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

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

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

But any thought that defense spending will be increased in any large degree by the military services must be dispelled. To the contrary, the industry has been informed that in the event of threatened excess of spending it may be necessary to cut back some of its programs to keep within budget limits. These changing
demands in military requirements, and the cutbacks and cancellations during the last twenty-four month period, has brought about a steadily lowering level of production activity. As a result, industry employment declined from some 861,700 in 1957 to 757,500 in early 1958. Employment in the industry is expected to stabilize during 1959 at 750,000.

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

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

It is hoped that this edition, as those in the past, may serve as a standard aviation reference work of value to legislators, administrators and managers in Government and industry, writers and editors, analysts and students.

Orval R. Cook
President, Aerospace Industries Association
May 1959
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</tr>
</thead>
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<td>INDEX</td>
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</table>
The year 1958 was a significant milestone in the aircraft and missile manufacturing industry's record of achievement in military and civil aviation. Hardware was delivered that placed five satellites in orbit and the first American turbine-powered transports were delivered to the airlines.

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

Although achievements were made in every aspect of aerospace technology by the aircraft industry in 1958, the industry was still faced with economic limitations and will continue to be faced with them in 1959. Raising the national debt ceiling and lifting the defense expenditure ceiling of fiscal 1958 resulted in increased orders for aircraft, missiles and related equipment but expenditures for these weapon systems remained about the same in 1958 as in 1957.
Production of military aircraft continued to drop. An estimated 4,000 units were produced in 1958 compared to 5,600 in 1957. Military orders for aircraft have dropped from 2,145 units in fiscal 1958, to 1,754 in fiscal 1959, to an estimated 1,610 in fiscal 1960. Sales of the manufacturers of military aircraft and parts dropped slightly from $5.6 billion in 1957 to $5.3 billion in 1958. Estimated military piston, turbine and ramjet engine production dropped sharply in 1958 to 8,500 units from 10,700 units in 1957. Sales of engines and parts to military customers were $1.9 billion in 1958 compared to $2.1 billion in 1957. There are no complete statistics available on rocket engine production or sales.

U. S. AIRCRAFT PRODUCTION
1909 TO DATE
(Number of aircraft)

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<thead>
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<th>Civil</th>
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<tr>
<td>1933</td>
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(Continued on next page)
### PRODUCTION AND FACILITIES

#### AIRCRAFT PRODUCTION

1909 to Date (cont'd)

(Number of Aircraft)

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<th>Civil</th>
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<tr>
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<td>3,773</td>
<td>949</td>
<td>2,824</td>
</tr>
<tr>
<td>1938</td>
<td>3,623</td>
<td>1,800</td>
<td>1,823</td>
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<td>3,545</td>
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<td>3,520</td>
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<td>2,477</td>
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<td>1952</td>
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<td>14,760</td>
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<td>1954</td>
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<td>1955</td>
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<td>4,820</td>
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<tr>
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<td>10,860E</td>
<td>4,000E</td>
<td>6,860</td>
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</table>

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

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

1914 to Date

(Thousands of Dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Value ($)</th>
<th>Part of Total Which is Added by Manufacture</th>
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<tr>
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* The figures shown beginning with 1947 include other products and services such as missiles, conversions, modifications, and all other products and services produced and performed by manufacturers of complete aircraft, aircraft engines, and propellers.

* 1940-1945: Value of Products

* 1947-Date: Sales of Manufacturers of Complete Aircraft, Engines, Propellers, and Parts.

* N. A. — Not available.

Sources: 3, 11, 15
## Sales of Manufacturers of Complete Aircraft, Aircraft Engines, Propellers and Parts 1948 to Date

(Millions of Dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Aircraft and Parts</th>
<th>Aircraft Engines and Parts</th>
<th>Aircraft Propellers and Parts</th>
<th>Other Products and Services</th>
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</thead>
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<tr>
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<td>U.S. Military</td>
<td>Other</td>
<td>Total</td>
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<td>6,319</td>
<td>5,305</td>
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*a Total for last three quarters of 1948 only.

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

Source: 15

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

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

The value of backlog of orders reported by manufacturers of complete aircraft, aircraft engines, and aircraft propellers as of December 31, 1958, amounted to $13.1 billion. This represents a decrease of 10 percent below the backlog of orders at the end of the previous year, which amounted to $14.5 billion. The value of backlog reported by these manu-
### Backlog of Orders Reported by Manufacturers of Complete Aircraft, Engines and Propellers, 1948 to Date

(Millions of Dollars)

<table>
<thead>
<tr>
<th>December 31</th>
<th>Total</th>
<th>Aircraft and Parts</th>
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<th>Aircraft Propellers and Parts</th>
<th>Other Products and Services</th>
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<td>8,110</td>
<td>2,018</td>
<td>69</td>
<td>2,865</td>
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</tbody>
</table>

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

Source: 15

The backlog of orders reported by manufacturers of complete aircraft, engines, and propellers has declined over $5 billion from December 31, 1956, to December 31, 1958.

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

The industry with its expanded responsibilities of aircraft, missiles, and spacecraft has been faced with a new requirement for facilities. Facilities, not only for production of the end item, but the intricate research, development and test work which must precede its acceptance are required. At one time, the Government supported to a large extent a facilities expansion and construction program. The Government is still financing facilities construction, but there is an increasing demand that privately-built facilities be utilized. Advancing technology has dictated
### Airframe Weight Production, 1939 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight in Millions of Pounds (Excluding Spares)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
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<td>1939</td>
<td>12.5&lt;sup&gt;E&lt;/sup&gt;</td>
</tr>
<tr>
<td>1940</td>
<td>27.8&lt;sup&gt;E&lt;/sup&gt;</td>
</tr>
<tr>
<td>1941</td>
<td>86.1&lt;sup&gt;E&lt;/sup&gt;</td>
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<tr>
<td>1942</td>
<td>275.8</td>
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<td>1943</td>
<td>654.2</td>
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<tr>
<td>1944</td>
<td>961.1</td>
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<td>1945</td>
<td>541.1</td>
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<td>1946</td>
<td>38.4</td>
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<td>1947</td>
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<td>1954</td>
<td>140.9</td>
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<tr>
<td>1955</td>
<td>124.5</td>
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<tr>
<td>1956</td>
<td>106.2&lt;sup&gt;E&lt;/sup&gt;</td>
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<tr>
<td>1957</td>
<td>100.4&lt;sup&gt;E&lt;/sup&gt;</td>
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<tr>
<td>1958</td>
<td>76.5&lt;sup&gt;E&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>E</sup> Estimate.

Sources: 1, 13, 20
large-scale building programs because existing facilities are not adequate for research, development and production of the new weapons.

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

**Materials Consumed in Making Aircraft Engines, 1958**

*Per Cent Distribution of Weight of Materials, by Type*

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<thead>
<tr>
<th>Materials</th>
<th>Reciprocating</th>
<th>Jet</th>
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<tbody>
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<td>Carbon Steel</td>
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<tr>
<td>Alloy Steel</td>
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<td>Aluminum</td>
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<tr>
<td>Magnesium</td>
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<td>1.5</td>
</tr>
<tr>
<td>Copper and Copper</td>
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<td></td>
</tr>
<tr>
<td>Base Alloys</td>
<td>2.0</td>
<td>—</td>
</tr>
<tr>
<td>Titanium</td>
<td>—</td>
<td>3.0</td>
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<tr>
<td>Miscellaneous Metals</td>
<td>—</td>
<td>1.5</td>
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</table>

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

Source: 1
### Aircraft Engine Production, 1917 to Date

(Number of Engines)

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<tr>
<th>Year</th>
<th>Total</th>
<th>Military</th>
<th>Civil</th>
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<td>44,453</td>
<td>N.A.</td>
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<tr>
<td>1926</td>
<td>N.A.</td>
<td>842</td>
<td>N.A.</td>
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<tr>
<td>1927</td>
<td>N.A.</td>
<td>1,397</td>
<td>N.A.</td>
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<tr>
<td>1928</td>
<td>3,252</td>
<td>2,620</td>
<td>632</td>
</tr>
<tr>
<td>1929</td>
<td>7,378</td>
<td>1,861</td>
<td>5,517</td>
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<tr>
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<td>6,500&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>1942</td>
<td>138,089</td>
<td>138,089</td>
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<td>1943</td>
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<table>
<thead>
<tr>
<th>Year</th>
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<th>Jet</th>
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<tr>
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<td>1945</td>
<td>111,650&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>43,407</td>
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<td>1948</td>
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<td>1949</td>
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<td>2,500&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>1958</td>
<td>18,733&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1,500&lt;sup&gt;c&lt;/sup&gt;</td>
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N.A. Not available.

<sup>a</sup> Estimate.

Sources: 1, 3, 13, 20
### Shipments of Civilian Engines

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</tr>
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</table>

*Type Certificate number
Source: 1
In the judgment of our principal military leaders the manned bomber is still the primary means of delivering the large nuclear weapons in the volume and with the accuracy needed to strike a decisive retaliatory blow. In this respect the United States has a force far superior to that of our principal opponent, both in numbers and in overall combat capability. The United States intends to maintain this superiority during the period ahead as evidenced by the 1960 budget, which includes substantial funds for the procurement of additional intercontinental jet bombers, supersonic medium jet bombers, and the supporting jet tankers.

Also included in the budget are additional funds for air-to-ground "stand-off" missiles which will greatly enhance the capability of our strategic bombers to penetrate enemy defenses. The program to improve the protection and shorten the reaction time of our manned bombers through base dispersal and the construction of alert facilities is now well
### Floor Space of Airframe, Engine and Propeller Facilities, 1939 to Date

(Millions of Square Feet)

<table>
<thead>
<tr>
<th>Date</th>
<th>Total</th>
<th>Airframe</th>
<th>Engine</th>
<th>Propeller</th>
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<tbody>
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<td>1.7</td>
<td>.3</td>
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<td>.5</td>
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<td>117.1</td>
<td>77.5</td>
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<td>Dec. 1943</td>
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<td>141.5</td>
<td>103.5</td>
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<td>2.8</td>
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<tr>
<td>Dec. 31, 1958</td>
<td>137.8</td>
<td>103.1</td>
<td>31.6</td>
<td>3.1</td>
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Sources: 1, 3, 20
Composition of Military Air Forces

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

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<th></th>
<th>Actual</th>
<th>Planned</th>
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<td>3</td>
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<td>Army missile commands</td>
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<td>4</td>
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<tr>
<td>Guided Missile battalions</td>
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<tr>
<td>Helicopters</td>
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<td>Fixed-wing</td>
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<td>2,822</td>
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<td>Carrier air groups</td>
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<td>Patrol and warning squadrons</td>
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<td>Marine air wings</td>
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<tr>
<td>Active aircraft inventory</td>
<td>10,533</td>
<td>9,300</td>
</tr>
<tr>
<td>Jet aircraft as per cent of active aircraft inventory</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td><strong>Department of the Air Force:</strong></td>
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<td></td>
</tr>
<tr>
<td>USAF combat wings (including missile wings) TOTAL</td>
<td>117</td>
<td>105</td>
</tr>
<tr>
<td>Strategic</td>
<td>44</td>
<td>43</td>
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<tr>
<td>Air defense</td>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>Tactical (including airlift)</td>
<td>45</td>
<td>35</td>
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<td>USAF combat support forces</td>
<td></td>
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<tr>
<td>Air refueling squadrons</td>
<td>48</td>
<td>59</td>
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<tr>
<td>MATS squadrons</td>
<td>27</td>
<td>27</td>
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<tr>
<td>Other specialized squadrons</td>
<td>62</td>
<td>59</td>
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<tr>
<td>Active aircraft inventory</td>
<td>22,578</td>
<td>20,358</td>
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<tr>
<td>Jet aircraft as per cent of active aircraft inventory</td>
<td>62</td>
<td>65</td>
</tr>
</tbody>
</table>

Source: 26

advanced with funds appropriated in prior years. Additional funds are included in the 1960 budget to carry on this program as well as for the new ballistic missile early warning system which was started last year. Even if no strategic warning were to be received, this new system is designed to provide that vital period of time needed to get a significant proportion of our bombers into the air and on their way to the targets. These are some of the reasons why our military leaders feel that regard-
less of who might strike the first blow, and regardless of the number of ICBM's an enemy might use against us, this nation will continue to have a retaliatory force sufficient to strike a decisive blow.

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

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

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

### Production of Military Aircraft, by Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Bombers</th>
<th>Fighters</th>
<th>Transports</th>
<th>Trainers</th>
<th>Other*</th>
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<td>1940</td>
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<td>1,194</td>
<td>1,689</td>
<td>290</td>
<td>2,731</td>
<td>124</td>
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<td>4,421</td>
<td>532</td>
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<td>997</td>
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<tr>
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<td>10,780</td>
<td>1,985</td>
<td>17,632</td>
<td>4,644</td>
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<tr>
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<td>29,362</td>
<td>24,005</td>
<td>7,013</td>
<td>19,942</td>
<td>5,111</td>
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<tr>
<td>1944</td>
<td>95,272</td>
<td>35,008</td>
<td>38,895</td>
<td>9,834</td>
<td>7,578</td>
<td>3,957</td>
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<tr>
<td>1945</td>
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<td>16,502</td>
<td>21,578</td>
<td>4,613</td>
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<tr>
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<td>132</td>
<td>1,017</td>
<td>93</td>
<td>—</td>
<td>175</td>
</tr>
<tr>
<td>1947</td>
<td>2,122</td>
<td>317</td>
<td>909</td>
<td>98</td>
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<tr>
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<td>563</td>
<td>1,438</td>
<td>61</td>
<td>73</td>
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<tr>
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<tr>
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<td>351</td>
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<td>510</td>
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<td>271</td>
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</tbody>
</table>

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

*"Estimate.*

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

Source: 20
### Airframe Weight of Military Aircraft Produced, by Type
#### 1940 to Date
(Weight in Millions of Pounds, Excluding Spares)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Bombers</th>
<th>Fighters</th>
<th>Transports</th>
<th>Trainers</th>
<th>Other</th>
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<tbody>
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<td>2.5</td>
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<td>18.1</td>
<td>2.2</td>
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<td>162.5</td>
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<td>39.3</td>
<td>7.0</td>
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<td>55.5</td>
<td>47.1</td>
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<td>75.5</td>
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<td>4.7</td>
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<td>1.6</td>
<td>.4</td>
<td>.7</td>
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<tr>
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<td>8.7</td>
<td>2.4</td>
<td>.5</td>
<td>.7</td>
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<td>10.2</td>
<td>6.7</td>
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<tr>
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<td>31.1</td>
<td>9.6</td>
<td>2.5</td>
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<tr>
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<td>39.9</td>
<td>43.2</td>
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<td>N.A.</td>
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<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

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

\(^\text{a}\)“Other” includes helicopter, liaison, observation, utility, search and rescue and basic reconnaissance types; however, reconnaissance versions of bombers and fighters are included with bombers and fighters.

Source: 20

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Active Inventory</th>
<th>Air Force</th>
<th>Navy</th>
<th>Army</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Active Inventory</td>
<td>Operating</td>
<td>Active Inventory</td>
<td>Operating</td>
</tr>
<tr>
<td>1940</td>
<td>N.A.</td>
<td>N.A.</td>
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<tr>
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<td>36,100 N.A.</td>
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</tr>
<tr>
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<td>23,694</td>
<td>12,821 9,761</td>
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<tr>
<td>1956</td>
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<td>26,760</td>
<td>12,317 9,687</td>
<td></td>
</tr>
<tr>
<td>1957</td>
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<td>25,909</td>
<td>11,617 9,421</td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>38,138</td>
<td>22,578</td>
<td>10,533 8,424</td>
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</tr>
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<td>20,358</td>
<td>9,300 7,595</td>
<td></td>
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<tr>
<td>1960*</td>
<td>34,545</td>
<td>19,982</td>
<td>9,200 7,200</td>
<td></td>
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</table>

* Includes helicopters.
* 1940-1950: December 31; since then June 30.
Sources: 3, 26
## Military Aircraft in Development or Production

*(Fixed Wing)*

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<th>Designation</th>
<th>Name</th>
<th>Type</th>
<th>Service</th>
<th>Manufacturer</th>
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</thead>
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<td>Army</td>
<td>Aero Design</td>
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</tr>
<tr>
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<td>Seminole</td>
<td>Command</td>
<td>Army</td>
<td>Beech</td>
</tr>
<tr>
<td>T-34A</td>
<td>Mentor</td>
<td>Trainer</td>
<td>Navy, USAF</td>
<td>Beech</td>
</tr>
<tr>
<td>B-52F, G</td>
<td>Stratofortress</td>
<td>Bomber</td>
<td>USAF</td>
<td>Boeing</td>
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<tr>
<td>KC-135A</td>
<td>Stratotanker</td>
<td>Tanker</td>
<td>USAF</td>
<td>Boeing</td>
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<tr>
<td>T-37A</td>
<td>Bird Dog</td>
<td>Observation</td>
<td>Army</td>
<td>Cessna</td>
</tr>
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<td>Adm./Cargo</td>
<td>USAF</td>
<td>Cessna</td>
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<td>Fighter</td>
<td>Navy</td>
<td>Chance Vought</td>
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<td>Convair</td>
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<td>Convair</td>
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<td>B-58A</td>
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<td>Skyray</td>
<td>Fighter</td>
<td>Navy</td>
<td>Douglas</td>
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<td>A3D, -2P, -2Q, -2T</td>
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<td>Attack</td>
<td>Navy</td>
<td>Douglas</td>
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<tr>
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<td>Skyhawk</td>
<td>Attack</td>
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<td>Douglas</td>
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<td>F3H-2N</td>
<td>-</td>
<td>Fighter</td>
<td>Navy</td>
<td>McDonnell</td>
</tr>
<tr>
<td>F4H-1</td>
<td>Voodoo</td>
<td>Fighter</td>
<td>USAF</td>
<td>McDonnell</td>
</tr>
</tbody>
</table>

*(Continued top of next page)*
Military Aircraft in Development or Production—Continued
(Fixed Wing)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Name</th>
<th>Type</th>
<th>Service</th>
<th>Manufacturer</th>
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</thead>
<tbody>
<tr>
<td>RF-101C</td>
<td>Voodoo</td>
<td>Fighter</td>
<td>USAF</td>
<td>McDonnell</td>
</tr>
<tr>
<td>A3J-1</td>
<td>Vigilante</td>
<td>Attack</td>
<td>Navy</td>
<td>North American</td>
</tr>
<tr>
<td>B-70</td>
<td>—</td>
<td>Bomber</td>
<td>USAF</td>
<td>North American</td>
</tr>
<tr>
<td>F-100D, F</td>
<td>Super Sabre</td>
<td>Fighter</td>
<td>USAF</td>
<td>North American</td>
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<tr>
<td>F-108</td>
<td>—</td>
<td>Fighter</td>
<td>USAF</td>
<td>North American</td>
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<tr>
<td>T-39</td>
<td>Saberliner</td>
<td>Trainer</td>
<td>USAF</td>
<td>North American</td>
</tr>
<tr>
<td>T2J-1</td>
<td>—</td>
<td>Trainer</td>
<td>Navy</td>
<td>North American</td>
</tr>
<tr>
<td>T38A</td>
<td>—</td>
<td>Trainer</td>
<td>USAF</td>
<td>Northrop</td>
</tr>
<tr>
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<td>Thunderchief</td>
<td>Fighter</td>
<td>USAF</td>
<td>Republic</td>
</tr>
</tbody>
</table>

Source: 20

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

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

The Military Air Transport Service currently includes 27 squadrons
comprising 9 wings. By fiscal year end 1960, however, MATS will be reduced by three squadrons. There are 59 other specialized squadrons within the Air Force structure comprising communications, air rescue, etc.

