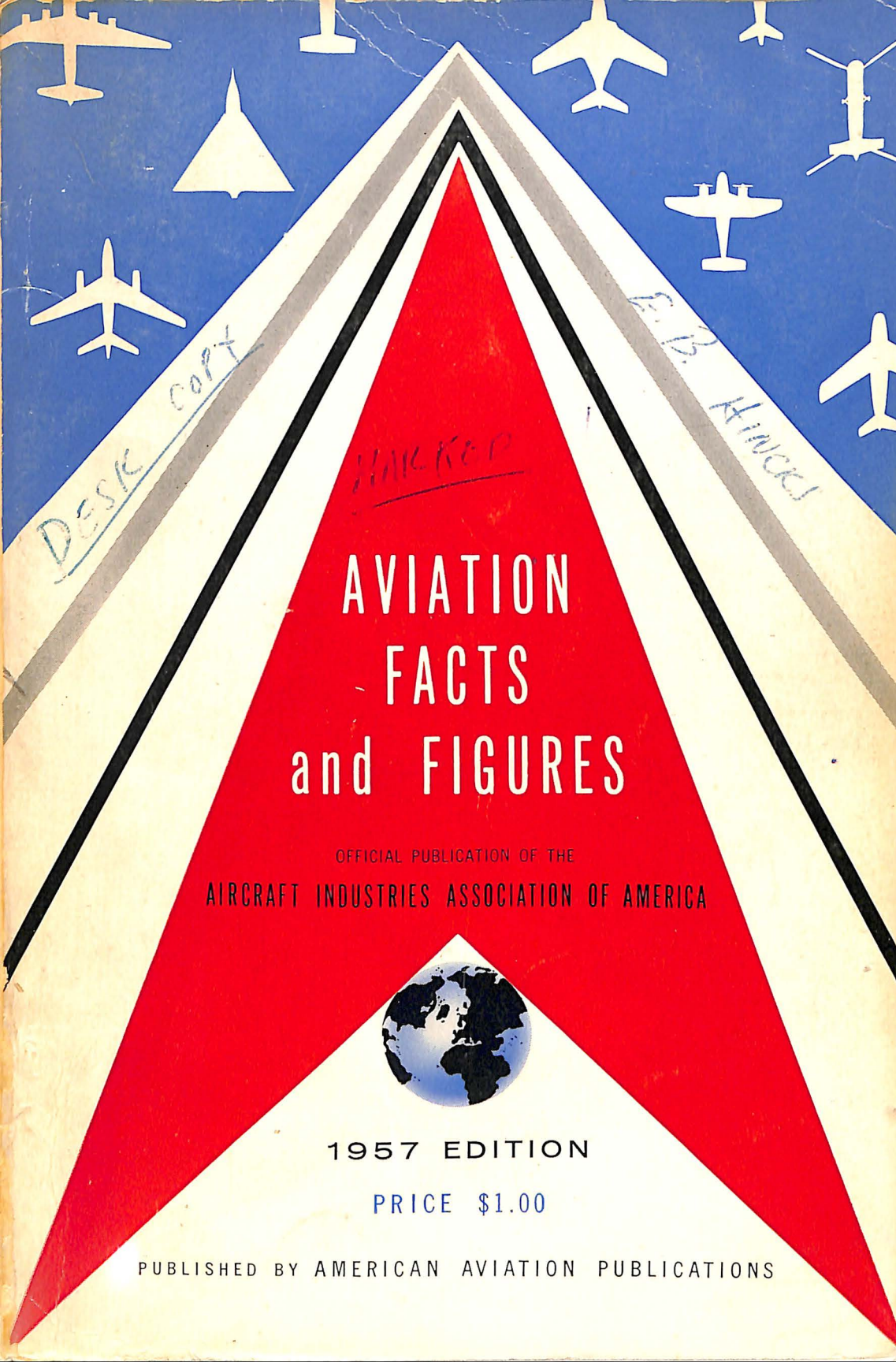

DESK COPY
E. B. HINCKLEY
HINCKLEY
AVIATION
FACTS
and FIGURES
OFFICIAL PUBLICATION OF THE
AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA
1957 EDITION
PRICE $1.00
PUBLISHED BY AMERICAN AVIATION PUBLICATIONS

FY 58 Prod Sched (57-3)
inc. FY 57 Program, FY 58 Program

Bombers	262	
Fighters	1381	
Cargo	254	FY56 6800
Trainers	453	FY7 4500 ?
total	2350	
GAR	16,000	
GM, non-bal	230	
Ballistic	85	
Misc	200	

ans
10/4/57

AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA, INC.

AVIATION FACTS AND FIGURES 1957

Compiled by

RUDOLF MODLEY
Consultant

EDWARD B. HINCKS
Statistical Assistant

Edited by

BEN S. LEE
Director of Publications

American Aviation Publications • PUBLISHERS
1001 VERMONT AVENUE, N.W. • WASHINGTON 5, D. C.

FOREWORD

Today, superiority in the quality of the aerial weapons we now hold poised is a decisive factor in holding the peace for the free world. Continuing superiority is, of course, dependent, in large measure, upon emphasis in research and development. At the same time, research and development programs deal with the future, whereas "holding the peace" depends upon our forces in being. So we must always have the proper balance between force in being and research and development programs.

In productive capacity and in scientific and technical resources the United States aircraft industry is a prime national asset. It could, if need be, produce more aircraft, engines, guided missiles, and their associated electronic systems than the entire Communist coalition. But, such a program would be both shortsighted and dangerous. Instead, our aircraft industry, as all defense manufacturing, is geared to an economy designed to maintain the strength necessary to deter aggression while continuing to build for our national welfare and to provide economic and military support to the free world.

Generally speaking, the military services are spending substantially more for research and development of new aerial weapons than the entire military air services were spending before the Korean War. Today, these services, for each three dollars spent on aircraft production, are spending another dollar in research for future aeronautical superiority.

While there are many intangibles to equating the requirements for insuring the peace, both military and administration leaders feel that a proper balance in spending for research, development

and production programs has been reached and that we are somewhere near adequate force-in-being levels *under present conditions* for maintaining national security. So, with no marked change in world conditions in prospect, a leveling off in military aircraft production is to be expected during this, and for the next several, years.

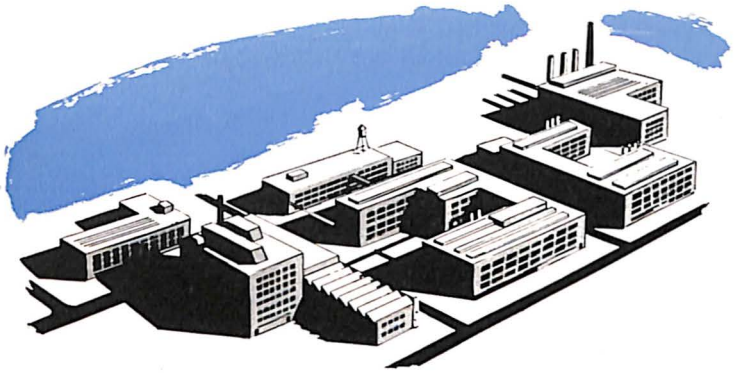
Meanwhile, commercial aircraft production has been steadily increasing as peoples of the free world have come to realize the value of the airplane as a tool of commerce; for the business of travel — domestically and internationally; and communications generally. Today, the United States aircraft industry has a record backlog for the production of civil transports of all categories including more than $2.5 billion dollars of orders for giant 600-mile-per-hour, long-range jet and fast medium-range turboprop transports.

This fifth 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 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, GENERAL (USAF-RET.)
President, Aircraft Industries Association
May 1957

CONTENTS



PRODUCTION AND FACILITIES

Military aircraft production, in terms of unit production, has leveled off. For the first time since 1950, civil aircraft unit production in 1956 exceeded military unit production.

In terms of dollar volume, however, military purchases of aeronautical products have continued to rise. In 1956, the leading aircraft, engine and propeller companies sold, to the military, an estimated 6.6 billion dollars worth of aircraft and parts and almost 1.8 billion dollars of "other products"—mostly guided missiles. Total sales to military and civil consumers reached an all-time post-World War II high of $9,496,000,000. Total sales of the aircraft industry during 1956 increased more than one billion dollars over 1955.

In terms of airframe weight produced during 1956, military deliveries, although 16.2 per cent below 1955 levels, far exceeded civil airframe weight production. Of the total 111,600,000 pounds of airframe weight produced by the U. S. aircraft industry in 1956, deliveries to the military totaled 95.5 million pounds while airframe weight delivered for civil use amounted to only 16.1 million pounds.

In 1956, the aircraft industry produced 14,000 aircraft. Of this number, 7,200 were built for civil users and 6,800 were manufactured for the military services. The nation's aircraft engine manufacturers produced an estimated 24,500 engines of all types, of which approximately 13,000 were built for the military and 11,500 were manufactured for civil consumption.

Today, the manufacture of aircraft in itself is a costly operation, not counting the cost of the plane, the missile, the great engines, etc. For example, for each pound of total airframe weight produced, the air-

TRANSPORT AND EXECUTIVE FIXED-WING AIRCRAFT IN PRODUCTION

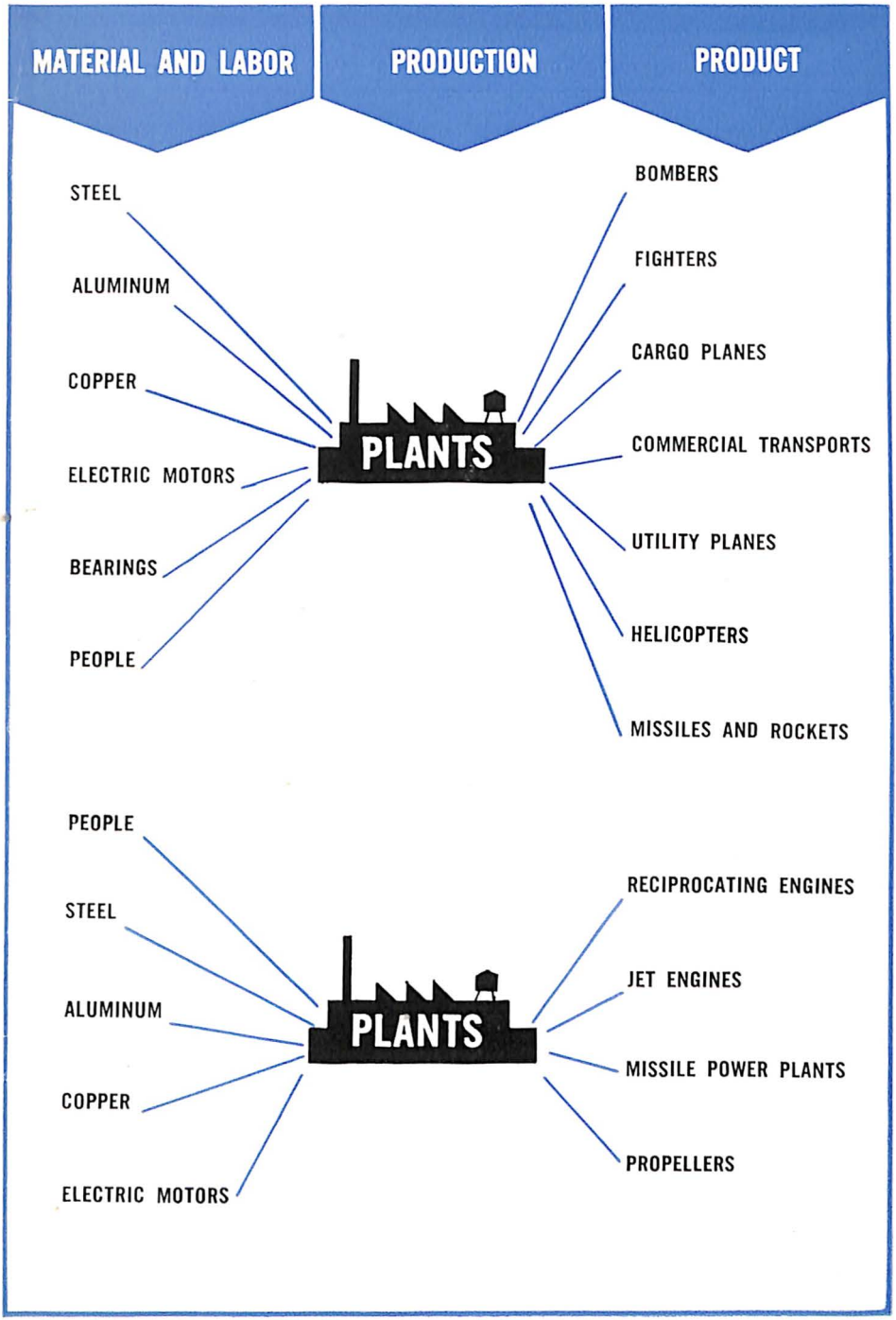
Manufacturer	Designation
Aero Design and Engineering	Aero Commander 560 and 680
Beech	D50, E50 Twin Bonanza
Beech	Bonanza
Beech	D18S, E18S Super 18
Boeing	707
Call	A4
Cessna	Model 170, 172
Cessna	Model 180, 182, 195B
Cessna	Model 310, 325
Cessna	Model 620
Champion	Model 7EC
Convair	Model 440 Metropolitan
Convair	Model 880
Douglas	DC-6A, DC-6B
Douglas	DC-7, DC-7C
Douglas	DC-8
Fairchild	F-27
Fairchild	M-185
Helio Aircraft	Courier
Lockheed	L-1049 and L-1649 Super Constellation
Lockheed	Electra
Mooney	Mark 20
Piper	PA-18 Super Cub
Piper	PA-23 Twin Apache
Piper	PA-22 Tri-Pacer
Taylorcraft	Model 20 Taylorcraft
Temco	D-16A Twin Navion
Trecker	Royal Gull

Source: 1

craft industry consumes approximately two pounds of aluminum, two pounds of steel alloy, and four pounds of carbon steel. These tremendous quantities consumed by the aircraft industry include also the metals that go into fixed equipment, spare parts, jigs and dies and scrap.

In this air/atomic age, superiority in the quality of aeronautical weapons has become the decisive factor in military power. A strong aircraft industry is the key to the security of America.

The United States aircraft industry is one of the country's most significant national resources. In productive capacity and in scientific and technical resources the aircraft industry is a leader among American industries. It could, if need be, produce more aerial weapons than the entire Communist coalition. This latt[illegible] fact it of vital significance in


MATERIAL AND LABOR
PRODUCTION
PRODUCT
STEEL
ALUMINUM
COPPER
ELECTRIC MOTORS
BEARINGS
PEOPLE
PLANTS
BOMBERS
FIGHTERS
CARGO PLANES
COMMERCIAL TRANSPORTS
UTILITY PLANES
HELICOPTERS
MISSILES AND ROCKETS
PEOPLE
STEEL
ALUMINUM
COPPER
ELECTRIC MOTORS
PLANTS
RECIPROCATING ENGINES
JET ENGINES
MISSILE POWER PLANTS
PROPELLERS

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*)

relation to the current restive international situation. The scope of Soviet activity in military aviation is continually broadening. They have now the means to inflict widespread destruction upon the United States and they are augmenting this capability with long-range ballistic missiles.

Historically, normal reaction would be to build bigger and better weapons — certainly more of them. To some degree this is what the nation's military leaders have ordered the aircraft industry to do. For some years the numerical strength of our air forces has been steadily increased. With atomic weaponry in great variety, and in megaton

U. S. 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	12,804	6,019	6,785
1941	26,277	19,433	6,844
1942	47,836	47,836	—
1943	85,898	85,898	—
1944	96,318	96,318	—
1945	49,761	47,714	2,047
1946	36,670	1,669	35,001
1947	17,717	2,100	15,617
1948	9,586	2,284	7,302
1949	6,089	2,544	3,545
1950	6,520[E]	3,000[E]	3,520
1951	7,877[E]	5,400[E]	2,477
1952	12,509[E]	9,000[E]	3,509
1953	15,134[E]	11,000[E]	4,134
1954	12,389[E]	9,000[E]	3,389
1955	12,753[E]	8,000[E]	4,753
1956	14,005[E]	6,800[E]	7,205

N.A.—Not available.
E Estimate.
Sources: 1, 2, 9, 13, 20, 29, 31, 44, 75.

yields, the air power which this nation holds poised is powerful beyond imagination.

But there comes a time in the course of increasing our air power in terms of quantities when our military leaders must make a determination of sufficiency in force levels. Measured in relation to *current international conditions*, our military and administration leaders believe that this nation is somewhere near adequate strength and that current expenditures in production and those for research and development activities are proper and in balance with one another.

For example, the U. S. Air Force 137-Wing program as conceived in 1953 was a considerably less powerful force than we have today. Many of our fighter planes can now deliver nuclear bombs that formerly could

ENGINES IN PRODUCTION

Manufacturer	Designation	Type	Thrust or Horsepower
Aerojet	15KS-1000	Rocket	1000 pounds
Aerojet	5KS-4500	Rocket	4500 pounds
Aerojet	AJ10-24	Rocket	.....
Aerojet	15NS-250	Rocket	250 pounds
Aerojet	2.2KS-11,000	Rocket	11000 pounds
Aerojet	2.2KS-33,000	Rocket	33000 pounds
Aerojet	40NS-4500	Rocket	4500 pounds
Aircooled Motors	Franklin 6AG4-185	Piston	185 hp
Aircooled Motors	Franklin 6A4-165	Piston	165 hp
Aircooled Motors	Franklin 6V4-200	Piston	200 hp
Aircooled Motors	Franklin 6V4-178	Piston	178 hp
Aircooled Motors	Franklin 6V6-245	Piston	245 hp
Aircooled Motors	Franklin 6A4-150	Piston	150 hp
Allison	501-D13	Turboprop	3750 eshp
Allison	T56	Turboprop	3750 eshp
Allison	J33	Turbojet	4600 pounds
Allison	J71	Turbojet	10000 pounds
Continental	J69	Turbojet	1000 pounds
Continental	O-470	Piston	240 hp
Continental	O-300	Piston	145 hp
Continental	A-65	Piston	65 hp
Continental	C-90	Piston	90 hp
Continental	C-145	Piston	145 hp
Continental	E-185	Piston	205 hp
Continental	E-225	Piston	225 hp
Fairchild	J44(FT-101)	Turbojet	1000 pounds
Fairchild	XJ83	Turbojet	2000 pounds
General Electric	J79	Turbojet	10,000 pounds
General Electric	CJ805	Turbojet	10,000 pounds
General Electric	XJ85	Turbojet	2000 pounds
General Electric	T58	Turboprop	1000 eshp
Avco Lycoming	SO-580	Piston	400 hp
Avco Lycoming	O-290	Piston	140 hp
Avco Lycoming	O-340	Piston	170 hp
Avco Lycoming	GO-480	Piston	270-295 hp
Avco Lycoming	0-320	Piston	150 hp
Avco Lycoming	GSO-480	Piston	340 hp
Avco Lycoming	VO-435	Piston	260 hp
Avco Lycoming	O-360	Piston	180 hp
Avco Lycoming	GO-435	Piston	240 hp
Avco Lycoming	O-235	Piston	115 hp
Avco Lycoming	O-435	Piston	190 hp
Avco Lycoming	GSO-580	Piston	400 hp
Avco Lycoming	SO-480	Piston	325 hp

(*Continued on page 11*)

ENGINES IN PRODUCTION

Manufacturer	Designation	Type	Thrust or Horsepower
Avco Lycoming	R-1820	Piston	1425-1525 hp
Avco Lycoming	R-1300	Piston	800 hp
Avco Lycoming	T53	Turboprop	825 eshp
Avco Lycoming	T55	Turboprop	1670 eshp
Pratt and Whitney	R-2000	Piston	1450 hp
Pratt and Whitney	R-2800	Piston	2400 hp
Pratt and Whitney	J48	Turbojet	7250 pounds
Pratt and Whitney	T34	Turboprop	5500 eshp
Pratt and Whitney	J57	Turbojet	10000 pounds
Pratt and Whitney	JT-3	Turbojet	10000 pounds
Pratt and Whitney	J75	Turbojet	15000 pounds
Pratt and Whitney	JT-4	Turbojet	15000 pounds
Westinghouse	J34	Turbojet	3400 pounds
Wright	R-1300	Piston	800 hp
Wright	R-1820	Piston	1425-1525 hp
Wright	R-3350	Piston	2700 hp
Wright	R-3350	Turbo Compound	3700 hp
Wright	J65	Turbojet	7700 pounds

Source: 1.

be carried only by bombers. Fighter interceptors fly faster, higher, farther, and are armed with guided missiles and rockets.

Production Facilities

Despite the fact that in 1950 we were producing less aircraft per month than we were in 1940, the floor space required for aircraft production had increased greatly. By June 1956, approximately 60 million square feet were being used in the manufacture of aircraft as compared to less than 10 million square feet in 1940.

Today, over-all space available for the manufacture of jet fighters, bombers, guided missiles and civilian aircraft, engines and propellers is approximately 138,400,000 square feet — more than twice that used in 1950, and almost 11 times that required in 1940.

