AVIATION FACTS and FIGURES

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AVIATION FACTS AND FIGURES 1958

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FOREWORD

Fifty years ago, in 1908, the United States took delivery of its first military aircraft. It could fly at a speed of 44 miles an hour at an altitude of slightly more than 100 feet. Today, the United States aircraft industry is building, under Air Force supervision, an aircraft which is designed to travel at speeds approaching 4,000 miles an hour at altitudes above 100 miles.

During the last ten years, industry advances in aircraft technology have tripled speeds, doubled operational altitudes, increased firepower by seven or eight times, and have extended range by a factor of two or three.

We are deeply engrossed in bringing the development of the intercontinental ballistic missile to *operational* status. It, in turn, will provide the basic platform for associated development of both unmanned and manned space travelling vehicles. But our great effort to perfect and produce the long-range ballistic missile is not measured in terms of weeks, or even months. Aeronautical superiority is based upon adequate research and development and time for each. Any lead time we *may* have—and that lead is in doubt—stems not only from research and development contracts awarded years ago but, as significantly, from a financially stable industry. Financial stability is derived directly from a healthy program of long-range planning. These are the prerequisites of sound research and development efforts.

Financial stability and long-range planning of the aircraft industry were badly shaken during 1957 by an unfortunate fiscal

situation which developed suddenly at mid-year. The incident is delineated elsewhere in this book. Suffice it to say that drastic readjustments in research, development and production, directed by the Defense Department and immediately enforced by the industry, were met—not without hardship in many cases—in an effort to operate within the suddenly lower budget ceiling.

The effects of the sudden downward revisions of programming, coming in rapid succession, have been profound. The aircraft industry is complex, widely dispersed, reaching into tens of thousands of subcontracting and supplying companies. The machinery of aeronautical research, development and production is such that time lost cannot easily be regained. In light of the restive international situation which exists today, we can ill afford to lose any time in the building of aeronautical superiority.

This sixth edition 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, Aircraft Industries Association
May 1958

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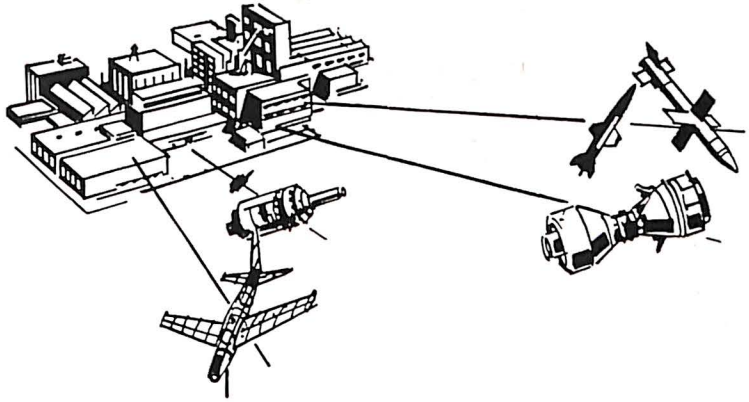


Production and Facilities 1

The year 1957 was one of the most extraordinary in the "peak and valley" history of the United States aircraft industry. The first seven months were normal. Production of military materiel proceeded at a relatively high level on schedules intended to peak early this year. Commercial transport and other civil aircraft production progressed satisfactorily.

But the last months of 1957 were marked by remarkable confusion, resulting in sharp reduction across the board in production efforts.

The sequence of events affecting the aircraft industry was so rapid and so radical that the industry found itself thrown out of tempo, out of phase, and into a state of uncertainty. It arose from a difficult situation within the Department of Defense in which it was discovered that the current rate of expenditure would exceed the $38 billion limit for fiscal year 1958 (ending June 30) by some $2 billion.

In June 1957, leading airframe, engine and systems and components manufacturers were summoned to Washington and were told that it would be necessary to make drastic economies due to the unusual fiscal situation. There followed through July and August, a series of cutbacks, stretch-outs and cancellations which affected practically all categories of the industry effort, except ballistic missiles.

Throughout this series of extraordinary events, the aircraft industry made every effort to cooperate with the military services, despite the uncertainties and disruptions suddenly brought upon the industry.

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*)

During the year, the industry delivered only an approximate 12,150 aircraft for civil and military use—about 1,850 units less than were produced in 1956. Of the aircraft produced, approximately 5,500 were delivered to the military—1,300 less than were delivered to the military in 1956. The industry produced 6,656 aircraft for civil use, representing a decrease of 549 units under the 7,205 civil aircraft produced in 1956.

In terms of airframe weight produced during 1957, military deliveries amounting to 77.6 million pounds, were 18.7 per cent below 1956

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	14,005[E]	6,800[E]	7,205
1957	12,156[E]	5,500[E]	6,656

N.A.—Not available.
E Estimate.
Sources: 1, 2, 3, 10, 19

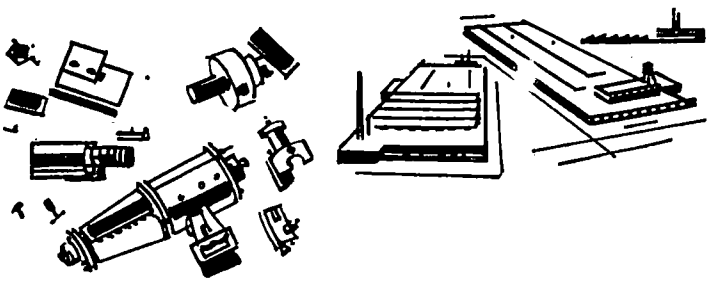
levels and 32 per cent below 1955 levels. In terms of dollar volume, during 1957, the leading aircraft, engine and systems and components manufacturers sold an estimated 7.9 billion dollars worth of aircraft, engines and related equipment to the military. In addition, almost 2.3 billion dollars of "other products"—mostly guided missiles—were delivered to the military services.

Although civil aircraft in number of units decreased during the year, their dollar value increase from $454.2 million in 1956, to $682.3 million in 1957. Indicative of the trend in general aviation manufacture

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

Year	TOTAL VALUE[a]	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]

[a] 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, 8, 12



to larger, heavier aircraft, particularly in the business types, deliveries of civil aircraft weighing 3,000 pounds and over, rose from $355.8 million in 1956 to $586.4 million in 1957, representing an increase of 65 per cent. On the other hand, during the same period, deliveries of general aviation aircraft weighing less than 3,000 pounds, decreased nine per cent in number, seven per cent in total airframe weight, and three per cent in dollar value under 1956 levels.

Civil aircraft engines produced during 1957, amounted to 10,859 units delivering a total of 7,231 horsepower. These totals represent a decrease of six per cent in quantities delivered but an increase of 28 per cent in horsepower produced. The value of engines delivered for civil use in 1957 amounted to $152 million, an increase of 41 per cent over 1956 sales of $108.3 million.

The greatest problem facing the military services, and therefore reflected in the aircraft industry's production planning, is keeping step in weapons technology. The USAF, for example, must build a missile force and at the same time maintain in-being a modern manned air force so that there can be no period of weakness in the transition in some combat categories from manned aircraft to missiles.

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

[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: 12

For many years to come the manned bomber, interceptor and fighter will have essential roles in the military order of battle. At the same time, it is obvious that guided missiles—both air-breathing and ballistic—will be assuming a more important role on aircraft industry production lines and there will be an equally pressing requirement for new facilities in which to design, develop and produce these new weapons.

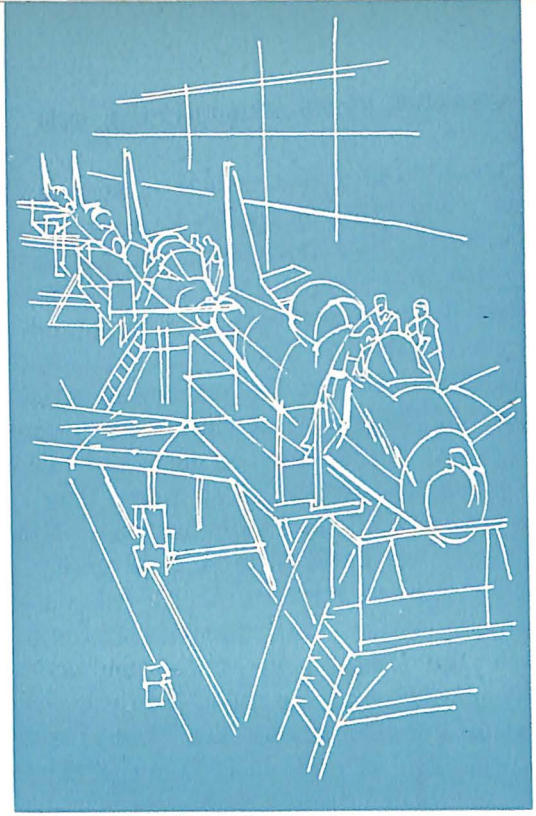
Most of the nation's major aircraft companies and engine manufacturers are engaged in facilities expansion of some magnitude. In 1957, over-all space available for the manufacture of jet fighters, bombers, guided missiles and civilian aircraft engines and propellers was 141,400,000 square feet—more than twice that used in 1950, and almost 11 times that required prior to World War II in 1940.

Since World War II, the aircraft industry has been reinvesting, as rapidly as is possible in keeping with sound business principles, much

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	111.7[E]	95.5[E]	16.2
1957	98.9[E]	77.6	21.3

[E] Estimate.
Sources: 1, 10, 19



of its profits into modernization of existing facilities and in brick and mortar for new expanded facilities. Already having spent more than one billion dollars in research and test facilities since World War II, the aircraft industry, despite the lower volume production activity of 1957, is planning to spend another billion for the same purpose in the next five- to ten-year period.

While some of the industry-financed expansion programs of the past and future have commercial applications, the bulk of the money is being spent primarily in an effort to evolve better military aircraft.

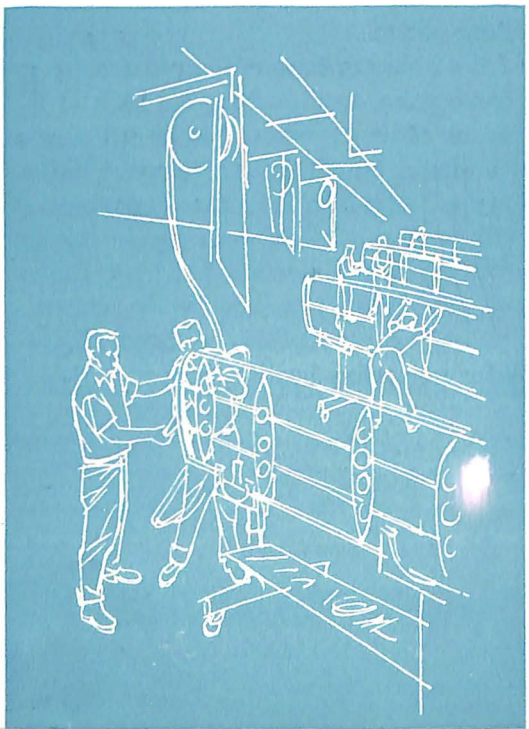
According to a report issued by a Congressional subcommittee last year, the 12 leading military airframe manufacturers over the next five years will use $350 million of their own funds for new plants, equipment and research. The same aircraft builders, the report adds, have already reinvested their past earnings to the extent of $395 million.

In addition, principal powerplant producers have earmarked well over $200 million for expansion between now and 1961. That figure does not include the planning of one of the largest manufacturers, a firm which makes engines, helicopters and propellers and which alone spent $212 million between 1946 and 1956.

The remaining companies in the aircraft industry; i.e., makers of other guided missiles, helicopters, smaller aircraft and components, are

scheduled to use another half-billion dollars of company funds for new buildings, machinery and research studies to insure that American air power remains dominant. This transition from the air weapons in use now to those that will be needed in the foreseeable future has created, among other things, financial problems of a magnitude heretofore unknown in the aircraft industry. How to accumulate the risk capital needed for new facilities has been the primary financial problem.

Generally speaking, the brick-and-mortar for production and test facilities now owned by the aircraft industry was designed and laid out for the development and production of World War II type aircraft. The same is true for much of the production and test equipment. The subsonic wind tunnels of World War II are wholly inadequate for today's Mach 2-3 fighters and bombers. Under today's competitive conditions, it is also necessary that the design-manufacturer own or control some of these high-speed wind tunnels, since some testing of models or verification of calculations must be made before a company can even submit a proposal in a design competition. Thus, industry's facilities problem today is somewhat of a paradox. Many of the facilities now in being are excess to the productive and development needs of today's and tomorrow's weapons. At the same time, the greatest single problem of management today is where to get the funds to provide for production and test facilities needed to produce the air weapons on order now and during the foreseeable future.



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

N.A. Not available.
[E] Estimate.
Sources: 1, 3, 10, 19

The aircraft industry is a multi-billion dollar activity dedicated primarily to the nation's security. If government-provided plants and equipment and government expenditures for research and development are added to the industry totals, the aviation manufacturing business is undoubtedly now the industry which does more basic and applied research and utilizes more expensive production machinery than any other.

CONSUMPTION OF SELECTED MATERIALS BY AIRCRAFT AND PARTS INDUSTRY
1947-1954
(Short Tons)

Year	All Metal-working Industries	Aircraft and Parts Industries	Aircraft and Parts As Percent of All Metal-working
CARBON STEEL			
1947	36,411,380	22,934	.1
1949	36,707,265	51,279	.1
1950	43,025,011	72,474	.2
1951	47,381,914	120,608	.3
1953	44,104,294	327,942	.7
1954	N.A.	260,466	N.A.
STEEL ALLOYS			
1947	2,670,257	24,017	.9
1949	2,789,855	41,464	1.5
1950	3,853,858	53,716	1.4
1951	4,563,142	112,672	2.5
1953	4,041,774	137,754	3.4
1954	N.A.	152,651	N.A.
ALUMINUM			
1947	461,001	33,936	7.4
1949	460,315	40,098	8.7
1950	712,233	59,884	8.4
1951	662,844	116,529	17.6
1953	846,793	164,137	19.4
1954	N.A.	133,436	N.A.
COPPER AND COPPER-BASE ALLOYS			
1947	942,902	326	.1
1949	1,027,118	N.A.	N.A.
1950	1,334,222	3,102	.2
1951	1,393,821	9,705	.7
1953	1,159,787	10,554	.9
1954	N.A.	12,126	N.A.

N.A.—Not available.
Source: 8

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	14,520	9,231	2,970	158	2,161

[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 manufactuers of complete aircraft, aircraft engines, or propellers.

Source: 12

Planes in Production
Military Aircraft

Manufacturer	Type	Service	Name	Designation
Aero Design	Liaison	Army	—	RL-26D
Beech	Command	Army	Seminole	L-23D
Beech	Trainer	Navy, USAF	Mentor	T-34
Boeing	Bomber	USAF	Stratofortress	B-52
Boeing	Tanker	USAF	Stratotanker	KC-135
Cessna	Trainer	USAF	—	T-37
Cessna	Observation	Army	Bird Dog	L-19
Chance Vought	Fighter	Navy	Crusader	F8U
Convair	Fighter	USAF	Delta Dagger	F-102
Convair	Fighter	USAF	Delta Dart	F-106
Convair	Bomber	USAF	Hustler	B-58
Douglas	Fighter	Navy	Skyray	F4D
Douglas	Attack	Navy	Skywarrior	A3D
Douglas	Attack	Navy	Skyhawk	A4D
Douglas	Bomber	USAF	Destroyer	B-66
Douglas	Cargo	USAF	—	C-133
Fairchild	Cargo	USAF	Provider	C-123B
Grumman	Fighter	Navy	Cougar	F9F-8T
Grumman	Fighter	Navy	Tiger	F11F-1
Grumman	Anti-submarine	Navy	Tracker	S2F-1
Grumman	Cargo/utility	Navy	Trader	TF-1
Grumman	Airborne Early Warning	Navy	Tracer	WF-2
Lockheed	Anti-submarine	Navy	Super Constellation	WV-2
Lockheed	Fighter	USAF	Starfighter	F-104
Lockheed	Cargo	USAF	Hercules	C-130
Lockheed	Trainer	USAF	Shooting Star	T-33
Lockheed	Patrol	Navy	Neptune	P2V-7
Martin	Minelayer	Navy	Sea Master	P6M-1
Martin	Patrol	Navy	Marlin	P5M-2
McDonnell	Fighter	Navy	Demon	F3H
McDonnell	Fighter	Navy	—	F4H
McDonnell	Fighter	USAF	Voodoo	F-101
North American	Fighter	Navy	Fury	FJ-4B
North American	Fighter	USAF	Super Sabre	F-100
North American	Trainer	Navy	—	T2J-1
Northrop	Trainer	USAF	—	T-38
Republic	Fighter	USAF	Thunderchief	F-105
Temco	Trainer	Navy	—	TT-1

Source: 19

MANNED EXPERIMENTAL MILITARY AIRCRAFT

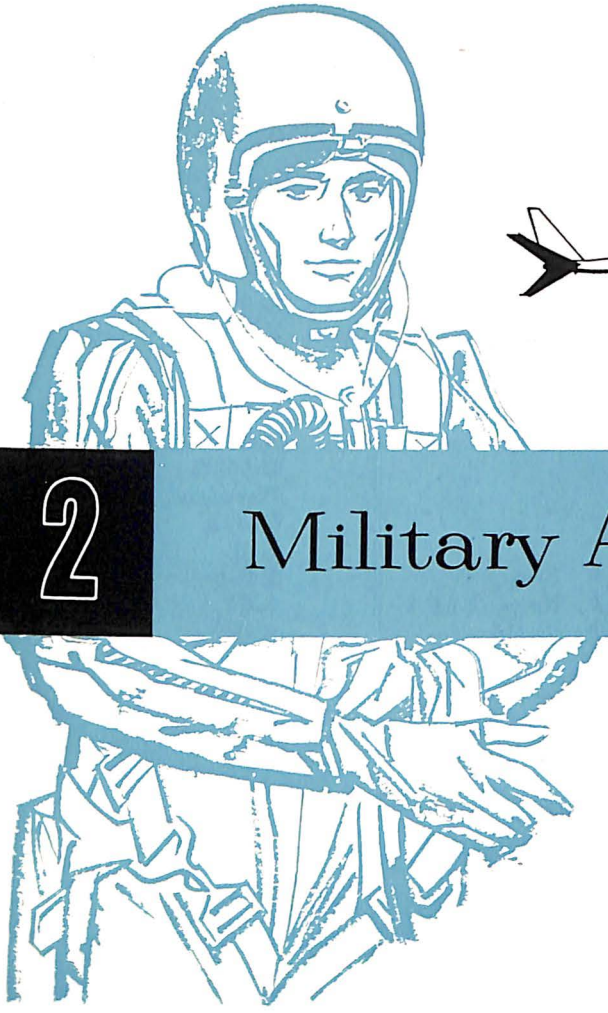
Manufacturer	Service	Designation
Bell	USAF, NACA	X-1
Bell	USAF, NACA	X-2
Bell	USAF, NACA	X-5
Bell	USAF	X-14
Bell	USAF, Army	XV-3
Douglas	USAF, NACA	X-3
Douglas	NACA	D-558-1 Skystreak
Douglas	NACA	D-558-2 Skyrocket
Grumman	Army	YAO-1
Hiller	USAF	X-18
McDonnell	USAF, Army	XV-1
North American	USAF, Navy, NACA	X-15
Northrop	USAF, NACA	X-4
Ryan	USAF	X-13

Source: 19

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

Sources: 1, 3, 19



2 Military Aviation

The first military airplane that was delivered to the military services fifty years ago, the Wright Flyer, flew at a speed of 44 miles per hour and could reach an altitude of slightly more than 100 feet. Today, there is being fabricated, under Air Force supervision, an air-spacecraft designed to fly at speeds approaching 4,000 miles per hour and at altitudes of more than 100 miles. While the latter is scheduled for research purposes only, it is indicative of the tremendous advances made by the United States aircraft industry in behalf of military aviation.

