AVIATION WEEK

FEB. 23, 1948

A McGRAW-HILL PUBLICATION

15th Annual Yearbook Issue . . .

INVENTORY OF U.S. AIR POWER

VALVES VANES and BLADES

LEADING MANUFACTURERS of reciprocating-type aircraft engines depend on the Thompson Sodium-cooled Valve that withstands heat, pounding and friction for thousands of flying hours—and on the intricate vane designs that go into supercharger and other important assemblies.

Jet engines became a practical reality only after metallurgical and engineering science developed blades of new alloys and contours, delicately balanced, that stand up under great heat and centrifugal strains.

Valves, vanes and blades are an important part of Thompson's aircraft production—they are the result of unremitting research in metallurgy, engineering and manufacturing.

Thompson Products

Cleveland • Detroit • Los Angeles • St. Catharines, Canada

Martin Aircraft Company mechanic installs electric rubber on the Martin 2-0-2.

Where ice made metal melt

ICE THAT FORMS on an airplane's air scoop chokes off the air that cools the generator. And without air, heat can build up until insulation and even metal melt—and the generator burns up.

This was always a serious problem for pilots and mechanics. But it was licked the day B. F. Goodrich engineers came up with electrically heated rubber. This thin, tough rubber has wires imbedded in its core which distribute heat uniformly over its entire surface. The hot rubber keeps ice from forming on the narrow intake, and the generator gets a continuous flow of cooling air.

In the picture above, a mechanic is installing B. F. Goodrich electric rubber on the generator oil cooler duct of the Martin 2-0-2. This is an easy job because the rubber is very flexible and fits curved surfaces tightly and smoothly. After it is cemented on, the pair of wires that carry power from the generator are connected—and the installation is complete.

B. F. Goodrich electric rubber is the most efficient way of getting the right amount of heat to a specific spot. It simplifies design problems and saves weight. It can be adapted to any power supply. And it can be internally installed where design permits.

B. F. Goodrich electric rubber has done a successful anti-icing job on propellers, spinner domes, cowls, antenna and pitot masts, hydraulic lines, water tanks and other installations. Research to make electric rubber even better is a constant project of B. F. Goodrich engineers. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER

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Vol. 48, No. 8 AVIATION WEEK Feb. 23, 1948

National Has Service Despite Pilots Strike

With service already reinstated over its Miami-Key West and Miami-Tampa-New Orleans links, National Airlines last week prepared to resume flights on its main New York-Miami-Havana route despite the continuing strike by 145 members of the Air Line Pilots Association.

Statements by NAL officials that the non-union pilots hired to replace ALPA crews would be retained permanently brought a prompt retort from ALPA president David L. Behncke. The union chief said "not only will National have to return all of its striking pilots to work when the dispute is settled, but any previously furloughed pilots will have to be returned to the company payroll, in accordance with seniority, before any pilots hired during the strike can possibly hope to remain."

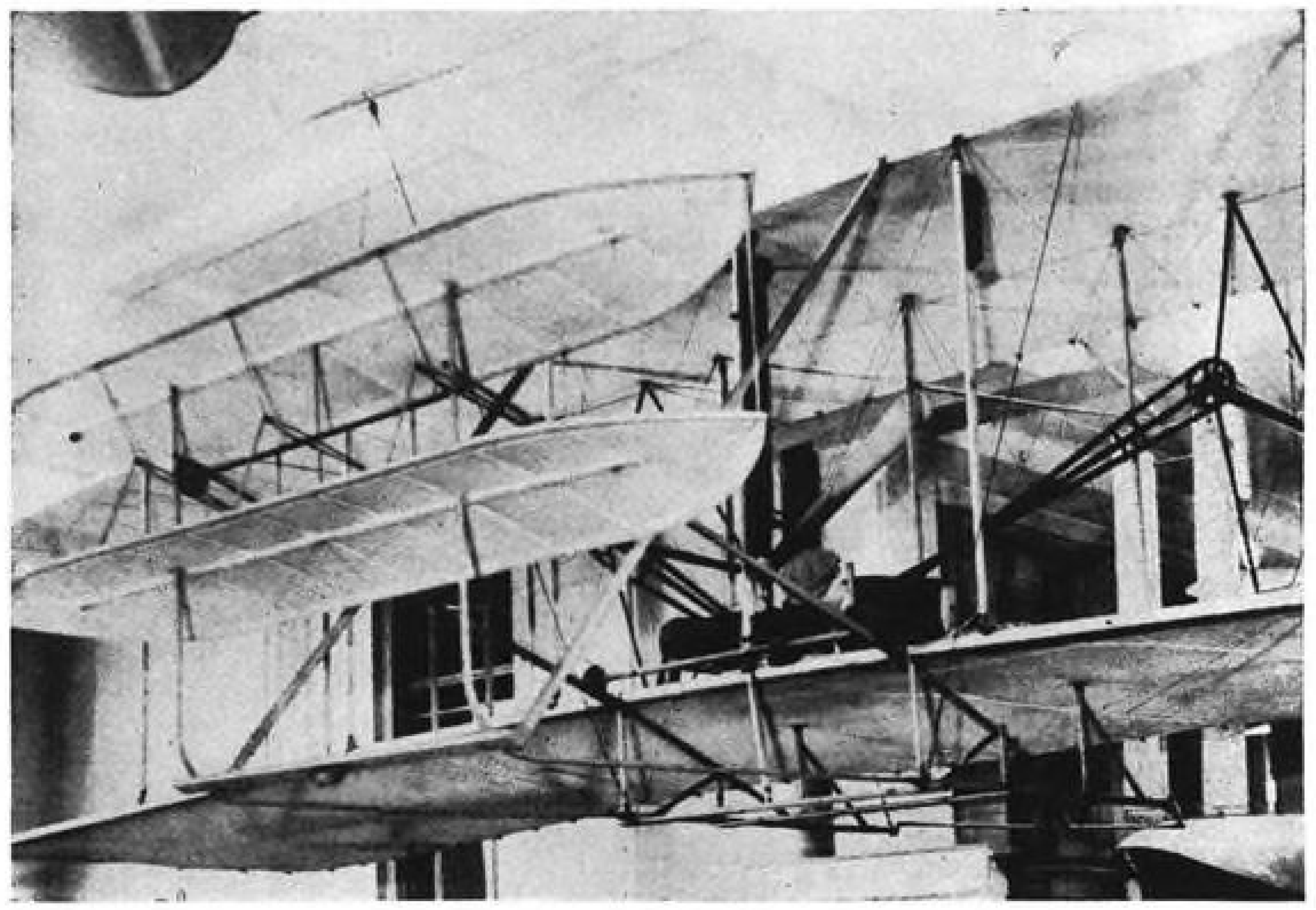
Meanwhile, CAA announced it was tightening operating requirements for National until its new pilots can get necessary experience over their routes. Minimum ceilings have been raised temporarily by 200 ft. at each airport served by NAL flights.

In another phase of its labor difficulties, National filed a $750,000 damage suit against the International Association of Machinists, charging that the union—which has been on strike since Jan. 24—had violated its contract. Previously, NAL had filed a $5,000,000 damage suit against ALPA, alleging libel and slander (AVIATION WEEK, Feb. 16).

CAB Extends DC-3 Service Until 1953

The Air Transport Association has won a determined fight on Civil Air Regulations which would have forced early retirement of DC-3s and other prewar transports or required extensive and costly alterations to the planes.

CAB this month amended rules specifying that DC-3, Lockheed Lodestar and Boeing 247-D equipment used in scheduled operations must meet the stiff performance standards of part 04(a) of the CAR by Dec. 31, 1948. The airlines have now been authorized to use the planes without alteration until the end of 1953.



The Wright Flyer

Wright Biplane May Return to U. S. Aug. 19

Aug. 19, birthday of Orville Wright, and date designated by Congress as National Aviation Day in 1939, is expected to be the date for the return of the Wright brothers first power plane to this country.

Executors of the Orville Wright will have announced that they expect to wait six months in compliance with Ohio law before announcing their decision as to disposition of the plane. The waiting period is required to give opportunity for filing claims. Meanwhile they expect to examine papers left by the first man to fly a power plane, seeking further indications as to his intentions as to where he wished the plane placed.

The Science Museum, South Kensington, near London, disclosed its willingness to return the Kitty Hawk biplane to the United States at the earliest possible moment following the receipt of a notification from the executors of Orville Wright's estate regarding the home of the machine.

A spokesman for the Smithsonian Institution said last week that there was still no indication that the plane would be placed there when returned to this country, but that it would be given "the highest place of honor," as promised, if it should be received.

Eventually it would be placed in the new National Air Museum when that is built if it is given to the Smithsonian's custody, he pointed out. Since Orville Wright had repeatedly indicated verbally to friends that he thought the plane ought to be in Washington, rather than some other place (AVIATION NEWS, Nov. 18, 1946), it is likely that it will eventually go to the Smithsonian.

Convair-Liner NC

The Convair-Liner has been approved by the Civil Aeronautics Administration for airline operation, Consolidated Vultee announces.

A supplemental approved type CAA NC certificate was issued following extensive pressurization and anti-icing tests. A limited approved type NC certificate had been granted in November. The company's flight test program will continue with various combinations of power plant, propellers and gross weight for which CAA approval will be sought.

Airlines which have ordered the twin-engine transports will conduct training programs before placing them in regular service.

New Postal Rate Law Is Pushed in House

Members of the House Post Office and Civil Service Committee last week appeared near agreement on legislation, vigorously opposed by the Air Transport Association, setting up a three-member postal rate-fixing board in the Post Office Department.

The board would be directed to establish rates for the various categories of mail which would assure the Department an income at least equal to its expenditures, but which would give consideration to the "public interest" aspect of certain types of postal services, such as the dissemination of books and newspapers. Testifying on the measure, ATA's executive vice president, Robert Ramspeck, objected to Congress' relinquishing its power over postal rates to a government bureau and proposed that if the Department is required to be self-supporting but at the same time continue "public interest" postal services, it would mean that a portion of cost of these services would have to be borne by the air mail and other first class postal services. Under the legislation, introduced by Rep. Katharine St. George (R., N. Y.), being considered by the House committee, Congress would have sixty days to veto postal rates proposed by the Post Office Department rate-fixing board.

Other developments on Capitol Hill last week were:

- **Commerce Department Appropriations** subcommittee, headed by Rep. Karl Stefan (R., Neb.), completed action on 1949 fiscal year budgets for Civil Aeronautics Administration and Civil Aeronautics Board. Indications were that the subcommittee would make down-the-line cuts in most, if not all, CAA categories—as it did last year.
- **Joint Congressional Air Policy Board** rushed its final report to completion by the Mar. 1 deadline set for it. The Board's chief concern appeared to be to come forth with a document which would be more than a "me too" to the report of the President's Air Policy Commission.
- **House Post Office** and Civil Service Committee planned early action on legislation establishing a domestic air mail parcel post service along lines approved by independent airfreight operators, but opposed by scheduled airlines.
- **CAB's Authority** to set different air mail rates for different carriers operating over the same route segment would be wiped out under legislation introduced by influential Sen. Walter George (D., Ga.).
- **U. S. Air Force** would be authorized to detail its scientific and technical personnel to private plants and establishments for periods up to six months under legislation approved by the Senate Armed Service Committee.
- **An $8,000,000 international airport** at Anchorage, Alaska, and a $5,000,000 airport at Fairbanks would be authorized under a bill passed by the House and now before the Senate Interstate and Foreign Commerce Committee for action.
- **Small Airports**, costing $25,000 or less, would be eligible for 85 percent Federal financing under legislation introduced by Rep. Clair Engle (R., Calif.). The Federal Government at present is authorized to finance only 50 percent of the cost of class three and smaller airports.

New Martin Order

The second large commercial order in ten days for new transport planes was disclosed last week when Glenn L. Martin Co. announced that Northwest Airlines had signed a $4,500,000 contract for 15 twin-engine 2-0-2s. One-a-week deliveries are to begin in March, with the entire order to be filled by the end of June.

NWA's additional order (following shortly after Douglas' sale of 11 DC-6s to Delta Air Lines and United Air Lines) is for the 36-passenger version of the 2-0-2. Northwest's original ten 2-0-2s, which were put in service last November, are 40-passenger craft. These will be modified to conform to the new planes with their larger cargo capacity.

Croil Hunter, NWA president and general manager, states that his company will retire all its DC-3s by July 15. By that time the carrier hopes to have 2-0-2s in service on all its domestic routes. Hunter said performance of the 2-0-2 has exceeded expectations.

NOVEL BOEING XB-47 COCKPIT CLOSEUP

Boeing test pilots Scott Osler and Robert Robbins are shown seated in the swept-wing Stratojet bomber. Closeup reveals compact, sturdy lines of pressurized, refrigerated enclosure. Metal rails of ejection seat runners are shown directly behind each pilot. For crew ejection, entire canopy assembly is jettisonable. Heating and ventilating duct extends along top of enclosure. Note heavy crash helmets of both crew members. XB-47 is completing preliminary flight tests at Moses Lake preparatory to flying to Muroc Air Force Base, Calif.

Delays Cause Extension For Terrain Indicators

Equipment engineering and production delays were behind inability of airlines to meet CAB's Feb. 15 deadline, now extended to May 15, for installation of terrain proximity indicators.

To some extent this was brought about by instrument builders being unable to proceed with the development of indicator units until CAA specifications, considered deficient in original form, were revised. A variety of devices now are in production.

Skyrocket Flies

Douglas' Skyrocket (D-558-2) has completed its first phase test flights. The swept-wing rocket and jet powered research plane was flown by Douglas test pilot John Martin in low speed airworthiness tests at the USAF Muroc Desert Test Center. The Skyrocket's flight research at transonic and supersonic speeds will be done by Navy and National Advisory Committee for Aeronautics pilots.

AVIATION WEEK

Inventory of U. S. Air Power

If world leadership cannot be solely moral, but must be backed by the ability to employ force, there are few today who would deny that the only decisive force is air power.

Air power, by definition sharpened in the recent war, is the sum total of all aviation resources and facilities. It is civil as well as military.

On the following pages, the editors of Aviation Week present a full-dress assessment of United States air power in all its varied aspects. It is the most extensive appraisal of this nature undertaken by any publication since the end of the war. It is inspired by events that have occurred since then.

The United States has assumed political leadership in the peacetime conduct of world affairs. This is principally manifested in the European Recovery Program and other foreign aid measures.

In thus taking world leadership, the United States also is taking the risk of having that leadership challenged. At that point, the military force immediately at hand may be the telling factor.

The air strength of any one nation is relative to the strength of other nations that conceivably may be factors in the employment of air power. To measure the quality of U. S. air power, it is necessary also to examine air power of key foreign nations.

On the premise that the ability of any nation today to maintain world political leadership must be measured by its air power, the staffs of Aviation Week and McGraw-Hill World News have undertaken to answer this question:

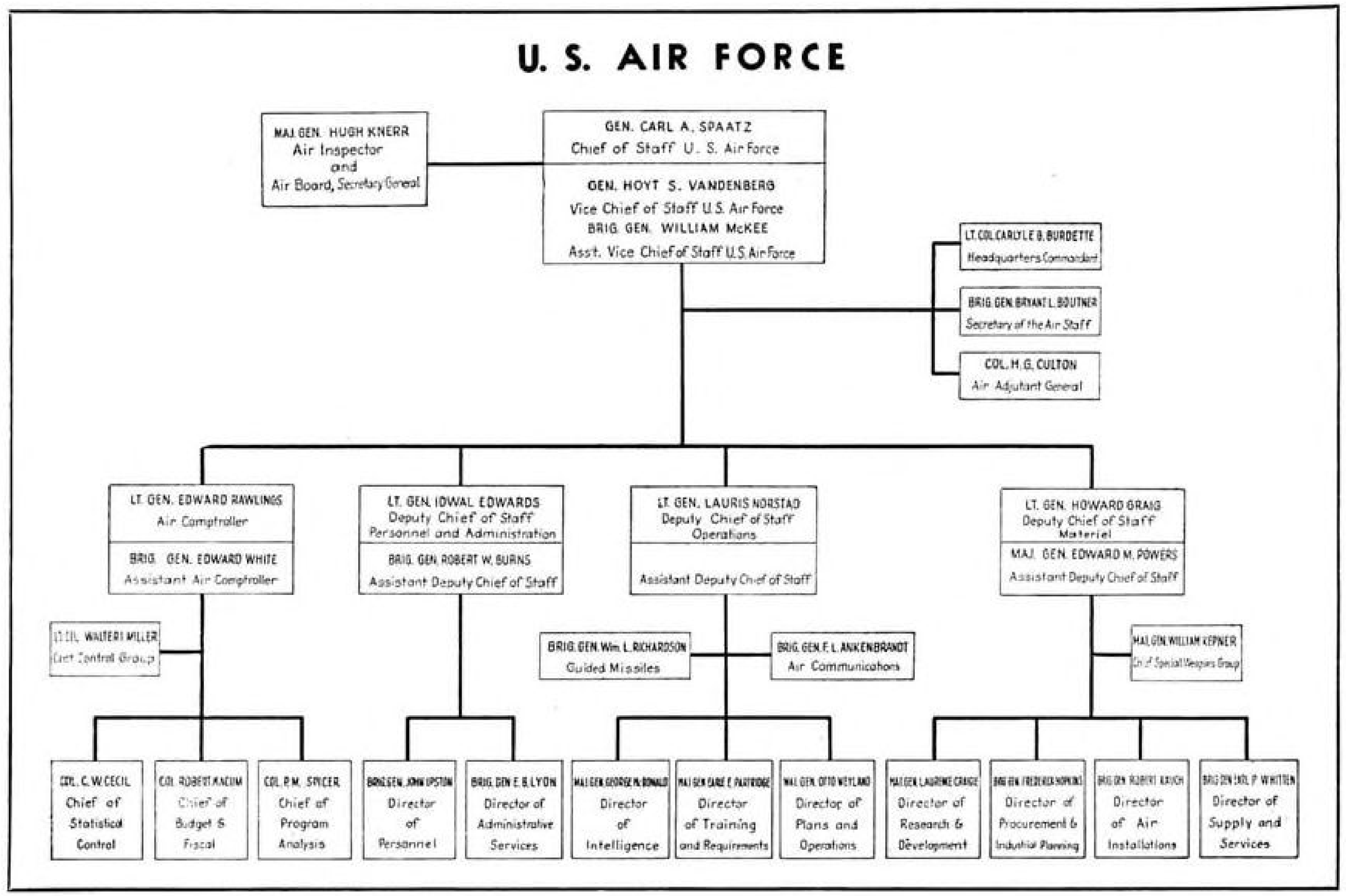
What is the state of U. S. air power today, in the late winter of 1948?