The cost value, before depreciation, of facilities devoted to aircraft and related production by 12 major aircraft companies is approximately one billion two hundred and eighty-two million dollars. About one-third is company-owned facilities, the balance is government-owned.

Since World War II, the aircraft industry has been reinvesting, as rapidly as is possible in keeping with sound business principles, much 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 is now 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, the 12

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

Year	Value or Sales[a]	Value 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	N.A.
1956	9,496,000	N.A.

[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: 17, 18, 19, 22

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 power plant 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

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

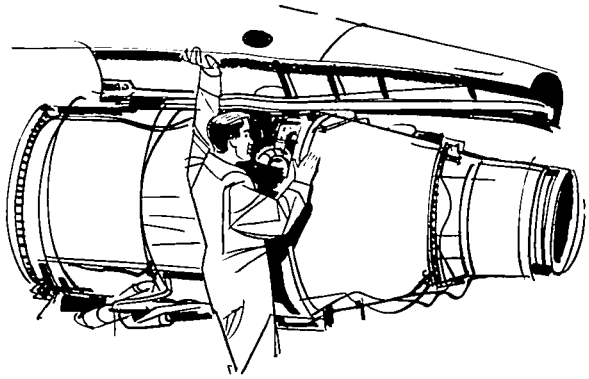
Year	All Metal-working Industries	Aircraft and Parts Industries	Aircraft and Parts As Percent of All Metal-working
CARBON STEEL			
1947	36,411,380	22,934	.1
1949	36,707,265	51,279	.1
1950	43,025,011	72,474	.2
1951	47,381,914	120,608	.3
1953	44,104,294	327,942	.7
1954	N.A.	260,466	N.A.
STEEL ALLOYS			
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: 18.

AIRCRAFT ENGINE PRODUCTION, 1917 TO DATE

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.	3,800E
1939	11,172	N.A.	N.A.
1940	30,167E	22,667	7,500E
1941	64,681E	58,181	6,500E
1942	138,089	138,089	—
1943	227,116	227,116	—
1944	256,911	256,911	—
1945	111,650E	109,650	2,000E
1946	43,407	2,585	40,822
1947	21,159	4,808	16,351
1948	N.A	N.A.	9,032
1949	N.A.	N.A.	3,982
1950	N.A.	N.A.	4,314
1951	N.A.	N.A.	4,580
1952	31,382E	26,000E	5,382
1953	41,147E	34,500E	6,647
1954	27,519E	22,000E	5,519
1955	20,639E	13,000E	7,639
1956	24,501E	13,000E	11,501

N.A.—Not available.
E Estimate.
Sources: 1, 2, 17, 20, 21, 31, 44.



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.

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.

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

Sources: 1, 3, 71.

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
		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

[a] Total for last three quarters of 1948 only.

Source: 22

Aircraft Material Price Index

Price Index for metals and hardware commonly used in constructing airframes compared with Wholesale Price Indexes for All Commodities and for Industrial Commodities, 1947 to Date

1947–1949 = 100

Year	All Commodities	Industrial Products	Aircraft Material
1947	96.4	95.3	92.4
1948	104.4	103.4	102.5
1949	99.2	101.3	105.2
1950	103.1	105.0	109.2
1951	114.8	115.9	120.9
1952	111.6	113.2	121.7
1953	110.1	114.0	127.1
1954	110.3	114.5	128.6
1955	110.7	117.0	136.3
1956	114.3	122.2	153.9

Source: 1, 67.

Planes in Production
Military Aircraft

BE.

Manufacturer	Type	Service	Name	Designation
Beech	Liaison	Army	Twin Bonanza	L-23B
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	Liaison	Army, Marines	Bird Dog	L-19, OE-2
Chance Vought	Fighter	Navy	Crusader	F8U
Convair	Fighter	USAF	—	F-102
Convair	Fighter	USAF	—	F-106
Convair	Transport/ Trainer	USAF, Navy	— —	T-29, C-131, R4Y
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-8
Grumman	Fighter	Navy	Tiger	F11F-1
Grumman	Anti-submarine	Navy	Tracker	S2F-1
Grumman	Cargo/utility	Navy	Trader	TF-1
Grumman	Utility	USAF, Navy, CG	Albatross	SA-16, UF-1
Lockheed	Anti-submarine	USAF, Navy	Super Constellation	WV-2, EC-121
Lockheed	Fighter	USAF	Starfighter	F-104
Lockheed	Cargo	USAF	Hercules	C-130
Lockheed	Trainer	USAF, Navy	Shooting Star (Sea Star)	T-33, TV-2, T2V
Lockheed	Patrol	Navy	Neptune	P2V-7
Martin	Minelayer	Navy	Sea Master	P6M-1
Martin	Patrol	Navy	Marlin	P5M-2
Martin	Bomber	USAF	—	B-57
McDonnell	Fighter	Navy	Demon	F3H-2N
McDonnell	Fighter	Navy	—	F4H
McDonnell	Fighter	USAF	Voodoo	F-101
North American	Fighter	Navy	Fury	FJ-3, FJ-4
North American	Fighter	USAF	Super Sabre	F-100
North American	Trainer	Navy	—	T-28C
Northrop	Trainer	USAF	—	T-38
Republic	Fighter	USAF	Thunder-streak	F-84F
Republic	Fighter	USAF	Thunderchief	F-105
Stroukoff	Transport	USAF	—	C-134
Temco	Trainer	Navy	—	TT-1

Source: 1

ALUMINUM, COPPER, AND STEEL CONSUMED IN MILITARY PROGRAMS, 1952
(Thousands of Pounds)

(Shipments by Metal Producers to manufacturers for incorporation in selected Department of Defense and Atomic Energy Commission Programs)

	Total Department of Defense and AEC Programs	Aircraft A-1 Program	Guided Missiles A-2 Program	Electronics & Communication Equipment A-7 Program	AEC Operations (excludes Construction) E-2 Program
ALUMINUM—ALL PRODUCTS—TOTAL	602,508	370,687	5,616	28,725	4,976
Rolled Rod, Bar, and Structural Shapes	127,368	84,563	679	2,702	684
Wire, Other than Conductor	2,418	1,255	5	130	36
ACSR and Other Cable	1,026	29	—	—	7
Insulated Wire and Cable, and Bare Wire Conductor	1,175	289	1	13	3
Extruded Shapes, Soft Alloy	18,217	5,683	181	2,135	639
Hard Alloy	69,555	53,979	888	331	485
Tubing, Drawn, Soft Alloy	8,674	2,725	62	1,298	117
Hard Alloy	11,092	3,264	140	196	15
Sheet and Plate, Non-heat-treatable	97,429	27,162	593	14,317	750
Heat-treatable	229,990	191,661	3,062	5,274	2,239
Foil	2,506	50	1	2,327	1
Powder, Flake, and Paste	33,508	27	4	2	—

ALUMINUM, COPPER, AND STEEL CONSUMED IN MILITARY PROGRAMS, 1952
Continued
(Thousands of Pounds)

(Shipments by Metal Producers to manufacturers for incorporation in selected Department of Defense and Atomic Energy Commission Programs)

	Total Department of Defense and AEC Programs	Aircraft A-1 Program	Guided Missiles A-2 Program	Electronics & Communication Equipment A-7 Program	AEC Operations (excludes Construction) E-2 Program
COPPER AND COPPER-BASE ALLOY PRODUCTS— TOTAL	868,045	31,901	1,661	58,903	3,494
Brass Mill Products— Total	655,504	14,465	594	13,978	2,220
Unalloyed, Rod	4,633	1,217	47	253	135
Sheet	20,630	800	63	998	625
Tube	20,506	590	58	288	450
Alloyed, Rod	268,611	9,206	253	7,535	709
Sheet	291,974	1,559	122	3,852	209
Tube	49,150	1,093	51	1,052	92
Wire Mill Products	152,082	11,158	909	42,596	1,058
Foundry Products	54,860	5,944	158	2,289	78
Powder Mill Products	5,599	334	—	40	138
		(Short Tons)			
STEEL MILL PRODUCTS— TOTAL	6,264,963	285,930	—	31,073	—
Carbon and Low Alloy	5,322,754	103,532	—	27,535	—
Full Alloy	849,680	128,705	—	1,467	—
Stainless	92,529	53,693	—	2,071	—

Source: 15.

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	Navy, NACA	D-558-1 Skystreak
Douglas	Navy, NACA	D-558-2 Skyrocket
McDonnell	USAF, Army	XV-1
North American	USAF, Navy, NACA	X-15
Northrop	USAF, NACA	X-4
Ryan	USAF	X-13

Source: 1

Production of Commercial Transport Aircraft, 1953 to Date

(Fixed Wing, Multiple-Engine)

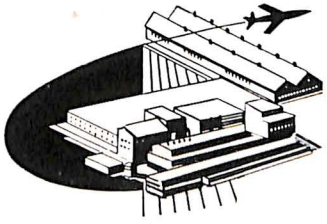
	Convair		Douglas		Lockheed	
	Model	No. of Aircraft Produced	Model	No. of Aircraft Produced	Model	No. of Aircraft Produced
1953	340	101	DC–6	69	1049	28
			DC–7	11		
1954	340	61	DC–6	41	1049	41
			DC–7	48		
1955	340	14	DC–6	14	1049	55
			DC–7	30		
1956	440	57	DC–6	39	1049	43
			DC–7	67		

Source: 1

U. S. AIRFRAME WEIGHT PRODUCTION, 1939 TO DATE

Year	Weight in Millions of Pounds (Excluding Spares)		
	TOTAL	Military	Civil
1939	12.5	10.1	2.4[E]
1940	27.8	23.1	4.7[E]
1941	86.1	81.4	4.7[E]
1942	275.9	275.9	—
1943	654.7	654.7	—
1944	962.4	962.4	—
1945	542.2	540.5	1.7
1946	38.4	12.9	25.5
1947	29.3	11.4	17.9
1948	35.3	25.2	10.1
1949	36.5	29.8	6.7
1950	41.0[E]	35.0[E]	6.0
1951	55.0[E]	50.0[E]	5.0
1952	117.3[E]	108.0[E]	9.3
1953	151.4[E]	141.0[E]	10.4
1954	140.5[E]	130.0[E]	10.5
1955	124.2[E]	114.0[E]	10.2
1956	111.6[E]	95.5[E]	16.1

E Estimate.
Sources: 1, 20, 31, 33, 39.



MILITARY AVIATION

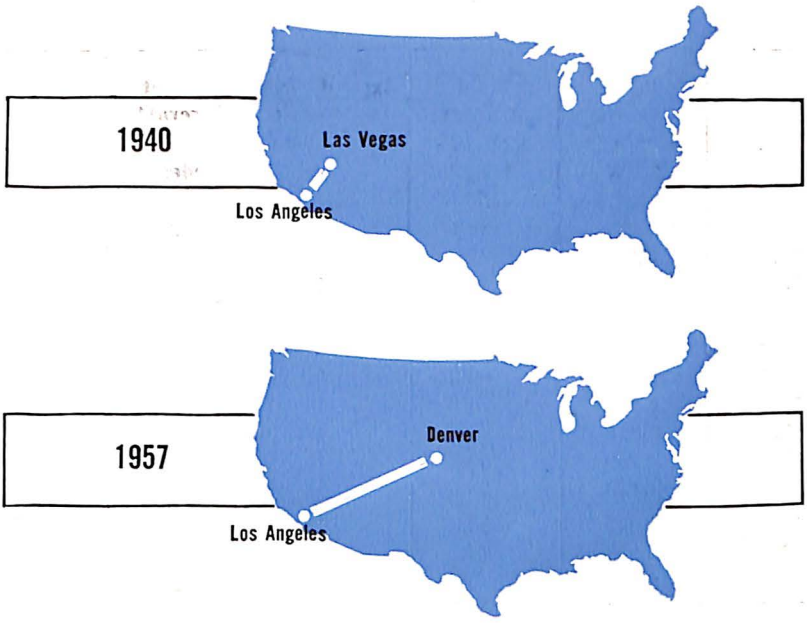
During the last five years an inventory of air power has been built by the United States aircraft industry and the military services which has been described as the greatest war deterrent the world has ever known. Technological progress in this period has resulted in aircraft superior to those of any nation. Dramatic advances in air power have made inter-hemispheric warfare a possibility for the first time in history. The development of the intermediate and intercontinental ballistic missile is being given top priority.

Spurred by the needs established for military purposes, the aircraft industry has produced aircraft and missiles with performance undreamed of a few years ago. Nuclear weaponed bombers today fly at transonic speeds and are capable of circling the globe in less than 46 hours. Supersonic fighters and interceptors—many of these armed with guided missiles containing nuclear warheads—are now integral parts of today's Air Force and Naval Air Wings.

Defense Policy

Qualitative superiority is the guiding policy of this nation. Maintaining this superiority in air power, which will deter war, is the mutual goal of the aircraft industry and the military services. To compete quantitatively with a potential aggressor is not the intent of this country.

MILITARY PLANE FLIGHTS IN ONE HOUR



Attempting to build more aircraft, to have more nuclear weapons, and to have more people in service than an aggressor in this era of cold war and peacetime economy would disrupt our economy and might threaten national bankruptcy. In effect, the very way of life we are seeking to preserve could be destroyed. The aircraft industry proved during World War II that it could reach production levels that would out-produce all the other nations of the world combined.

The introduction of new equipment and weapons with vastly greater combat capability is also having a powerful impact on military strategy, tactics, and organization. The combat power of our divisions, wings, and warships has increased to such an extent that it is no longer valid to measure military power in terms of the number of such units. Our nuclear weapons and our ability to employ them constitute the most effective deterrent to an attack on the free nations.

Expenditures by the Department of Defense for major national security reflect this "guns and butter" policy. Expenditures for the military decreased after the Korean War. For the past several years they have remained relatively steady and are estimated to remain in the range of $38 billion to $40 billion annually in the coming fiscal years 1958 through 1960. These estimates are predicated on maintaining the present force levels and deployments. Defense Department feels that a sudden sharp increase of the military budget not only would be misunderstood

Total Federal Expenditures and Expenditures for Military Aircraft and Related Procurement 1922 to Date

(Dollar Figures in Millions)

Fiscal Year	Total Federal Expenditures	Total Military Expenditures	Expenditures for Aircraft and Related Items[a]	Percent Aircraft of Total Federal	Percent Aircraft 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	4,623	784	25	.5	3.2
1934	6,694	706	13	.2	1.8
1935	6,521	924	23	.4	2.5
1936	8,493	1,147	44	.5	3.8
1937	7,756	1,185	58	.7	4.9
1938	6,938	1,240	67	1.0	5.4
1939	8,966	1,368	68	.8	5.0
1940	9,183	1,799	205	2.2	11.4
1941	13,387	6,252	587	4.4	9.4
1942	34,187	22,905	2,915	8.5	12.7
1943	79,622	63,414	10,072	12.6	15.9
1944	95,315	75,976	12,828	13.5	16.9
1945	98,703	80,537	11,521	11.7	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	40,156	13,440	1,705	4.2	12.7
1951	44,633	20,821	2,536	5.7	12.2
1952	66,145	38,967	5,712	8.6	14.7
1953	73,982	47,565	8,605	11.6	18.1
1954	67,772	40,336	9,247	13.6	22.9
1955	64,570	35,533	8,794	13.6	24.7
1956	66,540	35,791	8,046	12.1	22.5
1957E	68,900	36,005	7,861	11.4	21.8
1958E	71,807	38,031	8,113	11.3	21.3

[a] Includes Guided Missiles.
E Estimate.
Sources: 8, 26, 27, 46, 75.

AIRCRAFT ON HAND
1939 TO DATE

Year	U. S. Air Force				Navy
	Total[a]	Tactical	Trainers	Transport & Other	Total[b]
1939	2,546	1,647	761	138	2,098
1940	3,961	1,760	2,069	132	2,166
1941	12,297	4,477	7,340	480	5,233
1942	33,304	11,607	17,607	4,653	11,772
1943	64,232	27,448	26,051	10,733	25,588
1944	72,726	41,961	17,060	13,705	36,100
1945	44,782	26,077	7,617	11,088	29,714
1946	30,035	17,186	6,297	6,552	19,301
1947	23,814	13,118	5,714	4,982	14,976
1948	20,068	8,888	6,177	5,003	14,894
1949	17,222	7,863	5,811	3,548	14,015
1950	17,337	7,854	5,961	3,522	13,412
1951	19,021	8,135	6,556	4,330	13,213
1952	20,436	8,501	7,099	4,836	13,694
1953	22,278	9,152	7,502	5,624	13,308
1954	23,500	N.A.	N.A.	N.A.	13,285
1955	25,100	N.A.	N.A.	N.A.	13,191
1956	24,600	N.A.	N.A.	N.A.	13,710
1957	24,000[E]	N.A.	N.A.	N.A.	N.A.

N.A.—Not available.
[a] As of December 31.
[b] As of June 30 from 1935-1939; as of December 31 from 1940 to 1952; as of June 30 from 1953-1955; as of January 1, 1956.
E Estimate.
Sources: 1, 3, 8, 75, 76.

all over the world but also would require the imposition of some types of controls on the economy.

Currently the aircraft industry is competing in the open market for the engineers, scientists, and technical manpower essential to building aircraft. Yet the aircraft coming off the production lines are weapon systems far superior to those built under the complete mobilization controls in effect during World War II.

Ten years ago speed was spoken of in miles per hour, and altitudes in terms of feet. Now speed is measured by *mach numbers* (multiples of the speed of sound), and altitude is measured by miles into the stratosphere. Since World War II, the advances in aircraft perform-

ance have tripled speeds, doubled operational altitudes, increased fire power by seven or eight times and have extended range by a factor of two or three.

Aviation Aspects of Defense Spending

Expenditures for the procurement of aircraft, missiles and related items represent about 21 per cent of the total military expenditures. The aircraft portion of these expenditures has decreased during the last few years as force levels have been met and guided missiles have come into the inventory. Expenditures for the procurement of aircraft are estimated at about $6.74 billion in fiscal 1958, compared to the $6.79 billion estimate for fiscal 1957, $7.15 billion in fiscal 1956, and $8.04 billion in fiscal 1955. Simultaneously expenditures for the procurement of missiles have increased 179 per cent in the last four years from $718 million in fiscal 1955 to an estimated $2.04 billion in fiscal 1958. 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.

Force Levels

The Defense Department has revealed that the 128-Wing Air Force strength would be achieved by June 30, 1958 and would be as follows:

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

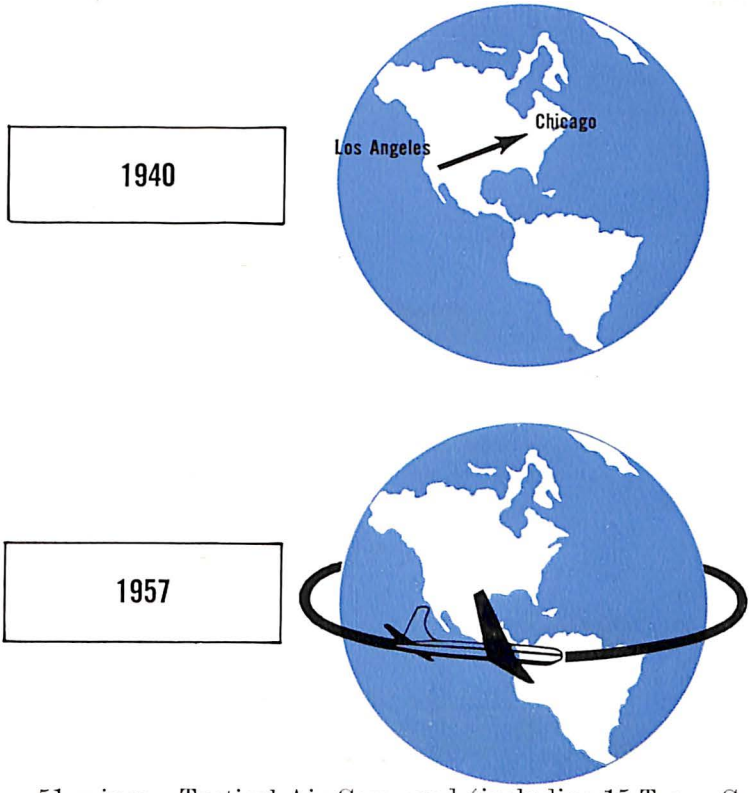
32 wings—Air Defense Command

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

[a] Navy and Marine.
[b] Pilots as of Aug. 31; others as of October 31.
[c] Includes non-pilots in flying status and formerly designated pilots.
[d] As of January 1.
[e] As of November 30, 1956.
Source: 77

LENGTHENING RANGE OF MILITARY FLIGHTS



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

By the end of fiscal 1958, the Navy plans to have 17 Carrier Air Groups, 20 Carrier Anti-Submarine Squadrons, and Three 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 1958, Strategic Air Command is expected to include eight wings of heavy jet bombers, three 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 capa-

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	[illegible]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 Appropr ations	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	939.8	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[E]	17,686.5	16,822.1E/	2,743.7	2,571.0
1958[E]	16,481.0E/	17,383.3E/	2,810.0	2,710.0

N.A.—Not available.
E Estimate.
[a] FY 1949 Construction of Aircraft & Related Procurement appropriation enacted in FY 1948.
Sources: 3, 8, 46, 75

bility for amphibious assault operations.