**ORGANIZATION OF WINGS, AIR GROUPS**

Air Force: The basic organization unit of the United States Air Force is the "wing." A wing is comprised of a combat group and necessary administrative and service units. The number of airplanes in a wing depends on its mission; for example, a wing of heavy bombers has 45 planes, a medium bomber wing has 45, a light bomber wing 48, a day fighter wing 75, an all-weather fighter squadron 25. The USAF also

<table>
<thead>
<tr>
<th>June 30</th>
<th>Total</th>
<th>Army</th>
<th>Navy</th>
<th>Air Force</th>
</tr>
</thead>
<tbody>
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<td>1955</td>
<td>2,268</td>
<td>1,188</td>
<td>650</td>
<td>430</td>
</tr>
<tr>
<td>1956</td>
<td>2,556</td>
<td>1,456</td>
<td>700</td>
<td>400</td>
</tr>
<tr>
<td>1957</td>
<td>3,061</td>
<td>1,901</td>
<td>800</td>
<td>360</td>
</tr>
<tr>
<td>1958</td>
<td>3,423</td>
<td>2,193</td>
<td>900</td>
<td>330</td>
</tr>
<tr>
<td>1959</td>
<td>3,567</td>
<td>2,267</td>
<td>1,000</td>
<td>300</td>
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</table>

* Includes Marine Corps.
* Estimate.
Source: 20
### Personnel in the United States Air Force, 1912 to Date

<table>
<thead>
<tr>
<th>Year As of June 30</th>
<th>Total</th>
<th>Officers</th>
<th>Aviation Cadets</th>
<th>Airmen</th>
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</thead>
<tbody>
<tr>
<td>1912&lt;sup&gt;a&lt;/sup&gt;</td>
<td>51</td>
<td>12</td>
<td>—</td>
<td>39</td>
</tr>
<tr>
<td>1914</td>
<td>122</td>
<td>18</td>
<td>—</td>
<td>104</td>
</tr>
<tr>
<td>1916</td>
<td>311</td>
<td>63</td>
<td>—</td>
<td>248</td>
</tr>
<tr>
<td>1918&lt;sup&gt;b&lt;/sup&gt;</td>
<td>195,023</td>
<td>20,708</td>
<td>—</td>
<td>174,315</td>
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<tr>
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<td>9,050</td>
<td>969</td>
<td>—</td>
<td>8,081</td>
</tr>
<tr>
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<td>9,642</td>
<td>958</td>
<td>113</td>
<td>8,571</td>
</tr>
<tr>
<td>1924</td>
<td>10,547</td>
<td>884</td>
<td>119</td>
<td>9,544</td>
</tr>
<tr>
<td>1926</td>
<td>9,674</td>
<td>954</td>
<td>142</td>
<td>8,578</td>
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<tr>
<td>1928</td>
<td>10,549</td>
<td>1,055</td>
<td>280</td>
<td>9,214</td>
</tr>
<tr>
<td>1930</td>
<td>13,581</td>
<td>1,499</td>
<td>378</td>
<td>11,654</td>
</tr>
<tr>
<td>1932</td>
<td>15,028</td>
<td>1,659</td>
<td>325</td>
<td>13,044</td>
</tr>
<tr>
<td>1934</td>
<td>15,861</td>
<td>1,545</td>
<td>318</td>
<td>13,998</td>
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<td>17,233</td>
<td>1,593</td>
<td>328</td>
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<tr>
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<td>21,089</td>
<td>2,179</td>
<td>342</td>
<td>18,558</td>
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<tr>
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<td>51,165</td>
<td>3,361</td>
<td>1,394</td>
<td>45,910</td>
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<tr>
<td>1941</td>
<td>152,125</td>
<td>10,611</td>
<td>8,627</td>
<td>132,887</td>
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<tr>
<td>1942</td>
<td>764,415</td>
<td>55,956</td>
<td>50,213</td>
<td>658,246</td>
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<tr>
<td>1943</td>
<td>2,197,114</td>
<td>205,874</td>
<td>99,672</td>
<td>1,891,568</td>
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<tr>
<td>1944</td>
<td>2,372,292</td>
<td>333,401</td>
<td>82,647</td>
<td>1,956,244</td>
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<tr>
<td>1945</td>
<td>2,282,259</td>
<td>381,454</td>
<td>16,764</td>
<td>1,884,041</td>
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<tr>
<td>1946</td>
<td>455,515</td>
<td>81,733</td>
<td>7</td>
<td>373,775</td>
</tr>
<tr>
<td>1947</td>
<td>305,827</td>
<td>42,745</td>
<td>53</td>
<td>263,082</td>
</tr>
<tr>
<td>1948</td>
<td>387,730</td>
<td>48,957</td>
<td>1,338</td>
<td>337,435</td>
</tr>
<tr>
<td>1949</td>
<td>419,347</td>
<td>57,861</td>
<td>1,860</td>
<td>359,636</td>
</tr>
<tr>
<td>1950</td>
<td>411,277</td>
<td>57,006</td>
<td>2,186</td>
<td>352,085</td>
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<tr>
<td>1951</td>
<td>788,381</td>
<td>107,099</td>
<td>2,476</td>
<td>678,806</td>
</tr>
<tr>
<td>1952</td>
<td>973,474</td>
<td>128,401</td>
<td>6,782</td>
<td>838,291</td>
</tr>
<tr>
<td>1953</td>
<td>977,593</td>
<td>130,769</td>
<td>9,157</td>
<td>837,677</td>
</tr>
<tr>
<td>1954</td>
<td>947,918</td>
<td>129,752</td>
<td>9,072</td>
<td>809,094</td>
</tr>
<tr>
<td>1955</td>
<td>959,946</td>
<td>137,149</td>
<td>4,384</td>
<td>813,413</td>
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<tr>
<td>1956</td>
<td>909,958</td>
<td>142,093</td>
<td>3,256&lt;sup&gt;c&lt;/sup&gt;</td>
<td>764,609</td>
</tr>
<tr>
<td>1957</td>
<td>919,835</td>
<td>140,563</td>
<td>2,706&lt;sup&gt;d&lt;/sup&gt;</td>
<td>776,566</td>
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<tr>
<td>1958</td>
<td>871,156</td>
<td>132,939</td>
<td>2,485&lt;sup&gt;e&lt;/sup&gt;</td>
<td>735,759</td>
</tr>
</tbody>
</table>

N.A.—Not available.
<sup>a</sup> As of November 1.
<sup>b</sup> As of November 11.
<sup>c</sup> This category includes a total of 263 Air Force Cadets not shown in previous years.
<sup>d</sup> This category includes 504 Air Force Academy Cadets.
<sup>e</sup> This category includes 1,169 Air Force Cadets.

Sources: 3, 6
### Naval Aviation Personnel*, 1941 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Pilots</th>
<th>Enlisted Aviation Rates</th>
<th>Aviation Ground Officers</th>
</tr>
</thead>
<tbody>
<tr>
<td>as of June 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1941</td>
<td>23,148</td>
<td>6,300</td>
<td>14,848</td>
<td>2,000</td>
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<tr>
<td>1944*</td>
<td>299,968</td>
<td>47,276</td>
<td>228,356</td>
<td>24,336</td>
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<td>1950</td>
<td>91,298</td>
<td>12,978</td>
<td>76,349</td>
<td>1,971</td>
</tr>
<tr>
<td>1951</td>
<td>162,214</td>
<td>18,287</td>
<td>139,838</td>
<td>4,089</td>
</tr>
<tr>
<td>1952</td>
<td>194,730</td>
<td>20,944</td>
<td>168,486</td>
<td>5,300</td>
</tr>
<tr>
<td>1953</td>
<td>196,813*</td>
<td>22,903</td>
<td>163,673</td>
<td>4,930</td>
</tr>
<tr>
<td>1954</td>
<td>179,783*</td>
<td>21,316</td>
<td>147,467</td>
<td>4,725</td>
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<tr>
<td>1955*</td>
<td>165,243*</td>
<td>21,352</td>
<td>133,424</td>
<td>4,885</td>
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<td>204,388</td>
<td>23,740</td>
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<td>1957</td>
<td>212,684</td>
<td>23,101</td>
<td>181,583</td>
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<td>1958</td>
<td>202,884</td>
<td>23,214</td>
<td>172,777</td>
<td>6,893</td>
</tr>
</tbody>
</table>

* Navy and Marine.
* Pilots as of Aug. 31; others as of October 31.
* Includes non-pilots in flying status and formerly designated pilots.
* As of January 1.
* As of November 30, 1956.

Sources: 3, 45
operates separate squadrons for rescue, support and in-flight refueling. There are 20 aircraft per in-flight refueling squadron. There are 6 to 10 aircraft per air rescue squadron depending on the mission.

Navy: Navy carrier air groups usually are composed of 2 fighter squadrons; 2 attack squadrons; 1 heavy attack squadron or detachment; 4 photo planes; and 4 aircraft early warning (AEW) planes. Super aircraft carriers of the Forrestal Class (60,000 tons) have up to 80 or 120 aircraft. Large Midway Class (55,000 tons) carriers have slightly less aircraft, while medium sized carriers of the Essex Class (33,000 tons) have a complement of 70 to 80 aircraft. Antisubmarine squadrons attached to light and escort carriers average about 22 aircraft, and shore-based patrol squadrons have a complement of 12 planes each. Marine fighter squadrons are assigned 24 aircraft.

Army: An Army detachment currently has 26 to 28 aircraft per division, depending on whether it is infantry or armor and is assigned to a division in liaison, reconnaissance, observation, or courier missions. Helicopter companies are light, medium or heavy, depending upon the type of helicopters used. Each company has 21 helicopters. A fixed-wing group has 21 basic 1 1/2 ton, 11-passenger aircraft and is assigned to field Army level.

### DEPARTMENT OF DEFENSE

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

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total Procurement and Production</th>
<th>Aircraft</th>
<th>Aircraft as Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>37.6</td>
</tr>
<tr>
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<td>29,536</td>
<td>13,471</td>
<td>45.6</td>
</tr>
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<td>1953</td>
<td>19,956</td>
<td>13,346</td>
<td>66.9</td>
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<tr>
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<td>10,432</td>
<td>4,470</td>
<td>42.8</td>
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<tr>
<td>1955</td>
<td>7,149</td>
<td>4,403</td>
<td>61.6</td>
</tr>
<tr>
<td>1956</td>
<td>9,653</td>
<td>6,241</td>
<td>64.7</td>
</tr>
<tr>
<td>1957</td>
<td>11,737</td>
<td>6,303</td>
<td>53.7</td>
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<tr>
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<td>11,399</td>
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<tr>
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<tr>
<td>1960*</td>
<td>14,398</td>
<td>6,353</td>
<td>44.1</td>
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</tbody>
</table>

*Estimate.

Source: 23
<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Total Federal Expenditures</th>
<th>Total Military Expenditures*</th>
<th>Expenditures for Aircraft and Missiles*</th>
<th>Percent Aircraft and Missiles of Total Federal</th>
<th>Percent Aircraft and Missiles of Military</th>
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</thead>
<tbody>
<tr>
<td>1922</td>
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<td>$935</td>
<td>$6</td>
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<td>.6</td>
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<td>689</td>
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<td>.3</td>
<td>1.5</td>
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<td>717</td>
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<td>29</td>
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<td>205</td>
<td>2.3</td>
<td>11.4</td>
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<td>6,252</td>
<td>587</td>
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<td>11.5</td>
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<td>1,649</td>
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<td>593</td>
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<td>1,248</td>
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</tr>
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<td>13,009</td>
<td>1,705</td>
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<td>22,444</td>
<td>2,433*</td>
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</tr>
<tr>
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<td>45,963</td>
<td>5,057*</td>
<td>7.7</td>
<td>11.0</td>
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<td>7,712*</td>
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<tr>
<td>1955</td>
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<td>42,089</td>
<td>8,755*</td>
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<td>66,540</td>
<td>41,825</td>
<td>8,314*</td>
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<td>1957</td>
<td>69,433</td>
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<td>44,142</td>
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<td>46,120</td>
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<td>77,030</td>
<td>45,805</td>
<td>10,090*</td>
<td>13.1</td>
<td>22.0</td>
</tr>
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* Estimate.
* Includes stockpiling Mutual Defense, and Atomic Energy.
* Includes related items.
* Procurement and Production, military functions only.
Sources: 3, 17, 21, 26
### Department of Defense

#### New Obligational Availability for Aircraft Procurement, by Agency 1951 to Date

(Millions of Dollars)

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total Defense Department</th>
<th>Air Force</th>
<th>Navy</th>
<th>Army</th>
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<td>1953</td>
<td>13,346</td>
<td>10,202</td>
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<td>1,923</td>
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<td>1,680</td>
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E Estimate.

Source: 23

### Department of Defense

#### Unobligated Funds Available for Procurement, January 31, 1959

Total and Aircraft

(Millions of Dollars)

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<tr>
<th></th>
<th>Total Procurement and Production</th>
<th>Aircraft</th>
<th>Aircraft As Percent of Total</th>
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Source: 22
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<th>Fiscal Year</th>
<th>U. S. Air Force</th>
<th>Naval Aviation</th>
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<tr>
<td></td>
<td>Total Cash Appropriations</td>
<td>Total Cash Appropriations</td>
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<tr>
<td></td>
<td>Expenditures</td>
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<td>1914</td>
<td>.17</td>
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<td>1915</td>
<td>.20</td>
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<td>13.1</td>
<td>18.1</td>
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<tr>
<td>1924</td>
<td>12.6</td>
<td>11.0</td>
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<td>1925</td>
<td>13.5</td>
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<td>14.9</td>
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<td>1927</td>
<td>15.3</td>
<td>16.8</td>
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<td>1928</td>
<td>21.1</td>
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<td>1929</td>
<td>28.9</td>
<td>23.3</td>
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<td>1930</td>
<td>34.9</td>
<td>28.1</td>
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<td>38.9</td>
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<td>1932</td>
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<td>1933</td>
<td>25.7</td>
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<td>1934</td>
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<td>1935</td>
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<td>1936</td>
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<tr>
<td>1937</td>
<td>59.6</td>
<td>41.3</td>
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<td>1938</td>
<td>58.9</td>
<td>51.1</td>
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<td>1939</td>
<td>71.1</td>
<td>83.4</td>
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<td>1940</td>
<td>186.6</td>
<td>108.5</td>
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<td>1941</td>
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<td>605.9</td>
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<td>1942</td>
<td>23,049.9</td>
<td>2,555.2</td>
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<td>1943</td>
<td>11,317.4</td>
<td>9,392.4</td>
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(Continued top next page)
### Appropriations and Expenditures for Military Aviation
1899 to Date—Continued
(Millions of Dollars)

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<thead>
<tr>
<th>Fiscal Year</th>
<th>U.S. Air Force</th>
<th>Naval Aviation*</th>
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<td>Total Cash Appropriations</td>
<td>Expenditures</td>
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<td>1944</td>
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<td>13,087.7</td>
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<td>1945</td>
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<td>11,357.4</td>
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<td>1946</td>
<td>5</td>
<td>2,519.4</td>
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<td>1947</td>
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<td>1950</td>
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<tr>
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<td>1953</td>
<td>22,076.2</td>
<td>15,089.6</td>
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<td>1954</td>
<td>11,402.4</td>
<td>15,668.5</td>
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<td>1955</td>
<td>11,715.8</td>
<td>16,406.7</td>
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<td>1956</td>
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<td>16,748.8</td>
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<tr>
<td>1957</td>
<td>17,696.5</td>
<td>18,362.7</td>
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<td>1958</td>
<td>17,732.0</td>
<td>18,435.0</td>
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<td>1959 f</td>
<td>18,717.0</td>
<td>18,993.0</td>
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<tr>
<td>1960 f</td>
<td>18,820.0</td>
<td>18,675.0</td>
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**Note:** For details on missiles see separate tables in this and the missiles chapter.
N.A.—Not available.

*Includes "Aircraft and Related Procurement" and "Aircraft and Facilities" only.

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

**Sources:** 3, 26

### Department of Defense
Unexpended Funds Available for Procurement, January 31, 1959
Total and Aircraft
(Million Dollars)

<table>
<thead>
<tr>
<th></th>
<th>Total Procurement and Production</th>
<th>Aircraft</th>
<th>Aircraft As Percent of Total</th>
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</thead>
<tbody>
<tr>
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<td>9,020</td>
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<td>Navy . . . . . . . . . . . .</td>
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<tr>
<td>Army . . . . . . . . . . . .</td>
<td>2,700</td>
<td>142</td>
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<td>Office of Secretary of Defense . . .</td>
<td>7</td>
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<td>—</td>
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</table>

**Source:** 22
### Department of Defense

**Expenditures for Production and Procurement, Total and Aircraft**

1951 to Date

(Millions of Dollars)

<table>
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<th>Year Ending June 30</th>
<th>Total Procurement and Production</th>
<th>Aircraft</th>
<th>Aircraft as Percent of Total</th>
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<td>60.7</td>
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<tr>
<td>1952</td>
<td>11,478</td>
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<td>42.2</td>
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<tr>
<td>1953</td>
<td>17,123</td>
<td>7,417</td>
<td>43.3</td>
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<tr>
<td>1954</td>
<td>15,958</td>
<td>8,335</td>
<td>52.2</td>
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<tr>
<td>1955</td>
<td>12,997</td>
<td>8,037</td>
<td>61.8</td>
</tr>
<tr>
<td>1956</td>
<td>12,182</td>
<td>7,146</td>
<td>58.6</td>
</tr>
<tr>
<td>1957</td>
<td>13,649</td>
<td>7,978</td>
<td>59.5</td>
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<td>1958</td>
<td>14,677</td>
<td>8,448</td>
<td>57.6</td>
</tr>
<tr>
<td>1959&lt;sup&gt;B&lt;/sup&gt;</td>
<td>14,234</td>
<td>7,117</td>
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<tr>
<td>1960&lt;sup&gt;E&lt;/sup&gt;</td>
<td>14,596</td>
<td>6,589</td>
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Source: 21

### Department of Defense

**Expenditures for Aircraft Procurement, by Agency**

1951 to Date

(Millions of Dollars)

<table>
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<th>Year Ending June 30</th>
<th>Total Defense Department</th>
<th>Air Force</th>
<th>Navy</th>
<th>Army</th>
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</thead>
<tbody>
<tr>
<td>1951</td>
<td>$2,412</td>
<td>$1,812</td>
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<td>1952</td>
<td>4,888</td>
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<td>1953</td>
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<td>5,586</td>
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<td>1954</td>
<td>8,335</td>
<td>6,254</td>
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<td>1955</td>
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<td>1956</td>
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<sup>E</sup> Estimate.

Source: 21
USAFT AIRCRAFT ENGINE INVENTORY

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<th>January 1958</th>
<th>January 1959</th>
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<td>7,064</td>
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<td>6,898</td>
<td>5,906</td>
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<td>J-47</td>
<td>29,174</td>
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<td>297</td>
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<td>3,856</td>
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<td>818</td>
<td>817</td>
<td>730</td>
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<td>J-75</td>
<td>-</td>
<td>49</td>
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<td>J-79</td>
<td>-</td>
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<td>Others</td>
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Note: Inventory includes all engines, inactive and active, in use and awaiting repair and ready for installation.

Source: 5
# U. S. Navy Aircraft Engine Inventory

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<thead>
<tr>
<th>Engine Type and Model</th>
<th>January 1957</th>
<th>January 1958</th>
<th>January 1959</th>
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</thead>
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<tr>
<td>T-58-GE-2</td>
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<td>12</td>
<td>10</td>
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<tr>
<td>O-335</td>
<td>227</td>
<td>240</td>
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<tr>
<td>O-435</td>
<td>266</td>
<td>153</td>
<td>59</td>
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<tr>
<td>O-470</td>
<td>548</td>
<td>787</td>
<td>763</td>
</tr>
<tr>
<td>R-760-8</td>
<td>96</td>
<td>98</td>
<td>96</td>
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<tr>
<td>R-975-46</td>
<td>454</td>
<td>410</td>
<td>399</td>
</tr>
<tr>
<td>R-985-AN</td>
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<td>916</td>
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<tr>
<td>R-985-14B</td>
<td>1,901</td>
<td>1,973</td>
<td>2,063</td>
</tr>
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<td>425</td>
<td>423</td>
<td>435</td>
</tr>
<tr>
<td>R-1340</td>
<td>3,191</td>
<td>2,862</td>
<td>210</td>
</tr>
<tr>
<td>R-1820</td>
<td>3,694</td>
<td>4,400</td>
<td>4,193</td>
</tr>
<tr>
<td>R-1830</td>
<td>3,180</td>
<td>1,970</td>
<td>745</td>
</tr>
<tr>
<td>R-2000</td>
<td>1,173</td>
<td>1,120</td>
<td>1,085</td>
</tr>
<tr>
<td>R-2800</td>
<td>7,884</td>
<td>4,857</td>
<td>1,354</td>
</tr>
<tr>
<td>R-3350</td>
<td>7,202</td>
<td>7,195</td>
<td>6,856</td>
</tr>
<tr>
<td>R-4360</td>
<td>491</td>
<td>324</td>
<td>237</td>
</tr>
</tbody>
</table>

**Total**          | 43,838       | 40,686       | 32,064       |

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

<table>
<thead>
<tr>
<th>Engine Type and Model</th>
<th>January 1958</th>
<th>January 1959</th>
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<tr>
<td>H-RJ2B</td>
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<tr>
<td>O-335-3</td>
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<tr>
<td>O-335-4</td>
<td>83</td>
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<tr>
<td>O-335-5</td>
<td>692</td>
<td>1,175</td>
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<td>750</td>
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<tr>
<td>O-360-C2B</td>
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<td>2</td>
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<tr>
<td>O-435-17</td>
<td>241</td>
<td>305</td>
</tr>
<tr>
<td>O-435-23</td>
<td>147</td>
<td>461</td>
</tr>
<tr>
<td>O-470-7</td>
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</tr>
<tr>
<td>O-470-11</td>
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<td>2,557</td>
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<tr>
<td>O-470-15</td>
<td>121</td>
<td>408</td>
</tr>
<tr>
<td>O-480-A, B, C, G</td>
<td>38</td>
<td>54</td>
</tr>
<tr>
<td>O-480-1</td>
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<td>391</td>
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<tr>
<td>O-526-A</td>
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<td>13</td>
</tr>
<tr>
<td>O-580-A1A</td>
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<td>3</td>
</tr>
<tr>
<td>P-ALOUSE</td>
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<td>5</td>
</tr>
<tr>
<td>R-1300-3</td>
<td>232</td>
<td>229</td>
</tr>
<tr>
<td>R-1340-AN</td>
<td>82</td>
<td>230</td>
</tr>
<tr>
<td>R-1340-57</td>
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<td>432</td>
<td>690</td>
</tr>
<tr>
<td>R-1820-103</td>
<td>320</td>
<td>510</td>
</tr>
<tr>
<td>R-2000-4</td>
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<td>82</td>
</tr>
<tr>
<td>R-2800-54</td>
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</tr>
<tr>
<td>R-755</td>
<td>67</td>
<td>115</td>
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<tr>
<td>R-975-46</td>
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<td>3</td>
</tr>
<tr>
<td>R-985</td>
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<td>691</td>
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<tr>
<td>T-53</td>
<td>—</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,919</strong></td>
<td><strong>9,036</strong></td>
</tr>
</tbody>
</table>

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

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

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

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

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

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

**DEPARTMENT OF DEFENSE**

**NEW OBLIGATIONAL AVAILABILITY FOR MISSILE PROCUREMENT, BY AGENCY**

**1951 to Date**

(Millions of Dollars)

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

*Estimate.

Source: 23
The average guided missile contains approximately 300,000 parts. Failure of a single part which might cost but a few cents could mean the failure of a multimillion dollar missile system. The missile, once it leaves its launching site, must function perfectly.

