resulting in improved performance.

Hours flown in general aviation increased from 9.0 million in 1954 to 10.9 million in 1957. Half of the two million hour increase which occurred between 1954 and 1957 was due to the increasing use of the aircraft for business purposes. During the same period scheduled airline flight hours increased only 900,000, growing from 2.7 to 3.6 million.

Instructional flying hours increased sharply from 1.3 million in 1954

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

N.A.—Not available.
E Estimate.
Source: 27

to 1.9 million in 1957, which further bears out the strong and steady growth trend in the field of general aviation.

General aviation now is and, for as far as the future can be reasonably projected, will continue to be the largest user of the airspace. Thousands of businessmen, farmers and ranchers who measure their time in dollars have made the small airplane an indispensable tool of their operations.

Almost all multi-engined, and more than 50 per cent of the active single-engined, utility aircraft in operation today are extensively instrumented and fully equipped for all-weather flying under IFR (Instrument Flight Rules) conditions. In fact, it is the availability of accurate instruments and electronic navigational and radio equipments of a size and weight which can be satisfactorily installed, at a price which makes such equipments economically practical, which has contributed substantially to the present-day utility of the general aircraft fleet. The IFR capability of the general aircraft fleet, already proportionately large, is expected to increase. Value of the instrumentation alone aboard these planes now exceeds one hundred million dollars.

In 1957, a survey conducted by the General Aviation Facilities Planning Group revealed there were approximately 209,000 pilots with current medical certificates flying the general aviation fleet. Of this number 23,500 had instrument ratings. Relating these figures to the increase in instructional flying hours, the number has probably increased.

Although general aviation already includes some turbine-powered planes capable of high-speed operation, the great bulk of the general aircraft fleet will continue to operate at speed ranges of from 100-300 miles per hour, compared to airline operating speeds already in the 300 to 550 mile per hour speed range. The problem posed is that of mixing a few thousand high-speed aircraft with tens of thousands flying at half, or less, the speeds of the turbine-powered craft.

There is a need for many more small airports to accommodate the ever-increasing volume of general aviation, and improvement is needed

at the large airports so that simultaneous operation of the slower general aircraft and the high-speed airline type traffic can be jointly accommodated. One way to accomplish this is to provide a separate runway and a separate traffic pattern at such airports. This will increase the airport's capacity for larger aircraft by freeing runways which are now jointly used by both large and small planes, and will increase their capacity for the small aircraft which has an ever-growing need to feed traffic to and from these major centers.

The Airport Operator's Council estimates that $1 billion for airport development is needed in the next four years: to assure that airport capacity will keep pace with the growth of air transportation; to assure that adequate airports will be available to support air transportation's contribution to the national economy; and to assure that airports will be available for training and logistics of the military establishment and as standby bases in time of war.

The Federal Airport Act of 1946 authorized a grant-in-aid program to assist public agencies in the development of a nation-wide system of airports. Unfortunately, Federal appropriations have been made in varying amounts annually — no funds one year, very small appropriation in other years. This lack of stability has prevented communities from making reliable financial plans.

The vital modernization program for airports and facilities must not be allowed to lag if we are to fully realize the benefits of air travel.

CIVIL AIRCRAFT[a], BY YEAR OF MANUFACTURE
AS OF JANUARY 1, 1958

Year of Manufacture	Number	Percent of Total
	67,153	100.0
1957	4,573	6.8
1956	5,265	7.8
1955	3,315	4.9
1954	2,188	3.3
1953	2,718	4.1
1952	2,338	3.5
1951	1,450	2.2
1950	2,241	3.3
1949	2,044	3.1
1948	3,966	5.9
1947	7,548	11.2
Prior to 1947	29,507	43.9

[a] Number of active civil aircraft, commercial transport and utility, recorded with Federal Aviation Agency.
Source: 18

ANNUAL SHIPMENTS OF UTILITY AIRCRAFT, 1947 TO DATE[a]

(As reported to Aerospace Industries Association by selected manufacturers)

Year	TOTAL	Aero Design	Beech	Cessna	Piper	All Other Manufacturers
NUMBER						
1947	15,594	--	1,288	2,390	3,464	8,452
1948	7,037	—	746	1,631	1,479	3,181
1949	3,405	—	341	857	1,278	929
1950	3,386	—	489	1,134	1,108	655
1951	2,302	—	429	551	1,081	241
1952	3,058	39	414	1,373	1,161	71
1953	3,788	69	375	1,434	1,839	71
1954	3,071	67	579	1,200	1,191	34
1955	4,434	72	680	1,746	1,870	66
1956	6,738	154	724	3,235	2,329	296
1957	6,118	139	788	2,489	2,300	402
1958	6,414	97	694	2,926	2,162	535
MANUFACTURERS NET BILLING PRICE (Million Dollars)						
1947	$ 58.1	—	$13.4	$ 6.0	$ 7.7	$30.9
1948	32.4	—	10.1	6.8	3.1	12.4
1949	17.7	—	6.2	4.5	3.2	3.9
1950	19.2	—	6.5	5.5	3.1	4.1
1951	16.9	—	7.7	3.6	3.9	1.7
1952	26.2	$ 2.0	9.9	9.2	4.9	0.2
1953	34.5	4.3	9.5	12.1	8.3	0.3
1954	43.5	4.5	20.1	10.7	8.1	0.1
1955	68.3	5.1	24.9	21.9	16.0	0.4
1956	103.8	11.2	28.8	38.5	23.5	1.8
1957	99.7	9.9	32.1	31.0	23.3	3.4
1958	101.9	6.9	27.1	36.9	26.5	4.5

[a] The figures shown here may vary from CAA figures because they are based on reports by selected manufacturers only.

Source: 1

UTILITY AIRCRAFT, FACTORY SHIPMENTS, 1958

(As reported to Aerospace Industries Association by selected manufacturers)

Manufacturer and Model	Complete Aircraft[a] Number	Manufacturers Net Billing Price (Thousands of Dollars)
Aero Design		6,902
Model 500	31	
Model 560E	18	
Model 680, 680E	46	
Model 720	2	
Beech		27,072
Model 18S	60	
MS760	1	
Bonanza	376	
Twin Bonanza	60	
45 Mentor	25	
95 Travel Air	172	
Call Air		286
Model A4	26	
Model A5	13	
Model A6	4	
Cessna		36,897
150	122	
172	790	
175	702	
180	262	
182	874	
310B	176	
Champion		1,516
Model 7EC	50	
Model 7FC	200	
Model 7GC	46	
Colonial		138
1A13	6	
Helio		613
H 391B	21	
Mooney		1,868
Mark 20	160	
Piper		26,548
Super Cub	524	
Tri Pacer	720	
Apache	304	
Commanche	614	
Taylorcraft		99
Model 20	9	
TOTAL	6,414	101,939

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

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

Source: 1

U. S. Active Civil Aircraft, by Type and by States
As of January 1, 1958

State	Total active aircraft	Air Carrier (scheduled and irregular)	General Aviation		
			Multi-engine	Postwar 4- and 5-Place Single Engine	All Other
Alabama	597	10	43	206	338
Arizona	838	4	43	317	474
Arkansas	812	0	32	239	541
California	7,970	92	498	2,968	4,412
Colorado	942	34	63	340	505
Connecticut	524	0	48	182	294
Delaware	219	7	32	73	107
District of Columbia	331	68	91	66	106
Florida	2,079	104	195	651	1,129
Georgia	901	81	49	295	476
Idaho	639	0	25	250	364
Illinois	3,782	198	278	1,554	1,752
Indiana	1,933	8	126	793	1,006
Iowa	1,621	0	49	661	911
Kansas	1,715	0	96	772	847
Kentucky	478	0	37	230	211
Louisiana	1,021	1	112	329	579
Maine	330	0	3	108	219
Maryland	609	0	45	195	369
Massachusetts	947	29	66	289	563
Michigan	2,812	4	215	1,082	1,511
Minnesota	1,994	71	93	592	1,238
Mississippi	636	0	17	139	480
Missouri	1,646	204	102	584	756
Montana	927	1	37	330	559
Nebraska	1,111	0	48	382	681
Nevada	320	13	39	100	168
New Hampshire	170	0	12	48	110
New Jersey	1,269	12	113	462	682
New Mexico	630	0	40	306	284
New York	3,240	542	350	831	1,517
North Carolina	1,170	19	72	393	686
North Dakota	685	0	5	134	546
Ohio	3,106	2	332	1,182	1,590
Oklahoma	1,402	0	176	524	702
Oregon	1,256	4	84	499	669
Pennsylvania	2,429	0	239	831	1,359
Rhode Island	146	0	7	49	90
South Carolina	390	0	20	128	242