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

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

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.
Soure: 8.

AIRCRAFT ACCEPTED BY THE USAF AND NAVY
1946 TO DATE

Calendar Year	TOTAL		USAF		Navy[a]	
	Number of Aircraft	Airframe Weight, Excluding Spares (1,000's of Pounds)	Number of Aircraft	Airframe Weight, Excluding Spares (1,000's of Pounds)	Number of Aircraft	Airframe Weight, Excluding Spares (1,000's of Pounds)
1946	1,409	12,707	650[b]	7,799[b]	759	4,908
1947	2,117	11,441	1,197[b]	5,586[b]	920	5,855
1948	2,204	24,306	1,055	15,821	1,149	8,485
1949	2,290	29,604	1,475	23,149	815	6,455
1950	2,655	35,941	1,670	26,803	985	9,138
1951	5,521	51,659	4,148[b]	40,000[b]	1,373	11,659
1952	9,284	107,422	6,973[b]	88,000[b]	2,311	19,422
1953	10,630	138,396	8,204[b]	109,908[b]	2,426	28,488
1954	8,729	130,546	6,507[b]	104,653[b]	2,245	25,893
1955	8,000[E]	114,000[E]	6,000[E]	N.A.	2,000[E]	N.A.
1956	6,800[E]	95,500[E]	4,800[E]	N.A.	2,000[E]	N.A.

N.A.—Not available.
E Estimate.
[a] Includes USAF acceptances for Navy, excludes Navy acceptances for USAF and Army.
[b] Includes USAF acceptances for other agencies. The duplication in acceptances accounts partly for the difference between this table and the table on page 9.
Sources: 8, 49, 75.

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 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.

WARPLANE PROGRESS SINCE THE SECOND WORLD WAR

	1945	1953	1955
Fighter.	P–51	F–100	F–106
Speed	470 mph	Supersonic. 755.149 mph	Supersonic (Mach 1 or above)
Range	Over 2,000 miles	Over 1,000 miles	Range and armament not disclosed
Fire power	Six 50-cal. guns in wings. Can carry ten 5-inch HVAR with zero launchers or two 1,000-lb. bombs.	20 mm canons	
Bomber.	B–17	B–47	B–58
Speed	285 mph	600 mph class	Supersonic (Mach 1 or above)
Range	2,500 miles	Over 3,000 miles	Range and armament not disclosed
Fire power	Twelve 50-cal. machine guns	20 mm cannons in tail	
Bomb load	12,800 pounds	Over 20,000 pounds	

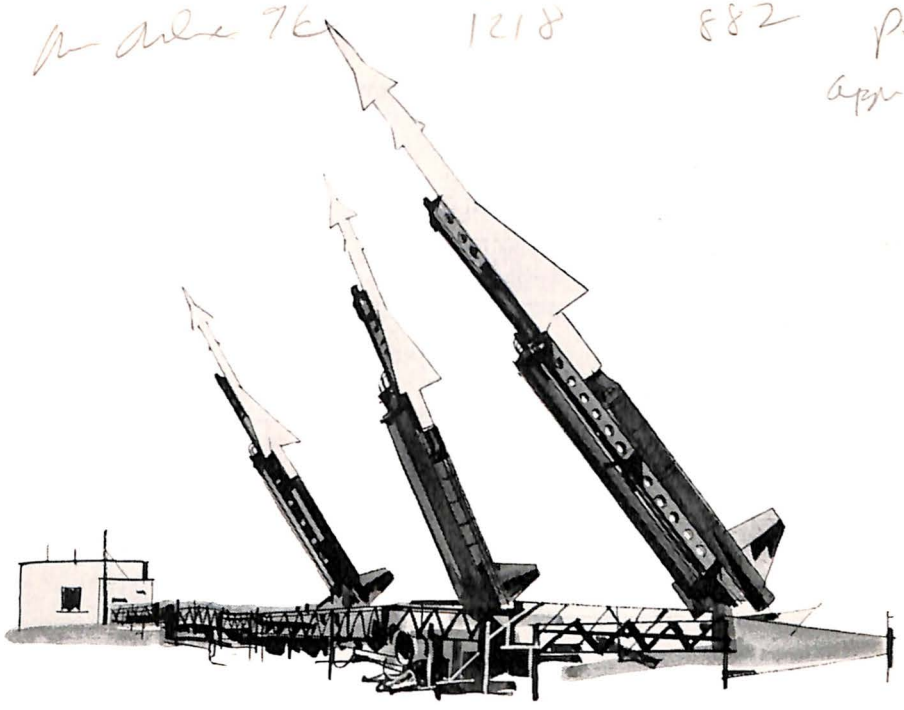
Source: 43.

Aircraft Inventory

Total active aircraft inventory, scheduled to be reached at the end of fiscal year 1958, will be 41,219 aircraft: Air Force, 24,398; Army, 5,031; and Navy, 11,790. This compares with an inventory of 42,650 at the end of fiscal year 1957. In this connection, the Air Force will decrease its active inventory by 2,300 units, the Navy inventory will be down some 600 units, while the Army increases by 1,500 units.

Air Force Planned Obligations for Aircraft in Fiscal 1958

	Number	Percent of Total Number	Total Cost (in Millions)	Percent of Total Cost
Bombers	121	8	$ 999.4	36.4
Fighters	697	46	1,167.0	42.5
Transports	212	14	462.1	16.8
Trainers	485	32	118.4	4.3
TOTAL	1,515	100	$2,746	100.0



GUIDED MISSILES

Missiles have been used by man in combat since the day he first learned to fashion a spear and hurl it at an enemy. Since that day, more than 20,000 years ago, man has devoted countless talents and treasures to improving the warhead, the power system and the guidance system. The intercontinental ballistic missile is a direct descendant of the spear.

The guided missile today is one of the most sophisticated weapons in the U. S. arsenal. The vast public interest in the guided missile and its characterization as the "ultimate weapon" makes it necessary to keep the definition clear. It is not simply a weapon, but rather a category of weapons. Different types of missiles are required for specific missions. The over-all role of the missile is to destroy an enemy target automatically and effectively. The target can be as small as an enemy aircraft or missile, or cover several square miles. The target may be a fixed one, such as a city or a troop concentration, or it may be moving

UNEXPENDED FUNDS AVAILABLE FOR THE PROCUREMENT OF GUIDED MISSILES AND OF AIRCRAFT, JANUARY 31, 1957
(Million Dollars)

	Guided Missiles	Aircraft
Defense Department	$4,175	$18,560
Air Force	2,360	13,187
Navy	635	5,026
Army	1,180	347

Source: 37

OBLIGATIONS FOR RESEARCH AND DEVELOPMENT ON GUIDED MISSILES AND ON AIRCRAFT—DEPARTMENT OF DEFENSE
(Million Dollars)

Fiscal Year	Guided Missiles	Aircraft and Related Equipment
1954	$231.4	$269.8
1955	214.0	293.6
1956	280.5	352.2
1957[E]	346.5	282.1
1958[E]	331.8	276.2

E Estimate.

Source: 46

at a speed faster than sound miles above the surface of the earth. The ICBM, for example, is not designed to knock down an enemy aircraft; a surface-to-air missile for aircraft defense would be of little or no use against a ground target. This means that missiles must be developed for highly specialized missions.

The trend toward missiles has been greatly accelerated in the past three years. The Air Force estimates that in 1954, about 90 per cent of the procurement money went for aircraft and approximately 10 per cent for missiles. In the current budget for fiscal 1958, about 35 per cent of the procurement money will be spent on missiles, and in 1961, the money will be split 50-50 between aircraft and missiles.

A meeting between the President of the United States and the Premier of Great Britain indicates that British units will be equipped with U. S.

missiles. The industry anticipates no difficulties in handling this additional demand for American missiles. One leading manufacturer in 1956 doubled the number of personnel engaged in the development and production of missiles and expects to double it again this year.

This shift in air power emphasis, stemming from an aggressive program of missile research and development work by the aircraft industry, is having profound effects. The newest facilities for aerial weapons were built for the production of heavy bombers. These structures feature high

EXPENDITURES FOR THE PROCUREMENT OF GUIDED MISSILES AND AIRCRAFT
(Million Dollars)

Fiscal Year Ending June 30	Guided Missiles	Aircraft
1951	$ 21	$2,412
1952	169	4,888
1953	295	7,417
1954	504	8,335
1955	718	8,037
1956	1,168	7,146
1957[E]	1,506	6,786
1958[E]	2,039	6,737

E Estimate.

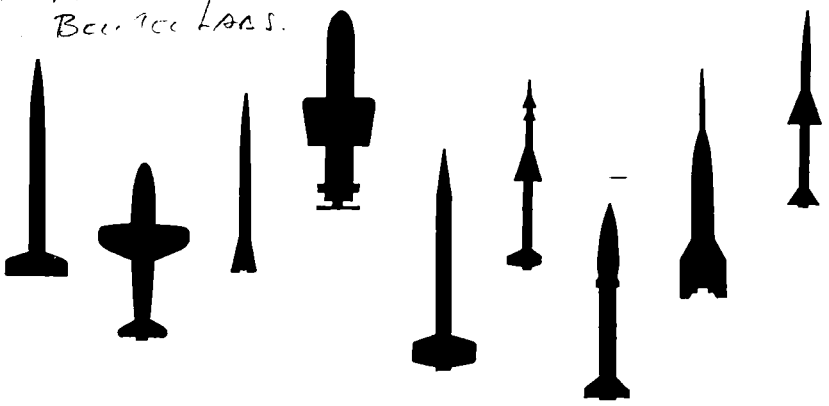
Source: 38

EXPENDITURES FOR THE PROCUREMENT OF GUIDED MISSILES
(Million Dollars)

Fiscal 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	194	333
1957[E]	1,506	860	221	425
1958[E]	2,039	1,213	264	562

E Estimate.

Source: 38



bay sections to accommodate the tail sections of jet bombers that are three stories high. The manufacture and assembly of missiles requires more than simply space. The temperature of the working space must be carefully controlled; contamination of the air by dust or any other minute particle must be eliminated. The precision required in the manufacture of delicate guidance systems exceeds that of any other industry. The requirement of new facilities and the disposal of surplus facilities is a problem that is receiving the concentrated attention of industry executives.

There are four principal parts to a guided missile: the structure or airframe; the guidance and control system; the power plant and the warhead. The effective "marriage" of these components is the essence of a successful guided missile. In many cases the company holding the prime contract for a missile may actually manufacture only one or two of the basic parts. The development and manufacture of the balance of the principal parts and some components of the "in shop" basic parts are handled through subcontracts. The prime contractor, however, retains the responsibility for the complete system. The only counterpart that a missile has in complexity, performance requirements and manufacturing techniques is the manned aircraft. The aircraft industry has assumed the responsibility for developing and manufacturing guided missiles because of its long experience in managing manned weapons systems, an assignment requiring a high degree of technical management skills. The missile essentially is a projection of the manned aircraft.

There are four basic types of missiles: Surface-to-Surface, Surface-to-Air, Air-to-Surface (including underwater targets), and Air-to-Air. Each of these missile types requires a different design approach. The

MISSILES—OPERATIONAL

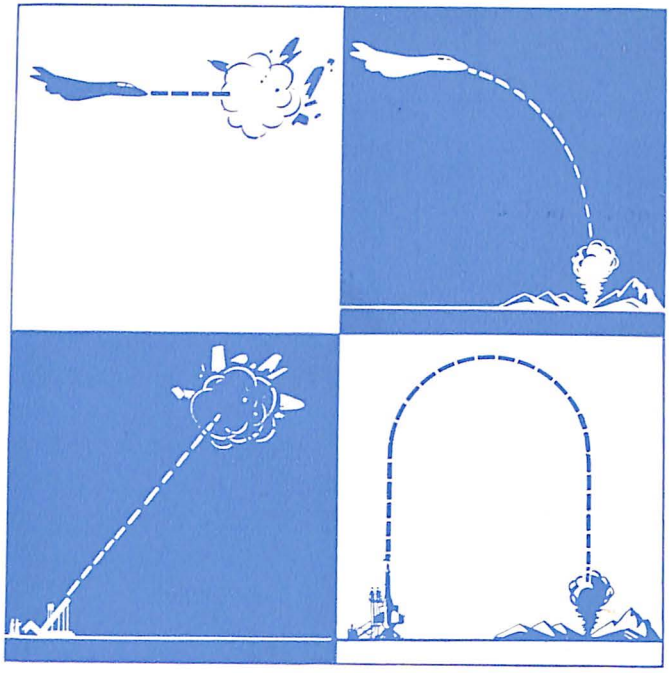
Missile	Manufacturer	Service
Air-to-Air		
Falcon	Hughes	USAF
Sidewinder	Philco & GE	Navy
Sparrow	Sperry Douglas Raytheon	Navy
An additional air-to-air missile with atomic warhead is operational.		
Air-to-Surface		
Petrel	Fairchild	Navy
Surface-to-Air		
Nike Ajax	Western Electric	Army
Nike Hercules	Douglas	Army
Terrier	Convair	Navy
Surface-to-Surface		
Corporal	Firestone and Gilfillan	Army
Matador	Martin	USAF
Regulus	Chance Vought	Navy
Honest John	Douglas	Army

MISSILES—RESEARCH AND DEVELOPMENT PROJECTS

Missile	Manufacturer	Service
Atlas	Convair	USAF
Bomarc	Boeing	USAF
Dart	Aerophysics	Army
Hawk	Raytheon	Army
Jupiter	Chrysler	Army
La Crosse	Martin	Army
Navaho	North American	USAF
Polaris	Lockheed	Navy
Rascal	Bell	USAF
Redstone	Chrysler	Army
Snark	Northrop	USAF
Talos	Bendix	USAF
Tartar	Convair	Navy
Thor	Douglas	USAF
Titan	Martin	USAF

Target Drones: Target Drones are made by Beech, Radioplane, Ryan and Temco. All of the above has been officially released.

Source: 40.



configuration is first determined through wind tunnel tests where actual flight conditions are simulated. The missile designer must then decide on the type and size of the power plant. He can choose among the turbojet, ramjet and solid or liquid fuel rocket engines. They all have specific advantages and disadvantages that must be carefully weighed against the mission of the missile. The turbojet or air-breathing engine has the capability of lengthy flight duration, but, of course, must operate where air is present. The rocket engine, which consumes fuel at a tremendous rate, has the advantage of being able to operate without an outside supply of air since it carries its own oxidizer. The ramjet, simple in design, and capable of producing very high thrusts, requires another engine to get the missile to sufficient speed before it will operate. An engine may already be available for application in a missile; in other cases, an entirely new engine must be developed.

The designer must next select a guidance system. Some of the types used today are based on radar where the missile is controlled by a radar beam; the infra-red system which is controlled by the heat emanating from the target; star tracking in which the guidance system picks up successive pairs of stars and figures the missile position; and the inertial guidance system. The inertial system cannot be jammed by

outside electronic measures. This system is built around a platform stabilized by a precise arrangement of gyroscopes which maintain the platform as an absolutely stable frame of reference. The slightest deviation from the pre-arranged course of the missile is picked up by sensitive devices and corrected by a control system.

The problem of reliability is great. The average missile contains approximately 300,000 parts. Failure of a single part which might cost only a few cents could mean failure of a multi-million dollar missile system. And the missile, once it leaves its launching site, must function perfectly.

The most vital technological race that the United States is engaged in today is the development of the intercontinental ballistic missile to operational status. The race between the U. S. and its potential enemies to produce this weapon is not measured in terms of months or even weeks. Any lead we have today stems from a contract awarded ten years ago to an aircraft company for a systems study to investigate possible approaches to the development of a strategic ballistic missile. The study project was cancelled because of economy reasons, but during its brief existence, it yielded basic information concerning stabilization, guidance and power plant problems. This information proved invaluable when the ICBM program was quickly elevated by the National Security Council to the top priority position of all defense projects.

RESEARCH AND DEVELOPMENT

Research and development is the foundation upon which the defense policy of qualitative superiority is built. The vast research and development program being carried on jointly by the Department of Defense and the aircraft industry has the primary function to maintain a technological lead which cannot be challenged. It is now widely recognized that qualitative superiority in weapons can outweigh quantitative superiority in men and materials. Developments in the research centers of the aircraft industry continue to lead to new weapon systems and result in the greatest insurance policy this country has ever known.

The rise of science and technology to the principal position in shaping the outcome of war has occurred during the last decade. Although many technological breakthroughs, such as the development of radar, proximity fuses, precision fire control systems, and finally the atomic bomb, made substantial contributions to winning World War II, victory was primarily due to the vast number of aircraft and other war machines produced by this country. Consequently the largest portion of military expenditures during the war years was for production equipment, while research and development expenditures averaged only about $245 million annually. Without the rapid mobilization by the U. S. aircraft industry and the fantastic aircraft production achievements during the war, the

guided missile and the jet engine breakthroughs by the aggressor might have altered the course of the war.

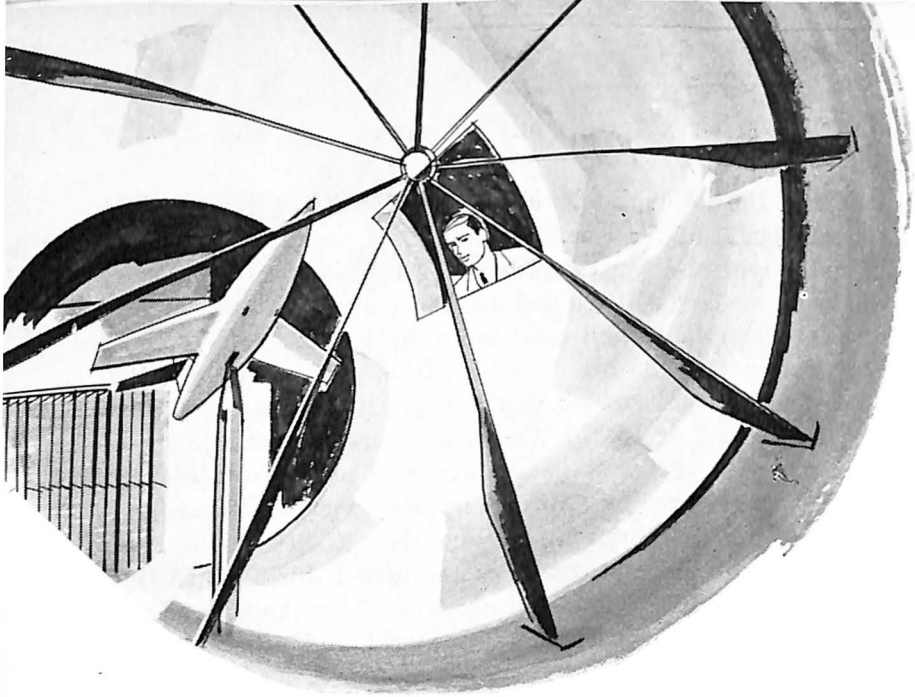
The war ended with the general recognition by the experts that new technology in aeronautics (with guided missiles and rocket and jet propulsion systems, electronics, and nucleonics in leading roles) would henceforth be dominant in any all-out war. Although the demobilization of our fighting forces at the end of World War II was almost as rapid as it had been at the end of World War I, a generation earlier, a moderately strong program of research and development was maintained. Average annual expenditures by all three military services for research and development from 1945 through 1949 was about $549 million. Many of the present guided missile programs were started during that time. The air/atomic power resulting from this work has been the major factor in maintaining a balance of power in the world and consequently a semblance of peace.

Technology has progressed at a tremendous pace during the last

EXPENDITURES FOR RESEARCH AND DEVELOPMENT BY THE FEDERAL GOVERNMENT AND SELECTED AGENCIES, 1940 TO DATE
(In Millions of Dollars)

	Total for all Federal Agencies	Air Force[a]	Army	Navy	AEC[a]	NACA
1940-1944 Av. for 5 yrs.	520.4	83.7	80.9	80.2	403.5[b]	7.6
1945-1949 Av. for 5 yrs.	1,083.9	164.9	265.5	118.2	353.4	33.5
By Fiscal Yrs.						
1950	1,143.1	218.4	120.8	310.8	221.4	54.5
1951	1,342.3	297.9	159.3	363.8	242.6	61.6
1952	1,839.0	523.0	316.0	476.0	249.6	67.4
1953	2,118.8	618.4	415.0	535.7	261.8	78.6
1954	2,102.5	598.0	428.4	505.8	274.3	89.5
1955	2,290.6	695.2	458.0	511.5	289.8	73.8
1956[E]	2,446.6	745.2	422.9	493.3	403.5	71.0
1957[E]	2,729.7	816.4	420.0	514.1	530.8	75.0

[E] Estimate.
[a] and predecessor agencies.
[b] 2-year average—1943 and 1944.
Source: 74.



decade, with significant results and great strides continuously being made. Yet demands for higher and higher performance in all weapon systems keep increasing. Without the never-ending search by the aircraft industry-military team for new equipment to meet the nation's security needs, the nation's future would be jeopardized. Every aircraft company is studying requirements to meet the needs of national defense ten and twenty years hence. These companies are investing large portions of their earnings in research and development facilities and devoting much of their engineering manpower to future requirements.