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

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

**Funds Available for Missile Development and Production**  
1946 to Date  
(Millions of Dollars)

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>All Missile Programs</th>
<th>Intermediate and Intercontinental Ballistic Missiles</th>
<th>Other Surface to Surface Missiles</th>
<th>All Other Missiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1946 &amp; prior</td>
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<td>$19</td>
<td>$51</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>58</td>
<td>20</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>1948</td>
<td>81</td>
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<tr>
<td>1949</td>
<td>98</td>
<td>45</td>
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<tr>
<td>1950</td>
<td>134</td>
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<tr>
<td>1951</td>
<td>784</td>
<td>$1</td>
<td>185</td>
<td>598</td>
</tr>
<tr>
<td>1952</td>
<td>1,058</td>
<td>1</td>
<td>239</td>
<td>818</td>
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<tr>
<td>1953</td>
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<tr>
<td>1954</td>
<td>1,067</td>
<td>14</td>
<td>336</td>
<td>717</td>
</tr>
<tr>
<td>1955</td>
<td>1,470</td>
<td>161</td>
<td>398</td>
<td>911</td>
</tr>
<tr>
<td>1956</td>
<td>2,270</td>
<td>515</td>
<td>387</td>
<td>1,368</td>
</tr>
<tr>
<td>1957</td>
<td>4,470</td>
<td>1,365</td>
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<td>1958</td>
<td>5,707</td>
<td>2,077</td>
<td>639</td>
<td>2,391</td>
</tr>
<tr>
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<td>726</td>
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</tr>
<tr>
<td>1960*</td>
<td>6,817</td>
<td>2,376</td>
<td>287</td>
<td>3,494</td>
</tr>
</tbody>
</table>

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

a Preliminary.  
b Projected.  
Source: 20

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

The shift in air power emphasis from manned aircraft to missiles is having a profound effect on the aerospace industry and the nation. A typical ballistic missile today costs about $100 per pound, not includ-
ing the warhead. This means, simply stated, that they cannot be stored around the nation like stacks of cordwood against a future need. Hence, mass production of these weapons, as we think of mass production in terms of planes, guns and artillery pieces, is not practical.

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

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

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

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total Procurement and Production (Millions of Dollars)</th>
<th>Guided Missiles (Millions of Dollars)</th>
<th>Missiles as Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>$23,114</td>
<td>$424</td>
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</tr>
<tr>
<td>1952</td>
<td>29,536</td>
<td>468</td>
<td>1.6</td>
</tr>
<tr>
<td>1953</td>
<td>19,956</td>
<td>896</td>
<td>4.5</td>
</tr>
<tr>
<td>1954</td>
<td>10,432</td>
<td>748</td>
<td>7.2</td>
</tr>
<tr>
<td>1955</td>
<td>7,149</td>
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</tr>
<tr>
<td>1956</td>
<td>9,653</td>
<td>938</td>
<td>9.7</td>
</tr>
<tr>
<td>1957</td>
<td>11,737</td>
<td>2,322</td>
<td>19.8</td>
</tr>
<tr>
<td>1958</td>
<td>11,399</td>
<td>2,313</td>
<td>20.3</td>
</tr>
<tr>
<td>1959*</td>
<td>15,325</td>
<td>4,345</td>
<td>28.6</td>
</tr>
<tr>
<td>1960**</td>
<td>14,398</td>
<td>3,961</td>
<td>27.5</td>
</tr>
</tbody>
</table>

* Estimate.

Source: 23
### Department of Defense

**Expenditures for Guided Missile Procurement, by Agency**

1951 to Date

(Millions of Dollars)

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total Department</th>
<th>Air Force</th>
<th>Navy</th>
<th>Army</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>$21</td>
<td>$16</td>
<td>$5</td>
<td></td>
</tr>
<tr>
<td>1952</td>
<td>169</td>
<td>66</td>
<td>56</td>
<td>$46</td>
</tr>
<tr>
<td>1953</td>
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<tr>
<td>1956</td>
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<td>333</td>
</tr>
<tr>
<td>1957</td>
<td>2,095</td>
<td>1,417</td>
<td>264</td>
<td>414</td>
</tr>
<tr>
<td>1958</td>
<td>2,737</td>
<td>1,668</td>
<td>345</td>
<td>724</td>
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<td>2,356</td>
<td>417</td>
<td>587</td>
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<tr>
<td>1960&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3,922</td>
<td>2,661</td>
<td>566</td>
<td>695</td>
</tr>
</tbody>
</table>

<sup>2</sup> Estimate.

Source: 22

---

### Department of Defense

**Expenditures for Procurement and Production**

Total and Guided Missiles

1951 to Date

(Millions of Dollars)

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total Procurement and Production</th>
<th>Guided Missiles</th>
<th>Guided Missiles as Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
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<td>0.5</td>
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<td>17,123</td>
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<td>1.7</td>
</tr>
<tr>
<td>1954</td>
<td>15,958</td>
<td>504</td>
<td>3.2</td>
</tr>
<tr>
<td>1955</td>
<td>12,997</td>
<td>718</td>
<td>5.5</td>
</tr>
<tr>
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<tr>
<td>1958</td>
<td>14,677</td>
<td>2,737</td>
<td>18.6</td>
</tr>
<tr>
<td>1959&lt;sup&gt;2&lt;/sup&gt;</td>
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<td>3,360</td>
<td>23.6</td>
</tr>
<tr>
<td>1960&lt;sup&gt;2&lt;/sup&gt;</td>
<td>14,596</td>
<td>3,922</td>
<td>26.9</td>
</tr>
</tbody>
</table>

<sup>2</sup> Estimate.

Source: 22
industry were built for the production of large aircraft with high tails and broad wings. The manufacture of missiles requires more than simply space. The temperature must be controlled; contamination of the air by dust and other minute particles must be eliminated. Manufacture, for example, of delicate guidance systems requires a precision production technique exceeding that of any other industry. The switch from manned aircraft to missile production is knotty, involving company facility investments, labor responsibilities and many other problems. Needless to say, it is being given concentrated attention by both industry and Government.

**DEPARTMENT OF DEFENSE**

**UNEXPENDED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1959**

**TOTAL AND GUIDED MISSILES**

(Millions of Dollars)

<table>
<thead>
<tr>
<th></th>
<th>Procurement and Production</th>
<th>Guided Missiles</th>
<th>Missiles as Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defense Department</td>
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<td>$6,192</td>
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</tr>
<tr>
<td>Air Force</td>
<td>15,660</td>
<td>3,922</td>
<td>25.0</td>
</tr>
<tr>
<td>Navy</td>
<td>10,554</td>
<td>1,108</td>
<td>10.5</td>
</tr>
<tr>
<td>Army</td>
<td>2,700</td>
<td>1,162</td>
<td>43.0</td>
</tr>
<tr>
<td>Office of Secretary</td>
<td>7</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>of Defense</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 22

**DEPARTMENT OF DEFENSE**

**UNOBLIGATED FUNDS AVAILABLE FOR PROCUREMENT, JANUARY 31, 1959**

**TOTAL AND GUIDED MISSILES**

(Millions of Dollars)

<table>
<thead>
<tr>
<th></th>
<th>Total Procurement and Production</th>
<th>Guided Missiles</th>
<th>Missiles as Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defense Department</td>
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</tr>
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<td>10.1</td>
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<tr>
<td>Army</td>
<td>1,532</td>
<td>530</td>
<td>34.6</td>
</tr>
<tr>
<td>Office of Secretary</td>
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<td>—</td>
<td>—</td>
</tr>
<tr>
<td>of Defense</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 22
<table>
<thead>
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<th>Powerplant</th>
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<tr>
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<th>Guidance</th>
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**Surface-to-Surface**

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Source: 20
### Drones in Production or Development

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</table>

Source: 20
For a number of years, the aircraft manufacturing industry has been undergoing a transition of its workload. From an industry devoted purely to aircraft manufacture up to the time of World War II, it moved into the missile field in the years following the war, the new assignment increasing in proportion to the total workload with every passing year.

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

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

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

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

Although the member companies of the aerospace industry are already very active in all fields of space activity, the infant space age has not yet produced a significant impact insofar as total output is concerned. It appears, however, that space work will reach significant
proportions in a relatively short period of time, although it is too early to predict what proportion of the total it will eventually become. Aircraft and missile production, research and development will continue to occupy the major portion of industry’s attention for a long time.

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

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

Space exploration as a civil project is handled by the National Aeronautics and Space Administration. NASA’s program contemplates obligations of $330,000,000 during the fiscal year 1960 for research and development activities in space exploration. This represents an increase over fiscal 1959 of close to 50%, but the 1960 figure is not really indica-
tive of the effort to come. It involves, in a number of cases, initial funding for long term projects which will increase sharply as development status advances.

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

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

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

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

Later requirements are not clearly defined, but one thing appears inevitable: the order of complexity for vehicles designed to explore
### National Aeronautics and Space Administration
Research and Development Programs
Fiscal Years 1959 and 1960
(Millions of Dollars of Contracts)

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<thead>
<tr>
<th>Programs</th>
<th>1959</th>
<th>1960</th>
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<td>Research contracts</td>
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<td>Scientific investigations in space:</td>
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**Note:** Includes direct appropriations to NASA and transfers to NASA from Air Force, Advanced Research Projects Agency, Navy, Army.

**Source:** 47
space will increase over the already high degree involved in manufacture of today’s automated weapons and high-performance manned aircraft. This will compound the industry’s task of maintaining cost levels.

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

### Expenditures for Research and Development

1953 to Date

(Millions of Dollars)

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</table>

Source: 26
Research and development has a direct bearing on national survival, for no single weapon system in the American arsenal has the capability, if independently relied upon, to deter aggression. The objective of the United States aircraft, missile and spacecraft industry, the military services, the Government and private research agencies, working in close harmony, has been to maintain technical superiority.

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

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

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

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

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
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<th>Major National Security</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>$ 74</td>
<td>$ 26</td>
<td>$ 48</td>
</tr>
<tr>
<td>1941</td>
<td>198</td>
<td>144</td>
<td>54</td>
</tr>
<tr>
<td>1942</td>
<td>280</td>
<td>211</td>
<td>69</td>
</tr>
<tr>
<td>1943</td>
<td>602</td>
<td>472</td>
<td>130</td>
</tr>
<tr>
<td>1944</td>
<td>1,377</td>
<td>1,178</td>
<td>199</td>
</tr>
<tr>
<td>1945</td>
<td>1,591</td>
<td>1,372</td>
<td>219</td>
</tr>
<tr>
<td>1946</td>
<td>918</td>
<td>754</td>
<td>134</td>
</tr>
<tr>
<td>1947</td>
<td>898</td>
<td>768</td>
<td>130</td>
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<tr>
<td>1948</td>
<td>853</td>
<td>698</td>
<td>155</td>
</tr>
<tr>
<td>1949</td>
<td>1,080</td>
<td>889</td>
<td>191</td>
</tr>
<tr>
<td>1950</td>
<td>1,080</td>
<td>871</td>
<td>209</td>
</tr>
<tr>
<td>1951</td>
<td>1,298</td>
<td>1,063</td>
<td>235</td>
</tr>
<tr>
<td>1952</td>
<td>1,815</td>
<td>1,565</td>
<td>250</td>
</tr>
<tr>
<td>1953</td>
<td>2,100</td>
<td>1,830</td>
<td>270</td>
</tr>
<tr>
<td>1954</td>
<td>2,085</td>
<td>1,806</td>
<td>279</td>
</tr>
<tr>
<td>1955</td>
<td>2,085</td>
<td>1,804</td>
<td>281</td>
</tr>
<tr>
<td>1956</td>
<td>2,538</td>
<td>2,202</td>
<td>336</td>
</tr>
<tr>
<td>1957</td>
<td>3,027</td>
<td>2,596</td>
<td>431</td>
</tr>
<tr>
<td>1958</td>
<td>3,498</td>
<td>2,988</td>
<td>510</td>
</tr>
<tr>
<td>1959</td>
<td>4,841</td>
<td>4,108</td>
<td>732</td>
</tr>
<tr>
<td>1960</td>
<td>5,484</td>
<td>4,572</td>
<td>912</td>
</tr>
</tbody>
</table>

*Estimate.

*Includes increase of "Research and Development Plant" ($304 million in 1957).

*Includes pay and allowances of military personnel.

*Figures for "Total" and "National Security" include figures previously classified as "procurement." An additional $2 billion in support of "research and development" continues to be financed from "procurement" funds.

Source: 26
The Federal Government supports about half of the research and development of the nation, but private industry finances much of the remainder. In the ten years following the end of World War II, the aircraft industry invested more than $1 billion of its earnings in research and development programs and facilities for aircraft and missiles, and by 1961 at the present rate will have invested in excess of another $1 billion.

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

<table>
<thead>
<tr>
<th>Budget title and program</th>
<th>1958 actual</th>
<th>1959 estimate</th>
<th>1960 estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research, development, test, and evaluation appropriations:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Military sciences</td>
<td>$334.4</td>
<td>$360.3</td>
<td>$371.9</td>
</tr>
<tr>
<td>2. Aircraft and related equipment</td>
<td>442.5</td>
<td>472.6</td>
<td>487.3</td>
</tr>
<tr>
<td>3. Missiles and related equipment</td>
<td>904.3</td>
<td>1,341.8</td>
<td>1,437.6</td>
</tr>
<tr>
<td>4. Military astronautics and related equipment</td>
<td>17.4</td>
<td>345.9</td>
<td>309.1</td>
</tr>
<tr>
<td>5. Ships and small craft and related equipment</td>
<td>132.1</td>
<td>158.7</td>
<td>167.7</td>
</tr>
<tr>
<td>6. Ordnance, combat vehicles, and related equipment</td>
<td>179.1</td>
<td>188.8</td>
<td>235.0</td>
</tr>
<tr>
<td>7. Other equipment</td>
<td>323.6</td>
<td>379.9</td>
<td>430.8</td>
</tr>
<tr>
<td>8. Programwide management and support</td>
<td>135.1</td>
<td>137.8</td>
<td>133.0</td>
</tr>
<tr>
<td>9. Emergency fund and expired accounts</td>
<td>34.2</td>
<td>136.1</td>
<td>150.0</td>
</tr>
<tr>
<td><strong>Total direct obligations, research, development, test, and evaluation appropriations</strong></td>
<td><strong>2,502.7</strong></td>
<td><strong>3,521.9</strong></td>
<td><strong>3,722.4</strong></td>
</tr>
</tbody>
</table>

| Procurement appropriations:" |             |               |               |
| 1. Aircraft                  | 221.5       | 476.4         | 729.9         |
| 2. Missiles                  | 1,367.3     | 1,253.7       | 1,062.3       |
| 3. Other                     | 67.2        | 91.6          | 51.2          |
| **Total direct obligations, procurement appropriations** | **1,656.0** | **1,821.7**   | **1,843.4**   |
| **Military personnel appropriations** | **188.5**   | **196.9**     | **194.5**     |
| **Total direct obligations** | **4,347.2** | **5,540.5**   | **5,760.3**   |

*a Estimated amounts for items identified as development, test, and evaluation support.
Source: 26*
The emphasis placed by the Department of Defense on research and development has constantly increased. Expenditures for defense research and development have almost doubled from the end of the Korean conflict to those estimated for fiscal 1960—about $1.4 billion was spent in fiscal 1953, and an estimated $2.6 billion will be spent in fiscal 1960. These expenditures, however, do not take into account the entire research
and development program of the Department of Defense during this period. A large portion of the test and evaluation program has been financed by procurement money. Supporting activities, such as military personnel and military construction, are not included.

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

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

<table>
<thead>
<tr>
<th>Program</th>
<th>1958</th>
<th>1959*</th>
<th>1960*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Direct Obligations</td>
<td>$801.3</td>
<td>$948.3</td>
<td>$1,046.5</td>
</tr>
<tr>
<td>Military sciences</td>
<td>124.0</td>
<td>132.3</td>
<td>119.7</td>
</tr>
<tr>
<td>Aircraft and related equipment</td>
<td>60.0</td>
<td>30.3</td>
<td>24.1</td>
</tr>
<tr>
<td>Missiles and related equipment</td>
<td>321.1</td>
<td>454.7</td>
<td>543.3</td>
</tr>
<tr>
<td>Ships and small craft and related equipment</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Ordnance, combat vehicles, and related equipment</td>
<td>96.2</td>
<td>89.7</td>
<td>124.4</td>
</tr>
<tr>
<td>Other equipment</td>
<td>144.0</td>
<td>177.3</td>
<td>175.0</td>
</tr>
<tr>
<td>Programwide management and support</td>
<td>55.6</td>
<td>63.7</td>
<td>59.8</td>
</tr>
</tbody>
</table>

\* Estimate.
Source: 26
of the military, research agencies, and the industry for continued technological superiority in the aerospace era.

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

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

### Department of Defense

**Expenditures for Research and Development**

(Millions of Dollars)

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Department of Defense</th>
<th>Air Force</th>
<th>Navy</th>
<th>Army</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>758</td>
<td>269</td>
<td>327</td>
<td>162</td>
<td>–</td>
</tr>
<tr>
<td>1952</td>
<td>1,165</td>
<td>429</td>
<td>448</td>
<td>288</td>
<td>–</td>
</tr>
<tr>
<td>1953</td>
<td>1,411</td>
<td>530</td>
<td>499</td>
<td>382</td>
<td>–</td>
</tr>
<tr>
<td>1954</td>
<td>1,385</td>
<td>513</td>
<td>476</td>
<td>396</td>
<td>–</td>
</tr>
<tr>
<td>1955</td>
<td>1,391</td>
<td>524</td>
<td>467</td>
<td>400</td>
<td>–</td>
</tr>
<tr>
<td>1956</td>
<td>1,491</td>
<td>632</td>
<td>449</td>
<td>'10</td>
<td>–</td>
</tr>
<tr>
<td>1957</td>
<td>1,687</td>
<td>729</td>
<td>523</td>
<td>435</td>
<td>–</td>
</tr>
<tr>
<td>1958</td>
<td>1,742</td>
<td>694</td>
<td>569</td>
<td>476</td>
<td>3</td>
</tr>
<tr>
<td>1959(^e)</td>
<td>2,355</td>
<td>755</td>
<td>716</td>
<td>519</td>
<td>365</td>
</tr>
<tr>
<td>1960(^e)</td>
<td>2,594</td>
<td>725</td>
<td>779</td>
<td>547</td>
<td>543</td>
</tr>
</tbody>
</table>

\(^e\) Estimate. Source: 26
### RESEARCH AND DEVELOPMENT

#### DISTRIBUTION of the
FEDERAL RESEARCH AND DEVELOPMENT DOLLAR
Fiscal Year 1958

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Federal Government</td>
<td>44 cents</td>
</tr>
<tr>
<td>To Profit Organizations</td>
<td>38 cents</td>
</tr>
<tr>
<td>To Educational Institutions</td>
<td>15 cents</td>
</tr>
<tr>
<td>Other</td>
<td>3 cents</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100 cents</td>
</tr>
</tbody>
</table>

*a Based on obligations.

Source: 45

---

#### SCIENTISTS AND ENGINEERS IN INDUSTRY, JANUARY 1957

<table>
<thead>
<tr>
<th>Occupation</th>
<th>ALL OCCUPATIONS</th>
<th>Engineers</th>
<th>Chemists</th>
<th>Metallurgists</th>
<th>Physicists</th>
<th>Mathematicians</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Industries</td>
<td>738,000</td>
<td>528,200</td>
<td>72,000</td>
<td>10,800</td>
<td>12,100</td>
<td>12,400</td>
<td>71,800</td>
</tr>
<tr>
<td>Aircraft</td>
<td>84,900</td>
<td>66,000</td>
<td>1,600</td>
<td>900</td>
<td>1,900</td>
<td>2,200</td>
<td>12,200</td>
</tr>
<tr>
<td>Percent in Aircraft</td>
<td>11.4</td>
<td>12.5</td>
<td>2.2</td>
<td>8.3</td>
<td>15.7</td>
<td>17.7</td>
<td>17.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation</th>
<th>ALL OCCUPATIONS</th>
<th>Engineers</th>
<th>Chemists</th>
<th>Metallurgists</th>
<th>Physicists</th>
<th>Mathematicians</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Industries</td>
<td>227,700</td>
<td>154,900</td>
<td>32,700</td>
<td>4,300</td>
<td>7,100</td>
<td>4,100</td>
<td>18,700</td>
</tr>
<tr>
<td>Aircraft</td>
<td>56,700</td>
<td>44,800</td>
<td>1,100</td>
<td>600</td>
<td>1,500</td>
<td>1,600</td>
<td>7,100</td>
</tr>
<tr>
<td>Percent in Aircraft</td>
<td>24.9</td>
<td>28.9</td>
<td>33.9</td>
<td>14.0</td>
<td>21.1</td>
<td>39.0</td>
<td>38.0</td>
</tr>
</tbody>
</table>

#### PERCENTAGE INCREASE IN SCIENTISTS AND ENGINEERS JAN. 1954 TO JAN. 1957

<table>
<thead>
<tr>
<th>Occupation</th>
<th>ALL OCCUPATIONS</th>
<th>Engineers</th>
<th>Chemists</th>
<th>Metallurgists</th>
<th>Physicists</th>
<th>Mathematicians</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Industries</td>
<td>30.1</td>
<td>27.0</td>
<td>16.1</td>
<td>14.3</td>
<td>59.5</td>
<td>91.4</td>
<td>67.2</td>
</tr>
<tr>
<td>Aircraft</td>
<td>75.0</td>
<td>60.5</td>
<td>59.5</td>
<td>34.3</td>
<td>58.7</td>
<td>104.1</td>
<td>257.4</td>
</tr>
</tbody>
</table>

*a Includes Earth Scientists and Life Scientists.
* Includes Scientists and Engineers classified as "Administrators."

Source: 43
Brief Glossary of Terms Used In Federal and Military Budgeting and Financial Accounting

**Apportionment:** A ceiling established by the Bureau of the Budget of amounts available to an agency for obligation or expenditure in an appropriation or fund account for specified time periods, activities, functions, projects, objects, or combinations thereof. The apportioned amount is the limit to the obligations that may be incurred by the agency receiving the apportionment.

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

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

**Available for Expenditure:** Total funds available to an agency for expenditure. At any one time the total includes unexpended carryover from prior years and new obligational availability. Funds available for expenditure are net of refunds and reimbursements.