The building and the holding of the military aeronautical superiority that the United States must maintain is costly, as text and tables elsewhere in this chapter reflect, but the choice is not entirely ours. In a world in which aggressive powers refuse to respect anything less than

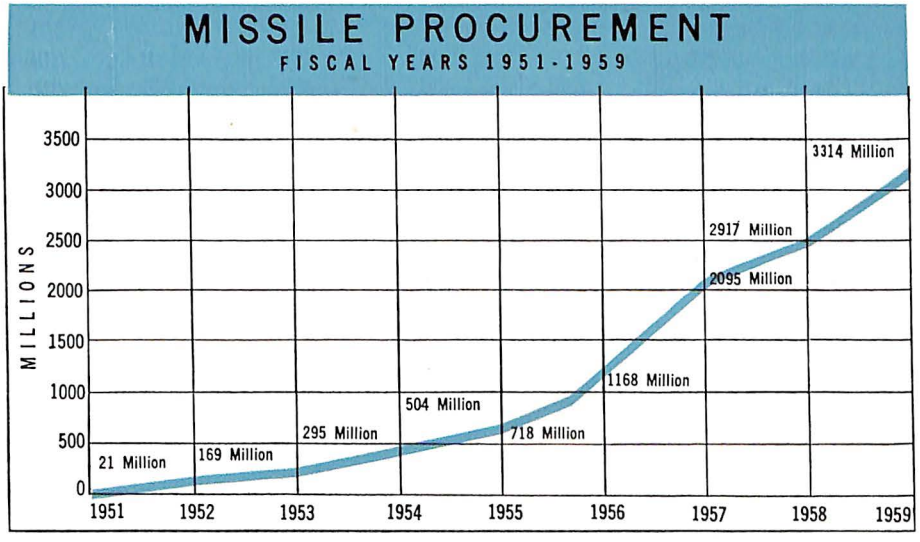
superior armed might, this nation has no alternative but to keep up that superiority.

In this air-missile-atomic age in which the world can be circled in a matter of hours and a missile can span a continent in a matter of minutes, the impact of military aviation preparedness is coldly clear. At present, then, and for as far as U. S. military leaders can see into the future, the prime agent for defending the nation is a task for military aeronautics.

While the USAF Continental Air Defense Command, charged with the task of guarding against air attacks, is equipped with barely adequate numbers of 100-series jet fighter planes, and our Navy similarly equipped with carrier units and planes for their aeronautical task, our retaliatory strategic air strength remains the number one aggression deterrent force.

Today's Strategic Air Command is equipped with a number of B-36 piston engined bombers; increasing numbers of the B-36 replacement, the intercontinental B-52 jet bomber and approximately 1,000 B-47 medium-range jet bombers and reconnaissance aircraft. The B-47 is globally dispersed and, using in-flight refueling, can offer mighty support to the B-52.

Just now entering production is the supersonic B-58, slated to become replacement for the B-52. Beyond this aircraft is coming the giant supersonic and chemically fueled B-70. By way of comparison in bomber



NOTE: 1958, $2,955; 1959, $3,444. (Revised April 30, 1958)

fly-away costs, a World War II B-17 cost approximately $200,000. The B-52 costs about $8 million; and the B-58, will cost approximately $10 million. The new B-70 now in the development stage is estimated to cost in the neighborhood of $12 million apiece.

Supporting the manned aircraft, several categories of guided missiles are out of experimental test phase, in production, and joining operational units both domestically and abroad. A few giant intercontinental missile types are now in production and soon will become operational within the Strategic Air Command structure.

The key technical breakthrough which has made the intercontinental ballistic missile program of today possible, came in 1953 when a hydrogen device was detonated. From this breakthrough it became apparent that high yield warheads of small size and weight could be developed. As a result, the accuracy requirements for a ballistic missile of military

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

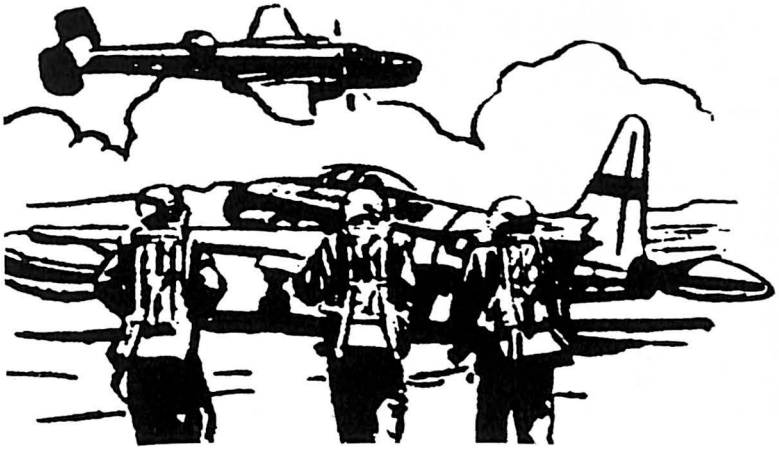
Year	Total	Bombers	Fighters	Transports	Trainers	Other[a]
1940	6,028	1,194	1,689	290	2,731	124
1941	19,445	4,119	4,421	532	9,376	997
1942	47,675	12,634	10,780	1,985	17,632	4,644
1943	85,433	29,362	24,005	7,013	19,942	5,111
1944	95,272	35,008	38,895	9,834	7,578	3,957
1945	46,865	16,502	21,578	4,613	1,309	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[E]	6,800	N.A.	N.A.	N.A.	N.A.	N.A.
1957[E]	5,500	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: 19



worth could be realized to the point where existing knowledge could be applied in the development of a satisfactory guidance system. In other words, the thermonuclear breakthrough assured the economic and technical feasibility of an intercontinental ballistic missile. It was no longer necessary to hit within a few feet of a target since the effective radius of destruction of an H-bomb is measured in miles. This greatly simplified the mechanisms necessary to guide the missile to its target.

While missiles are joining operational units of the three military services in steadily increasing quantity, it will be some years before the military services have a full operational capability with these new weapons systems.

In the meantime, the military continues to rely on manned interceptors and bombers, and the aircraft industry is steadily pushing research and development activities in an all-out drive for higher performance. Mach 3—about 2,000 miles per hour—is an immediate engineering goal for interceptors and bombers. Five to seven thousand miles per hour for manned air vehicles is a scientific target for the next ten years.

Aviation Aspects of Defense Spending

Expenditures for the procurement of aircraft, missiles and related items represent about 25 per cent of the total military expenditures. The aircraft portion of these expenditures has decreased during the

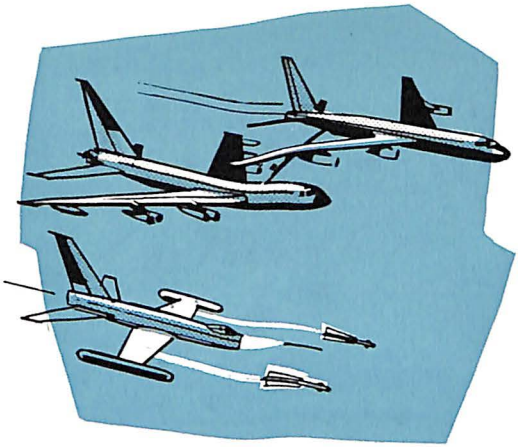
AIRFRAME WEIGHT OF MILITARY AIRCRAFT PRODUCED, BY TYPE
1940 TO DATE
(Weight in Millions of Pounds, Excluding Spares)

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]	95.5	N.A.	N.A.	N.A.	N.A.	N.A.
1957[E]	77.6	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: 19

last few years as force levels have been met and guided missiles have came into the inventory. The 1959 budget expenditure estimate for aircraft procurement is $7.0 billion compared to $7.8 billion in 1958. Requested new obligational availability is $6.3 billion for 1959. Expenditures for missiles for 1959 are estimated at $3.4 billion compared to the 1958 estimate of $3.0 billion. New missiles obligational availability in the amount of $4.2 billion is requested. Guided missiles continue to supplement manned aircraft in the inventories of the military services as technology progresses to more automatic weapon systems and higher performance.

By the end of fiscal 1959, the Air Force is scheduled to have 105 wings, compared to 117 at the end of fiscal 1958 and 137 at the end of



fiscal 1957. The major reduction during 1959 will be effected in tactical wings. Carrier air groups are scheduled to be reduced from 17 to 16 in 1959, while carrier anti-submarine squadrons and Marine air wings are scheduled to remain at 20 and 3, respectively. Army aviation continues to increase with the active aircraft inventory scheduled to go up from 4,937 to 5,439.

Military Aircraft Force Levels

43 wings—Strategic Air Command (all bombers or strategic reconnaissance, no fighters)

27 wings—Air Defense Command

35 wings—Tactical Air Command (including 15 Troop Carrier Wings—heavy, medium and assault and one Matador Missile Wing)

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

Year	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[E]	37,648	22,057	20,330	10,654	8,733	4,937
1959[E]	36,108	20,843	19,142	9,826	8,054	5,439

[a] Includes helicopters.
[b] 1940-1950: Dec. 31; since then June 30.
Sources: 3, 25

By the end of fiscal 1959, the Navy plans to have 16 carrier Air Groups, 20 Carrier Anti-Submarine Squadrons, and 3 Marine Aircraft Wings in operation.

The Army is planning for 19 divisional (aircraft) detachments, 32 helicopter companies, and 3 fixed-wing groups.

Strategic fighter wings are being eliminated in the Air Force, for they are no longer considered necessary to support the transonic and supersonic bombers. By the end of fiscal 1959, Strategic Air Command is expected to include 8 wings of heavy jet bombers, 3 wings of heavy piston bombers, and 28 wings of medium bombers, plus strategic reconnaissance aircraft. The greater mobility and effectiveness of tactical aircraft, coupled with the growing guided missile capabilities of the Army, permit a reduction in the number of Air Force tactical wings. The three Marine divisions and air wings are now being equipped with a variety of atomic weapons and are continually improving their capability for amphibious assault operations.

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	3,370	2,140	900	330
1959	3,743	2,443	1,000	300

[E] Estimate.
[a] Includes Marine Corps.
Source: 19

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

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.
Sources: 3, 5

Organization of Wings, Air Groups

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

Navy: Navy carrier air groups usually are composed of 2 fighter squadrons; 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 to 120 aircraft. Large Midway Class (55,000 tons) carriers have slightly less aircraft, while medium size carriers of the Essex Class (33,000 tons) have a complement of 70 to 80 aircraft. Anti-submarine 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

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

[a] Navy and Marine.
[b] Pilots as of Aug. 31; others as of October 31.
[c] Includes non-pilots in flying status and formerly designa[illegible] pilots.
[d] As of January 1.
[e] As of November 30, 1956.
Source: 3, 41

to a division in liaison, reconnaissance, observation, and 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.

Aircraft Inventory

Total active aircraft inventory, scheduled to be reached at the end of fiscal year 1959, will be 36,108 aircraft: Air Force, 20,843; Army, 5,439; and Navy, 9,826. This compares with an inventory of 37,648 at the end of fiscal year 1958. In this connection, the Air Force will decrease its active inventory by 1,214 units; the Navy inventory will be down 828 units; while the Army increases by 502 units.

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[E]	11,432	5,759	50.4
1959[E]	14,572	6,289	43.2

[E] Estimate.
Source: 22

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	10,07[illegible]	14.5	22.7
1958[E]	72,788	44,871	10,73[illegible]	14.7	23.9
1959[E]	73,934	45,836	10,433[c]	14.1	22.8

[E] Estimate.
[a] Includes stockpiling Mutual Defense, and Atomic Energy.
[b] Includes related items.
[c] Procurement and Production, military functions only.
Sources: 3, 14, 20, 25

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

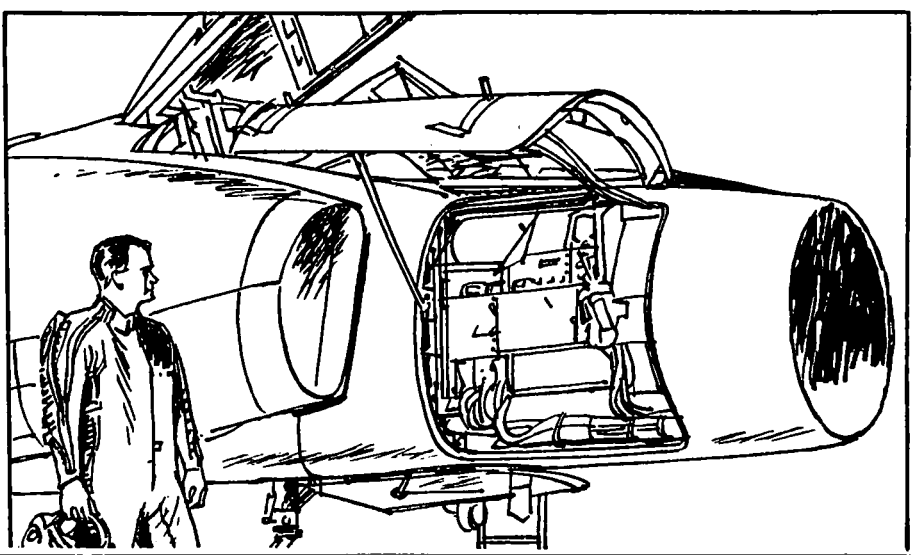
Year Ending June 30	Total Defense Department	Air Force	Navy	Army
1951	$ 8,686	$ 6,247	$2,304	$135
1952	13,471	10,091	3,335	44
1953	13,346	10,202	3,119	25
1954	4,470	3,080	1,276	114
1955	4,403	2,480	1,923	..
1956	6,241	5,480	761	..
1957	6,303	4,821	1,483	..
1958[E]	5,759	4,223	1,536	..
1959[E]	6,289	4,414	1,739	136

[E] Estimate.
Source: 22

DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1958
(Millions of Dollars)

	Total Procurement and Production	Aircraft	Aircraft As Percent of Total
Defense Department	$12,870	$7,265	56.4
Air Force	7,550	5,267	69.8
Navy	3,526	1,846	52.4
Army	1,787	152	8.5
Office of Secretary of Defense	8	—	—

Source: 21



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	
	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 [a] 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[E]	17,739.2	18,441.0	2,690.5	3,045.0
1959[E]	18,044.0	18,736.0	2,909.6	2,940.0

NOTE: For details on missiles see separate tables in this and the missiles chapter.
N.A.—Not available.
E Estimate.
[a] FY 1949 Construction of Aircraft & Related Procurement appropriation enacted in FY 1948.
Sources: 3, 25

DEPARTMENT OF DEFENSE
UNEXPENDED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1958
(Million Dollars)

	Total Procurement and Production	Aircraft	Aircraft As Percent of Total
Defense Department	$26,805	$14,507	54.1
Air Force	14,685	10,035	68.3
Navy	9,292	4,280	46.1
Army	2,814	192	6.8
Office of Secretary of Defense	14	—	—

Source: 21

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[E]	14,153	7,779	55.0
1959[E]	14,077	6,989	49.6

Source: 20

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[E]	7,779	5,410	2,195	175
1959[E]	6,989	5,056	1,830	104

[E] Estimate.
Source: 20

Guided Missiles 3

Considering the fact that the U. S. guided missile industry is little more than twelve years old, its progress has been truly astounding. At the end of World War II, when our missile developments really began taking shape, there existed little information on supersonic flight—and most of that information existed only as an exciting theory.

The turbojet was an infant; the ramjet engine of doubtful capability; rocket engines were explosively unpredictable; and large grain solid fuels were a whole new field. Radar, despite its brilliant war record, was relatively new, and the electronics industry was largely suspect as the manufacturers of magic black boxes which added unnecessarily to aircraft weight.

Today, these items have combined, through the genius of the aircraft industry, to form some of the most sophisticated weapons that man can imagine. It has not been easy. Reliability of a missile's component parts remains a prime foe to production line manufacture. A minor derangement of equipment in a piloted aircraft—often adjustable by the pilot or crew—would cause the failure of a guided missile. The average

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[a]	5,060	2,070	599	2,391
1959[b]	5,729	1,941	669	3,119

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.

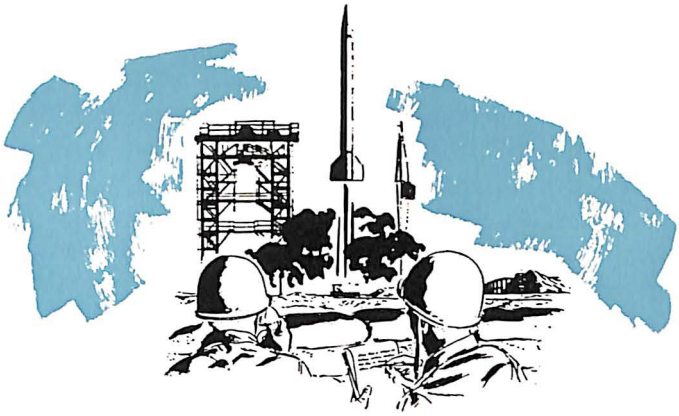
[a] Preliminary as of January 1958.

[b] Projected as of January 1958.

Source: 19

guided missile contains approximately 300,000 parts. Failure of a single part which might cost but a few cents could mean failure of a multi-million 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 aircraft industry 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 aircraft industry to manufacturing methods, assembly, and testing techniques that are completely new.

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[E]	11,432	2,313	20.2
1959[E]	14,572	4,170	28.6

[E] Estimate.
Source: 22

Modern guided missiles must be considered as a new family of weapons. In their infancy surface-to-surface missiles were considered as "the logical extension of heavy artillery," and surface-to-air missiles as "the replacement for the anti-aircraft gun." Actually, the guided missile, in each category, is a weapon system far beyond the capability of the weapon system which each presently complements—and, in a few cases, may one day replace.

The guided missile, however, will not relegate piloted aircraft to the museums. It is true that certain tasks are being taken over by missiles. In other fields it will probably never be true. Nevertheless, defense establishments of this nation and its friendly neighbors and certainly the military establishments of the Soviet bloc—are depending heavily on these new weapons.

In the United States, the trend toward missiles has increased greatly during the last four years. The U. S. Air Force estimates that in 1954, about 90 per cent of its money went for aircraft and only approximately 10 per cent was spent for missiles. Today, about 35 per cent of USAF procurement money is devoted to missiles, and estimates are that by 1959, one-half of Air Force procurement dollars will be spent for missiles.

The guided missile art has advanced to a point where the military services are already eliminating some of the manned tactical and air defense aircraft units. Later, missiles will undoubtedly replace more

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	2[illegible]	—
1957	2,322	1,970	352	—
1958[E]	2,313	1,890	402	20
1959[E]	4,170	2,849	692	629

[E] Estimate.
Source: 22

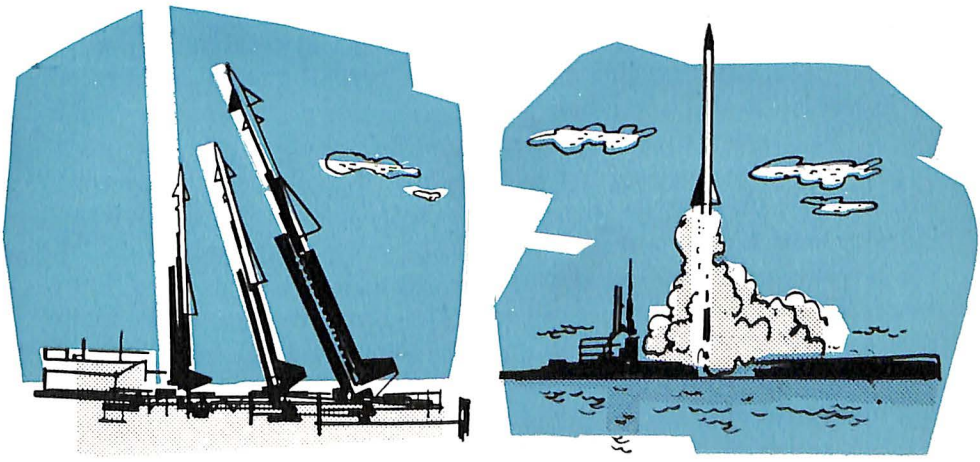
DEPARTMENT OF DEFENSE
UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1958
(Millions of Dollars)

	Total Procurement and Production	Guided Missiles	Missiles as Percent of Total
Defense Department	$12,870	$2,474	19.2
Air Force	7,550	1,216	16.1
Navy	3,526	356	10.1
Army	1,787	903	50.5
Office of Secretary of Defense	8	—	—

Source: 21

manned aircraft units, but no one can say today at what rate and to what extent a transition from manned aircraft will be possible. Most informed quarters in industry and government, however, conclude that manned combat aircraft will remain the backbone of the military air services for at least several years to come.