In 1954, the last year for which statistics are available, aircraft manufacturers were utilizing almost three-fifths of their nearly 50,000 scientists and engineers in research and development work—a higher proportion than in any other industry. At the same time, these manufacturers, with an average of 270 supporting workers per 100 research and development scientists and engineers, made more extensive use of supporting personnel than any other industry. This was due to the extensive use of supporting personnel in such work as building and testing prototype aircraft.

The cost of research and development in the aircraft industry rose about 21 per cent, from $758 million in 1953 to over $900 million in 1954, representing the sharpest research and development cost rise in any industry. The all-industry average increase was only about 12 per cent for the two-year period. The aircraft industry's r earch and development cost was about one-fifth of that by all U. S. industries in both years.

Expenditures by the military for research and development have almost doubled from fiscal 1951 to the end of fiscal 1956, rising from $758

million in 1951 to $1.5 billion in 1956. These expenditures are expected to remain at these high levels and are estimated at $1.54 billion in fiscal 1957 and $1.58 billion in fiscal 1958.

Yet these expenditures do not represent the entire research and development efforts of the Defense Department. Because of rapidly advancing technology, the lines between research, development, test, and procurement cannot be drawn precisely. For purposes of budgetary presentation, a narrowly construed definition has been used by the Department of Defense for "research and development," which does not give the full meaning of the research, development, test, and evaluation

TS

MAJOR RESEARCH AND DEVELOPMENT PROGRAMS OF THE FEDERAL GOVERNMENT
1954 TO DATE
(In Millions of Dollars)

Department of Defense
(including Air Force, Army, and Navy)
Obligations[a]

Year	Aircraft	Guided Missiles	Operation of Research Facilities	Expenditures for Increase of Research and Development Plant
1954	269.8	231.4	266.3	145.2
1955	293.6	214.0	249.0	110.5
1956	352.2	280.4	280.2	120.0
1957[E]	282.2	346.5	349.8	177.0
1958[E]	276.3	331.8	385.8	228.0

ATOMIC ENERGY COMMISSION EXPENDITURES

	Production & Weapons	Reactor Development	Biology, Medicine, & Physical	Increase in R & D Plant
1954	96.0	70.6	62.9	44.8
1955	92.1	95.4	65.9	36.4
1956	106.4	155.1	74.0	49.6
1957[E]	117.5	261.3	89.0	104.5
1958[E]	142.0	329.7	98.5	139.9

E Estimate.

[a] Obligations may exceed expenditures; for total DOD obligation the difference is less than 3%, but may be more in any one program.

Source: 46.

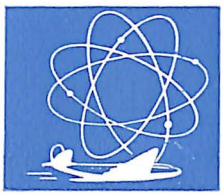
effort. It does not include funding for supporting activities directly related to research and development. The entire military research and development program for fiscal 1957 has been estimated at about $5.2 billion. This compares with an estimated program in fiscal 1955 of $3.4 billion and in fiscal 1956, $3.8 billion.

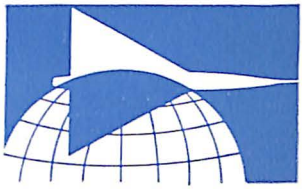
Items under development, test, and evaluation account for $2.9 billion of the estimated fiscal 1957 program, compared to $1.8 billion in both 1955 and 1956. Aircraft represent $816 million of the $1.8 billion in 1955, which decreased to $163 million in 1956, and are expected to rise to $522 million in fiscal 1957. Outlays for guided missile development, test, and evaluation continue to rise—from $657 million in fiscal 1955 to an estimated $1.9 billion in fiscal 1957.

Also important to the over-all research and development effort are the activities supporting it. These include funds for military construction, industrial facilities, and military personnel pay and allowances. The cost of these supporting activities has increased 76 per cent since fiscal 1955.

The emphasis on research and development during the last ten years is responsible for fighter interceptor aircraft which today fly at twice the speed of sound, with programs under way which will carry man at Mach 5, or five times the speed of sound, and forecasts of Mach 10 manned vehicles have been made. A U. S. bomber flying today is the first supersonic bomber in the world, supplementing transonic bombers in today's inventory which are capable of intercontinental missions with in-flight refueling. Today fighters operate at altitudes which were only touched a few short years ago in research vehicles.

Although missiles are virtually still in their infancy, nevertheless, their performance and fire power are beyond the imagination of a decade ago. Research resulting in guidance and propulsion sys-

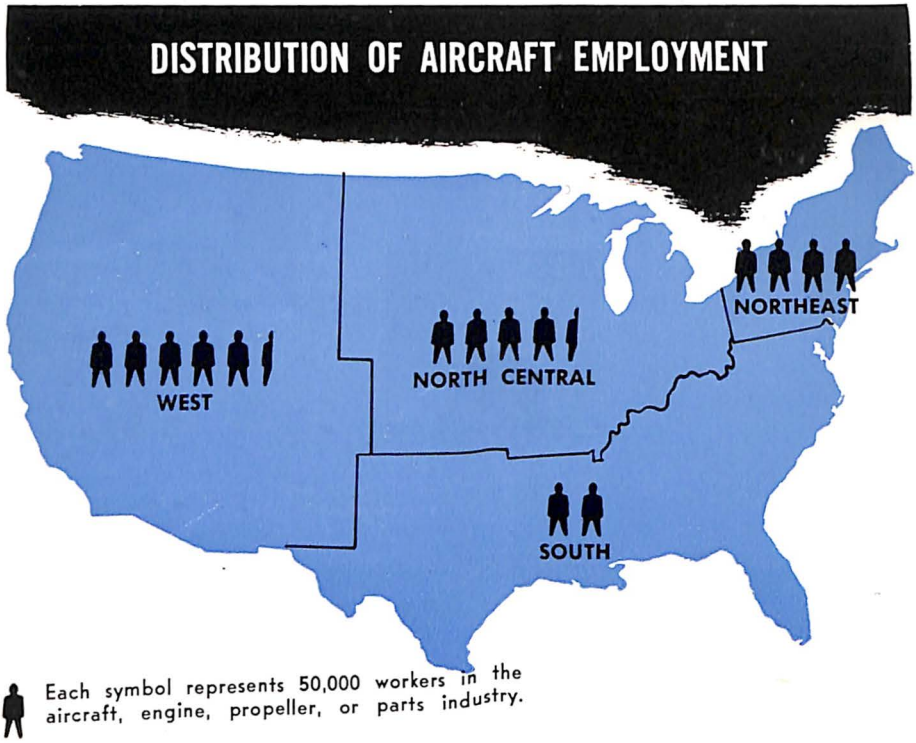




tems and materials to withstand temperatures greater than any ever before encountered have provided the way for guided missiles to become a major part of future plans for deterring war or winning a war if one should be inevitable.

Every science known today is needed in the development of future weapon systems. Yet the technological advancement resulting from military work cannot be isolated from commercial uses. Wartime know-how and technological developments, resulting largely from the use of federal funds, have a multitude of peacetime applications. Technological developments in new materials (e.g., synthetic rubber, aviation gasoline, plastics and other synthetic materials, plywood, magnesium, aluminum, and alloying elements); new methods (e.g., in joining of metal by riveting, welding or stretching, in heat treating procedures, in metal spinning, in powder metallurgy, in casting, in metal spraying and in inspection); and new products (e.g., aircraft design, bombsight, and navigation devices, jet propulsion, radar, processed foods, and numerous other developments in the electronics field) have made their appearance as a result of military research supported in whole or in part by government funds.

While security in this air/atomic age requires us to place a greater emphasis on technology, specifically to meet military requirements, it has made some significant contributions to a better life in these United States. The jet engine, for instance, was almost entirely a military development. Now we can look forward to better means of transportation that will bring the entire world closer together. 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 today will open up new fields and contribute to a continued upward trend in technology and better national economy for years to come.



MANPOWER

Employment in the aircraft industry climbed from an average of 738,400 in 1955, to 804,100 in 1956. Characterized as a "healthy" gain, the increase is due, in part, to the steadily increasing complexity of the aeronautical product, and, in part, to the general advance of aviation in the economy of the nation as a tool of commerce and transportation.

The 804,100 employees of the aircraft industry wo ed an average of 42 hours per week at an average weekly wage of $95.57. The aircraft industry today is the largest manufacturing employer in the United States. And, because of the quality of skills demanded in the manufacture of its aeronautical products, its employees' wages are among the highest weekly wages among manufacturing employees.

Today, great technological progress is being made throughout the aircraft industry. To fashion this progress, approximately 11 per cent of the total employees in the aircraft industry are engineers, compared with 4 per cent during World War II. The aircraft industry employs nearly 10 per cent of the total research and development personnel employed by American industry as a whole.

The materials required for the construction of the super and hypersonic aircraft and missiles have created a whole new materials technology for men to master. The industry is already at the approximate limits of aluminum alloy usage. It has barely opened up the potential of the titanium family of metals. It has begun to show increasingly large requirements for stainless steels.

The developments in "metal-cutting" alone have had a significant

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

Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	$0.83	N.A.	N.A.
1940	N.A.	N.A.	.83	N.A.	N.A.
1941	N.A.	N.A.	1.00	N.A.	N.A.
1942	N.A.	N.A.	1.21	N.A.	N.A.
1943	N.A.	$1.16[E]	1.26	N.A.	N.A.
1944	N.A.	1.22[E]	1.31	N.A.	N.A.
1945	N.A.	1.22[E]	1.28	N.A.	N.A.
1946	N.A.	1.28[E]	1.34	N.A.	N.A.
1947	$1.38	1.36	1.41	$1.44	$1.41
1948	1.49	1.47	1.55	1.57	1.55
1949	1.57	1.55	1.60	1.63	1.61
1950	1.64	1.62	1.70	1.73	1.70
1951	1.79	1.75	1.89	1.93	1.80
1952	1.90	1.87	1.98	2.05	1.88
1953	2.00	1.99	2.03	2.05	1.99
1954	2.08	2.08	2.09	2.09	2.08
1955	2.17	2.17	2.17	2.18	2.17
1956	2.27	2.27	2.28	2.26	2.29

N.A.—Not available.
E Estimate.
Sources: 64, 65

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

[a] Less than .05 percent.
Source: 16, 17, 31, 64, 65

impact upon the manpower problem in the aircraft industry. For example, as aircraft, aircraft engine, components and systems manufacture become more complex, an increased reliance is placed upon controlled machine operations. As a result, the aircraft industry has had to move to increasingly larger proportions of highly skilled workers and technicians for its labor force. This is directly reflected in the upward trend in aircraft industry wages.

The perfection of the piston engine; of jet propulsion; the turbo-propeller engine; and the spectacularly increasing demands in missile manufacturing, have revolutionized transportation in peace and war — today and tomorrow. Further refinements in these engine fields require still higher skills among the men that design and build them.

The same is true in aircraft electronics systems manufacturing. Achievements in electronics are coming so rapidly that their significance has come to be considered almost commonplace. But continued gains in this phase of aeronautics, similarly, place great demand upon new

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	29.8	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

Sources: 64, 65

CIVIL PILOT AND OTHER RATINGS CERTIFICATES ISSUED
1954–1956

Type of Certificate	1954		1955		1956	
	Original Issuances	Additional Ratings	Original Issuances	Additional Ratings	Original Issuances	Additional Ratings
Pilot Ratings						
Student	43,393	—	44,354	—	45,036	—
Private	15,523	923	15,866	1,082	16,399	1,128
Commercial	5,192	4,685	7,031	5,519	8,419	8,336
Air Transport	627	1,588	719	1,659	1,172	2,146
Flight Instructor	—	738	—	802	—	897
Instrument	—	1,928	—	2,781	—	6,993
Other	80	3	118	4	168	16
Other Ratings						
Mechanic	3,867	1,606	4,315	1,813	4,491	2,005
Navigator	77	—	37	—	243	—
Radio Operator	2	—	2	—	8	—

Sources: 29, 32

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

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

N.A.—Not available.
Source: 62

talents and ever greater skills of engineers as well as production line employees.

The complexes of systems and components of the modern aerial weapon are so inter-related and the skills needed to produce and integrate these, so specialized, that only a highly educated and trained individual can perform adequately.

The aircraft manufacturing industry, which has been repeatedly faced with shortages of skilled personnel, undertakes apprentice and in-plant training programs. Some of the larger companies offer advanced courses in various technical aspects of aviation research, development, and production. These companies, hard pressed for qualified technical personnel in most cases, will take qualified engineers in any field and train them to their aeronautical need.

CIVIL FLYING SCHOOLS, STUDENTS AND CERTIFICATED PILOTS
1927 TO DATE

Year	Certified Civil Flying Schools	Student Pilot Certificates Issued As of December 31
1927	—	545
1928	—	9,717
1929	24	20,400
1930	39	18,398
1931	29	16,061
1932	21	11,325
1933	19	12,752
1934	21	11,994
1935	24	14,572
1936	27	17,675
1937	30	21,770
1938	24	15,556
1939	46	29,839
1940	749	110,938
1941	1,054	93,366
1942	843	93,777
1943	693	36,802
1944	N.A.	51,618
1945	964	77,188
1946	1,557	173,432
1947	3,078	192,924
1948	3,058	117,725
1949	2,430	49,575
1950	2,086	44,591
1951	1,625	45,003
1952	1,280	30,537
1953	1,093	37,397
1954	1,035	43,393
1955	902	44,354
1956	809	45,036

N.A.—Not available.

Sources: 29, 32.

In 1953, the aircraft industry employed 48,500 of the 553,800 professional research engineers and scientists in United States industry.

The aircraft industry in 1953 also employed 10.1 per cent of all engineering personnel employed by American industry; 1.7 per cent of all chemists; 6.2 per cent of all metallurgists; 16.0 per cent of all physicists; 14.1 per cent of all mathematicians; and a considerable number of research personnel covering virtually all other of the physical sciences.

The nation's airlines operate flight and ground schools for the orientation and training of new employees, and for maintaining a high level of personnel efficiency.

While our educational prowess has, until recently, presented a bleak picture for the future, public spirited Americans in industry, govern-

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	2.7	N.A.	4.4	N.A.	11.9	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: 63, 68

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

N.A.—Not available.
Sources: 64, 65.

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

Source: 17, 31, 61

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	4,150,000[E]	1,570,000[E]	2,580,000[E]	90.79[E]
1956	4,800,000[E]	1,900,000[E]	2,900,000[E]	96.79[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: 16, 17, 19

ment, and in our great educational institutions are aroused and are taking remedial action. The high schools and colleges of the nation, more and more, are increasing their curricula to cover many fields of aviation. Colleges are, in many cases, offering pre-flight aviation training, and some offer flight training.

Flight Training

During World War II, more than 160 civilian aviation schools were

under Army Air Force contract to train flying and technical personnel. To a lesser degree, the Air Force employed this system of contracting with civilian schools during the early days of the Korean War.

The Air Force has since discontinued its use of civilian schools for other than primary flying instruction, and as a result most training schools have been faced with serious economic problems. The picture is brightening generally, however, with the growing awareness of the public of the significance of the civil aviation industry in the nation's economy.

Flight training is gradually increasing. In 1955, 45,036 new certificates were issued to student pilots; 16,399 private pilot certificates were issued; 8,419 commercial certificates; 1,172 air transport certificates; and 168 other proficiency type certificates were issued by the Civil Aeronautics Administration.

AVERAGE WEEKLY HOURS IN AIRCRAFT AND PARTS PLANTS
1939 TO DATE

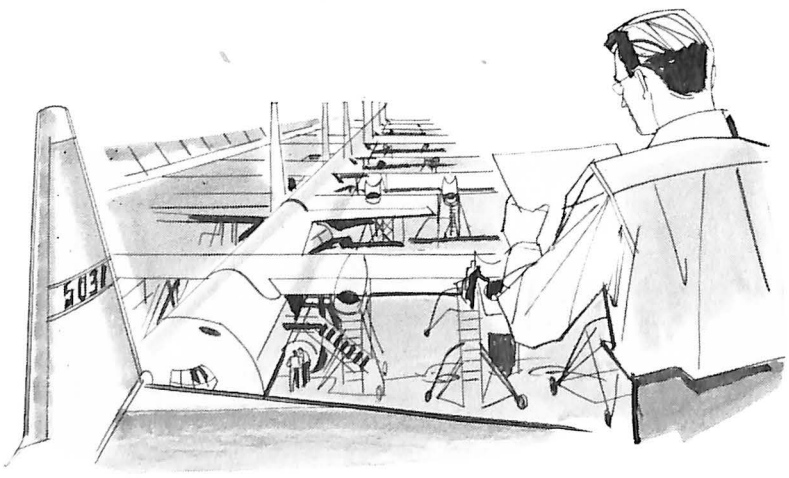
Monthly Average for the Year	TOTAL	Aircraft (Airframes)	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1939	N.A.	N.A.	44.6	N.A.	N.A.
1940	N.A.	N.A.	46.6	N.A.	N.A
1941	N.A.	N.A.	47.6	N.A.	N.A.
1942	N.A.	N.A.	49.7	N.A.	N.A.
1943	N.A.	N.A.	48.6	N.A.	N.A
1944	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

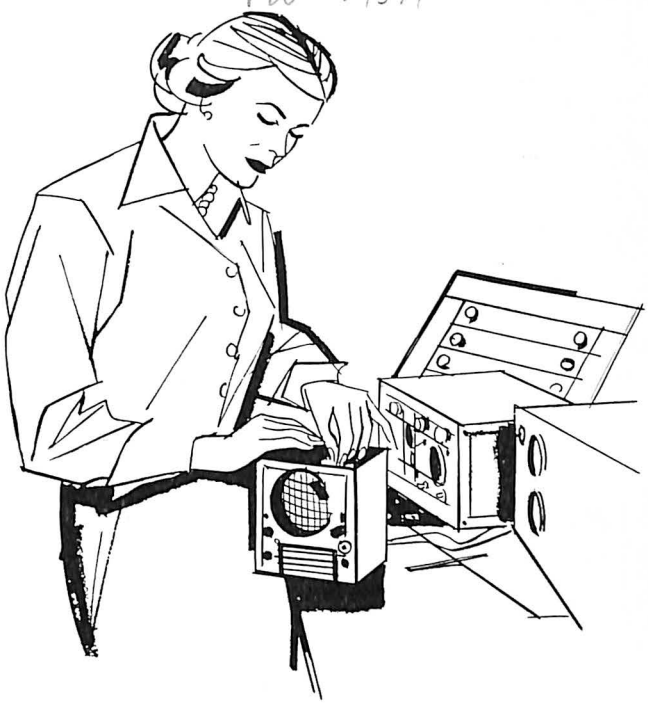
N.A.—Not available.
Sources: 64, 65

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

N.A.—Not available.
Sources: 64, 65





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

Sources: 18, 64, 65, 66

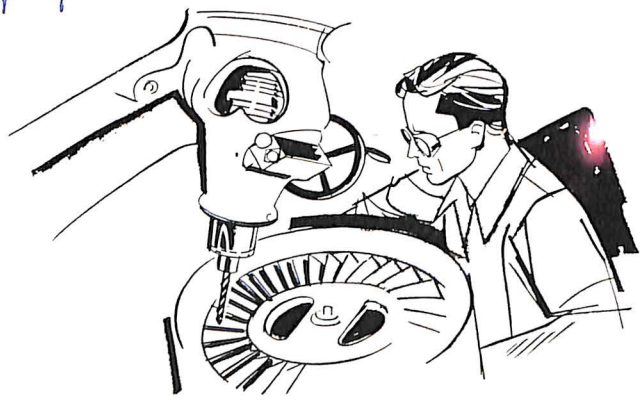
Average Weekly Earnings in Aircraft and Parts Plants 1939 to Date

(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

N.A.—Not available.

Sources: 64, 65



FINANCE

The aircraft manufacturing industry is a "contracting industry" and is capitalized accordingly.* This requires, among other things, that the capitalization of the companies (1) provide the liquidity necessary to justify a 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.

*Data contained in this chapter cover financial activities of the twelve major airframe companies with the exception of one large producer which is a division of another corporation and does not publish financial data on its aircraft activities. Financial activities shown herein cover the years 1950 through 1956.

It should be noted that all earning figures in the tables for the years 1953 through 1956 are subject to downward readjustment, in accordance with the Renegotiation Act of 1941; data for these and earlier years may be overstated by an unknown amount, since the effect of renegotiation refunds, when made, is not reflected in the earlier published financial statements of the companies involved.

NET PROFIT AS PERCENT OF SALES
1956

NON FERROUS METALS — 10.5

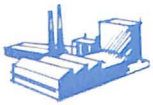
PETROLEUM PRODUCTS — 10.4

AUTOS AND TRUCKS — 5.7

RAILWAY EQUIPMENT — 4.4

IRON AND STEEL — 7.2

AIRCRAFT AND PARTS — 3.4



ALL MANUFACTURING — 6.