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

**New Obligational Authority:** Congressional appropriations and re appropriations.

**New Obligational Availability:** New obligational authority plus transfers.

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

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

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

Source: 29, 26
### ATOMIC ENERGY COMMISSION
**Expenditures for Research and Development**
1954 to Date (Millions of Dollars)

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total</th>
<th>Conduct of Research and Development</th>
<th>Increase in Research and Development Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Production and Weapons</td>
</tr>
<tr>
<td>1954</td>
<td>$274.3</td>
<td>$229.5</td>
<td>$ 96.0</td>
</tr>
<tr>
<td>1955</td>
<td>289.8</td>
<td>253.4</td>
<td>92.1</td>
</tr>
<tr>
<td>1956</td>
<td>385.1</td>
<td>335.5</td>
<td>106.4</td>
</tr>
<tr>
<td>1957</td>
<td>512.2</td>
<td>419.5</td>
<td>90.1</td>
</tr>
<tr>
<td>1958</td>
<td>637.0</td>
<td>516.1</td>
<td>110.6</td>
</tr>
<tr>
<td>1959&lt;sup&gt;a&lt;/sup&gt;</td>
<td>790.3</td>
<td>617.6</td>
<td>104.3</td>
</tr>
<tr>
<td>1960&lt;sup&gt;a&lt;/sup&gt;</td>
<td>845.6</td>
<td>651.9</td>
<td>85.5</td>
</tr>
</tbody>
</table>

Source: 26
Employment in the aerospace industry declined generally during 1958. In January of the year employment in the industry stood at 762,400, but by May it had dropped to 742,800. During the last half of the year, however, the employment picture brightened somewhat, gaining steadily to 767,400 in December 1958. In February 1959, employment once more began to drop—falling by month’s end to 756,600. It is expected to level out at about this average figure for the remainder of the year.

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

The “cold” war in which the United States finds itself has been characterized as an arms race. In a restricted sense of the word there
is some degree of truth in this analysis. Without doubt, the Soviet Union is deliberately creating a potent military force that can have only one purpose: aggression. It has to be classed as a potential offensive machine, since no other world power has in any way threatened to attack the USSR.

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

**AIRCRAFT AND TOTAL MANUFACTURING EMPLOYMENT, 1914 TO DATE**

<table>
<thead>
<tr>
<th>Year or Month</th>
<th>Aircraft Employment (in thousands)</th>
<th>Total Manufacturing Employment</th>
<th>Aircraft as Percent of Total Manufacturing Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1914</td>
<td>.2</td>
<td>7,514</td>
<td>.1</td>
</tr>
<tr>
<td>1919</td>
<td>4.2</td>
<td>9,837</td>
<td>.5</td>
</tr>
<tr>
<td>1921</td>
<td>2.0</td>
<td>7,557</td>
<td>.7</td>
</tr>
<tr>
<td>1929</td>
<td>18.6</td>
<td>9,660</td>
<td>.1</td>
</tr>
<tr>
<td>1933</td>
<td>9.6</td>
<td>6,558</td>
<td>.2</td>
</tr>
<tr>
<td>1939</td>
<td>64.0</td>
<td>9,527</td>
<td>.8</td>
</tr>
<tr>
<td>Dec. 1941</td>
<td>423.0</td>
<td>13,817</td>
<td>3.1</td>
</tr>
<tr>
<td>Nov. 1943</td>
<td>1,342.5</td>
<td>17,858</td>
<td>7.5</td>
</tr>
<tr>
<td>Aug. 1945</td>
<td>351.4</td>
<td>15,343</td>
<td>2.2</td>
</tr>
<tr>
<td>Including subcontractors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec. 1941</td>
<td>567.0</td>
<td>13,817</td>
<td>4.1</td>
</tr>
<tr>
<td>Nov. 1943</td>
<td>2,101.6</td>
<td>17,858</td>
<td>11.8</td>
</tr>
<tr>
<td>Aug. 1945</td>
<td>519.9</td>
<td>15,343</td>
<td>3.4</td>
</tr>
<tr>
<td>1948</td>
<td>237.7</td>
<td>15,321</td>
<td>1.6</td>
</tr>
<tr>
<td>1950</td>
<td>281.8</td>
<td>14,967</td>
<td>1.9</td>
</tr>
<tr>
<td>1953</td>
<td>779.1</td>
<td>17,238</td>
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*Less than .05 percent.
Sources: 3, 39
### Employment in the Aircraft and Parts Industry, 1939 to Date

<table>
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<tr>
<th>Monthly Average for the Year</th>
<th>TOTAL</th>
<th>Aircraft (Air-frames)</th>
<th>Aircraft Engines and Parts</th>
<th>Aircraft Propellers and Parts</th>
<th>Other Aircraft Parts and Equipment</th>
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</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>148.8</td>
<td>14.9</td>
<td>137.6</td>
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</tbody>
</table>

N.A.—Not available.
Source: 39

Which nation is "leading"—USSR or the United States—is a matter of serious conjecture. In certain areas of hardware production—aircraft, for instance—our nation has a decided edge. In the missile area it appears that the Soviets may be somewhat ahead of the United States. Currently, because of the quality of skills demanded in the manufacture of its aeronautical products, aerospace industry employee wages are among the highest weekly wages for all manufacturing employees.

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

PRODUCTION WORKERS IN THE AIRCRAFT AND PARTS INDUSTRY
1939 TO DATE
(Thousands of Production Workers)

<table>
<thead>
<tr>
<th>Monthly Average for the Year</th>
<th>TOTAL</th>
<th>Aircraft (Airframes)</th>
<th>Aircraft Engines and Parts</th>
<th>Aircraft Propellers and Parts</th>
<th>Other Aircraft Parts and Equipment</th>
</tr>
</thead>
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<tr>
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<td>9.5</td>
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<td>N.A.</td>
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<td>35.0</td>
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<tr>
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<td>286.8</td>
<td>88.8</td>
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</table>

N.A.—Not available.
Source: 39

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

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

The aircraft and parts industry employs about 67 per cent of its total
## SALARIES AND WAGES IN THE AIRCRAFT INDUSTRY

1914 TO DATE

(Thousands of Dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>TOTAL</th>
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<th>Production Workers</th>
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<td></td>
<td></td>
<td>Wages</td>
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<td>$ 61</td>
<td>$ 135</td>
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<tr>
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<td>6,908</td>
<td>2,001</td>
<td>4,907</td>
</tr>
<tr>
<td>1921</td>
<td>3,235</td>
<td>1,033</td>
<td>2,202</td>
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<tr>
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<td>6,160</td>
<td>1,638</td>
<td>4,522</td>
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<tr>
<td>1925</td>
<td>N.A.</td>
<td>N.A.</td>
<td>4,222</td>
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<tr>
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<td>9,146</td>
<td>2,289</td>
<td>6,857</td>
</tr>
<tr>
<td>1929</td>
<td>31,448</td>
<td>9,524</td>
<td>21,924</td>
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<td>13,824</td>
<td>3,516</td>
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<tr>
<td>1935</td>
<td>21,475</td>
<td>6,582</td>
<td>14,893</td>
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<tr>
<td>1937</td>
<td>46,867</td>
<td>13,514</td>
<td>33,353</td>
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<tr>
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<td>108,286</td>
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<tr>
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<td>4,894,000*</td>
<td>2,231,000*</td>
<td>2,663,000*</td>
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</table>

N.A.—Not available.
*Estimate.
*This line and all following lines include data for aircraft engine manufacturers which are not available for prior years.

Sources: 11, 12

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

This is the largest number of scientists and engineers assigned to research and development by any major manufacturing industry, and reflects the intensive technological effort of the aircraft and missile industry. In addition, a substantial number of scientists and engineers
listed in the "electrical equipment" category are employed on projects directly relating to aircraft, missile and spacecraft projects.

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

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

### Average Weekly Hours in Aircraft and Parts Plants
1939 to Date

<table>
<thead>
<tr>
<th>Monthly Average for the Year</th>
<th>TOTAL</th>
<th>Aircraft Engines and Parts</th>
<th>Aircraft Propellers and Parts</th>
<th>Other Aircraft Parts and Equipment</th>
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<tr>
<td>1939</td>
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<td>41.0</td>
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<td>1959</td>
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<td>40.4</td>
<td>41.1</td>
<td>40.9</td>
</tr>
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</table>

N.A.—Not available.
Source: 39
From January 1954 to January 1957, the period covered by the National Science Foundation survey, the aircraft and parts industry increased its employment of scientists and engineers assigned to research and development projects by 105 per cent, the second largest gain registered by any industry. In all activities, the aircraft and missile industry led other manufacturers in the increase of scientific and engineering personnel with 75 per cent gain from January 1954 to 1957. This compares with an increase by all industries of 30 per cent.

### Average Weekly Earnings in Aircraft and Parts Plants 1939 to Date

(Includes Overtime Premiums)

<table>
<thead>
<tr>
<th>Monthly Average for the Year</th>
<th>Total</th>
<th>Aircraft (Airframes)</th>
<th>Aircraft Engines and Parts</th>
<th>Aircraft Propellers and Parts</th>
<th>Other Aircraft Parts and Equipment</th>
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<tr>
<td>1939 N.A.</td>
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<td>$36.93</td>
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<td>N.A.</td>
<td>N.A.</td>
</tr>
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<td>N.A.</td>
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<td>N.A.</td>
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<tr>
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<td>$53.99</td>
<td>56.30</td>
<td>$59.68</td>
<td>$56.50</td>
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<tr>
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<td>60.21</td>
<td>63.40</td>
<td>62.13</td>
<td>63.59</td>
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</tr>
<tr>
<td>1949 63.62</td>
<td>62.69</td>
<td>65.24</td>
<td>66.83</td>
<td>68.08</td>
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<tr>
<td>1950 68.39</td>
<td>67.15</td>
<td>71.40</td>
<td>73.90</td>
<td>70.81</td>
<td></td>
</tr>
<tr>
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<td>75.78</td>
<td>85.81</td>
<td>89.17</td>
<td>78.66</td>
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</tr>
<tr>
<td>1952 81.70</td>
<td>79.66</td>
<td>86.92</td>
<td>92.25</td>
<td>81.22</td>
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<tr>
<td>1953 83.80</td>
<td>82.19</td>
<td>87.29</td>
<td>85.90</td>
<td>85.17</td>
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<tr>
<td>1954 85.07</td>
<td>85.07</td>
<td>85.06</td>
<td>82.35</td>
<td>85.70</td>
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<tr>
<td>1955 89.62</td>
<td>89.40</td>
<td>88.97</td>
<td>90.47</td>
<td>90.49</td>
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</tr>
<tr>
<td>1956 95.99</td>
<td>94.89</td>
<td>96.90</td>
<td>96.93</td>
<td>98.01</td>
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<tr>
<td>1957 96.76</td>
<td>95.65</td>
<td>98.23</td>
<td>97.76</td>
<td>99.78</td>
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</tr>
<tr>
<td>1958 101.91</td>
<td>101.40</td>
<td>102.62</td>
<td>96.87</td>
<td>103.09</td>
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</tr>
<tr>
<td>1959 Feb.</td>
<td>105.67</td>
<td>105.04</td>
<td>107.68</td>
<td>99.80</td>
<td>105.50</td>
</tr>
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</table>

N.A.—Not available.

Source: 39
### Average Hourly Earnings in Aircraft and Parts Plants
**1939 to Date**
(Includes Overtime Premiums)

<table>
<thead>
<tr>
<th>Monthly Average for the Year</th>
<th>Total</th>
<th>Aircraft (Airframes)</th>
<th>Aircraft Engines and Parts</th>
<th>Aircraft Propellers and Parts</th>
<th>Other Aircraft Parts and Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939 N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>$0.83</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1940 N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>.83</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1941 N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>1.00</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1942 N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>1.21</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1943 N.A.</td>
<td>N.A.</td>
<td>$1.16E</td>
<td>1.26</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1944 N.A.</td>
<td>N.A.</td>
<td>1.22E</td>
<td>1.31</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1945 N.A.</td>
<td>N.A.</td>
<td>1.22E</td>
<td>1.28</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1946 N.A.</td>
<td>N.A.</td>
<td>1.28E</td>
<td>1.34</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1947 $1.38</td>
<td>1.36</td>
<td>1.41</td>
<td>$1.44</td>
<td>$1.41</td>
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<tr>
<td>1948 1.49</td>
<td>1.47</td>
<td>1.55</td>
<td>1.57</td>
<td>1.55</td>
<td></td>
</tr>
<tr>
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<td>1.60</td>
<td>1.63</td>
<td>1.61</td>
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<tr>
<td>1950 1.64</td>
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<td>1.73</td>
<td>1.70</td>
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</tr>
<tr>
<td>1951 1.79</td>
<td>1.75</td>
<td>1.89</td>
<td>1.93</td>
<td>1.80</td>
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</tr>
<tr>
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<td>1.87</td>
<td>1.98</td>
<td>2.05</td>
<td>1.88</td>
<td></td>
</tr>
<tr>
<td>1953 2.00</td>
<td>1.99</td>
<td>2.03</td>
<td>2.05</td>
<td>1.99</td>
<td></td>
</tr>
<tr>
<td>1954* 2.08</td>
<td>2.08</td>
<td>2.09</td>
<td>2.09</td>
<td>2.08</td>
<td></td>
</tr>
<tr>
<td>1955 2.17</td>
<td>2.17</td>
<td>2.17</td>
<td>2.18</td>
<td>2.17</td>
<td></td>
</tr>
<tr>
<td>1956 2.28</td>
<td>2.27</td>
<td>2.28</td>
<td>2.27</td>
<td>2.29</td>
<td></td>
</tr>
<tr>
<td>1957 2.36</td>
<td>2.35</td>
<td>2.39</td>
<td>2.35</td>
<td>2.37</td>
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<tr>
<td>1958 2.51</td>
<td>2.51</td>
<td>2.54</td>
<td>2.38</td>
<td>2.49</td>
<td></td>
</tr>
<tr>
<td>1959 Feb. 2.59</td>
<td>2.60</td>
<td>2.62</td>
<td>2.44</td>
<td>2.53</td>
<td></td>
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</table>

N.A.—Not available.
E Estimate.
Source: 39
### Work Stoppages in the Aircraft and Parts Industry

**1927—To Date**

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

N.A.—Not available.

Source: 38
## MANPOWER

**WORK-INJURY RATES FOR THE AIRCRAFT AND ALL MANUFACTURING INDUSTRIES**

**1939 TO DATE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Aircraft Industry</th>
<th>Aircraft Parts Industry</th>
<th>All Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Injury-Frequency Rates&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Severity Rates&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Injury-Frequency Rates&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>1939</td>
<td>12.9</td>
<td>1.9</td>
<td>b</td>
</tr>
<tr>
<td>1940</td>
<td>15.8</td>
<td>1.3</td>
<td>b</td>
</tr>
<tr>
<td>1941</td>
<td>10.4</td>
<td>1.4</td>
<td>b</td>
</tr>
<tr>
<td>1942</td>
<td>11.4</td>
<td>0.7</td>
<td>9.5</td>
</tr>
<tr>
<td>1943</td>
<td>9.7</td>
<td>0.7</td>
<td>11.7</td>
</tr>
<tr>
<td>1944</td>
<td>8.8</td>
<td>0.6</td>
<td>10.1</td>
</tr>
<tr>
<td>1945</td>
<td>9.4</td>
<td>1.2</td>
<td>10.6</td>
</tr>
<tr>
<td>1946</td>
<td>5.2</td>
<td>0.8</td>
<td>13.7</td>
</tr>
<tr>
<td>1947</td>
<td>4.8</td>
<td>0.7</td>
<td>11.1</td>
</tr>
<tr>
<td>1948</td>
<td>4.9</td>
<td>0.8</td>
<td>10.2</td>
</tr>
<tr>
<td>1949</td>
<td>4.3</td>
<td>1.0</td>
<td>9.2</td>
</tr>
<tr>
<td>1950</td>
<td>4.0</td>
<td>0.9</td>
<td>5.9</td>
</tr>
<tr>
<td>1951</td>
<td>4.5</td>
<td>0.6</td>
<td>7.1</td>
</tr>
<tr>
<td>1952</td>
<td>3.7</td>
<td>0.3</td>
<td>6.7</td>
</tr>
<tr>
<td>1953</td>
<td>3.8</td>
<td>0.6</td>
<td>6.3</td>
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<tr>
<td>1954</td>
<td>3.2</td>
<td>0.7</td>
<td>5.8</td>
</tr>
<tr>
<td>1955</td>
<td>2.8</td>
<td>0.3</td>
<td>4.8</td>
</tr>
<tr>
<td>1956</td>
<td>2.6</td>
<td>0.2</td>
<td>4.7</td>
</tr>
<tr>
<td>1957</td>
<td>2.7</td>
<td>0.3</td>
<td>3.8</td>
</tr>
<tr>
<td>1958</td>
<td>2.8</td>
<td>N.A.</td>
<td>4.5</td>
</tr>
</tbody>
</table>

N.A.—Not available.

<sup>a</sup>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.

<sup>b</sup>Included with "Aircraft."

Source: 40
## Employment in the Aircraft and Parts Industry, by Geographical Division and Selected States—1947 to 1956

<table>
<thead>
<tr>
<th>Geographical Divisions and Selected States</th>
<th>1947</th>
<th>1948</th>
<th>1949</th>
<th>1950</th>
<th>1951</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>227,582</td>
<td>219,445</td>
<td>254,358</td>
<td>273,956</td>
<td>462,194</td>
</tr>
<tr>
<td>New England</td>
<td>26,336</td>
<td>25,662</td>
<td>29,142</td>
<td>28,376</td>
<td>41,726</td>
</tr>
<tr>
<td>Mass.</td>
<td>440</td>
<td>204</td>
<td>9,108</td>
<td>8,263</td>
<td>9,800</td>
</tr>
<tr>
<td>Conn.</td>
<td>25,775</td>
<td>25,458</td>
<td>20,034</td>
<td>20,112</td>
<td>31,530</td>
</tr>
<tr>
<td>Me., N.H., Vt., R.I.</td>
<td>121</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>396</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>34,549</td>
<td>32,325</td>
<td>35,962</td>
<td>42,643</td>
<td>70,800</td>
</tr>
<tr>
<td>New York</td>
<td>16,747</td>
<td>16,789</td>
<td>19,138</td>
<td>24,129</td>
<td>42,239</td>
</tr>
<tr>
<td>New Jersey</td>
<td>11,879</td>
<td>11,654</td>
<td>13,881</td>
<td>14,667</td>
<td>22,162</td>
</tr>
<tr>
<td>Penna.</td>
<td>3,993</td>
<td>3,882</td>
<td>2,943</td>
<td>3,947</td>
<td>6,399</td>
</tr>
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<td>East North Central</td>
<td>31,674</td>
<td>24,734</td>
<td>25,996</td>
<td>28,443</td>
<td>59,581</td>
</tr>
<tr>
<td>Ohio</td>
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<td>9,740</td>
<td>9,990</td>
<td>10,357</td>
<td>24,513</td>
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<td>Indiana</td>
<td>12,616</td>
<td>13,767</td>
<td>14,135</td>
<td>16,483</td>
<td>21,856</td>
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<tr>
<td>Illinois</td>
<td>52</td>
<td>46</td>
<td>722</td>
<td>312</td>
<td>7,411</td>
</tr>
<tr>
<td>Mich., Wis.</td>
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<td>1,181</td>
<td>1,149</td>
<td>1,291</td>
<td>5,801</td>
</tr>
<tr>
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<td>10,704</td>
<td>14,076</td>
<td>21,331</td>
<td>23,786</td>
<td>47,194</td>
</tr>
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<td>Missouri</td>
<td>3,486</td>
<td>4,665</td>
<td>7,283</td>
<td>7,277</td>
<td>11,122</td>
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<tr>
<td>Kansas</td>
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<td>8,406</td>
<td>12,972</td>
<td>15,494</td>
<td>34,139</td>
</tr>
<tr>
<td>Minn., Iowa, N.D., Neb.</td>
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<td>1,005</td>
<td>1,076</td>
<td>1,015</td>
<td>1,933</td>
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<tr>
<td>South Atlantic</td>
<td>17,703</td>
<td>16,080</td>
<td>14,827</td>
<td>14,489</td>
<td>29,421</td>
</tr>
<tr>
<td>Maryland</td>
<td>16,761</td>
<td>15,440</td>
<td>14,071</td>
<td>14,081</td>
<td>24,569</td>
</tr>
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<td>Del., Va., W.Va.</td>
<td>784</td>
<td>571</td>
<td>623</td>
<td>282</td>
<td>454</td>
</tr>
<tr>
<td>N.C., S.C., Ga., Fla.</td>
<td>158</td>
<td>69</td>
<td>124</td>
<td>126</td>
<td>4,398</td>
</tr>
<tr>
<td>East South Central</td>
<td>769</td>
<td>659</td>
<td>599</td>
<td>716</td>
<td>1,100</td>
</tr>
<tr>
<td>(Ky., Tenn., Ala., Miss.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>West South Central</td>
<td>14,358</td>
<td>15,775</td>
<td>22,891</td>
<td>27,052</td>
<td>44,274</td>
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<td>(La., Okla., Tex.)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>274</td>
<td>189</td>
<td>230</td>
<td>379</td>
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<tr>
<td>Arizona</td>
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<td>99</td>
<td>1,266</td>
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<td>Wyo., Colo., N.Mex., Utah, Nev.</td>
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<td>189</td>
<td>191</td>
<td>280</td>
<td>553</td>
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<td>89,945</td>
<td>103,380</td>
<td>108,072</td>
<td>166,279</td>
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<td>74,666</td>
<td>79,337</td>
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<td>24,043</td>
<td>19,795</td>
<td>27,718</td>
</tr>
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</table>

**Note:** The difference between these totals and employment totals appearing elsewhere are due to technical differences in methodologies of B.E.S., B.L.S., and Census, and do not seriously affect the usability of the data.