U. S. Active Civil Aircraft, by Type and by States—*Continued*
As of January 1, 1958

State	Total active aircraft	Air Carrier (scheduled and irregular)	General Aviation		
			Multi-engine	Postwar 4- and 5-Place Single Engine	All Other
South Dakota	715	0	6	189	520
Tennessee	721	15	62	265	379
Texas	5,552	135	689	2,052	2,676
Utah	388	0	14	163	211
Vermont	108	0	6	32	70
Virginia	868	62	55	254	497
Washington	1,722	27	41	551	1,103
West Virginia	385	0	21	132	232
Wisconsin	1,410	0	117	436	857
Wyoming	367	0	18	146	203
Continental U. S.	65,863	1,747	4,961	23,334	35,821
Alaska	1,090	90	51	361	588
Hawaii	113	22	10	16	65
Other	87	5	14	40	28
Grand Total	67,153	1,864	5,036	23,751	36,502

Source: 27

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

[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: 27

PUBLIC AIRPORTS BY LENGTH OF RUNWAY AND REGION, JANUARY 1, 1958

Region	TOTAL	Airports by Length of Runway (in feet)						
		0-2,999	3,000-3,499	3,500-4,199	4,200-4,999	5,000-5,899	5,900-6,999	7,000- & over
TOTAL	3,195	1,363	397	467	265	387	118	198
New England	131	64	4	28	12	11	2	10
Middle Atlantic	280	170	40	26	14	20	2	8
East North Central	510	277	84	74	23	31	6	15
West North Central	145	54	21	28	12	20	2	8
South Atlantic	377	127	48	69	49	47	19	18
East South Central	354	58	40	56	47	70	40	43
West South Central	503	265	76	69	26	31	12	24
Mountain	362	121	40	47	38	85	6	25
Pacific	347	143	35	38	30	51	22	28
Other	186	84	9	32	14	21	7	19

Source: 27

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

N.A.—Not available.
[a] Airline Transport Rating became effective May 5, 1932.
Sources: 3, 27

LANDING AIDS TO AIR NAVIGATION, 1941 TO DATE

December 31	Instrument Landing Systems	Precision Approach Radar	Airport Surveillance Radar
1941	1	—	—
1946	31	—	—
1951	97	10	10
1952	120	10	10
1953	143	10	17
1954	153	10	28
1955	157	10	31
1956	160	10	40
1957	165	10	42
1958	171	10	47

Source: 27

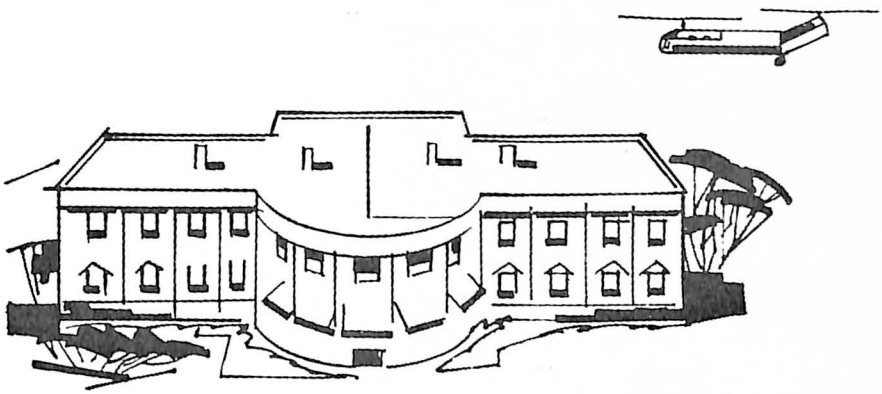
AIDS TO AIR NAVIGATION, 1926 TO DATE

Dec. 31	Civil Airways Mileage		Radio Range Stations		Non-directional Radio Beacons	Federally Operated Traffic Control Facilities		Air Traffic Communications Systems	Combined Station Towers
	Low and Medium Frequency	Very High Frequency	Low and Medium Frequency	Very High Frequency		Airport Towers	Airway Centers		
1926	2,041	—	—	—	—	—	—	—	—
1931	17,152	—	47	—	46	—	—	—	—
1936	22,245	—	146	—	57	—	—	203	—
1941	36,062	—	323	8	48	—	14	415	—
1946	44,145	—	364	50	74	115	29	397	—
1951	74,424	—	375	385	152	157	31	427	34
1953	72,097	54,490	368	392	181	115	31	395	53
1954	69,359	64,995	346	403	170	104	31	376	70
1955	67,770	81,209	344	424	175	100	31	364	75
1956	67,783	90,268	342	441	180	103	32	358	79
1957	64,817	104,484	332	486	185	110	33	356	81
1958	57,705	124,870	329	556	191	N.A.	N.A.	N.A.	N.A.

Sources: 3, 27

Helicopters

9



The versatile flight characteristics of the helicopter which have made it an exceptionally useful vehicle have been further augmented by two significant breakthroughs during the past year.

First is the highly successful adaptation of the turbine engine, with accompanying reductions in direct operating costs, improvements in noise problems, and other benefits relating to maintenance and operations. In short-haul transport helicopter service, the lighter-weight turbine power plant will permit a 40 per cent increase in payload within a 100-mile range; and direct seat-mile operating cost will be reduced approximately as much as 50 per cent. Turbine-powered helicopters are in civil and military operation today.

The second major breakthrough is "all-visibility instrument flight," the result of improved stability and instrumentation. With the development and refinement of electronic automatic stabilization systems for helicopters, its instrument flight potentialities took a vast step forward.

An antisubmarine helicopter recently put into production for the Navy by one manufacturer demonstrates the substantial progress made in instrument operations. This helicopter, in addition to being fully capable of point-to-point instrument flight, can automatically fly to a predetermined point and there hover at a predetermined altitude. Instruments and equipment include a Doppler groundspeed sensing

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

Company and Helicopter	1953	1954	1955	1956	1957	1958
TOTAL	111	131	146	268	311	200
Bell						
47 Series	59	68	84	111	132	99
Hiller						
12B	34	20	16	—	—	—
12C	—	—	—	21	21	12
12E	—	—	—	—	—	4
Republic Alouette	—	—	—	—	—	5
Sikorsky						
S-55	18	43	41	52	38	11
S-58	—	—	5	55	60	22
Vertol						
H-21	—	—	—	29	60	35
V-44	—	—	—	—	—	12

Source: 1

unit, automatic engine speed controls, new radar altitude measuring equipment, and a "hover coupler" for automatic hovering.

One electronic stabilization system, which provides complete automatic stabilization used continuously throughout the flight of the helicopter, was certificated within the past year by the Federal Aviation Agency for use in commercial helicopters.

The Federal Aviation Agency is currently sponsoring an experiment with a navigation system in New York in cooperation with New York Airways and the New York Port Authority. The experiment involves the use of New York Airways scheduled helicopter operations. This program was designed to assist in the development of air traffic control techniques, reduce enroute minimums and thereby increase schedule regularity and reliability, establish precise flight tracks and optimum operation over densely populated areas. A further tentative program is being scheduled by FAA for this fall in the form of an all-weather test

project, designed to provide operating data and experience of a regularly scheduled all-weather helicopter operation using military helicopters.

In the last two years, total military helicopter flight hours increased 61 per cent from 550,000 in Fiscal Year 1956 to 886,000 hours in Fiscal Year 1958. The military services continue to expand the use of the helicopter beyond its proven role as a transport and rescue vehicle. It is utilized in a variety of unique tasks; such as fire fighting, antisubmarine warfare, missile and rocket transport, and combat reconnaissance. The strong support given the helicopter by the military forces has provided the basis for the development of a substantial commercial market. The great variety of essential services the helicopter performs for the armed services has served to draw the attention of commercial users who can apply the helicopter's adaptability to civil needs.