However, just as we begin to enter the so-called "missile age," it suddenly appears that it is only a way station; that the next step is to add a man to a missile. Then, we give this manned missile another missile to fire at the target, and then we are right back where we started—back to the manned vehicle! All we have done is to provide man with a fantastically increased reach—both in space and in time.



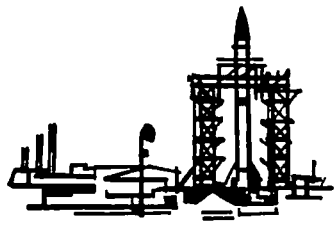
DEPARTMENT OF DEFENSE
EXPENDITURES FOR PROCUREMENT AND PRODUCTION
TOTAL AND GUIDED MISSILES
1951 TO DATE
(Millions of Dollars)

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[E]	14,153	2,955	20.9
1959[E]	14,077	3,444	24.5

[E] Estimate.
Source: 20

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

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 aircraft 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; contamina on 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 in-



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[E]	2,955	1,970	319	666
1959[E]	3,444	2,166	487	791

[E] Estimate.
Source: 20

DEPARTMENT OF DEFENSE
UNEXPENDED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1958
(Millions of Dollars)

	Procurement and Production	Guided Missiles	Missiles as Percent of Total
Defense Department	$26,805	$4,458	16.6
Air Force	14,685	2,611	17.8
Navy	9,292	674	8.4
Army	2,814	1,173	41.7
Office of Secretary of Defense	14	—	—

Source: 21

vestments, labor responsibilities and many other problems. Needless to say, it is being given concentrated attention by both industry and government.

Today, there are 40 announced missile projects under way. Divided into four categories, they are: air-to-air (6 projects), air-to-surface (6 projects), surface-to-air (10 projects), and surface-to-surface (18 projects). They range in size from the air-to-air missiles which can be handled by one man to the huge intercontinental missiles which require giant, multi-story gantry rigs to position them for firing. The aircraft industry is the prime contractor for most of the guided missiles now under development and in production; and in *every* missile the aircraft industry supplies either the airframe, propulsion or guidance system.

Today, there are tiny moons orbiting the earth—flung hundreds of miles into space by Army's *Jupiter* and Navy's *Vanguard*. The next step that the aircraft industry-military team sees beyond these unmanned satellites are unmanned and manned spacecraft. The manned spacecraft will be far more than a weapon. It will expand man's horizon into the universe.

The aircraft industry has available, now, most of the hardware and all of the basic knowledge needed to send a man into space and to return him safely to earth. Already under construction, as the forerunner to this vehicle, is the X-15. Now under construction, this air-spacecraft is expected to fly at speeds exceeding 4,000 miles per hour and to reach altitudes well above 100 miles. It is expected to fly during 1959. With this craft, the aircraft industry and the military expect to gather data that will enable man to launch himself successfully into space in his reach for the moon and beyond.

U. S. MISSILES

	Service	Prime	Airframe	Powerplant	Guidance
Air-to-Air					
Falcon	USAF	Hughes	Hughes	Thiokol	Hughes
Genie	USAF	Douglas	Douglas	Aerojet	
Sidewinder	Navy	Philco/ General Electric			Philco/General Electric
Sparrow I	Navy	Sperry	Douglas	Aerojet	Sperry
Sparrow II	Navy	Douglas	Douglas	Aerojet	Bendix
Sparrow III	Navy	Raytheon	Raytheon	Aerojet	Raytheon
Air-to-Surface					
Bullpup	Navy	Martin	Martin	Allegany Ballistics/ Aerojet	Martin
Corvus	Navy	Temco	Temco	Reaction Motors	W. L. Maxson/ Texas Instr.
Hound Dog	USAF	North American	North American	Pratt & Whitney	North American
Green Quail (*Decoy*)	USAF	McDonnell	McDonnell	General Electric	McDonnell
Petrel	Navy	Fairchild	Fairchild	Fairchild	Fairchild
Rascal	USAF	Bell Aircraft	Bell Aircraft	Aircraft	Radio Corp. of America/Texas Instr.
Surface-to-Surface					
Atlas	USAF	Convair	Convair	North American	General Electric/ Burroughs
Corporal	Army	Firestone	Firestone	Ryan	Gilfillan
Dart	Army	Curtiss Wright	Curtiss Wright	Grand Central	Wagner
Jupiter	Army	Chrysler	Chrysler	North American	Ford Instrument
Lacrosse	Army	Martin	Martin	Stewart Warner/ Thiokol	Federal Tel. Lab.
Little John	Army	Douglas	Douglas	Allegany Ballistics	
Mace	USAF	Martin	Martin	Allison	Goodyear/AC Spark Plug
Honest John	Army	Emerson	Douglas	Allegany Ballistics	
Matador	USAF	Martin	Martin	Allison	Martin
Pershing	Army	Martin	Martin		

(*Continued next page*)

U. S. MISSILES—*Continued*

	Service	Prime	Airframe	Powerplant	Guidance
Polaris	Navy	Lockheed	Lockheed	Aerojet	General Electric
Redstone	Army	Chrysler	Reynolds Metal	North American	Ford Instrument
Regulus I	Navy	Chance-Vought	Chance-Vought	Allison	Chance-Vought
Regulus II	Navy	Chance-Vought	Chance-Vought	General Electric	AC Spark Plug
Sergeant	Army	Sperry	Sperry	Thiokol	Sperry
Snark	USAF	Northrop	Northrop	Pratt & Whitney	Northrop
Thor	USAF	Douglas	Douglas	North American	AC Spark Plug
Titan	USAF	Martin	Martin	Aerojet	Bell Tel/ARMA/ Sperry
			Surface-to-Air		
Bull Goose	USAF	Fairchild	Fairchild	Fairchild	Fairchild
Bomarc	USAF	Boeing	Boeing	Marquardt/ Aerojet	Westinghouse
Hawk	Army	Raytheon	Northrop	Aerojet/ Thiokol	Raytheon
Nike-Ajax	Army	Western Electric	Douglas	Aerojet	American Tel. & Tel
Nike-Hercules	Army	Western Electric	Douglas	Aerojet	American Tel. & Tel
Nike-Zeus	Army	Western Electric	Douglas		
Plato	Army	Sylvania			
Talos	Navy	Bendix	McDonnell	McDonnell/ Allegany Ballistics/ Bendix	Farnsworth Electric
Tartar	Navy	Convair	Convair	Aerojet/ Allegany Ballistics	Convair
Terrier	Navy	Convair	Convair	Allegany Ballistics	Convair

Source: 19

Research and Development 4

Research and development is, and for the future will be, a major factor in our national security, militarily—*and* economically.

In this regard, the race for aeronautical supremacy has become the major battle in the technological war between the United States and the USSR. The objective of the United States aircraft industry, the military services and governmental research agencies such as the National Advisory Committee for Aeronautics, working in close harmony, has been to maintain technical superiority.

The price tag for advancing technological superiority in any of the aeronautical fields is expensive when reckoned in terms of dollars; cheap, when reckoned in terms of security.

Expenditures in research and development for major national security have more than trebled between fiscal 1951 and fiscal 1959, rising from about a billion in 1951 to over $3 billion in fiscal 1959. Expenditures of the military services in this field are expected to remain at these high levels.

The cost of research and development in the aircraft industry rose about 25 per cent, from $758 million in 1953 to over two billion dollars

in 1956, representing the sharpest research and development cost rise in any industry. The all-industry average increase was only about 12 per cent for the three-year period.

The magnitude of the dollars, the manhours, and materials in research and development leading to production of an end item is often beyond the comprehension of most of us. Put into simple terms, the very high cost of research and development efforts may be more apparent if equated by a single project. Consider the "new" ballistic missile program of the USAF. This program alone involves 17 major contractors, 220 subcontractors, and thousands of suppliers in virtually every section of the country. In fact, more than 85,000 men and women are directly involved

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 E]	3,427	2,886	541
1959[b E]	3,722	3,093	629

[E] Estimate.
[a] Includes increase of "Research and Development Plant" ($304 million in 1957).
[b] Includes pay and allowances of military personnel.
Source: 25

DEPARTMENT OF DEFENSE
FUNDS PROGRAMMED FOR RESEARCH AND DEVELOPMENT AND SUPPORTING ACTIVITIES
1955 TO DATE
(Millions of Dollars)

Year Ending June 30	TOTAL	Research and Development[a]	Activities Supporting Research and Development[b]	Development, Test and Evaluation[c]
1955	$3,520.3	$1,349.6	$344.3	$1,826.4
1956	3,814.6	1,539.0	445.5	1,830.1
1957	5,088.3	1,651.4	633.0	2,803.9
1958[E]	5,602.5[d]	1,886.7	424.6	3,291.2
1959[E]	6,219.1	2,588.1	444.5	3,186.5

[E] Estimate.
[a] Financed from Research and Development appropriations.
[b] Financed from several appropriations, such as, military construction, industrial facilities, and pay and allowances for military personnel.
[c] Financed from Procurement and Production appropriations.
[d] Includes $400 million advanced from 1959 to 1958 through supplemental appropriation.
Source: 19

in the research laboratory, on the drawing board, and on production lines of this program.

It is difficult to determine the proper balance between research and development on the one hand and procurement and production on the other. Yet, aircraft industry production lines require stability if the nation is to have adequate air power in being whether it be unmanned missiles, sleek manned fighters and bombers, or civil transports for domestic and international airlines. At the same time, the military air weapons user can never be satisfied. If he could be, he would soon be outdone by his adversary. So there is constant, but healthy, controversy

DEPARTMENT OF DEFENSE
FUNDS PROGRAMMED FOR DEVELOPMENT, TEST AND EVALUATION[a]
1955 TO DATE
(Millions of Dollars)

Year Ending June 30	Department of Defense	Air Force	Navy	Army
TOTAL				
1955	$1,826.4	$1,419.9	$198.1	$208.4
1956	1,830.1	1,256.0	325.9	248.2
1957	2,803.9	1,518.1	732.8	553.0
1958[E]	3,291.2	1,582.0	785.3	923.9
1959[E]	3,186.5	1,389.5	861.1	935.9
Aircraft				
1955	$ 815.7	$ 755.3	$ 60.4	—
1956	163.3	152.4	10.9	—
1957	541.9	96.3	445.6	—
1958[E]	287.7	49.8	178.0	59.9
1959[E]	427.0	110.9	283.1	33.0
Guided Missiles				
1955	$ 657.1	$ 418.4	$ 70.0	$168.7
1956	998.2	810.9	104.3	83.0
1957	1,671.1	1,076.1	142.0	453.0
1958[E]	1,910.7	1,161.8	154.5	594.4
1959[E]	1,923.4	845.7	387.0	690.7
Other				
1955	$ 353.6	$ 246.2	$ 67.7	$ 39.7
1956	668.6	292.7	210.7	165.2
1957	590.9	345.7	145.2	100.0
1958[E]	1,092.8	370.4	452.8	269.6
1959[E]	836.1	432.9	191.0	212.0

[a] Financed from Procurement and Production Aprropriations.
Source: 19

between those who would emphasize procurement and production and those who would emphasize research and development.

Actually, there can be no sharp lines precisely drawn between research, development, and production. However, for budgetary purposes a narrowly construed definition has been used for research and development which does not give full measure of the industry's research, test and evaluation effort. But the Department of Defense has attempted to indicate the total of funds programmed for research and development and evaluation. These studies showed that for every $1.00 spent on research and development (in the narrow definition) in 1958, there were an

DEPARTMENT OF DEFENSE
FUNDS PROGRAMMED FOR RESEARCH AND DEVELOPMENT
1955 TO DATE
(Millions of Dollars)[a]

Year Ending June 30	Department of Defense	Air Force	Navy	Army	Other[b]
TOTAL					
1955	$1,349.6	$587.9	$395.4	$366.3	—
1956	1,539.0	640.0	495.5	403.5	—
1957	1,651.4	686.1	537.9	427.4	—
1958[E]	1,886.7	692.3	526.7	456.9	$210.8
1959[E]	2,588.1	728.0	751.4	493.7	615.0
Aircraft					
1955	$ 293.6	$162.6	$123.3	$ 7.7	—
1956	352.3	187.9	148.6	15.8	—
1957	272.9	136.7	125.5	10.7	—
1958[E]	272.5	136.2	119.5	16.8	—
1959[E]	259.5	125.1	118.5	15.9	—
Guided Missiles					
1955	214.0	$ 82.7	$ 63.3	$ 68.0	—
1956	280.4	73.3	95.2	111.9	—
1957	355.8	83.3	159.3	113.2	—
1958[E]	379.8	64.2	187.6	128.0	—
1959[E]	610.7	104.6	336.7	169.4	—
Other					
1955	$ 842.0	$342.6	$208.8	$290.6	—
1956	906.3	378.8	251.7	275.8	—
1957	1,022.7	466.1	253.1	303.5	—
1958[E]	1,234.4	491.9	219.6	312.1	$210.8
1959[E]	1,717.9	498.3	296.2	308.4	615.0

[E] Estimate.
[a] Direct Obligations from Research and Development Appropriations.
[b] Advanced Research Projects Agency, Emergency Fund and U. S. Scientific Satellite.
Source: 19

additional 22.5 cents spent for activities supporting that research and development; and further, another $1.74 for test and evaluation of the item researched and developed. Thus, for every dollar required in research and development, an additional two dollars was spent in supporting activities.

Today, the world is witnessing a transition from jet aircraft to the missile; from atmospheric flight to extra-atmospheric flight; and from hypersonic speeds to super speed ranges yet unnamed. The race for the conquest of space is on. But the only way that the aeronautical industry

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
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[E]	94.0	65.4	28.6
1959[E]	100.5	69.4	31.1

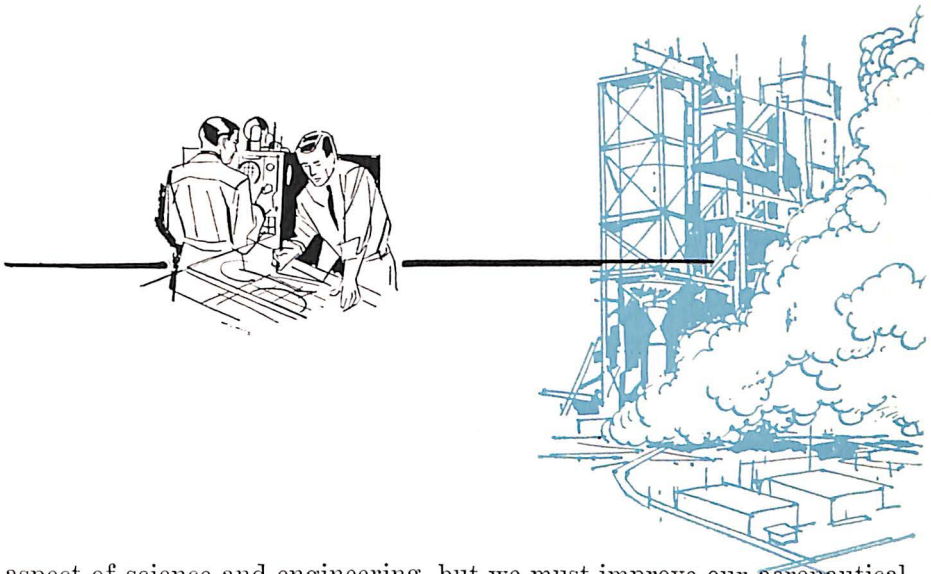
Source: 25

can accomplish the extremely critical transition to *astronautical* superiority is through the stockpiling of fundamental knowledge—building our community of research scientists and engineers. Illustrative of vastly expanding needs in recruiting youth for this science and engineering "stockpile" are the growing engineering manhours required to produce a modern, complex bomber.

It required 200,000 engineering manhours to bring the World War II B-17 to the point of first production flight. The big B-52 required 4,085,000 engineering manhours. The new B-58 just now coming off the production line in numbers required 9,340,000 engineering manhours. The B-70, which is a new chemically-powered bomber now being fabricated, will require 14,500,000 engineering manhours to bring it to first production. From the B-17 to the B-70 there has been a *SEVENTY-FOLD* increase in requirements for skilled scientists and trained engineers.

The aircraft industry-military team is moving as rapidly into the space age as its scientific research and engineering manpower resources can move forward. Oddly enough, it remained for an aeronautical achievement of the Soviets to galvanize this nation into action along all industrial fronts. That the Soviet Union is not a backward scientific power had been clear for a number of years to thinking people, but it was an aeronautical feat involving outer space that proved it to the world.

This nation cannot be first and foremost in today's world in every



aspect of science and engineering, but we must improve our aeronautical status in the field of science if the democratic world is to survive. Toward this objective, the aircraft industry and its military and government partners are moving.

So far, there are three announced U. S. space satellite projects: Explorer/Jupiter C, developed for the United States Army; Vanguard

DEPARTMENT OF DEFENSE
EXPENDITURES FOR RESEARCH AND DEVELOPMENT, BY AGENCY
1953 TO DATE
(Millions of Dollars)

Year Ending June 30	TOTAL	Conduct of Research and Development						Increase of Research and Development Plant
		Total	Air Force	Navy	Army	Other	Military Personnel	
1953	$1,567.9	$1,412.3	$530.2	$499.4	$382.7	—	—	$155.6
1954	1,530.0	1,384.8	513.3	475.8	395.7	—	—	145.2
1955	1,507.4	1,396.9	524.2	468.8	403.9	—	$157.2[a]	110.5
1956	1,803.0	1,683.0	622.5	449.1	413.8	$ 9.6	188.0	120.0
1957	2,059.1	1,881.8	728.5	522.6	435.1	—	195.6	177.3
1958[E]	2,198.8	1,994.4	730.0	573.1	450.0	48.0[b]	193.3	204.4
1959[E]	2,360.6	2,269.7	730.0	605.0	460.0	280.3[b]	194.4	90.9

[a] Not included in totals.
[b] Advanced Research Projects Agency and Special Accounts (Satellite, etc.)
Source: 25

I, developed for the United States Navy and Pied Piper, now under development for the United States Air Force.

The aircraft engine segments of the aircraft industry have been moving in the direction of high thrust rocket engines of various types for many years in research sponsored jointly by the industry and the military services. The aircraft/airframe industry and systems and components manufacturers have also been heavily engaged in various advanced research and development activities which join to produce air weapons and other aerial systems.

One of the real tangible evidences of joint industry-military-government science agency efforts is the development of the X-15, now in the fabrication stage and slated to fly next year. The air-spacecraft has a design capability to carry it at speeds approaching 4,000 miles per hour at an altitude well over 100 miles.

Customer for the craft is the National Advisory Committee for Aeronautics. The Air Force is directing and managing the development program and the supporting flight research. The Navy is providing research support facilities, and North American Aviation, Inc., has been charged by the Air Force with designing and building the X-15.

Every science known today is needed in the building of aerial supremacy. While security in this air/atomic age requires the nation to place a greater emphasis on technology, specifically to meet military requirements, it has made some significant contributions to a better life

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	
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[E]	655.5	538.0	118.7	318.4	100.9	117.5
1959[E]	697.9	545.8	109.0	331.3	105.5	152.1

Source: 25

ADVANCED AIRCRAFT, MISSILE AND TEST PROJECTS

Name/Designation	Service	Contractor
U-2	USAF	Lockheed
X-15	USAF	North American
X-7	USAF	Lockheed
X-17	USAF	Lockheed
HTV	USAF	Aerophysics
Terrapin		Republic-U. of Md.
Hasp	Navy	Naval Ordnance Lab.
Aerobee	Army, Navy, USAF	Aerojet
Aerobee Hi	Navy, USAF	Aerojet
Nike-Cajun	Army	Army
Asp	Navy	Horning Cooper
Farside	USAF	Aeronutronic

Source: 19

in these United States. The jet engine, for example, was almost entirely a military development. Now, this nation and the world are looking forward to a better means of transportation that will bring the entire world closer. Television, common to almost every home in America today, was moved ahead by many years as a direct result of military work. The atomic bomb—perhaps the greatest of all war deterrents—has brought about the adaptation of nuclear power for many peacetime purposes. Military research being conducted now will continue to open up new fields and to contribute to a better national economy for years to come.