**Source:** 37
MANPOWER

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

<table>
<thead>
<tr>
<th>Geographical Divisions and Selected States</th>
<th>1952</th>
<th>1953</th>
<th>1954</th>
<th>1955</th>
<th>1956</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>663,803</td>
<td>774,150</td>
<td>761,964</td>
<td>745,424</td>
<td>818,074</td>
</tr>
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<td>New England</td>
<td>59,722</td>
<td>69,335</td>
<td>67,040</td>
<td>66,672</td>
<td>77,845</td>
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<tr>
<td>Mass.</td>
<td>10,043</td>
<td>10,148</td>
<td>8,762</td>
<td>8,977</td>
<td>9,092</td>
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<tr>
<td>Conn.</td>
<td>46,467</td>
<td>54,623</td>
<td>55,349</td>
<td>56,269</td>
<td>67,166</td>
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<td>Me., N.H., Vt., R.I.</td>
<td>3,212</td>
<td>4,564</td>
<td>2,929</td>
<td>1,426</td>
<td>1,587</td>
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<tr>
<td>Middle Atlantic</td>
<td>104,386</td>
<td>127,349</td>
<td>122,622</td>
<td>103,372</td>
<td>103,837</td>
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<tr>
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<td>70,971</td>
<td>73,406</td>
<td>61,648</td>
<td>59,385</td>
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<td>32,272</td>
<td>27,409</td>
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<td>Penna.</td>
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<td>24,106</td>
<td>21,807</td>
<td>16,745</td>
<td>16,585</td>
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<tr>
<td>East North Central</td>
<td>109,318</td>
<td>146,560</td>
<td>132,207</td>
<td>121,821</td>
<td>123,484</td>
</tr>
<tr>
<td>Ohio</td>
<td>44,602</td>
<td>55,203</td>
<td>68,062</td>
<td>66,192</td>
<td>66,016</td>
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<tr>
<td>Indiana</td>
<td>32,932</td>
<td>33,288</td>
<td>29,212</td>
<td>28,554</td>
<td>30,643</td>
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<td>Illinois</td>
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<td>23,103</td>
<td>16,353</td>
<td>14,965</td>
<td>16,956</td>
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<tr>
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<td>34,966</td>
<td>18,580</td>
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<td>9,869</td>
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<tr>
<td>West North Central</td>
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<td>69,456</td>
<td>67,577</td>
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<td>68,682</td>
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<tr>
<td>Missouri</td>
<td>17,192</td>
<td>24,202</td>
<td>23,517</td>
<td>21,456</td>
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<td>Kansas</td>
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<td>42,320</td>
<td>41,463</td>
<td>39,308</td>
<td>41,348</td>
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<tr>
<td>Minn., Iowa, N.D., Neb.</td>
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<td>2,934</td>
<td>2,597</td>
<td>3,252</td>
<td>3,972</td>
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<tr>
<td>South Atlantic</td>
<td>43,118</td>
<td>45,201</td>
<td>45,044</td>
<td>49,535</td>
<td>54,494</td>
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<tr>
<td>Maryland</td>
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<td>30,546</td>
<td>29,227</td>
<td>30,339</td>
<td>33,690</td>
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<td>Del., Va., W.Va.</td>
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<td>741</td>
<td>386</td>
<td>408</td>
<td>538</td>
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<td>N.C., S.C., Ga., Fla.</td>
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<td>13,914</td>
<td>15,431</td>
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<td>20,266</td>
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<td>East South Central (Ky., Tenn., Ala., Miss.)</td>
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<td>5,141</td>
<td>6,411</td>
<td>5,803</td>
<td>7,540</td>
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<td>West South Central (La., Okla., Tex.)</td>
<td>53,018</td>
<td>57,158</td>
<td>53,176</td>
<td>54,003</td>
<td>63,201</td>
</tr>
<tr>
<td>Mountain</td>
<td>3,697</td>
<td>6,998</td>
<td>4,876</td>
<td>6,614</td>
<td>11,100</td>
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<td>Arizona</td>
<td>2,918</td>
<td>6,108</td>
<td>3,857</td>
<td>5,030</td>
<td>7,149</td>
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<tr>
<td>Wyo., Colo., N.Mex., Utah, Nev.</td>
<td>779</td>
<td>890</td>
<td>1,019</td>
<td>1,584</td>
<td>3,951</td>
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<tr>
<td>Pacific</td>
<td>223,501</td>
<td>246,952</td>
<td>263,011</td>
<td>273,588</td>
<td>307,891</td>
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<tr>
<td>California</td>
<td>193,279</td>
<td>212,648</td>
<td>225,407</td>
<td>234,022</td>
<td>263,009</td>
</tr>
<tr>
<td>Wash., Ore.</td>
<td>30,222</td>
<td>34,304</td>
<td>37,604</td>
<td>39,566</td>
<td>44,882</td>
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</table>
### Labor Turnover in the Aircraft and Parts Industry, 1950 to Date
(Rates per 100 Employees per Year)

<table>
<thead>
<tr>
<th>Date</th>
<th>Total Acces-sions</th>
<th>Total Separa-tions</th>
<th>Aircraft (Airframes) Acces-sions</th>
<th>Aircraft (Airframes) Separa-tions</th>
<th>Aircraft Engines and Parts Acces-sions</th>
<th>Aircraft Engines and Parts Separa-tions</th>
<th>Aircraft Propellers and Parts Acces-sions</th>
<th>Aircraft Propellers and Parts Separa-tions</th>
<th>Other Aircraft Parts and Equipment Acces-sions</th>
<th>Other Aircraft Parts and Equipment Separa-tions</th>
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</thead>
<tbody>
<tr>
<td>1950</td>
<td>62.8</td>
<td>33.8</td>
<td>67.2</td>
<td>37.1</td>
<td>48.2</td>
<td>21.3</td>
<td>32.0</td>
<td>17.6</td>
<td>59.6</td>
<td>27.6</td>
</tr>
<tr>
<td>1951</td>
<td>94.8</td>
<td>50.0</td>
<td>97.5</td>
<td>52.4</td>
<td>86.9</td>
<td>39.6</td>
<td>52.7</td>
<td>27.6</td>
<td>89.6</td>
<td>44.5</td>
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<td>1952</td>
<td>63.1</td>
<td>45.9</td>
<td>64.1</td>
<td>49.0</td>
<td>60.1</td>
<td>40.8</td>
<td>49.1</td>
<td>25.1</td>
<td>65.3</td>
<td>41.3</td>
</tr>
<tr>
<td>1953</td>
<td>47.5</td>
<td>42.7</td>
<td>47.2</td>
<td>42.7</td>
<td>47.4</td>
<td>43.2</td>
<td>33.2</td>
<td>28.3</td>
<td>52.7</td>
<td>47.8</td>
</tr>
<tr>
<td>1954</td>
<td>28.2</td>
<td>31.8</td>
<td>28.2</td>
<td>29.5</td>
<td>21.6</td>
<td>36.3</td>
<td>13.1</td>
<td>41.7</td>
<td>33.0</td>
<td>37.1</td>
</tr>
<tr>
<td>1955</td>
<td>33.1</td>
<td>29.5</td>
<td>38.0</td>
<td>27.4</td>
<td>30.7</td>
<td>28.8</td>
<td>22.7</td>
<td>38.2</td>
<td>43.3</td>
<td>52.5</td>
</tr>
<tr>
<td>1956</td>
<td>41.9</td>
<td>28.5</td>
<td>40.8</td>
<td>26.6</td>
<td>41.1</td>
<td>28.3</td>
<td>43.3</td>
<td>20.9</td>
<td>49.5</td>
<td>48.9</td>
</tr>
<tr>
<td>1957</td>
<td>30.1</td>
<td>42.5</td>
<td>31.0</td>
<td>42.0</td>
<td>21.9</td>
<td>38.6</td>
<td>32.9</td>
<td>25.8</td>
<td>41.9</td>
<td>63.8</td>
</tr>
<tr>
<td>1958</td>
<td>26.6</td>
<td>31.2</td>
<td>25.8</td>
<td>28.5</td>
<td>27.3</td>
<td>34.6</td>
<td>10.8&lt;sup&gt;e&lt;/sup&gt;</td>
<td>42.0&lt;sup&gt;e&lt;/sup&gt;</td>
<td>39.0</td>
<td>43.9</td>
</tr>
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</table>

Source: 30

### Women Employees in the Aircraft Industry, 1942 to Date

<table>
<thead>
<tr>
<th>Date</th>
<th>Number (thousands)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 1942</td>
<td>23.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Nov. 1943</td>
<td>486.1</td>
<td>36.7</td>
</tr>
<tr>
<td>Oct. 1947</td>
<td>28.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Sept. 1949</td>
<td>33.3</td>
<td>12.5</td>
</tr>
<tr>
<td>Sept. 1950</td>
<td>36.2</td>
<td>12.4</td>
</tr>
<tr>
<td>Sept. 1951</td>
<td>88.6</td>
<td>17.7</td>
</tr>
<tr>
<td>Sept. 1952</td>
<td>117.9</td>
<td>18.0</td>
</tr>
<tr>
<td>Sept. 1953</td>
<td>133.4</td>
<td>17.6</td>
</tr>
<tr>
<td>Sept. 1954</td>
<td>132.3</td>
<td>16.6</td>
</tr>
<tr>
<td>Oct. 1955</td>
<td>118.4</td>
<td>15.7</td>
</tr>
<tr>
<td>Oct. 1956</td>
<td>135.4</td>
<td>15.6</td>
</tr>
<tr>
<td>Oct. 1957</td>
<td>134.7</td>
<td>15.9</td>
</tr>
<tr>
<td>Oct. 1958</td>
<td>112.9</td>
<td>14.8</td>
</tr>
</tbody>
</table>

Sources: 3, 39
Some 82 per cent of aerospace industry revenues are derived from Government contracts for weapons for the three services. A slightly larger percentage of our research and development efforts are for military purposes. An even higher percentage of the funds the industry is spending for new facilities—new plants, new test centers, new tools—are for military use.*

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

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

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

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Sales</th>
<th>Total Income</th>
<th>Total Federal Taxes, net</th>
<th>Net Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937</td>
<td>$ 61.8</td>
<td>$ 3.6</td>
<td>$ 1.3</td>
<td>$ 2.3</td>
</tr>
<tr>
<td>1938</td>
<td>88.5</td>
<td>10.1</td>
<td>2.1</td>
<td>8.0</td>
</tr>
<tr>
<td>1939</td>
<td>141.0</td>
<td>19.1</td>
<td>4.5</td>
<td>14.6</td>
</tr>
<tr>
<td>1940</td>
<td>247.4</td>
<td>45.1</td>
<td>13.3</td>
<td>31.8</td>
</tr>
<tr>
<td>1941</td>
<td>812.6</td>
<td>168.7</td>
<td>108.6</td>
<td>60.1</td>
</tr>
<tr>
<td>1942</td>
<td>2,788.9</td>
<td>341.8</td>
<td>281.2</td>
<td>60.6</td>
</tr>
<tr>
<td>1943</td>
<td>5,209.0</td>
<td>429.8</td>
<td>367.0</td>
<td>72.8</td>
</tr>
<tr>
<td>1944</td>
<td>5,766.3</td>
<td>322.1</td>
<td>263.5</td>
<td>58.6</td>
</tr>
<tr>
<td>1945</td>
<td>3,965.3</td>
<td>215.1</td>
<td>147.7</td>
<td>67.4</td>
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<tr>
<td>1946</td>
<td>519.0</td>
<td>(37.0)</td>
<td>26.3&quot;</td>
<td>(10.7)</td>
</tr>
<tr>
<td>1947</td>
<td>545.0</td>
<td>(115.4)</td>
<td>73.5&quot;</td>
<td>(41.9)</td>
</tr>
<tr>
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<td>843.4</td>
<td>24.2</td>
<td>21.8</td>
<td>2.4</td>
</tr>
<tr>
<td>1949</td>
<td>1,131.7</td>
<td>57.8</td>
<td>21.7</td>
<td>36.1</td>
</tr>
<tr>
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<td>48.5</td>
<td>62.6</td>
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<td>68.0</td>
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</tr>
<tr>
<td>1952</td>
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<td>220.5</td>
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<td>81.7</td>
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<tr>
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<td>371.0</td>
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<td>182.6&quot;</td>
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<tr>
<td>1955</td>
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<td>370.7</td>
<td>191.9</td>
<td>178.8&quot;</td>
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<tr>
<td>1956</td>
<td>5,637.1</td>
<td>328.1</td>
<td>171.6</td>
<td>156.5&quot;</td>
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<tr>
<td>1957</td>
<td>6,912.7</td>
<td>346.8</td>
<td>150.4</td>
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<tr>
<td>1958</td>
<td>7,280.9</td>
<td>294.9</td>
<td>152.5</td>
<td>142.4&quot;</td>
</tr>
</tbody>
</table>

* Subject to renegotiation.
** Credit.
Figures in parentheses indicate loss.
Source: 1
<table>
<thead>
<tr>
<th>Industry</th>
<th>Net Profit as Percent of Sales (1958)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Ferrous Metals</td>
<td>6.4</td>
</tr>
<tr>
<td>Petroleum Products</td>
<td>8.4</td>
</tr>
<tr>
<td>Autos and Trucks</td>
<td>4.2</td>
</tr>
<tr>
<td>Railway Equipment</td>
<td>3.5</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>6.3</td>
</tr>
<tr>
<td>Aircraft and Parts</td>
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</tr>
<tr>
<td>All Manufacturing</td>
<td>5.2</td>
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</table>
previous high of 1957 and exceeded the peak of World War II. Total sales in 1958 of the 12 major airframe companies were $7.3 billion, exceeding the previous high of $6.9 billion in 1957 and the World War II peak of $5.8 billion in 1944.

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

During the year 1958, the effects of the Department of Defense policy to shift financial responsibilities to industry were felt with increasing intensity, and are reflected in the consolidated balance sheets. The Department of Defense is following a policy of decreasing the Government’s financial investment in “work-in-process” by requiring industry to provide increased working capital. Department of Defense policy also is decreasing the Government’s investment in brick and mortar, facilities and equipment. Industry was responsible for large financial responsibilities in research, developing and testing programs needed to lay the basis for the aircraft, missiles, spacecraft, power plants and accessories that the military services will need in the next decade. Bank borrowings, both long- and short-term, were again increased to $689
### BALANCE SHEET COMPARISONS, 12 MAJOR AIRFRAME COMPANIES

**1953 to Date**

(Thousands of Dollars)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Current assets</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>$261,932</td>
<td>$295,365</td>
<td>$295,506</td>
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<td>463,848</td>
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<td>23,040</td>
<td>31,329</td>
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<td>52,582</td>
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<tr>
<td><strong>Total current assets</strong></td>
<td>$1,405,200</td>
<td>$1,388,702</td>
<td>$1,449,974</td>
<td>$1,811,698</td>
<td>$2,013,926</td>
<td>$2,357,794</td>
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<tr>
<td><strong>Total net plant</strong></td>
<td>166,077</td>
<td>186,406</td>
<td>214,077</td>
<td>309,984</td>
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<td>Investments</td>
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<tr>
<td>Development, etc., expenses</td>
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<td>Deferred charges</td>
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<td>19,410</td>
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<td>30,119</td>
<td>23,738</td>
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</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$1,596,331</td>
<td>$1,601,117</td>
<td>$1,689,140</td>
<td>$2,150,106</td>
<td>$2,488,625</td>
<td>$2,866,545</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current liabilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payables</td>
<td>$544,162</td>
<td>$396,217</td>
<td>$375,822</td>
<td>635,018</td>
<td>874,693</td>
<td>960,713</td>
</tr>
<tr>
<td>Accruals—taxes—renegotiation—refunds due U.S.</td>
<td>406,906</td>
<td>409,039</td>
<td>375,642</td>
<td>347,620</td>
<td>335,246</td>
<td>363,081</td>
</tr>
<tr>
<td>Advances—contracts deposits</td>
<td>92,540</td>
<td>121,403</td>
<td>127,246</td>
<td>176,468</td>
<td>126,525</td>
<td>126,281</td>
</tr>
<tr>
<td>Reserve</td>
<td>3,458</td>
<td>8,851</td>
<td>12,317</td>
<td>5,078</td>
<td>4,800</td>
<td>8,373</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>8,347</td>
<td>11,112</td>
<td>13,509</td>
<td>27,315</td>
<td>31,303</td>
<td>36,779</td>
</tr>
<tr>
<td><strong>Total current liabilities</strong></td>
<td>$1,055,413</td>
<td>$946,622</td>
<td>$904,536</td>
<td>$1,191,499</td>
<td>$1,372,567</td>
<td>$1,495,227</td>
</tr>
<tr>
<td><strong>Bank loans, etc.</strong></td>
<td>8,648</td>
<td>8,589</td>
<td>36,756</td>
<td>73,600</td>
<td>127,804</td>
<td>260,869</td>
</tr>
<tr>
<td><strong>Contingency reserve</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capital stock</strong></td>
<td>95,460</td>
<td>125,706</td>
<td>135,499</td>
<td>168,391</td>
<td>178,006</td>
<td>201,440</td>
</tr>
<tr>
<td><strong>Capital (paid) surplus</strong></td>
<td>77,181</td>
<td>100,331</td>
<td>110,216</td>
<td>162,056</td>
<td>164,283</td>
<td>197,939</td>
</tr>
<tr>
<td><strong>Earned surplus</strong></td>
<td>353,885</td>
<td>415,443</td>
<td>495,861</td>
<td>548,971</td>
<td>638,418</td>
<td>703,187</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>5,744</td>
<td>4,426</td>
<td>6,272</td>
<td>5,499</td>
<td>6,947</td>
<td>7,883</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td>$1,596,331</td>
<td>$1,601,117</td>
<td>$1,689,140</td>
<td>$2,150,106</td>
<td>$2,488,625</td>
<td>$2,866,545</td>
</tr>
<tr>
<td><strong>Net current assets</strong></td>
<td>$349,787</td>
<td>$442,080</td>
<td>$545,438</td>
<td>$620,199</td>
<td>$641,359</td>
<td>$862,567</td>
</tr>
</tbody>
</table>

Source: 1
Composition of Current Assets, 1937 to Date, 12 Major Airframe Companies
(In Percent of Total)

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

Source: 1

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

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

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

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

Figures in parentheses indicate net loss as a percent of sales.

* Subject to renegotiation.
Source: 1
of the additional capitalization that would be required by all contractors to finance payrolls and inventories during production cycles exceeding 12 months.

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

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

<table>
<thead>
<tr>
<th>Company</th>
<th>July 1, 1950 to June 30, 1958</th>
<th>July 1, 1957 to June 30, 1958</th>
<th>World War II</th>
</tr>
</thead>
<tbody>
<tr>
<td>U. S. Total, All Contracts, (in Billions)</td>
<td>$181.3</td>
<td>$21.8</td>
<td>$193.3b</td>
</tr>
</tbody>
</table>

### 20 Largest Defense Contractors

<table>
<thead>
<tr>
<th>Company</th>
<th>July 1, 1950 to June 30, 1958</th>
<th>July 1, 1957 to June 30, 1958</th>
<th>World War II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing Airplane</td>
<td>5.1</td>
<td>9.8</td>
<td>1.5</td>
</tr>
<tr>
<td>General Motors</td>
<td>4.1</td>
<td>1.3</td>
<td>7.9</td>
</tr>
<tr>
<td>United Aircraft</td>
<td>3.6</td>
<td>3.0</td>
<td>2.2</td>
</tr>
<tr>
<td>General Dynamics</td>
<td>3.6</td>
<td>6.3</td>
<td>*</td>
</tr>
<tr>
<td>General Electric</td>
<td>3.6</td>
<td>3.6</td>
<td>1.9</td>
</tr>
<tr>
<td>North American Aviation</td>
<td>2.9</td>
<td>3.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Douglas Aircraft</td>
<td>2.8</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Lockheed Aircraft</td>
<td>2.7</td>
<td>3.5</td>
<td>1.9</td>
</tr>
<tr>
<td>American Telephone &amp; Telegraph</td>
<td>2.1</td>
<td>3.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Curtiss-Wright</td>
<td>1.6</td>
<td>1.0</td>
<td>4.1b</td>
</tr>
<tr>
<td>Republic Aviation</td>
<td>1.5</td>
<td>1.2</td>
<td>.7</td>
</tr>
<tr>
<td>Ford Motor</td>
<td>1.4</td>
<td>.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Chrysler</td>
<td>1.4</td>
<td>1.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Martin</td>
<td>1.2</td>
<td>1.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Sperry Rand</td>
<td>1.1</td>
<td>1.7</td>
<td>.9b</td>
</tr>
<tr>
<td>Bendix Aviation</td>
<td>1.0</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>McDonnell Aircraft</td>
<td>1.0</td>
<td>1.6</td>
<td>N.A.</td>
</tr>
<tr>
<td>Westinghouse Electric</td>
<td>.9</td>
<td>1.2</td>
<td>.8</td>
</tr>
<tr>
<td>Grumman Aircraft</td>
<td>.9</td>
<td>1.1</td>
<td>.3</td>
</tr>
<tr>
<td>Hughes Aircraft</td>
<td>.9</td>
<td>2.2</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

### Other Selected Major Contractors

<table>
<thead>
<tr>
<th>Company</th>
<th>July 1, 1950 to June 30, 1958</th>
<th>July 1, 1957 to June 30, 1958</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northrop</td>
<td>.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Fairchild</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>Chance Vought</td>
<td>.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Bell Aircraft</td>
<td>.4</td>
<td>.4</td>
</tr>
</tbody>
</table>

N.A.—Not Available.

* Listed among the 12 major airframe manufacturers.

b Estimate.

* Major change in corporate composition or product during the period.

b Does not include Chance Vought.