During 1958, more than 30 new commercial helicopter services were organized. There are now approximately 150 commercial helicopter operators in the United States and Canada. These companies operate more than 540 helicopters—ranging in size from 3 to 15 places. This represents a 41.4 per cent increase in the number of operators and a 15 per cent increase in the number of helicopters as compared with 1957.

In addition to these commercial operators and the three scheduled helicopter airlines (Los Angeles Airways, Inc., Chicago Helicopter Airways, Inc., and New York Airways, Inc.) more than 75 corporations are now operating helicopters as executive transports. There are at least 19 State and Federal agencies which own and operate more than 35 helicopters. Many of these helicopters were obtained under the Civil Defense matching funds program. Civil Defense will pay for half the cost of a helicopter under an agreement with the states with the proviso that the helicopter will be available on a standby basis to Civil Defense for rescues or in cases of local disaster.

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
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

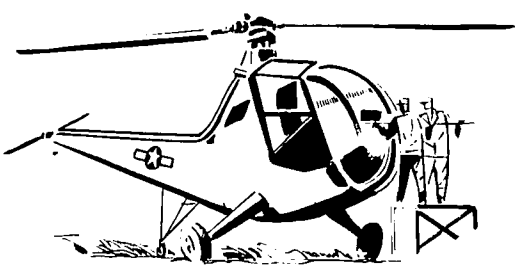
[a] Includes spare parts, subcontracts, etc.
Source: 1

During the past year, the three scheduled helicopter airlines set a new record in the number of passengers carried, which totaled 232,000, as compared to 152,000 in 1957.

Today, U.S.-built helicopters are operating in all the states and in 57 foreign countries.

The Federal Aviation Agency advises that on January 1, 1953, there were approximately 2,000 civilian helicopter pilots in the United States. Five years later, as of January 1, 1958, there were 5,565. The number of military pilots is not available.

The civil helicopter fleet offers a myriad of services to communities. They serve as "air taxis," as "skywatchers" for traffic departments, as "flying cranes" for construction companies, as "tractors" on the farm,



as "trucks" in hauling products ranging from perishables to heavy equipment and as "aerial ambulances," as well as playing the key role in rescue operations under conditions in which the 'copter is the only guard between life and death.

The expanding use of these civilian helicopters focuses the need for city-center and suburban heliports. In this connection, the Helicopter Council of the Aerospace Industries Association published a Heliport Design Guide for charter and private operations to aid city planners in the selection of heliport sites. The Council distributed 10,000 copies of this 12-page Guide to members of The American Society of Planning Officials, the Urban Land Institute, the National Association of State Aviation Officials, the American Association of Airport Executives and other groups and individuals concerned with planning aviation facilities for their communities.

The formation of an official industry-FAA Heliport Working Group was still another indication of expanding helicopter service in the country and the critical need for heliports. This Working Group was assigned the task of drafting an official heliport criterion. To assist in this project, the Helicopter Council arranged plant visits to a number of member plants selected by the FAA. Associations represented in the industry

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

Year	Passengers Carried	Available Ton-Miles Flown	Revenue Ton-Miles Flown	Ton-Mile Load Factor Percent	Revenue Passenger Miles Flown	Available Seat-Miles Flown	Passenger Load Factor Percent	Revenue Plane-Miles Flown
1948	—	108	28	25.93	—	—	—	284
1950	—	189	63	33.33	—	—	—	668
1952	—	181	75	41.44	—	—	—	631
1953	1	350	129	36.86	26	191	13.61	1,006
1954	9	388	152	39.18	183	716	25.58	1,071
1955	28	434	195	44.93	628	1,708	36.77	1,148
1956	62	567	277	49.03	1,588	3,561	44.59	1,315
1957	148	1,497	450	42.61	3,273	8,049	40.66	1,604
1958	228	1,397	598	36.95	4,885	11,419	42.78	1,675

Source: 4

group were: Air Line Pilots Association, Airport Operators Council, Air Transport Association, Aircraft Industries Association and the American Association of Airport Executives.

Highlighting increasing public support for a program to expand development of helicopter service and eliminate undue restrictions applicable only to fixed-wing aircraft, The American Legion at its 1958 national convention, in an official resolution, stated that "the tremendous potential of the helicopter, our most versatile vehicle, will not be realized until we eliminate any and all administrative and regulatory roadblocks to its operation." It urged the local Posts to strive for and support the adoption of local ordinances and regulations which will allow the helicopter to serve the community without undue restrictions. It pointed out the usefulness of the helicopter "as a scheduled carrier of passengers, mail and cargo, an aerial bus or taxi, an emergency rescue vehicle and as a workhorse in a variety of tasks for both Government and private industry."

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	Charter Flights
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	598	465	84	34	6	3	—

Source: 4

HELICOPTERS IN PRODUCTION AND DEVELOPMENT, 1959

Company	Symbol of Military Services	Civil Designation [a]	Number Places	Horse Power	Useful Load Pounds	Range, Nautical Miles	Maximum Speed M.P.H.
Bell	H-13H, Army	47G-2	3	250	886	238	100
	—	47H-1	3	200	851	211	98
	HUL-1, Navy	47J	4	250	1,235	200	105
	HTL-7, Navy	47K	2	250	649	198	103
	HU-1, Army, Air Force	204[b]	6	825	1,900	210	142
	XV-3, Army, Air Force	R & D[c]	2	450	1,210	408	184
Brantley	—	B-2	2	180	420[E]		100[E]
Cessna	YH-41, Army, Air Force	CH-1C	4	270	1,050	290	122
Gyrodyne	XRON-1, Navy, Marines	—	1	62	280	52	68
Hiller	H-23D, Army	12D	3	250	928	170	93
	—	12E	3	310	1,000	162	95
	XROE-1, Navy	Rotorcycle	1	45	256	31	66
	X-18, Air Force	R & D Tiltwing					
Hughes	YHO-2HU, Army	—	2	180	635	150	90
Kaman	H43-A, AF HOK, Marines HUK, Navy	K-600	5	600	2,000	220	108
	H43-B, Air Force	K 600-3	8	860	3,052	228	113
	HU2K, Navy	—		1,024			
	K16B	R & D (twin-engine)		1,025			250
	K17	—	2	400	772	70	80
McDonnell	—	XV-1	4	525	1,228		200
	—	120	1		2,550	85	136
Omega	—	BS-12	5	210 ea, (twin)	1,400[E]	165[E]	103[E]
Republic	—	Alouette II	5	400	1,400	375	122
	YHO-1, Army	Djinn	2	230	882	120	81
Sikorsky	Various—Army, Air Force, Navy, Marines	S-55 Series	10	600–700	2,250	350	101–112
	H37A, Army HR2S-1, Marines HR2S-1W, Navy	S-56 (twin-engine)	36	4,200	10,310	121	130
	Various—Army, Navy, Marines, Coast Guard	S-58	18	1,525	5,370	302	123
	—	S-62 R & D	10	1,024	2,950	202	117
	—	S-60 (twin-engine)	2	2,100	12,200		130

(*Continued on next page*)

HELICOPTERS IN PRODUCTION AND DEVELOPMENT, 1959—*Continued*

Vertol	H-21B, Air Force	—	22	1,425	4,730		115
	H-21C, Coast Guard	44	15–19	1,425	5,360		125
	YHC-1—107	R & D	25				
	UZ-2—76	R & D	2				

E—Estimate
[a]If certificated by F.A.A.
[b]Certificate pending
[c]Convertiplane
Source: 1

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

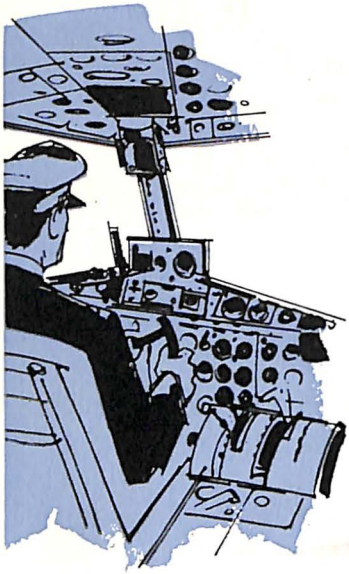
Source: 16

Airlines and Transportation

10

The progress of the United States domestic and international airlines in the last two decades has come about by a fruitful blend of cooperation and competition. Cooperation, that is, of the airline industry and the aircraft manufacturing industry, in areas such as safety development, improvement of operational techniques, and in techniques designed to make things more convenient for the passenger or shipper. Competition, of a particular intense variety, is carried on in matters of market development among the air carriers.