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

	1951	1952	1953	1954	1955	1956
Assets						
Current assets:						
Cash	$ 159,676	$ 216,470	$ 261,932	$ 295,365	$ 295,506	$ 311,572
Securities	8,484	5,613	5,478	26,437	29,372	—
Receivables	360,165	479,506	526,400	461,910	463,848	594,247
Inventories	373,429	531,020	583,923	592,056	638,208	874,550
Miscellaneous	13,102	18,569	27,467	12,934	23,040	31,329
Total current assets	$ 914,856	$1,251,178	$1,405,200	$1,388,702	$1,449,974	$1,811,698
Total net plant	124,457	154,010	166,077	186,406	214,077	309,984
Investments	9,264	9,531	9,208	6,278	5,679	5,820
Development, etc., expenses	—	1,780	2,202	—	—	—
Deferred charges Miscellaneous	13,271	11,932	13,644	19,731	19,410	22,604
Total assets	$1,061,848	$1,428,431	$1,596,331	$1,601,117	$1,689,140	$2,150,106
Liabilities						
Current liabilities:						
Payables	$ 369,910	$ 541,006	$ 544,162	$ 396,217	$ 375,822	635,018
Accruals—taxes—renegotiation—refunds due U. S.	209,048	297,102	406,906	409,039	375,642	347,620
Advances—contracts deposits	48,087	91,550	92,540	121,403	127,246	176,468
Reserve	4,923	3,618	3,458	8,851	12,317	5,078
Miscellaneous	8,474	9,577	8,347	11,112	13,509	27,315
Total current liabilities	$ 640,442	$ 942,853	$1,055,413	$ 946,622	$ 904,536	$1,191,499
Bank loans, etc.	27,782	30,763	8,648	8,589	36,756	73,690
Contingency reserve	—	500	—	—		
Capital stock	66,164	94,831	95,460	125,706	135,499	168,391
Capital (paid) surplus	61,371	68,927	77,181	100,331	110,216	162,056
Earned surplus	260,828	283,366	353,885	415,443	495,861	548,971
Miscellaneous	5,261	7,191	5,744	4,426	6,272	5,499
Total liabilities	$1,061,848	$1,428,431	$1,596,331	$1,601,117	$1,689,140	$2,150,106
Net current assets	$ 274,414	$ 308,325	$ 349,787	$ 442,080	$ 545,438	$ 620,199

Source: 4

As is the case with the other contracting industries, the most economical and efficient method of financing production is for the customer (whether civil or military) to provide some of the financing needed for performance of the contract. If such were not the practice, and if contracting industries were capitalized to handle their infrequent peak volume, it would be necessary during years of low volume for the price of the end product to include the heavy carrying costs of excess capitalization.

The nature of the aviation product, with its inevitable high unit cost, its 16 to 30 months manufacturing cycle and the necessity to avoid the danger of over-capitalization, requires that the industry make efficient use of its working capital as well as the total funds invested. Efficiency in financial management has historically been one of the distinguishing characteristics of the aircraft manufacturing industry. The aircraft industry has always achieved a higher rate of net worth turn-over than any other comparable industry. In 1956, for example, the twelve major airframe companies turned over their net worth 6.4 times. Working capital of approximately $620,000,000 during the same period was turned over a little better than nine times. With a working capital of this magnitude, and a turn-over rate of once every 40 days, the length of time between receipt of cash and its disbursement is extremely short. Any disturbance in the flow of incoming cash inevitably has a serious effect upon the individual company's—or the industry's—operations.

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
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	15,776	10,682	3,123	130	1,841
1956	18,385	11,784	4,064	191	2,346

Source: 22

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

Source: 4, 5

The extremely rapid advance in all of the sciences and the almost daily rate of new discoveries in recent years have permitted industry to provide the military air forces with weapons of far greater effectiveness than their comparable World War II counterparts. Since World War II, we have seen the missile come over the horizon as an offensive and defensive air weapon. Within the next decade, missiles will undoubtedly constitute the bulk of our air arsenal. This transition from the air weapons of World War II to those in use now and 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 were 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 needed during the foreseeable future.

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]

[a] Subject to renegotiation.
[cr] Credit.
Figures in parentheses indicate loss.
Sources: 4, 5

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

Figures in parentheses indicate net loss as a percent of sales.
[a] Subject to renegotiation.
Sources: 4, 5

NET PROFIT AS PERCENT OF SALES,
Seven Selected Industries,
1950 TO DATE
(After Taxes)

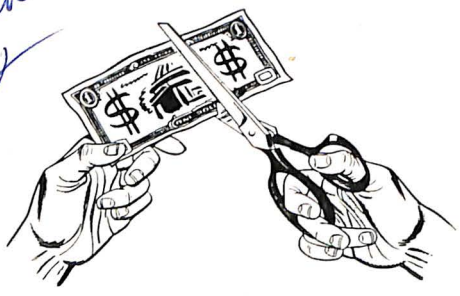
Industry	1951	1952	1953	1954	1955	1956
Nonferrous Metals	8.8	7.7	6.9	7.3	9.5	10.5
Petroleum Products	11.5	10.5	10.6	10.7	10.6	10.4
Autos and Trucks	5.2	5.5	4.4	6.4	7.4	5.7
Railway Equipment	4.8	3.8	3.3	4.1	4.7	4.4
Iron and Steel	5.8	5.0	5.7	6.0	7.8	7.2
AIRCRAFT AND PARTS	2.2	2.4[a]	2.4	3.8[a]	3.9[a]	3.4[a]
Total Manufacturing	6.2	5.4	5.3	5.9	6.7	6.0

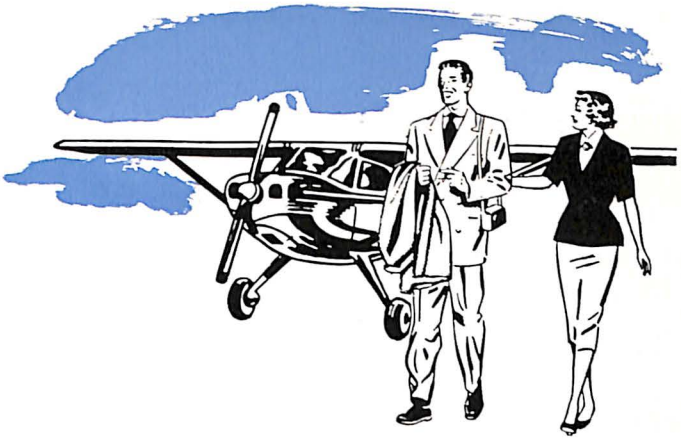
[a] Subject to renegotiation.
Source: 48

Some evidence of industry's efforts to solve this problem is indicated by the table on page 61 covering the consolidated balance sheet of the 12 major airframe companies. The total facilities investment for these twelve companies increased during the year from $214,000,000 to $310,000,000. This additional $96,000,000 that was risked by the industry during 1956 represents their earnings during the same year on three and one-half billion dollars in sales at their profit rate during that year of 2.8¢ per dollar of sales. Thus the earnings on over 60 per cent of their sales during 1956 were used to provide some of the needed production and test facilities.

The primary source for most of these funds invested in new facilities during 1956 was retained earnings. In addition, it will be noted that during the year the bank borrowings increased a little over three-fold. Also, several companies sold additional shares of equity capital. Others increased their long-term fixed debt through the sale of debentures. Thus the industry is using every available source of funds to solve this most pressing problem. How this problem is resolved today will have an important bearing on the quality and quantity of air weapons available to the military services in 1965.

Forward financial planning in the aircraft industry is further complicated by the delays inherent in the renegotiation process. Although 1956 earnings have been reviewed and scrutinized by the military services on a contract-by-contract basis, either during original negotiations or, as is more often the case, at varying points during performance of the contract, earnings are subject to later review by the Renegotiation Board leading to possible refunds by manufacturers. This review and determination that a refund of earnings should or should not be made often requires four years. This extended delay greatly increases the unknown, and thus the risk involved in any investment in facilities that have limited use for other than military weapon development, test and production.





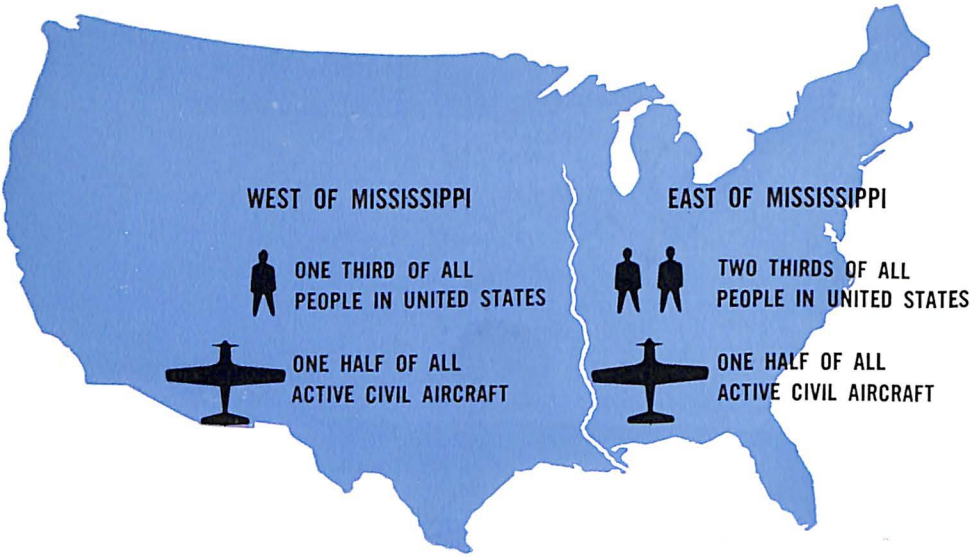
GENERAL AVIATION

The largest segment of civil aviation, in terms of hours flown, units of aircraft operated, and use of the federal airways system, is general aviation—which is all civil flying, excepting that of the scheduled airlines and the large irregular air carriers. During the past year, according to Civil Aeronautics Administration and industry estimates, general aviation operated 63,000 aircraft and flew 10,000,000 hours. This is in contrast to the nation's civil airline fleet which numbers about 1500 units which flew approximately 3½ million hours.

General aviation has become a major business and one, which through its very nature, makes substantial contributions to the national economy and defense through speeding the transportation of businessmen, materials, equipment and supplies, and for agricultural purposes.

General aviation includes the activities of many different kinds of users of the air space of the nation and its various aviation facilities—airports, airways, air navigation aids and the communications which link these facilities together. General aviation also utilizes all types of civil aircraft, from the small single-engined cub type craft to multi-engined aircraft similar to transport airliners. Helicopters are also used in various fields of general aviation.

Nor, contrary to the frequently found popular belief, is general aviation principally flying for pleasure or sport. Actually, though still a substantial segment of all such flying, it is the least in terms of hours, less than 21 per cent of the total. The fleet of general aviation is used in six principal areas which are:



Business—the aircraft is a means of rapid transportation in connection with the operation of a business. Owned and operated by businessmen themselves, fleets are frequently maintained by corporations who retain professional pilots to fly these aircraft.

Industry—the aircraft becomes a tool of industry itself. Typical examples are: power and pipe line patrol; geophysical exploration; aerial mapping and survey; forestry; and, the supply of construction crews in remote areas.

Agriculture—the aircraft is both transportation and a tool of the farmer or rancher who uses it for a great number of utilitarian purposes: survey of his land from the air in connection with planning crops; erosion control; patroling and mending fences; quick transportation to remote places on the farm or ranch; dusting, spraying and other application of agricultural chemicals and fertilizers which can be applied more efficiently from the air.

Instruction—teaching people to fly is still a substantial use for light aircraft, and is largely carried on by base operators as a part of their aviation business enterprise.

Various "For-Hire" Uses—aircraft are maintained by aviation services (base operators) for charter or rent, much as a car, either with or without a pilot.

Pleasure or Sport—light aircraft are extensively used for pleasure or sport.

CERTIFICATED CIVIL PILOTS AND STUDENT PILOTS, 1927 TO DATE

As of December 31	Certificated Airplane Pilots				Student Pilot Approvals During Year	Glider Pilots
	TOTAL PILOTS	Airline Transport	Commercial	Private		
1927	1,572	[a]	N.A.	N.A.	545	—
1928	4,887	[a]	N.A.	N.A.	9,717	—
1929	10,287	[a]	6,053	4,162	20,400	—
1930	15,280	[a]	7,847	7,433	18,398	178
1931	17,739	[a]	8,513	9,226	16,061	267
1932	18,594	330	7,967	10,297	11,325	209
1933	13,960	554	7,635	5,771	12,752	149
1934	13,949	676	7,484	5,789	11,994	109
1935	14,805	736	7,362	6,707	14,572	145
1936	15,952	842	7,288	7,822	17,675	138
1937	17,681	1,064	6,411	10,206	21,770	161
1938	22,983	1,159	7,839	13,985	15,556	172
1939	33,706	1,197	11,677	20,832	29,839	170
1940	69,829	1,431	18,791	49,607	110,938	138
1941	129,947	1,587	34,578	93,782	93,366	160
1942	166,626	2,177	55,760	108,689	93,777	211
1943	173,206	2,315	63,940	106,951	36,802	1,435
1944	183,383	3,046	68,449	111,888	51,276	2,412
1945	296,895	5,815	162,873	128,207	77,188	2,438
1946	400,061	7,654	203,251	189,156	173,432	N.A.
1947	433,241[b]	7,059[b]	181,912[b]	244,270[b]	192,924	2,995[b]
1948	491,306[c]	7,762[c]	176,845[c]	306,699[c]	117,725	3,143[c]
1949	525,174	9,025	187,769	328,380	49,575	3,291
1950	[d]	[d]	[d]	[d]	44,591	[d]
1951	580,574	10,813	197,900	371,861	45,003	3,300
1952	581,218	11,357	193,575	376,286	30,537	3,365
1953	585,974	12,757	195,363	377,854	37,397	3,402
1954	613,695	13,341	201.441	398,913	43,393	3,512
1955	643,201	13,700	211,142	418,359	44,354	3,657

N.A.—Not available.
[a] Airline Transport Rating became effective May 5, 1932.
[b] As of April 1, 1948.
[c] As of May 1, 1949.
[d] No survey made.
Sources: 29, 32.

The business use of utility and executive type aircraft has perhaps shown the most spectacular growth, having increased from about one million annual hours in 1946 to an estimated 5 million hours in 1956. The strong trend towards the decentralization of American business enterprises has generated a demand for faster means of travel. Today's businessman cannot spend three or four days travelling to do one or two days of productive work. Through the use of executive aircraft he has found that he can double, and often quadruple, his productivity. A measure of the extent to which aircraft are used by businessmen today is found in the numbers of general aircraft used for business purposes: an estimated 23,000, which is more than one-third of the total active fleet of civil aircraft. More than ninety of the nation's 100 largest corporations operate one or more aircraft for business purposes and executive transportation.

Farmers, ranchers, and others engaged in various phases of agricul-

CIVIL AIRPLANE PRODUCTION

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	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

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.

Source: 20, 29

ture, too, have found that the general aircraft has a vital place. Agronomists of the Civil Aeronautics Administration and the Department of Agriculture, have estimated that agricultural uses of aircraft have added as much as 3 billion dollars annually to farm income.

The airplane also is assuming an increasing industrial role where it becomes less a means of transportation and more a tool of industry. Specific examples are power and pipeline patrol, geophysical exploration, and aerial mapping and survey work.

General aviation utilizes *all* types—but principally light transports, some helicopters, and large numbers of single-engined aircraft.

There are four main types of utility aircraft:

(1) small one- and two-place aircraft with 65 to 150 horsepower engines, and speeds of 70 to 135 miles per hour. These are the kind of aircraft most often used for instruction, for light agricultural use, and for sport flying.

(2) three- and four-place aircraft grossing up to 2,700 pounds and powered with engines from 125 to 225 horsepower. Good "cross-country" aircraft, able to maintain cruising speeds of 150 miles per hour or more, they have endurance of three to four hours without refueling. Such aircraft are extensively used in all categories of general aviation.

(3) four- to five-place aircraft, weighing as much as 5,000 pounds with 175 to 300 horsepower. Able to cruise at speeds ranging from 140 to 225 miles per hour and generally referred to as executive aircraft, they are well equipped with radio and instruments, and capable of cross-country flight under instrument conditions.

(4) four- to ten-place, multi-engine light transports, with 175 to 500 horsepower engines. Literally small transports, such aircraft have a cross-country speed of from 150 to 300 miles per hour.

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: 29

Four to seven hours' endurance, and extensive instrumentation and radio, enable these aircraft to duplicate airline-type performance and to operate in marginal weather. This type of aircraft is much in demand by corporate users.

In addition to these four principal aircraft types, all of which are being currently manufactured and delivered, there is an active fleet of several hundred larger multi-engined aircraft, quite comparable or identical to planes used by the airlines, in use by corporations for busi-

ness purposes, principally executive transportation.

Deliveries of new aircraft of the above-described types used in general aviation—a significant yardstick to measure growth—has shown a marked increase in recent years. In 1954, 3,098 new airplanes were delivered; in 1955, 4,575; and in 1956, 6,778. The 1956 shipments show a 50 per cent increase in both unit and dollar volume which, in this latter year, was $98,000,000 (retail value).

The dollar value of the active fleet of general aviation is now estimated to exceed 700 million dollars; and, in terms of purchases of new equipment, gasoline, repair and maintenance, and the salaries of mechanics, and of professional personnel who fly many of these aircraft, now

LANDING AIDS TO AIR NAVIGATION, 1941 TO DATE

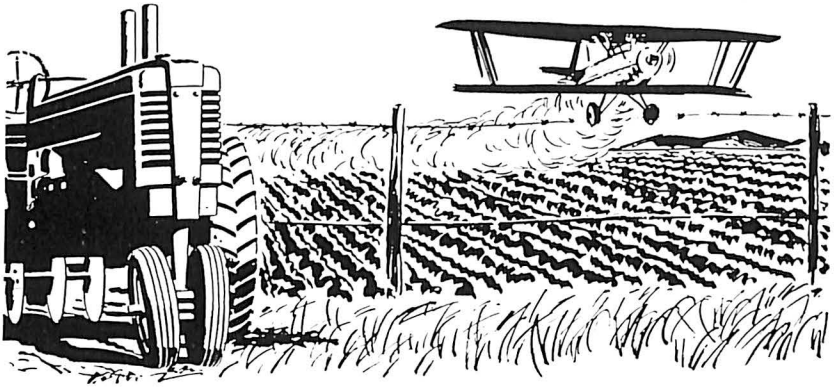
Calendar Year	Instrument Landing Systems	Precision Approach Radar	Airport Surveillance Radar
1941	1	—	—
1946	31	—	—
1951	97	10	10
1952	120	10	10
1953	143	10	17
1954	153	10	28
1955	157	10	31
1956	160	10	40

Sources: 29, 32

HOURS FLOWN BY UTILITY AIRCRAFT, 1931 TO DATE

Calendar Year	TOTAL (Thousands of Hours)	Instructional		Commercial[a]		Business[b]		Pleasure, etc.	
		Hours 000's	Per-cent	Hours 000's	Per-cent	Hours 000's	Per-cent	Hours 000's	Per-cent
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[E]	13.4	1,950[E]	20.5	4,300[E]	45.3	1,975[E]	20.8

[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.
Sources: 1, 28



adds an estimated half billion dollars or more annually to the national economy.

General aviation's active fleet includes several times more multi-engined aircraft fully equipped to fly on the nation's airways under instrument conditions than do the airlines. Large numbers of single-engined craft are also so equipped. It is not unusual for small business aircraft to have *one-third or more* of their cost represented in the instrumentation. The general aircraft fleet operates more auto pilots and airborne weather radar than do the airlines. This results from the fact that users of general aircraft have found that to gain the most efficient

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: 29.

AIDS TO AIR NAVIGATION, 1926 TO DATE

Year	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	369	79

Sources: 29, 32

use of their aircraft, they must be well equipped so as to be able to fly both on and off the airways in fair weather and foul. The value of these equipments is now in excess of $100,000,000.

Although there are approximately 644,000 certificated pilots, only about 217,000 of these pilots have current medical certificates. Of the active pilots, airline pilots and co-pilots number about 8,000, which gives an indication of the size of the active pilot group which flies general aviation's planes. The large number of certificated pilots results in a degree from the fact that returning military pilots at the end of World War II were given civilian pilot certificates, many of which are no longer active. The number of current medical certificates is the real measure of the number of active pilots. Of the approximately 209,000 pilots who operate the general aircraft fleet, about 76,000 have air transport or commercial ratings, and 23,500 instrument ratings, which is a further measure of the competence of the pilots of general aircraft's fleet to operate on today's increasingly congested airways.

In the type of economy existing in the United States, which is vitally dependent on transportation, and which is quick to utilize any new means which will increase the efficiency of business, broaden its base, and make it more competitive, the air transportation provided by

the use of general aircraft offers a challenge which increasing numbers of businessmen, industries, and farmers and ranchers are accepting.

Nor, are the day-to-day civil uses of general aircraft's fleet its only value to the nation. The thousands of well-equipped light aircraft, together with the trained pilots who fly them and the base operators who service and maintain them, provide a reserve of transportation which could become vital under the emergency conditions which would be imposed by war or civil disaster. Under such conditions when the usual form of surface transportation can become seriously disrupted or completely blocked, light aircraft capable of landing in small areas under emergency conditions would be vitally important in bringing the supplies and providing the communications necessary to re-establish the productivity of devastated areas.