5 Manpower

Employment in the aircraft industry gained generally during 1957, from 891,500 in January to a peak in April of 909,100, but declined during the last half to a low of 787,200 by December 31. Industry employment average for the year, nevertheless, totaled 878,000.

The decline during the last quarter was attributable to a rash of military contract cancellations and program cutbacks resulting from a peculiar fiscal situation in which the Department of Defense found itself. The Department discovered that, while operating within its obligational authority, its current rate of expenditure would exceed the $38 billion limit for fiscal year 1958 (ending June 30) by some $2 billion. Because it was national policy not to ask Congress for an increase in the statutory national debt ceiling of $275 billion, it was necessary for the armed forces to stay within the $38 billion spending limit. The result was that industry was ordered to effect stringent economies. An ensuing series of cutbacks, cancellations and stretch-outs

affected practically all categories of the industry effort. As a result of this lower level of activity, among other industry economy moves, sharp reductions in personnel were mandatory.

During 1957, employees of the aircraft industry worked an average of 41.1 hours per week at an average hourly rate of $2.36 for an average weekly wage of $97.00. As of June 1957, 26.6 per cent were employed in the East Coast areas; 34.8 per cent were employed in Central United States areas; and 38.6 percent were employed in West Coast areas.

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

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
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	738.4	16,557	4.5
1956	804.1	16,893	4.8
1957	878.1	16,800	5.2

[a] Less than .05 percent.

Sources: 3, 36

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	641.6	413.9	134.7	14.0	79.1
1953	779.1	472.4	174.7	17.7	114.2
1954	764.1	470.0	159.4	15.8	118.9
1955	738.4	471.2	147.1	13.6	106.5
1956	804.1	512.0	165.2	16.1	110.8
1957	878.1	537.5	174.3	20.5	145.8
1958					
Feb.	766.2	463.7	149.3	20.8	132.4

N.A.—Not available.
Source: 36

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. At the same time, two declining employment conditions will slowly evolve. First, less airframe pounds are required per missile; second, although missiles have a higher sale price per pound, it takes 30 per cent less man-years production for the same dollar volume of sales.

Currently, because of the quality of skills demanded in the manufacture of its aeronautical products, aircraft 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 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.

The aircraft and missile industry is spending nearly $135,000 each working day on formal training programs to teach the wide variety of new skills and techniques required in the development and production

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	504.9	322.4	95.3	9.3	77.9
1956	582.3	369.6	114.9	12.5	85.3
1957	574.6	350.9	108.2	14.0	101.5
1958					
Feb.	490.4	298.6	88.1	14.3	89.4

N.A.—Not available.
Source: 36

of today's complex air weapon systems. A survey of these extensive training programs, conducted by the Aircraft Industries Association, covered AIA member companies, employing 650,000 workers, the bulk of total industry employment during a single year. The survey did not include routine orientation or "on-the-job" training.

The industry-wide survey made by AIA revealed these dramatic facts

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	56.33
1949	956,189	311,821	644,368	62.98
1950	1,132,017	371,773	760,244	69.12
1951	2,102,913	642,821	1,460,092	77.42
1952	3,179,442	1,014,977	2,164,465	81.17
1953	3,941,133	1,301,268	2,639,847	84.50
1954	4,048,811	1,423,511	2,625,300	86.16
1955	4,153,201	1,584,834	2,568,367	90.06
1956	4,882,071	1,937,243	2,944,828	96.66
1957	5,375,000[E]	2,200,000[E]	3,175,000[E]	98.12[E]

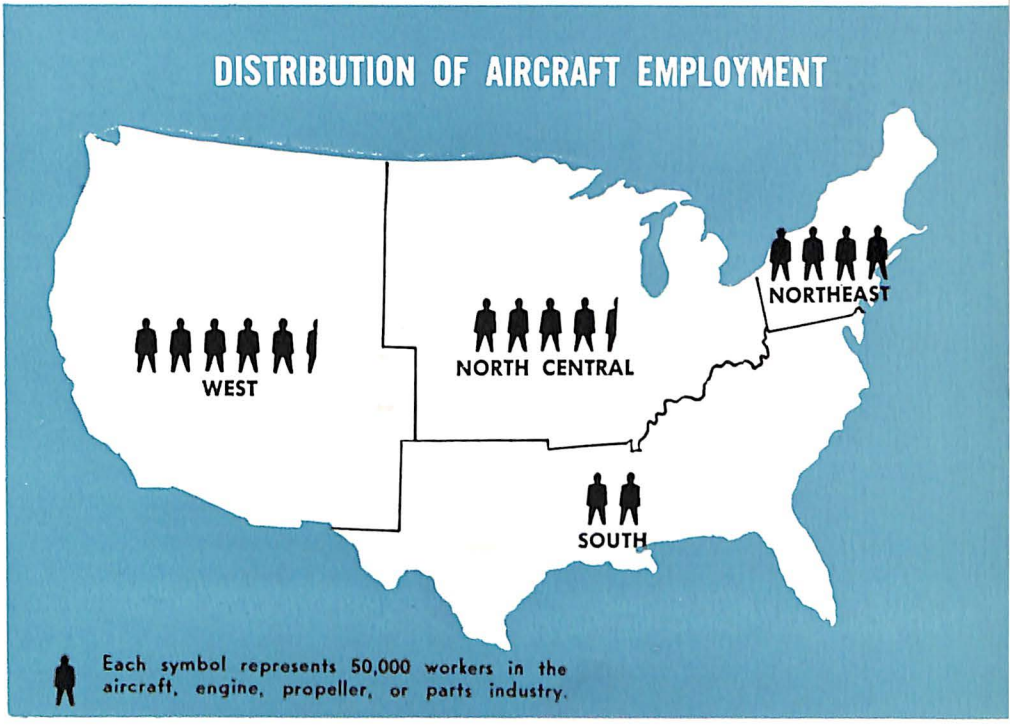
N.A.—Not available.
E Estimate.
[a] This line and all following lines include data for aircraft engine manufacturers which are not available for prior years.
Sources: 8, 9

on the scope and size of its training programs: 1. More than 5,400 different courses were offered during one year. 2. More than 330,000 course completions were recorded. 3. Approximately 12,000,000 man hours were devoted to the courses. 4. Cost of the training programs was more than $30,000.000.

These training programs covered factory skills, office skills, sub-professional skills, apprenticeships, management development, and engineering training. If on-the-job training had been included, the statistics would be substantially greater.

The balance of the survey covered courses of study in which the company reimbursed educational institutions for tuition and laboratory fees or paid for all or part of company-sponsored courses of study. This part of the survey disclosed that 60,174 employees put in nearly 4,000,000 man hours in these courses at a cost of nearly $4,500.000.

The aircraft and missile industry is governed by a chain reaction of its expansive technological progress, unparalleled in the history of



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	41.6	41.7
1956	42.4	42.1	42.9	40.3	43.0
1957	41.1	40.7	41.2	41.8	42.0
1958					
Feb.	40.4	40.4	39.9	41.5	40.9

N.A.—Not available.
Source: 36

manufacturing. Aggressive research programs of the industry consistently produce revolutionary concepts for aircraft and missiles that require new materials, new production methods and, of course, new skills.

Providing these skills is the goal of the aircraft industry's training program. Without these skills, the most advanced designs would remain only "paper" projects, incapable of being translated into hardware for the operating units of the military services. And there is no reservoir of talent to draw upon—the aircraft and missile industry must provide these skills through resourceful, comprehensive training programs.

The aircraft industry, along with the rest of industry and indeed the

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	90.65	90.49
1956	95.57	94.66	97.13	96.95	98.01
1957	97.00	95.65	98.47	98.23	99.54
1958					
Feb.	98.58	98.17	99.75	98.36	99.39

N.A.—Not available.
Source: 36

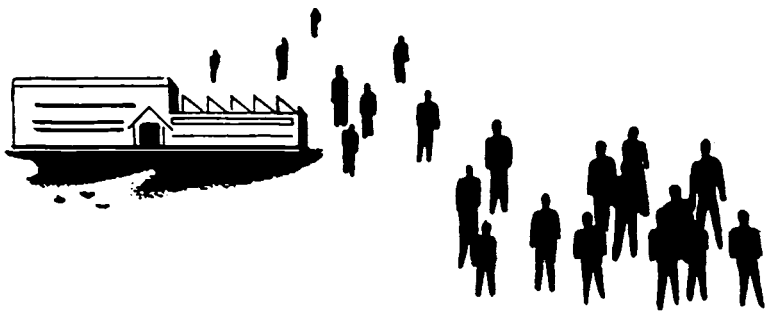
nation, is engaged in a grim contest of scientific and industrial skill. Technology is advancing at such a rapid rate that our limited number of highly trained people are being badly overloaded in order to keep the pace. As the industry moves further along, the nation's young men and women will face even graver knowledge barriers and scientific challenges than are posed today.

The industry needs scientists and research specialists with the kind of initiative and imagination it takes to penetrate barriers guarding new propulsion systems, new air weapon designs and improved performance of existing equipment.

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.	$1.16E	1.26	N.A.	N.A.
1944	N.A.	1.22E	1.31	N.A.	N.A.
1945	N.A.	1.22E	1.28	N.A.	N.A.
1946	N.A.	1.28E	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	2.27	2.27	2.28	2.26	2.29
1957	2.36	2.35	2.39	2.35	2.37
1958					
Feb.	2.44	2.43	2.50	2.37	2.43

N.A.—Not available.
E Estimate.
Source: 36



GEOGRAPHICAL DISTRIBUTION OF EMPLOYMENT IN THE AIRCRAFT AND PARTS INDUSTRY, 1939 TO DATE
(In Percent of Totals)

Date	TOTAL	East Coast	Central	West Coast
1939	100.0	54.5	4.5	41.0
Nov. 1943	100.0	30.8	43.5	25.7
June 1950	100.0	32.0	28.8	39.2
Feb. 1953	100.0	29.3	40.1	30.6
June 1954	100.0	31.0	34.4	34.6
June 1955	100.0	29.2	33.9	36.9
June 1956	100.0	28.9	33.9	37.2
June 1957	100.0	26.6	34.8	38.6

Sources: 3, 8, 34

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

Date	Total		Aircraft (Airframes)		Aircraft Engines and Parts		Aircraft Propellers and Parts		Other Aircraft Parts and Equipment	
	Accessions	Separations	Accessions	Separations	Accessions	Separations	Accessions	Separations	Accessions	Separations
1950	62.8	33.8	67.2	37.1	48.2	21.3	32.0	17.6	59.6	27.6
1951	94.8	50.0	97.5	52.4	86.9	39.6	52.7	27.6	89.6	44.5
1952	63.1	45.9	64.1	49.0	60.1	40.8	49.1	25.1	65.3	41.3
1953	47.5	42.7	47.2	42.7	47.4	43.2	33.2	28.3	52.7	47.8
1954	28.2	31.8	28.2	29.5	21.6	36.3	13.1	41.7	33.0	37.1
1955	33.1	29.6	38.0	27.4	30.7	28.8	22.7	38.2	43.3	52.5
1956	41.9	28.5	40.8	26.6	41.1	28.3	43.3	20.9	49.5	48.9
1957	30.1	42.5	31.0	42.0	21.9	38.6	32.9	25.8	41.9	63.8

Source: 36

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

Sources: 3, 36

RANGE OF HOURLY RATES FOR SELECTED OCCUPATIONS IN LARGE AIRCRAFT MANUFACTURING COMPANIES, 1956

	Range
Laboratory technicians	$2.00 - $2.70
Electronic technicians	2.00 - 2.70
Tool planners	1.85 - 2.90
Tool designers	2.15 - 2.95
Assemblers	1.55 - 2.45
Sheet metal workers	1.60 - 2.70
Machinists	2.00 - 2.75
Machine tool operators	1.65 - 2.45
Tool and die makers	2.05 - 2.75
Jig and fixture builders	2.10 - 2.70
Aircraft mechanics	1.95 - 2.70
Field and service mechanics	2.00 - 2.60
Inspectors and testers	1.75 - 2.65
Maintenance craftsmen	1.85 - 2.70

NOTE: The above figures are for mid-1956. Average hourly earnings increased about 15 cents between that time and the spring of 1958.
Source: 37

MAJOR OCCUPATIONAL GROUPING OF AIRFRAME EMPLOYEES, 1956

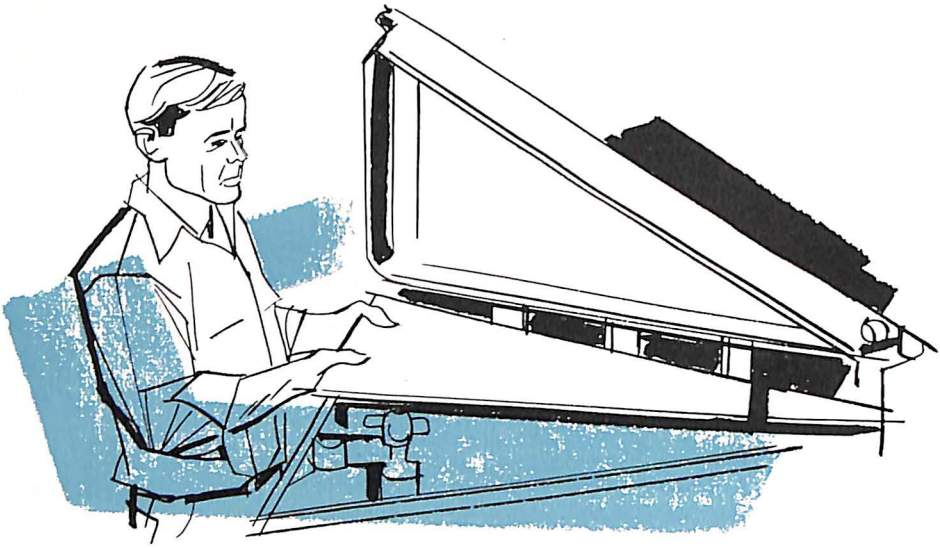
	Percent of Total Employment
Total employment	100.0
Nonplant employees	35.2
Managerial and supervisory	5.0
Professional and technical	18.5
Clerical and stenographic	11.7
Plant employees	64.8
Maintenance, repair and power	4.1
Tool fabrication, pattern shop, and allied	7.1
Machining	4.5
Fabricating and processing	10.8
Assembly	21.5
Inspecting and testing	4.5
Field service and flight line	5.1
Other plant workers	7.2

Source: 37

MAJOR OCCUPATIONAL GROUPING OF AIRCRAFT ENGINE EMPLOYEES, 1956

	Percent of Total Employment
Total employment	100.0
Nonplant employees	38.7
Managerial and supervisory	7.8
Professional and technical	12.4
Clerical and stenographic	12.0
Other nonplant workers	6.5
Plant employees	61.3
Maintenance, repair and power	6.9
Tool fabrication	3.8
Machining	11.9
Fabricating and processing	6.2
Assembly	4.7
Inspecting and testing	9.1
Other plant workers	18.7

Source: 37



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	35,000
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

N.A.—Not available.
Source: 35

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	N.A.	3.8	N.A.	11.1	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: 38

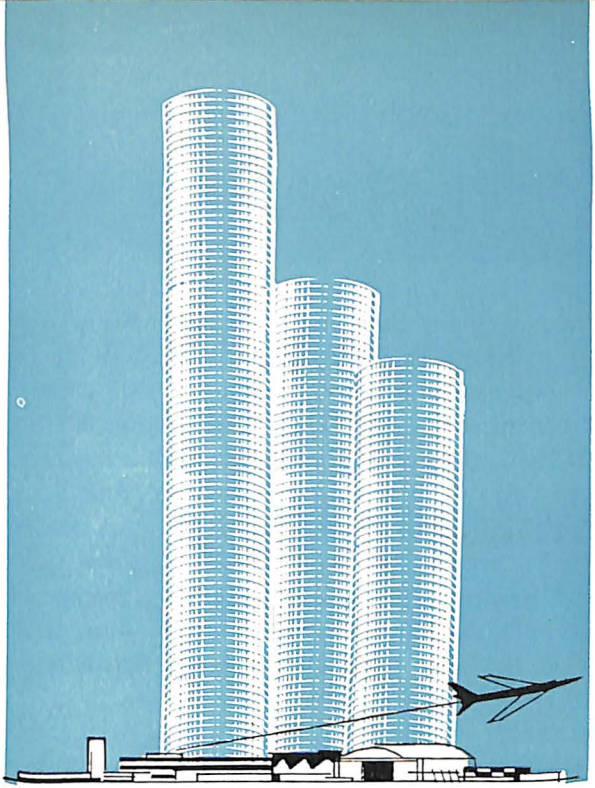
6 Finance

Financial problems of the aircraft and missile industry required more than the usual amount of management's time and attention during 1957. Total sales of $6.9 billion by the 12 major airframe companies in that year were the highest in history, exceeding by a considerable margin the previous high of $5.8 billion in 1944.*

Total earnings for the 12 companies amounted to $166 million in 1957, as compared with earnings of $156 million in 1956. These profit figures, as well as those shown in the attached tables are overstated as far back as 1953, since they are still subject to renegotiation. The 1957 earnings rate dropped to 2.4¢ per dollar of sales as compared with 2.8¢ in 1956, 3.4¢ in 1955 and 3.7¢ in 1954.

The most difficult financial problem confronting industry during 1957 was created by another change in the payment terms of government contracts. Prior to 1954, progress payments on work completed, with title going to the government, were generally 90 per cent of costs incurred. Despite industry protests, they were reduced in 1954 from

*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 1957. 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 70, 71, 73 and 74.



90 per cent to 75 per cent. A policy directive issued at the time, mentioned, among other things, "the need to keep expenditures of public funds within the statutory debt limit."

This percentage was further reduced to 70 per cent in August 1957, after attempts were made to establish workable "ceilings" on payments made to the major contractors. Later on, another change was made in the terms of reimbursement under cost-plus-fixed-fee type contracts. Undoubtedly the need to keep within the statutory debt limit played some part in the changed payment terms of government contracts that were put into effect during 1957.

These changes in payment terms came during the year when cash requirements were unusually heavy, due to large expenditures during the year to provide research, development, test and production facilities needed to produce the aircraft, missiles, power plants and accessories of the future. Bank borrowings, shown in the table on page 70, both short and long term, increased from $279 million in 1956 to $505 million in 1957. Despite these heavy borrowings, cash balances declined to $233 million at the end of 1957, compared with $312 million at the end of 1956. Military contract inventories and accounts receivable required increasing investments of cash, not only as a result of increased volume,

but also of the change in payment terms on government contracts. Industry investment in inventories (see table page 70) increased from $875 million in 1956 to $948 million at the end of 1957. Cash tied up in receivables increased from $594 million in 1956 to $792 million in 1957.

The substantial and increasing Air Force and Navy Bureau of Aeronautics delays in definitizing contractual documents in 1957, while not expressed Department of Defense policy, were an additional cause of increasing investment of contractor funds. These delays have held up invoicing of amounts due, with the result that substantial amounts of contractor funds have been tied up for extended periods of time.