The Congress, when it adopted the Civil Aeronautics Act in 1938—and enacted the Federal Aviation Act of 1958—and directed the Government to promote the sound economic development of the air transport industry, legislated wisely and well. The future progress in the public interest now depends upon the ability of the industry and the Government to work together effectively in applying this congressional mandate.



Despite the continually upward spiraling of costs over the last 20 years the scheduled air carriers of the U.S. are now offering the public a fare level only 3.2 per cent greater than the 1939 level.

During this time, the airlines have greatly expanded their usefulness by adding most U. S. cities to their network, carrying more passengers, more freight and increasing their service to the U.S. Post Office Department.

Contribution of the U.S. airlines to the national defense has also increased. Today, more than 300 long-range, four-engine aircraft are available to the Department of Defense on 36 hours' notice for airlift in the event of a national emergency.

Last year, the first U.S. commercial pure jet planes went into scheduled operation. The speed of the new planes, the comfort they will afford passengers, the almost-revolutionary changes that will improve the lot of the traveler, shipper and postal user, are but a few of the major benefits.

This age means business, not only in terms of the multibillion dollar investment that will go into the planes and the supporting equipment right now, but more importantly, in the years to come.

Here is how the investment made by the nation's airlines will be apportioned:

$2,500,000,000 for new aircraft, along with spare parts and engines.

$250,000,000 for supporting ground equipment, hangars, maintenance bases and other equipment.

$220,000,000 to be spent by others for facilities, but to be taken over, and paid for, by the airlines.

The investment for 1959 alone compares favorably with the capital expenditures of basic manufacturing industries.

The overall importance of the investment to the general economy promises to have a far greater, and more lasting, benefit in the long run than the temporary pump-priming effect of the aircraft orders.

The investment is radiating out into the nation's economy, creating more jobs, and making existing jobs more secure, by the need to: (1) supply the airline orders; and (2) maintain this enormous fleet when it is delivered and in scheduled service.

The airlines are good customers of more than 10,000 different concerns who supply the more than 100,000 different items that carriers need.

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

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

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

U. S. SCHEDULED AIRLINES—AIRCRAFT IN SERVICE BY MAKE AND MODEL AS OF DECEMBER 31

Domestic						International[a]					
Aircraft Make and Model	1941	1955	1956	1957	1958	Aircraft Make and Model	1941	1955	1956	1957	1958
Bell											
B47D,G	..	7	7	6	6						
Boeing						Boeing					
247D	27	..	..	..	..	307	3	..	..	..	..
307	5	..	..	..	..	314	8	..	..	..	..
377	..	10	9	9	9	377	..	26	25	24	23
Convair						707	..	..	..	..	6
240	..	93	95	99	76	Convair					
340	..	123	123	134	133	240	..	5	5	1	..
440	..	..	19	31	31						
Curtiss											
C-46	..	..	3	7	7						
Douglas											
DC-3, 3S	280	301	321	312	307	Douglas					
DC-4	..	100	75	39	31	DC-2	3	..	..	..	..
DC-6,A, B	..	190	218	267	271	DC-3	45	18	15	10	8
DC-7	..	77	99	169	214	DC-4	..	28	40	28	27
Fairchild						DC-6A, B	..	60	70	68	83
F-27					10	DC-7	..	5	33	38	38
						Grumman					
Lockheed						G-21	..	..	..	1	..
10	16	..	..	..	..						
18	13	9	10	10	7	Lockheed					
L49	..	44	50	59	53	10	2	..	..	..	..
749	..	58	58	57	56	18	3	..	..	..	..
1049	..	61	73	81	89	L49	..	5	6	..	..
1649	..	..	..	25	29	1049	..	..	2	..	..
Martin											
2-0-2	..	19	23	25	26						
4-0-4	..	100	97	85	95						
Sikorsky						Martin					
S51	..	2	2	2	2	130	1	..	..	..	..
S55	..	10	8	12	6						
S58	..	..	3	6	5	Sikorsky					
Vertol						S42B	4	..	..	..	..
V44B	..	..	..	..	5	S43	1	..	..	..	..
Vickers											
700 Series	..	8	54	59	65						
800 Series	..	..	..	..	15						
TOTAL	341	1212	1347	1494	1546		70	147	196	170	185

(*Continued on next page*)

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

Domestic						International[a]					
Aircraft Make and Model	1941	1955	1956	1957	1958	Aircraft Make and Model	1941	1955	1956	1957	1958
Fixed Wing											
4-engine turbojet	..	..	..	..	..		..	..	..	..	6
4-engine turboprop	..	8	54	59	80		..	..	..	..	..
2-engine turboprop	..	..	..	..	10		..	..	..	..	..
4-engine piston	5	540	582	706	752		16	124	176	158	171
2-engine piston	336	645	691	703	682		54	23	20	12	8
Helicopter											
Piston engine	..	19	20	26	22		..	..	..	..	..

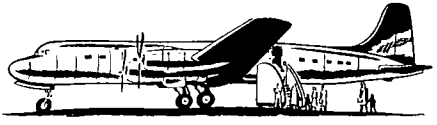
[a] Excludes certain aircraft in both domestic and international operations.
Source: 27

Last year airline spending reached an all-time peak when they reinvested into the U.S. economy more than two billion dollars among suppliers, employees and, through taxes, to Federal, state and local agencies.

Wages and salaries of airlines reached $834 million in 1957, and increased further in 1958.

Financially, 1958 was the same kind of frustrating year that the air transport industry had experienced in 1957; record-breaking revenues, all-time highs in traffic, but, when all the bills were paid, a net profit that remained at a critically low level.

Generally, airline traffic showed an increase over 1957. The domestic airlines—compared with their public transportation competitors, the railroads and the buses—more than held their own. While the airlines



maintained their 1957 level, the railroads' passenger traffic dropped 14 per cent and the buses dropped two per cent.

Mail reached new highs with a 165,000,000 ton-mile haul in the year ending June 30, 1958. Cargo ton-miles showed a drop, due to the cessation of common carriage by one of the major all-cargo carriers.

While the total amount of aid that has been given to the domestic airlines since 1938 is small in relation to many other support programs of the United States Government, the country has benefited from the investment in an actual return that now approaches the billion dollar mark.

SUMMARY OF U. S. AIR TRAFFIC TRENDS, 1948 TO DATE

Year Ending June 30	TOTAL[a]	Domestic Trunk Lines	Local Service Carriers	International Carriers	Territorial and Alaska	Other Carriers
Revenue Passenger-Miles (Millions)						
1948	7,913	5,931	64	1,868	N.A.	....
1953	18,465	13,398	371	3,261	113	1,322
1956	27,186	20,460	585	4,801	130	1,210
1957	30,323	23,049	688	5,522	147	917
1958	32,276	24,599	787	5,920	152	818
Cargo Ton-Miles (Millions)						
1948	137	89	[b]	46	N.A.	....
1953	452	182	2	89	3	176
1956	598	248	3	115	5	229
1957	692	286	4	133	6	263
1958	652	290	4	141	6	211
Mail Ton-Miles (Millions)						
1948	50	36	[b]	14	N.A.	....
1953	95	69	1	23	2	....
1956	147	89	1	55	1	1
1957	158	95	2	57	2	2
1958	165	100	2	60	2	1

N.A.—Not available.

[a] "Total" may exceed the listed components because subtotals for "Not Available" items may be included.

[b] Less than one-half million.

Source: 18

DOMESTIC SCHEDULED AIRLINES—OPERATORS, EQUIPMENT, AND SPEED
1926 TO DATE

As of December 31	Operators	Aircraft in Service	Average Available Seats	Route Mileage Operated	Average Speed, M.P.H.	Passenger Fatalities per 100 Million Passenger-Miles Flown
1926	13	N.A.	N.A.	N.A.	N.A.	N.A.
1930	43	497	N.A.	30,293	N.A.	N.A.
1935	26	363	10.33	29,190	N.A.	N.A.
1940	19	369	16.54	42,757	N.A.	3.0
1945	20	421	19.68	48,516	155.4	2.2
1950	38	960	37.47	77,440	181.2	1.1
1951	38	981	39.55	78,913	184.6	1.3
1952	35	1,078	42.71	77,894	190.8	0.4
1953	32	1,139	46.07	78,384	197.8	0.6
1954	32	1,175	50.06	78,294	205.8	0.1
1955	31	1,212	51.62	78,992	209.0	0.76
1956	30	1,347	52.43	84,189	212.6	0.6
1957	30	1,494	53.99	88,325	216.1	0.1
1958	30	1,546	55.79	89,747	219.6	N.A.