U. S. Military and Naval Planes

Manufacturer	Designation	Engine, Make Model, hp.	Range	High Speed, mph.	Ceiling	Gross Weight	Empty Weight, lb.	Span	Length	On Order
U. S. AIR FORCE										
Aeronca Aircraft Corp.	L-16-B	C; C-90-8FJ; 90	302	104	16,000	1,200	790	35′ 2″	21′ 6″	100
Municipal Airport										
Middletown, Ohio										
Boeing Airplane Co.	XL-15	L; 125	250	112	16,400	2,050	1,509	40′	25′ 2.9″	
Box 3107	YC-97A	4 P&W; R-4360; 3,500	4,700	375	30,000	130,000	72,865	141′ 3″	110′ 4″	4
Seattle 14, Wash.	B-50	4 P&W; R-4360; 3,500	5,000	400+	35,000*	120,000	NA	141′ 2″	99′	215
	XB-47	6 GE-A; -35; 4,000 (T)	2,000*	600+	NA	NA	NA	116′	108′	1
Chase Aircraft Co., Inc.	XCG-18A	None	(2)	180(1)	(2)	16,000	8,000	86′ 4″	53′ 5⅛″	
West Trenton, N. J.	MS-7	2 W; R-1820; 1,275	750	220	23,000	26,000	15,250	86′ 4″	53′ 5⅛″	
Consolidated Vultee Aircraft Corp.	B-36	6 P&W; R-4360-25; 3,000	10,000	300+	40,000	278,000	NA	230′	163′	98
	XB-46	4 GE-A; J-35; 4,000 (T)	3,000+	480+	NA	91,000	48,018	113′	106′	
San Diego 12, Calif.	XC-99	4 P&W; R-4360-25; 3,000	8,100	300+	30,000	265,000	135,232	230′	182′ 6″	
	L-13	Ai; 245	368	115	15,000	2,900	1,888	40′ 5.5″	31′ 9″	
Curtiss-Wright Corp., Airplane Div.	XP-87	4 We; 24C	2,000*	600*	NA	37,500	32,800	60′	66′	
Columbus 16, Ohio										
Fairchild E & A Corp.	C-82	2 P&W; R-2800-85; 1,700	3,875	248	21,200	50,000	32,500	106′ 5″	77′ 1″	
Hagerstown, Md.	XNQ-1	L; 300	640	174	15,750	3,724	2,786	41′ 4″	27′ 11″	
	C-119B	2 P&W; R-4360-20; 2,650	2,925	266	23,900	64,000	37,385	109′ 3″	85′ 10″	37
Hughes Aircraft Co.	XF-11	2 P&W; R-4360-37; 3,000	5,000*	420*	44,000*	47,000*		101′ 5″*	65′ 5″*	NA
Culver City, Calif.										
Glenn L. Martin	XB-48	6 GE-A; J-35; 4,000 (T)	800+	480+	NA	NA	NA	108′ 4″	85′ 9″	1
Baltimore 3, Md.										
Lockheed Aircraft Corp.	P-80B	A; J-33; 4,000+ (T)	1,500+	600+	45,000+	14,000*	8,000*	38′ 10½″	34′ 6″	NA
255 N. Hollywood Way										
Burbank, Calif.										
North American Aviation, Inc.	P-86A	GE-A; J-35; 4,000 (T)	1,000+	480+	40,000+	13,715	NA	37′	37′	225
5701 Imperial Highway	B-45	4 GE-A; J-35; 4,000 (T)	1,600+	500+	40,000	82,600	NA	89′ 6″	74′	99
Inglewood, Calif.	P-82E	2 A; V1710-143, 145; 3,170	2,500+	475+	40,000	20,750	NA	51′	37′	150
Northrop Aircraft Co.	B-35	4 P&W; R-4360; 3,000	10,000	NA	NA	209,000	89,000	172′	53′ 1″	13
Northrop Field	B-49	8 GE-A; J-35; 4,000 (T)	4,000*	500*	30,000+	200,000+	88,100	172′	53′ 1″	12
Hawthorne, Calif.										
Republic Aviation Corp.	P-84	GE-A; J-35; 4,000 (T)	1,000+	600+	40,000+	13,000	NA	37′	37′	515
Conklin Street	XF-12	4 P&W; R-4360; 3,000	NA	450	44,000+	114,000	NA	130′	94′	2
Farmingdale, L. I., N. Y.										
Ryan Aeronautical Co.	L-17	C-185; 185	500	157	15,600	2,750	1,680	33′ 4″	27′ 3″	
San Diego, Calif.										
NAVY										
Chance Vought Aircraft, United Aircraft Corp.	F4U-5	P&W; R-2800E; 1800*	1,500+*	450+	35,000+*	NA	NA	40′ 11.7″	34′ 6.5″	258
	XF5U-1	P&W; R-2000-2	NA	460						
Stratford, Conn.	F6U-1	We; 24C	NA	500						
Douglas Aircraft Co., Inc.	AD-1	W; R-3350-24W; 2,400	NA	NA	25,000	15,929	10,470	50′ ¼″	39′ 4⅞″	123
3000 Ocean Park Blvd.										
Santa Monica, Calif.										
Edo Aircraft Corp.	XOSE-1	R; 550	1,000	200+	NA	3,700		31′ 10.3″	32′ 10″	30
College Point										
New York										
Grumman Airc. Eng. Corp.	XJR2F	W; R-1820-76; 1,425	600-2,600	270	NA	NA	NA	80′	61′ 4″	NA
Bethpage, L. I., N. Y.	F8F-1	P&W; R-2800-34W; 2,100	1,650	381+	40,000	9,583	7,323	35′ 6″	28′ 3″	365
	F9F-2	RR-None; 5,000 (T)	NA	600+	45,000+*	NA	NA	NA	NA	101
Lockheed Aircraft Corp.	XR-60	4 P&W; R-4360; 3,000	2,310	303	27,600	184,000	114,575	189′ 1¼″	156′ 1″	
255 N. Hollywood Way	P2V-2	2 W; 825C18BD1; 2,100	3,080	308	29,200	45,000+	32,910	100′	78′ 2¾″	100
Burbank, Calif.										
Glenn L. Martin	PBM-5A	2 P&W; R-2800; 2,100	2,000+	180+	15,000+	60,300	39,698	118′	80′	36
Baltimore 3, Md.	AM-1	P&W; R-4360; 3,000	1,150	350+	25,000+	21,000	14,100	50′ 1″	41′ 6″	163
	P4M-1	2 A; J33; 4,000 (T) and 2 P&W; R-4360; 3,000								
McDonnell Aircraft Corp.	FH-1	2 We; 19-B	1,000	500+	37,000	10,000	NA	42′	37′ 3″	29
Lambert-St. Louis Municipal Airport, Box 516	XF2H-1	2 We; 24-C	1,200	600+	48,000	14,000		41′ 7″	40′	56
St. Louis 21, Mo.										
North American Aviation, Inc.	FJ-1	GE; -A; J35; 4,000 (T)	NA	550+	NA	12,697	NA	38′ 1″	33′ 7″	12
5701 Imperial Highway	XSN2J-1	W;R-1820-78; 1,100	1,600	308	32,200	8,406	5,948	42′ 11¼″	33′ 10″	NA
Inglewood, Calif.										

Engine Symbols
A —Allison.
Ai —Aircooled Motors.
C —Continental.
GE —General Electric.
L —Lycoming.
P&W—Pratt & Whitney.
R —Ranger.
RR —Rolls Royce.
W —Wright.
We —Westinghouse.
NA —Not available.

(T) —Thrust.
* —Aviation Week Estimate.
– —Less than.
(1) —Designed tow speed.
(2) —Dependent on tow plane.



Air Power and National Security

While air arms are adequate for defense, their ability to support foreign policy is open to question.

By ROBERT B. HOTZ

While air power of the United States may be adequate to meet present national security requirements, there is a growing opinion that drastic increases both in quantity and quality are necessary to meet requirements of the immediate future.

There is no present concern over ability of U. S. air power to protect the North American continent from enemy attack. Earliest date when that problem may become acute was set at Jan. 1, 1953, by the President's Air Policy Commission, although in some quarters that is regarded as an unduly optimistic view of the technical advances in aircraft and guided missiles.

▶ **Foreign Problem**—Ability of U. S. air power adequately to support this country's foreign policy is a more immediate problem. The steadily deteriorating international situation of the past two years now indicates that U. S. air power may have to operate in three troubled areas—the Middle East; Western Europe and the Far East. Of these three the Middle East with its four billion barrel oil reserve seems the most explosive. Preliminary moves to insure facilities for U. S. air power in that area have already been made in the preparation of Mediterranean and Middle Eastern airfields.

Numerically U. S. airpower now consists of 6805 combat planes in active service with the Air Force and 4900 combat planes in the carrier combat groups and fleet support units of the Navy. This total of 11,705 combat planes compares with Air Force Chief of Staff Spaatz's recent estimate of Russian air strength as 14,000 combat planes.

In addition, the Air Force has 9184 combat planes in storage with the Navy reserve in storage numbering 3,010. This gives a total of 23,899 combat planes of which 12,194 are in storage capable of being reconditioned for combat on short notice. Although many of these planes are already tactically obsolete, and most of them will become so within the next two years, they will form an important component of air power for considerably longer by virtue of their use as trainers and utility types.

▶ **Many Estimates**—In contrast to this present strength are a number of estimated minimum requirements to meet future needs. The Air Force wants to increase its present 55 group program (only 35 at full strength) to 70 full strength combat groups totalling 6689 first line combat planes and backed by a reserve of 8100 planes manned by National Guard and Air Force Reserve personnel. This program was backed by the Air Policy Commission.

Navy plans for its air power call for a 14,500 plane total of which 8000 would be first line. The Air Policy Commission took a less urgent view of the Navy's needs and recommended its air power be maintained at its present numerical strength with more modern equipment.

Of even more concern is the state of the aircraft industry required to build and maintain air power on this scale. The Air Coordinating Committee has set an annual production rate of 3000 military aircraft with airframe weight of

Air Force and Naval Aviation Appropriations

AIR FORCE Fiscal Year		BUREAU OF AERONAUTICS Fiscal Year	
1938	$47,948,620(1)	1938 (after supplementals)	$66,500,000
1939	54,430,078(2)	1939 " "	66,950,000
1940	186,252,294(3) (7)	1940 " "	131,459,000
1941	3,892,769,570(7)	1941 " "	982,320,000
1942	21,952,516,861(7)	1942 (after rescissions)	6,989,444,100
1943	11,316,898,910(7)	1943 " "	4,736,498,981
1944	23,655,481,000(7)	1944 " "	5,307,808,038
1945	1,610,200,000(4) (7)	1945 " "	2,551,613,679
1946	100(5) (7)	1946 " "	796,921,000
1947	1,199,500,000	1947 " "	870,760,000
1948	829,272,100(6)	1948 " "	749,000,000

(1) In addition, contract authorization of $19,126,894 was provided.
(2) In addition, contract authorization of $19,126,894 was provided.
(3) In addition, contract authorization of $76,205,988 was provided.
(4) In addition, $11,000,000,000 was authorized for obligations from savings in prior year funds.
(5) Original program approved by Congress was $5,779,798,185. Reduced subsequently to $1,500,000,000 as a result of the third revision following V-J Day. Actual cash appropriation $100 — balance was made available from carryover and reappropriation of prior year funds.
(6) In addition, contract authorization of $430,000,000 was approved.
(7) From total funds appropriated to the AAF by the Congress during F. Y. 1940–1946 inclusive the AAF effected savings of approximately $22,100,000,000. $15,300,000,000 of this amount was covered into the Treasury and $6,800,000,000 was transferred to other War Department appropriations.

30,700,000 lb. as the minimum required to maintain a healthy aircraft industry capable of rapid emergency wartime expansion. Air Force estimates the 70 group program would require a 3200 plane annual production rate with 46,414,000 lb. of airframe weight. Navy's program would need an annual production rate of 2500 planes. Backing this Air Force-Navy requirement of 5700 new planes per year is the Air Coordinating Committee's 1947 report setting a 5789 plane rate as the current minimum requirement.

▶ **Production Record**—Against these requirements are the facts that in calendar 1946 the aircraft industry built 1330 military aircraft; 1800 in 1947 and received procurement funds for fiscal 1948 to build 1511 planes. To meet the ACC requirements current military aircraft production rates would have to be trebled. Blame for the fiscal 1948 procurement plight rests squarely on President Truman who slashed the 1948 Army-Navy request for 3140 planes, with an airframe weight of 26,233,000 lb., by more than 50 percent.

Aircraft procurement funds for fiscal 1949 have not yet been determined by Congress. Presidential budget called for a total of $1,172,000 which is expected to buy 2131 military planes—1164 for the Air Force and 967 for the Navy.

Although Congressional sentiment balks at the $6,000,000,000 annual expenditures required by the Air Force 70 group program, there have been indications of solid bi-partisan support for as much as a 10 percent increase over the Presidential requests for aircraft procurement. Congressional leaders are wary of committing themselves to any particular air power expansion program until the Joint Chiefs of Staff have drawn up an overall strategic defense plan for the United States. Lack of such a plan at present was bitterly accented in the President's Air Policy Commission Report.

▶ **Twin Assumptions**—All estimates of military air power required for the future and the minimum size of its industrial base have been based on twin assumptions. These are: at least a year's warning of the approaching emergency that will require all-out production; and a high degree of industrial mobilization planning that will facilitate rapid expansion. Air Force plans are based on fighting a future war for 18 months with its force in being and allowing that much time for production to reach its wartime rate. ACC now believes that it may be impossible to get a full year's warning. The present state of industrial mobilization planning indicates that it will contribute little to the anticipated acceleration.

In addition to its military and industrial components, U. S. air power with its current technical limitations of range is dependent on the use of foreign bases. These in turn must rest on a solid base of diplomacy during peacetime and alliances during war. Operations from these bases whether they are in the Middle East or in the Orient will still find it necessary to depend on sea borne supplies.

USAF in Evolutionary Period

Force sufficient for immediate use, but near future holds perplexing problems.

The newly hatched United States Air Force, still struggling with its recently acquired administrative problems, also finds itself in the midst of a technical and tactical evolution that has not yet crystallized into a clear definition of its future course.

To meet its immediate requirements the USAF has a numerically impressive but qualitatively erratic array of aircraft backed by flying personnel of exceptionally high experience levels, with ground crews and administrative personnel of only average or sub-average experience.

▶ **Latest Figures**—Latest figures available give the USAF a total of 28,307 aircraft of all types of which 14,216 are available for immediate use and 14,091 are in storage. Of this total 15,989 are combat aircraft with 6805 in active inventory and 9184 in storage. Breakdown of the combat types reveals: a total of 3000 B-29s of which 2443 are in storage; 4246 medium bombers (from B-17 to A-26) with 2157 in storage; 7965 fighters with 4291 in storage; and 775 reconnaissance planes with 290 in storage. Active inventory of combat types includes: 557 B-29s; 2089 twin- and four-engine bombers; 3674 fighters and 485 reconnaissance planes.

If war came tomorrow the Air Force offensive would depend on Boeing B-29s escorted by North American P-82 Twin Mustangs. Air defense would consist primarily of Lockheed P-80 jet fighters aided by two Groups of Republic P-84 Thunderjets. By present day standards this would be a formidable force but the era in which it could be so considered is rapidly drawing to a close. It is in this era just beyond the immediate future that the Air Force finds itself faced with its most perplexing problems.

▶ **Range Problem**—Biggest problem is that of range. To fulfill its basic strategic concept of mounting an air offensive from bases in North America and striking at the heart of enemy industrial and military strength, considerably more range is required than is available in current operational types (B-29 and B-50) or in those in prospect for the near future (B-35 and B-36). Tactical radius of the B-29 and B-50 is approximately 2000 miles with the B-35 stretching to about 3500 miles and the B-36 reaching closer to 4000 miles. Both B-35 and B-36 must take consider-

Air Defense: The Planes Behind It

Boeing Aircraft L-15 liaison plane. (Ross-Pix)

Consolidated Vultee L-13 folding wing liaison plane.

McDonnell Aircraft Banshee (Navy jet-fighter).

Glenn L. Martin AM-1 Mauler (Navy fighter).

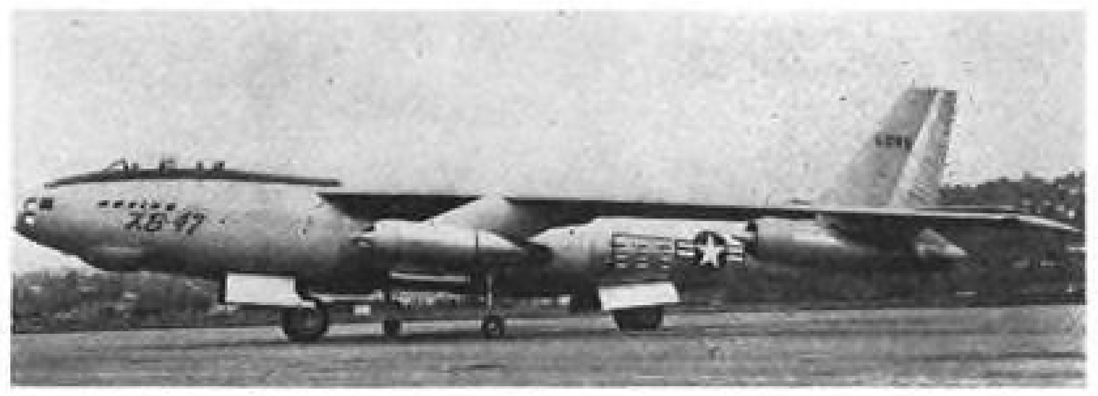
Lockheed Aircraft P2V Search-Patrol plane.

McDonnell Aircraft Phantom Navy jet-fighter.

Glenn L. Martin XB-48 experimental six-jet bomber.

North American B-45 jet powered bomber.

Boeing Aircraft B-50 superbomber for Army.



Boeing Aircraft XB-47 experimental jet bomber.

Unified Bid For Air Power

Service aircraft boast speed, versatility, striking power.

Douglas Aircraft AD-1.

North American FJ-1.

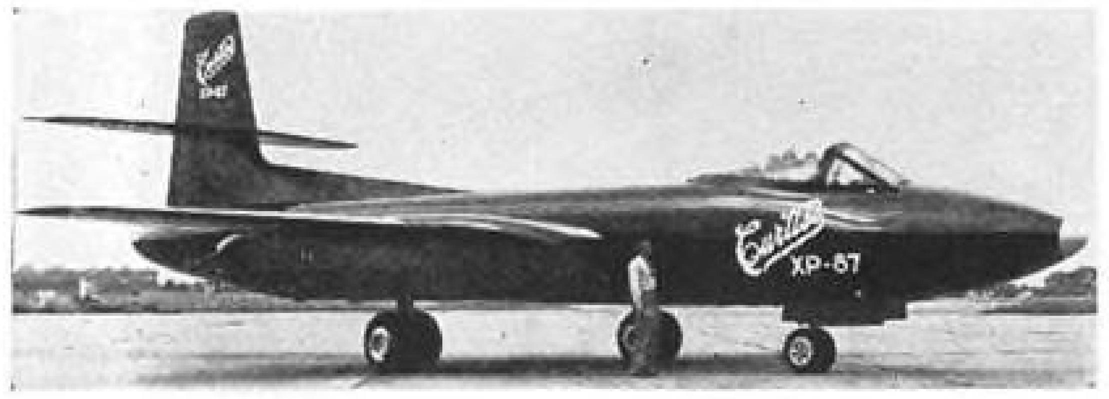
Northrop YB-49 Flying Wing.

Lockheed P-80B jet-fighter.

Glenn L. Martin XP4M-1.

Consolidated Vultee XC-99.

Lockheed Constitution Navy transport.



Curtiss XP-87 experimental jet fighter.

Fairchild C-119 Packet.

able penalty in reduced bomb load to function at these extreme radii.

With these cold figures, the Polar Concept, so popular in Air Force circles immediately after the last war, is a less appealing doctrine. Great Circle courses across the Polar area to the major industrial and population centers of the Eurasian heartland demand combat radii of at least 5000 miles.

▶ **Limit on Size**—Although the trend since the beginning of military aircraft has been toward bigger and longer ranged planes there are indications that designers are now facing severe practical limitations on increased ranges. To achieve the ranges necessary to fulfill the Polar Concept of strategic airpower, aircraft with useful loads better than 60 percent of their empty weight will be necessary. With the present materials and structural techniques 50 percent is the maximum yet achieved. And that is found in the Northrop B-35 rather than in the larger Convair B-36.

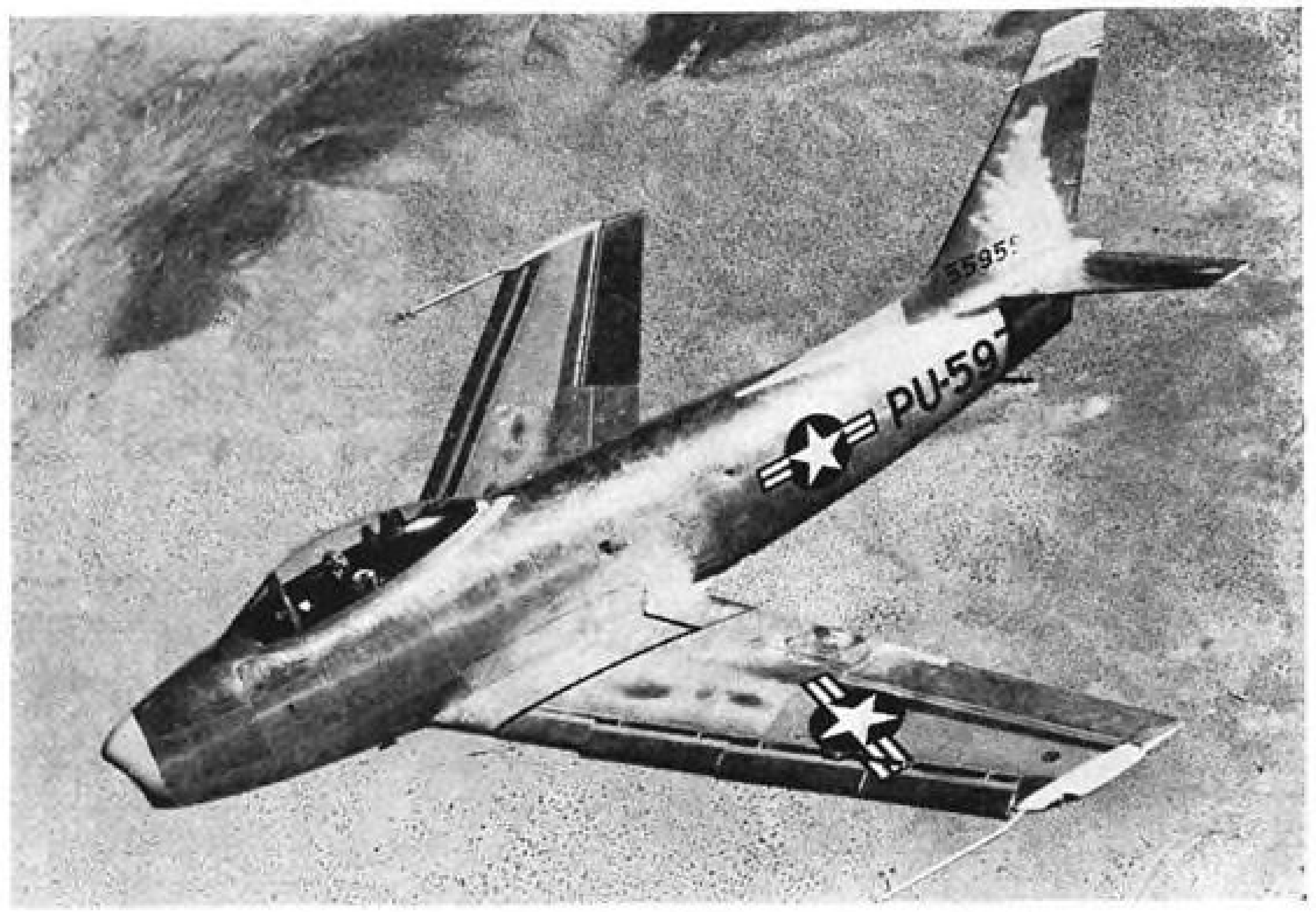
Until these serious technical problems are solved the Air Force will be tied to the use of foreign bases and staging fields to achieve required ranges much as the Navy uses the carrier to extend the range of its air power. Recognition of these range limitations are evidenced by the Air Force's plans for production of the Boeing YC-97 improved Stratofreighter as a companion transport for the B-50 to move minimum logistical requirements to staging fields by air at approximately the same speed of the bomber.

This in turn means that the Air Force will be dependent on ground defense of its bases and sea borne supply for its logistical support. Intercontinental air warfare either by piloted aircraft or by guided missiles is not an immediate prospect.