TOTAL 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.
Sources: 29, 32

AVERAGE COSTS PER MILE TO FLY NEW SINGLE ENGINE AIRPLANES IN 1956

Flying at 145 MPH Block Speed Costs • 8½ cents per mile

Range of Costs:

A $10,000 Plane at 125 MPH	6 8/10 cents per mile
A $25,000 Plane at 170 MPH	10 8/10 cents per mile

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: 30

HELICOPTERS

Increasing recognition of the helicopter's place in civil operations and important strides in the field of VTOL* and STOL** development work were the important mileposts during the past year in this phase of the aircraft manufacturing industry. Acceptance of rotorcraft by the armed forces following World War II and the remarkable record established by this craft, not only in assault landings and other tactical maneuvers but in the field of spectacular rescue operations, established helicopters as an integral part of our military system and made possible the continued development of "bigger and better" craft readily adaptable to innumerable civil needs.

According to an industry survey, approximately 400 helicopters are now being operated by about 80 charter companies and, at the same time, individual corporations have learned the efficient capabilities of this type of aircraft and, early in 1957, a check showed that forty corporations were operating 65 helicopters on company business.

A very significant statement was made by Hervey F. Law of the Port of New York Authority regarding the growth of helicopter passenger business. Speaking before the Helicopter Association of America this past January, Mr. Law declared: "We of the Port Authority believe that the helicopter will be the most frequently used business aircraft of the future for short-haul operations. We are also convinced that the

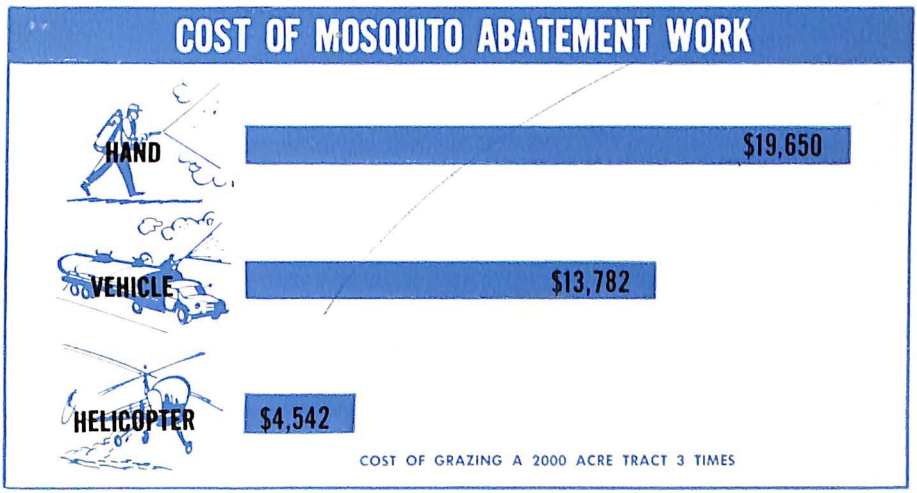
*Vertical Takeoff and Landing
**Short Takeoff and Landing

helicopter common carrier has a great future in the short-haul field. Our 1952 study 'Transportation by Helicopter 1955-75' indicated that helicopters are admirably suited to provide a vastly improved type of service in three important fields: (1) on routes between cities from 40 to 175 miles apart; (2) on routes linking city centers with the suburbs; and (3) on routes linking the airports with each other and with downtown centers. The study indicated that three types of services would result in a combined total of 5,000,000 helicopter passengers a year entering or leaving Manhattan by 1970 . . . traveling by helicopter will be as common as air travel today.''

Confirming the New York situation is the announcement that the Port Authority plans additional heliports in mid-town east side, in the downtown Wall Street area, in the northern area of Staten Island, and in Brooklyn.

In similar fashion the Department of Airports, City of Los Angeles, has announced that their over-all planning for the future includes a system of modern design heliports to be located in five areas—valley, Hollywood, downtown, east and harbor. These would be so situated as to serve the large population areas with speedy shuttle service for both mail and passengers. The Department points out that passenger helicopter service in that area has been increasing by about 20 per cent a month since its inauguration in 1954 and that about 50 communities in the greater Los Angeles metropolitan area are being served by Los Angeles Airways from fourteen heliports, through interline connection with International Airport.

Significant also as to the definite trend toward development of the



U. S. EXPORTS OF CIVIL ROTARY-WING AIRCRAFT
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

Source: 20.

helicopter as a public service vehicle was the action of the Pennsylvania Aeronautics Commission in retaining the services of Frederic P. Kimball, aviation consultant, to prepare an exhaustive report on the helicopter to provide guidance for the state's line of action.

In an industry report submitted to Edward P. Curtis, Special Assistant to the President for Aviation Facilities Planning, certain pertinent conclusions are presented, such as the indication that five distinct markets represent a fertile potential for the continuing sale of rotary-wing aircraft:

(a) Department of Defense
(b) Corporations
(c) Air Commerce (other than air carrier)
(d) Air Carrier
(e) Private

With an analysis showing that the 1956 distribution was predominently military (80 per cent) with commercial second (15 per cent) this report looks ahead to 1965 and the expansion of corporate and commercial deliveries to 50 per cent and military being 40 per cent of total output. Air carrier demand would take 8 per cent and private the remaining 2 per cent.

Growth of corporate and commercial usage would follow the trend already clearly perceptible. Despite the slowness of the majority of our larger cities and industrial centers to make helicopter services accessible to their people through the provision of suitable landing areas—heliports—the existing, and prospering, charter operators are establishing a remarkable record of accomplishment. For example, Rick Helicopters, located at San Francisco, now operate 30 helicopters on a wide variety

of charter missions. Okanagan Helicopters, organized by Carl Agar and now operating a total of 52 helicopters, reports 1956 income at $2,000,000 as compared to $7,000 in 1947.

Twelve-passenger helicopters already are in service in scheduled operations, while the Civil Aeronautics Administration this Spring certificated a fifteen-passenger, tandem rotor helicopter with greatly improved cabin silencing and extremely roomy in the transport type, where regular airline-type seating is used. For higher density seating, a different type of furnishing will accommodate 19 passengers.

The announcement that two helicopters had been acquired for the use of the President and his aides made international news this Spring and provided great impetus to the growing realization of this aircraft's efficiency. The President's helicopters will pick him up right on the White House grounds for flight to his destination, thus eliminating the traffic jams and congestion on the highways always occasioned by the President's automobile journeys.

HELICOPTERS IN PRODUCTION
April 1957

Producer	No. of Places	No. of Engines	HP	Commercial Design	Military Designations				
					USAF	USA	USCG	USMC	USN
Bell	3	1	200	47G	H-13G	H-13G	HTL-6	HTL-6	HTL-6
	3	1	250	47G2		H-13H			
	3	1	200	47H1					
	4	1	250	47-J				HUL	HUL
Doman	8	1	400	LZ-5-2		YH-31			
Hiller	3	1	200	12-C	H-23-C	H-23-C			
	3	1	250	12-D	H-23-D	H-23-C			
	2	2	96	HJ-1	H-32				
Kaman	5	1	600	KC-600				HOK-1	HOK-1
Sikorsky	12	1	600	S-55	H-19A	H-19C	H04S-2G	HRS-1	H04S-1
	12	1	700	S-55A	H-19B	H-19D		HRS-3	H04S-3
	—	2	4,200	S56		H-37-A		HR2S-1	HR2S-1W
	20	1	1525	S-58		H-34-A		HUS-1	HSS-1
Vertol	22	1	1425	H-21	H-21B	H-21C			

Source: 1

SALES AND BACKLOG OF MAJOR HELICOPTER MANUFACTURERS
(In Millions of Dollars)

	1954	1955	1956
Totals Sales during the Year	$307.4	$333.5	$337.0
To Military Agencies	202.6	260.1	283.6
Civilian Sales	104.8	73.4	53.4
Total Backlog at End of Year	$677.8	$540.1	446.6
Military Orders	584.3	469.0	379.7
Civilian Orders	93.5	71.1	66.9

Source: 2.

More than 1,000 members and guests of the American Society of Planning Officials, meeting in San Francisco in March, were told of the urgency of heliport planning as well as the need for eliminating unnecessary legal restrictions that unintentionally hamper the full development of helicopter services and resulting benefits to the public.

Years ago when state aeronautical laws were first being passed, legislatures drew upon the definition of the word "aircraft" used in Federal statutes: "Any contrivance now known or hereafter invented, used or designed for navigation of or flight in the air." This definition, coined when only fixed-wing aircraft were in common usage, still appears in statute books throughout the country and, consequently, today embraces helicopters and other rotary-wing vehicles.

Where no corrective action has been taken to distinguish the helicopter's performance characteristics and relieve it from fixed-wing restrictions, development has been seriously retarded. Prospective operators, for example, hesitate to invest in rotary-wing aircraft when they fear that operations will be unduly curtailed.

AIA's Helicopter Council, the National Association of State Aviation Officials, the American Bar Association, the Helicopter Association of America and other organizations and individuals are striving to correct this condition.

While concentrating in the main upon helicopter development and production, the industry has been equally alert to the promise of STOL and VTOL development. A number of developmental designs awarded by the military are well along toward completion. One design, described as a tilt-wing, and the first of this type built, was a development contracted for by the Army and Naval Research. In April it was undergoing ground tests with flight testing to follow.

AIRLINES AND TRANSPORTATION

In the short span of seven years, the scheduled airlines of the free world have made record gains in every type of operation. Since 1949, there has been almost a threefold increase in the number of passengers carried and passenger miles flown. During 1956, the world's scheduled airlines carried 78 million passengers, each an average distance of 575 miles.

U. S. scheduled airlines, for the 19th consecutive year, set new records in 1956. The number of passengers carried increased 10 per cent over 1955 and was more than three times greater than in 1949. As an indication of the rapid growth of the U. S. scheduled airline industry, in July 1956, these airlines carried their 300,000,000th passenger, just two years after carrying their 200,000,000th passenger . In 1950, more than 20 years after airline service began, the 100,000,000th passenger was carried.

This vast number of air travelers are flying today, with greatly improved equipment and service, at about the same fares set when the Civil Aeronautics Act of 1938 was passed. Safety in flying continues to improve with a steady drop in airline accident fatality rate in the last ten years. Air travel today is four times as safe as riding in one's own automobile.

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.
1927	8.7	N.A.	3.0	N.A.	N.A.	N.A.
1928	48.3	N.A.	13.0	N.A.	11.0	N.A.
1929	161.9	N.A.	41.0	N.A.	12.0	N.A.
1930	384.5	N.A.	85.1	N.A.	8.3	221
1931	472.4	N.A.	107.0	N.A.	6.7	226
1932	476.0	303.6	127.4	N.A.	6.1	268
1933	502.2	373.8	174.8	N.A.	6.1	348
1934	475.5	367.8	189.9	N.A.	5.9	399
1935	678.5	577.7	316.3	N.A.	5.7	415
1936	931.7	686.2	439.0	N.A.	5.7	421
1937	985.1	836.2	411.5	49.22	5.6	418
1938	1,197.1	951.5	479.8	50.43	5.2	401
1939	1,734.8	1,215.2	682.9	56.20	5.1	394
1940	2,802.8	1,817.1	1,052.2	57.90	5.1	375
1941	3,848.9	2,341.9	1,384.7	59.13	5.0	360
1942	3,136.8	1,963.6	1,418.0	72.22	5.3	452
1943	3,019.7	1,857.0	1,634.1	88.00	5.3	541
1944	4,046.0	2,436.8	2,178.2	89.39	5.4	538
1945	6,476.3	3,815.6	3,362.5	88.12	5.0	511
1946	12,213.4	7,556.5	5,948.0	78.71	4.6	487
1947	12,890.2	9,373.8	6,109.5	65.12	5.1	474
1948	13,168.1	10,385.1	5,981.0	57.59	5.8	454
1949	15,080.7	11,672.9	6,752.6	57.85	5.8	448
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	18,819.0	62.29	5.3	521
1956	41,737.0	35,285.7	22,360.2	63.37	5.3	N.A.

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.

Sources: 29, 35.

Trans-Atlantic Air Travel

Trans-Atlantic air travel surpassed sea travel for the first time in history last year. Approximately 482,000 passengers traveled Westbound across the Atlantic in airplanes during 1956, compared to about 479,000 in ships. Eastbound traffic by air was even higher as compared to sea: 411,000 air travelers compared to 385,000 sea travelers. Eighty-six civil airplanes a day flew across the North Atlantic during July and August. This means that about every 16 or 17 minutes a passenger plane, either scheduled or non-scheduled, was taking off for a trans-Atlantic flight.

Air Mail

Although the mail ton miles of the U. S. scheduled airlines continues to increase, the revenue obtained from carrying mail represents a smaller and smaller portion of airline earnings each year. In 1939 mail pay in the form of subsidy, or public service revenue, was a major source of airline income. By comparison, in 1956, public service revenue paid to the airlines represented only 2.3 per cent of their gross income. The domestic trunklines were almost entirely free of subsidy. Only the local service airlines, certain segments of international routes, the territorial airlines and new helicopter services still receive public service revenues.

An experiment of carrying three-cent mail by air when the scheduled airlines have space available was begun in 1953. It continues to expand

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: 58, 78

and proves to be more and more successful. It is estimated that in 1956 this experiment saved billions of hours of delivery time for millions of letter writers. Millions of letters reached their destinations an average of 12 hours sooner than had they been carried by surface means.

Inaugurated in 1948, the use of air parcel post has increased 277 per cent in less than ten years. The number of pieces flown, both domestic and international, in 1956, was 24,201,198, a gain of 11.9 per cent over the previous year.

Equipment

Airlines of the free world operated a fleet of over 2500 aircraft in 1956, of which more than 85 per cent were American-built. The combined fleets of the nation's scheduled airlines by the end of 1956 exceeded 1,500 aircraft, representing an investment of more than half a billion dollars.

At the end of the first two months of 1956, U. S. manufacturers had

AIRCRAFT IN SERVICE ON WORLD AIRLINES

(Members of International Air Transport Association—Dec. 31, 1955)

Aircraft by Country in Which Manufactured	Number of Aircraft	Percent of Total
GRAND TOTAL	2,529	100.0
Made in the United States	2,188	86.5
DC-7	89	
DC-6	336	
DC-4	208	
DC-3	702	
Super Constellation	140	
Constellation	173	
Convair 340	151	
Convair 240	132	
Stratocruiser	52	
Martin 4-0-4 and 2-0-2	115	
All other	90	
Made in Great Britain	250	9.9
Viscount	69	
Viking	36	
DH Heron	38	
Bristol 170	21	
Elizabethan	19	
DH Rapide	18	
All other	49	
Made in Canada	60	2.4
Made in other countries	31	1.2

Source: 53

orders on their books for about 900 large transport aircraft. Nearly 400 of these are large piston and turbo-compound powered airliners—planes which will be delivered in the 1957-1959 period and which will remain in airline service for decades. About 500 jet and turboprop airliners are also on order from U. S. aircraft companies. American-manufactured turboprop airliners will enter service in 1958, U. S. jet transports in 1959.

Air Traffic Control

On this threshold of the jet age in civil aviation, the problems of air traffic control become more intensified. Today, military and civilian aircraft using the Federal Airways System have speeds ranging from 100 miles per hour to 600 miles per hour and fly at altitudes to 40,000 feet and above. This presents a very different situation from that of a few years ago when practically all aircraft flown on instruments on the airways were unpressurized and had approximately the same modest cruising speed and climb and descent capabilities. In early 1956, a Special Assistant for Aviation Facilities Planning was appointed by the President to develop comprehensive proposals for meeting the Nation's need

DEVELOPMENT OF 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	1,200	52	29,000	720	190	24	560
1955	1,440	68	39,000	910	260	27	570
1956	1,630	78	45,000	1,030	280	28	575

N.A.—Not available.

Sources: 50, 55

Tentative

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 Million Passenger-Miles Flown
1928	1	57	N.A.	N.A.	N.A.	N.A.
1929	4	83	N.A.	N.A.	N.A.	N.A.
1930	3	103	N.A.	19.2	N.A.	N.A.
1931	3	100	N.A.	19.5	N.A.	N.A.
1932	3	108	N.A.	19.6	N.A.	N.A.
1933	3	86	N.A.	19.4	N.A.	N.A.
1934	2	99	N.A.	22.2	N.A.	N.A.
1935	2	101	N.A.	31.3	N.A.	N.A.
1936	2	94	N.A.	32.0	N.A.	N.A.
1937	2	92	N.A.	32.0	N.A.	N.A.
1938	2	73	16.9	35.0	N.A.	13.0
1939	2	84	17.7	43.5	N.A.	12.8
1940	3	68	18.3	52.3	N.A.	N.A.
1941	3	83	18.0	N.A.	N.A.	1.2
1942	3	68	17.7	N.A.	N.A.	N.A.
1943	3	70	17.5	27.2	N.A.	3.9
1944	3	70	18.5	29.7	149.2	5.3
1945	4	97	18.9	38.9	150.7	3.7
1946	9	147	27.2	66.4	166.3	3.5
1947	12	154	35.2	95.5	191.1	1.1
1948	13	175	35.1	105.9	198.5	1.0
1949	13	177	36.6	109.0	207.1	N.A.
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	58.43	131.4	244.6	0.19

E Estimate.
N.A.—Not available.
Sources: 29, 35.

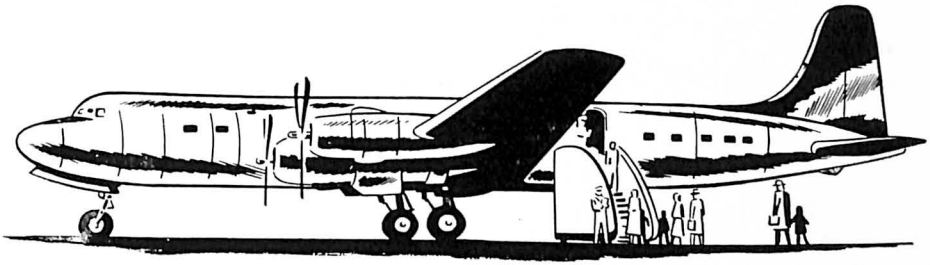
Domestic Scheduled Airlines—Operators, Equipment, and Speed 1926 to Date

As of December 31	Operators	Aircraft in Service	Average Available Seats	Route Mileage Operated	Average Speed, M.P.H.	Passenger Fatalities per Million Passenger-Miles Flown
1926	13	N.A.	N.A.	N.A.	N.A.	N.A.
1927	18	N.A.	N.A.	N.A.	N.A.	N.A.
1928	34	268	N.A.	N.A.	N.A.	N.A.
1929	38	442	N.A.	N.A.	N.A.	N.A.
1930	43	497	N.A.	30,293	N.A.	N.A.
1931	39	490	N.A.	30,857	N.A.	N.A.
1932	32	456	6.61	28,956	N.A.	N.A.
1933	25	418	7.59	28,283	N.A.	N.A.
1934	24	423	8.86	28,609	N.A.	N.A.
1935	26	363	10.33	29,190	N.A.	N.A.
1936	24	280	10.67	29,797	N.A.	N.A.
1937	22	291	12.52	32,006	N.A.	N.A.
1938	16	260	13.91	34,879	N.A.	4.5
1939	18	276	14.66	36,654	N.A.	1.2
1940	19	369	16.54	42,757	N.A.	3.0
1941	19	370	17.54	45,163	N.A.	2.3
1942	19	186	17.91	41,596	N.A.	3.7
1943	19	204	18.34	42,537	N.A.	1.3
1944	19	288	19.05	47,384	155.6	2.2
1945	20	421	19.68	48,516	155.4	2.2
1946	24	674	25.25	53,981	160.2	1.2
1947	28	810	29.93	62,215	168.2	3.2
1948	31	878	32.37	67,702	171.9	1.3
1949	37	913	35.03	74,667	179.0	1.3
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	78,092	209.0	0.76
1956	30	1,347	52.43	84,645	214.5	0.6

E Estimate.
N.A.—Not available.
Sources: 29, 35.

for air traffic control and air navigation. Aviation Facilities Planning Group has worked with and studied all segments of aviation and the air traffic control problems for the past year. The establishment of an Airways Modernization Board by Congress to continue the improvement of the Airways System has been proposed as a result of the year's study.

Forecasts of 66 million passengers traveling the domestic airways in 1960, 93 million by 1965, and 118 million by 1970 further amplify the need for air traffic control improvement. In line with the growth trends of U. S. airline travel, it has been estimated that airline travel will exceed railroad travel for the first time in 1957.



Military Air Transport Service

During the year 1956, MATS transport, air rescue, air evacuation, weather, and other aircraft logged 1.2 million hours, an increase of some 20,000 hours over record-breaking 1955. Every hour of the day, the Military Air Transport Service airlifted about 100 passengers and patients and nearly 20 tons of cargo for all branches of the Department of Defense.

In August MATS planes passed the 100,000th ocean-crossing mark. This meant that the big transports have averaged an Atlantic or Pacific crossing every 48 minutes since the creation of the Command in mid-1948.

The largest United States military mercy mission since the Berlin Airlift—a mission designed to help provide a home for thousands of Hungarian victims of communist tyranny—was one of the great accomplishments of the Military Air Transport Service in 1956.