Sources: 20, 48
NET PROFIT AS PERCENT OF SALES,
Seven Selected Industries,
1952 to Date
(After Taxes)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonferrous Metals</td>
<td>6.9</td>
<td>7.3</td>
<td>9.5</td>
<td>10.5</td>
<td>7.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Petroleum Products</td>
<td>10.6</td>
<td>10.7</td>
<td>10.6</td>
<td>10.4</td>
<td>9.7</td>
<td>8.4</td>
</tr>
<tr>
<td>Autos and Trucks</td>
<td>4.4</td>
<td>6.4</td>
<td>7.4</td>
<td>5.7</td>
<td>5.7</td>
<td>4.2</td>
</tr>
<tr>
<td>Railway Equipment</td>
<td>3.3</td>
<td>4.1</td>
<td>4.7</td>
<td>4.4</td>
<td>4.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>5.7</td>
<td>6.0</td>
<td>7.8</td>
<td>7.2</td>
<td>7.4</td>
<td>6.3</td>
</tr>
<tr>
<td>AIRCRAFT AND PARTS</td>
<td>2.4</td>
<td>3.8</td>
<td>3.9</td>
<td>3.4</td>
<td>3.0</td>
<td>2.6</td>
</tr>
<tr>
<td>Total Manufacturing</td>
<td>5.3</td>
<td>5.9</td>
<td>6.7</td>
<td>6.0</td>
<td>5.9</td>
<td>5.2</td>
</tr>
</tbody>
</table>

* Subject to renegotiation.
Source: 28

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

<table>
<thead>
<tr>
<th></th>
<th>1957</th>
<th></th>
<th>1958</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dollars</td>
<td>Percent</td>
<td>Dollars</td>
<td>Percent</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$5.3</td>
<td>100</td>
<td>$5.2</td>
<td>100</td>
</tr>
<tr>
<td>Purchases from Small Business</td>
<td>1.0</td>
<td>20</td>
<td>.8</td>
<td>16</td>
</tr>
<tr>
<td>Purchases from Large Business</td>
<td>2.1</td>
<td>39</td>
<td>1.8</td>
<td>35</td>
</tr>
<tr>
<td>Overhead, Payroll, Etc.</td>
<td>2.2</td>
<td>41</td>
<td>2.5</td>
<td>49</td>
</tr>
</tbody>
</table>

Source: 1
General Aviation in 1958 continued its record of phenomenal growth which has characterized the utility aircraft industry since the end of World War II.

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

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

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

A major factor in this growth is the increasing acceptance of the
# Production of Civil Airplanes

## 1937–1945, by Number of Engines and Places

<table>
<thead>
<tr>
<th>Year</th>
<th>TOTAL PRODUCTION</th>
<th>By Number of Engines</th>
<th>Landplanes, by Place</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Single</td>
<td>Multi</td>
</tr>
<tr>
<td>1937</td>
<td>2,289¹</td>
<td>2,171</td>
<td>118</td>
</tr>
<tr>
<td>1938</td>
<td>1,833</td>
<td>1,770</td>
<td>53</td>
</tr>
<tr>
<td>1940</td>
<td>6,785</td>
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<td>1945</td>
<td>2,047</td>
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</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>TOTAL PRODUCTION</th>
<th>By Type of Use</th>
<th>By Place</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>General⁵</td>
<td>Transports</td>
</tr>
<tr>
<td>1946</td>
<td>35,001</td>
<td>34,568</td>
<td>433</td>
</tr>
<tr>
<td>1948</td>
<td>7,302</td>
<td>7,039</td>
<td>263</td>
</tr>
<tr>
<td>1950</td>
<td>3,520</td>
<td>3,391</td>
<td>129</td>
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<tr>
<td>1951</td>
<td>2,477</td>
<td>2,279</td>
<td>198</td>
</tr>
<tr>
<td>1952</td>
<td>3,509</td>
<td>3,057</td>
<td>452</td>
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<tr>
<td>1953</td>
<td>4,134</td>
<td>3,825</td>
<td>309</td>
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</tr>
<tr>
<td>1956</td>
<td>7,205</td>
<td>6,778</td>
<td>427</td>
</tr>
<tr>
<td>1957</td>
<td>6,805</td>
<td>6,208</td>
<td>597</td>
</tr>
<tr>
<td>1958</td>
<td>6,882</td>
<td>6,522</td>
<td>360</td>
</tr>
</tbody>
</table>

* N.A.—Not available.

¹ Civil airplane production shown here differs from that on pp 6 & 7. Recent FAA revision of total civil airplane production not yet carried through all breakdowns.

⁵ The "General" category conforms closely to the total shipments figures of "Utility Aircraft" on pages 90 and 91.

Sources: 13, 27

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

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

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

Instructional flying hours increased sharply from 1.3 million in 1954

<table>
<thead>
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<th>As of January 1</th>
<th>Total</th>
<th>Active</th>
<th>Inactive</th>
</tr>
</thead>
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<tr>
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<td>2,740</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1932</td>
<td>10,680</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1935</td>
<td>8,322</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1941</td>
<td>26,013</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1951</td>
<td>92,809</td>
<td>60,921</td>
<td>31,888</td>
</tr>
<tr>
<td>1952</td>
<td>88,545</td>
<td>54,039</td>
<td>34,506</td>
</tr>
<tr>
<td>1955</td>
<td>92,067</td>
<td>58,994</td>
<td>33,073</td>
</tr>
<tr>
<td>1956</td>
<td>85,320</td>
<td>60,432</td>
<td>24,888</td>
</tr>
<tr>
<td>1957</td>
<td>87,531</td>
<td>64,688</td>
<td>22,843</td>
</tr>
<tr>
<td>1958</td>
<td>93,189</td>
<td>67,153</td>
<td>26,036</td>
</tr>
</tbody>
</table>

N.A.—Not available.
E Estimate.
Source: 27
to 1.9 million in 1957, which further bears out the strong and steady growth trend in the field of general aviation.

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

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

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

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

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

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

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

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

### Civil Aircraft*, by Year of Manufacture

As of January 1, 1958

<table>
<thead>
<tr>
<th>Year of Manufacture</th>
<th>Number</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1957</td>
<td>4,573</td>
<td>6.8</td>
</tr>
<tr>
<td>1956</td>
<td>5,265</td>
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<tr>
<td>1955</td>
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<td>4.9</td>
</tr>
<tr>
<td>1954</td>
<td>2,188</td>
<td>3.3</td>
</tr>
<tr>
<td>1953</td>
<td>2,718</td>
<td>4.1</td>
</tr>
<tr>
<td>1952</td>
<td>2,338</td>
<td>3.5</td>
</tr>
<tr>
<td>1951</td>
<td>1,450</td>
<td>2.2</td>
</tr>
<tr>
<td>1950</td>
<td>2,241</td>
<td>3.3</td>
</tr>
<tr>
<td>1949</td>
<td>2,044</td>
<td>3.1</td>
</tr>
<tr>
<td>1948</td>
<td>3,966</td>
<td>5.9</td>
</tr>
<tr>
<td>1947</td>
<td>7,548</td>
<td>11.2</td>
</tr>
<tr>
<td>Prior to 1947</td>
<td>29,507</td>
<td>43.9</td>
</tr>
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</table>

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

Source: 18
### Annual Shipments of Utility Aircraft, 1947 to Date

(As reported to Aerospace Industries Association by selected manufacturers)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Aero Design</th>
<th>Beech</th>
<th>Cessna</th>
<th>Piper</th>
<th>All Other Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947</td>
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<td>1,288</td>
<td>2,390</td>
<td>3,464</td>
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<td>746</td>
<td>1,631</td>
<td>1,479</td>
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<tr>
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<td>3,405</td>
<td>341</td>
<td>857</td>
<td>1,278</td>
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<td>431</td>
<td>1,134</td>
<td>1,108</td>
<td>655</td>
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<tr>
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<td>392</td>
<td>551</td>
<td>1,081</td>
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<td>414</td>
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<td>67</td>
<td>579</td>
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<tr>
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<td>72</td>
<td>680</td>
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<td>1,870</td>
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<tr>
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<td>154</td>
<td>724</td>
<td>3,235</td>
<td>2,329</td>
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<td>6,118</td>
<td>139</td>
<td>788</td>
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<td>97</td>
<td>694</td>
<td>2,926</td>
<td>2,162</td>
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</table>

**Manufacturers Net Billing Price (Million Dollars)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Aero Design</th>
<th>Beech</th>
<th>Cessna</th>
<th>Piper</th>
<th>All Other Manufacturers</th>
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<td>1947</td>
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<td>$13.4</td>
<td>$ 6.0</td>
<td>$ 7.7</td>
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<td>6.8</td>
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<td>6.2</td>
<td>4.5</td>
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<td>3.9</td>
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</tr>
<tr>
<td>1950</td>
<td>19.2</td>
<td>6.5</td>
<td>5.5</td>
<td>3.1</td>
<td>4.1</td>
<td></td>
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<tr>
<td>1951</td>
<td>16.9</td>
<td>7.7</td>
<td>3.6</td>
<td>3.9</td>
<td>1.7</td>
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<td>1952</td>
<td>26.2</td>
<td>$ 2.0</td>
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<td>4.9</td>
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<tr>
<td>1955</td>
<td>68.3</td>
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<td>1956</td>
<td>103.8</td>
<td>11.2</td>
<td>38.5</td>
<td>23.5</td>
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<tr>
<td>1957</td>
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<td>1958</td>
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<td>6.9</td>
<td>27.1</td>
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*a The figures shown here may vary from CAA figures because they are based on reports by selected manufacturers only.
Source: 1
<table>
<thead>
<tr>
<th>Manufacturer and Model</th>
<th>Complete Aircraft Number</th>
<th>Manufacturers Net Billing Price (Thousands of Dollars)</th>
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<td>Model 680, 680E</td>
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<tr>
<td>Model 720</td>
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<tr>
<td>Beech</td>
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<td></td>
</tr>
<tr>
<td>Model 18S</td>
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<td>27,072</td>
</tr>
<tr>
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<td>Bonanza</td>
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</tr>
<tr>
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<tr>
<td>45 Mentor</td>
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<td></td>
</tr>
<tr>
<td>95 Travel Air</td>
<td>172</td>
<td></td>
</tr>
<tr>
<td>Call Air</td>
<td></td>
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<td>Model A4</td>
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<td>Model A5</td>
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<tr>
<td>Model A6</td>
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<td>Model 7FC</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>TOTAL</td>
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<td>101,939</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>State</th>
<th>Total active aircraft</th>
<th>Air Carrier (scheduled and irregular)</th>
<th>General Aviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Multi-engine</td>
<td>Postwar 4- and 5-Place Single Engine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama</td>
<td>597</td>
<td>10</td>
<td>43</td>
</tr>
<tr>
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<td>43</td>
</tr>
<tr>
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<tr>
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<td>7</td>
<td>32</td>
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<tr>
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<td>91</td>
</tr>
<tr>
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</tr>
<tr>
<td>Georgia</td>
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</tr>
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</tr>
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<tr>
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<td>45</td>
</tr>
<tr>
<td>Massachusetts</td>
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<td>29</td>
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<tr>
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<td>636</td>
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<td>17</td>
</tr>
<tr>
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<td>1,646</td>
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<td>102</td>
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<td>927</td>
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<td>37</td>
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<tr>
<td>Nebraska</td>
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<td>320</td>
<td>13</td>
<td>39</td>
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<td>New Hampshire</td>
<td>170</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>New Jersey</td>
<td>1,269</td>
<td>12</td>
<td>113</td>
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<tr>
<td>New Mexico</td>
<td>630</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>New York</td>
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<td>542</td>
<td>350</td>
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<td>19</td>
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<td>4</td>
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<tr>
<td>South Carolina</td>
<td>390</td>
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</table>
### U. S. Active Civil Aircraft, by Type and by States—Continued

As of January 1, 1958

<table>
<thead>
<tr>
<th>State</th>
<th>Total active aircraft</th>
<th>Air Carrier (scheduled and irregular)</th>
<th>General Aviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Multi-engine</td>
<td>Postwar 4- and 5-Place</td>
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<td>715</td>
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<td>6</td>
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<tr>
<td>Tennessee</td>
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<td>15</td>
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<tr>
<td>Texas</td>
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<td>135</td>
<td>689</td>
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<tr>
<td>Utah</td>
<td>388</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Vermont</td>
<td>108</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Virginia</td>
<td>868</td>
<td>62</td>
<td>55</td>
</tr>
<tr>
<td>Washington</td>
<td>1,722</td>
<td>27</td>
<td>41</td>
</tr>
<tr>
<td>West Virginia</td>
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<td>0</td>
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<tr>
<td>Wisconsin</td>
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<td>117</td>
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<td>Wyoming</td>
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<td>0</td>
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<tr>
<td><strong>Continental U. S.</strong></td>
<td><strong>65,863</strong></td>
<td><strong>1,747</strong></td>
<td><strong>4,961</strong></td>
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<td>90</td>
<td>51</td>
</tr>
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<td>Hawaii</td>
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<td>22</td>
<td>10</td>
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<tr>
<td>Other</td>
<td>87</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>67,153</strong></td>
<td><strong>1,864</strong></td>
<td><strong>5,036</strong></td>
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Source: 27
## Hours Flown in Utility Aircraft, 1931 to Date

(Thousands of Hours)

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<tr>
<th>Year</th>
<th>Total Hours</th>
<th>Business&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Commercial&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Instructional</th>
<th>Pleasure</th>
<th>Other&lt;sup&gt;c&lt;/sup&gt;</th>
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<tbody>
<tr>
<td></td>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
</tr>
<tr>
<td></td>
<td>Per-cent</td>
<td>Per-cent</td>
<td>Per-cent</td>
<td>Per-cent</td>
<td>Per-cent</td>
<td>Per-cent</td>
</tr>
<tr>
<td>1931</td>
<td>1,083</td>
<td>152 14</td>
<td>281 26</td>
<td>307 28</td>
<td>343 32</td>
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<tr>
<td>1932</td>
<td>877</td>
<td>130 15</td>
<td>215 25</td>
<td>223 25</td>
<td>309 35</td>
<td>—</td>
</tr>
<tr>
<td>1933</td>
<td>795</td>
<td>129 16</td>
<td>200 25</td>
<td>198 25</td>
<td>268 34</td>
<td>—</td>
</tr>
<tr>
<td>1934</td>
<td>846</td>
<td>121 14</td>
<td>207 24</td>
<td>217 26</td>
<td>301 36</td>
<td>—</td>
</tr>
<tr>
<td>1935</td>
<td>954</td>
<td>132 14</td>
<td>229 24</td>
<td>292 31</td>
<td>301 31</td>
<td>—</td>
</tr>
<tr>
<td>1936</td>
<td>1,059</td>
<td>122 12</td>
<td>245 23</td>
<td>330 36</td>
<td>312 29</td>
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<tr>
<td>1937</td>
<td>1,173</td>
<td>156 13</td>
<td>227 19</td>
<td>432 37</td>
<td>358 31</td>
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</tr>
<tr>
<td>1938</td>
<td>1,478</td>
<td>183 13</td>
<td>254 17</td>
<td>577 39</td>
<td>459 31</td>
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</tr>
<tr>
<td>1939</td>
<td>1,922</td>
<td>246 13</td>
<td>332 17</td>
<td>755 39</td>
<td>589 31</td>
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<tr>
<td>1940</td>
<td>3,200</td>
<td>314 10</td>
<td>387 12</td>
<td>1,529 48</td>
<td>970 30</td>
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<tr>
<td>1941</td>
<td>4,460</td>
<td>250 6</td>
<td>511 11</td>
<td>2,816 63</td>
<td>883 20</td>
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<tr>
<td>1942</td>
<td>3,786</td>
<td>270 7</td>
<td>473 12</td>
<td>2,680 71</td>
<td>363 10</td>
<td>—</td>
</tr>
<tr>
<td>1946</td>
<td>9,788</td>
<td>1,068 11</td>
<td>943 10</td>
<td>5,996 61</td>
<td>1,686 17</td>
<td>95 1</td>
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<tr>
<td>1947</td>
<td>16,334</td>
<td>1,966 12</td>
<td>1,279 8</td>
<td>10,353 63</td>
<td>2,616 16</td>
<td>120 1</td>
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<tr>
<td>1948</td>
<td>15,130</td>
<td>2,576 17</td>
<td>1,066 7</td>
<td>8,701 58</td>
<td>2,606 17</td>
<td>181 1</td>
</tr>
<tr>
<td>1949</td>
<td>11,031</td>
<td>2,615 24</td>
<td>1,449 13</td>
<td>4,187 38</td>
<td>2,732 25</td>
<td>48 (c)</td>
</tr>
<tr>
<td>1950&lt;sup&gt;*&lt;/sup&gt;</td>
<td>9,650</td>
<td>2,750 28</td>
<td>1,500 16</td>
<td>3,000 31</td>
<td>2,300 24</td>
<td>100 1</td>
</tr>
<tr>
<td>1951</td>
<td>8,451</td>
<td>2,950 35</td>
<td>1,584 19</td>
<td>1,902 23</td>
<td>1,880 22</td>
<td>135 1</td>
</tr>
<tr>
<td>1952</td>
<td>8,186</td>
<td>3,124 38</td>
<td>1,727 21</td>
<td>1,503 18</td>
<td>1,629 20</td>
<td>203 3</td>
</tr>
<tr>
<td>1953</td>
<td>8,527</td>
<td>3,626 42</td>
<td>1,649 19</td>
<td>1,248 15</td>
<td>1,846 22</td>
<td>158 2</td>
</tr>
<tr>
<td>1954</td>
<td>8,963</td>
<td>3,875 43</td>
<td>1,829 20</td>
<td>1,292 15</td>
<td>1,920 22</td>
<td>47 (c)</td>
</tr>
<tr>
<td>1955&lt;sup&gt;*&lt;/sup&gt;</td>
<td>9,500</td>
<td>4,300 45</td>
<td>1,950 21</td>
<td>1,275 13</td>
<td>1,975 21</td>
<td>—</td>
</tr>
<tr>
<td>1956&lt;sup&gt;*&lt;/sup&gt;</td>
<td>10,200</td>
<td>4,600 45</td>
<td>2,000 20</td>
<td>1,500 15</td>
<td>2,100 20</td>
<td>—</td>
</tr>
<tr>
<td>1957</td>
<td>10,938</td>
<td>4,864 45</td>
<td>2,013 18</td>
<td>1,864 17</td>
<td>2,109 19</td>
<td>88 1</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes flying for corporate or executive purposes as well as flying by individuals, including farmers and ranchers, on personal business.

<sup>b</sup> Includes contract, charter, industrial and commercial agricultural flying.

<sup>c</sup> Testing, experimental, ferrying, etc.

<sup>*</sup> Less than ½ of 1 percent.

Note: This table excludes all aircraft operated by the scheduled airlines. Data for war years are not available.

Source: 27
### Public Airports by Length of Runway and Region, January 1, 1958

<table>
<thead>
<tr>
<th>Region</th>
<th>TOTAL</th>
<th>0-2,999</th>
<th>3,000-3,499</th>
<th>3,500-4,199</th>
<th>4,200-4,999</th>
<th>5,000-5,899</th>
<th>5,900-6,999</th>
<th>7,000- &amp; over</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td>3,195</td>
<td>1,363</td>
<td>397</td>
<td>467</td>
<td>265</td>
<td>387</td>
<td>118</td>
<td>198</td>
</tr>
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<td>New England</td>
<td></td>
<td>131</td>
<td>64</td>
<td>4</td>
<td>28</td>
<td>12</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>280</td>
<td>170</td>
<td>40</td>
<td>26</td>
<td>14</td>
<td>20</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>East North Central</td>
<td>510</td>
<td>277</td>
<td>84</td>
<td>74</td>
<td>23</td>
<td>31</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>West North Central</td>
<td>145</td>
<td>54</td>
<td>21</td>
<td>28</td>
<td>12</td>
<td>20</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>377</td>
<td>127</td>
<td>48</td>
<td>69</td>
<td>49</td>
<td>47</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>East South Central</td>
<td>354</td>
<td>58</td>
<td>40</td>
<td>56</td>
<td>47</td>
<td>70</td>
<td>40</td>
<td>43</td>
</tr>
<tr>
<td>West South Central</td>
<td>503</td>
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<td>76</td>
<td>69</td>
<td>26</td>
<td>31</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Mountain</td>
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<td>121</td>
<td>40</td>
<td>47</td>
<td>38</td>
<td>85</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Pacific</td>
<td>347</td>
<td>143</td>
<td>35</td>
<td>38</td>
<td>30</td>
<td>51</td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td>Other</td>
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<td>9</td>
<td>32</td>
<td>14</td>
<td>21</td>
<td>7</td>
<td>19</td>
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</tbody>
</table>

Source: 27

### Certificated Civil Pilots, Student Pilots and Flying Schools, 1927 to Date

<table>
<thead>
<tr>
<th>As of December 31</th>
<th>Certificated Airplane Pilots</th>
<th>Student Pilot Approvals During Year</th>
<th>Certificated Civil Flying Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL PILOTS</td>
<td>Airline Transport</td>
<td>Commercial</td>
</tr>
<tr>
<td>1927</td>
<td>1,572</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1930</td>
<td>15,280</td>
<td>7,843</td>
<td>7,433</td>
</tr>
<tr>
<td>1935</td>
<td>14,805</td>
<td>7,362</td>
<td>6,707</td>
</tr>
<tr>
<td>1940</td>
<td>69,829</td>
<td>1,431</td>
<td>18,791</td>
</tr>
<tr>
<td>1945</td>
<td>296,895</td>
<td>5,815</td>
<td>128,207</td>
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<td>580,574</td>
<td>10,813</td>
<td>371,861</td>
</tr>
<tr>
<td>1952</td>
<td>581,218</td>
<td>11,875</td>
<td>376,236</td>
</tr>
<tr>
<td>1953</td>
<td>585,974</td>
<td>12,757</td>
<td>377,854</td>
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<tr>
<td>1954</td>
<td>613,995</td>
<td>13,341</td>
<td>398,913</td>
</tr>
<tr>
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<td>643,201</td>
<td>13,700</td>
<td>418,359</td>
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<tr>
<td>1956</td>
<td>669,079</td>
<td>15,295</td>
<td>432,688</td>
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<tr>
<td>1957</td>
<td>702,519</td>
<td>16,900</td>
<td>448,470</td>
</tr>
</tbody>
</table>

N.A.—Not available.

* Airline Transport Rating became effective May 5, 1932.