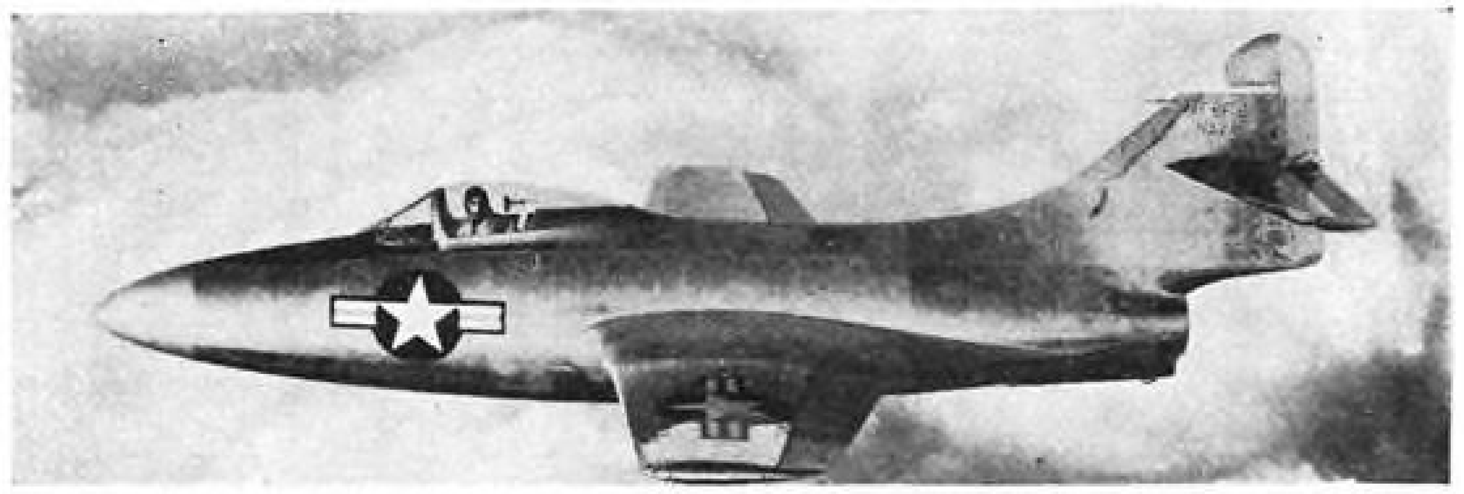
▶ **Tactical Problems**—Even with current operational equipment, a revolution in tactics is well under way. Present trend, similar to the pre-war trend of the '30's, is to rely primarily on speed for security of bombers against fighter attack. Tactical tests of P-80 interceptions against single B-29s found the fighters invariably unsuccessful although they enjoyed a 100 mph. speed advantage over the bomber. When radar ground controllers made an error of as small as two miles in the collision course of the fighters, the bombers were usually not spotted. When they were sighted no more than two attacks could be made and frequently by the time the P-80's completed their initial attack the B-29 would be out of sight making a second pass impossible.

Another factor in placing primary reliance on speed is the feeling that despite the attainment of supersonic speeds by research aircraft, production line aircraft will be limited to subsonic speeds for at least another decade. During this period the fighter speeds will be frozen just below the speed of sound while bomber speeds will creep upwards progressively cutting down the already inadequate speed differential between jet fighters and propeller driven bombers.

While the first line of fighter defense now consists entirely of jet interceptors it is evident that the reciprocating engine, turpoprop, and compound engine are destined to play a key role in bomber development.



North American XP-86 high performance jet powered fighter.



Gruman XF9F-2 Rolls Royce Nene powered Navy jet-fighter.

Strength of USAF

(As of Dec. 31, 1947)

AIRCRAFT

Active	11,300
Inactive (Storage)	11,500
TOTAL	22,800

Included in the above figures are 6,000 utility planes in active status and 4,500 in storage. "Active" planes are those not in storage, but the figure shown does not necessarily indicate the total immediately ready for combat.

PERSONNEL

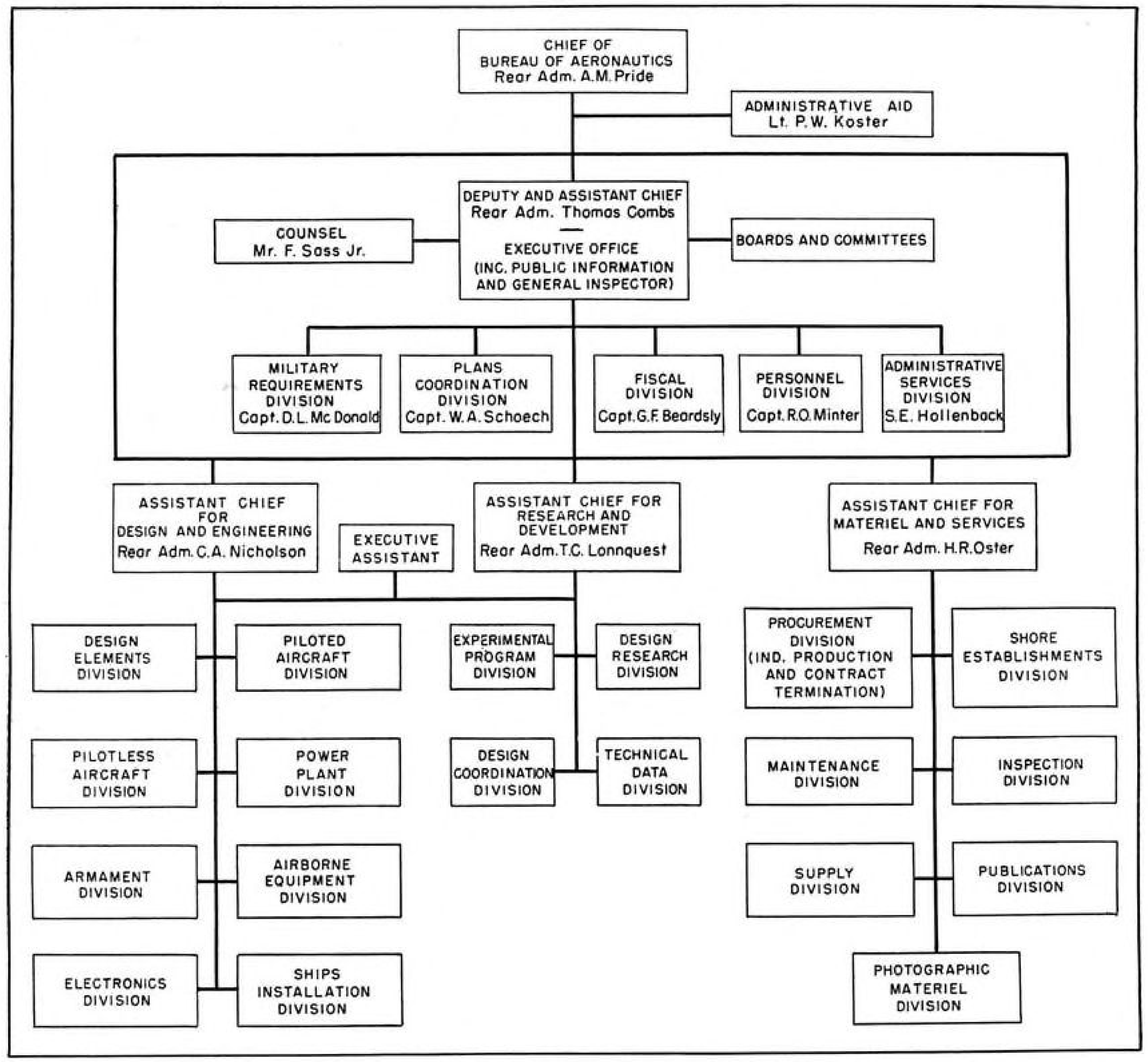
Officers	46,000
Enlisted Men	292,000
TOTAL	338,000

Included in the above figures are 12,000 officers and 88,000 enlisted men stationed overseas.

Air Training

As of Dec. 31, 1947, USAF was operating cadet training fields at: Goodfellow Air Force Base, San Angelo, Tex.; Randolph AFB, San Antonio, Tex.; Williams AFB, Chandler, Ariz.; and San Marcos AFB, San Marcos, Tex., the latter for helicopter training. On that date, there were 574 cadets in training and 483 officers undergoing flight instruction for a total of 1057 trainees.

In January, 1948, the Navy had in training 1335 officers and men, plus 89 Marine, Coast Guard and foreign officers, for a total of 1424.



New Concept of Naval Air Power

Strength of postwar Navy being measured in terms of carrier-based aviation.

Postwar Naval Aviation must be evaluated from two distinct viewpoints. First is the fitness of its force in being to discharge its immediate assignments and second the degree to which its plan for evolution during the next decade fits the overall strategic concept of air power as the prime factor in the defense of North America.

There is no longer any argument, even in the inner circles of the Navy, that the postwar Navy must be measured principally by the quantity and quality of its air power. Navy believes that its development of sea-going air power is complementary to and not competitive with the USAF. On this score it can make a strong case, at least in the immediate future, on the basis of the tactical mobility of its fast carrier forces and the extreme range of attack offered by the combination of carrier and planes—a range that cannot yet be matched by land-based aircraft tied to bases on the North American continent.

▶ **Strength Figures**—Latest figures on the current strength of Naval air power show a total first line combat strength of 3000 carrier based planes, backed by an operational reserve of 3500 planes. Aircraft operating in fleet support total 1900 planes including patrol bombers, transports, helicopters and rescue planes. Training program is using 1500 planes with 2000 more earmarked for reserve training.

This total of 11,500 planes is considered adequate to meet present needs but current operations are restricted far below maximum levels possible with this plane strength by the lack of personnel, maintenance funds and an aircraft procurement program of sufficient size to provide adequate replacements. Naval air power can skimp along until 1950 by drawing heavily on its "pickled" storage reserve of World War II combat types. This reserve will be exhausted in 1950.

▶ **New Program**—To meet its own estimate of its future requirements the Navy wants a total force of 14,500 planes broken down as follows:

Fleet combat aircraft	3300
Fleet support aircraft	2700
Training Aircraft	2000
Total regular operating force	8000
Reserve aircraft	2700
Spares and overhaul	3800
Total	14,500

Combined attrition and obsolesence under this program would require an annual replacement rate of from 2500 to 3000 aircraft. For combat operations this naval air fleet would require 16 fast carriers divided into four task forces; six anti-submarine hunter-killer groups and a large force of long range reconnaissance planes and amphibious support squadrons.

▶ **Navy Roles**—The Navy conceives of its role in the immediate future as acting as an international "fire brigade" to cool off hotspots in the international scene that require principally a show of force as an indication of this country's serious intentions. In the event of a major war within the next few years the Navy believes it will provide a disturbing left hook to the Air Force's heavy bomber haymakers and may be able to reach some key targets faster than less mobile, land-based aviation. For the future the Navy pins its hopes on carrier based atom bombers. By increasing both the range of its carriers and the range of carrier based planes, Naval Aviation hopes to lick the range problem posed by Breuget's law that now stymies development of bigger planes.

Because of the peculiar operational problems of carrier-based planes and the Navy's generally conservative approach, transition of the Navy to jet propelled planes has been slow and gradual and is likely to continue in that manner. Bulk of Navy's 1948 production contracts is for propeller driven planes. Carrier fighter strength will still be built around the Grumman F8F Bearcat, with the latest model carrying four 20-mm. cannon, and the Chance Vought F4U-5 Corsair. Both of these conventional fighters are now in the 500 mph. class.

▶ **New Jet Fighters**—Among the new jet fighters that made their Naval debut during the year Grumman's F9F Panther with a speed of 650 mph. was indicated as the Navy's choice for top spot among its jet fighter squadrons. Among other jet fighters the North American FJ-1, McDonnell's Phantom and Banshee and the Chance Vought F6U Pirate will all be in production during 1948.

Development of attack planes has now completed the wartime evolution that saw abandonment of multi-placed torpedo and dive bombers with internal bomb bays and bristling defensive armament. New attack types now in service (Douglas AD-1 Skyraider and the Martin AM-1 Mauler) carry their bomb loads externally, rely principally on rockets for their hitting power and use speed as their primary defense. Both these planes are single seaters and use the weight gained by eliminating power turrets, bomb bay hydraulics, crewmen, etc. to gain additional speed and range. Navy has yet to unveil a jet attack plane although several are in the advanced development stage.

▶ **Future Development**—Future development of carrier task force plans will probably be concentrated on four types —long range attack planes; long range escort fighters; light attack planes for short range diversionary attacks that can also double as interceptor fighters; and short range interceptor fighters.

With development of the giant 80,000 ton, flush deck carriers and long range attack planes capable of carrying the atom bomb, Naval Aviation may solve two of the problems that limited its effectiveness in the last war—the relatively light weight of its attack and the short ranges over which it could be delivered from a carrier. It is unlikely that in future operations carriers will be able to operate in landlocked waters such as the Mediterranean and to deliver its attack on prime targets far inland from points far enough at sea to insure defensive mobility. New standards of range will be required both for carriers and for their planes.

When the Navy develops its proposed carrier based atomic bombers there will undoubtedly be a shift in the present 50-50 ratio of fighters to attack planes in carrier striking groups. New tactics will see a relatively few atomic bombers heavily escorted by long range fighters. Neither the longer ranged fighters nor attack planes required by these tactics appear to pose any insoluble technical problems since the USAF has already developed types capable of this performance and the Navy's primary problem in this respect is to adapt and refine these range requirements to carrier operations.

Aircraft On Hand in Service 1939-1947

NAVY

1939	1,766
'40	2,166
'41	5,233
'42	11,772
'43	26,172
'44	36,788
'45	29,631
'46	19,204
'47	15,000

AIR FORCE

1939	2,402
'40	2,546
'41	3,961
'42	12,297
'43	33,304
'44	64,232
'45	72,726
'46	44,782
'47	30,035

▶ **Anti-Sub Tactics**—Dependence of the United States on imports of strategic raw materials during the last war indicates that in any prolonged future struggle a major portion of enemy efforts will be directed against vital sea lanes carrying these strategic imports. In this type of warfare the submarine is generally conceded to be the most efficient. Consequently Navy development of anti-submarine tactics occupies a high priority.

Primary emphasis is on long range land-based patrol planes for reconnaissance and attack and adaptations of the future carrier light attack types for short range submarine hunting from carriers. Necessity for extremely long range at relatively high speeds with short bursts of really high speed to close the range once submarine contact has been made will involve unusual power combinations.

Turboprop power plants with rocket or pure jet boost and the compound engine with some type of auxiliary thrust for short periods seem to offer considerable promise to meet these long range patrol requirements. The Martin P-4M Mercator featuring two reciprocating engines plus two turbojets is typical of what may be expected in this field. Principally because of their mobility in being able to operate without advance preparation of air bases, the flying boat will continue to be developed for some long range patrol duties.

Transport Merger Tests Unification

First concrete test of armed services unification comes with amalgamation of Naval Air Transport Service and the Air Force Air Transport Service into the Military Air Transport Service charged with providing scheduled air transportation for the Army, Navy and Air Force.

First step in this process was National Defense Secretary James Vincent Forrestal's directive ordering the merger and naming Air Force Maj. Gen. Laurence Sherman Kuter to be MATS commander with Navy's Rear Admiral John P. Whitney, as deputy commander. More difficult will be the actual assimilation of Air Force and Navy personnel, equipment and operating techniques into the single service.

▶ **Retain Some Services**—Under Forrestal's directive the Navy and Air Force will retain such air transport facilities as they deem necessary to provide for their own particular needs. This has been interpreted as applying only to tactical and non-scheduled administrative air lift. Neither Air Force nor the Navy can operate their own services unless MATS indicates it cannot meet their individual requirements.

MATS is intended to function as the

sole military airline providing regularly scheduled air service over trunk lines that may be shifted to meet varying requirements of the three services to be served. For example NATS recently reopened its north-Atlantic service to Port Lyautey, Morocco and planned an extension to Athens to serve Navy units sent to Middle Eastern waters because of the strained international situation in Greece, Palestine and Iran. Air Transport Service at the same time closed the only gap in its round the world service by instituting service between Manila and Dahran, Arabia. These routes will be consolidated into a single trunk line serving all vital points in the areas affected.

▶ **Merger Details**—MATS acquires all equipment, personnel and unexpended funds of ATS and NATS. In the future the Navy will be required to furnish personnel to MATS in direct proportion to Navy's demands on MATS for air lift.

Under this agreement MATS acquires:

• **Equipment**—From ATS 380 aircraft of which 200 are currently operational. Bulk of these planes are Douglas C-54s with some Douglas C-47s; 3 Boeing C-97s; 4 Douglas C-74s and 10 Douglas C-118s. From NATS come 116 aircraft of which 84 are Douglas C-54s; 17 Douglas C-47s; 8 Beechcraft JRB; and 4 Martin Mars flying boats. NATS was scheduled to acquire two Lockheed Constitutions (XR-60) and one Pratt & Whitney Wasp-powered Mars.

• **Personnel**—From ATC about 8300 personnel, currently the total strength of ATC's Air Transport Service. Remaining 11,000 personnel of Air Weather Service, Airways and Air Communications Service and Air Rescue will remain temporarily as the Air Force Air Transport Command under command of Maj. Gen. Robert Harper. NATS will provide approximately 6000 personnel, the current operational strength of NATS.

• **Routes**—ATS has been flying 76,400 route miles compared to 40,835 by NATS. Route consolidation will be decided after a joint route survey by Kuter and Whitney.

During the 1947 calendar year ATS flew 501,960,123 passenger miles compared to 495,893,175 for NATS. Cargo ton miles were 44,892,067 for NATS and 72,000,000 for ATS. Total ton miles were 98,770,966 for NATS compared with 130,246,130 for ATS.

All intra-service dispute regarding MATS will be resolved by a Military Air Transport Board composed of one representative appointed by each of the three undersecretaries of defense for the Army, Navy and Air Force. This board will be the final arbiter on what constitutes trunk routes and scheduled services; utilization of property, personnel and facilities of the component services; questions of compliance with directives of the Joint Chiefs of Staff and complaints of departments regarding unfair treatment by MATS.

Navy is given special authorization to continue its present responsibility for development of the flying boat.

USAF Smoothes Administrative Details

Emergence of the United States Air Force as a separate entity under the Armed Forces Unification Act (Public Law 533) was the most significant military administrative event of 1947. Although the USAF will require nearly two years to work out all aspects of its independent status and separation from the old War Department many significant policies have already been determined.

In general the Air Force will continue to rely on the new Department of the Army for all housekeeping services and units not peculiar to the Air Force.

▶ **Air Force Control**—Quartermaster Corps will continue to provide uniforms, food, transport units and other items it has supplied in the past. Biggest difference in the new arrangement is that the Air Force will have final control over specifications of materiel to be delivered and authority to reject unsuitable items. Similarly Army ordnance will continue to act as a development and supply agency for most Air Force ordnance.

There will be no separate Air Force Chaplain or Medical Corps. Personnel in these categories will be assigned to the Air Force from the Army. A joint Army-Air Force budget has been submitted for fiscal 1949 with the first independent Air Force budget due in fiscal 1950.

▶ **Agreements Listed**—Among the 200 specific agreements already reached between the Air Force and the Army the following are interpreted as the most significant:

• **Plans and Policy**—The Air Force assumes complete control of its own planning and policy recommendations. It will also assume administrative supervision of military air missions and commissions in Latin American including execution of contracts and procurement.

• **Procurement**—Air Force will assume responsibility for its own procurement program. Air Force will assume responsibility for contract settlement on its contracts that do not fall under Contract Settlement Act of 1944. The latter will continue as joint Army-Air Force responsibilities. Air Force renegotiating cases will be transferred to the Army before January 1948. Air Force will assume approval of its own contracts and responsibility for contract frauds at a future date.

• **Research**—Air Force will be responsible for its own research and development program including primary responsibility for guided missile work for both Army and Air Force as previously prescribed. Increased emphasis will be placed on a broadened concept of the old War Department Research Council to insure Air Force representation on Army and Navy research groups and vice versa.

• **Industrial Mobilization**—Air Force will do its own industrial mobilization planning subject to direction of the Munitions Board.

• **Guided Missiles**—Air Force will assume control of all strategic long range missiles and surface to air missiles designed for use in area air defense. Army gets short range tactical missiles and surface to air missiles which are designed for air defense of troops or tactical objectives.

• **Weather**—Air Force will operate its own weather service and provide meteorological data for the Army.

• **Anti-Aircraft**—Air Force will train and control all anti-aircraft attached to it for air defense purposes. Army will continue to train initially and activate all anti-aircraft and provide Air Force with units it requires.

• **Intelligence**—Air Force will operate its own foreign attache system.

• **Troop Carriers**—Air Force will be responsible for training all troop carrier and transport units required by the Army.

• **Transportation**—Air Force will provide air transportation including operation of aerial ports for both Air Force and Army. It will also continue to conduct rate negotiations with commercial air carriers.

New Spy Camera

A new electronic flash technique permitting night photo reconnaissance at altitudes as low as 900 ft. is under test at March Field, Calif., and has shown remarkable results.

The flash unit is installed in the bomb bay of an A-26 and functions with a K-19B camera. Speed of the flash is such that ground spotting of the carrier plane, and its interception, is reduced to a minimum. Successful photos have been shot at altitudes up to 2000 ft.

The new unit overcomes the requirement of high-altitude flight of the camera plane, necessary in the dropping of flash bombs for light source.