N.A.—Not available.
E Estimate.
Source: 27

Subsidy now accounts for only 2.2 per cent of the total airline revenues. The greater part of the Government aid today goes to the local service airlines in order to guarantee air service to smaller communities. Other subsidy payments go to help develop the experimental helicopter service in three cities, for Alaskan airlines, and to maintain national interest routes in Latin America. No domestic trunk line is now receiving subsidy.

U. S. INTERNATIONAL SCHEDULED AIRLINES—OPERATORS, EQUIPMENT, SPEED, 1928 TO DATE

As of December 31	Operators	Aircraft in Service	Average Available Seats	Route Miles Operated (thousands)	Average Speed M.P.H.	Passenger Fatalities per 100 Million Passenger-Miles Flown
1928	1	57	N.A.	N.A.	N.A.	N.A.
1930	3	103	N.A.	19.2	N.A.	N.A.
1935	2	101	N.A.	31.3	N.A.	N.A.
1940	3	68	18.3	52.3	N.A.	N.A.
1945	4	97	18.9	38.9	150.7	3.7
1950	12	160	41.0	106.4	218.4	2.1
1951	12	140	46.4	108.8	223.5	1.1
1952	13	148	49.1	110.5	226.8	3.0
1953	14	161	52.3	112.3	229.9	0.1
1954	15	161	56.9	111.8	N.A.	N.A.
1955	15	147	57.03	114.0	245.4	0.4
1956	13	196	59.03	113.7	249.1	0.19
1957	14	170	61.88	133.9	254.0	0.6
1958	15	171	64.35	138.8	257.8	N.A.

E Estimate.
N.A.—Not available.
Source: 27

The airspace—that rapidly dwindling natural, and public, resource—has now for the first time been placed under single, and unified, management. The management is the Federal Aviation Agency.

The Air Force estimates that the military planes fly about ten million hours a year—within the continental U.S. The general aviation planes fly about 11½ million hours a year and the airlines about 3.9 million hours.

Complicating the problem of allocation is the fact that not all of the navigable airspace can be used. Areas around radio-TV towers and tall buildings and over natural preserves are closed off to all kinds of flying. Also, some 130,000 square miles over the continental U.S. are closed off to nonmilitary flying.

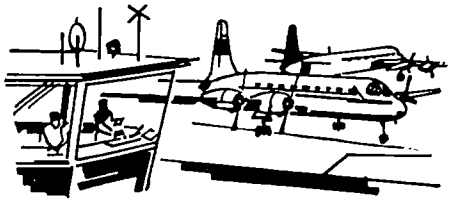
The end result of the planning on the part of the airlines and the Government, with the cooperation of the other users, the military and general aviation, has as its ultimate goal, safety.

The safety record of the airlines has demonstrated the wisdom of advanced planning, as well as the manufacturers' ceaseless search for equipment and devices that will make flying safer today than it was yesterday.

The record: in the last seven years, the domestic scheduled airlines have had a safety rate of less than one fatality for every one hundred million passenger miles.

Domestic scheduled airlines flew a total of 25.3 billion revenue passenger miles in 1958, almost exactly the same as in 1957. Passenger load factors, an index showing the actual use of available seat miles, continued to drop. It reached 59.43 per cent in 1958, having been 60.83 per cent in 1957 and 63.37 per cent in 1956.

The average length of a trip on a domestic scheduled airline has remained almost the same over the last five years, about 520 miles.



Trunk line jet programming indicates that a total of 62 pure-jet and 185 prop-jet airliners will have been delivered by the end of 1959.

The fastest service in international airline history was introduced in 1958, but U.S.-flag airlines saw their share of the total market continue to shrink. Two-thirds of the increased air travel between the U.S. and foreign countries was secured by foreign-flag airlines.

It was a record year for traffic. U.S.-flag airlines flew an all-time

DOMESTIC AIRMAIL RATES, SINCE 1918

Effective Date	Rate	Note
1918, May 15....	24¢ per ounce or fraction	10¢ of this for special delivery
July 15.....	16¢ for first ounce or fraction	10¢ of this for special delivery
Dec. 15....	6¢ per ounce or fraction	
1919, July 18.....	2¢ per ounce	
1924, July 1.....	8¢ per ounce or fraction per zone	3 zones established
1925, July 1.....	10¢ per ounce or fraction	Overnight airmail New York-Chicago
1926, Jan. 19.....	10¢ per ounce for fraction up to 1,000 miles	More for greater distances
Sep. 4-11...	Special rates for special services	Varying from 8 to 32¢
1927, Feb. 1.....	10¢ per half ounce or fraction	Zoning abandoned
1928, Aug. 1.....	5¢ for first ounce or fraction	
1932, July 6.....	8¢ for first ounce or fraction	
1934, July 1.....	6¢ per ounce or fraction	
1944, Mar. 26....	8¢ per ounce or fraction	Overseas mail to servicemen 6¢ per half ounce
1946, Oct. 1.....	5¢ per ounce or fraction	
1949, Jan.1	6¢ per ounce or fraction 4¢ per postal card or post card	
1953, Oct. 6.....	Experimental airlift of 3¢ mail	On a "space available" basis between selected points.
1958, Aug. 1	7¢ per ounce or fraction 5¢ per postal card or post card	Airlift of 4¢ mail on "space available" basis between selected points.

Sources: 3, 46

EMPLOYMENT, WAGES, AND AVERAGE ANNUAL EARNINGS IN THE TRANSPORTATION INDUSTRY, 1957

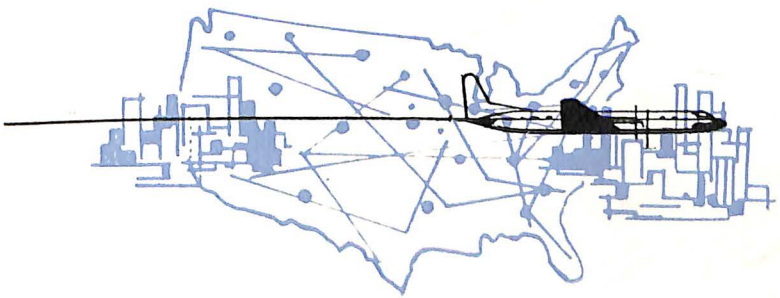
	ALL INDUSTRY	ALL TRANSPORTATION	Air Transportation (Common Carrier)	Railroads	Highway Transportation	Water, Pipeline, and Other Transportation
Full-Time Equivalent Employees (Thousands)	56,544	2,657	145	1,117	1,038	357
Wages and Salaries (Million Dollars)	$238,120	$13,939	$834	$6,057	$5,059	$1,921
Average Annual Earnings per Full Time Employee	$4,211	$5,246	$5,752	$5,423	$4,874	$5,572

Source: 7

high of 6.0 billion revenue passenger miles, up 3.9% from the previous record total of 5.8 billion in 1957. Cargo ton-miles reached a new high of 141 million for an increase of 6.0% over 1957.

The gap between air and sea travelers widened with air traffic accounting for 60 per cent of the total U.S./foreign market. But increased competition from foreign-flag airlines was evident as those carriers, for the first time, carried more passengers to and from the U.S. than all steamship companies combined, increased their share of the total U.S./foreign air market to 40% and, in such vital areas as the North Atlantic, widened their share to 59% by year end.