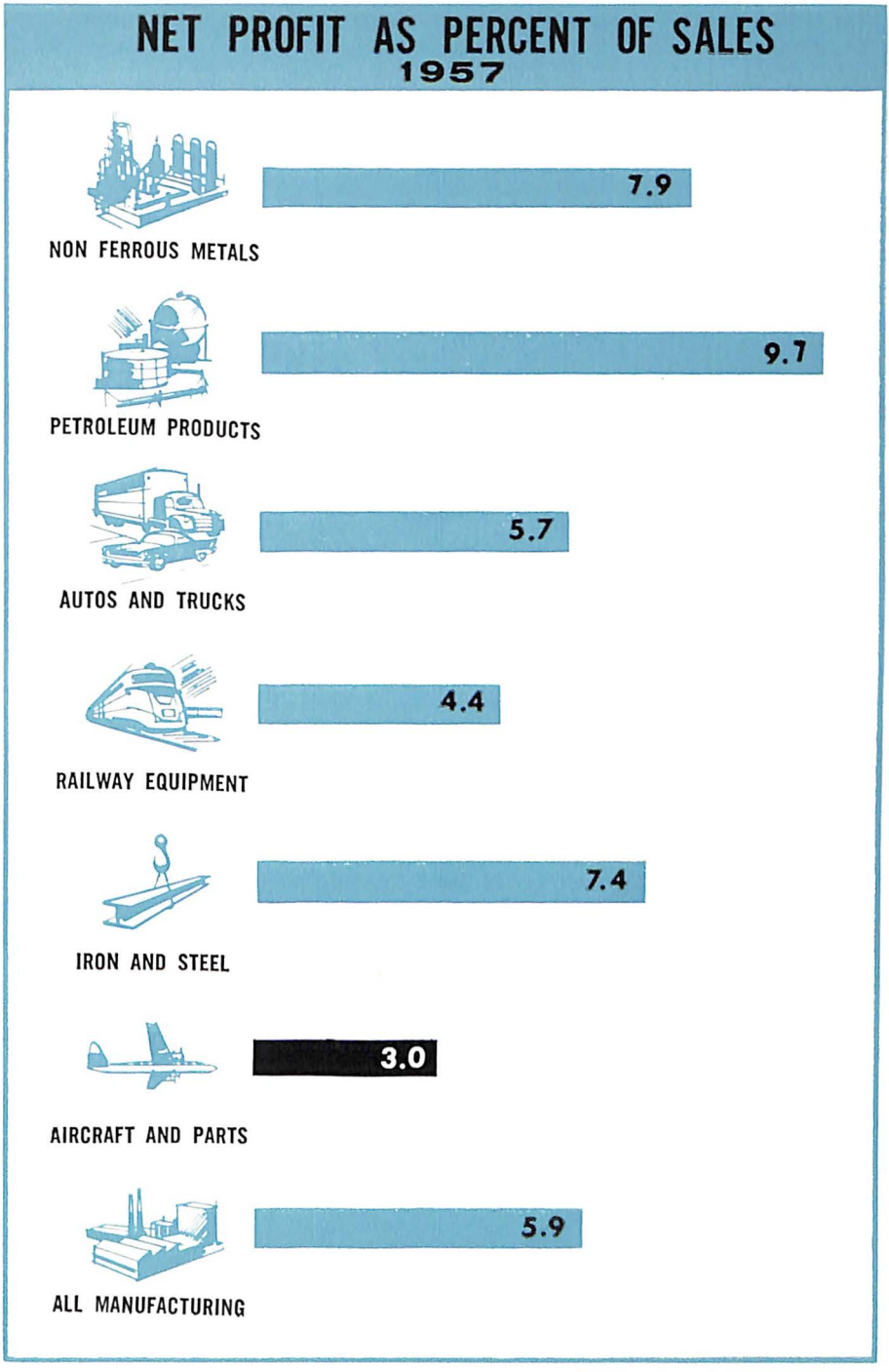
Because of the long period of time required to design and manufacture aircraft and missiles, the tremendous amount of in-process inventory, and the highly specialized and changing product requirements of a customer, aircraft and missile manufacturing can only be done under contract, the terms and specifications of which are agreed upon before work is begun.

The industry is capitalized to meet these requirements in the most efficient and conservative manner. This requires, among other things, that the capitalization of the companies: (1) provide the liquidity necessary to justify a relatively high level of mercantile and bank credit, (2) furnish the working capital and financial strength to support a high level of sales and yet, (3) avoid the costly burden of over-capitalization during the prolonged periods of low volume production. This need to avoid over-capitalization in this industry where the volume of any particular company fluctuates widely over a period of years is an extremely important one. 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 aircraft engines in 1918, all of them had gone through bankruptcy or drastic reorganization prior to 1926.

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

	Dollars	Percent
TOTAL	$5.3	100.0
Purchases from Small Business	1.0	20.0
Purchases from Large Business	2.1	39.0
Overhead, Payroll, Etc.	2.2	41.0

Source: 1


NET PROFIT AS PERCENT OF SALES
1957
7.9
NON FERROUS METALS
9.7
PETROLEUM PRODUCTS
5.7
AUTOS AND TRUCKS
4.4
RAILWAY EQUIPMENT
7.4
IRON AND STEEL
3.0
AIRCRAFT AND PARTS
5.9
ALL MANUFACTURING

BALANCE SHEET COMPARISONS, 12 MAJOR AIRFRAME COMPANIES
1951 TO DATE
(Thousands of Dollars)

	1952	1953	1954	1955	1956	1957
Assets						
Current assets:						
Cash	$ 216,470	$ 261,932	$ 295,365	$ 295,506	$ 311,572	$ 233,296
Securities	5,613	5,478	26,437	29,372	—	—
Receivables	479,506	526,400	461,910	463,848	594,247	792,013
Inventories	531,020	583,923	592,056	638,208	874,550	947,721
Miscellaneous	18,569	27,467	12,934	23,040	31,329	40,896
Total current assets	$1,251,178	$1,405,200	$1,388,702	$1,449,974	$1,811,698	$2,013,926
Total net plant	154,010	166,077	186,406	214,077	309,984	431,453
Investments	9,531	9,208	6,278	5,679	5,820	5,842
Development, etc., expenses	1,780	2,202	—	—	—	—
Deferred charges	11,932	13,644	19,731	19,410	22,604	30,119
Miscellaneous						7,285
Total assets	$1,428,431	$1,596,331	$1,601,117	$1,689,140	$2,150,106	$2,488,625
Liabilities						
Current liabilities:						
Payables	$ 541,006	$ 544,162	$ 396,217	$ 375,822	635,018	874,693
Accruals—taxes—renegotiation—refunds due U. S.	297,102	406,906	409,039	375,642	347,620	335,246
Advances—contracts deposits	91,550	92,540	121,403	127,246	176,468	126,525
Reserve	3,618	3,458	8,851	12,317	5,078	4,800
Miscellaneous	9,577	8,347	11,112	13,509	27,315	31,303
Total current liabilities	$ 942,853	$1,055,413	$ 946,622	$ 904,536	$1,191,499	$1,372,567
Bank loans, etc.	30,763	8,648	8,589	36,756	73,690	127,804
Contingency reserve	500	—	—	—	—	—
Capital stock	94,831	95,460	125,706	135,499	168,391	178,606
Capital (paid) surplus	68,927	77,181	100,331	110,216	162,056	164,283
Earned surplus	283,366	353,885	415,443	495,861	548,971	638,418
Miscellaneous	7,191	5,744	4,426	6,272	5,499	6,947
Total liabilities	$1,428,431	$1,596,331	$1,601,117	$1,689,140	$2,150,106	$2,488,625
Net current assets	$ 308,325	$ 349,787	$ 442,080	$ 545 38	$ 620,199	$ 641,359

Source: 1

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]

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

As is common with all contracting industries, the customer must pay for the work being done on his account as it reaches the various stages of completion. This is particularly necessary in any industry working on a contract basis that is manufacturing, in relatively large quantities, exceptionally high unit cost products with a 16- to 30-month manufacturing cycle.

By paying for the work as it progresses, the contract buyer avoids paying in one form or another any carrying charges on the substantial amount of additional capitalization that would be required by the contractor to finance the work throughout the entire manufacturing cycle. During prolonged periods of low-volume production, these carrying charges would be an extremely costly burden.

Selected Major Defense Contractors

(Listed by rank according to net value of military prime contracts awarded, 1950-1957)

	July 1, 1950 to June 30, 1957	Jan. 1, 1955 to June 30, 1957	World War II
U. S. Total, All Contracts, (in Billions)	$159.5	$ 44.8	$193.3[E]
Company	Percent of Total		
20 Largest Defense Contractors			
General Motors	4.5	1.3	7.9
*Boeing Airplane	4.4	4.3	1.5
United Aircraft[a]	3.7	4.4[b]	2.2
General Electric	3.5	4.3	1.9
General Dynamics[a]	3.2	5.3	[a]
*North American Aviation	2.9	4.1	1.6
*Douglas Aircraft	2.9	1.9	2.5
*Lockheed Aircraft	2.5	2.7	1.9
American Telephone & Telegraph	1.9	3.0	1.5
Curtiss-Wright[a]	1.6	1.5	4.1[a]
*Republic Aviation	1.6	.9	.7
Ford Motor	1.5	1.7	3.0
Chrysler	1.4	0.3	1.9
Sperry Rand[a]	1.1	1.0	.9[a]
Bendix Aviation	1.1	1.2	1.1
*Martin	1.1	1.7	1.3
*McDonnell Aircraft	1.0	1.8	N.A.
Westinghouse	.9	.6	.8
*Grumman Aircraft	.9	.9	.8
*Northrop Aircraft	.8	.8	.1
Other Selected Major Contractors			
*Fairchild	.5	.3	.2
*Bell Aircraft	.4	.4	.7
*Chance Vought	[a]	1.0	[a]

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: 19, 43

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

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

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

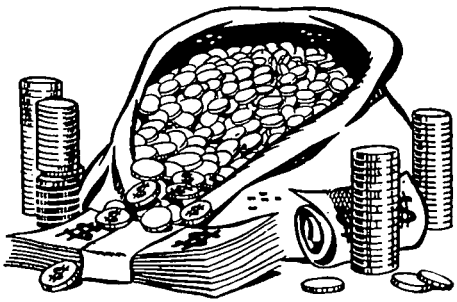
Industry	1952	1953	1954	1955	1956	1957
Nonferrous Metals	7.7	6.9	7.3	9.5	10.5	7.9
Petroleum Products	10.5	10.6	10.7	10.6	10.4	9.7
Autos and Trucks	5.5	4.4	6.4	7.4	5.7	5.7
Railway Equipment	3.8	3.3	4.1	4.7	4.4	4.4
Iron and Steel	5.0	5.7	6.0	7.8	7.2	7.4
AIRCRAFT AND PARTS	2.4[a]	2.4	3.8[a]	3.9[a]	3.4[a]	3.0[a]
Total Manufacturing	5.4	5.3	5.9	6.7	6.0	5.9

[a] Subject to renegotiation.
Source: 26

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

Source: 1



General Aviation 7

General aviation—all civil flying except that performed by the airlines—now has an active fleet of more than 65,000 aircraft, and during calendar year 1957 accounted for more than 10 million flying hours. About one-half of these flying hours were recorded by the more than 20,000 general aviation aircraft used for business.

In 1952, approximately 3,058 general aviation aircraft, with a retail value of $35 million, were sold. In 1957, 6,118 units worth approximately $125 million were delivered. During the same five-year period, general aviation operators took delivery of about 3,300 small multi-engine aircraft, nearly twice the number of multi-engine aircraft operated by the airlines.

The general aviation fleet includes almost every type of civil aircraft from the smallest single-engine plane to large multi-engined transport types identical to those in airline use. Its fleet units are used for business purposes, for industry, in agriculture, as air taxis, for air cargo and special charter purposes, for instruction, for geophysical research, survey and patrol and, of course, for non-business personal use. General aircraft are now utilized in almost every field of business and industry.

UTILITY 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	6,656	6,119	537	5,872		784

N.A.—Not available.

[a] Civil airplane production shown here differs from that on pp 8 & 9. Recent CAA 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 the following tables.

Sources: 10, 16

The 65,000 aircraft comprising general aviation is forty times larger than the combined scheduled airline fleets of the nation; and general aviation currently flies at a rate of 10 million annual hours, which is *three* times more annual hours than are now flown by the nation's commercial carriers.

Experience has taught most of those close to general aviation that it has been at best poorly understood and that its present-day size and ever-growing economic importance has been litt known. But the potentials which lie in general aviation are almost unlimited, and the surface of that potential has hardly been scratched.

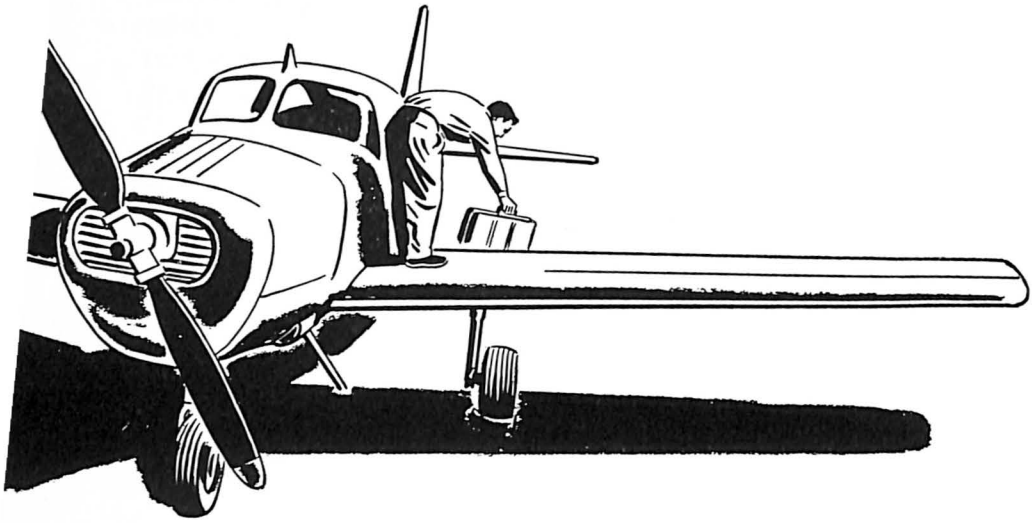
General aviation is a large and important factor in the total aviation picture today. Both its magnitude and importance will increase in the

future. In 1956, some 200,000 pilots flew 58,000 active general aviation aircraft ten million hours: 4,600,000 of these hours were for business transportation; passenger or cargo for hire accounted for 610,000 hours; patrol and survey flying reached 750,000 hours; instruction and miscellaneous flying, including agricultural aviation, utilized 2,100,000 hours. These various categories thus account for almost 80 per cent of general aircraft flying hours in 1956. The balance were for non-business personal reasons. Official figures covering 1957 flying-hour activities are not yet available, but there is ample evidence that the trend is continuing its upward climb.

ANNUAL SHIPMENTS OF UTILITY AIRCRAFT, 1947 TO DATE[a]
(As reported to Aircraft 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
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

[a] The figures shown here may vary from CAA figures because they are based on reports by selected manufacturers only.
Source: 1



A study of the primary purpose of aircraft usage by type of owners places heavy emphasis on business use. The field of business transportation seemingly affords the greatest economic resources to purchase and operate aircraft. Because these aircraft are generally flown more hours than the over-all average of the fleet, they generate a greater load than might be expected on aviation facilities. Business uses utilized only about a million hours ten years ago. The rate today is in excess of five million.

General aviation's fleet is widely dispersed throughout the nation, but there is a marked tendency for airplances to be owned and based in more populated areas. More than 60 per cent of the total fleet is based in less than 10 per cent of the States' counties. Similarly, general flying also tends to coincide with areas of population concentration.

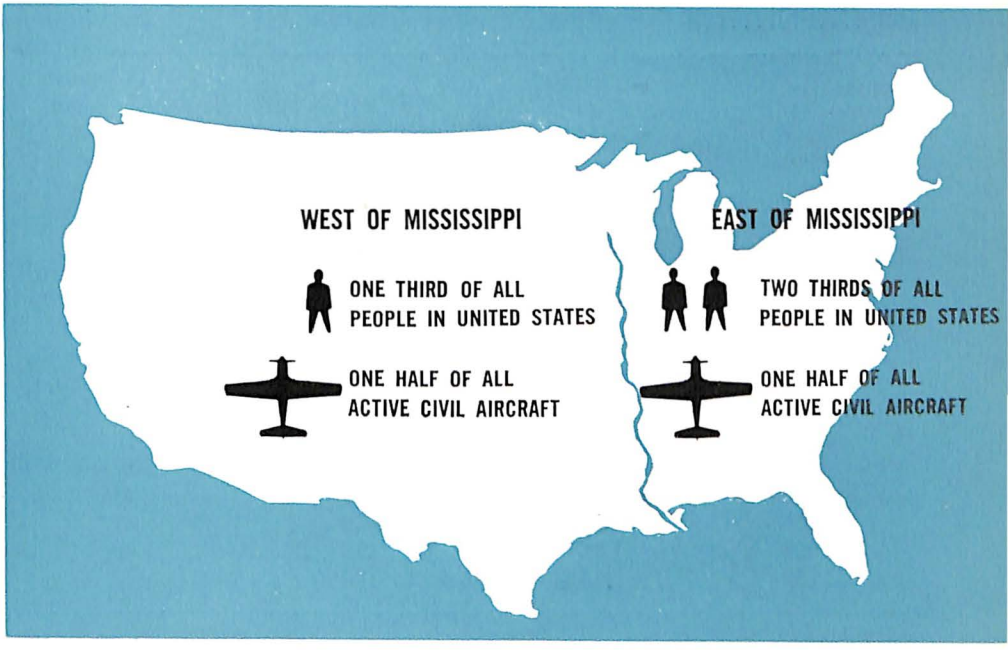
As a result, these segments of the nation's flying population are vitally concerned with airways modernization. Without it, freedom of movement to and from the nation's airports and through the vast air space which lies over our heads will become increasingly inhibited and curtailed. This will also cause serious economic harm to the business, industrial and agricultural users who have found that general aviation is the modern tool which gives a third dimension to their activities and greatly enhances their efficiency and productivity—a factor which, once incorporated into a business enterprise becomes an essential.

The fleet of general aviation is well equipped to operate on the airways of the nation under the instrument flight regulations of the

Civil Aeronautics Administration, known in aviation parlance as "IFR," and to maintain adequate communications with the ground. Few people, even many in aviation, are aware of this fact. The larger transport-type aircraft utilized principally for executive and business purposes, and most small twins, are quite completely equipped; and almost 100 per cent of this fleet is capable of operating under CAA-IFR conditions. In addition, a great deal of other equipment is available in such aircraft. This is also true to a lesser degree in a very large number of single-engined aircraft.

In 1956, about 23,500 of the 200,000 pilots flying the general aviation fleet had instrument ratings. This number is growing. In fact, the CAA in the first nine months of 1957 scored more than 115,000 written student pilot examinations. They have noted that this is a marked uptrend over what has been occurring in recent years. As more pilots acquire private licenses, increasingly more go on to obtain higher ratings so as to obtain fuller utility from the aircraft they find to be so useful.

The ever-growing number of private pilots emphasizes the great importance of there being a "floor" to the controlled air space. This means a reasonable altitude below which there would be relative freedom of movement, assuming of course reasonable conditions of visibility.



Said another way, this would mean that the aircraft capable of high performance and full control could be kept separated from those which would be operating under what general aviation pilots call a "see and be seen" basis, without unduly penalizing the typical air transport and military movement accomplished under positive control, and the typical itinerant cross-country movement of the non professional pilot.

Another important need is for flexibility in the traffic control system of the future. It is obvious that a complex system will be needed to handle the heavy concentrations of the various types of mixed traffic in the major hubs and along the more congested civil airways of the nation.