U. S. Aircraft Industry*

Company	Location	Plant Area (Sq. Ft.)	Plant Employment	1947 Sales	1947 Profit or Loss	Backlog (10-30-47)
Beech Aircraft Corp.	Wichita, Kan.	966,447	2,500	$26,211,000	−$1,816,000	$20,000,000
Bell Aircraft Corp.	Niagara Falls, N. Y.	1,200,000	2,000	10,645,000[1]	−381,000[1]	13,092,313
Boeing Airplane Co.	Seattle, Wash.	1,700,000	17,000	14,345,000[1]	−357,000[1]	227,659,436[8]
	Wichita, Kans.	306,207	1,700			
Consolidated Vultee Aircraft Corp.	San Diego, Calif.	2,370,373	10,785	31,465,000[2]	6,265,000[2]	211,632,429
	Fort Worth, Tex.	4,106,108	11,529			
	Wayne, Mich.	231,100	933			
Curtiss-Wright Corp.	Columbus, Ohio.	1,408,693	3,000	58,828,000[1]	−465,000	130,000,000[8]
	Caldwell, N. J.	750,000	3,900			
	Wood-Ridge, N. J.	2,289,784	6,025			
Douglas Aircraft Co.	Santa Monica, Calif.	6,005,645				
	El Segundo, Calif.	113,055	13,300	92,563,000[2]	−1,170,000[3]	182,600,000
	Long Beach, Calif.	347,275				
Fairchild E & A Corp.	Farmingdale, N. Y.	204,750	1,175	NA	NA	27,700,000
	Hagerstown, Md.	882,450	3,550			
	Winfield, Kan.	91,175	76			
Grumman Airc. Eng. Corp.	Bethpage, N. Y.	....	3,500	NA	1,238,000[5]	NA
Lockheed Aircraft Corp.	Burbank, Calif.	1,520,000	12,684	133,000,000	NA	126,000,000[8]
Glenn L. Martin Co.	Middle River, Md.	2,800,000	10,500	NA	−15,500,000[4]	122,000,000
McDonnell Aircraft Corp.	St. Louis, Mo.	1,343,793	3,465	11,172,000[5]	541,000[5]	NA
North American Aviation, Inc.	Los Angeles, Calif.	3,787,288	18,522	20,509,000[6]	−28,000[6]	269,148,114[8]
Northrop Aircraft, Inc.	Hawthorne, Calif.	1,148,000	4,900	28,819,000[7]	241,000[7]	19,900,000
Republic Aviation, Inc.	Farmingdale, N. Y.	650,000	5,800	20,481,000[1]	−944,000[1]	60,266,578
Ryan Aeronautical Corp.	San Diego, Calif.	640,197	1,200	NA	NA	3,000,000
United Aircraft Corp.	East Hartford, Conn. (Pratt & Whitney)	3,000,000	14,000	144,084,000[1]	6,083,000[1]	280,000,000
	East Hartford, Conn. (Pratt & Whitney)	300,000	2,100			
	Bridgeport, Conn.	180,000	1,200			
	Stratford, Conn.	900,000	8,000			
Totals		39,242,340	163,344			

* Sixteen Leading companies listed by President's Air Policy Commission.
NA—Not available.
[1] Nine months to Sept. 30, 1947.
[2] Nine months to Aug. 31, 1947.
[3] Six months to June 30, 1947.
[4] Predicated on winning tax suit.
[5] Year ended June 30, 1947.
[6] Year ended Sept. 30, 1947.
[7] Year ended July 31, 1947.
[8] As of Dec. 31, 1947.

Ability to Produce at Low Point

While plant capacity is ample, labor force, materials and parts, subcontracting system and working capital all are weak.

The ability of the U. S. aeronautical manufacturing industry to produce right now is one of the most accurate gauges of the state of American air power. It determines not only rate of design progress, but the combat readiness and staying power of the military and naval air forces.

Some of the basic elements of productivity are so lacking today that the industry would be unable to meet demands for expansion measured in weeks, or an immediate utilization of combat air power.

The broad picture of the industry looks like this:

- **Plant facilities**, overall, are more than adequate, sufficient to meet an immediate stepped-up demand as well as a long-term expansion.
- **The existing labor force** is too small. Postwar shrinkage has left serious gaps particularly in the ranks of skilled workmen and engineers.
- **Supplies of materials** and strategic metals are low—the flow geared to small production.
- **Subcontractors** and parts manufacturers have had to turn away from the aeronautical field.
- **Working capital** is another of the elements of productivity which is lacking. Uncertain status of the industry has scared away venture capital. And manufacturers have drained their cash reserves maintaining volume facilities on a trickle of business. As a result, many new products have been held back.

Another shortcoming, the "volume engineering approach," is necessarily missing because of the low current output. Instead, throughout the industry today job-shop methods are used. At least an approximation of volume engineering must be attained somehow if productivity is to be kept at a safe level.

Even on its present reduced basis, the prime airframe and engine contractors have in use sufficient floor space to accommodate a major expansion. An Aviation Week query indicates the floor space in use by 16 major airframe and engine manufacturers (and the two leading propeller producers) totals better than 35,000 sq. ft.—sufficient to handle an annual output estimated at over 300,000,000 lb. airframe weight.

Recommendations of the Presidential and Congressional air policy groups, if implemented by law, would go far toward buttressing the aeronautical manufacturing industry's productivity.

▶ **Labor Problem**—A five-year military procurement program rather than the current year-to-year contracts would greatly simplify the labor force problem. Employment has followed the ups and downs of the industry. From a war peak of several millions, employment in the overall manufacturing industry dropped to about 200,000 in 1947. A long-term program would bring stability and make it easier to attract and hold skilled labor. Even so, it would take a broad recruiting and training program to rebuild the labor force.

U. S. Aircraft Production—1947

	Personal Type[1]		Executive & Transport[2]		Military		Total Aircraft		Engine		
Month	Numbers	Value	Numbers	Value	Numbers	Value	Numbers	Value	Numbers	Value	Total value[3]
January	2,146	$6,826,181	20	$1,764,990	111	$38,445,248	2,277	$47,036,419	2,862	$27,513,272	$23,937,639
February	1,903	6,320,271	11	1,200,302	99	42,535,288	2,013	50,055,861	2,126	23,888,621	80,046,171
March	1,762	5,908,246	23	8,485,010	137	34,548,763	1,922	48,942,019	2,895	27,321,056	82,684,881
April	2,006	6,518,657	32	11,812,983	105	33,434,597	2,143	51,766,237	2,902	29,722,179	88,228,015
May	1.618	5,641,249	28	13.404,802	94	37,326,323	1,740	56,372,374	2,160	31,116,497	94,086,713
June	1,164	4,541,835	29	16,111,148	139	64,073,206	1,332	84,726,189	1,348	33,164,268	23,821,842
July	984	4,131,290	14	7,786,729	104	27,748,095	1,102	39,666,114	1,357	21,528,858	66,406,716
August	906	3,699,283	23	12,422.266	211	32,208,081	1,140	48,329,630	947	21,799,208	75,340,957
September	998	3,991,343	30	16,676,300	323	37,842,732	1,351	58,510,375	1,117	26,747,356	90,650,511
October	770	2,997.078	32	19,305,426	239	49,489,300	1,041	71,791,804	1,167	29,730,657	107,014,147
November	594	2,542,746	21	9,537,260	252	38,261,962	867	50,341,968	1,228	23,636,063	78,377,636
December[4]	487	2,134,206	15	2,744,403	288	59,158,013	780	64,036,622	1,069	29,872,550	95,326,499
Totals[4]	15,338	$55,252,385	278	$121,251,619	2,102	$495,071,608	17,708	$671,575,612	21,178	$326,045,447	$905,821,726

[1]Under 3,000 lb. airframe weight.
[2]Over 3,000 lb. airframe weight.
[3]Includes all payments, for parts, conversions, etc. in addition to those for aircraft and engines. Figures from Bureau of Census.
[4]Preliminary.

Another aspect of the labor problem is presented by the situation of McDonnell Aircraft Corp. in St. Louis. It was a small company before the war, and not even a prime contractor for airframes during the war. Aircraft labor naturally gravitated to the large aircraft producing centers on the East and West coasts. Now McDonnell is an important and growing prime contractor with a sore need of labor. But the reservoirs of aircraft workers are still on the coasts where some of the older manufacturers are reducing, rather than increasing their employment.

▶ **Materials and Subcontractors**—The materials problem is one of time-lag between mine and fabricator. Average time is six months, although even at peak war production some orders had to be placed nine months ahead. Because of the time-lag, materials delivery could hamstring an emergency expension of output. Shortage of materials was one of the greatest limiting factors in the World War II production program. According to testimony before the President's Air Policy Commission, part and material orders now must be placed one year ahead.

Impact of the shrinkage of aeronautical suppliers is pointed up by reference to the automobile industry. Automotive plants are fed by a chain of 1200 parts and tool and die suppliers. A recent check of aeronautical suppliers showed some 400 firms, many of them only token producers. This despite the fact that aircraft are many times more complex and much more subject to obsolescence than autos.

Since war's end there has been a great exodus of suppliers and subcontractors from the aeronautical field. Diminishing returns have forced them to drop out of highly specialized aircraft production. Planes have become so complex that one of the latest bombers contains over 60,000 different parts. It is easy to appreciate the seriousness of this shortage of suppliers.

Financial condition of the 15 major airframe companies is a yardstick of the situation in the overall industry. During 1947 these 15 concerns operated at a loss approaching $100,000,000. A year-end report of the industry attributed these losses to continuing costs resulting from shrunken production volumes, and to disappointing results of most commercial aviation projects.

Lack of a volume engineering approach prior to Pearl Harbor forced costly delays in the delivery of equipment to the armed forces during World War II. Much of the materiel had to be completely redesigned for mass-production methods. Today the majority of new equipment is designed and fabricated by tool-room methods. Effect of tool-room methods on costs is illustrated by the case of one late model turbo jet engine. Over 2,000 changes in drawings were made in a 12-month period while output was only 100 a month.

A 25%-a-year replacement rate for air forces would both keep them in combat readiness and enable industry to employ volume engineering methods.

Labor Decline Seen In Aircraft Plants

Last year's employment in the aircraft and parts industry was at its lowest in July, moved upward at the end of the year, but is expected to decline during the first half of 1948.

This picture of employment situation and prospect in the industry is given by the U. S. Employment Service on the basis of reports from 52 establishments representing nearly three-fourths of the aircraft industry.

USES analysis of what happened during October, November and December shows a mixed trend by areas and branches of the industry. Over-all, the December employment rose about four-tenths of one percent above October, or from 184,400 to 185,200. Yet, engine and engine parts gained as much as 3 percent while smaller segments of the industry showed employment losses. Propeller and propeller parts employment dropped 1 percent. In plants producing only aircraft parts and auxiliary equipment, the drop was as much as 4 percent. There was a slight rise of less than 1 percent in the largest segment of the industry—assembly plants.

▶ **No Upswing Ahead**—Despite recent optimism for expanded military orders, USES believes any significant uptrend

Monthly Employment, 1947

	Aircraft & Parts (excl. engines)	Aircraft Engines
Jan.	143,900	29,500
Feb.	141,900	28,600
Mar.	141,200	28,000
Apr.	141,900	28,100
May	138,200	27,000
June	133,900	26,900
July	129,300	26,800
Aug.	130,700	26,700
Sept.	129,700	26,600
Oct.[1]	133,000	26,200
Nov.[1]	133,100	25,900
Dec.[2]	133,100	25,900

[1] Preliminary
[2] Estimated

NOTE: Above figures from Bureau of Labor Statistics are lower than employment figures from the United States Employment service because BLS figures cover only production workers.

in employment is still many months away and that the industry would do well to maintain current employment levels during the next few months.

Establishments reporting to USES anticipate a slight decline from December's 185,200 to about 183,600 in February and a further drop to 183,100 in April. Forecasts of declines are concentrated in a relatively few plants, the largest of them in California, Maryland and Texas. Some of these plants are retooling and expect to boost employment in the second half of 1948. Others have new contracts under negotiation and some do not anticipate new contracts to replace orders now being filled.

About three-fourths of the establishments reporting to USES expect stable or increasing employment. The most significant increases were forecast by plants in Connecticut, New York, Pennsylvania and Washington.

Guided Missile Production Seen As Increasing

Indication that the U. S. in 1948 will increase by 100 percent guided missiles production and research comes from a West Coast laboratory specializing in manufacture of missile accessories.

E. C. Osborne, vice-president of G. M. Giannini & Co., Pasadena, Cal., reports that his company this year expects to double its $1,000,000 production of missile specialties in 1947.

During the past year the company's production included manufacture of more than 3000 transducers for telemeter relay of missile test data in flight.

Now credited with holding a one-eighth interest in a basic nuclear fission patent filed by eight Italians prior to U. S. entry into the war, and which is understood to have aided materially in development of the atom bomb, the founder of the company, Gabriel M. Giannini, established his Pasadena company primarily for pulse jet research and development.

The company's interest in power plants is believed renewed, now, in the field of supersonic research and a former associate, Alfred J. Klose, who in 1942 developed the first U. S. pulse jet engine accepted for testing by Wright Field, has rejoined the Giannini company in California.

Aviation's Place

Aviation's contributions to some local economies was determined by a spot check at several key points:

▶ **Atlanta** (Site of two large airline bases and a cluster of fixed base operators)—Aviation employment of 4,500 with annual payroll of $13,000,000 is 1.5 percent of total Atlanta employment and 2.5 percent of total local payroll.

▶ **Seattle** (Site of Boeing Airplane Co. and Northwest air gateway to Alaska)—Aviation employment of 18,800 with annual payroll of $48,500 is 33 percent of total Seattle industrial employment and approximately 34 percent of total annual industrial payroll.

▶ **Los Angeles** (Largest aircraft producing center and served by five airlines)—Aviation employment of 70,590 with annual payroll of $186,615,000 is about 17 percent of both total Los Angeles industrial employment and annual payroll.

Shipments of Leading Personal Plane Manufacturers, 1947

	Numbers Jan.-Dec.	Value (All models) Jan.-Dec.
Aeronca		
Super Chief 85 hp	333	$2,329,000
Champion 65 hp	487	
Chief 65 hp	295	
Scout	89	
Champion 85 hp	14	
All American–10A	1[a]	3,000[a]
Beech–Bonanza	1,209	7,945,000[b]
Bellanca–Cruisair	214	1,070,000
Cessna		
120	1,009	5,976,000
140	1,312	
190	8	
195	61	
Engineering & Research		
Ercoupe	805	2,084,000
Fairchild–F-24	16	71,000
Funk–Bee	41	155,000
Luscombe–Silvaire	1,401	3,413,000
North American Aviation–Navion	853	5,021,000
Piper		
Cub Special	950	7,697,000
Supercruiser	2,158	
Cub Trainer	356	
Republic–Seabee	818	3,902,000
Ryan–Navion	18	125,000
Stinson–Voyager	2,662	11,525,000
Taylorcraft		
Taylorcraft	196	366,000
Texas Engineering		
Fairchild F-24	66	787,000
Swift	143	
Total Personal	15,515	$52,469,000
Aeronca–L-16	508	737,000[c]
TOTAL	16,023	$53,206,000

[a] Incomplete figures for the year.
[b] Excludes January, February and March.
[c] Payments from military customers.

Women Employment

Employment of women in aircraft and aircraft parts continue the downward trend of the post-war period. It dropped 4 percent during the fourth quarter of 1947 and a drop of 3 percent is forecast by the U. S. Employment Service during the first two months this year.

An exception to the general trend were engine plants, which increased women employment during the last three months of 1947.

Women comprised almost one-third of aircraft employes at the peak of the war. A year ago the proportion had dropped to 15 percent, and was down to 13 percent at the beginning of this year. In November only one out of every 10 hired was a woman.

Manufacturers' Capital Reserves Depleted

Unsettled government buying policy contributes to difficulty of finding new money.

Awaiting government decision on the size and type of aircraft manufacturing industry required for national security, U. S. producers have been burning up capital reserves in the effort to preserve volume facilities on a trickle of output.

The aircraft industry, which ranked first in the nation in value of products during World War II, today is about 16th. It has been piling up deficits for two years. During 1947, operating losses of the 16 major airframe producers totaled nearly $100,000,000.

There are several reasons for this situation. The government has yet to evolve a long-range military aircraft procurement program, which would greatly stabilize the industry. In addition, since VJ-Day military plane buying has slowed almost to a halt. And airline losses have caused a decline of the commercial plane market.

▶ **Cost Increase**—Rising costs have harried aircraft manufacturers. Materials and parts have more than doubled since 1939. Hourly wages have doubled. Engineering pay is up about 150 percent.

Output is below the break-even point. Nearly 90 percent of the industry's business is military. In the peak war year more than 96,000 military planes were produced. Last year about 1800 military planes were produced. Many of these were small liaison types. Like a man out of a job, the industry has been living off its insurance policies—its capital reserves.

Back in 1946, when net income of nearly 3000 corporations averaged a gain of 28 percent, aircraft manufacturing earnings dropped 95 percent. In the family of 16 major airframe producers, working capital dropped 13 percent in 1946. Total available cash dropped 38 percent. Industry spokesmen attributed this to operating deficits, additions to plants and equipment, and large increases in inventories. Planes the airlines didn't buy made up part of these inventories.

▶ **No Source of Capital**—With large amounts of cash needed to launch new models, the industry finds itself short of working capital. Its uncertain status has diminished its ability to raise new capital.

Few firms have been able to arrange commercial credits, and these only on a short-term basis. Some firms have gone to the government to borrow. But to fall back on continued government loans would be to invite eventual socialization of the industry.

A month after issuance of the report of the President's Air Policy Commission, the industry still was waiting for some definite decision from the government. The stock market, too, appeared wary and was waiting. Aircraft stocks have not surged upward despite the Finletter report, asking for a strong aircraft industry. The report of the Congressional Air Policy Board, if implemented by action, should tell the story.

Precision Barometer

Affording various models for airports, weather stations, and laboratories is new series of precision barometers made by American Paulin System, 1847 So. Flower St., Los Angeles, Calif., designed to offer advantage over mercury column in readability and simplicity of operation. Change in atmospheric pressure is instantly indicated on dial and read directly in inches of mercury. Type PB500 aneroid instrument, graduated in increments of 1/500 in. of mercury, is intended for scientific and lab. use.

Materials Problems in Aircraft Manufacture

The movement of aluminum from mine to finished airplane provides an illustration of the materials problem of the aeronautical manufacturing industry.

Bauxite ore, in combination with other metals, makes up aluminum. Bauxite goes through at least a year of treatment, processing, and handling before it takes its first flight in the structure of an airplane.

Bauxite must be mined, shipped to processing plant, refined, poured into molds, drawn or extruded into thousands of different shapes, treated, fabricated into sub-assemblies and major assemblies and finally fit into the completed plane.

In addition to aluminum, other critical materials include steel, copper, magnesium, rubber, plastics, paints, and lead.

Since VJ-Day, several million pounds of lead have been recovered from control system counterweights in junked surplus planes, providing some idea of the vast amounts of materials consumed in war output.

▶ **War Consumption**—Less than 20 processors of these basic raw materials now are supplying the aeronautical manufacturing industries. Airplane manufacture at the peak of World War II absorbed 50 percent of total aluminum production. It used 9.4 percent of alloy steel output, 2.6 percent of copper and alloys, and .2 percent of carbon steel.

Since shortage of materials was such a delaying factor in the World War II production effort, students of the situation, both in and out of government and industry, see peacetime stockpiling the only solution. Only a tiny start has been made in this direction.

Current U. S. Jet Engines

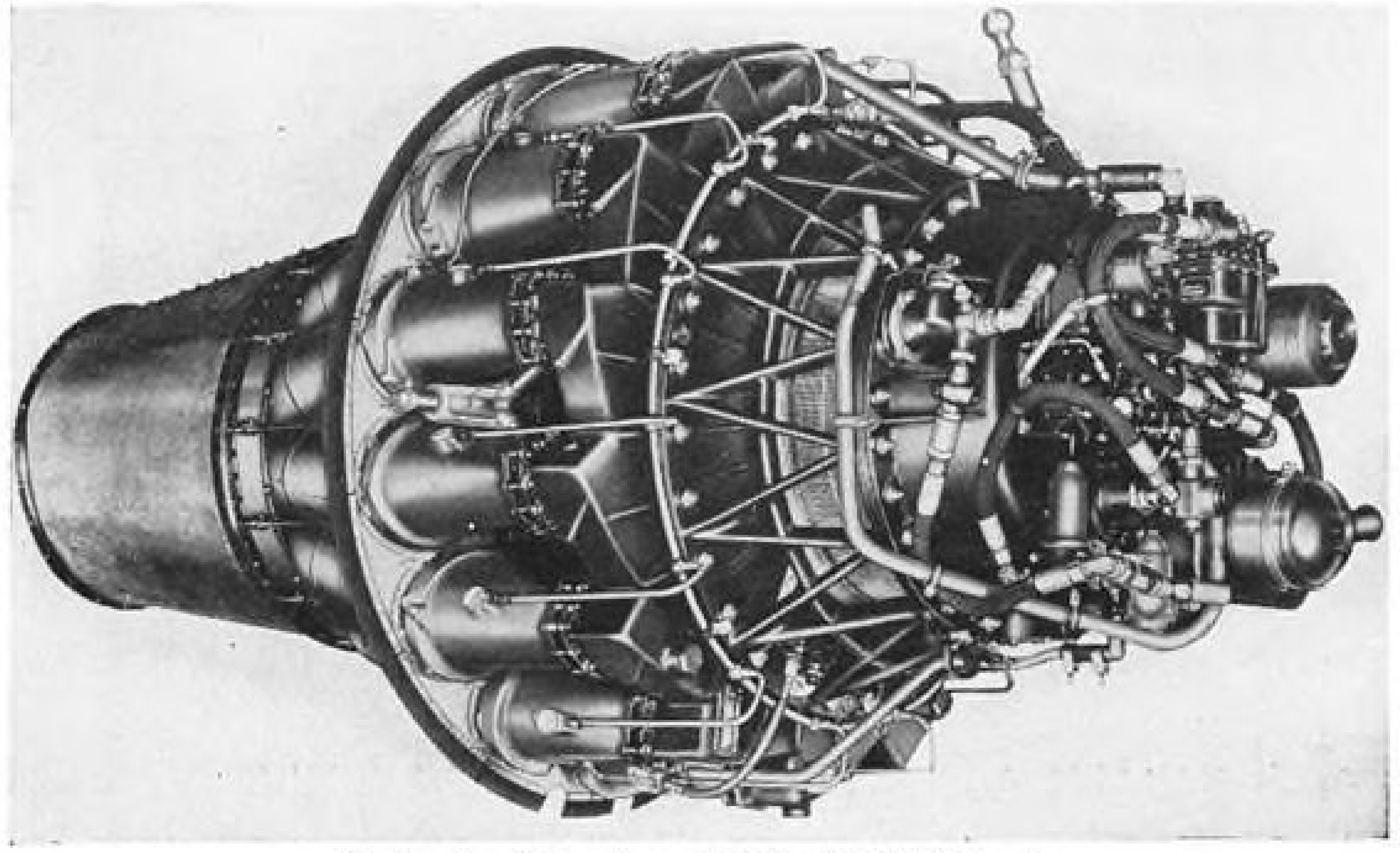
Manufacturer	Model	Type	Compressor Stages	Turbine Stages	Thrust, lb., Static SL	Shaft Hp. SL	At rpm.	Spec. Fuel Cons. lb./hr./lb. Thrust	Overall Length (in.)	Overall Dia. (in.)	Weight, lb.
Allison Div. of General Motors	J-22-A-33	C	1	1	4600[1]	None	11750	1.12[2]	103	50½	1735
	J-35-A-15	A	11	1	3750[1]	None	7700	1.075[2]	145	37½	2425
General Electric Co.	T-31-GE-3 (TG-100B)	AP	14	1	500[3]	1900[3]	13000	0.768[4]	114⅝	35⅛	1984
Westinghouse Electric Corp.	J-30 (19XB-2B)	A	10	1	1600[5]	None	17000	1.15[6]	91	19	718

[1] Takeoff.
[2] Cruising.
[3] 1900 shp. + 500 lb. T. R. 13,000 rpm.
[4] lb./e. shp./hr.
[5] Military.
[6] Normal.