The local airline service pattern continues to expand rapidly. These



DOMESTIC SCHEDULED AIRLINES—PASSENGER SERVICE, 1926 TO DATE

Year	Passengers Carried[a] (Thousands)	Passenger Seat-Miles Flown (Millions)	Revenue Passenger-Miles Flown[b] (Millions)	Revenue Passenger Load Factor (Percent)	Average Passenger Revenue per Passenger-Mile (Cents)	Average Length of Trip (Miles)
1926	5.8	N.A.	1.0	N.A.	N.A.	N.A.
1930	384.5	N.A.	85.1	N.A.	8.3	221
1935	678.5	577.7	316.3	N.A.	5.7	415
1940	2,802.8	1,817.1	1,052.2	57.90	5.1	375
1945	6,476.3	3,815.6	3,362.5	88.12	5.0	511
1950	17,343.7	13,064.5	8,002.8	61.26	5.6	461
1951	22,652.2	15,565.7	10,566.2	67.88	5.6	466
1952	25,009.8	19,098.0	12,528.3	65.60	5.6	501
1953	28,721.0	23,263.2	14,760.3	63.45	5.5	514
1954	32,343.0	26,851.4	16,768.7	62.45	5.4	518
1955	38,026.0	31,299.0	19,819.0	62.29	5.3	521
1956	41,738.0	35,285.7	22,361.8	63.37	5.3	536
1957	48,563.6[c]	41,653.2	25,339.6	60.83	5.3	522
1958	48,130.0[c]	42,643.0	25,343.4	59.43	N.A.	527

E Estimate.
N.A.—Not available.
[a] 1926-1934: Duplicated revenue and nonrevenue passengers. 1935-1941: Duplicated revenue passengers. 1942 to date: Unduplicated revenue passengers.
[b] 1926-1936: Includes nonrevenue passenger-miles.
[c] Enplaned pasengers. These figures are not comparable to those for previous years.
Source: 27

carriers increased their revenue passenger miles by 14.4 per cent in the year ending June 30, 1958, compared with the preceding year.

The number of cities served by local carriers increased from 468 to 516 at the end of the year. It is significant that 283 of those communities would otherwise be without scheduled airline passenger, mail and freight service.

During 1958, the scheduled helicopter carriers continued their upward traffic trend registered so markedly the previous year.

Revenue ton-miles, the overall indicator of activity, were up 32.9 per cent for the year, from 450,000 to 598,000, a new high.

U. S. INTERNATIONAL SCHEDULED AIRLINES—PASSENGER SERVICE
1930 TO DATE

Year	Passengers Carried[a] (Thousands)	Passenger Seat-Miles Flown (Millions)	Revenue Passenger-Miles Flown[b] (Millions)	Revenue Passenger Load Factor (Percent)	Average Passenger Revenue per Passenger Mile (Cents)	Average Length of Trip (Miles)
1930	33.0	N.A.	18.6	N.A.	N.A.	464
1935	111.3	N.A.	46.0	N.A.	N.A.	381
1940	170.2	175.5	99.8	56.88	8.83	614
1945	493.5	583.4	448.0	76.78	8.67	942
1950	1,675.5	3,695.4	2,206.4	59.71	7.28	1,316
1951	2,041.8	4,327.7	2,599.8	60.08	7.10	1,273
1952	2,365.5	4,850.9	3,021.0	62.28	7.04	1,277
1953	2,700.4	5,472.5	3,385.6	61.87	6.87	1,254
1954	2,875.0	6,288.0	3,750.0	59.63	6.79	1,314
1955	3,415.0	7,029.0	4,419.0	62.87	6.69	1,294
1956	3,949.0	8,104.7	5,126.1	63.25	6.70	1,298
1957	4,422.2[c]	9,076.4	5,769.5	63.57	6.66	1,305
1958	4,594.1[c]	10,103.2	5,992.3	59.31	N.A.	1,304

E Estimate.
N.A.—Not available.
[a] 1930-1946: Total passengers; 1947 to date; Revenue passengers only.
[b] 1930-1937: Total passenger-miles; 1938 to date: Revenue passenger-miles.
[c] Enplaned pasengers. These figures are not comparable to those for previous years.
Source: 27

The helicopter lines carried 228,000 passengers during the year, a 54.1 per cent increase over the previous year. The passenger mile figure was up, too, during 1958. The lines operated 4,885,000 passenger miles, a 49.3 per cent gain over the year before.

Available ton-miles were at a new peak. The helicopter lines operated 1,497,000 available ton-miles in 1958, compared with 1,056,000 in 1957, a gain of 41.8 per cent.

Together, the three helicopter lines operate 22 aircraft over 905 route miles serving 29 points.

AIRCRAFT[a] IN SERVICE ON WORLD AIRLINES, APRIL 1959
Members of International Air Transport Association[b]

Aircraft by Country in Which Manufactured	Number of Aircraft	Per Cent of Total
GRAND TOTAL	3,197	100.0
Made in the United States	2,642	82.6
707	6	
Stratocruiser	32	
Convair 440	98	
Convair 340	147	
Convair 240	107	
DC-7	243	
DC-6	417	
DC-4	171	
DC-3	793	
Super Constellation	230	
Constellation	140	
Martin 4-0-4 and 2-0-2	114	
Commando C-46	64	
All other	80[c]	
Made in Great Britain	455	14.2
Viscount 800 Series	83	
Viscount 700 Series	152	
Viking	50	
DH Heron	54	
DH Dove	16	
DH Rapide	12	
Britannia	12	
Hermes	13	
York	18	
All other	45[d]	
Made in France	24	0.8
Caravelle	3	
Breguet	12	
All other	9	
Made in Canada	59	1.9
DC-4M	18	
All other	32	
Made in other countries	17	0.5

[a] As of April 22, 1959, U. S. Flag Carriers were operating 14 additional 707's and 35 Electras.
[b] Does not include the airlines of the Soviet and some of the smaller airlines of the world.
[c] Includes 31 helicopters.
[d] Includes 3 helicopters.
Source: 31

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)	Average No. of Passengers Per Aircraft	Average Miles Flown Per Passenger
1919	1	N.A.	N.A.	N.A	N.A.	N.A.	N.A.
1929	57	N.A.	132	N.A.	N.A.	2.3	N.A.
1934	101	N.A.	405	N.A.	N.A.	4.0	N.A.
1939	185	N.A.	1,262	N.A.	N.A.	6.8	N.A.
1944	257	N.A.	3,412	N.A.	N.A.	13.3	N.A.
1949	840	27	15,000	390	130	18	545
1951	1,010	42	22,000	640	170	22	520
1953	1,190	52	29,000	720	190	24	560
1955	1,430	68	39,000	910	260	27	570
1956	1,580	77	44,000	1,040	280	28	575
1957	1,750	86	51,000	1,135	300	29	593
1958	1,845	89	53,500	1,145	320	29	600

N.A.—Not available.
Source: 32

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

Year	Airlines		Railroad		Intercity Bus
	Domestic Scheduled	Domestic Non-Scheduled	Coach (Excluding Commuter)	Pullman (Total)	
1926	12.0	—	3.35	N.A.	2.96
1937	5.6	—	1.80	3.08	1.73
1947	5.1	—	2.02	3.53	1.70
1952	5.55	3.20	2.53	4.60	2.02
1953	5.45	3.20	2.53	4.68	2.06
1954	5.39	3.20[E]	2.50	4.66	2.08
1955	5.35	3.20[E]	2.47	4.62	2.06
1956	5.32	3.20[E]	2.56	4.77	2.13
1957	5.30	3.20[E]	2.71	5.20	2.29
1958	5.30[E]	3.20[E]	2.76	5.30	2.42[E]

N.A.—Not Available.
[E] Estimate.
Sources: 1, 3, 27, 33, 41

TRANS-ATLANTIC PASSENGER TRAVEL BY AIR AND SEA, 1950 TO DATE

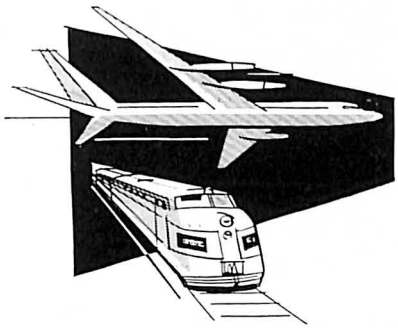
Year Ending June 30	By AIR (Regular Scheduled)			By SEA, PASSENGERS
	TOTAL PASSENGERS	U. S. Carriers	Other	
Westbound				
1950	161,091	106,908	54,183	427,113
1951	180,465	107,195	73,270	401,243
1952	194,914	114,659	80,255	458,427
1953	251,303	142,153	109,150	397,018
1954	309,648	177,124	132,524	419,559
1955	370,026	231,861	138,165	452,520
1956	481,618	307,280	174,338	479,401
1957	602,404	354,958	247,446	457,119
1958	681,837	384,370	297,467	440,116
Eastbound				
1950	135,804	88,020	47,784	296,996
1951	137,733	82,990	54,743	262,378
1952	177,432	100,768	76,664	308,654
1953	245,718	143,928	101,790	354,494
1954	274,001	155,755	118,246	379,119
1955	338,163	206,111	132,052	377,932
1956	411,454	243,280	168,174	385,339
1957	463,044	255,427	207,619	376,349
1958	604,745	304,639	300,106	406,496