CIVIL AIRCRAFT, 1928 TO DATE

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

N.A.—Not available.
E Estimate.
Source: 16

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

Source: 16

UTILITY AIRCRAFT, FACTORY SHIPMENTS, 1957
(As reported to Aircraft Industries Association by selected manufacturers)

Manufacturer and Model	Complete Aircraft[a] Number	Manufacturers Net Billing Price (Thousands of Dollars)
Aero Design	139	$ 9,914
Model 560A, E	34	
Model 680	105	
Beech	788	32,110
Bonanza	515	
Model D18S	7	
Model E18	110	
Twin Bonanza	108	
B-45	39	
95	9	
Call Air	33	204
Model A4	33	
Cessna	2,489	30,988
170B	36	
172	939	
180	438	
182	835	
195	1	
310	82	
310B	68	
L-19[b]	90	
Champion	217	1,045
Model 7EC	110	
Model 7FC	107	
Helio	33	874
H 391B	32	
H 392	1	
Mooney	107	1,095
Mark 20	107	
Piper	2,300	23,294
Super Cub	799	
Tri Pacer	1,101	
Apache	400	
Taylorcraft	12	128
Model 20	12	
TOTAL	6,118	$99,652

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

[b] 90 L19's were sold to the French Government. Since the sale was not made through the U. S. Military Services it is considered a civilian transaction.

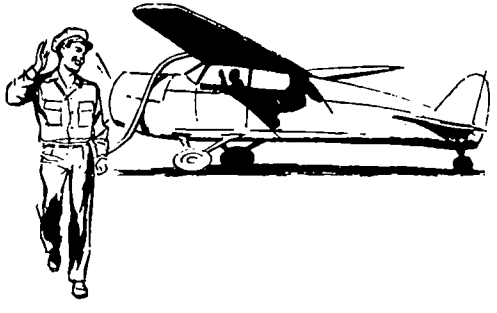
NOTE: The figures shown here may vary from CAA figures because they are based on selected reports only.

Source: 1

Civil Aircraft by States, January 1, 1956

State	Total	Active	Inactive	State	Total	Active	Inactive
TOTAL	85,320	60,432	24,888				
Alabama	668	468	200	Nebraska	1,565	1,231	334
Arizona	1,174	780	394	Nevada	444	307	137
Arkansas	1,018	680	338	New Hampshire	203	135	68
California	9,926	6,766	3,160	New Jersey	1,789	1,199	590
Colorado	1,168	852	316	New Mexico	780	534	246
Connecticut	664	469	195	New York	4,255	2,969	1,286
Delaware	224	156	68	North Carolina	1,526	1,055	471
District of Columbia	446	331	115	North Dakota	974	625	349
Florida	2,458	1,442	1,016	Ohio	4,115	2,904	1,211
Georgia	1,121	766	355	Oklahoma	1,812	1,311	501
Idaho	802	631	171	Oregon	1,619	1,176	443
Illinois	4,741	3,487	1,254	Pennsylvania	3,388	2,413	975
Indiana	2,538	1,834	704	Rhode Island	184	133	51
Iowa	1,966	1,629	337	South Carolina	509	361	148
Kansas	2,200	1,641	559	South Dakota	992	769	223
Kentucky	641	455	186	Tennessee	845	585	260
Louisiana	1,326	863	463	Texas	6,617	4,703	1,914
Maine	434	314	120	Utah	484	355	129
Maryland	799	551	248	Vermont	149	90	59
Massachusetts	1,295	877	418	Virginia	1,075	687	388
Michigan	3,611	2,625	986	Washington	2,219	1,587	632
Minnesota	2,220	1,675	545	West Virginia	507	336	171
Mississippi	867	559	308	Wisconsin	1,689	1,255	434
Missouri	1,965	1,498	467	Wyoming	477	360	117
Montana	1,123	868	255	Territories and Foreign	1,708	1,135	573

Source: 16



CIVIL AIRCRAFT[a], BY YEAR OF MANUFACTURE
AS OF JANUARY 1, 1957

Year of Manufacture	Number	Percent of Total
	85,320	100.0
Prior to 1945	23,652	27.7
1945	1,157	1.3
1946	1,606	1.9
1947	24,342	28.5
1948	10,283	12.1
1949	5,102	6.0
1950	2,558	3.0
1951	2,729	3.2
1952	1,786	2.1
1953	2,734	3.2
1954	3,255	3.8
1955	2,613	3.1
1956	3,503	4.1

[a] Number of civil aircraft, active and inactive, commercial transport and utility, recorded with Civil Aeronautics Administration.

Source: 16

HOURS FLOWN BY UTILITY AIRCRAFT, 1931 TO DATE

Calendar Year	TOTAL (Thousands of Hours)	Instructional		Commercial[a]		Business[b]		Pleasure, etc.	
		Hours 000's	Percent	Hours 000's	Percent	Hours 000's	Percent	Hours 000's	Percent
1931	1,083	307	28.3	281	25.9	152	14.1	343	31.7
1941	4,460	2,816	63.1	511	11.5	250	5.6	883	19.8
1951	8,451	1,902	22.5	1,584	18.8	2,950	34.9	2,015	23.8
1952	8,186	1,503	18.4	1,727	21.1	3,124[c]	38.2	1,832	22.3
1953	8,527	1,248	15.0	1,649	19.0	3,626	42.0	2,004	24.0
1954	8,963	1,292	14.4	1,829	20.4	3,875	43.2	1,967	22.0
1955	9,500[E]	1,275	13.4	1,950	20.5	4,300	45.3	1,975	20.8
1956	10,000[E]	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

[a] Includes contract, industrial, and commercial agricultural flying.
[b] Includes flying for corporate or executive purposes as well as flying on personal business
[c] Company Business 2.1 million hours; Individual Business 1.0 million hours.
E Estimate.
N.A. Not available.
Sources: 1, 15

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	N.A.	N.A.	N.A.	N.A.	N.A.	809

N.A.—Not available.
[a] Airline Transport Rating became effective May 5, 1932.
Sources: 3, 16

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
	Controlled Airways	Direct VOR Airways	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	482	185	110	33	356	81

Sources: 3, 16

PUBLIC AIRPORTS BY LENGTH OF RUNWAY AND REGION, JANUARY 1, 1957

Region	TOTAL	Airports by Length of Runway (in feet)						
		0-2,999	3,000-3,499	3,500-4,199	4,200-4,999	5,000-5,899	5,900-6,999	7,000- & over
TOTAL	2,798	1,229	363	389	203	346	92	176
New England	120	59	3	26	12	11	2	7
Middle Atlantic	299	193	36	24	13	21	3	9
East North Central	538	305	90	71	20	32	7	13
West North Central	441	226	70	62	21	29	10	23
South Atlantic	329	115	43	39	27	76	6	23
East South Central	118	47	17	20	11	14	1	8
West South Central	341	107	46	67	36	45	18	22
Mountain	301	51	23	50	36	70	27	44
Pacific	311	126	35	30	27	48	18	27

Source: 16

8 Helicopters

The first successful helicopter in the Western hemisphere was made by Dr. Igor Sikorsky at Bridgeport, Connecticut, in 1939. During World War II, the helicopter gained great favor with the military although its use was restricted largely to light emergency transport and air rescue.

On March 8, 1946, the first commercial helicopter was certificated by the Civil Aeronautics Administration. In 1947, the Marine Corps formed the first experimental helicopter squadron to test a new combat technique. It worked. And a third dimension was added to amphibious assault—vertical landings.

In 1947, the world's first scheduled helicopter mail route was established to serve a 50-mile radius of Los Angeles. But it remained for the Korean War to bring into sharp focus the great utility of the helicopter in military operations and the great potential of the helicopter to civil aviation.

Today, there are approximately 3,400 helicopters performing myriad tasks for the military, and its role in the military order of battle is firm. During fiscal 1959, budgetary estimates indicate that at least another 350 helicopters of all types will become a part of the military helicopter fleet.

Scheduled helicopter operations have also made great strides forward; 145 per cent more passengers flew scheduled helicopters in 1957 than in 1956, testifying to the growing popularity of the helicopter.

Serving the greater Los Angeles, Chicago, and New York areas, three helicopter airlines, operating 26 aircraft over 545 route miles, carried 152,000 passengers in 1957, compared to 62,000 in 1956. Revenue passenger-miles tabulated by these scheduled airlines totaled 3,273,000 in 1957, an increase of 106 per cent over 1956.

Largely through the introduction of additional and larger rotor-craft during the year, the helicopter airlines provided, in terms of seat-miles available, 126 per cent more service than in 1956. Helicopter air freight tonnage carried by the airlines also made a sharp gain in 1957 of almost 100 per cent to 14,000 ton miles, while helicopter air express increased about 13 per cent during the same period. In addition, the helicopter airlines flew 91,000 ton miles of mail in 1957 for a two per cent gain over 1956.

Nevertheless, despite its proven performance under extremely haz-

PRODUCTION OF COMMERCIAL HELICOPTERS
(Number of Helicopters)
1953 TO DATE

Year	Total	Bell	Hiller		Sikorsky	
		47 Series	12-B	12-C	S-55	S-58
1953	90	59	13	—	18	—
1954	126	68	15	—	43	—
1955	144	84	14	—	41	5
1956	235	111	—	17	52	55
1957	251	132	—	21	38	60

Source: 1

ardous conditions during rescue operations of every conceivable type, the helicopter's expansion into nation-wide service for all towns and cities is hampered. A convenient and efficient air carrier of people and freight, the helicopter continues to be handicapped by a lack of general understanding by state and local officials as to its distinctive operational characteristics. All too often, the helicopter is considered merely as an "aircraft" and confined, therefore, to the operating areas and restrictive regulations applicable to the fixed-wing aircraft.

In cities where these barriers have been hurdled through Civil Aeronautics Board certification of mail and passenger helicopter services—New York, Chicago and Los Angeles—the fallacy of putting helicopters into a general category as "aircraft" has been exposed. Continuing expansion of services in these cities and plans for extension of areas served by those carriers should establish the case for helicopters. The Civil Aeronautics Board, on the record established in the three major city areas, must proceed promptly in awarding operating certificates in other parts of the country where scheduled helicopter passenger, mail and freight services await Board action.

Significant developments in recent months have delineated the rising demand for helicopter services. For example, a report prepared by the group representing about 27 Chambers of Commerce and business groups in the San Francisco Bay area points to the existing three services—New York, Chicago and Los Angeles—and contends that "the San Fran-

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
Backlog			
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

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

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	152	1,056	450	42.61	3,273	8,049	40.66	1,604

Source: 4

cisco Bay Area and other metropolitan areas, so desiring, should be permitted scheduled passenger and freight helicopter service."

In another instance, A. S. Quinn, manager of Douglas Municipal Airport at Charlotte, N. C., in March, reported a move under way to have cities and towns within a 50-mile radius of Charlotte file for helicopter routes. To implement them, the city would turn a franchise over to an operator with the concurrence of the Civil Aeronautics Board.

In Washington, dramatic demonstration of the helicopter's fast growing importance in the eyes of the nation is the fact that a proclamation was issued by the Commissioners of the District of Columbia setting apart the period of April 13-20, 1958, as "Helicopter Week" in the nation's capital.

Meanwhile, other striking evidence of an awakening official consciousness of the potency of helicopter services is given in the following letter addressed to B. L. Whelan, Chairman of AIA's Helicopter Council by Governor Averell Harriman, of New York. Under date of March 21, 1958, Governor Harriman writes:

> "I have long been aware of the great potential that the helicopter has for providing rapid, short-haul air transportation for our New York State communities.

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

Year	TOTAL	Passenger Ton-Miles	U. S. Mail	Express	Freight	Excess Baggage
1948	28	—	28	—	—	—
1950	63	—	63	—	—	—
1952	75	—	75	—	—	—
1953	129	2	123	—	2	2
1954	152	17	115	13	5	2
1955	195	60	96	31	5	3
1956	277	149	89	31	7	1
1957	450	309	91	35	14	1

Source: 4

"Two years ago, in 1956, I urged the mayors of our cities and larger villages to consider setting aside a centrally-located site in their respective areas to accommodate this new versatile vehicle.

"Initially, these sites could provide facilities useful in time of emergency—such as during the floods of 1955 and, more recently, during a paralyzing blizzard in upstate New York. Ultimately, these ports could serve commercial helicopter operations close to the center of larger communities.

"Our New York State Department of Commerce, through its Bureau of Aviation, has been working with municipalities in reviewing potential heliport sites. I am confident that, in time, we shall have a fine network of heliports designed to meet our short-haul air transportation requirements."

Indication of the helicopter's future in the transport field came when evaluation in the New York area of a highly accurate pictorial navigation device for helicopters was instituted by E. R. Quesada, Chairman of the Airways Modernization Board and Assistant to President Eisenhower for Aviation. The evaluation operations are now under way.

Mr. Quesada emphasized that the dramatic growth and potential of helicopter operations demands intensive effort to provide adequate navigational and air traffic control capabilities for these aircraft.

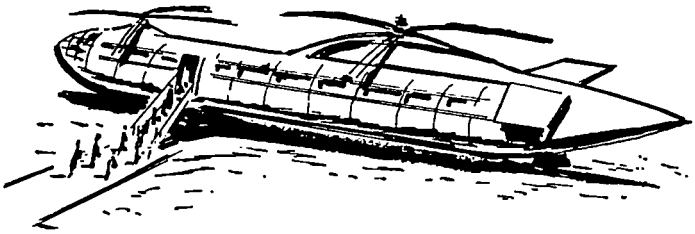
"The multi-engine helicopter is already here," he said, "and the multi-engine turbine-powered helicopter, certificated for IFR operations,

will be flying in the very near future. If navigational aids are not to restrict the full utilization of these machines, we must act now to determine optimum methods of navigation and air traffic control."

During the experimental period, New York Airways helicopters will continue to operate in accordance with all applicable regulations of the Civil Aeronautics Administration and the Civil Aeronautics Board. Present standards of safety will be maintained during the experimental use of the new equipment. The machines carry two pilots, and observation of the navigational display will not distract them from their regular duties.

Mr. Quesada said that the program is solely concerned with specific helicopter operations and has no effect upon the U. S. Vortac system of aids for general air navigational purposes. There is no research or development involved; the emphasis is upon evaluation under existing operational conditions.

In the field of VTOL* and STOL**, much interest was aroused by a recent statement of Hugo G. Sheridan, chief of the airplane design section, Navy Bureau of Aeronautics, in January 1958. Mr. Sheridan defined the Navy version of a VTOL as the ability to take off and land with zero ground speed and clear a 50-foot obstacle within 50 feet. STOL, he defined as the ability to take off and land over a 50-foot obstacle in less than 500 feet. Helicopter manufacturers are conducting experimental work in these fields under military contracts.



One of the major projects of the Aircraft Industries Association Helicopter Council is the production of a heliport design guide. Initial distribution of the publication was made April 16-19 during the Annual Forum of the American Helicopter Society in Washington, D. C. Ten thousand additional copies will be sent to city, county and state officials, planning groups and others seeking guidance in preparing for the helicopter age.

*Vertical takeoff and landing
**Short takeoff and landing

HELICOPTER CHARTER OPERATIONS AS OF APRIL 1958

Helicopter operators	79
Number of helicopters	455
Hours flown	214,221
Number of passengers	541,782
Heliports	223

NOTE: There are a total of 99 operators with 472 helicopters. Reports of operations were received from 79.
Source: 1

U. S. EXPORTS OF CIVIL HELICOPTERS
1948 TO DATE

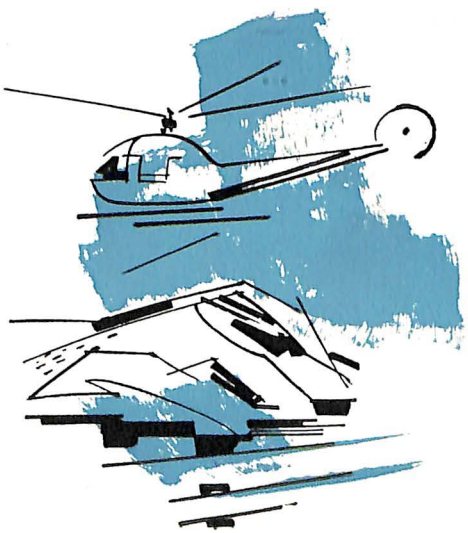
Year	Number	Value in Thousands
1948	47	$1,933
1949	31	1,181
1950	38	984
1951	28	899
1952	37	1,411
1953	98	4,873
1954	74	4,044
1955	66	4,165
1956	55	3,658
1957	104	11,907

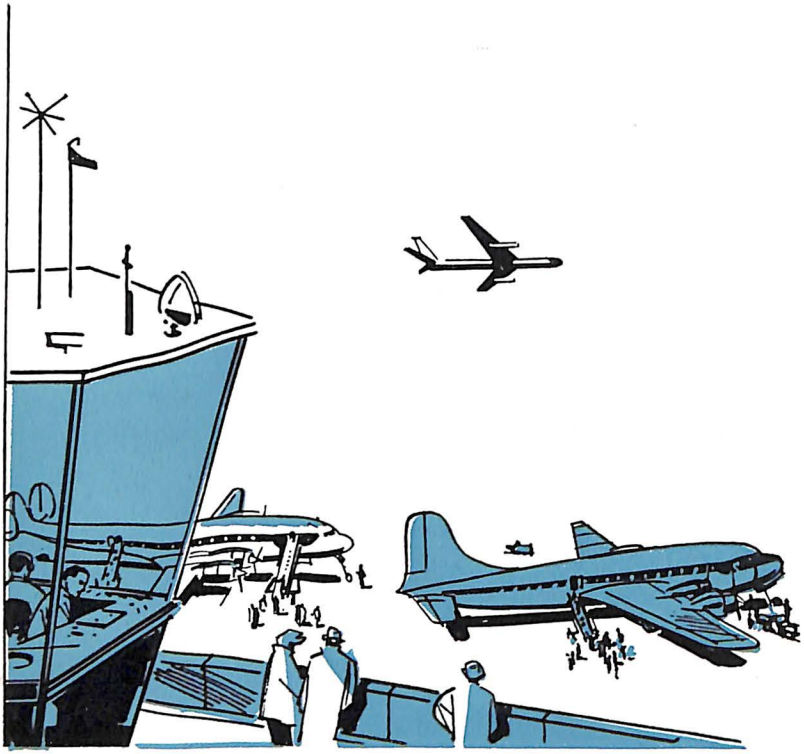
Source: 13

SELECTED HELICOPTER CHARACTERISTICS
1958

Company	Commercial Designation	Number of Places	Horse-power	Useful Load (pounds)	Range, Miles	Maxi-mum Speed	Mili-tary
Bell	47 Series	2–4	178–250	590–1185	200–238	86–105	Yes
	204	6	825	1953	200	151	Yes
Cessna	CH-1B	2–4	270	1000	290	122	Yes
Doman	LZ	8	400	1950	380	105	Yes
Hiller	12 Series	3	210–250	763–920	104–205	87–95	Yes
Kaman	H-43[a]	5	600	—	—	—	Yes
Sikorsky	S-55 Series	12	600–700	2250	400	101	Yes
	S-56	26	4200	10310	100	130	Yes
	S-58	20	1525	5440	293	130	Yes
Vertol	H-21A[a]	22	1425	4730	—	115	Yes
	44	15–19	1425	5420	287	127	No

[a] No civil designation.
Source: 1





9 Airlines and Transportation

By the end of 1957, the scheduled airlines of the United States had on order 474 luxurious new airliners slated for delivery between 1958 and 1961. Included in this equipment are: 230 turbojet, 167 turbopropeller, 70 piston engine, and 7 helicopter aircraft representing an airlines investment of more than $2,500,000,000.

America's airline industry has a hardy faith in the growing acceptance of air travel, for the $2.5 billion equipment expansion is a capital program equal to three times the industry's net worth. But the decision of the airlines to move determinedly into the jet era was not a sudden move. It came as the result of years of economic study and transportation research with the airlines, the aircraft industry, the military services, and the Civil Aeronautics Administration working together as a team.

Today, the nation's scheduled airline fleet consists of 1,664 aircraft

of various types. These planes, during 1957, flew 49,119,000 passengers some 31,109,100,000 revenue passenger miles; carried 160,689,000 ton miles of U. S. mail and more than 507,678,000 ton miles of freight.

The Civil Aeronautics Administration predicts that by 1965, domestic volume will reach 93 million passengers, nearly twice the 49, 339,000 passengers carried in 1957. The airlines estimate additionally, that at least 30 per cent of all air traffic will be flying aboard turbine-powered aircraft by year-end 1959, and further, that by 1961, the jet will be basic airline transport.