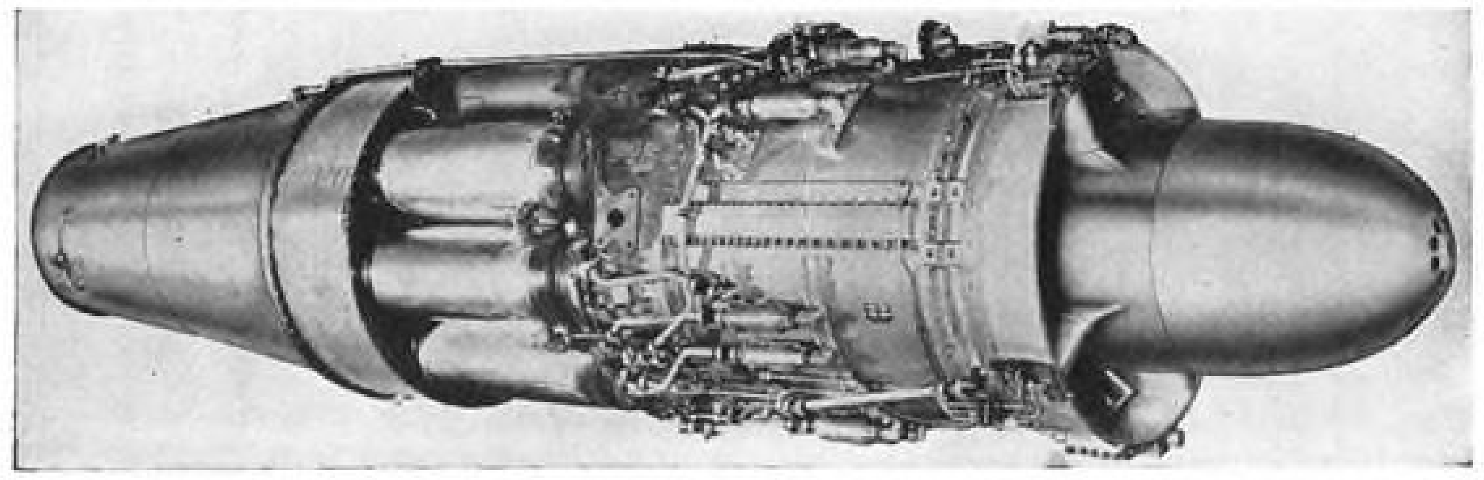
Leading U. S. Reciprocating Engines

Manufacturer	Model	No. Cylinders	Rate Hp.	At RPM.	At Altitude, ft.	Total Dry Wt. Without Hub or Starter	Lb. per Hp.	Displacement cu. in.	Compression Ratio	BMEP	Height or O.D., in.	Length Without Starter, in.	Guaranteed Fuel Cons. at Cruising Hp. Lb. per Hp. per Hr.
Aircooled Motors, Inc.	4A4-90-B3	4	90	2300	SL	230[1]	2.56	225	7.0	138	27 13/32	27[2]	.50
Liverpool Rd.	4A4-100-B3	4	100	2550	SL	230[1]	2.30	225	7.0	138	27 13/32	27[2]	.50
Syracuse 8, N. Y.	6A4-150-B3	6	150	2600	SL	321[1]	2.14	335	7.0	136	25 1/16	37[2]	.50
	6A4-165-B3	6	165	2800	SL	324[1]	1.97	335	7.0	140	25 11/32	37[2]	.50
	6V4-178-B32	6	178	3000	SL	308[1]	1.73	335	7.0	140	38 1/16	30¾[2]	.52
	6V4-165-B32F	6	165	3000	SL	356[1]	2.16	335	7 0	130	42½	30[2]	.55
	6A8-215-B8F	6	215	2500	SL	487[1]	2.26	500	7.0	136	27 11/16	66[2]	.52
	6A8-225-B8	6	225	2500	SL	430[1]	1.91	500	7.0	143	28 11/16	46[2]	.55
Continental Motors Corp.	W670-23	7	240	2200	......	519	2.16	667.8	6.1	130	42.5	35.6	.52
Market Street	R-9A	9	500	2300	......	705	1.34	971.9	6.3:1	....	45.2	42.5	.46
Muskegon 82, Mich.	A65-8F	4	65	2300	SL	170	2.6	171	6.3:1	....	25.3	28.9	.49
	C85-8F	4	85	2575	SL	176	2.07	188	6.3:1	139	25.3	28.9	.51
	C85-8FJ	4	85	2575	SL	180	2.11	188	6.3:1	139	25.3	28.9	.51
	C85-12F	4	85	2575	SL	185	2.17	188	6.3:1	139	24.4	31.25	.51
	C85-12FJ	4	85	2575	SL	189	2,22	188	6.3:1	139	24.4	31.25	.51
	C90-12F	4	90	2475	SL	186	2.06	201	7.0:1	143	24.4	31.25	.52
	C125-2	6	125	2550	SL	257	2.05	282	6.3:1	....	27.4	39.4	.50
	C145-2	6	145	2700	SL	257	1.77	301	7.0:1	145	27.4	39.4	.50
	E165-2	6	165	2050	SL	325	1.97	471	7.0:1	....	22.3	35.5	.51
	E185-1	6	185	2300	SL	318	1.72	471	7.0:1	....	22.3	47.3	.50
	E-185-3	6	185	2300	SL	326	1.75	471	7.0:1	....	22.3	47.3	.50
Jacobs Aircraft Engine Co.	O-240A	4	100	2300	SL	200	2.0	241	6.5	143	18.1	39.6	.50
Pottstown, Pa.	O-360A	6	165	2400	SL	300	1.82	361	6.5	151	18.1	47.4	.50
	R-755A	7	300	2200	SL	505	1.68	757	6.1:1	143	44	39.5	.45
	R-755E	7	350	2500	SL	600	1.72	757	6.5	146	44	42.3	.46
	R-915A	7	375	2300	SL	560	1.49	914	6.1	141	45.6	40.4	.49
Lycoming Div., AVCO Mfg. Co.	O-235-C	4	100	2600	SL	243[1]	2.43	233.3	6.5	136	22.5	29.5[2]	.60
Williamsport 38, Pa.	O-235-C1	4	108	2600	SL	235[1]	2.18	233.3	6.75	141	22.5	29.5[2]	.52
	O-290-A	4	125	2600	SL	273[1]	2.18	289	6.5	132	26.64	31.4[2]	.56
	GO-290-A	4	160	3000	SL	376[1]	2.35	289	7.5	146	28.50	34.59[2]	.60
	O-435-A	6	190	2550	SL	3925[1]	2.32	434	6.5	136	29.59	38.1[2]	.58
	GO-435-A	6	240	3000	SL	435[1]	1.83	434	7.5	146	26.61	47.7[2]	.60
	O-580	8	320	3000	SL	573	1.79	578	7.5	146	19.97	......	.50
	SO-580	8	320	3000	SL	570	1.78	578	7.5	146	19.97	52 09	.50
	XR-7755	36	5000	2600	......	6050	....	7755	.....	....	......	......	....
Pratt & Whitney Div., United Aircraft Corp.	Wasp Jr. B5	9	450	2300	2,300	682	1.54	985	6.0	157	46.0	42.5	....
400 S. Main Street.	Wasp S3H1	9	550	2200	5,000	865	1.57	1340	6.0	148	52.0	43.0	....
E. Hartford 8, Conn.	Twin Wasp S1C3-G	14	1050	2550	7,500	1467	1.4	1830	6.7	178	48.0	61.0	....
	Twin Wasp 2SD13-G	14	1200[3]	2550	5,000	1595	1.3	2000	6.5	187	49.0	61.0	....
			1100[4]	2550	14,000								
	Twin Wasp E12	14	1300[5]	2600	8,000	1900	1.5	2180	6.5	182	52.6	76.0	....
			1150[4]	2600	17,500								
	Double Wasp CA15	18	1800[6]	2600	6,000	2360	1.3	2800	6.75	196	53.0	78.5	....
			1600[4]	2600	16,000								
	Wasp Major TSB3-G	28	2650[7]	2550	5,500	3470	1.3	4360	6.7	188	54.0	97.0	....
Ranger Aircraft Div., Fairchild Engine & Airplane Corp.	6-440C-2	6	175	2450	SL	382	2.18	441	6.0	128.5	33.5	53.16	0.50
	6-440C-5	6	200	2450	SL	382	1.91	441	7.5	146	33.5	53.16	0.43
Farmingdale, L. I., N. Y.	SGV-770C-1B	12	450[8]	3000	12,000	760	1.46	773	6.5	169	34.13	66.45	0.49
			520[9]	3150	SL								
	SGV-770C-2A	12	500[8]	3150	9,000	757	1.38	773	6.5	171	34.13	66.45	0.59
			550[9]	3300	SL								
	SGV-770D-1	12	565[8]	3300	8,000	855	1.38	773	6.5	181	31.11	74.92	0.54
			620[9]	3500	SL								
	SGV-770D-4	12	465[8]	3200	13,500	896	1.56	773	6.5	173	36.75	77.24	....
			575[9]	3400	SL								
	SGV-770D-9	12	465[8]	3200	12,500	910	1.58	773	6.5	....	36.75	77.24	....
			575[9]	3400	SL								
Wright Aeronautical Corp.	957C7BA1	7	700	2400	5,000	1015	1.28	1300	6.2	178	50.45	48.12	.46
Wood Ridge, N. J.	736C9HDB	9	1275	2500	3,500	1376	.95	1820	6.8	221	54.95	49.10	.45
	740C9HD1	9	1275	2500	3,500	1368	.94	1820	6.8	221	54.95	49.10	.45
	964C9HD1	9	1000	2300	6,500	1360	1.2	1820	6.3	189	54.95	49.10	.44
	961C9HE1	9	1275	2500	3,500	1398	.91	1820	6.8	221	54.95	48.50	.45
	959C9HE1	9	1275	2500	3,500	1398	.91	1820	6.8	221	54.95	48.50	.45
	955C9HE1	9	1275	2500	3,600	1413	.99	1820	6.8	221	54.95	48.50	.45
	745C18BA3	18	2000	2400	4,800	2780	1.2	3350	6.5	197	55.78	76.26	.46
	749C18BD1	18	2100	2400	4,400	2884	1.03	3350	6.5	206	55.62	78.52	.45

[1] Weight includes starter, generator, other parts and accessories.
[2] Length includes starter.
[3] Single stage.
[4] Two speed.
[5] Single stage; take-off hp. with water injection is 1800.
[6] Single stage; take-off hp. with water injection is 2400.
[7] Take-off hp. with water injection is 3500.
[8] Normal rating.
[9] Take-off.



Production jet engines, J-33 (top), J-35 (below).



Engine Development

The time and expense involved in a drastic change in engine types—such as now confronts the engine manufacturing industry in the transition from piston to jet engines—is dramatically highlighted by some figures from Pratt & Whitney:

Development cost of the original Wasp engine was less than $1,000,000. The design of the Double Wasp was begun in 1936. There are refinements being made in it even today and the full cost of the engine up to now is approximately $30,000,000.

The Harvard University Graduate School of Business Administration report on acceleration of production during World War II, places the elapsed time from development to fifth production engine for major types used during the war at from two and one-quarter to three and three-quarters years.

Engine Output in Transition Period

Although suffering from lack of business, industry must grapple with problem of conversion from reciprocating to jet.

The U. S. aircraft engine manufacturing industry, while suffering from the same lack of government business besetting airframe producers, has an additional difficulty. It is in a period of transition from conventional reciprocating powerplant to jets, rockets, and eventually atomic engines.

Although most combat craft now in production are to be powered with jets, the two major World War II producers of military engines are not yet turning out jet engines for service.

These companies—Pratt & Whitney Aircraft division of United Aircraft Corp., and Wright Aeronautical subsidiary of Curtiss-Wright Corp.—were not in on the early development of jet engines in the U. S. as all of their engineering and manufacturing facilities had to be devoted to piston engines. They are now spending about upwards of $30,000,000 to catch up on jet development.

The only company now in quantity production of jet engines is Allison division of General Motors Corp., although their production engines were developed originally by a non-aviation firm, General Electric Co.

The engine manufacturing industry today comprises about 14 producers located principally in the East and distributed among nine states: Michigan, Pennsylvania, New Jersey, Connecticut, New York, Massachusetts, Ohio, Maryland and California.

The industry's average monthly employment in 1947 was 33,500, compared to a peak war month employment of 339,833, and average monthly business was $27,000,000, compared to $286,000,000 a month during the war.

▶ **Low Business**—That is the broad picture of the situation today in the engine manufacturing industry. The industry's difficult task in this period of change has been complicated by lack of a long-range program plus the fact that business has dropped to a fraction of capacity.

Output in 1947 was only a trickle compared with 260,000 in the peak war year. The industry's capacity to produce, measured in floor space, was one fifth of the war-time peak of 55,000,000 square feet. This shrinkage has brought the same problems that affect the overall industry—inadequate labor force, dissipation of working capital, loss of materials and parts, sources, etc.

▶ **One Company**—The weakness in the engine industry, as far as its air power implications are concerned, is the concentration of jet engine production in one firm—although that firm has a shining production record and, as far as is known, is the only company in the world that is in quantity production on jet engines. Due to the dependence of commercial aviation on the products of P&W and Wright, neither firm can convert completely to jet output. That means a more expensive, more complicated manufacturing system.

Possibly ten years of development will go into jet and rocket type engines before their range is extended sufficiently to warrant complete changeover from the reciprocating piston-type powerplant. The engine industry must continue to turn out ever-improved conventional powerplants, at the same time setting the pace in development and production of jet and rocket types.

Lag in Preparedness Causes Industry Crisis

With production at low level, air power should have rapid expansion program.

In addition to insufficient government orders, the aircraft manufacturing industry is faced with a serious lag in adequate planning and concrete preparations for rapid, efficient expansion.

President Truman's Air Policy Commission recommended that industrial mobilization planning receive immediate attention at an administrative level comparable to that given to research, development and procurement. Report of the Congressional Air Policy Board should give further emphasis to the problem's urgency.

Adequate industrial moblization plans crystalized for immediate action provide the best means of offsetting the surprise advantage which an aggressor nation would have in a sudden attack on the U.S. Military authorities are agreed that a surprise attack will open the next world conflict, if it comes.

► **Steps in Preparedness**—The Finletter commission, after consultation with industry and military leaders, recommended definite steps for setting mobilization of industry into action immediately in an emergency. These include:

• **Annual mobilization budget**, showing appropriations and forward contract authorization needed for the fiscal year.

• **Congressional approval** of such budget annually without voting appropriations.

• **An Office of War Mobilization** under the National Security Resources Board for control of materials, plants, tools and other goods, ready for immediate action upon the declaration of an emergency.

• **Immediate vote** by Congress approving forward contracts and appropriations, upon declaration of emergency.

Four other things are necessary for industrial mobilization beyond these immediate authorizations: materials, standby plants, machine tools and manpower.

► **Stockpiling**—National Security Resources Board, the Munitions Board, and the Secretaries of Defense and of the Treasury are charged by law with responsibility and authority for stockpiling strategic and critical materials, while alternative of developing adequate domestic sources for such materials in lieu of importing them is emphasized by the Finletter report.

J. H. Kindelberger, North American Aviation Inc. president, recommended to the Air Policy Commission that billets of proper alloys be stockpiled for quick delivery to manufacturers, and that semi-finished materials in standard shapes and gauges such as sheets, tubes, bars, and wires, be placed in a revolving stockpile to be drawn on by industry in peacetime thereby avoiding large scale obsolescence. He estimated there is a lag of six months from the mining of bauxite to the production of aluminum and its delivery to the airframe plant, and a further lag of probably six months, until that material is assembled into a finished airplane.

▶ **Plant Preparation**—J. Carlton Ward, Jr., president of Fairchild Engine and Airplane Corp., points out that a definite study should be made of the war standby plant capacity and locations needed to carry out an overall expansion plan, with arrangements for short notice conversion of these plants into military aircraft production when needed.

Maintenance of the continuing availability of 21,200,000 sq. ft. of specialized airframe plants, and 11,700,000 sq. ft. of specialized aircraft engine plants, on a standby basis, or with leases subject to repossession within 90 days in event of emergency, is called for by the Finletter commission. The commission also asked for completion of the Air Coordinating Committee's recommendation that a reserve of 65,000 general purpose machine tools be stored by the Air Force and Navy for standby purposes.

Ward, and most other aircraft industry heads agree that any program of completely tooling such plants in advance of an emergency, would be too costly because of the rapid obsolecence of tooling due to aircraft design changes. Kindelberger advocates maintenance of the reserve of general purpose machine tools already made by the government which will permit the machine tool industry to produce more rapidly the critically needed special purpose machine tools.

▶ **Training Program**—Emergency large scale training programs to develop quickly basic shop skills needed in aircraft fabrication should be planned for prompt activation, as a main solution of the trained manpower needed in an expanded program. Revision of military draft requirements to prevent manufacturers from losing their key workers to armed services is urged as another essential.

▶ **Production Plans**—Three important considerations in all military aircraft procurement contracts are urged by the Finletter commission:

Producibility, low cost production, and design for expanded production if

Aircraft & Engine Production—1913-1947

YEAR	AIRCRAFT Number	AIRCRAFT Value	ENGINE Number	ENGINE Value
1913	43	NA	NA	*
1914	49	789,872	NA	*
1915	178	NA	NA	*
1916	411	NA	NA	*
1917	2,148	NA	NA	*
1918	14,020	NA	NA	*
1919	780	14,372,643	NA	*
1920	328	NA	NA	*
1921	437	7,430,824	NA	*
1922	263	NA	NA	*
1923	743	13,142,364	NA	*
1924	377	NA	NA	*
1925	789	12,775,181	NA	*
1926	1,186	17,694,905	NA	*
1927	1,995	30,896,638	NA	*
1928	4,346	64,662,491	3,252	13,400,000
1929	6,193	91,051,044	7,378	26,500,000
1930	3,437	60,846,177	3,766	17,100,000
1931	2,800	48,539,715	3,776	14,500,000
1932	1,396	34,861,185	1,898	9,300,000
1933	1,324	33,357,122	1,980	9,700,000
1934	1,615	43,891,925	2,736	15,500,000
1935	1,710	42,506,204	2,965	12,700,000
1936	3,010	78,148,893	4,237	22,100,000
1937	3,773	114,092,601	6,084	30,100,000
1938	3,623	198,292,874	NA	NA
1939	5,856	247,904,863	11,172	74,300,000
1940	12,871	548,000,000	22,667	NA
1941	26,134	1,765,000,000	58,181	462,000,000
1942	48,858	6,071,000,000	138,089	1,434,000,000
1943	85,946	12,979,000,000	227,116	2,453,000,000
1944	96,369	16,745,000,000	256,911	3,432,000,000
1945	49,761	NA	109,650	NA
1946	36,204	362,772,192	43,407	126,860,393
1947	17,708**	671,575,612**	21,178**	326,045,447**

*Prior to 1922 engine values were not reported separately.
**Preliminary.
NA—Not Available. This indication has been used in all cases where no complete figures for entire year are available.

needed. It is pointed out that proper planning and coordination of these considerations with the primary requirement of superior performance will aid industrial mobilization problems.

Recommendations are made that each military aircraft contractor should have at least one type aircraft in production, another in development, and a third in the design study stage.

Engine Definitions

World War II produced a whole new family of aircraft propulsion systems, and some modifications of familiar types. With these new methods came almost a new language consisting mostly of coined words that have caused confusion. Here are the definitions of the major propulsive systems as used by research men:

- **Gas Turbine**—Any of a family of powerplants which utilize a turbine to take energy from a stream of hot gases for doing useful work external from the machine itself.
- **Turbojet**—Air is drawn in the compressor inlet, compressed to a high pressure, passes through a combustion chamber, where fuel is added and burned and the high temperature products expand through the turbine that drives the compressor and continues to expand through a nozzle as a jet in the atmosphere.
- **Turboprop**—A turbojet engine in which the turbine is geared to drive a propeller. When a portion of the hot gases is ejected through a nozzle, the unit is frequently referred to as a propjet.
- **Compound Engine**—A conventional reciprocating engine to which a steady flow exhaust-gas turbine and an auxiliary supercharger are added. The engine exhaust gas is ducted to the turbine, which is provided with a nozzle for jet propulsion. The turbine drives the auxiliary supercharger and the excess turbine power is delivered to the engine shaft through gearing. An intercooler is provided for cooling the engine charge air after the auxiliary compressor.
- **Turboramjet**—A conventional turbojet engine with provision for reheating the gas between the turbine discharge and the exhaust nozzle. Actually a form of constant thrust augmentation, this combination system makes it possible to obtain higher temperatures in the exhaust jet than can be withstood by the turbine.