Sources: 3, 27
### Landing Aids to Air Navigation, 1941 to Date

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

Source: 27

### Aids to Air Navigation, 1926 to Date

<table>
<thead>
<tr>
<th>Dec. 31</th>
<th>Civil Airways Mileage</th>
<th>Radio Range Stations</th>
<th>Non-directional Radio Beacons</th>
<th>Federally Operated Traffic Control Facilities</th>
<th>Air Traffic Communications Systems</th>
<th>Combined Station Towers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low and Medium Frequency</td>
<td>Very High Frequency</td>
<td>Low and Medium Frequency</td>
<td>Very High Frequency</td>
<td>Airport Towers</td>
<td>Airway Centers</td>
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<tr>
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<td>392</td>
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<td>115</td>
</tr>
<tr>
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<td>64,995</td>
<td>346</td>
<td>403</td>
<td>170</td>
<td>104</td>
</tr>
<tr>
<td>1955</td>
<td>67,770</td>
<td>81,209</td>
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<td>424</td>
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<td>100</td>
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</tr>
<tr>
<td>1957</td>
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<td>486</td>
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<td>124,870</td>
<td>329</td>
<td>556</td>
<td>191</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

Sources: 3, 27
The versatile flight characteristics of the helicopter which have made it an exceptionally useful vehicle have been further augmented by two significant breakthroughs during the past year.

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

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

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

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

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

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

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

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

In addition to these commercial operators and the three scheduled helicopter airlines (Los Angeles Airways, Inc., Chicago Helicopter Airways, Inc., and New York Airways, Inc.) more than 75 corporations are now operating helicopters as executive transports. There are at least 19 State and Federal agencies which own and operate more than 35 helicopters. Many of these helicopters were obtained under the Civil Defense matching funds program. Civil Defense will pay for half the cost of a helicopter under an agreement with the states with the proviso that the helicopter will be available on a standby basis to Civil Defense for rescues or in cases of local disaster.
During the past year, the three scheduled helicopter airlines set a new record in the number of passengers carried, which totaled 232,000, as compared to 152,000 in 1957.

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

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

The civil helicopter fleet offers a myriad of services to communities. They serve as “air taxis,” as “skywatchers” for traffic departments, as “flying cranes” for construction companies, as “tractors” on the farm.
as "trucks" in hauling products ranging from perishables to heavy equipment and as "aerial ambulances," as well as playing the key role in rescue operations under conditions in which the 'copter is the only guard between life and death.

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Passengers Carried</th>
<th>Available Ton-Miles Flown</th>
<th>Revenue Ton-Miles Flown</th>
<th>Revenue Mile Load Factor Percent</th>
<th>Available Passenger Miles Flown</th>
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Source: 4
group were: Air Line Pilots Association, Airport Operators Council, Air Transport Association, Aircraft Industries Association and the American Association of Airport Executives.

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

### Helicopter Scheduled Airlines

**Revenue Ton-Mile Traffic Carried**

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<th>Year</th>
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Source: 4
| Company      | Symbol of Civil Number Horse Useful Range, Maximum |
|--------------|---------------------------------------------------|--------------------------------------------------|
|              | Military Designation * Number Power Load Pounds Nautical Speed M.P.H. |
| Bell         | H-13H, Army 47G-2 3 250 886 838 |
|              |                      47H-1 3 200 851 861 |
|              | HUL-1, Navy 47J 4 250 1,235 200 |
|              | HTL-7, Navy 47K 2 250 649 818 |
|              | HU-1, Army, Air Force 204b 6 825 1,900 210 |
|              | XV-3, Army, Air Force R & D 2 450 1,210 408 |
|              |                      B-2 2 180 420c 100c |
| Brantley     | YH-41, Army, Air Force CH-1C 4 270 1,050 290 |
| Cessna       |                      Gyrodyne XRON-1, Navy, Marines |
| Hiller       | H-23D, Army 12D 3 250 928 170 |
|              |                      XBOE-1, Navy Rotorcycle |
|              | X-18, Air Force R & D Tiltwing |
| Hughes       | YHO-2HU, Army |
| Kaman        | H43-A, AF  |
|              | HOK, Marines K-600 5 600 2,000 220 |
|              | H43-B, Air Force K 600-3 8 860 3,052 228 |
|              | HU2K, Navy |
|              | K16B R & D (twin-engine) |
| McDonnell    | XV-1 4 525 1,228 200 |
|              | 120 1 2,550 230 85 136a |
| Omega        | BS-12 5 210 ea, 1,400n 165s 103b |
| Republic     | YHO-1, Army Alouette II 5 400 1,400 375 |
| Sikorsky     | Various- S-55 10 600- 2,250 350 |
|              | Army, Air Force Series 700 121 |
|              | Force, Navy, Marines 112 |
|              | H37A, Army  |
|              | HR2S-1, Marines S-56 (twin-engine) |
|              | HR2S-1W, Navy  |
|              | Various- S-58 18 1,525 5,370 302 |
|              | Army, Navy, Marines, Coast Guard 123 |
|              | S-62 R & D (twin-engine) |
|              | S-60 2 2,100 12,200 130 |

(Continued on next page)
### Helicopters in Production and Development, 1959—Continued

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<tr>
<th>Vertol</th>
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*—Estimate
*aIf certificated by F.A.A.
*bCertificate pending
*cConvertiplane

Source: 1

### U. S. Exports of Civil Helicopters 1948 to Date

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<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Value in Thousands</th>
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<td>104</td>
<td>11,907</td>
</tr>
<tr>
<td>1958</td>
<td>67</td>
<td>9,564</td>
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</table>

Source: 16
The progress of the United States domestic and international airlines in the last two decades has come about by a fruitful blend of cooperation and competition. Cooperation, that is, of the airline industry and the aircraft manufacturing industry, in areas such as safety development, improvement of operational techniques, and in techniques designed to make things more convenient for the passenger or shipper. Competition, of a particular intense variety, is carried on in matters of market development among the air carriers.

The Congress, when it adopted the Civil Aeronautics Act in 1938—and enacted the Federal Aviation Act of 1958—and directed the Government to promote the sound economic development of the air transport industry, legislated wisely and well. The future progress in the public interest now depends upon the ability of the industry and the Government to work together effectively in applying this congressional mandate.
Despite the continually upward spiraling of costs over the last 20 years the scheduled air carriers of the U.S. are now offering the public a fare level only 3.2 per cent greater than the 1939 level.

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

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

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

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

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

$2,500,000,000 for new aircraft, along with spare parts and engines.
$250,000,000 for supporting ground equipment, hangars, maintenance bases and other equipment.
$220,000,000 to be spent by others for facilities, but to be taken over, and paid for, by the airlines.

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

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

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

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

**Shipments of Commercial Transport Aircraft 1953 to Date**

(Fixed Wing-Multiple Engine)

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*Commercial transport totals differ from FAA totals for "transports" because they exclude executive and other transports for other than commercial use.

Source: 1
### U. S. Scheduled Airlines—Aircraft in Service by Make and Model as of December 31

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(Continued on next page)
AIRLINES AND TRANSPORTATION

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

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</table>

* Excludes certain aircraft in both domestic and international operations.
Source: 27

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

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

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

Generally, airline traffic showed an increase over 1957. The domestic airlines—compared with their public transportation competitors, the railroads and the buses—more than held their own. While the airlines
maintained their 1957 level, the railroads' passenger traffic dropped 14 per cent and the buses dropped two per cent.

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

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

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

<table>
<thead>
<tr>
<th>Year Ending June 30</th>
<th>Total*</th>
<th>Domestic Trunk Lines</th>
<th>Local Service Carriers</th>
<th>International Carriers</th>
<th>Territorial and Alaska</th>
<th>Other Carriers</th>
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<tr>
<td>Revenue Passenger-Miles (Millions)</td>
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<td>688</td>
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<tr>
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<tr>
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<tr>
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N.A.—Not available.

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

b Less than one-half million.

Source: 18
### Domestic Scheduled Airlines—Operators, Equipment, and Speed
#### 1926 to Date

<table>
<thead>
<tr>
<th>As of December 31</th>
<th>Operators</th>
<th>Aircraft in Service</th>
<th>Average Available Seats</th>
<th>Route Mileage Operated</th>
<th>Average Speed, M.P.H.</th>
<th>Passenger Fatalities per 100 Million Passenger-Miles Flown</th>
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<td>13</td>
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<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
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<td>219.6</td>
<td>N.A.</td>
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</table>

N.A.—Not available.

*Estimate.*

Source: 27

Subsidy now accounts for only 2.2 per cent of the total airline revenues. The greater part of the Government aid today goes to the local service airlines in order to guarantee air service to smaller communities. Other subsidy payments go to help develop the experimental helicopter service in three cities, for Alaskan airlines, and to maintain national interest routes in Latin America. No domestic trunk line is now receiving subsidy.
### U.S. International Scheduled Airlines—Operators, Equipment, Speed, 1928 to Date

<table>
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<th>As of December 31</th>
<th>Operators</th>
<th>Aircraft in Service</th>
<th>Average Available Seats</th>
<th>Route Miles Operated (thousands)</th>
<th>Average Speed M.P.H.</th>
<th>Passenger Fatalities per 100 Million Passenger-Miles Flown</th>
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<td>170</td>
<td>61.88</td>
<td>133.9</td>
<td>254.0</td>
<td>0.6</td>
</tr>
<tr>
<td>1958</td>
<td>15</td>
<td>171</td>
<td>64.35</td>
<td>138.8</td>
<td>257.8</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

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

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

The Air Force estimates that the military planes fly about ten million hours a year—within the continental U.S. The general aviation planes fly about $11\frac{1}{2}$ million hours a year and the airlines about 3.9 million hours.  

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

The end result of the planning on the part of the airlines and the Government, with the cooperation of the other users, the military and general aviation, has as its ultimate goal, safety.
The safety record of the airlines has demonstrated the wisdom of advanced planning, as well as the manufacturers' ceaseless search for equipment and devices that will make flying safer today than it was yesterday.

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

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

The average length of a trip on a domestic scheduled airline has remained almost the same over the last five years, about 520 miles.
Trunk line jet programming indicates that a total of 62 pure-jet and 185 prop-jet airliners will have been delivered by the end of 1959.

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

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

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

Sources: 3, 46
### Employment, Wages, and Average Annual Earnings in the Transportation Industry, 1957

<table>
<thead>
<tr>
<th></th>
<th>ALL INDUSTRY</th>
<th>ALL TRANSPORTATION</th>
<th>Air Transportation (Common Carrier)</th>
<th>Highway Transportation</th>
<th>Water, Pipeline, and Other Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Time Equivalent Employees (Thousands)</td>
<td>56,544</td>
<td>2,657</td>
<td>145</td>
<td>1,117</td>
<td>1,038</td>
</tr>
<tr>
<td>Wages and Salaries (Million Dollars)</td>
<td>$238,120</td>
<td>$13,939</td>
<td>$834</td>
<td>$6,057</td>
<td>$5,059</td>
</tr>
<tr>
<td>Average Annual Earnings per Full Time Employee</td>
<td>$4,211</td>
<td>$5,246</td>
<td>$3,752</td>
<td>$5,423</td>
<td>$4,874</td>
</tr>
</tbody>
</table>

Source: 7

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

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

The local airline service pattern continues to expand rapidly. These
## Domestic Scheduled Airlines—Passenger Service, 1926 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Passengers Carried (Thousands)</th>
<th>Passenger Seat-Miles Flown (Millions)</th>
<th>Revenue Passenger-Miles Flown (Millions)</th>
<th>Revenue Passenger-Mile Factor (Percent)</th>
<th>Average Passenger Revenue per Passenger-Mile (Cents)</th>
<th>Average Length of Trip (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>5.8</td>
<td>N.A.</td>
<td>1.0</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>1930</td>
<td>384.5</td>
<td>N.A.</td>
<td>85.1</td>
<td>N.A.</td>
<td>8.3</td>
<td>221</td>
</tr>
<tr>
<td>1935</td>
<td>678.5</td>
<td>577.7</td>
<td>316.3</td>
<td>57.9</td>
<td>5.1</td>
<td>375</td>
</tr>
<tr>
<td>1940</td>
<td>2,602.8</td>
<td>1,817.1</td>
<td>1,052.2</td>
<td>88.12</td>
<td>5.0</td>
<td>511</td>
</tr>
<tr>
<td>1945</td>
<td>6,476.3</td>
<td>3,815.6</td>
<td>3,362.5</td>
<td>61.26</td>
<td>5.6</td>
<td>461</td>
</tr>
<tr>
<td>1950</td>
<td>17,343.7</td>
<td>13,064.5</td>
<td>8,002.8</td>
<td>105.6</td>
<td>5.6</td>
<td>466</td>
</tr>
<tr>
<td>1951</td>
<td>22,652.2</td>
<td>15,565.7</td>
<td>10,566.2</td>
<td>67.88</td>
<td>5.6</td>
<td>466</td>
</tr>
<tr>
<td>1952</td>
<td>25,009.8</td>
<td>19,098.0</td>
<td>12,528.3</td>
<td>65.60</td>
<td>5.6</td>
<td>501</td>
</tr>
<tr>
<td>1953</td>
<td>28,721.0</td>
<td>23,263.2</td>
<td>14,760.3</td>
<td>63.45</td>
<td>5.5</td>
<td>514</td>
</tr>
<tr>
<td>1954</td>
<td>32,343.0</td>
<td>26,851.4</td>
<td>16,768.7</td>
<td>62.45</td>
<td>5.4</td>
<td>518</td>
</tr>
<tr>
<td>1955</td>
<td>38,026.0</td>
<td>31,299.0</td>
<td>19,819.0</td>
<td>62.29</td>
<td>5.3</td>
<td>521</td>
</tr>
<tr>
<td>1956</td>
<td>41,738.0</td>
<td>35,285.7</td>
<td>22,361.8</td>
<td>63.37</td>
<td>5.3</td>
<td>536</td>
</tr>
<tr>
<td>1957</td>
<td>48,563.6e</td>
<td>41,053.2</td>
<td>25,339.6</td>
<td>60.83</td>
<td>5.3</td>
<td>522</td>
</tr>
<tr>
<td>1958</td>
<td>48,130.0e</td>
<td>42,643.0</td>
<td>25,343.4</td>
<td>59.43</td>
<td>N.A.</td>
<td>527</td>
</tr>
</tbody>
</table>

* Estimate.
N.A.—Not available.

* 1926-1934: Duplicated revenue and nonrevenue passengers. 1935-1941: Duplicated revenue passengers. 1942 to date: Unduplicated revenue passengers.

* 1926-1936: Includes nonrevenue passenger-miles.

* Enplaned passengers. These figures are not comparable to those for previous years.

Source: 27

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

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

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

Revenue ton-miles, the overall indicator of activity, were up 32.9 per cent for the year, from 450,000 to 598,000, a new high.
### U. S. International Scheduled Airlines—Passenger Service
1930 to Date

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

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

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

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

Together, the three helicopter lines operate 22 aircraft over 905 route miles serving 29 points.
## Aircraft in Service on World Airlines, April 1959

**Members of International Air Transport Association**

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

---

*As of April 22, 1959, U.S. Flag Carriers were operating 14 additional 707's and 35 Electras.
*Does not include the airlines of the Soviet and some of the smaller airlines of the world.
*Includes 31 helicopters.
*Includes 3 helicopters.
Source: 31
## Development of Free World Civil Air Transport

(Scheduled Services—International and Domestic, Excluding China and USSR)

**1919 to Date**

<table>
<thead>
<tr>
<th>Year</th>
<th>Miles Flown (millions)</th>
<th>Passengers Carried (millions)</th>
<th>Passengers-Miles (millions)</th>
<th>Cargo-Ton-Miles (millions)</th>
<th>Mail-Ton-Miles (millions)</th>
<th>Average No. of Passengers Per Aircraft</th>
<th>Average Miles Flown Per Passenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>1919</td>
<td>1</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>2.3</td>
<td>N.A.</td>
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<tr>
<td>1929</td>
<td>57</td>
<td>N.A.</td>
<td>132</td>
<td>N.A.</td>
<td>N.A.</td>
<td>4.0</td>
<td>N.A.</td>
</tr>
<tr>
<td>1934</td>
<td>101</td>
<td>N.A.</td>
<td>405</td>
<td>N.A.</td>
<td>N.A.</td>
<td>6.8</td>
<td>N.A.</td>
</tr>
<tr>
<td>1939</td>
<td>185</td>
<td>N.A.</td>
<td>1,262</td>
<td>N.A.</td>
<td>N.A.</td>
<td>13.3</td>
<td>N.A.</td>
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<tr>
<td>1944</td>
<td>257</td>
<td>N.A.</td>
<td>3,412</td>
<td>N.A.</td>
<td>N.A.</td>
<td>18.0</td>
<td>545</td>
</tr>
<tr>
<td>1949</td>
<td>840</td>
<td>27</td>
<td>15,000</td>
<td>390</td>
<td>130</td>
<td>22</td>
<td>252</td>
</tr>
<tr>
<td>1951</td>
<td>1,010</td>
<td>42</td>
<td>22,000</td>
<td>640</td>
<td>170</td>
<td>24</td>
<td>560</td>
</tr>
<tr>
<td>1953</td>
<td>1,190</td>
<td>52</td>
<td>29,000</td>
<td>720</td>
<td>190</td>
<td>27</td>
<td>570</td>
</tr>
<tr>
<td>1955</td>
<td>1,430</td>
<td>68</td>
<td>39,000</td>
<td>910</td>
<td>260</td>
<td>28</td>
<td>575</td>
</tr>
<tr>
<td>1956</td>
<td>1,580</td>
<td>77</td>
<td>44,000</td>
<td>1,040</td>
<td>280</td>
<td>29</td>
<td>593</td>
</tr>
<tr>
<td>1957</td>
<td>1,750</td>
<td>86</td>
<td>51,000</td>
<td>1,135</td>
<td>300</td>
<td>29</td>
<td>600</td>
</tr>
<tr>
<td>1958</td>
<td>1,845</td>
<td>89</td>
<td>53,500</td>
<td>1,145</td>
<td>320</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

N.A.—Not available.

Source: 32

### Average Revenue Per Passenger-Mile, 1926 to Date

( cents)

<table>
<thead>
<tr>
<th>Year</th>
<th>Airlines</th>
<th>Railroad</th>
<th>Inter-City Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Domestic Scheduled</td>
<td>Domestic Non-Scheduled</td>
<td>Coach (Excluding Commuter)</td>
</tr>
<tr>
<td>1926</td>
<td>12.0</td>
<td>—</td>
<td>3.35</td>
</tr>
<tr>
<td>1937</td>
<td>5.6</td>
<td>—</td>
<td>1.80</td>
</tr>
<tr>
<td>1947</td>
<td>5.1</td>
<td>—</td>
<td>2.02</td>
</tr>
<tr>
<td>1952</td>
<td>5.55</td>
<td>3.20</td>
<td>2.53</td>
</tr>
<tr>
<td>1953</td>
<td>5.45</td>
<td>3.20</td>
<td>2.53</td>
</tr>
<tr>
<td>1954</td>
<td>5.39</td>
<td>3.20</td>
<td>2.50</td>
</tr>
<tr>
<td>1955</td>
<td>5.35</td>
<td>3.20</td>
<td>2.47</td>
</tr>
<tr>
<td>1956</td>
<td>5.32</td>
<td>3.20</td>
<td>2.56</td>
</tr>
<tr>
<td>1957</td>
<td>5.30</td>
<td>3.20</td>
<td>2.71</td>
</tr>
<tr>
<td>1958</td>
<td>5.30</td>
<td>3.20</td>
<td>2.76</td>
</tr>
</tbody>
</table>

N.A.—Not Available.

Estimate.