The growth of America's airlines is a tribute to airline industry management from the ticket agent to the company executive. A measure of this success is also due to the U. S. aircraft industry, whose research,

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

Year	TOTAL[a]	Convair		Douglas		Lockheed	
		340	440	DC-6	DC-7	1049	1649
1953	209	101	—	69	11	28	—
1954	198	61	—	41	48	48	—
1955	113	14	—	14	30	55	—
1956	206	—	57	39	67	43	—
1957	323	—	79	44	123	42	35

[a] Commercial transport totals differ from CAA 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

Domestic						International[a]					
Aircraft Make and Model	1941	1954	1955	1956	1957	Aircraft Make and Model	1941	1954	1955	1956	1957
Bell											
B47D,G	..	6	7	7	6						
Boeing						Boeing					
247D	27	..	..	..	..	307	3	..	..	..	..
307	5	..	..	..	..	314	8	..	..	..	..
377	..	11	10	9	9	377	..	27	26	25	24
Convair						Convair					
240	..	92	93	95	99	240	..	10	5	5	1
340	..	121	123	123	134						
440	..	..	..	19	31						
Curtiss											
C-46	..	..	..	3	7						
Douglas						Douglas					
DC-3, 3S	280	299	301	321	312	DC-2	3	..	..	..	..
DC-4	..	109	100	75	39	DC-3	45	22	18	15	10
DC-6,A, B	..	185	190	218	267	DC-4	..	31	28	40	28
DC-7	..	61	77	99	169	DC-6A, B	..	62	60	70	68
						DC-7	..	..	5	33	38
						Grumman					
						G-21	..	..	..	..	1
Lockheed						Lockheed					
10	16	..	..	..	..	10	2	..	..	..	..
18	13	11	9	10	10	18	3	..	..	..	..
L49	..	37	44	50	59	L49	..	9	5	6	..
649	..	3	..	..	..	1049	..	..	..	2	..
749	..	62	58	58	57						
1049	..	39	61	73	81						
1649	..	..	..	..	25						
Martin						Martin					
2-0-2	..	25	19	23	25	130	1	..	..	..	..
4-0-4	..	100	100	97	85						
Sikorsky						Sikorsky					
S51	..	3	2	2	2	S42B	4	..	..	..	..
S55	..	11	10	8	12	S43	1	..	..	..	..
S58	..	..	..	3	6						
Vickers											
744	..	..	8	54	59						
Total	341	1175	1212	1347	1494		70	161	147	196	170

(*Continued on next page*)

Domestic						International[a]					
Aircraft Make and Model	1941	1954	1955	1956	1957	Aircraft Make and Model	1941	1954	1955	1956	1957
Fixed Wing											
4-engine turboprop	..	..	8	54	59		..	..	..	..	..
4-engine piston	5	507	540	582	706		16	129	124	176	158
2-engine piston	336	648	645	691	703		54	32	23	20	12
Helicopter											
Piston engine	..	20	19	20	26		..	..	..	..	..

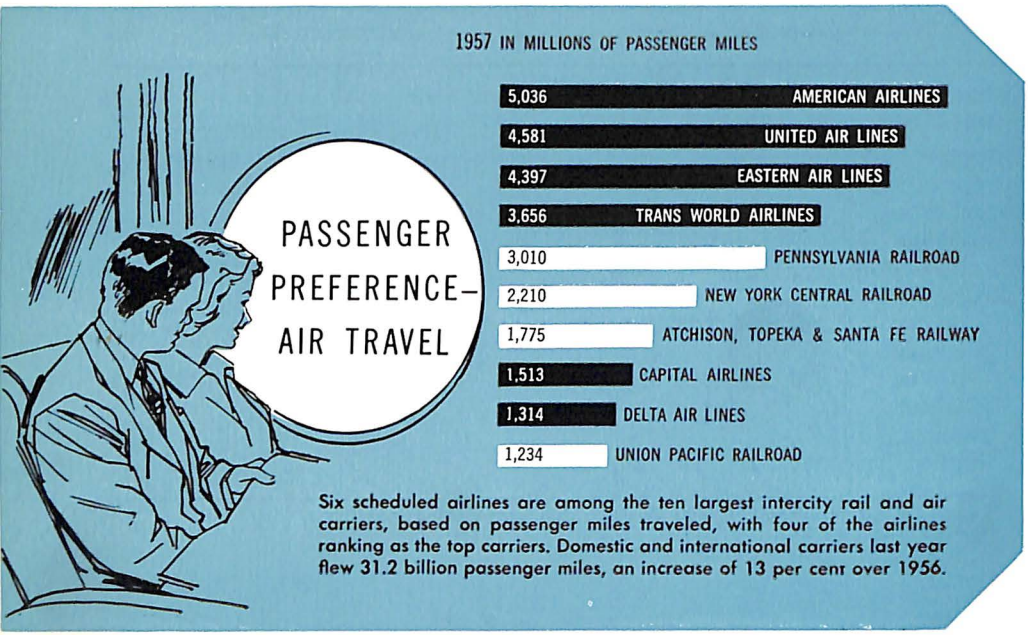
[a] Excludes certain aircraft in both domestic and international operations.
Source: 16

engineering and production teams have built the world's standard of economy, efficiency, safety and luxury into U. S. air transports.

In spite of the relentless upward spiraling costs during the period 1938 to 1958, airline passenger fares have been held at the 1938 levels. For example, in 1938 the average revenue per passenger mile for domestic trunkline aircraft was 5.32 cents, while today, the average revenue per passenger mile is only 5.42 cents—a gain of only 1.9 per cent in passenger revenue in twenty years.

In 1938, the airlines received 42.1 per cent of their revenue from the government in the form of mail pay, which included both subsidy and mail pay. By 1957 their dependency on mail pay had been reduced to a point where only 3.1 per cent of airline revenues came from mail service.

The last of the domestic airlines withdrew from subsidy during 1957. However, a few local service airlines received the majority of *public service* revenues which amounted, in 1957, to only 1.9 per cent of the scheduled airlines total revenues. Public service revenue is a federal guarantee provided, so that smaller communities can receive the benefits of air transport service. A small portion of the public service revenues was also used for the development of helicopter service and for the development and maintenance of national interest routes in Alaska, Hawaii and Latin America.



In 1957, the airline industry climbed to first place among the public carriers competing for inter-city traffic. During the twelve-month period the airlines flew more than 25 billion passenger miles; the railroads travelled approximately 21 billion passenger miles; and the busses accounted for about 16 billion passenger miles.

During the same period, the airlines established a near all-time high safety record with only .12 fatalities per 100 million passenger miles. During this same period, by comparison, more than 26,000 persons lost their lives in automobile accidents on the nation's streets and highways.

Although the scheduled airline industry is devoted to the air travelling interests of the nation and its friendly neighbors around the world, the industry also provides significantly for the national defense under terms of the Civil Reserve Air Fleet (CRAF). The airlines, in cooperation with several government agencies, can make available to the military on a global basis, 368 four-engined, long-range airliners—314 available from the airline industry and the remainder from other agencies. In operation, these planes, which would cost the taxpayer in excess of $550 million to purchase and $350 million annually to maintain, could be placed at the disposal of the government in an emergency within 48 hours. These planes would be furnished, ready to go anywhere in the

world—*complete* with crews. Today, CRAF is able to make available approximately 2,800,000,000 ton miles annually. By 1961, when the giant jet transports are phased into CRAF, this capability will increase more than three times to something in excess of 9,000,000,000 ton miles. This airlines transport potential available to the military is 15 times more than the average annual airlift provided by the airlines in World War II.

In addition to the CRAF availability, the military services provide a tremendous airlift in their own support with Military Air Transport Service (MATS). During 1957, MATS transport, air rescue, air medical evacuation, weather and other aircraft logged 1,103,280 hours, a decrease of some 75,000 hours over record-breaking 1956. Every hour of the day MATS airlifted about 88 passengers and patients and nearly 20 tons of cargo for all branches of the Department of Defense. In carrying out

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	27,185	20,460	585	4,808	122	1,210
1957	30,326	23,049	688	5,529	139	921
Cargo Ton-Miles (Millions)						
1948	137	89	[b]	46	N.A.	....
1953	452	182	2	89	3	176
1956	584	248	3	115	3	215
1957	690	286	4	133	4	263
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	157	95	2	57	1	2

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: 17

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	54.02	88,248	216.1	0.1

N.A.—Not available.
E Estimate.
Source: 16

its military assignments MATS aircraft have completed an Atlantic or Pacific crossing every 41 minutes since the creation of the command in 1948.

The advent of the jet transports into the nation's scheduled airlines next year will also have an important impact on military air travel and cargo movements where high priority is concerned. In 1957, Secretary of Air Force James Douglas stated: "We have not ordered any turbo-jet transport aircraft for the Military Air Transport Service such as the airlines have on order in large number and which we count on the air-lines' making a part of the Civil Reserve Air Fleet."

Inasmuch as a great part of military air transport is high priority movement, the Defense Department undoubtedly will have to step up its military volume aboard civil transport. This will be due, of course, to the fact that civil jet transports will increase travel speeds almost 250 miles per hour over speeds within the present capability of the MATS piston-engined fleet.

Trans-Atlantic Air Travel

About 2,900 aircraft are flown by the scheduled airlines of the world. Of this number, approximately 85 per cent are manufactured in the United States—a tribute to the superiority of American-built aircraft.

In 1957, the latest year for which international air travel statistics are available, approximately 87 million passengers were transported between nations of the free world. The majority of this passenger traffic was carried in the United States and between European nations and Great Britain.

During 1957, U. S. international carriers increased their passenger traffic considerably over the previous year. During the 12 months of 1957, U. S. carriers flew approximately 4,148,000 passengers some 5,769,500,000 passenger miles on international routes. In 1956, these carriers flew 3,949,000 passengers some 5,126,000,000 passenger miles. Cargo carried increased 12 per cent during 1957, and mail ton miles carried jumped from 55,156,000 in 1956, to 57,265,000 ton miles in 1957.

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.

Sources: 3, 42

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

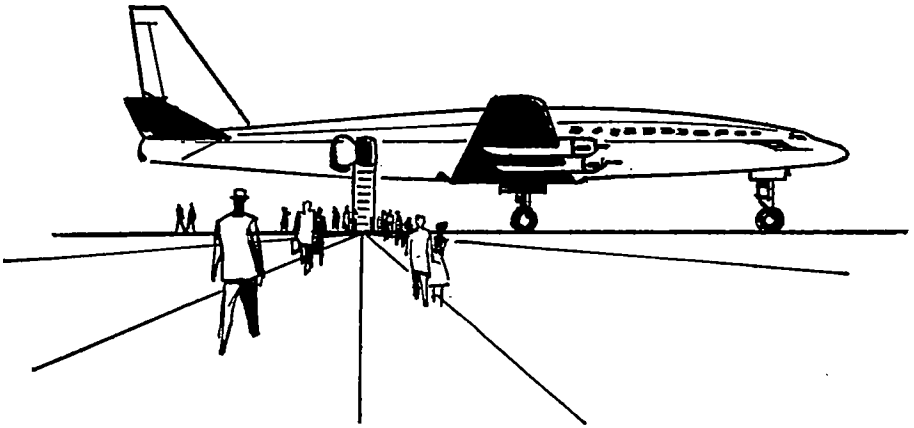
As of December 31	Operators	Aircraft in Service	Average Available Seats	Route Miles Operated (thousands)	Average Speed M.P.H.	Passenger Fatalities per 100 Million Passenger-Miles Flown
1928	1	57	N.A.	N.A.	N.A.	N.A.
1930	3	103	N.A.	19.2	N.A.	N.A.
1935	2	101	N.A.	31.3	N.A.	N.A.
1940	3	68	18.3	52.3	N.A.	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	132.4	254.0	0.6

E Estimate.
N.A.—Not available.
Source: 16

EMPLOYMENT, WAGES, AND AVERAGE ANNUAL EARNINGS IN THE TRANSPORTATION INDUSTRY, 1956

	ALL INDUSTRY	ALL TRANSPORTATION	Air Transportation (Common Carrier)	Railroads	Highway Transportation	Water, Pipeline, and Other Transportation
Full-Time Equivalent Employees (Thousands)	56,512	2,652	135	1,185	984	348
Wages and Salaries (Million Dollars)	$227,237	$13,344	$739	$6,021	$4,789	$1,795
Average Annual Earnings per Full Time Employee	$4,021	$5,032	$5,474	$5,081	$5,166	$5,158

Source: 7



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	4,148.0	9,076.4	5,769.5	63.57	N.A.	1,391

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.
Source: 16

AIRCRAFT IN SERVICE ON WORLD AIRLINES, March 14, 1958
Members of International Air Transport Association[a]

Aircraft by Country in Which Manufactured	Number of Aircraft	Percent of Total
GRAND TOTAL	2,900	100.0
Made in the United States	2,451	84.5
DC-7	209	
DC-6	381	
DC-4	198	
DC-3	694	
Super Constellation	186	
Constellation	161	
Convair 440	67	
Convair 340	141	
Convair 240	102	
Stratocruiser	50	
Martin 4-0-4 and 2-0-2	114	
Commando C-46	53	
All other	95[a]	
Made in Great Britain	392	13.5
Britannia	22	
Viscount	158	
DH Heron	46	
Viking	31	
DH Dove	21	
DH Rapide	24	
All other	90[b]	
Made in Canada	31	1.1
Made in other countries	26	0.9

[a] Does not include the airlines of the Soviet Union and some of the smaller airlines of the world.
[b] Includes 40 helicopters.
[c] Includes 3 helicopters.
Source: 29

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	1,030	280	28	575
1957	1,760	87	51,000	1,150	300	29	585

N.A.—Not available.

Source: 30

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

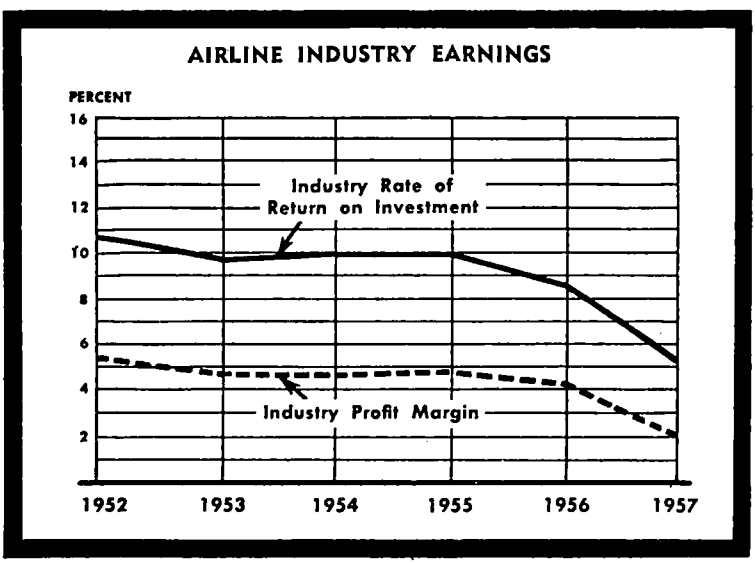
Year	AIRLINES		RAILROAD		INTER-CITY BUS
	Domestic Scheduled	Domestic Non-Scheduled	Coach (Excluding Commuter)	Pullman (Total)	
1926	12.0	—	3.35	N.A.	2.96
1937	5.6	—	1.80	3.08	1.73
1947	5.1	—	2.02	3.53	1.70
1952	5.55	3.20	2.53	4.60	2.02
1953	5.45	3.20	2.53	4.68	2.06
1954	5.39	3.20[E]	2.50	4.66	2.08
1955	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[E]	3.20[E]	2.71	5.20	2.25[E]

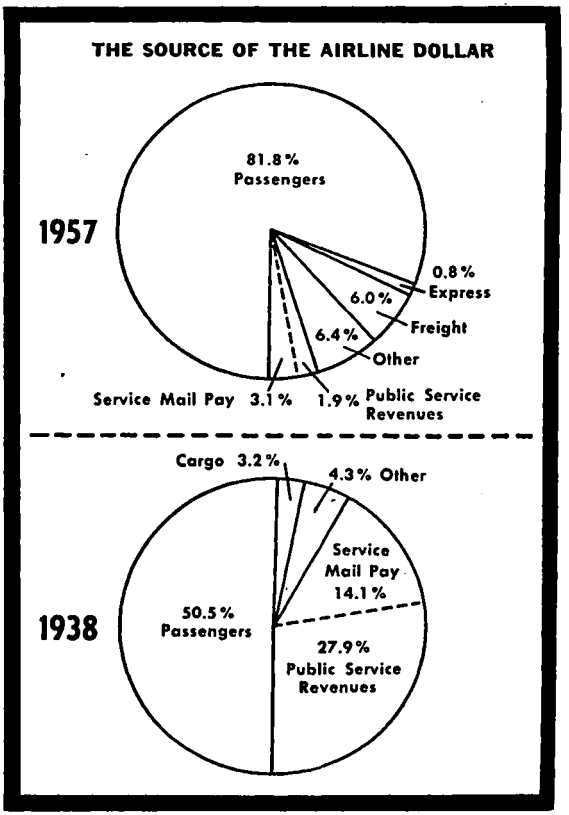
N.A.—Not Available.
[E] Estimate.
Sources: 1, 3, 16, 31, 39

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
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

Source: 33



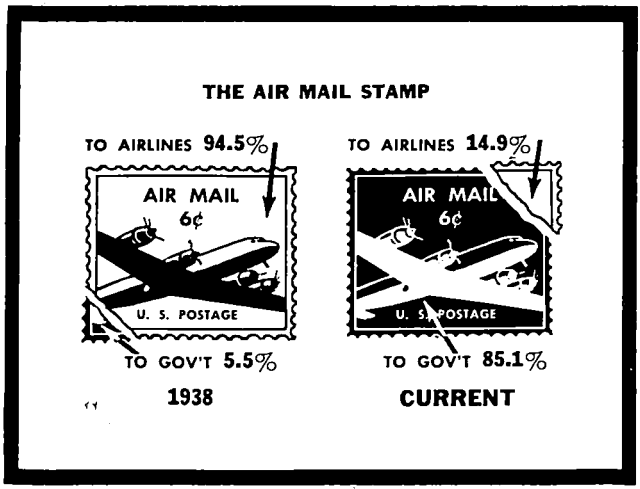


THE TEN LEADING PASSENGER TRANSPORT COMPANIES
(Millions of Passenger Miles[a])

1957	
American Airlines	5,036
United Air Lines	4,583
Eastern Air Lines	4,397
Trans World Airlines	3,656
Pennsylvania Railroad	3,010
New York Central System	2,218
Atchison, Topeka & Santa Fe Railway System	1,775
Capital Airlines	1,513
Delta Air Lines	1,314
Union Pacific Railroad Company	1,236

1954	
Pennsylvania Railroad	3,447
American Airlines	3,372
United Air Lines	3,135
New York Central System	3,041
Eastern Air Lines	2,847
Trans World Airlines	2,611
Atchison, Topeka & Santa Fe Railway System	1,948
Union Pacific Railroad Company	1,459
Southern Pacific Company	1,342
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: 18, 31



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	44,971.0	41,653.2	25,339.6	60.83	N.A.	563

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.
Source: 16

AIR VS. RAILROAD PASSENGER TRAVEL
1937 TO DATE
(PassengerMiles 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]	21.3	5.4	15.9

E Estimate.
N.A.—Not available.
Sources: 3, 16, 31

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

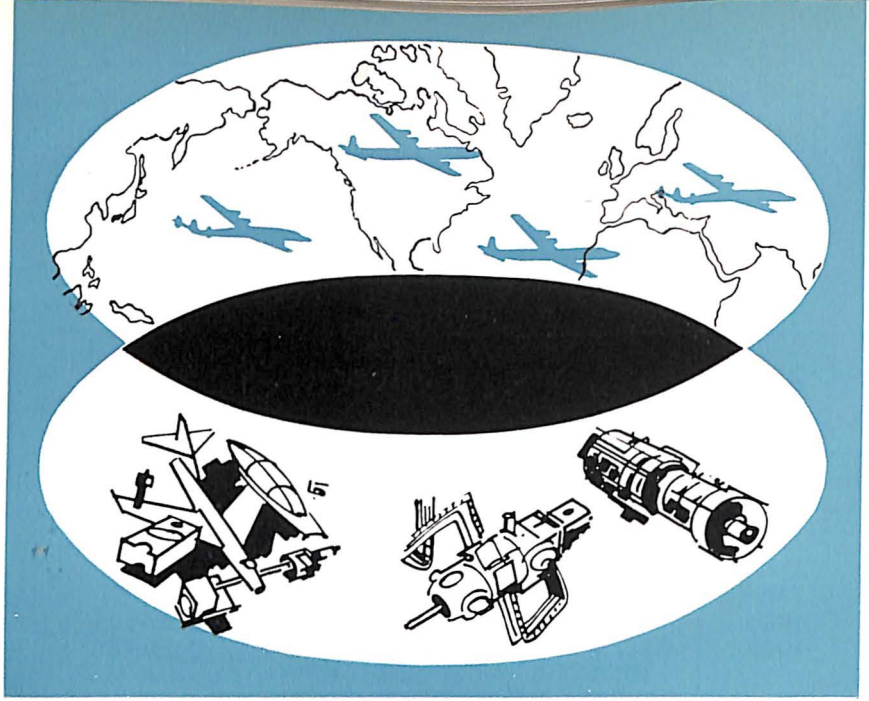
Year	Domestic Airlines	Railroads	Buses	Cars and Taxis
Passenger Deaths				
1943	1.4	0.31	0.22	2.7
1945	2.1	0.25	0.20	2.8
1949	1.3	0.13	0.20	2.2
1951	1.3	0.36	0.19	2.3
1952	0.35	0.35	0.18	2.9
1953	0.58	0.16	0.13	2.9
1954	0.09	0.08	0.11	2.6
1955	0.76	0.07	0.19	2.7
1956	0.62	0.20	0.16	2.7
Total Deaths[a]				
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

[a] Includes pedestrians, employees, trespassers, etc.
Source: 40

ESTIMATED INTERCITY PASSENGER TRAFFIC, BY TYPE, 1916 TO DATE

Year	TOTAL	Domestic Air Carriers	Railroads[a]	Highways	Inand 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	726.0[E]	25.3	25.9	672.9[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	3.6	92.7	.2

[a] Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.
[b] Negligible.
Sources: 3, 16, 32



10 Aviation Export and Foreign Aviation

The business of export is difficult. The world is faced with exchange restrictions, quotas, tariffs and other limitations which hamper the import-export activities of the friendliest of national neighbors of the free world.