Leading Helicopters of the U. S.

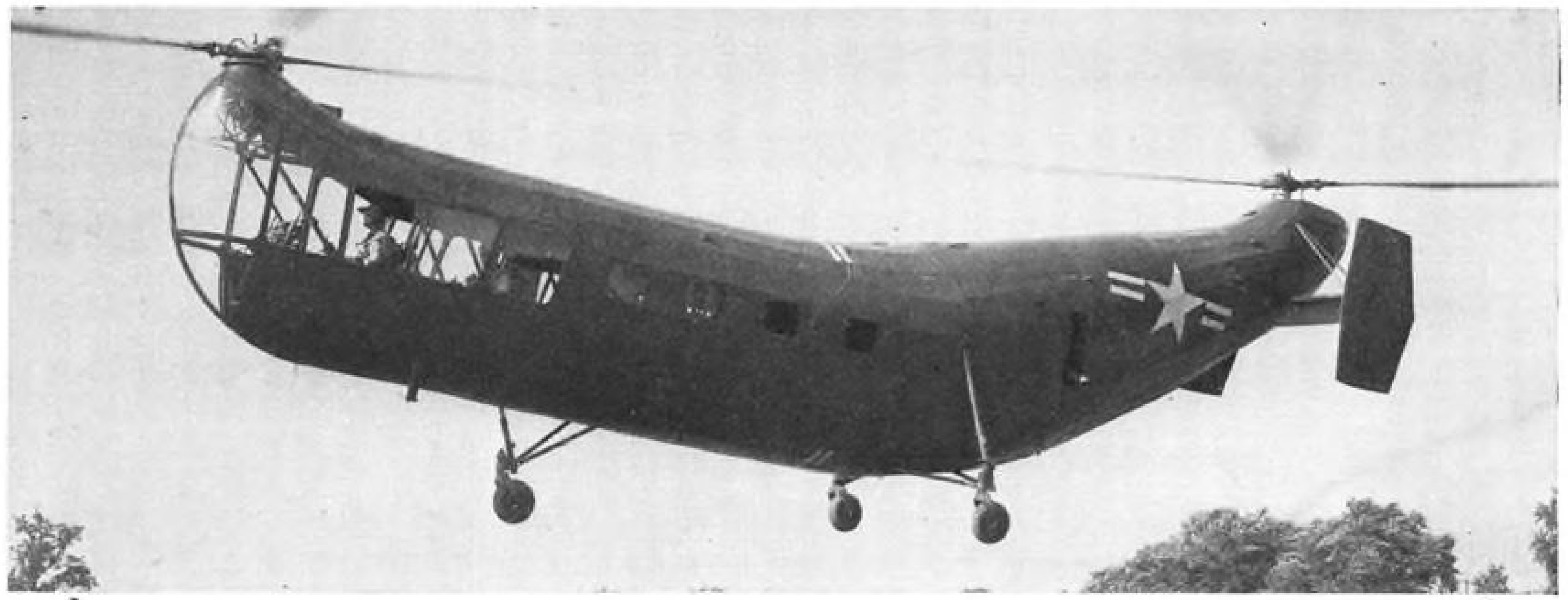
Manufacturer	Designation	Engine	Horsepower	High Speed, mph.	Cruise Speed, mph.	Range, mi.	Ceiling, ft.	Gross Weight, lb.	No. Rotor Blades	Dia., Rotor, ft.	Blade Area, sq. ft.	Rotor rpm., Cruise	Anti-Torque Rotor	Production Status
Bell Aircraft Corp.	47D	Air	178	92	85	210	11,500	2,086	2	35.16	35.24	333	Yes	In
P. O. Box 1,	48	P&W	600	105	90	300	13,000	6,000	2	47.5	81.6	256	Yes	Prot
Buffalo 5, N.Y.														
Bendix Helicopter, Inc.	K	Cont	100	95	75	95	NA	1,007	2–2[1]	25.0	21.0	412	No	Prot
50 Rockefeller Plaza														
New York, N. Y.	J	P&W	450	112	85	270	15,000	5,400	2–2[1]	48	99.0	192	No	Prot
Doman Frazier Helicopters, Inc.	LZ2-A	Air	245	120	95	235	17,000	2,950	4	40	60.8	230	Yes	In
Danbury Airport, Conn.														
Helicopter Engineering	JOV-3	Lyc	100 & 125	100	73	138	12,000	1,200	2–3[2]	18.5	54	470	No	Prot
Research Corp.														
Philadelphia 14, Pa.														
Kaman Aircraft Corp.	K-190-A	Lyc	190	100	80	300	NA	2,500	2–2[3]	38	44.4	221	No	Prot
Bradley Field														
Windsor Locks, Conn.	K-125-A	Lyc	125	100	80	NA	NA	NA	2–2[3]	38	NA	NA	No	Prot
Kellett Aircraft Corp.	XR-10	Cont	500	NA	NA	NA	NA	11,000	6	65	17.76	140	No	Prot
North Wales, Pa.														
Landgraf Helicopter Co.	H-2	Pob	85	100+	100+	150	NA	850	6	16	32.4	485	No	Prot
Central Ave. at 135th St.														
Los Angeles 2, Calif.														
McDonnell Aircraft Corp.	XHJD-1	P&W	450	100+	70+	350	NA	11,000+	6	46	200	190	No	Prot
Box 516														
St. Louis 2, Mo.	38	R-J	NA	50+	50	NA	NA	610	2	18	7.6	640	No	Prot
Piasecki Helicopter Corp.	PV-3	P&W	600	100+	90+	300+	12,000+	6,900	3–3[2]	41	NA	NA	No	In
Woodland Ave. & P. R. R.														
Morton, Pa.														
Seibel Helicopter	S-3	Air	65	90	75	80	12,000	800	2	25	15.5	360	Yes	Prot
Wichita, Kan.														
Sikorsky Aircraft Div.	R4	War	180	75	65	145	10,000	2,537	3	38	65.4	225	Yes	Out
United Aircraft Corp.	R5	P&W	450	100	80	245	13,000	4,867	3	48	115.05	186	Yes	Out
South Ave.,	R6	A	235	100	75	375	11,600	2,704	3	38	65.4	252	Yes	Out
Bridgeport 1, Conn.	S-51	P&W	450	103	85	260	14,000	4,985	3	48	115.15	186	Yes	In
	S-52	Air	165	97	87	265	13,500	1,900	3	32	41.22	290	Yes	Pend
United Helicopters, Inc.	360	Air	178	105	85	212	12,000+	2,100	2	34.5	NA	NA	Yes	Pend
625 El Camino Real														
Palo Alto, Calif.														

Engines
- Air—Aircooled Motors
- Cont—Continental
- Lyc—Lycoming
- P&W—Pratt & Whitney
- R-J—Ram Jets
- War—Warner
- Pob—Pobjoy

Rotor Systems
- 1—Co-Axial
- 2—Tandem
- 3—Contra-rotating, intermeshing

Production
- In—In production
- Out—Production ceased
- Pend—Production planned
- Prot—Only prototype built

NA—Not available



Piasecki Helicopter Corp. HRP-1 for Navy—the only transport-type helicopter in production in U. S.

S-51 (ATC #2) four-place 'copter now in production has steel-tube covered with plywood rotors loaded at 2.76 lb.

BELL 47D's steel tube construction is covered with metal and fabric. Laminated rotor is loaded at 2.21 lb./sq. ft.

Helicopter's Air Power Implications

Rotorcraft is still more of a potential force than present factor despite notable achievements based on limited experience.

By ALBERT E. SMYSER, JR.

In order fairly to assess the helicopter field today and its air power implications, it is imperative to consider that at the present stage of its evolution the 'copter has now reached essentially the same point of development which fixed-wing aircraft had reached at the outbreak of World War I, and that at that time conventional airplanes received a big boost from the government because of the pressing need for planes to do specific missions.

It is significant that the great strides which rotor-planes have made within the space of the past few years have been accomplished despite the fact that probably less than 400 such craft have ever been produced in the United States.

▶ **Three in Production**—In America today there are only three companies manufacturing operational helicopters on a production line basis (Bell, Sikorsky and Piasecki), and only one of these is making a model large enough to carry ten passengers.

Both Bell and Sikorsky are concentrating their commercial production on two to five place models suitable for crop dusting, fire patrol, and general utility work and the fields such craft best serve, admitting readily that at the present time they are unable to produce a reasonably priced personal 'copter because of the excessive costs due to limited production schedules.

Piasecki is manufacturing for the Navy a ten-place craft which is at present undergoing type testing. This is the largest model actually in quantity production in this country today, and is not available to commercial operators.

▶ **Contribution of Pioneers**—In evaluating the progress of the present day rotary wing craft it is necessary to include, at the same time, the work of the uncounted numbers of small manufacturers and experimenters who have entered the field since the war. These builders, some of whose craft have never gotten beyond the prototype stage, have added large quantities of knowledge to the general fund and materially contributed to the advance of the industry as a whole, but since they have not reached actual production phases, figure in air power only as a potential.

Fighting as it is for existence, the helicopter has progressed further than fixed-wing aircraft had in a comparable time. But lacking government support, helicopter firms are finding it increasingly difficult to finance their efforts.

The American helicopter, hardly out of the experimental stage now, has already proved itself a versatile device in the air, and at this time we stand well at the head of the field, it was reported in testimony before the President's Air Policy Commission.

▶ **Production Facilities**—We have some few facilities for manufacturing rotorcraft, but because of a limited commercial demand, they have not been designed to handle production requirements of an all-out war (Bell reports 118 Model 47 helicopters produced in 1947, with a present rate of 3 per week; while Sikorsky reported 30 Model S-51s were sold up to Dec. 1947).

Even our facilities for 'copter research are considered grossly inadequate, indicating that emergency production would necessarily be limited to the pitifully few types which are in production at present, or which are in the more advanced test stages.

▶ **Delaying Factors**—The helicopter admittedly has great possibilities in various commercial applications, but until larger models are available in quantity, the usefulness of the machine will continue to be overshadowed by its price penalty (caused by low production). In this same respect, the Air Force is suffering because of the added cost of development resulting from low orders.

Current high engineering costs resulting from rigid, necessary test work and construction (often amounting to as much as $300 per hour for present day craft), is blamed for the slow pace of our helicopter program.

Helicopter Performance

One index of helicopter reliability is certified performance—the following records, made by a Sikorsky R-5, are recognized by the F.A.I.:

Endurance—Closed circuit . . . 9 hr. 57 min.
Distance—Airline . . . . 703.60 mi.
Distance – Closed circuit . . . . 621.36 mi.
Altitude . . . . 19,167 ft.
Speed—1,000 Km. . . . 66.64 mph.

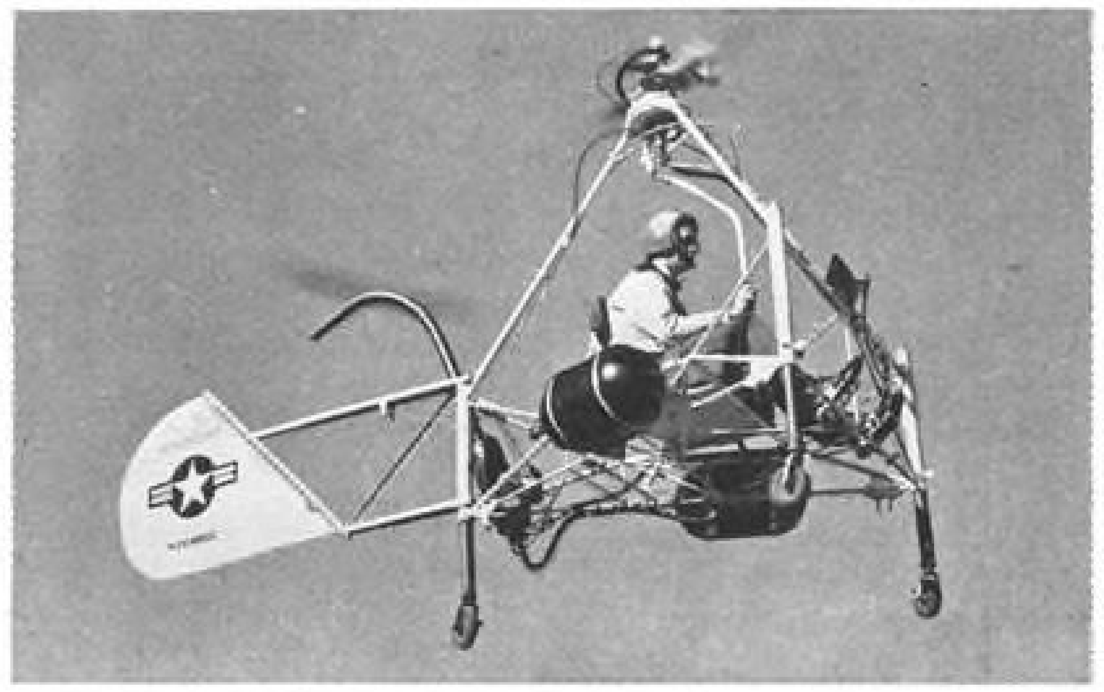
An index for measuring commercial reliability is the record made by the machines under rugged operating conditions:

Two Bell helicopters on fire fighting duty in California:

Flew:
1. All fire reconnaissance.
2. In 120 deg. F. temperatures.
3. Over 80 hr. in 5 days.
4. 19½ hr. in one day.

KELLETT XR-10 metal experimental model is designed for 10 plus 2 crew. Rotors are steel tube under plywood.

McDONNELL XHJH-1 showing engine and rotor mountings. Small wheeled landing gear is unusual.

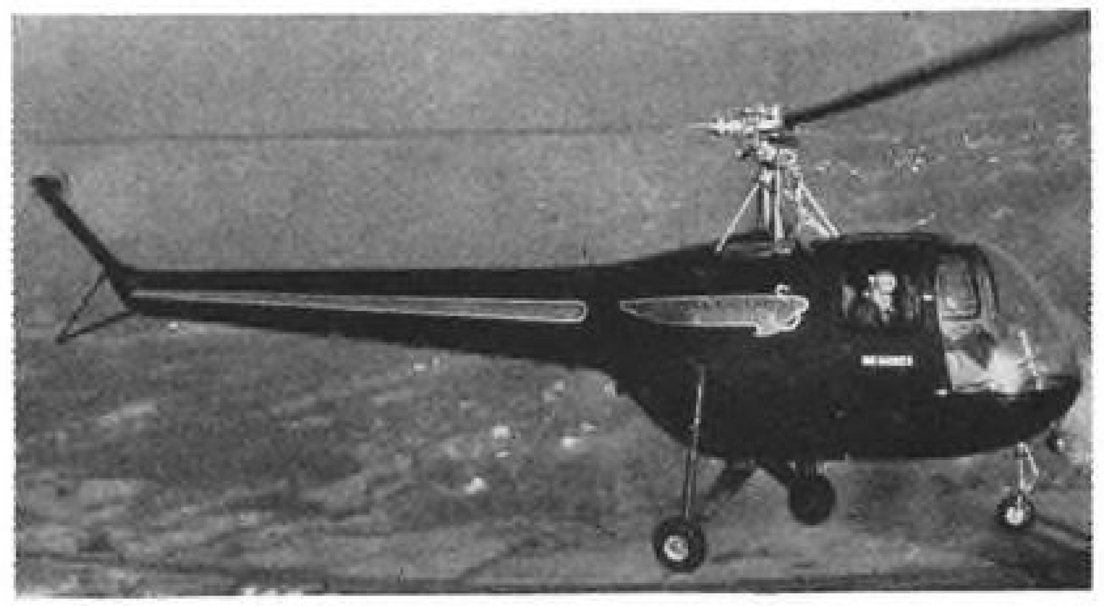


McDONNELL 38, 310 lb. "Flying Test Bed" for world's first ram-jet rotorcraft has metal covered rotor blades.

SEIBEL S-3 does not employ cyclic pitch, control is obtained by shifting center of gravity. Uses solid wood rotor.

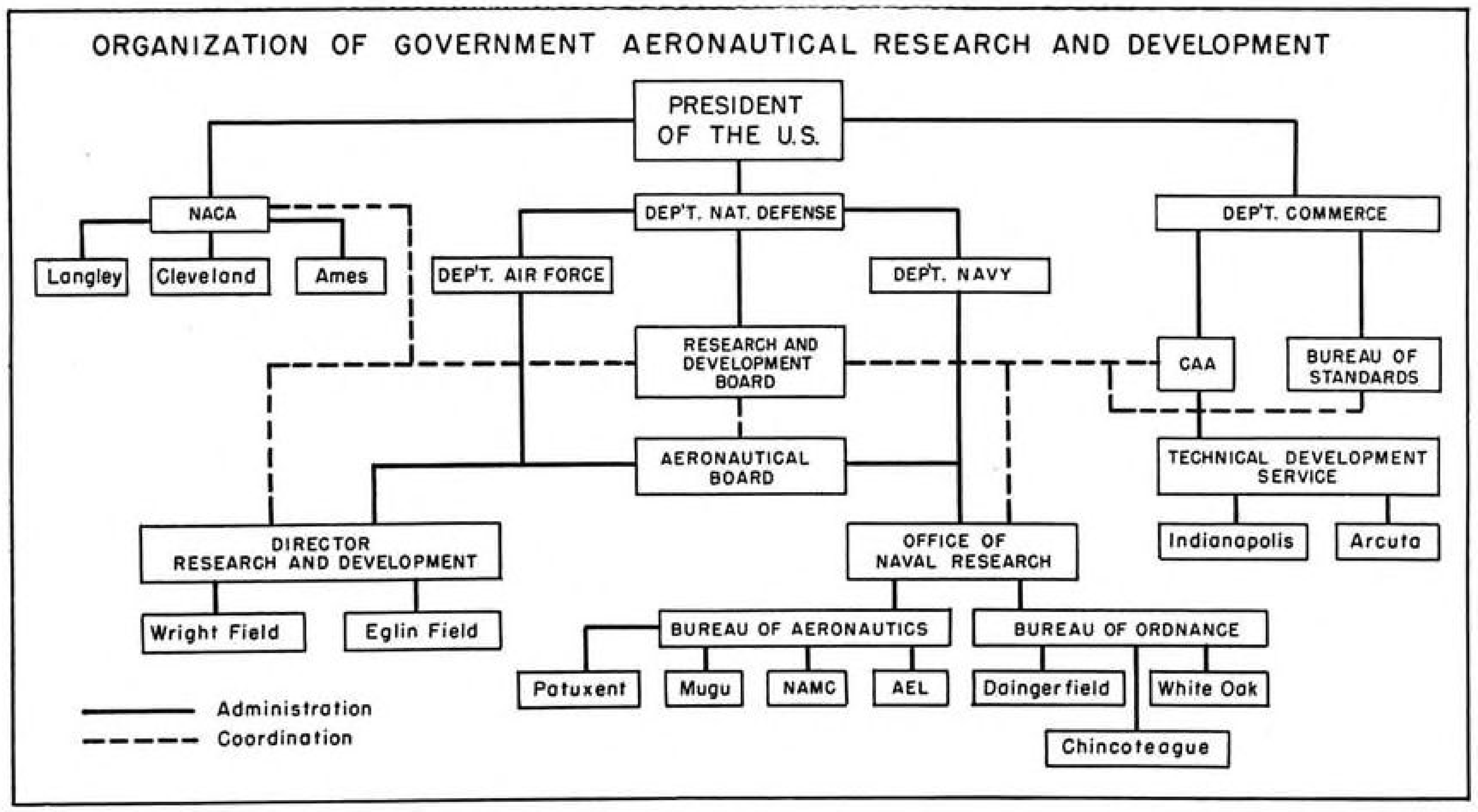
KAMAN K-125-A was designed as an engineering test stand for the development of their rotor systems.

JOV-3's high speed rotors mounted in tandem are claimed to reduce vibration and noise. Rotor loading 2.42.



HILLER 360 features a teetering type rotor and emphasizes simpler design that is easy and cheap to reproduce.

S-52 (left) two-place machine scheduled for production early this year. Features all metal rotor blade.



Largest Aero Research Program

U. S. government outstrips the world in attempting to gain new aeronautical knowledge, with nine agencies budgeting more than $300 million.

By ROBERT McLARREN

The United States Government is conducting the largest aeronautical research program in the entire world.

It is spending more than $300 million during the current fiscal year in an effort to gain new knowledge in the aeronautical sciences, to expand and crystallize presently available knowledge and to build new equipment and train new workers for future research.

It is fostering this gigantic program because only through research can leadership in the air be assured.

Aeronautical science has been completely revolutionized in the past decade. The introduction of successful jet propulsion of aircraft created an entirely new field of research containing problems heretofore unknown. Accompanying this tremendous new source of power are higher aircraft speeds, which themselves comprise difficult problems. Major culprit in this revolution, however, is supersonic speed, which has already manifested seemingly limitless new problems, the solution to which most often only creates a host of additional problems.