Civil Reserve Air Fleet (CRAF)

The Civil Reserve Air Fleet is composed of over 300 long-range, four-engine civil transports committed to fly on 48 hours' notice under opera-

tional control of the Military Air Transport Service. It is operated, manned, maintained, and serviced by the civil airlines with their own people under their own management. The CRAF program saves hundreds of millions of dollars in tax monies which otherwise would have to be spent for maintaining emergency airlift on a stand-by basis.

U. S. Scheduled Airlines—Aircraft in Service by Make and Model
1941 to Date

Domestic						International[a]					
Aircraft Make & Model	1941	1953	1954	1955	1956	Aircraft Make & Model	1941	1953	1954	1955	1956
Bell											
B47D, G	..	6	6	7	7						
Boeing						Boeing					
247D	27	..	..	..	..	307	3	..	..	..	..
307	5	..	..	..	..	314	8	..	..	..	..
377	..	16	11	10	9	377	..	27	27	26	25
Convair						Convair					
240	..	90	92	93	95	240	..	14	10	5	5
340	..	103	121	123	123						
440					19						
Curtiss											
C-46	..	..	..	..	3						
Douglas						Douglas					
DC-3, 3S	280	331	299	301	321	DC-2	3	..	..	..	..
DC-4	..	126	109	100	75	DC-3	45	24	22	18	15
DC-6,A,B	..	175	185	190	218	DC-4	..	45	31	28	40
DC-7	..	10	61	77	99	DC-6,A,B	..	42	62	60	70
						DC-7	..	..	..	5	33
Lockheed						Lockheed	2	..	..	..	..
10	16	..	..	..	..	10	3	..	..	..	..
18	13	11	11	9	10	18	..	9	9	5	6
L49	..	37	37	44	50	L49	.	..	..	..	2
649	..	5	3	..	..	L1049					
749	..	62	62	58	58						
1049	..	31	37	61	73						

(Continued on next page)

(Continued)

U. S. Scheduled Airlines—Aircraft in Service by Make and Model
1941 to Date

Domestic						International[a]					
Aircraft Make & Model	1941	1953	1954	1955	1956	Aircraft Make & Model	1941	1953	1954	1955	1956
Martin						Martin					
2-0-2	..	25	25	19	23	130	1	..	..	..	..
4-0-4	..	100	100	100	97						
Sikorsky						Sikorsky					
S51	..	3	3	2	2	S42B	4	..	..	..	..
S55	..	8	11	10	8	S43	1	..	..	..	..
S58	..	..	..	..	3						
Vickers											
744	..	..	..	8	54						
Total	341	1139	1175	1212	1347	Total	70	161	161	147	196
Single Eng.	..	17	20	19	20						
Twin Eng.	336	660	648	645	691	Twin Eng.	54	38	32	23	20
Four Eng.	3	462	507	548	636	Four Eng.	16	123	129	124	176

[a] Excludes certain aircraft used in both domestic and international operations
Sources: 29, 32

Passenger Rates,
Yield per Passenger-mile, in Cents

Type of Airline Travel	1955	1956
Domestic Trunk Line		
All classes	5.35	5.29
Coach	4.35	4.31
Family Plan	4.64	N.A.
All other	6.02	5.85
Local Service	6.25	6.86
International	6.69	6.66
Territorial (excluding Alaska)	7.69	7.75
Large Irregulars	N.A.	N.A.

N.A.—Not available.
E Estimate.

Sources: 1, 35.

U. S. International Scheduled Airlines—Passenger Service 1929 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)
1929	11.5	N.A.	N.A.	N.A.	N.A.	N.A.
1930	33.0	N.A.	18.6	N.A.	N.A.	464
1931	59.2	N.A.	14.2	N.A.	N.A.	238
1932	71.5	N.A.	20.8	N.A.	N.A.	289
1933	74.4	N.A.	25.0	N.A.	N.A.	315
1934	96.8	N.A.	36.8	N.A.	N.A.	351
1935	111.3	N.A.	46.0	N.A.	N.A.	381
1936	87.7	N.A.	41.8	N.A.	N.A.	414
1937	112.3	N.A.	53.7	N.A.	N.A.	416
1938	N.A.	116.1	53.2	45.83	8.33	487
1939	136.1	134.4	71.8	53.46	8.57	557
1940	170.2	175.5	99.8	56.88	8.83	614
1941	235.8	248.3	162.8	65.57	8.61	713
1942	276.2	313.1	237.0	75.68	8.85	880
1943	292.9	307.5	244.2	79.42	7.92	874
1944	356.7	391.3	310.6	79.37	7.82	910
1945	493.5	583.4	448.0	76.78	8.67	942
1946	1,066.4	1,553.7	1,100.7	70.85	8.31	1,057
1947	1,359.7	2,924.3	1,810.0	61.90	7.77	1,332
1948	1,372.9	3,292.3	1,889.0	57.38	8.01	1,376
1949	1,520.1	3,624.7	2,054.0	56.67	7.72	1,351
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	3,947.0	8,308.3	5,226.2	62.90	6.70	N.A.

E Estimate.
N.A.—Not available.
[a] 1929-1946: Total passengers; 1947 to date: Revenue passengers o[illegible].
[b] 1930-1937: Total passenger-miles; 1938 to date: Revenue passenger-miles.

Sources: 29, 35.

TRANSPORTATION ACCIDENT DEATH RATES
1955

Kind of Transportation	Passenger Miles (Millions)	Deaths	Death Rate per 100,000,000 Passenger Miles
Passenger Deaths in—			
passenger automobiles and taxis	900,000	24,000	2.7
busses	52,000	100	0.19
railroad passenger trains	28,550	19	0.07
scheduled air transport planes	20,550	156	0.76
All Deaths connected with the operation of			
passenger automobiles and taxis	900,000	33,700	3.7
busses	52,000	550	1.06
railroad passenger trains	28,550	1,065	3.6
scheduled air transport planes	20,550	181	0.9

Source: 73.

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
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

Source: 60

AMERICA'S TRANSPORTATION NETWORK
(Thousands of Miles)

Medium of Transportation	1930	1955
Airways — Domestic	30	79
Railroads — Road Owned	249	221
Total Rural Roads	3,009	3,045
Surfaced	649	1,942
Federal-Aid Primary Highways	193	234
Petroleum Pipelines	89	140
Waterways and Great Lakes	28	23

Sources: 1, 11, 26, 27, 29, 36, 59.

ESTIMATED INTERCITY PASSENGER TRAFFIC, BY TYPE, 1916 TO DATE

Year	TOTAL	Domestic Air Carriers	Railroads[a]	Highways	Inland Waterways
Billions of Passenger-Miles					
1916	36.0	[b]	35.2	[b]	.8
1939	270.7	.7	22.7	245.9	1.5
1941	310.6	1.4	29.4	278.0	1.8
1944	311.5	2.2	95.7	211.7	1.9
1947	424.5	6.1	46.0	370.9	1.8
1951	539.5	11.7	35.3	491.1	1.4
1954	609.9	17.9	29.4	560.9	1.7
1955	653.4	19.8	28.5	603.4	1.7[E]
1956	679.8[E]	22.4	28.2	627.5[E]	1.7[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
1947	100.0	1.5	10.8	87.3	.4
1951	100.0	2.2	6.5	91.0	.3
1954	100.0	2.9	4.8	92.0	.3
1955	100.0	3.0	4.4	92.3	.3
1956	100.0	3.3	4.1	92.3	.3

[a] Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.
[b] Negligible.
Sources: 11, 26, 29, 56.

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

Year	Domestic Air Carriers			Railroads (excluding Commutation)			Air as Percent of Railroad
	TOTAL	Scheduled	Irregular	TOTAL	Pullman	Coach	
1937	.4	.4	—	21.6	9.2	12.4	1.9
1938	.5	.5	—	18.5	8.3	10.2	2.7
1939	.7	.7	—	19.6	8.5	11.1	3.6
1940	1.1	1.1	—	20.7	8.2	12.5	5.3
1941	1.4	1.4	—	26.2	10.1	16.1	5.3
1942	1.4	1.4	—	50.0	19.1	30.9	2.8
1943	1.6	1.6	—	83.8	25.9	57.9	1.9
1944	2.2	2.2	—	91.7	28.3	63.4	2.4
1945	3.4	3.4	—	86.7	27.3	59.4	3.9
1946	6.0	5.9	N.A.	59.7	20.7	39.0	10.1
1947	6.3	6.1	N.A.	41.2	13.5	27.7	15.3
1948	6.3	6.0	N.A.	36.5	12.2	24.3	17.3
1949	7.4	6.8	.6	30.8	10.5	20.3	24.0
1950	8.8	8.0	.8	26.6	9.2	17.4	33.1
1951	11.7	10.6	1.1	29.4	9.9	19.5	39.8
1952	13.8	12.5	1.3	29.1	9.3	19.8	47.4
1953	16.1	14.8	1.3	27.2	8.2	19.0	59.2
1954	17.9[E]	16.8	1.1[E]	25.0	7.3	17.7	70.4
1955	20.9[E]	19.8	1.1[E]	24.2	6.9	17.3	86.4
1956	23.5[E]	22.4	1.1[E]	23.7	6.6	17.1	99.2

E Estimate.
N.A.—Not available.
Sources: 1, 29, 35, 56.

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
1954	20,326	15,128	412	3,523	115	1,148
1955	23,835	17,770	500	4,108	120	1,337
1956	27,306	20,460	585	4,808	122	1,331
Cargo Ton-Miles (Millions)						
1948	137	89	[b]	46	N.A.	....
1953	452	182	2	89	3	176
1954	435	190	2	97	3	143
1955	464	219	3	101	4	137
1956	584	248	3	115	3	215
Mail Ton-Miles (Millions)						
1948	50	36	[b]	14	N.A.	....
1953	95	69	1	23	2	....
1954	107	76	1	29	1	....
1955	131	83	1	46	1	....
1956	147	89	1	55	1	1

N.A.—Not available.

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

[b] Less than one-half million.

Source: 34.

AVERAGE PASSENGER LOADS, 1939 TO DATE

(Passenger-Miles per Vehicle-Mile)

Year	RR Coaches	Sleeping & Parlor Cars	All RR Passenger Cars	Class I Inter-City Busses	Scheduled Domestic Airliners
1939	17.0	9.3	13.4	16.4	7.9
1944	41.0	20.3	31.9	24.9	15.2
1949	23.6	11.0	18.1	18.4	19.2
1953	23.7	10.1	17.7	18.[illegible]	29.2
1954[E]	23.3	9.7	17.5	18.1	31.3
1955[E]	23.6	9.9	18.0	18.3	32.7

E Estimate.

Sources: 1, 57.

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	2.06
1955	5.35[E]	3.20[E]	2.47	4.62	2.07
1956	5.30[E]	3.20[E]	2.56	4.77	2.12[E]

N.A.—Not available.
E Estimate.
Sources: 1, 3, 35, 57, 72.

54 - 57

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

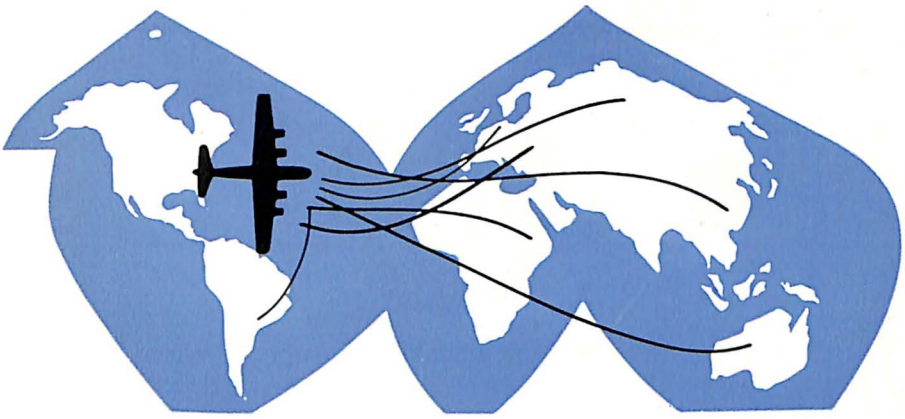
1956		1955	
American Airlines	4,793	American Airlines	4,266
United Air Lines	4,274	United Air Lines	3,754
Eastern Air Lines	3,788	Eastern Air Lines	3,342
Pennsylvania Railroad	3,305	Pennsylvania Railroad	3,324
Trans World Airlines	3,261	New York Central System	2,897
New York Central System	2,695	Trans World Airlines	2,866
Atchison, Topeka & Santa Fe Railway System	1,981	Atchison, Topeka & Santa Fe Railway System	1,943
Union Pacific Railroad Company	1,364	Union Pacific Railroad Company	1,437
New York, New Haven & Hartford Railroad Company	1,250	Southern Pacific Company	1,295
Southern Pacific Company	1,239	New York, New Haven & Hartford Railroad Company	1,208

[a] Excludes commuters and multiple ride passengers.
Note: Data do not include foreign operations of the airlines.
Sources: 35, 56.

EMPLOYMENT, WAGES, AND AVERAGE ANNUAL EARNINGS IN THE TRANSPORTATION INDUSTRY, 1955

	ALL INDUSTRY	ALL TRANSPORTATION	Air Transportation (Common Carrier)	Railroads	Highway Transportation	Water, Pipeline, and Other Transportation
Full-Time Equivalent Employees (Thousands)	54,917	2,601	120	1,196	951	334
Wages and Salaries (Million Dollars)	$210,354	$12,368	$633	$5,628	$4,446	$1,661
Average Annual Earnings per Full Time Employee	$3,830	$4,755	$5,275	$4,70	$4,675	$4,973

Source: 14

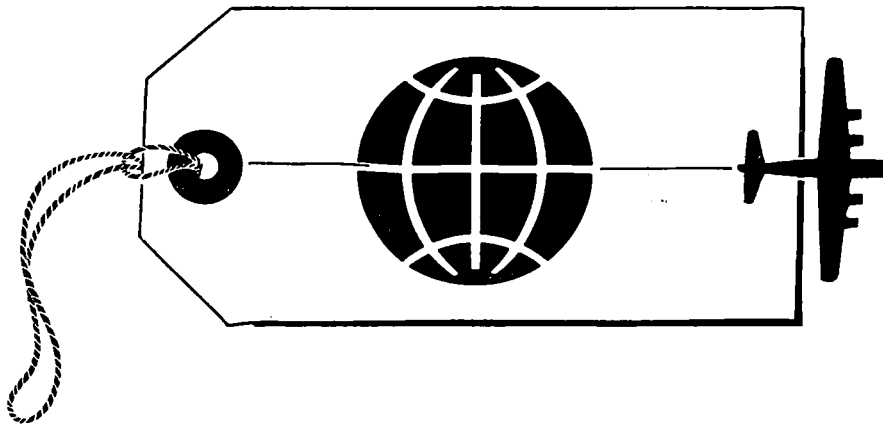


U. S. AND FOREIGN
AVIATION EXPORTS

The export of civil aviation products has a significance beyond its dollar value. Aviation products become an integral part of the importing nation's economy; flag carriers of many foreign countries are an arm of national policy, and are operated by the government. The ties formed among nations are based on the hard realities of export-import relations, and America's position of leadership in the free world is partially due to the superiority of its aviation products. This is apart from the key role that military aircraft play in the defense programs.

During 1956, the United States exported more than $1 billion in aviation products, the highest peacetime year in history. Total exports reached $1,059,300,000, an increase of about 45 per cent over 1955. This high degree of acceptability is underlined by the fact that the leading overseas market for this equipment was the British Commonwealth which is the largest producer of aircraft outside the United States and Russia. This British area in 1956 imported more than $54 million worth of civil aircraft and engines of less than 400 horsepower. This amounted to almost 26 per cent of this class of exports.

The remarkable gain in exports accounts for an increasingly impor-



tant part of over-all production in this country. It represents an advance from 8.6 per cent of gross aviation production value in 1955 to 11 per cent in 1956. In terms of manpower it means the employment of 88,000 workers for export production compared with 63,000 employed in 1955.

Dollar availability is still the limiting factor in exports. However, this situation is showing great improvement as longer term financing has become available through private and government sources. Financing institutions have become more liberal regarding aircraft loans. The size of the financing has, in some cases, put the risk involved out of proportion. The risk is actually small when it is considered in the light of earnings produced by the aircraft. New export financing sources have been found and the prospects are that the problem of dollar availability will become less critical.

One reason for the steadily advancing leadership of U. S. aviation products is the domestic demand. This domestic demand assures a tremendous market and a valuable proving ground for the products. It is

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		

Source: 51

UNITED KINGDOM: ORDERS FOR GAS TURBINE AIRLINERS UP TO MARCH 26, 1957
(Number of Units)

Name	Total	For British Use	For Export
Comet 1 & 1a (all delivered) ...	19	10	9
Comet II	18	18	..
Comet III	1	1	..
Comet IV and IVA	33	19	14
Viscount 700	265	47	218
Viscount 800	99	41	58
Vanguard	40	20	20
Britannia 100	15	15	..
Britannia 250	16	16	..
Britannia 300	6	1	5
Britannia 310	28	20	8
Total	502	179	323

Source: 51

UNITED KINGDOM: EMPLOYMENT AND PRODUCTION IN THE AIRCRAFT MANUFACTURING INDUSTRY

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.

N.A.—Not available.
E Estimate by official British sources.
[a] As of end of November.
Sources: 51, 52

possible to offer for export highly advanced equipment that has been fully proven in service in the United States far beyond the capabilities of other producers whose home markets are far more restricted. For example, the turbojet engine which will power two of the jet transports now being built in the U. S. will have accumulated 4,500,000 operational

CANADA: AIRCRAFT AND PARTS INDUSTRY, 1935 TO DATE

Year	Number of Plants	Average Number of Employees	Gross Selling Value of Products (Millions of U. S. 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	388.2
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	10,695	59.7
1950	15	10,549	50.2
1951	23	19,198	111.3
1953	43	38,048	398.7
1954	47	35,089	346.0
1955	51	32,751	353.2

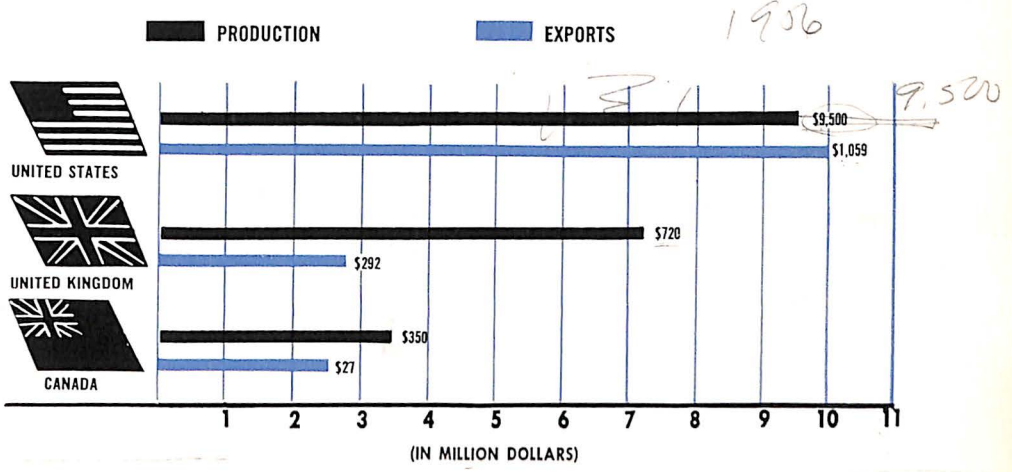
Sources: 10, 45

hours before it starts commercial service, insuring the same degree of safety and reliability that characterize U. S. piston-engined planes.

One of the notable increases in exports was in new commercial transport aircraft weighing more than 3,000 pounds. This category increased from 95 aircraft exported in 1955 to 151 in 1956, a gain of 59 per cent in number. The largest gain in the category was in the large transports with an airframe weight of 30,000 pounds and over. This category showed an increase from 51 planes in 1955 to 85 in 1956. The increase in value of aircraft in the 3,000 pounds-and-over-class was from about $81 million to nearly $133 million, a 64 per cent gain in value.

Utility, personal and liaison aircraft shipments continued to advance. This section of civil aviation accounted for shipments of 966 aircraft valued at $11 million with the greatest number shipped capable of carrying four or more persons.

U. S. military aircraft are flying today with the insignia of most nations of the free world emblazoned on the fuselage. The nations forming the North Atlantic Treaty Organization have based their air forces on American aircraft. It is not possible to break down by countries and models the aircraft exports made through the Mutual Security Program, but these account for the bulk of U. S. exports. During 1956, 2,766 aircraft were shipped, nearly twice the total shipments for 1955. Total shipments under the Mutual Security Program since 1950 amount to 10,644 military aircraft.



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

[a] Less than .05 percent.
Sources: 23, 24, 25, 26, 27

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
TOTAL[a]	10,664	9,204	1,460

[a] Oct. 6, 1949 to Dec. 31, 1956.
Sources: 41, 42

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

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

(Continued on next page)

(Continued from previous 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

[a] Less than $500,000.