Sources: 1, 3, 27, 33, 41
## Trans-Atlantic Passenger Travel by Air and Sea, 1950 to Date

### By Air (Regular Scheduled)

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

Source: 36

### The Ten Leading Passenger Transport Companies

(Millions of Passenger Miles*)

<table>
<thead>
<tr>
<th>1958</th>
<th>1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Air Lines .......... 4,915</td>
<td>Pennsylvania Railroad ... 3,447</td>
</tr>
<tr>
<td>American Airlines ......... 4,891</td>
<td>American Airlines ....... 3,372</td>
</tr>
<tr>
<td>Eastern Air Lines ......... 3,811</td>
<td>United Air Lines .......... 3,135</td>
</tr>
<tr>
<td>Trans World Airlines ...... 3,662</td>
<td>New York Central System .. 3,041</td>
</tr>
<tr>
<td>Pennsylvania Railroad ..... 2,523</td>
<td>Eastern Air Lines ........ 2,847</td>
</tr>
<tr>
<td>New York Central System ... 1,812</td>
<td>Trans World Airlines ..... 2,611</td>
</tr>
<tr>
<td>Atchison, Topeka &amp; Santa Fe Railway System .... 1,665</td>
<td>Atchison, Topeka &amp; Santa Fe Railway System .... 1,948</td>
</tr>
<tr>
<td>Capital Airlines .......... 1,413</td>
<td>Union Pacific Railroad Company ........ 1,459</td>
</tr>
<tr>
<td>Delta Air Lines ........... 1,400</td>
<td>Southern Pacific Company ... 1,342</td>
</tr>
<tr>
<td>Union Pacific Railroad Company .... 1,234</td>
<td>New York, New Haven &amp; Hartford Railroad Company .... 1,274</td>
</tr>
</tbody>
</table>

* Excludes commuters and multiple ride passengers.  
Note: Data do not include foreign operations of the airlines.  
Sources: 19, 33
### Air vs. Railroad Passenger Travel

**1937 to Date**

(Passenger Miles in Billions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Air Carriers</th>
<th>Railroads (excluding Commutation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Scheduled</td>
</tr>
<tr>
<td>1937</td>
<td>.4</td>
<td>.4</td>
</tr>
<tr>
<td>1938</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>1939</td>
<td>.7</td>
<td>.7</td>
</tr>
<tr>
<td>1940</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>1941</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>1942</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>1943</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>1944</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>1945</td>
<td>3.4</td>
<td>3.4</td>
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<tr>
<td>1946</td>
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<td>1949</td>
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<td>1951</td>
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<td>16.8</td>
</tr>
<tr>
<td>1955</td>
<td>20.9</td>
<td>19.8</td>
</tr>
<tr>
<td>1956</td>
<td>23.5</td>
<td>22.4</td>
</tr>
<tr>
<td>1957</td>
<td>26.4</td>
<td>25.3</td>
</tr>
<tr>
<td>1958</td>
<td>26.4</td>
<td>25.3</td>
</tr>
</tbody>
</table>

*Estimate.
N.A.—Not available.
Sources: 3, 27, 33
## Estimated Intercity Passenger Traffic, by Type, 1916 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Domestic Air Carriers</th>
<th>Railroads&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Highways</th>
<th>Inland Waterways</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Billions of Passenger-Miles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1916</td>
<td>36.0</td>
<td>35.2</td>
<td>.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1939</td>
<td>270.7</td>
<td>22.7</td>
<td>245.9</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>1941</td>
<td>310.6</td>
<td>1.4</td>
<td>29.4</td>
<td>278.0</td>
<td>1.8</td>
</tr>
<tr>
<td>1944</td>
<td>311.5</td>
<td>2.2</td>
<td>95.7</td>
<td>211.7</td>
<td>1.9</td>
</tr>
<tr>
<td>1948</td>
<td>424.5</td>
<td>6.1</td>
<td>46.0</td>
<td>370.9</td>
<td>1.8</td>
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<tr>
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<td>532.4</td>
<td>10.5</td>
<td>35.3</td>
<td>485.2</td>
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<tr>
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<td>621.9</td>
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<td>29.4</td>
<td>574.4</td>
<td>1.7</td>
</tr>
<tr>
<td>1955</td>
<td>661.2</td>
<td>19.7</td>
<td>28.5</td>
<td>611.3</td>
<td>1.7</td>
</tr>
<tr>
<td>1956</td>
<td>695.3</td>
<td>22.3</td>
<td>28.2</td>
<td>642.9</td>
<td>1.9</td>
</tr>
<tr>
<td>1957</td>
<td>716.3</td>
<td>25.3</td>
<td>26.3</td>
<td>662.8</td>
<td>1.9</td>
</tr>
<tr>
<td>1958</td>
<td>739.2&lt;sup&gt;z&lt;/sup&gt;</td>
<td>25.3</td>
<td>23.3</td>
<td>688.7&lt;sup&gt;z&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;z&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
<th>Domestic Air Carriers</th>
<th>Railroads&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Highways</th>
<th>Inland Waterways</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0</td>
<td>97.8</td>
<td>.8</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
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<td>8.4</td>
<td>90.8</td>
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<td>9.5</td>
<td>89.5</td>
<td>.6</td>
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<tr>
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<td>.7</td>
<td>30.7</td>
<td>68.0</td>
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<td>10.8</td>
<td>87.3</td>
<td>.4</td>
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<tr>
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<td>2.0</td>
<td>6.6</td>
<td>91.1</td>
<td>.3</td>
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<td>92.3</td>
<td>.3</td>
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<tr>
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<td>3.0</td>
<td>4.3</td>
<td>92.5</td>
<td>.2</td>
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<tr>
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<td>100.0</td>
<td>3.2</td>
<td>4.1</td>
<td>92.4</td>
<td>.3</td>
</tr>
<tr>
<td>1957</td>
<td>100.0</td>
<td>3.5</td>
<td>3.7</td>
<td>92.5</td>
<td>.3</td>
</tr>
<tr>
<td>1958</td>
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<td>3.4</td>
<td>3.1</td>
<td>93.2</td>
<td>.3</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes commutation and electrified divisions of steam railway companies, but excludes electric railways.

<sup>b</sup> Negligible.

Sources: 3, 27, 34
### Transportation Accident Death Rates
(Deaths per 100,000,000 Passenger-Miles)
1943 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Airlines</th>
<th>Railroads</th>
<th>Buses</th>
<th>Cars and Taxis</th>
</tr>
</thead>
<tbody>
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<td><strong>Passenger Deaths</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1.4</td>
<td>0.31</td>
<td>0.22</td>
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</tr>
<tr>
<td>1945</td>
<td>2.1</td>
<td>0.25</td>
<td>0.20</td>
<td>2.8</td>
</tr>
<tr>
<td>1949</td>
<td>1.3</td>
<td>0.13</td>
<td>0.20</td>
<td>2.2</td>
</tr>
<tr>
<td>1951</td>
<td>1.3</td>
<td>0.36</td>
<td>0.19</td>
<td>2.3</td>
</tr>
<tr>
<td>1952</td>
<td>0.35</td>
<td>0.35</td>
<td>0.18</td>
<td>2.9</td>
</tr>
<tr>
<td>1953</td>
<td>0.58</td>
<td>0.16</td>
<td>0.13</td>
<td>2.9</td>
</tr>
<tr>
<td>1954</td>
<td>0.09</td>
<td>0.08</td>
<td>0.11</td>
<td>2.6</td>
</tr>
<tr>
<td>1955</td>
<td>0.76</td>
<td>0.07</td>
<td>0.19</td>
<td>2.7</td>
</tr>
<tr>
<td>1956</td>
<td>0.62</td>
<td>0.20</td>
<td>0.16</td>
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</tr>
<tr>
<td>1957</td>
<td>0.12</td>
<td>0.07</td>
<td>0.13</td>
<td>2.6</td>
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<tr>
<td><strong>Total Deaths</strong></td>
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</tr>
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<td>1.8</td>
<td>2.6</td>
<td>1.7</td>
<td>4.4</td>
</tr>
<tr>
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<td>2.4</td>
<td>2.5</td>
<td>1.5</td>
<td>4.6</td>
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<tr>
<td>1949</td>
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<td>4.0</td>
<td>1.3</td>
<td>3.6</td>
</tr>
<tr>
<td>1951</td>
<td>1.5</td>
<td>4.3</td>
<td>1.2</td>
<td>3.4</td>
</tr>
<tr>
<td>1952</td>
<td>1.1</td>
<td>4.1</td>
<td>1.1</td>
<td>4.1</td>
</tr>
<tr>
<td>1953</td>
<td>0.7</td>
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<td>4.0</td>
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<tr>
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<td>3.4</td>
<td>0.9</td>
<td>3.6</td>
</tr>
<tr>
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<td>0.9</td>
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<td>1.06</td>
<td>3.7</td>
</tr>
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<td>0.67</td>
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<td>3.6</td>
</tr>
<tr>
<td>1957</td>
<td>0.13</td>
<td>3.5</td>
<td>0.7</td>
<td>3.4</td>
</tr>
</tbody>
</table>

* Includes pedestrians, employees, trespassers, etc.

Source: 42
The past year marked a period of transition for aviation export activities since quantity deliveries of turbine-powered planes will not be made to foreign airlines until the latter part of 1959, and most U. S. manufacturers have halted production of large piston transports.

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

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

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total United States Merchandise</th>
<th>Total Aeronautic Products</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1912</td>
<td>$2,170.3</td>
<td>$0.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>1915-1918</td>
<td>22,176.7</td>
<td>31.5</td>
<td>0.14</td>
</tr>
<tr>
<td>1921</td>
<td>4,378.9</td>
<td>.5</td>
<td>0.0%</td>
</tr>
<tr>
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<td>0.18</td>
</tr>
<tr>
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<td>117.8</td>
<td>3.8%</td>
</tr>
<tr>
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<td>9,500.2</td>
<td>115.3</td>
<td>1.2%</td>
</tr>
<tr>
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<td>15,025.7</td>
<td>603.2</td>
<td>4.0%</td>
</tr>
<tr>
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<td>15,649.0</td>
<td>880.6</td>
<td>5.6%</td>
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<tr>
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<td>14,948.1</td>
<td>618.9</td>
<td>4.1%</td>
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<tr>
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<td>15,418.5</td>
<td>727.5</td>
<td>4.7%</td>
</tr>
<tr>
<td>1956</td>
<td>18,839.7</td>
<td>1,059.3</td>
<td>5.6%</td>
</tr>
<tr>
<td>1957</td>
<td>20,850.3</td>
<td>1,028.0</td>
<td>4.9%</td>
</tr>
<tr>
<td>1958</td>
<td>17,857.9</td>
<td>971.7</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

*Less than .05 percent.
Sources: 16, 17

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

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Value (Millions)</th>
<th>3,000–14,999 lbs airframe weight</th>
<th>15,000–29,999 lbs airframe weight</th>
<th>30,000 lbs &amp; over airframe weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number</td>
<td>Value (Millions)</td>
<td>Number</td>
</tr>
<tr>
<td>1948</td>
<td>91</td>
<td>$37.4</td>
<td>34</td>
<td>$2.4</td>
<td>14</td>
</tr>
<tr>
<td>1949</td>
<td>51</td>
<td>22.2</td>
<td>16</td>
<td>1.3</td>
<td>25</td>
</tr>
<tr>
<td>1950</td>
<td>48</td>
<td>40.4</td>
<td>4</td>
<td>.4</td>
<td>15</td>
</tr>
<tr>
<td>1951</td>
<td>26</td>
<td>13.2</td>
<td>13</td>
<td>1.1</td>
<td>1</td>
</tr>
<tr>
<td>1952</td>
<td>25</td>
<td>18.2</td>
<td>9</td>
<td>.6</td>
<td>1</td>
</tr>
<tr>
<td>1953</td>
<td>87</td>
<td>79.2</td>
<td>17</td>
<td>1.3</td>
<td>13</td>
</tr>
<tr>
<td>1954</td>
<td>110</td>
<td>93.0</td>
<td>29</td>
<td>2.0</td>
<td>7</td>
</tr>
<tr>
<td>1955</td>
<td>95</td>
<td>61.2</td>
<td>39</td>
<td>2.5</td>
<td>5</td>
</tr>
<tr>
<td>1956</td>
<td>151</td>
<td>132.9</td>
<td>64</td>
<td>4.7</td>
<td>2</td>
</tr>
<tr>
<td>1957</td>
<td>203</td>
<td>179.3</td>
<td>94</td>
<td>7.7</td>
<td>9</td>
</tr>
<tr>
<td>1958</td>
<td>127</td>
<td>146.4</td>
<td>36</td>
<td>3.5</td>
<td>9</td>
</tr>
</tbody>
</table>

### New Utility, Personal and Liaison Planes

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Value (Millions)</th>
<th>3-Places or less</th>
<th>4-Places and over</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number</td>
<td>Value (Millions)</td>
</tr>
<tr>
<td>1948</td>
<td>935</td>
<td>$4.2</td>
<td>552</td>
<td>$1.5</td>
</tr>
<tr>
<td>1949</td>
<td>510</td>
<td>2.8</td>
<td>235</td>
<td>.7</td>
</tr>
<tr>
<td>1950</td>
<td>408</td>
<td>2.2</td>
<td>173</td>
<td>.5</td>
</tr>
<tr>
<td>1951</td>
<td>540</td>
<td>3.7</td>
<td>237</td>
<td>1.0</td>
</tr>
<tr>
<td>1952</td>
<td>815</td>
<td>5.6</td>
<td>551</td>
<td>3.1</td>
</tr>
<tr>
<td>1953</td>
<td>776</td>
<td>5.4</td>
<td>370</td>
<td>1.5</td>
</tr>
<tr>
<td>1954</td>
<td>529</td>
<td>4.5</td>
<td>223</td>
<td>1.1</td>
</tr>
<tr>
<td>1955</td>
<td>749</td>
<td>7.4</td>
<td>296</td>
<td>1.9</td>
</tr>
<tr>
<td>1956</td>
<td>966</td>
<td>11.0</td>
<td>340</td>
<td>2.5</td>
</tr>
<tr>
<td>1957</td>
<td>1,086</td>
<td>13.1</td>
<td>368</td>
<td>2.5</td>
</tr>
<tr>
<td>1958</td>
<td>896</td>
<td>12.1</td>
<td>268</td>
<td>2.2</td>
</tr>
</tbody>
</table>

*(Continued on next page)*
Other

<table>
<thead>
<tr>
<th>Year</th>
<th>Rotary Wing Aircraft</th>
<th>Used Aircraft</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Value (Millions)</td>
<td>Number</td>
</tr>
<tr>
<td>1948</td>
<td>47</td>
<td>$1.9</td>
<td>202</td>
</tr>
<tr>
<td>1949</td>
<td>31</td>
<td>1.2</td>
<td>252</td>
</tr>
<tr>
<td>1950</td>
<td>38</td>
<td>.9</td>
<td>262</td>
</tr>
<tr>
<td>1951</td>
<td>28</td>
<td>.9</td>
<td>300</td>
</tr>
<tr>
<td>1952</td>
<td>37</td>
<td>1.4</td>
<td>303</td>
</tr>
<tr>
<td>1953</td>
<td>98</td>
<td>4.9</td>
<td>416</td>
</tr>
<tr>
<td>1954</td>
<td>74</td>
<td>4.0</td>
<td>340</td>
</tr>
<tr>
<td>1955</td>
<td>66</td>
<td>4.2</td>
<td>800</td>
</tr>
<tr>
<td>1956</td>
<td>55</td>
<td>3.7</td>
<td>534</td>
</tr>
<tr>
<td>1957</td>
<td>104</td>
<td>11.9</td>
<td>627</td>
</tr>
<tr>
<td>1958</td>
<td>67</td>
<td>9.6</td>
<td>595</td>
</tr>
</tbody>
</table>

*Less than $500,000.
Source: 16

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

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

**DOLLAR SHORTAGE**

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

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

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

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

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

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

FOREIGN AVIATION

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

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

### Mutual Security Program, Shipment of Military Aircraft 1950 to Date

<table>
<thead>
<tr>
<th>Year Ending September 30</th>
<th>Total</th>
<th>Air Force</th>
<th>Navy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>251</td>
<td>818</td>
<td>283</td>
</tr>
<tr>
<td>1951</td>
<td>850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1952</td>
<td>1,317</td>
<td>1,124</td>
<td>193</td>
</tr>
<tr>
<td>1953</td>
<td>2,689</td>
<td>2,274</td>
<td>415</td>
</tr>
<tr>
<td>1954</td>
<td>1,170</td>
<td>923</td>
<td>247</td>
</tr>
<tr>
<td>1955</td>
<td>1,292</td>
<td>1,138</td>
<td>154</td>
</tr>
<tr>
<td>1956</td>
<td>2,659</td>
<td>2,580</td>
<td>79</td>
</tr>
<tr>
<td>1957</td>
<td>2,182</td>
<td>2,085</td>
<td>97</td>
</tr>
<tr>
<td>1958</td>
<td>1,846</td>
<td>1,697</td>
<td>149</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14,256</td>
<td>12,630</td>
<td>1,617</td>
</tr>
</tbody>
</table>


Source: 24
The development of the European Common Market and minor advances in the convertibility of currency, primarily in Western Europe, are being closely followed. These developments, if properly directed, could do much to enhance all phases of aviation.

**GREAT BRITAIN**

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

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

**FRANCE**

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

**U. S. EXPORTS OF AIRCRAFT ENGINES* FOR CIVILIAN AIRCRAFT, 1948 TO DATE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Value (Thousands of dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948b</td>
<td>660</td>
<td>$326</td>
</tr>
<tr>
<td>1949b</td>
<td>107</td>
<td>112</td>
</tr>
<tr>
<td>1950</td>
<td>247</td>
<td>285</td>
</tr>
<tr>
<td>1951</td>
<td>304</td>
<td>509</td>
</tr>
<tr>
<td>1952</td>
<td>551</td>
<td>941</td>
</tr>
<tr>
<td>1953</td>
<td>347</td>
<td>708</td>
</tr>
<tr>
<td>1954</td>
<td>728</td>
<td>1,516</td>
</tr>
<tr>
<td>1955</td>
<td>897</td>
<td>2,016</td>
</tr>
<tr>
<td>1956</td>
<td>1,371</td>
<td>3,529</td>
</tr>
<tr>
<td>1957</td>
<td>1,516</td>
<td>3,880</td>
</tr>
<tr>
<td>1958</td>
<td>1,552</td>
<td>4,312</td>
</tr>
</tbody>
</table>

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

* Under 250 hp.

Source: 16
### Canada: Aircraft and Parts Industry, 1935 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Plants</th>
<th>Average Number of Employees</th>
<th>Gross Selling Value of Products (Millions of Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1935</td>
<td>7</td>
<td>294</td>
<td>$ .9</td>
</tr>
<tr>
<td>1936</td>
<td>7</td>
<td>416</td>
<td>1.3</td>
</tr>
<tr>
<td>1937</td>
<td>8</td>
<td>606</td>
<td>1.7</td>
</tr>
<tr>
<td>1938</td>
<td>13</td>
<td>1,617</td>
<td>6.9</td>
</tr>
<tr>
<td>1939</td>
<td>13</td>
<td>3,596</td>
<td>12.6</td>
</tr>
<tr>
<td>1940</td>
<td>19</td>
<td>10,348</td>
<td>24.2</td>
</tr>
<tr>
<td>1941</td>
<td>24</td>
<td>26,661</td>
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</tr>
<tr>
<td>1942</td>
<td>42</td>
<td>44,886</td>
<td>137.8</td>
</tr>
<tr>
<td>1943</td>
<td>45</td>
<td>69,529</td>
<td>223.7</td>
</tr>
<tr>
<td>1944</td>
<td>45</td>
<td>79,572</td>
<td>427.0</td>
</tr>
<tr>
<td>1945</td>
<td>38</td>
<td>37,812</td>
<td>253.3</td>
</tr>
<tr>
<td>1946</td>
<td>16</td>
<td>11,405</td>
<td>36.2</td>
</tr>
<tr>
<td>1947</td>
<td>12</td>
<td>9,374</td>
<td>44.3</td>
</tr>
<tr>
<td>1948</td>
<td>11</td>
<td>8,049</td>
<td>45.6</td>
</tr>
<tr>
<td>1949</td>
<td>14</td>
<td>10,725</td>
<td>61.1</td>
</tr>
<tr>
<td>1950</td>
<td>15</td>
<td>10,549</td>
<td>50.2</td>
</tr>
<tr>
<td>1951</td>
<td>23</td>
<td>19,198</td>
<td>111.3</td>
</tr>
<tr>
<td>1953</td>
<td>43</td>
<td>38,048</td>
<td>398.7</td>
</tr>
<tr>
<td>1954</td>
<td>47</td>
<td>35,095</td>
<td>343.0</td>
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<td>1955</td>
<td>52</td>
<td>33,036</td>
<td>354.3</td>
</tr>
<tr>
<td>1956</td>
<td>52</td>
<td>35,563</td>
<td>354.5</td>
</tr>
<tr>
<td>1957</td>
<td>70</td>
<td>41,616</td>
<td>424.4</td>
</tr>
</tbody>
</table>

Sources: 7, 25
ITALY

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

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

JAPAN

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

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

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong Whitworth Argosy 650</td>
<td>4</td>
</tr>
<tr>
<td>Bristol Britannia</td>
<td>76</td>
</tr>
<tr>
<td>de Havilland Comet 4</td>
<td>27</td>
</tr>
<tr>
<td>de Havilland Comet 4B</td>
<td>6</td>
</tr>
<tr>
<td>de Havilland 121</td>
<td>24</td>
</tr>
<tr>
<td>Fairy Rotodyne</td>
<td>5</td>
</tr>
<tr>
<td>Vickers Viscount</td>
<td>405</td>
</tr>
<tr>
<td>Vickers Vanguard</td>
<td>40</td>
</tr>
<tr>
<td>Vickers VC-10</td>
<td>35</td>
</tr>
</tbody>
</table>

Source: 9
The proposed development of a transport to meet Japan's needs and also to compete in the export market appears to require more assistance from the Japanese Government.

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

WEST GERMANY

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

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

<table>
<thead>
<tr>
<th>United Kingdom: Aeronautic Exports, 1924 to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Average</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>1924–1928</td>
</tr>
<tr>
<td>1929–1933</td>
</tr>
<tr>
<td>1934–1938</td>
</tr>
<tr>
<td>1939–1943</td>
</tr>
<tr>
<td>1944–1948</td>
</tr>
<tr>
<td>1949–1951</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Source: 29
### Japan: Number of Aircraft Manufactured, Exported, and Imported 1952 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufactured</th>
<th>Exported</th>
<th>Imported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>1</td>
<td>-</td>
<td>66</td>
</tr>
<tr>
<td>1953</td>
<td>9</td>
<td>-</td>
<td>68</td>
</tr>
<tr>
<td>1954</td>
<td>36</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>1955</td>
<td>86</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>1956</td>
<td>93</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>1957</td>
<td>227</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>1958</td>
<td>211</td>
<td>27</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: 35

### United Kingdom: Employment and Production in the Aircraft Manufacturing Industry 1918 to Date

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment</th>
<th>Value of Production (Million Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1918</td>
<td>347,112</td>
<td>N.A.</td>
</tr>
<tr>
<td>1935</td>
<td>35,890</td>
<td>69.1</td>
</tr>
<tr>
<td>1939</td>
<td>355,000</td>
<td>N.A.</td>
</tr>
<tr>
<td>1944</td>
<td>1,821,000</td>
<td>N.A.</td>
</tr>
<tr>
<td>1948</td>
<td>134,219</td>
<td>455.2</td>
</tr>
<tr>
<td>1950</td>
<td>153,600</td>
<td>423.1</td>
</tr>
<tr>
<td>1954</td>
<td>238,200&lt;sup&gt;a&lt;/sup&gt;</td>
<td>624.0&lt;sup&gt;E&lt;/sup&gt;</td>
</tr>
<tr>
<td>1955</td>
<td>258,300&lt;sup&gt;a&lt;/sup&gt;</td>
<td>N.A.</td>
</tr>
<tr>
<td>1956</td>
<td>265,300&lt;sup&gt;a&lt;/sup&gt;</td>
<td>N.A.</td>
</tr>
<tr>
<td>1957</td>
<td>257,600&lt;sup&gt;b&lt;/sup&gt;</td>
<td>N.A.</td>
</tr>
<tr>
<td>1958</td>
<td>246,600&lt;sup&gt;b&lt;/sup&gt;</td>
<td>N.A.</td>
</tr>
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N.A.—Not available.
<sup>E</sup> Estimate by official British sources.
<sup>a</sup> As of end of November.
<sup>b</sup> As of end of December.
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