▶ **Federal Government**—About 99 percent of the present areonautical research effort is being sponsored by the United States Government. The reasons are obvious:

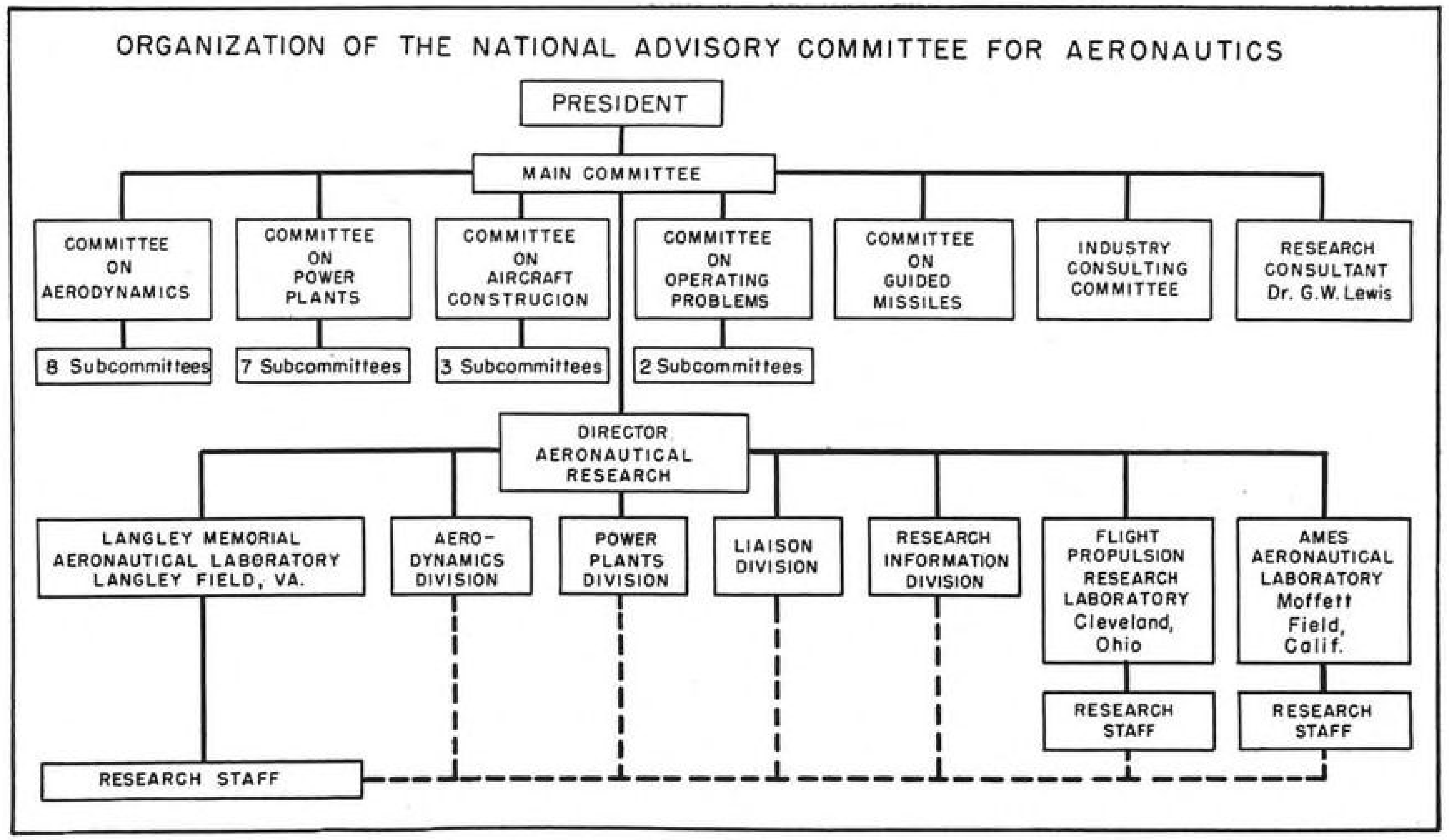
• **Military Application**—There are few scientific aeronautical data that are not of immediate or potential value to the Air Force and Naval Aviation in the design of new aircraft and missiles. Because the military are the largest users of current aeronautical information it only follows that they logically must subsidize the effort.

• **High Costs**—It is clearly evident that only the Government can afford the price of aeronautical research. Assuredly, no aircraft manufacturer, university or private citizen could afford to spend $20,000,000 for an areonautical laboratory, or even $10,000,000 for a single wind tunnel. None of these could afford to wait as long as four years for the construction, instrumentation and calibration of a major wind tunnel before the first test is actually run nor could it pay the salaries of 112 scientists, technicians and supporting workers for the operation of this single tunnel. Only the Government can afford the costs of aeronautical research.

• **Public Benefit**—In a competitive economy the results of a private research effort are for private use and few commercial laboratories make a practice of publishing their research results for the benefit of their competitors. The research itself is directed towards a specific problem in the creation of a specific product. Because scientific aeronautical research is applicable to all aeronautical devices and research results are widely distributed, it serves the public—and by definition that is a function of the Government.

▶ **U. S. Air Force**—About one-half of all the aeronautical research done in this country is sponsored by the Air Force. This research is accomplished in the Air Force's own laboratories, in other government laboratories and in private industrial laboratories under contract. All of its research program is directed towards military applications of research findings and only a fraction of these data is made public. For this reason it is not possible to discuss the USAF research program in detail.

• **Administration**—Direction of the USAF research program is vested in a Director of Research and Development,



presently Maj. Gen. Laurence Craigie. Responsible for the research and development activities of both the Air Materiel Command and the Air Materiel Proving Ground is Brig. Gen. Franklin O. Carroll. This research direction cuts across but does not circumvent the Air Force chain of command: Gen. Carl Spaatz, Chief of Staff; Lieut. Gen. Howard B. Craig, Deputy Chief of Staff for Materiel; Gen. Joseph B. McNarney, Commanding General, Air Materiel Command, in that order.

• **Facilities**—USAF possesses two major research facilities, Wright Field, Dayton, Ohio and Elgin Field, Fla. Wright Field contains a 5 ft. subsonic tunnel, a small supersonic tunnel and a 20 ft. dio. subsonic tunnel driven by a 40,000 hp. electric motor and capable of speeds up to 400 mph.

In addition, the laboratory contains numerous engine test cells, propeller test stands and special equipment for aeromedical, navigational instrument, aircraft radio, photographic and armament research. Eglin Field contains the world's largest climatic hangar for cold weather studies.

• **Research Contracts**—USAF is the largest research contractor in the world, with about $20 million worth of contracts currently in force. Representative USAF research contractees include: Univ. of Michigan; Calif. Inst. of Tech.; Mass. Inst. of Tech.; Northwestern Univ.; Cornell Univ.; General Electric Co.; Radio Corp. of America; Bell Telephone Laboratories; Western Electric Co.; Raytheon Mfg. Co.; Remington Rand Corp.; Kodak Research Laboratories; Carnegie Institute; Schwein Engineering Co.; Diehl Mfg. Co.; Globe Industries, Inc.; Offner Electronic Co.; M. W. Kellogg, Inc.; Hillyer Engineering Co.; Summers Instrument Co.; Photoswitch, Inc.; Thomas and Gibb Corp.; Navy Department; National Bureau of Standards; U. S. Weather Bureau; Atomic Energy Commission—and hundreds of others.

• **Scope of Research**—USAF research program is divided into ten major fields: (1) Complete Aircraft and Missiles, the largest single item in the entire USAF budget; (2) Experimental Power Plants, largely turbojet and ramjet types, rocket motors, nuclear energy for propulsion of aircraft, and research work on such accessories as superchargers, fuel pumps, ignition systems, fuel systems, cooling systems, thrust augmentation devices, lubricating systems, etc.; (3) Radio and Radar, an extremely large program devoted to the application of electronics to high speed aircraft and missiles, to ground aids for communication, warning and all-weather operation, and to long-range studies of the upper atmosphere, wave propagation, and circuit theory; (4) Service Test Equipment, development of special instrumentation including metallurgical research equipment, dynamometers, static test installations and various types of laboratory apparatus; (5) All Weather Operations, the effects of extreme heat and extreme cold on aircraft, aircraft engines, armament and airborne equipment; (6) Aircraft Armament, rapid-fire cannon, belt-fed rockets, shaped charges and other types of offensive armament including turrets, fire control equipment, and radar sighting and firing equipment to accommodate the vastly increased speeds of modern combat aircraft; (7) Machinery and Apparatus, special equipment constantly needed for the evaluation of contractor-furnished aircraft, engines and equipment, the construction of special research apparatus for research contractors and special production and test equipment needed by contractors, which is more economical to fabricate than to purchase; (8) Propellers, research continues (despite frequent predictions of the abandonment of the propeller) for gas turbine applications with accent on vibration, fatigue and noise problems, and work on helicopter rotors; (9) Aircraft Equipment, electrical equipment, auxiliary power plants, photographic equipment and special equipment items; and (10) Design, swept wings, missile configurations, engine mounting systems, structure, control systems and similar design work research.

▶ **Naval Aviation**—The Bureau of Aeronautics research program is confined largely to complete aircraft and airborne equipment with research on guided missiles, propulsion methods, radar and electronics being vested in other branches of the Navy Department.

• **Administration**—Bureau of Aeronautics research is directed by the Office of Naval Research in regard to research contracts and is coordinated by ONR in all research matters. Research is directed by Rear Adm. Theodore C. Lonnquest, Asst. Chief for Research and

NACA Supersonic Wind Tunnels

Size	Speed	Status
Langley Memorial Aeronautical Laboratory		
4 ft. by 4 ft.	Mach No. 2.2	Building
9 in. by 7½ in.	Mach No. 2.4	Completed 1942
4 in. by 18 in.	Mach No. 1.4	Completed 1940
24 in. circular	Mach No. 1.4	Completed 1947
Ames Aeronautical Laboratory		
6 ft. by 6 ft.	Mach No. 1.6	Building
1 ft. by 3 ft. No. 1	Mach No. 2.2	Completed 1945
1 ft. by 3 ft. No. 2	Mach No. 3.4	Completed 1946
8 in. by 8 in.	Mach No. 2.3	Completed 1945
Flight Propulsion Research Laboratory		
6 ft. by 8 ft.	Mach No. 1.8	Building
18 in. by 18 in.	Mach No. 2.2	Completed 1945
20 in. circular	Mach No. 2.0	Completed 1945
2 ft. by 2 ft.	Mach No. 4.5	Completed 1947

Development for Bureau of Aeronautics.

• **Facilities**—BuAer has administrative charge of the Naval Air Material Center at Philadelphia, Naval Air Station, Patuxent, Md., and extensive test facilities at Point Mugu, Calif. Although all of these facilities are used predominantly for evaluation work on contractor-furnished equipment, numerous research projects are by-products of this test and development activity.

• **Research Contracts**—Since the major share of Naval Aviation research is handled by the Office of Naval Research and the Bureau of Ordnance, the Bureau of Aeronautics has comparatively few research contracts over which it has direct administrative control. Prominent in this group is "Project Squid," a pulsejet research program conducted by Princeton Univ., Brooklyn Polytechnic Inst., Cornell Univ., New York Univ. and Purdue Univ. Other research contracts are held by aircraft prime contractors for research work in connection with special projects being developed for the Navy. These include Glenn L. Martin, McDonnell, Chance Vought, North American Aviation, Douglas, Lockheed, Curtiss-Wright and others.

• **Scope of Research**—(1) Complete Experimental Aircraft, conducted by airframe manufacturers as outlined above; (2) Experimental Engines, the Aero Engine Laboratory at Philadelphia is engaged in extensive research and development work on turbojet and turboprop engine units; pulsejet, ramjet and rocket work is conducted at present by the Bureau of Ordnance; (3) Engine Components, the Aero Engine Laboratory is engaged in a broad program of engine accessory development including fuel systems, lubricating systems and engine control systems for all types of engines; (4) Aircraft and Aircraft Components, the largest research category, includes electronic research on aircraft radar systems and methods of pilotless aircraft guidance, armament, automatic control instruments, catapults, arresting gear, solid fuel assisted takeoff equipment and carrier deck equipment.

▶ **NACA**—The National Advisory Committee for Aeronautics is the scientific aeronautical research agency of the government and is charged with the broad responsibilities of supervising and directing the scientific study of the problems of flight with a view to their practical solution. Founded in 1915, it consists of 15 members appointed by the President, including two from the Air Force, two from Naval Aviation, two from the aviation activities of the Department of Commerce, the administrative heads of the Weather Bureau, National Bureau of Standards and the Smithsonian Institution, all of whom serve during their tenure in those offices, and six scientists chosen from private life who serve until relieved by the President.

• **Administration**—The Main Committee is responsible directly to the President and directs the research programs of the agency. Assisting the Main Committee are six Technical Committees and 20 subcommittees comprising more than 300 of the outstanding aeronautical experts of the nation selected from the Air Force, Naval Aviation, other government agencies, the aircraft industry and from private life.

These committees submit recommendations for research programs in their specialized fields to the Main Committee, which integrates them into the overall research program of the agency. Responsible for the execution of the scientific research program is the Director of Aeronautical Research, Dr. Hugh L. Dryden. Responsible for the administration of the agency is the Executive Secretary, John F. Victory.

• **Facilities**—NACA operates more than $80,000,000 worth of aeronautical research facilities at its three principal laboratories: Langley Memorial Aeronautical Laboratory, Langley Field, Va., Flight Propulsion Research Laboratory, Cleveland, Ohio and the Ames Aeronautical Laboratory, Moffett Field, Calif. In addition, a special Pilotless Aircraft Research Station is located on Wallops Island, off the Virginia Capes in the Atlantic Ocean.

NACA has designed, built and operates special research equipment unique in all the world and its facilities are admittedly the finest in existence. Among these are: the largest wind tunnel in the world, the fastest wind tunnel in the world, and the first variable density, full-scale, refrigerated, free-flight, gust and high-speed wind tunnels in the world.

• **Research Contracts**—NACA awards research contracts to other agencies and to university laboratories when the latter possess unique equipment or exceptionally qualified personnel (professors, graduate students, etc.). Among these latter are: Stanford, M.I.T., Johns Hopkins, Calif. Inst. of Tech., Georgia School of Tech., Illinois, Michigan, Akron, New York, Polytechnic Inst. of Brooklyn, Rensselaer Polytech-

Aeronautical Research Budget

Agency	Fiscal 1948	Fiscal 1949
Air Force	$145,316,000	$142,615,735
Bureau of Aeronautics	75,000,000	75,000,000
NACA	43,454,000	48,000,000
Bureau of Ordnance—Navy	21,500,000	26,300,000
Ordnance Dep't.—Army	11,000,000	10,200,000
Office of Naval Research	4,952,000	5,850,000
CAA	1,600,000	2,000,000
Weather Bureau	633,500	1,491,984
TOTAL	$303,455,500	$311,457,719

nic Inst., etc. These contracts total about $500,000 a year.

• **Scope of Research**—The major portion of the NACA research program is scientific research producing basic information for the military and the aircraft industry. A portion of the current research program is directed towards specific projects assigned by the Air Force and Naval Aviation, the results of which are supplied only to these agencies.

The fundamental research program is divided broadly into four major activities: (1) Aerodynamic Research, almost entirely devoted to highspeed aerodynamics including supersonic speed for the development of data applicable to highspeed combat aircraft and supersonic guided missiles and includes: airfoils, high-lift devices, wing characteristics, boundary layer investigations, aerodynamic loads, wing-body interference, aerodynamic heating, shock waves, stability and control, flying qualities, spinning, highspeed air inlets, flutter, propellers, helicopters, seaplanes and the upper atmosphere; (2) Propulsion Research, gas turbine engines, ramjets, thrust augmentation, cooling, stress and vibration, controls, fuels and lubricants, compressors, turbines, combustion, heat-resistant materials and special power plants; (3) Airframe Construction Research, swept wings, stiffness, sandwich materials, vibration and flutter, skin-stiffened panels, shear webs, stiffened shells, box beams, forging alloys, corrosion, fracture of metals and nonmetallic aircraft materials; (4) Operating Problems Research, ditching, handling qualities, deicing, meteorology and speed control of highspeed transport planes.

▶ **Army Ordnance Department**—Through its responsibility for rocket weapons research, the Army Ordnance Department is engaged in an extensive aeronautical research program designed to provide fundamental data on rocket powered missiles.

• **Administration** — Direction of the AOD research program is the responsibility of the Chief, Research and Development Division of the War Department, presently Maj. Gen. Henry S. Aurand. Within the Ordnance Department, the program is directed by the Research and Development Section, under whose cognizance is the Guided Missiles Branch and the Rocket Research Division.

• **Facilities**—Aerodynamic research is conducted at the Ballistic Research Laboratories located at Aberdeen Proving Ground, Md. This facility includes a $2,750,000 supersonic wind tunnel with a 20-in. test section. Another important item of research equipment at this facility is the famed ENIAC computing machine. The White Sands Proving Ground is the site of the highly publicised V-2 experimental work and contains extensive laboratory facilities and firing ranges for research and test on contractor-furnished rocket devices. Also under AOD cognizance is the White Sands Proving Ground Annex used for high-priority guided missile projects.

• **Research Contracts**—The guided missile program of AOD includes research contracts with some 30 universities and private research groups including: General Electric Co., Radio Corp. of America, Bell Telephone Co., Cornell Univ., Ohio State Univ., Johns Hopkins Univ., M.I.T., Univ. of New Mexico, Armour Research Foundation, Univ. of Michigan and many others. Chief contractor is the California Institute of Technology at which the AOD maintains a sub-office for the administration of the many contracts involved.

• **Scope of Research**—The AOD research program includes ground-to-ground missiles, shore-to-ship missiles, countermeasure interceptor missiles, rocket propellants, rocket missile design, VT proximity fuze bombs and bomb fuzes, shaped charge, aircraft cannon, guided missile launching and control, air-to-ground rockets, high velocity aircraft rockets, improved multiple launchers and high cyclic rate automatic launchers.

▶ **Navy Bureau of Ordnance**—Because the guided missile was early classed as an ordnance item by the Navy Department, its development continues to be the responsibility of BuOrd.

• **Administration**—Direct control of this large program is centered in the Guided Missiles Section of the Bureau, presently headed by Captain B. F. Brown. Coordinating the program is the Office of Naval Research, which supervises the award of research contracts to outside agencies. Close liaison is also maintained with the Bureau of Aeronautics and the Bureau of Ships as using services.

• **Facilities**—BuOrd has administrative charge of the Naval Ordnance Test Station, Inyokern, Calif., the Naval Ordnance Laboratory, White Oak, Md. and the Aerophysics Laboratory at Daingerfield, Tex. The latter consists of a former steel plant containing two large blowers, which have been converted into supersonic air jets for the dynamic testing of ramjet engines. The Ordnance Laboratory at White Oak, when completed, will contain a number of wind tunnels including the famous Kochel supersonic wind tunnel equipment captured in Austria and shipped to the U. S. for reassembly. All test firings of new ordnance missiles and experimental ramjet engines are now centered at Inyokern, after BuOrd was forced to move from ranges at New

Jersey and also Delaware locations.

• **Research Contracts**—Johns Hopkins University Applied Physics Laboratory, Silver Spring, Md., is the prime contracting agency, which administers and coordinates the other contractors, which include Cornell Univ., Univ. of Virginia, Univ. of Tex., Consolidated Vultee Aircraft Corp., Univ. of New Mexico, Princeton Univ., Bendix Aviation Corp., Univ. of Michigan, Esso Laboratories, Farnsworth Laboratories, M. W. Kellogg Co., North American Aviation, Inc., Radio Corp. of America, Hercules Powder Co., Curtiss-Wright Corp. and many others.

• **Scope of Research**—Major share of the program is the ramjet engine as the power plant for a family of guided missiles now being developed, research on which includes: combustion, aerodynamics, launching and handling, guidance systems and servos, fuels, propulsion, countermeasures and counter-countermeasures. This program recently produced the largest ramjet engine yet flown at supersonic speed.

▶ **National Bureau of Standards**—Oldest research agency of the government (1901) NBS functions largely on funds transferred to it from other agencies for specific research activities, an important portion of which is aeronautical research. A major factor in NBS research is its great flexibility which enables it to plan new programs and execute them with promptness and minimum cost.

• **Administration**—National Bureau of Standards is an agency of the Department of Commerce, its Director reporting to the Assistant Secretary of Commerce.

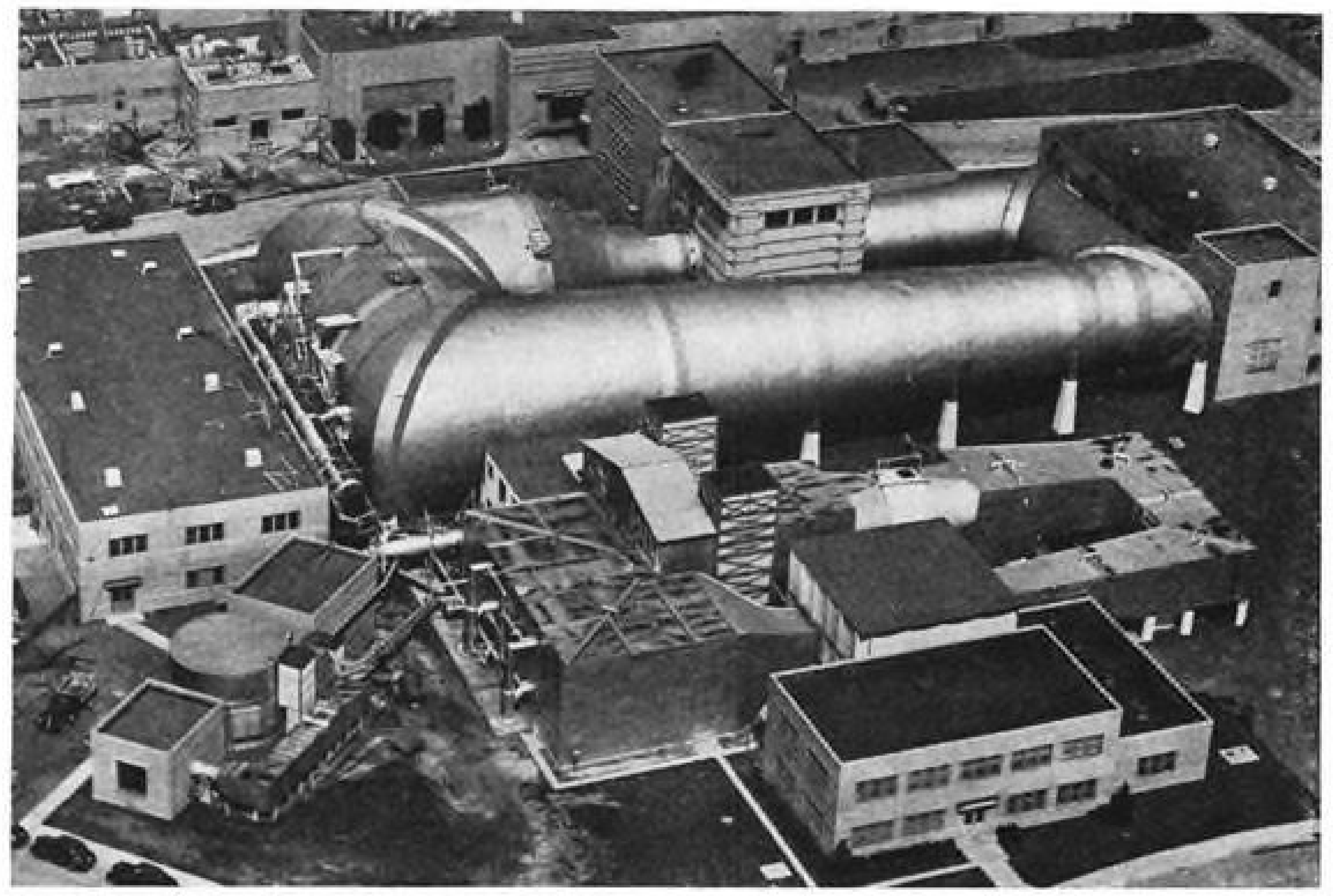
• **Facilities**—The equipment of NBS, located in Washington, D.C., is far too extensive and complex to permit even a partial listing. Generally, new devices are designed and built for each individual project which requires special facilities.