Although the airplane today is largely responsible for easy access to world markets, products of the aircraft industry suffer the same handicaps as all other merchandise when it comes to changes in national ownership.

Aircraft production in the United States exceeds that in all the rest of the world with the exception of Russia. Russian production, of course, is a matter of speculation. Although its production of aeronautical products is said to exceed that of the United States—particularly in the military field—most of that production apparently is for domestic use; for its aviation export is negligible.

In 1957, as in 1956, United States aviation exports continued to top the one billion dollar mark for the second time in history. Export for

1957 amounted to $1,028,728,000 and included both military and civil sales. This export was highlighted by an increase of 44 per cent in the value and 42 per cent in the number of transport aircraft.

While 1957 aviation exports declined $36 million (about 3 per cent below 1956 levels), as will be noted in statistical tables accompanying this text, the over-all decline was far more than offset by greatly increased direct factory shipments overseas, as indicated by an approximate 36 per cent reduction in military aviation exports. Overseas shipments of aviation military aid material, the details of which for security reasons, are concealed in a statistical classification described as "Special Category of Excluded Items," dropped 48 per cent in value.

However, direct factory exports moved up from $174.6 million to $252.8 million in 1957—an increase of 45 per cent. The value of transport aircraft exports was up 44 per cent and units increased 42 per cent. Utility aircraft advanced 19.4 per cent in value and 13 per cent in units.

In terms of economic importance to the country, aviation exports in 1957 accounted for almost 9 per cent of the estimated total value of the industry's production and supported almost 80,000 workers.

The Bureau of the Census export statistical report for 1957 (the categories considered confidential; no details as to quantities, values, and countries of destination are revealed) came to an aggregate value of

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	20,809.7	1,028.0	4.9

[a] Less than .05 percent.
Sources: 13, 14

$775,926,000 or over 75 per cent of the grand total. Hence, with only 25 per cent of the 1957 exports disclosed in full detail, it is virtually impossible to make a comprehensive study of the steadily increasing volume of direct factory export sales.

An indication of the magnitude of U. S. participation in the Military Assistance Program can be determined when considering the collective

EXPORTS OF CIVIL AIRCRAFT, 1948 TO DATE

NEW PASSENGER TRANSPORTS

Year	TOTAL		3,000–14,999 lbs airframe weight		15,000–29,999 lbs airframe weight		30,000 lbs & over airframe weight	
	Number	Value (Millions)	Number	Value (Millions)	Number	Value (Millions)	Number	Value (Millions)
1948	91	$37.4	34	$2.4	14	$4.2	43	$30.8
1949	51	22.2	16	1.3	25	7.6	10	13.4
1950	48	40.4	4	.4	15	6.6	29	33.4
1951	26	13.2	13	1.1	1	[a]	12	12.1
1952	25	18.2	9	.6	1	.6	15	17.0
1953	87	79.2	17	1.3	13	7.5	57	87.0
1954	110	93.0	29	2.0	7	4.0	74	70.4
1955	95	81.2	39	2.5	5	2.4	51	76.3
1956	151	132.9	64	4.7	2	.8	85	124.4
1957	203	179.3	94	7.7	9	6.9	100	164.7

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

(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

[a] Less than $500,000.

Source: 13

power of the NATO group. This force currently consists of approximately 200 Allied Army divisions involving five million soldiers; 2,500 combat vessels, and 32,000 aircraft, of which about 14,000 are jet fighters. This support has cost the United States about $20 billion over a seven-year period. However, our Allies, jointly, have contributed more than six times as much—$122 billion—toward support of these forces.

Far from being a "give away" program as the Mutual Assistance program is considered by some in this nation, mutual security is the most productive investment the USA can make to *insure its own future.*

Civil Air Transport

Perhaps the brightest spot in the U. S. aircraft industry export picture is free world purchases of this nation's giant new turbojet and turbopropeller airliners, slated to join world airline fleets by the end of the calendar year.

U. S. manufacturers have orders for 523 commercial turbojet and turboprop airliners from 41 airlines including 23 foreign carriers. This is indicative of the overwhelming preference for the standard of quality built into American manufactured transports. However, this preference has long been established, as world airline statistics show: Eighty-five per cent of the aircraft flown by all the world's airlines were built in America. There are no tricks of foreign trade or national preference involved in this record. In spite of some governments offering paternal-

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

[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: 13

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	1,362	1,138	224
1956	2,766	2,680	86
1957	1,761	1,634	127
TOTAL[a]	12,439	10,825	1,614

[a] Oct. 6, 1949 to Dec. 31, 1956.
Source: 23

istic provisions for their nation's air transport industry, American aircraft were chosen for no more complicated reason than they are the best aircraft obtainable. Even the government-owned airlines in some of these nations consistently order—and re-order—American flight equipment, especially for their international operations. Dependability, excellent servicing arrangements and competitive pricing still are the overriding factors in airline choice, whether the carrier operates in South Africa or South America.

Light Civil Aircraft

U. S. exports of civil aircraft weighing 6,000 pounds or less showed a marked rise in 1957, with 1,131 aircraft valued at $17,372,539 shipped to buyers in nations all over the free world. These shipments abroad represent an increase of 17 per cent in unit value over 1956, and an increase of 40 per cent in dollar value.

The aircraft were sold to 59 nations and to Alaska and Puerto Rico by five U. S. manufacturers. Leading customers for the U. S.-built business and utility planes were buyers in Argentina, purchasing 198 aircraft valued at $2,667,000. Canadians were the second largest purchasers of light planes during 1957, buying 156 planes valued at $2,150,000.

Foreign Aviation

The destruction of the German and Japanese aviation industry was complete in World War II. It wasn't until 1954 that either was again accepted as "members in good standing" by the free world. Prior to World War II, both were formidable competitors in world export markets. Both, with the assistance of the United States, are making rapid progress in the restoration of their respective aircraft industry. Neither, however, will be able for some years to offer competition to the United States in world exports.

Much of the aircraft industry of France, the Netherlands, Belgium

and Italy was destroyed during World War II. The United States, through several aid plans—the foremost being the one-time Mutual Defense Assistance Program—has in large measure been able to re-establish the aircraft industry of those nations including associated industries of aircraft engines, electronics, etc.

Since World War II, Great Britain, Canada, and France have all made great strides in the export of aviation products, particularly in military items. Great Britain, in addition to making great progress in the export of military aviation end items, has also placed heavy emphasis on the export of civil aviation products.

Great Britain

Employment in the United Kingdom aircraft manufacturing industry

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

Sources: 6, 24

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.

N.A.—Not available.
E Estimate by official British sources.
[a] As of end of November.
[b] As of end of December.
Sources: 27, 28

as of December 31, 1957, totaled 257,000. By way of comparison, it is interesting to note that U. K. aircraft employees, as of December 1946, totaled 264,000. Industry allied to that of the British aircraft manufacturing complex employs an additional approximate 100,000.

Over-all production figures for aircraft, engines, and other aviation products are not published in the U. K. because of government security regulations. Nor are aeronautical exports quoted in detail comparable to that of the United States. United Kingdom aeronautical exports for 1957 totaled $326.1 million.

In the gas turbine field, the U. K. has delivered more than 300 transports to domestic and world markets, excluding the Comet I, II and III. Of the new deliveries, Vickers Viscounts comprised the bulk with about 280 flying the world's airlanes. The remainder consisted of 27 Bristol Britannias.

Canada

Canada has worked in close cooperation with both Great Britain and the United States in her production of a very substantial volume of aircraft. She has combined the airframes of the United States with powerplants from Great Britain and vice versa. In addition, she has designed and produced numerous airframes and powerplants in her own companies. She has supplied substantial quantities of trainers, fighters

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

Source: 27

UNITED KINGDOM'S CURRENT ORDERS FOR TRANSPORT AIRCRAFT
(As of March 31, 1958)

Aircraft	Number
de Havilland Comet 4	19
de Havilland Comet 4B	6
de Havilland 121[a]	24
Vickers Viscount[b]	103
Vickers Vanguard	40
Vickers VC 10	30
Bristol Britannia[c]	51

[a] Unconfirmed as yet.
[b] 280 in service with 30 airlines.
[c] 27 in service with 6 airlines.
Source: 27

and bombers for Europe and elsewhere, and has sold many of her liaison-type aircraft in the United States despite domestic competition.

West Germany

Statistical data in connection with production, exports and employment in the German aviation industry is, at this time, meager. As is generally known, the German aircraft industry for the last several years has been engaged in creating the basic conditions for the resumption of production. Only the Dornier in Friedrichshafen has started serial production of the multi-purpose DO-27. As of December 31, 1957, 85 DO-27 aircraft with a value of approximately 12.5 million German marks were delivered.

As of the reporting period, most of the equipment and component

manufacturers in Germany had begun, on a modest scale, production under license on foreign equipment. At year-end 1957, total employment in the German aviation industry amounted to approximately 7,000.

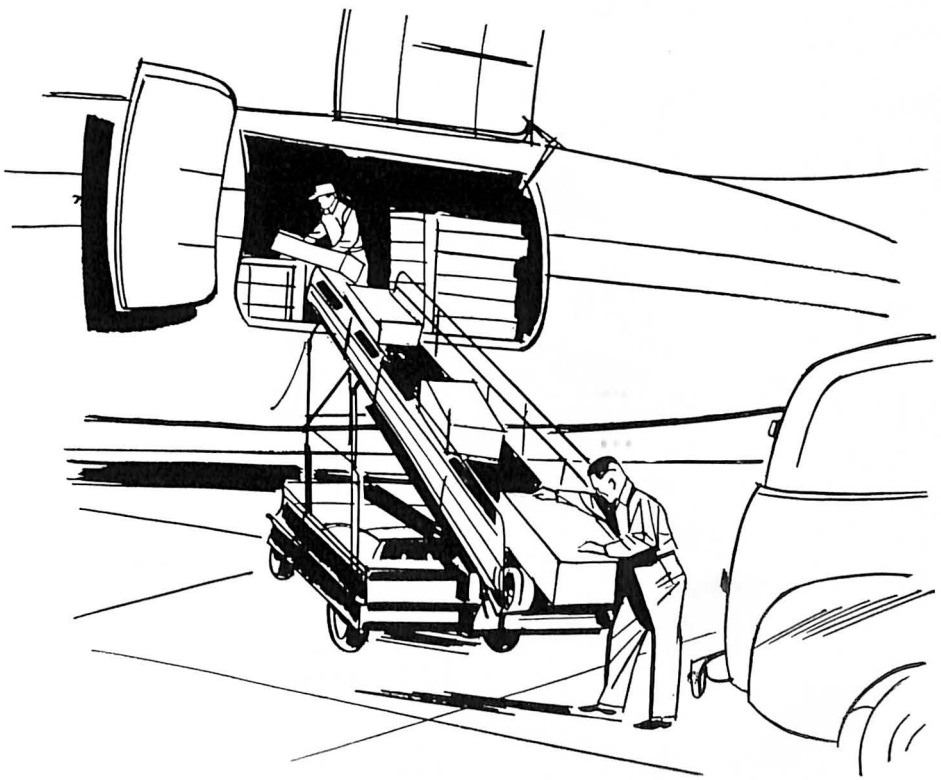
Japan

The aircraft manufacturing industry in Japan fares somewhat better than Germany's. During calendar year 1957, the industry employed 15,424 persons. Domestic production (in large part manufacture under license of foreign aircraft, engines and parts) amounted to 238 aircraft and three engines at an approximate value of $20,543,000. The export to Brazil of three helicopters amounted to $83,300.

Italy

Aircraft production in Italy has been beset by lack of a program for healthy growth and, in addition, has suffered from a series of peaks and valleys in production. The situation is severe in Italy due to a low overall volume.

Aircraft production is estimated at approximately 25 billion Italian lire ($40 million), approximately 50 per cent of which was produced



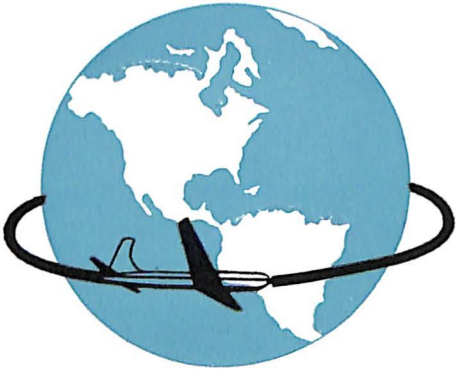
for export. Production included 120 aircraft (including helicopters), 100 aircraft engines, parts and spares.

Argentina

The aircraft industry in Argentina is a nationalized industry. It was organized in 1927 as the Military Aircraft Factory and entered into aircraft and engine production under Army supervision. Its history has followed much the same pattern of growth as one of our domestic companies might have expanded.

The aircraft company is known as DINFIA (Federal Directorates of Aeronautical Manufacturing and Research). As of December 31, 1957, DINFIA employed approximately 13,000 persons, 150 of which are graduate engineers with an American equivalent PhD. educational level.

Current production statistics are unknown, but production plans for the 1957-1961 period are reported by company officials to include 106 IA.35 (light twin-engine transport); 90 Beechcraft "Mentor" under U. S. license; 45 Morane Saulnier "Paris 760" under French license; 100 IA.45; and 200 IA.46. Engine production contemplates 300 Indio engines developing 800 horsepower; and 400 Lycoming O-320 engines under U. S. license.



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SOURCES:

1 Aircraft Industries Association

2 Aircraft Industries Association, "Aircraft Year Book" (1919-1957)

3 Aircraft Industries Association, "Aviation Facts & Figures" (1945, 1953, 1955, 1956, 1957)

4 Air Transport Association

5 Department of the Air Force, Directorate of Statistical Services

6 Air Industries & Transport Association of Canada, Annual Reports

7 Department of Commerce, "Survey of Current Business—National Income"

8 Department of Commerce, Bureau of the Census, "Census of Manufactures", 1954 and earlier

9 Department of Commerce, Bureau of the Census "Annual Survey of Manufactures" (1949, 1950, 1951, 1952, 1953, 1955)

10 Department of Commerce, Bureau of the Census, Facts for Industry, Series M37G, (Monthly) "Complete Aircraft and Aircraft Engines"

11 Department of Commerce, Bureau of the Census, Facts for Industry, Series M37C, (Monthly)

12 Department of Commerce, Bureau of the Census, Facts for Industry, Series M37D, (Quarterly) "Backlog of Orders for Aircraft Companies."

13 Department of Commerce, Bureau of the Census, U. S. Exports of Domestic & Foreign Merchandise'' (Report FT 410)

14 Department of Commerce, Bureau of the Census, "Historical Statistics of the United States, 1789-1945" and "Continuation to 1952"

15 Department of Commerce, Civil Aeronautics Administration, "The Airplane at Work for Business & Industry"

16 Department of Commerce, Civil Aeronautics Administration, "CAA Statistical Handbook of Civil Aviation"

17 Department of Commerce, Civil Aeronautics Board, "Annual Report of the Civil Aeronautics Board"

18 Department of Commerce, Civil Aeronautics Board, Statistical Section

19 Department of Defense

20 Department of Defense, "Expenditures by Major Budget Category, FY 1959 with Eight Year Comparisons," EFAD-220

21 Department of Defense, "Monthly Report of Status of Funds by Budget Category," EFAD 340

22 Department of Defense, "New Obligational Availability by Major Budget Category," EFAD 117

23 Department of Defense, Office of Military Assistance, "Department of Defense Key MDAP Statistics" (Monthly)

24 Dominion Bureau of Statistics, Ottawa, Ontario, Canada

25 Executive Office of the President, Bureau of the Budget, Estimates Division, "Budget of the U. S. Government" (Annual)

26 First National City Bank, Monthly Letter, "Business and Economic Conditions"

27 H. M. Central Office of Information, London

28 H. M. Stationery Office, London, "Ministry of Labour Gazette" (Monthly)

29 International Air Transport Association, "Bulletin" (Annual)

30 International Civil Aviation Organization, "Air Transport Scheduled Services — International and Domestic" (Annual)

31 Interstate Commerce Commission, Bureau of Transport Economics and Statistics

32 Interstate Commerce Commission, "Transport Economics, Monthly Comment"

33 Department of Justice, Immigration and Naturalization Service, Administrative Division, Statistics Branch, "Report of Travel Between U.S. and Foreign Countries" (Semi-Annual)

34 Department of Labor, Bureau of Employment Security

35 Department of Labor, Bureau of Labor Statistics, Division of Wages and Industrial Relations

36 Department of Labor, Bureau of Labor Statistics, "Employment and Earnings" (Monthly) (Formerly "Employment and Payrolls")

37 Department of Labor, Bureau of Labor Statistics, "Occupational Outlook in Aircraft Manufacturing," Bulletin No. 1215-12

38 Department of Labor, Bureau of Labor Statistics, "Work Injuries in the U. S." (Annual)

39 National Association of Motor Bus Operators

40 National Safety Council, "Accident Facts," (Annual)

41 Department of the Navy, Office of Information

42 Post Office Department, Bureau of Transportation, Division of Air Service

43 War Production Board

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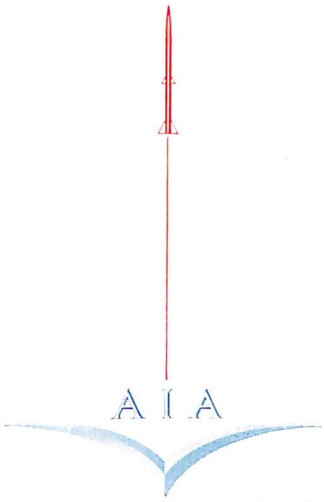

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