Source: 36

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

1958		1954	
United Air Lines	4,915	Pennsylvania Railroad	3,447
American Airlines	4,891	American Airlines	3,372
Eastern Air Lines	3,811	United Air Lines	3,135
Trans World Airlines	3,662	New York Central System	3,041
Pennsylvania Railroad	2,523	Eastern Air Lines	2,847
New York Central System	1,812	Trans World Airlines	2,611
Atchison, Topeka & Santa Fe Railway System	1,665	Atchison, Topeka & Santa Fe Railway System	1,948
Capital Airlines	1,413	Union Pacific Railroad Company	1,459
Delta Air Lines	1,400	Southern Pacific Company	1,342
Union Pacific Railroad Company	1,234	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: 19, 33



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

E Estimate.
N.A.—Not available.
Sources: 3, 27, 33

ESTIMATED INTERCITY PASSENGER TRAFFIC, BY TYPE, 1916 TO DATE

Year	TOTAL	Domestic Air Carriers	Railroads[a]	Highways	Inland Waterways
Billions of Passenger-Miles					
1916	36.0	[b]	35.2	[b]	.8
1939	270.7	.7	22.7	245.9	1.5
1941	310.6	1.4	29.4	278.0	1.8
1944	311.5	2.2	95.7	211.7	1.9
1948	424.5	6.1	46.0	370.9	1.8
1951	532.4	10.5	35.3	485.2	1.4
1954	621.9	16.7	29.4	574.4	1.7
1955	661.2	19.7	28.5	611.3	1.7
1956	695.3	22.3	28.2	642.9	1.9
1957	716.3	25.3	26.3	662.8	1.9
1958	739.2[E]	25.3	23.3	688.7[E]	1.9[E]
Percent					
1916	100.0	[b]	97.8	[b]	2.2
1939	100.0	.3	8.4	90.8	.5
1941	100.0	.4	9.5	89.5	.6
1944	100.0	.7	30.7	68.0	.6
1948	100.0	1.5	10.8	87.3	.4
1951	100.0	2.0	6.6	91.1	.3
1954	100.0	2.7	4.7	92.3	.3
1955	100.0	3.0	4.3	92.5	.2
1956	100.0	3.2	4.1	92.4	.3
1957	100.0	3.5	3.7	92.5	.3
1958	100.0	3.4	3.1	93.2	.3

[a] Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.
[b] Negligible.

Sources: 3, 27, 34

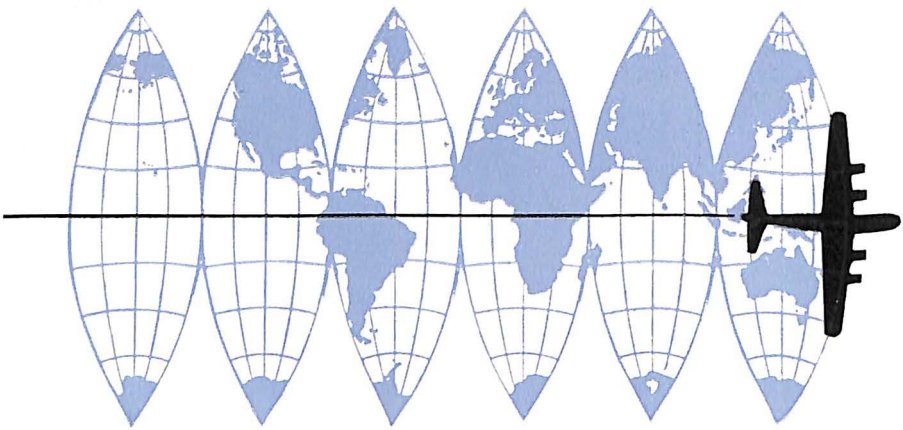
TRANSPORTATION ACCIDENT DEATH RATES
(Deaths per 100,000,000 Passenger-Miles)
1943 TO DATE

Year	Domestic Airlines	Railroads	Buses	Cars and Taxis
Passenger Deaths				
1943	1.4	0.31	0.22	2.7
1945	2.1	0.25	0.20	2.8
1949	1.3	0.13	0.20	2.2
1951	1.3	0.36	0.19	2.3
1952	0.35	0.35	0.18	2.9
1953	0.58	0.16	0.13	2.9
1954	0.09	0.08	0.11	2.6
1955	0.76	0.07	0.19	2.7
1956	0.62	0.20	0.16	2.7
1957	0.12	0.07	0.13	2.6
Total Deaths[a]				
1943	1.8	2.6	1.7	4.4
1945	2.4	2.5	1.5	4.6
1949	2.1	4.0	1.3	3.6
1951	1.5	4.3	1.2	3.4
1952	1.1	4.1	1.1	4.1
1953	0.7	3.9	0.9	4.0
1954	0.14	3.4	0.9	3.6
1955	0.9	3.6	1.06	3.7
1956	0.67	3.5	0.97	3.6
1957	0.13	3.5	0.7	3.4

[a] Includes pedestrians, employees, trespassers, etc.
Source: 42

Aviation Export and Foreign Aviation

II



The past year marked a period of transition for aviation export activities since quantity deliveries of turbine-powered planes will not be made to foreign airlines until the latter part of 1959, and most U. S. manufacturers have halted production of large piston transports.

Overseas dollar shortages and tight security restrictions placed on disclosure abroad of details relating to latest design developments still impose competitive handicaps. However, reliability, economy of operation, and high quality built into U. S. aircraft continue to thrust the products of the U. S. aviation industry well ahead in the competitive international market.

During 1958, aeronautical exports continued to level off, but increased civil shipments, especially heavier transports, offset the military aid decline.

U. S. exports of aviation products (not including missiles and related equipment) were valued at $971,704,000 during 1958. This was a drop of 5.5 per cent from the 1957 total. However, during the same period the total value of ALL U. S. exports dropped 14.4 per cent.

U. S. TOTAL EXPORTS AND EXPORTS OF AERONAUTIC PRODUCTS
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	17,857.9	971.7	5.4

[a] Less than .05 percent.
Sources: 16, 17

It is significant that the restricted category, "Aircraft, Parts, Accessories, N.E.C.," in which the overseas shipments of military aviation material are included with certain civil aviation items, dropped over 65 per cent. At the same time, the identifiable nonmilitary direct shipments increased 177 per cent. This indicates conclusively that during 1958 direct, factory, nonmilitary exports increased at a rate that came within a narrow margin ($57,024,000) of offsetting the very sharp decline in military overseas shipments.

Last year U. S. aviation exports accounted for 8.5 per cent of total production of such products and supported over 64,000 of the industry's workers.

During the thirteen years following World War II (1946 through December 1958), U. S. aviation exports have aggregated $7.1 billion in value. From the start (1939) of World War II through December 1958, the total has been $15.6 billion. The great measure of importance of this overseas business to the U. S. aviation industry may be judged from the fact that the extent of total production exported in recent years ranged

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	137.3
1958	127	146.4	36	3.5	9	5.6	82	164.7

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

(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

[a] Less than $500,000.

Source: 16

from a high of 16 per cent in 1949 (a big re-equipment year), down to 7.5 per cent in 1954 and up to 9 per cent in 1957 — an average of 10.1 per cent during the 1948-1957 period.

In the last five years the value of aviation overseas shipments have averaged 5 per cent of total U. S. merchandise exports. These figures clearly illustrate the significance of aviation exports to our national economy, security and prestige, employment and defense posture.

DOLLAR SHORTAGE

The industry has made broad strides in meeting the critical factor in export activities—dollar availability—despite acute dollar shortages in most countries abroad. The cooperation of bankers, furthered through numerous group meetings of the manufacturers and export financing organizations, has been most encouraging. The Export-Import Bank, the World Bank, commercial banks, insurance companies and private financing firms are individually and, in several cases, collectively rising to meet the occasion. Barring extraordinary intercession by other governments subsidizing their countries' aviation exports, continuance of sound competitive financing by American financing institutions should meet the situation.