Source: 20

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

[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: 20

PUBLIC RELATIONS OFFICIALS OF MEMBER COMPANIES OF THE AIRCRAFT INDUSTRIES ASSOCIATION

DIVISION A

Aero Design & Engineering Co.
Hal Weatherly
P. O. Box 118
Bethany, Oklahoma

Aerojet-General Corp.
George Pelletier
332 Irwindale Ave.
Azusa, California

Aeronca Manufacturing Corp.
John P. Lawler, President
Middletown, Ohio

Aircooled Motors, Inc.
C. F. B. Roth, President
Liverpool Rd.
Syracuse 8, New York

Allison Division, General Motors Corp.
Roger C. Fleming
Speedway, Indianapolis 6, Ind.

Avco Manufacturing Corp.
James J. Cassidy
420 Lexington Ave.
New York 17, New York

Bridgeport-Lycoming Div.
Paul Deegan
Stratford, Connecticut

Crosley Division
John Metcalfe
Cincinnati, Ohio

Research & Advance Developments Div.
Robert McLeod
Everett, Massachusetts

Beech Aircraft Corp.
Phil McKnight
E. Central Ave.
Wichita 1, Kansas

Bell Aircraft Corporation
Francis W. Dunn
Assistant to the President
P. O. Box 1
Buffalo 5, New York

Bell Helicopter Corporation
James C. Fuller
P. O. Box 482
Ft. Worth, Texas

Boeing Airplane Company
Harold Mansfield
Box 3107
Seattle 14, Washington

Wichita Division
J. O. Mitchell
Wichita 1, Kansas

Cessna Aircraft Company
W. G. Robinson
5800 Franklin Rd.
Wichita 14, Kansas

Chance Vought Aircraft, Inc.
Keith Baker
P. O. Box 5907
Dallas Texas

Continental Motors Corp.
Henry Hopkins
1504 Garden Building
Detroit, Michigan

Convair, a division of
General Dynamics Corp.
Ned Root
3165 Pacific Highway
San Diego 12, California

Fort Worth Division
Lloyd L. Turner
Grant's Lane
Fort Worth, Texas

Pomona Division
J. M. Glass
P. O. Box 1011
Pomona, California

Curtiss-Wright Corporation
Ronald S. Gall
Wood-Ridge, New Jersey

Doman Helicopters, Inc.
Walter J. Hatcher
Danbury, Connecticut

Douglas Aircraft Co., Inc.
A. M. Rochlen, Vice President
3000 Ocean Park Blvd.
Santa Monica, California

Santa Monica Division
Larry Vitsky
3000 Ocean Park Blvd.
Santa Monica, California

Long Beach Division
Wilson Silsby
3855 Lakewood Blvd.
Long Beach, California

El Segundo Division
Robert H. Wilson
827 Lapham St.
El Segundo, California

Tulsa Division
Dave Wyatt
2000 North Memorial Drive
Tulsa, Oklahoma

Fairchild Engine & Airplane Corp.
William G. Key, Director Public Relations

Airplane Division
Joseph Crockett
Hagerstown, Maryland

Engine Division
Lou Davis
Deerpark, L. I., New York

Guided Missiles Division
Gene Henkel
Wyandanch, L. I., New York

Stratos Division
Gene Henkel
Bayshore, L. I., New York

General Electric Company
Tom Irvine, News Bureau
Schenectady 5, New York

Aircraft Gas Turbine Division
Production Engine Dep't.
Gene Bradley
Evandale, Ohio

Aircraft Accessory Turbine Dep't.
Paul Schratter
Lynn, Massachusetts

Small Aircraft Engine Dep't.
Ralph Humen
Lynn, Massachusetts

Defense Electronics Division
Missile & Electronic Systems Dep't.
J. C. Hoffman
Philadelphia, Pa.

Heavy Military Electronic Equipment Dep't.
B. A. Mangum
Syracuse, New York

Light Military Electronic Equipment Dep't.
Harvey Johnson
Utica. New York

Goodyear Aircraft Corp.
L. E. Judd
1210 Massilon Road
Akron 15, Ohio

Grumman Aircraft Engineering Corp.
John B. Rettaliata
Bethpage, Long Island, N. Y.

Gyrodyne Co. of America, Inc.
Peter J. Papadakos, President
St. James
Long Island, New York

Hiller Helicopters
Ralph W. Kummer
1350 Willow Rd.
Palo Alto, California

Hughes Aircraft Company
C. E. Blandford
Culver City, California

Ingersoll Kalamazoo Div.,
Borg-Warner Corp.
R. F. Schutz, Vice President
1810 N. Pitcher Street
Kalamazoo, Michigan

The Kaman Aircraft Corp.
Charles Kirchner
Bloomfield, Connecticut

Kellett Aircraft Corp.
Don Duffin
160 N. 15th Street
Philadelphia 2, Pennsylvania

Lockheed Aircraft Corp.
John Canaday, Vice President
Burbank, California

Georgia Division
Henry Chappellet
Marietta, Georgia

Public Relations Officials (Continued)

California Division
W. R. Wilson
P. O. Box 551
Burbank, California

Marquardt Aircraft Co.
Jack G. Anderson
16555 Saticoy Street
South Annex, Van Nuys, Calif.

The Martin Co.
Joe M. Rowland, Corporate Director
Baltimore Division
F. N. Nutt
Baltimore 3, Maryland

Denver Division
Don Herron
Denver, Colo.

Orlando Division
E. L. Coster
Orlando, Florida

McDonnell Aircraft Corp.
W. B. Haylon
P. O. Box 516
St. Louis 3, Missouri

North American Aviation, Inc.
E. J. Ryan
Los Angeles Int'l. Airport
Los Angeles 45, California

Columbus Division
J. A. Snodgrass
Columbus, Ohio

Rocketdyne Division
D. B. Juenke
Canoga Park. Calif.

Missile Development Division
G. H. Hall
Downey, Calif.

Autonetics Division
Kerme Anderson
Bellflower, Calif.

Northrop Aircraft, Inc.
Al Cline
Northrop Field
Hawthorne, California

Radioplane Co.
Todd Fast
7901 Woodley Ave
Van Nuys, California

Piasecki Aircraft Corp.
A. Ceres
Island Road
International Airport
Philadelphia 42, Pennsylvania

Piper Aircraft Corp.
Howard Piper, Vice President
Lock Haven, Pennsylvania

Reaction Motors, Inc.
Richard Whitcomb
Denville, New Jersey

Republic Aviation Corp.
Leon Schloss, Manager, Public Relations
Farmingdale, L. I.
New York

The Ryan Aeronautical Co.
William Wagner, Director Public Relations
Lindbergh Field
San Diego, California

Stroukoff Aircraft Corp.
C. W. O'Connor
Scotch Road
W. Trenton, New Jersey

Taylorcraft, Inc.
Clifford Ball
Conway-Pittsburgh Airport
Conway, Pennsylvania

Temco Aircraft Corp.
Sydney Carter
P. O. Box 6191
Dallas, Texas

United Aircraft Corp.
Paul Fisher, Director, Public Relations
E. Hartford, Connecticut

Pratt & Whitney Division
John F. Smith
East Hartford, Connecticut

Hamilton Standard Division
Russell Trotman
Windsor Locks, Connecticut

Sikorsky Division
William Kilpatrick
Bridgeport Connecticut

Vertol Aircraft Corp.
E. J. Doherty
Assistant to the President
Morton, Pennsylvania

Westinghouse Electric Corp.
Aviation Gas Turbine Division
J. G. Graef, Manager
P. O. Box 288
Kansas City, Mo.

DIVISION B

Aero Supply Mfg. Co., Inc.
John L. Wilson
Director of Industrial Relations
611 W. Main St.
Corry, Pennsylvania

Aerodex, Inc.
Richard S. Skidmore
Public Relations Manager
P. O. Box 123, Int'l. Airport
Miami 48, Florida

Aluminum Co. of America
John St. Peter
1200 Ring Bldg.
Washington 6, D. C.

American Airmotive Corp.
Charles E. Lewis, President
P. O. Box 187, Int'l Airport, BR,
Miami 48, Florida

Arcturus Mfg. Corp.
Paul Anderson
4301 Lincoln Blvd.
Venice, California

The B. G. Corporation
Robert Brattvet
Director of Sales and Engineering
321 Broad Ave.
Ridgefield, New Jersey

Franklin Balmar Corp.
J. J. Kirchoff, General Manager
3500 Clipper Rd.
Baltimore 11, Maryland

Bendix Aviation Corp.
W. A. Mara
Director of Advertising
Fisher Building
Detroit 2, Michigan

Champion Spark Plug Co.
J. R. McGeorge
Toledo 1, Ohio

Chandler-Evans Div.
Pratt & Whitney Co., Inc.
J. E. Lowes
Charter Oak Blvd.
W. Hartford, Connecticut

The Cleveland Pneumatic Tool Co.
Harry Kendall
3781 E. 11th Street
Cleveland 5, Ohio

The Connecticut Hard Rubber Co.
James F. Cantwell
407 East Street
New Haven, Connecticut

Cook Electric Company
Harry Thornton
2700 Southport Ave.
Chicago 14, Ill.

The Dow Chemical Co.
Al Smith, Jr.
Midland, Michigan

Dumont Aircraft Fitting Co.
M. P. Balwan
1356 Orizaba Ave.
Long Beach, California

Fletcher Aviation Corp.
L. C. Launer
Executive Vice President
Fletcher Airport
Rosemead, California

Flexonics Corporation
D. Ghent
1315 S. Third Ave.
Maywood, Illinois

Flight Refueling, Inc.
H. A. May
Friendship Int'l. Airport
P. O. Box 1701
Baltimore 3, Maryland

The Garrett Corporation
Ted Burke
9851 Sepulveda Blvd.
Los Angeles 45, California

General Laboratory Associates, Inc.
L. A. De Mellier, Advertising
17 E. Railroad St.
Norwich, N. Y.

The B. F. Goodrich Co.
Henry Maxson
Akron, Ohio

Harvey Machine Co., Inc.
Gene Alfred
19200 S. Western Ave.
Torrence, California

Hoffman Laboratories, Inc.
John O'Brien
1625 Eye Street, N.W.
Washington 6, D. C.

Public Relations Officials (Continued)

Hydro-Aire, Inc.
S. Scott
3000 Winona Ave.
Burbank, California

Jack & Heintz, Inc.
John Whiteman
Cleveland 1, Ohio

Kaiser Aircraft & Electronics Corp.
H. W. Cloke
Cafritz Building
Washington, D. C.

Kollsman Instrument Corp.
Dr. Milla Alihan
80-08 Forty-fifth Ave.
Elmhurst, New York

Land-Air, Inc.
M. Breit
7444 Wilson Ave.
Chicago 31, Illinois

Lear, Inc.
Norman Warren, Vice President
3171 S. Bundy Dr.
Santa Monica, California

Longren Aircraft Co.
Hampden Wentworth, V. P.
2576 W. Carson St.
Torrence, California

Luria Engineering Co.
Charles Ketcham, V. P.
1010 Vermont Ave.
Washington, D. C.

The MB Manufacturing Co., Inc.
J. Wirtz
1060 State Street
New Haven 11, Conn.

MacWhyte Company
Forest Nelson
2904 14th Ave.
Kenosha, Wisc.

Minneapolis-Honeywell Regulator Company
J. H. Porterfield
2747 4th Ave.
S. Minneapolis 8, Minnesota

National Tapered Wings, Inc.
E. E. Baker, Vice President and General Manager
3001 E. 11th Street
Los Angeles 23, California

The New York Air Brake Company
H. R. Doughty
230 Park Avenue
New York 17, New York

Pacific Airmotive Corp.
R. Backman, Vice President-Sales
2940 Hollywood Way
Burbank, California

Parker Aircraft Company
Don Ziegler
5827 W. Century Blvd.
Los Angeles 43, California

Radio Corporation of America
J. Haber
Building 2-7
Camden 2, New Jersey

Reynolds Metals Co.
Keen Johnson
2500 S. 3rd St., P. O. 1800,
Louisville 1, Ky.

Rheem Manufacturing Co.
Ken Snelling
11711 S. Woodruff Ave.,
Downey, California

Robertshaw-Fulton Controls
Robert Sweeney
Santa Ana Freeway at Euclid,
Anheim, California

Rohr Aircraft Corp.
E. T. Austin
Chula Aista, California

Simmonds Aerocessories, Inc.
Edward L. Spellerberg
105 White Plains Road
Tarrytown, New York

Solar Aircraft Company
Fred S. Hage
2200 Pacific Highway
San Diego, California

Sperry Gyroscope Company
Div., Sperry Rand Corp.
C. H. Jones
Great Neck, N. I., New York

Sundstrand Aviation
Div. of Sundstrand Machine Tool Co
P. A. Anderson
2421 11th Street
Rockford, Illinois

Thiokol Chemical Corporation
Robert Way
780 North Clinton Avenue
Trenton 7, New Jersey

Thompson Products, Inc.
William R. Crowell
23555 Euclid Ave.
Cleveland 17, Ohio

Tinnerman Products, Inc.
W. A. Garman
P. O. Box 6688
Cleveland 1, Ohio

Transco Products, Inc.
M. Cleland, Sales Manager
12210 Nebraska Avenue
Los Angeles 25, California

Vickers, Inc.
Division of Sperry Rand Corp.
E. J. Doucet, Jr.
1400 Oakman Blvd.
Detroit 32, Michigan

Wm. R. Whittaker Co., Ltd.
J. M. Wehrly
915 North Citrus Avenue
Los Angeles 38, California

The Franklin C. Wolfe Co., Inc.
William Lester
10567 Jefferson Blvd.
Culver City, California

Zenith Plastics Company
Ross Garrett
P. O. Box 91
Gardena, California

Aircraft Industries Association
Avery McBee, Director, Public Relations
610 Shoreham Building
Washington 5, D. C.

Aircraft Industries Association
Fred Steifler—West Coast
7660 Beverly Boulevard
Los Angeles 36, California

Government Agencies Directly Concerned with Aviation

AIR COORDINATING COMMITTEE
Department of Commerce
14th Street and Constitution Avenue, N. W.
Washington 25, D. C.
Executive Secretary—William E. Neumeyer
Sterling 3-9200 Extension 3613

AIR FORCE, DEPARTMENT OF THE
Pentagon Building
Washington 25, D. C.
Office of Information Services—Brig. Gen. Arno Luehman
Liberty 5-6700 Extension 76061

ARMY, DEPARTMENT OF THE
Pentagon Building
Washington 25, D. C.
Chief of Information—Maj. Gen. G. S. Meloy, Jr.
Liberty 5-6700 Extension 55135

ATOMIC ENERGY COMMISSION
1901 Constitution Avenue, N. W.
Washington 25, D. C.
Director of Information Services—Morse Salisbury
Sterling 3-8000

CIVIL AERONAUTICS ADMINISTRATION
Temporary Building #4
17th Street and Constitution Avenue, N. W.
Washington 25, D. C.
Director, Aviation Information Office—Raymond Nathan
Sterling 3-9200 Extension 3661

CIVIL AERONAUTICS BOARD
Department of Commerce Building
14th Street and Constitution Avenue, N. W.
Washington 25, D. C.
Chief of Public Information—E. E. Slattery, Jr.
Sterling 3-9200 Extension 3806

COMMERCE, DEPARTMENT OF
14th Street and Constitution Avenue, N. W.
Washington 25, D. C.
Director of Public Information—Albert Leman
Sterling 3-9200 Extension 3135

DEFENSE AIR TRANSPORT ADMINISTRATION
14th Street and Constitution Avenue, N. W.
Washington 25, D. C.
Administrator—Theodore Hardeen, Jr.
Sterling 3-9200 Extension 4707

DEFENSE, DEPARTMENT OF
Pentagon Building
Washington 25, D. C.
Director of Public Information—C. Herschel Schooley
Liberty 5-6700 Extension 71346

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
1512 H Street, N. W.
Washington 5, D. C.
Assistant to Executive Secretary (Information)—Walter T. Bonney
Liberty 5-6700 Extension 63229

NAVY, DEPARTMENT OF THE
Pentagon Building
Washington 25, D. C.
Chief of Information—Rear Adm. E. B. Taylor
Liberty 5-6700 Extension 77391

SOURCES:

1 Aircraft Industries Association

2 Aircraft Industries Association, "Aircraft Year Book" (1919-1956)

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

4 Aircraft Industries Association: Compilations from Aircraft Manufacturing Companies' Annual Financial Statements

5 Aircraft Industries Association: Compilations from Moody's Industrial Manuals

6 Aircraft Resources Control Office, "Model Designations of Military Aircraft. Revised. December 1944"

7 Air Transport Association

8 Department of the Air Force, Directorate of Statistical Services

9 Department of the Air Force, Office of Public Information

10 Air Industries & Transport Association of Canada, Annual Reports

11 U. S. Army, Office of the Chief of Engineers

12 Automobile Manufacturers Association, "Automobile Facts and Figures" (Annual)

13 Department of Commerce, "Air Commerce Bulletin" (Volume 1, Number 5)

14 Department of Commerce, "Survey of Current Business–National Income"

15 Department of Commerce, Bureau of the Census, Machinery and Equipment Branch

16 Department of Commerce, Bureau of the Census, "Biennial Census of Manufactures" (1921, 1937)

17 Department of Commerce, Bureau of the Census, "Census of the United States — Manufactures" (1919, 1929, 1939)

18 Department of Commerce, Bureau of the Census, "Census of Manufactures, 1947, 1954"

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

20 Department of Commerce, Bureau of the Census, "Facts for Industry," Series M37G, (Monthly)

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

22 Department of Commerce, Bureau of the Census, "Facts for Industry," Series M37D, (Quarterly)

23 Department of Commerce, Bureau of the Census, Foreign Trade Division

24 Department of Commerce, Bureau of the Census, "Foreign Trade Statistics Notes"

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

26 Department of Commerce, Bureau of the Census, "Historical Statistics of the United States, 1789-1945"

27 Department of Commerce, Bureau of the Census, "Statistical Abstract of the United States," (Annual)

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

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

30 Department of Commerce, Civil Aeronautics Administration, "Statistical Study of U. S. Civil Aircraft," January 1, 1955

31 Department of Commerce, Civil Aeronautics Administration, "U. S. Military Aircraft Acceptances, 1940-1945"

32 Department of Commerce, Civil Aeronautical Administration, Office of Aviation Information

33 Department of Commerce, Civil Aeronautics Administration, "Report No. ACA-503"

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

35 Department of Commerce, Civil Aeronautics Board, Statistical Section

36 Department of Commerce, Bureau of Public Roads

37 Department of Defense, "Estimated Expenditures by Budget Category," EISED 315

38 Department of Defense, "Expenditures by Major Budget Category," FY 1958 with 7 Year Comparisons," EISED 220

39 Department of Defense, Office of Public Information

40 Department of Defense, Office of Secretary of Defense, Assistant Secretary (R&D)

41 Department of Defense, Managerial Statistics Division, Office of International Security Affairs

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

43 Department of Defense, "Releasable Information on U. S. Air Force Aircraft"

44 "Disposal of Surplus Aircraft and Major Components Thereof," Senate Subcommittee Print No. 6, June 26, 1944

45 Dominion Bureau of Statistics, Ottawa, Ontario, Canada

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

47 Federal Coordinator of Transportation, "Public Aids to Transportation," (Volume 1)

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

49 House Subcommittee Hearings, "Appropriations for the Department of the Air Force" (1954)

50 H. M. Stationery Office, London, "The Civil Aviation and Technical Review, 1938"

51 H. M. Central Office of Information, London

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

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

54 International Civil Aviation Organization "Development of Civil Aviation" (Annual)

55 International Civil Aviation Organization, "Scheduled Airline Operations Digest of Statistics, No. 36," Series T, No. 9

56 Interstate Commerce Commission, Bureau of Transport Economics and Statistics

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

58 Interstate Commerce Commission, "Some Aspects of Postwar Air & Surface Transpor tion" January 1945

59 Interstate Commerce Commission, Bureau of Transport Economics and Statistics, "Statistics of Oil Pipe Line Companies"

60 Department of Justice, Immigration and Naturalization Service, Administrative Division, Statistics Branch, "Report of Travel Between U. S. and Foreign Countries." (Monthly)

61 Department of Labor, Bureau of Employment Security

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

63 Department of Labor, Bureau of Labor Statistics, Industrial Hazards Branch

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

65 Department of Labor, Bureau of Labor Statistics, "Revised Series — Employment"

66 Department of Labor, Bureau of Labor Statistics, "Wartime Development of the Aircraft Industry," Bulletin #800

67 Bureau of Labor Statistics, "Wholesale Prices and Price Indexes"

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

69 Mooney Aircraft, Inc.

70 Munitions Board

71 Munitions Board, Office of Aircraft Programs

72 National Association of Motor Bus Operators

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

74 National Science Foundation, "Federal Funds for Science: II and V" (Annual)

75 Department of the Navy, Bureau of Aeronautics

76 Department of the Navy, Office of Information

77 Department of the Navy, Bureau of Naval Personnel, Military Personnel Statistics

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

INDEX

THE AIRCRAFT INDUSTRIES ASSOCIATION

OF AMERICA, INCORPORATED