SURPLUS AIRCRAFT

With the increasing number of turbine-powered transports now entering airline service, one of the knottiest problems ever faced by the U. S. aircraft industry is disposal of surplus piston-engine airliners.

A recent Government survey shows that the U. S. air carriers, foreign air carriers and the U. S. military services plan to dispose of an estimated 1,693 transport aircraft by the end of 1961. U. S. air carriers account for approximately half this number with 843 transports—556 four-engined and 287 twin-engined—scheduled to be released during the next three years. The magnitude of the problem is emphasized by the $827 million original cost of these airframes and components plus improvements through 1957.

The market already is limited for disposal of four-engined aircraft to the smaller foreign carriers since they serve less-populated cities and lighter-density routes which cannot support this larger equipment economically or technically. These local lines, most of them operating in the less developed areas abroad, are further handicapped by the lack

of airports capable of handling many of the surplus transports being released by U. S. carriers.

The aircraft industry has been working closely with inter-governmental committees seeking orderly and equitable solutions to these surplus transport aircraft disposal problems.

A firm foundation for disposing of used transports can be based on the continued growth of air transportation, particularly in the air cargo field, which should in the near future be able to absorb the most productive and useful of the equipment which will become surplus to the current main line requirements. There have been phenomenal gains made in Central and South America where the air cargo carriers are, in many cases, the only link for commerce between areas. Even in the United States, with a highly developed system of surface transportation, air cargo has demonstrated its increasing shipper acceptance. Since 1949, air freight and express tonnage has increased 410 per cent on scheduled U. S. carriers.

FOREIGN AVIATION

Further world-wide development in aviation manufacturing has increased the overall competitive export sales situation. Some areas appear to have reached a market saturation point due to lack of funds and facilities of purchasing nations; however, this is a temporary situation.

Progress in research and development and a trend toward increasing country-to-country licensing arrangements were significant factors during 1958.

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	1,846	1,697	149
TOTAL[a]	14,256	12,639	1,617

[a] Oct. 6, 1949 to Dec. 31, 1956.
Source: 24

The development of the European Common Market and minor advances in the convertibility of currency, primarily in Western Europe, are being closely followed. These developments, if properly directed, could do much to enhance all phases of aviation.

GREAT BRITAIN

Despite problems of transition within the British economy, which have directly affected aeronautical production, the British aircraft industry has conducted a successful export program during 1958. Total dollar value of aeronautical exports during 1958 amounted to $434.2 million dollars compared with $325.0 million in 1957.

The problems encountered in both aeronautical research and production will be especially difficult in the immediate future without some assistance from the British Government.

FRANCE

Available statistical data on French aircraft production is extremely limited. However, French aircraft designers have made advanced contributions during the past several years, and the medium, short-range Caravelle jet transport will be viewed with much interest as it enters airline service. France increased her aviation exports to the U. S. from $.1 million in 1957 to $4.4 million in 1958. Aircraft parts and equipment imported by France from the United States decreased from $51.9 million to $26.1 million during the same period.

U. S. EXPORTS OF 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

[a] Under 400 h.p.; data for exports of engines of 400 h.p. and over withheld for "security reasons."

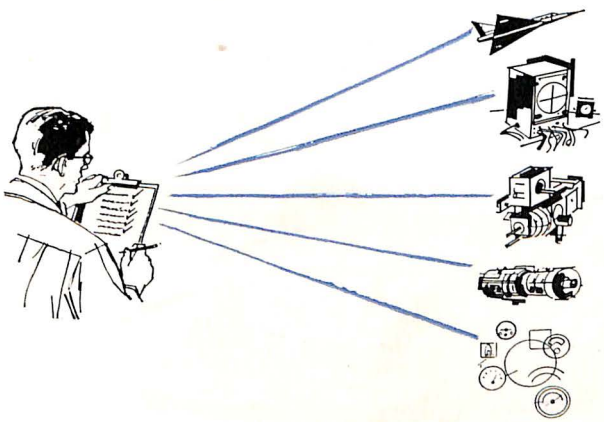
[b] Under 250 hp.

Source: 16

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

Sources: 7, 25



ITALY

Aircraft production in Italy during 1958 continued at about the same rate as in 1957. Italy won the NATO light fighter competition with the Fiat G-91 and has received orders for this aircraft.

Value of aircraft produced in 1958 continued at about 25 billion Italian lire ($40 million), approximately 25 per cent of which was produced for export. The Italian aircraft labor force appears to be stabilizing at about 10,000 employees.

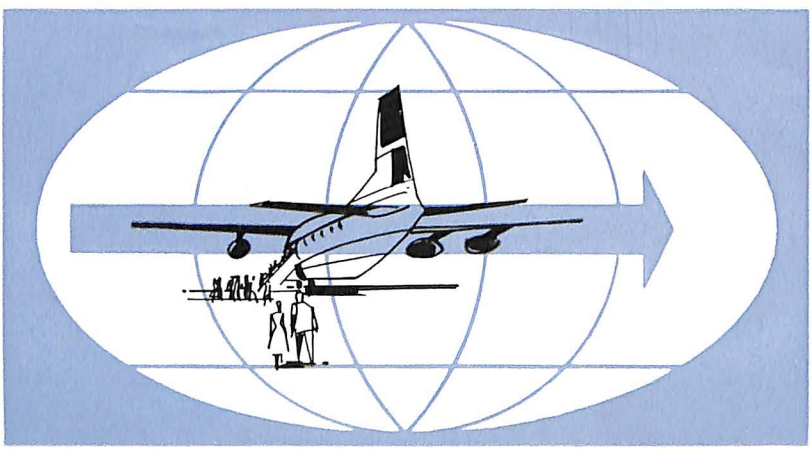
JAPAN

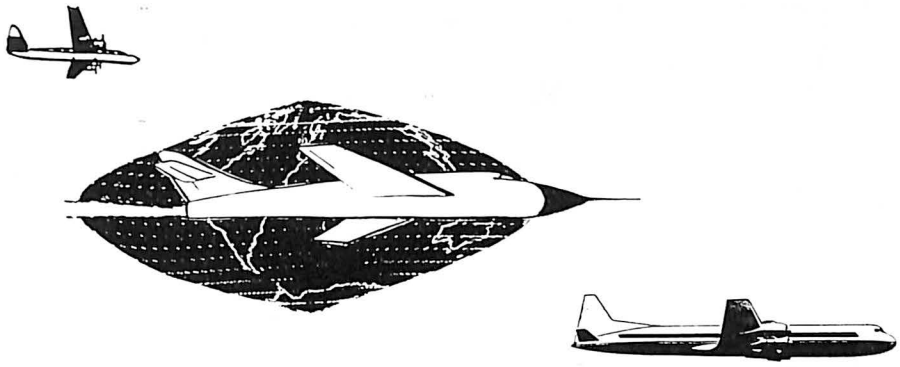
Japan continues to move conservatively in the development of aircraft manufacturing, and has placed considerable emphasis on licensing arrangements of foreign aviation equipment.

UNITED KINGDOM'S ORDERS FOR TRANSPORT AIRCRAFT
(From date of Certification to April 10, 1959)

Aircraft	Number
Armstrong Whitworth Argosy 650	4
Bristol Britannia	76
de Havilland Comet 4	27
de Havilland Comet 4B	6
de Havilland 121	24
Fairy Rotodyne	5
Vickers Viscount	405
Vickers Vanguard	40
Vickers VC-10	35

Source: 9





The proposed development of a transport to meet Japan's needs and also to compete in the export market appears to require more assistance from the Japanese Government.

A modest increase in the number of people employed in aircraft production is noteworthy during 1958. All aeronautical production during 1958 amounted to a little over $40 million. Aeronautical exports were not significant.

WEST GERMANY

Statistical information continues to be exceedingly meager on aircraft production in Germany; however, it is quite apparent that a considerable emphasis is being placed on licensing arrangements of foreign equipment, especially helicopters and fighter-type aircraft.

As of March 1, 1959, total employment in the German aviation industry amounted to 12,300, an increase of over 5,000 in comparison to 1957.

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

Source: 29

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

Source: 35

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.

N.A.—Not available.
E Estimate by official British sources.
[a] As of end of November.
[b] As of end of December.
Sources: 29, 30

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