• **Research Contracts**—The Bureau does not award research contracts to outside groups except for minor items of equipment and special studies required in the course of business.

• **Scope of Research**—Aerodynamics research includes improved measurement devices such as hot-wire anemometers for boundary layer investigations and extensive studies of laminar and turbulent flow fluctuations; improved aerodynamic characteristics of aircraft bombs, projectiles and guided missiles, aircraft structural research, interferometry (for measuring highspeed airflows), proximity fuze, homing missiles, electronics and radio propagation, all-weather navigational equipment and blind-landing aids, combustion in jet engines, aeronautic lighting, metallurgy and numerous other fields.

NACA Research Facilities

At Ames (California) . . .



at Cleveland (Ohio) . . .

and at Langley (Virginia).

▶ **Civil Aeronautics Administration**—CAA research is exclusively applied research and development work applicable to specific installations and consists largely of special studies and research contracts.

• **Administration**—CAA is a branch of the Department of Commerce, the Civil Aeronautics Administrator reporting to the Assistant Secretary of Commerce for Air. Within CAA, research is administered by several departments, chief of which are the Research Division of the Office of Safety Regulation and Technical Development Service.

• **Facilities**—CAA maintains an Experimental Station at Indianapolis, Ind., and administers the facilities at Arcata, Calif. used jointly by several agencies.

• **Research Contracts**—CAA generally awards contracts through the National Research Council and these include Harvard Univ., Ohio Univ., Univ. of Tennessee, Aeronautical Research Foundation, Fairchild Airplane and Engine Co., Goodyear Aircraft Corp., Firestone Aircraft Corp. and others.

• **Scope of Research**—Personnel, these studies center about the selection of pilots, analysis of flight instruction methods, stall warning indicators, crash-injury investigations, aviation medicine studies, accident analysis, physical specifications for pilots and crews, etc.; Radio, omnidirectional radio range, distance measuring equipment, airport surveillance radar, microwave navigational aids and anticollision devices; Aircraft, fire protection, windshield protection and crash resistant fuel tanks; Airports, lighting, surfacing; and cross-wind landing gear research.

▶ **Weather Bureau**—Aviation has failed to master the weather as the No. 1 threat to regular operation of aircraft. In the forefront of this attack is the Weather Bureau, which is continuing an extensive research program.

• **Administration**—The Weather Bureau is an agency of the Department of Commerce and its director reports directly to the Assistant Secretary of Commerce for Air. Since the entire agency is a research agency, its research activities are administered by the Director of the Weather Bureau.

• **Facilities**—The extensive facilities of the Weather Bureau are scattered throughout the nation at 420 airports, some 4,000 substations and about 5700 cooperating climatological stations.

• **Research Contracts**—The Weather Bureau has research contracts with New York University, Univ. of Chicago, M.I.T., Univ. of North Carolina, Univ. of California, Harvard Univ. and the Soaring Society of America.

• **Scope of Research**—A major project of the Weather Bureau is the "Thunderstorm Project" which it administers for the Air Force, Naval Aviation and NACA, and which is a study of the mechanics and structure of thunderstorms by actual piloted flights directly through them. Other areas of research include pressure waves by explosions, pressure deficiency on mountain tops, ascension rate of balloons, free energy in the atmosphere, forecasting, radiosonde, automatic weather stations, meteorological instruments, high wind probabilities, weather trends, solar radiation, icing of aircraft, and others.

▶ **Atomic Energy Commission**—Through research contracts, the AEC is investigating the possibilities of Nuclear Energy for the Propulsion of Aircraft. Administered by Fairchild Airplane and Engine Co., the NEPA project includes research contracts with United Aircraft, Wright Aeronautical, Continental Motors, Allison Division, Lycoming Division, Frederick Flader, Northrop Aircraft, Menasco, Westinghouse, NACA and M.I.T.

Aviation Expenditures Included In The Budget For Fiscal Year 1949

The following excerpts from the 1949 Budget indicate the amount and nature of the major expenditures contemplated for aviation purposes. The figures do not include salaries or other administrative expenses.

U. S. Air Force	***1948***	***1949***
Procurement of Aircraft............	$588,406,000	$767,000,000
Communication Equipment........	40,055,000	35,500,000
Controlled Missiles................	13,000,000	10,300,000
Maintenance Material.............	10,931,000	16,000,000
Fuel and Oil.......................	115,888,000	131,800,000
Modernization of Equipment.......	10,000,000	15,000,000
Individual Equipment.............	5,313,000	7,500,000
Supplies and Equipment...........	13,132,000	21,000,000
Industrial Planning & Procurement..	4,572,000	4,500,000
Photographic Equipment...........	1,544,000	2,000,000
Maps and Mapping Projects........	2,864,000	3,100,000
Packing and Crating...............	3,899,000	5,500,000
Commercial Printing...............	1,500,000	1,000,000
Handbooks, Literature.............	500,000	500,000
Research and Development.........	109,523,000	101,231,000
Service Test Equipment............	6,740,000	8,312,000
Research and Development, Medical	430,000	956,000
Research & Development, Meteorologic..........................	3,307,000	4,500,000
TOTAL............+22%	$931,604,000	$1,135,699,000

Civil Aeronautics Administration		
Supplies and Materials.............	$4,255,000	$4,716,000
Equipment..........................	1,952,000	2,478,000
Air Navigation Facilities Equipment	7,295,000	14,059,000
Technical Development Supplies....	102,000	186,000
Supplies and Materials, National Airport..........................	175,000	255,000
Equipment, National Airport.......	27,000	42,000
Construction, National Airport.....	295,000	1,835,000
Federal-Aid Airport Program.......	32,500,000	40,000,000
TOTAL................+23%	$46,601,000	$53,570,000

Navy, BuAer	***1948***	***1949***
Procurement of Planes.............	$333,649,000	$473,000,000
Equipment for Schools.............	1,000,000	1,000,000
Industrial Planning & Procurement.	6,000,000	4,000,000
Aerological Instruments............	870,000	575,000
Aeronautical Instruments..........	816,000	850,000
Electric & Electronic Equipment....	12,099,000	12,575,000
Photographic Equipment...........	4,673,000	4,000,000
Operation of Aircraft..............	79,531,000	102,968,000
Overhaul of Aircraft...............	123,956,000	137,210,000
Aeronautical Equipment, Supplies...	8,165,000	6,175,000
Shop Equipment..................	2,950,000	2,000,000
Catapults, Arresting Gear..........	1,650,000	1,400,000
Maintenance of Stations...........	97,394,000	87,000,000
Major Repairs, Improvement.......	7,430,000	8,000,000
Research and Development.........	75,000,000	75,000,000
TOTAL................+21%	$755,174,000	$915,753,000

NACA		
Contractual Services...............	$1,972,000	$2,425,000
Supplies and Materials.............	3,965,000	4,301,000
Equipment........................	7,500,000	8,655,000
Printing..........................	80,000	95,000
Construction and Equipment.......	11,432,000	26,057,000
TOTAL................+67%	$24,969,000	$41,533,000

Army Signal Corps		
Construction of Airways Communication System...........+242%	$1,844,000	$9,351,000

TOTALS

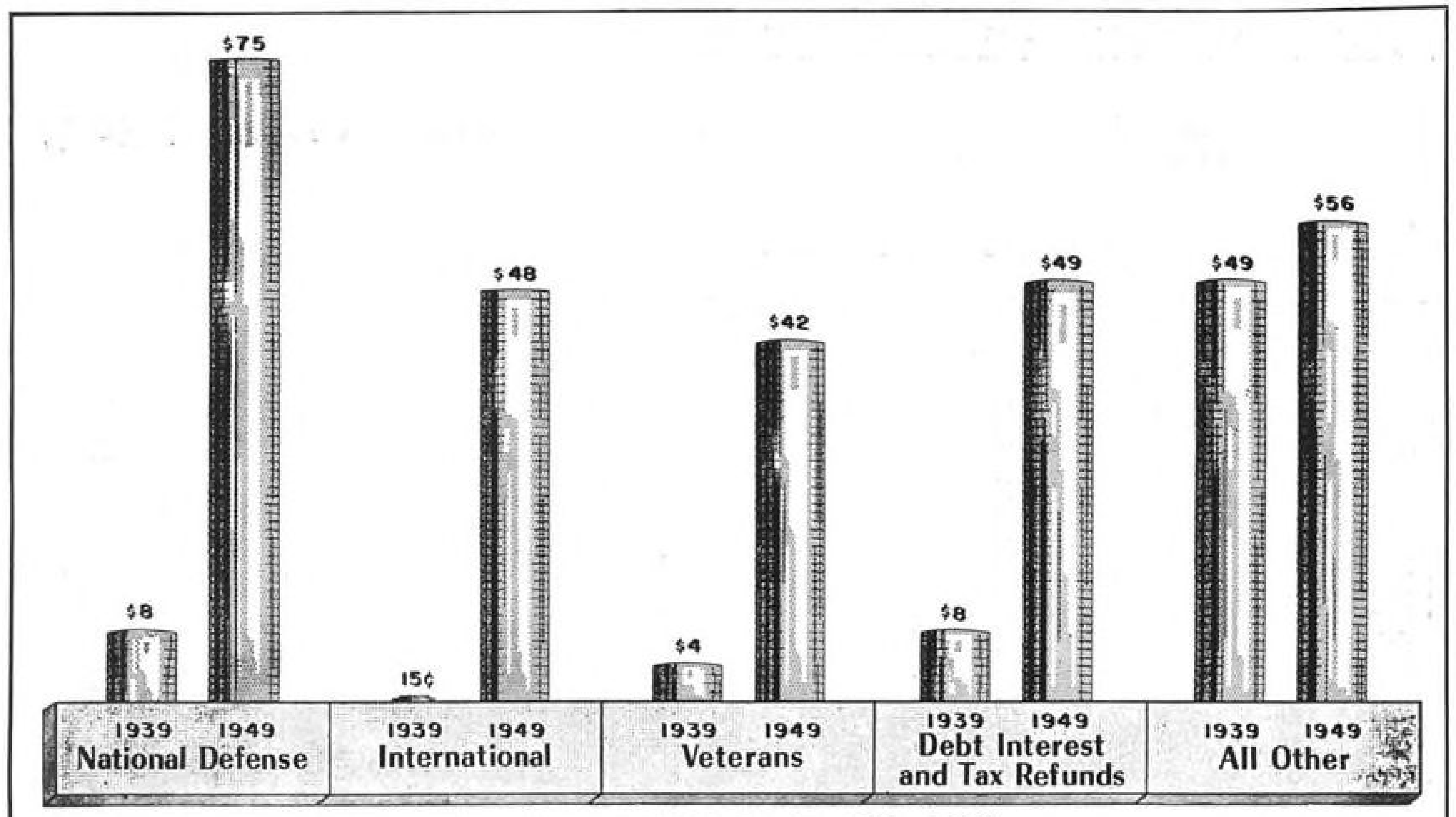
AIR FORCE	$931,604,000	$1,135,699,000
NAVY, BUAER	755,174,000	915,753,000
CAA	46,601,000	53,570,000
NACA	24,969,000	41,533,000
ARMY	1,844,000	9,351,000
TOTAL ....+23%	$1,760,192,000	$2,155,906,000

Total 1949 Budgets For All Purposes (Thousands of dollars)

AIR FORCE	*$1,719,426*	*(Not including salaries)*
NAVY, BUAER	*1,064,668*	*(Not including salaries)*
CAA	*153,570*	*(Including salaries)*
NACA	*48,000*	*(Including salaries)*

Air Policy Committee Recommendations

Total Military Aviation Budgets..........1948 — $5,150,000,000 1950 — $8,000,000,000
1949 — 6,500,000,000 1951 — 9,500,000,000
1952 — 11,000,000,000



Per capita expense of Federal Budget 1939 and 1949.

Aviation in the National Economy

Importance of airpower highlighted by Federal expenditures averaging more than $120 per taxpayer.

If the items for national defense in the present Federal Budget are unchanged by Congress, every taxpayer in fiscal 1949 will pay more than $120 for support of military and naval airpower.

On the basis of the present budget, national defense expenditures in fiscal 1949 are equivalent to about $75 from every man, woman and child in the country—and 54 percent of the per capita expense, or $40, is for the Air Force and Naval Aviation.

More than six billion dollars is budgeted in fiscal 1949 for aviation—military and naval, for airports, work of CAA, CAB, NACA and for carriage of mail. This is about 15 percent of the proposed Federal expenditures.

In contrast to this near-preeminent place in government fiscal affairs, aviation is but a small segment of the overall civilian economy. In 1947, it is estimated to have contributed less than one percent to a gross national product (total value of all goods and services) of $231 billion. Yet, annual revenue of aviation manufacturers and of airlines is now 300 percent and 700 percent higher, respectively, than in 1939.

▶ **Combination Industry**—The contradictions in aviation's economy arise from the fact that it is one of the few industries existing to serve war needs in time of peace. Under such a condition, the usual measurements of business activity and health can be meaningless. In normal years, even in the booming war years, profits in both aircraft manufacturing and in air transport have been lower than in general manufacturing and in other forms of transportation. In 1946, for example, income after taxes in the aircraft and aircraft parts industry was only .9 percent of net worth—the lowest of any manufacturing group. In that year, income in the railway equipment industry was 9.3 percent of net worth and in the automotive industry 6.9 percent.

▶ **1947 Operations**—In 1947 both aircraft manufacturers and airlines operated at losses of tremendous size.

Last year the aircraft manufacturing industry utilized enough plant-area to produce approximately 13 times the airframe weight actually turned out.

Scheduled, certificated air transport in 1947 flew more passengers more miles and took in greater revenue than in any other year, yet operated overall at a load factor of doubtful earning capacity.

▶ **Comparisons**—In both manufacturing and transport, wage rates are higher than in comparable industries and a higher percentage of the expense dollar goes for wages than is the case in most industries.

Under such circumstances, it is apparent that neither aviation manufacturing nor air transportation could stand alone in a civilian economy.

▶ **Defense Implications**—But a widespread air transportation industry and a large, multi-company manufacturing industry are essential to air power. So, for the next few years, at least, the present situation of a civilian aviation industry drawing its chief support from the government will continue.

Taxes now are at a peacetime highwater mark. The bulk of them in fiscal 1949 will come from individuals ($23 billion plus) and corporations ($10 billion). Those also are the first government revenues that will be washed away in any ebb of the present high-price, high-wage, high-profit tide. Present temper of the people seems to be in favor of high defense expenditures, regardless of other factors. The question is whether that attitude would change if such expenditures had to come from borrowing, thus increasing the national debt, instead of from taxes.

Leading Personal Aircraft of the U. S.

Manufacturer	Designation	Engine	Horsepower	High Speed, mph.	Cruise Speed, mph.	Range, mi.	Gross Weight, lb.	Empty weight, lb.	Span	Length	Price, F. A. F.
Aero-Flight Aircraft Corp.	Streak-85	Continental	85	175	165	750	1400	850	25′ 3″	21′ 2″	(*)
Long Beach Mun. Airport	Streak-125	Continental	125	203	192	800	1560	960	25′ 3″	21′ 8″	(*)
Long Beach, Calif.											
Aeronca Aircraft Corp.	Champion	Continental	65	100	90	250	1220	750	35′ 2″	21′ 6″	$2495
Middletown 19, Ohio	Super Chief	Continental	85	100	95	385	1350	820	36′ 1″	20′ 5″	$2755
	Sedan	Continental	145	120	105	445	2050	1150	37′ 6″	25′ 3″	$4795
All American Aircraft, Inc.	Ensign	Continental	85	125	110	400	1550	1000	33′	22′	$3495
Long Beach 4, Calif.											
Baumann Aircraft Corp.	Brigadier	2 Continental	125	170	150	750	3500	2150	41′	27′ 5″	(*)
P. O. Box 1116											
Burbank, Calif.											
Beech Aircraft Corp.	Bonanza	Continental	185	184	172	750	2550	1558	32′ 10″	25′ 2″	$9445
Wichita, Kans.											
Bellanca Aircraft Corp.	Cruisair Sr.	Franklin	150	170	150	600	2150	1230	34′	21′ 3″	$6350
New Castle, Del.											
Call Aircraft Co.	Callair A-3	Continental	125	120	109	456	1550	975	35′ 9″	23′ 5″	$4525
Afton, Wyo.											
Cessna Aircraft Co.	120	Continental	85	120+	100+	450	1450	785	32′ 10″	21′ 6″	$2845
Wichita, Kans.	140	Continental	90	125+	105+	450	1450	860	32′ 10″	21′ 6″	$3345
	170	Continental	145		125		2200	1200	36′	24′ 11½″	(1)
	190	Continental	240	170+	160+	750	3350	2015	36′ 2″	27′ 2″	$12,750
	195	Jacobs	300	180+	165+	750	3350	2030	36′ 2″	27′ 4″	$13,750
Consolidated Vultee-Stinson Div.	Voyager	Franklin	165	NA	130	554	2400	1294[2]	34′	25′ 2″	$6249
Wayne, Mich.											
Engineering & Research Corp.	Ercoupe	Continental	85	120	110	350[3]	1400	815	30′	20′ 9″	$3590
P. O. Box 209											
Hyattsville, Md.											
Funk Aircraft Co.	Customaire	Continental	85	115	100+	350[4]	1350	890	35′	20′	$3495
R. F. D. No. 5											
Coffeyville, Kans.											
Goodyear Aircraft Corp.	GA-2	Franklin	145	125	110	300+	2200	1450	36′	26′	(*)
Akron, Ohio											
Luscombe Airplane Corp.	Silvaire 8A[5]	Continental	65	115	105	300+	1260	750	35′	20′	$2495
P. O. Box 2128	Silvaire 8E[6]	Continental	85	125	112	250+	1400	765	35′	20′	$2595
Dallas, Texas	Silvaire 8F[7]	Continental	90	128	115	475+	1400	850	35′	20′	$3095
	Silvaire Sedan	Continental	165	145	130	500+	2280	1280	38′	23′ 6″	$6995
Meyers Aircraft Co.	MAC 125-C	Continental	125	155	142	500	1725	1075	30′	21′ 4″	(*)
Tecumseh, Mich.											
Monocoupe Aircraft & Engine	Monocoupe	Lycoming	108	145	130	520	1610	1000	32′	22′ 11″	$3890
Corp.	Monocoach	2 Lycoming	160	180	155	750	3365	2100	36′	24′ 6″	(*)
Melbourne, Fla.											
Piper Aircraft Corp.	PA-11	Continental	65	100	87	300	1220	730	35′ 2½″	22′ 4″	$2495
Lock Haven, Pa.	PA-14	Lycoming	108	123	110	600	1850	1000	35′ 5½″	23′ 2½″	$3825
	PA-15	Lycoming	65	102	90	300	1100	620	29′ 3″	18′ 8″	$1990
Ryan Aeronautical Co.	Navion	Continental	185	157	150	500	2750	1680	33′ 4½″	27′ 3″	$8750
Lindbergh Field											
San Diego, Calif.											
Taylorcraft, Inc.	Model 47	Continental	65	105	95	380	1200	760	36′	22′	$2345
Alliance, Ohio											
Texas Engineering & Mfg. Co., Inc.	Temco Swift	Continental	125	150	140	512	1710	1150	29′ 4″	20′ 10″	$3495
P. O. Box 6191											
Dallas, Tex.											

* Not yet in production.
[1] Production scheduled for March, 1948; announced price $5475.
[2] Flying Station Wagon empty weight is 1320 lb.; price $6289.
[3] Plus 100 mi. reserve.
[4] Plus ½ hr. reserve.
[5] Data shown are for 8A Standard; 8A Special range is 600 + mi., empty weight 776 lb., price $2695.
[6] Data shown are for 8E Standard; 8E Special range is 500 + mi., empty weight 775 lb., price $2795; 8E Master range is 500+mi., empty weight 850 lb., price $2995; 8E De Luxe range is 650 mi., empty weight 860 lb., price $3495.
[7] Data shown are for 8F Master; 8F De Luxe range is 575 mi., empty weight 860 lb., price $3595.

Private Flying Feeds Air Power

While long-term prospects contain bright promise for personal aviation and its auxiliaries, present position has weak spots.

By ALEXANDER McSURELY

Realistic analysis of the long range potential of private flying in the U. S. indicates a strongly encouraging future for the hardy members of this segment of the aviation industry, potentially its largest, if they are able to struggle through the lean intervening years immediately ahead.

Coupled with the business outlook of private flying must be taken into account the increasing impact which it is having on the national consciousness, and which is acting like an ever stronger "jet assist" to U. S. air power.

Comparison statistics on the three primary indices of private flying, numbers of pilots, planes and airports, show that all three have made sizable increases in the past year.

- **Number of planes** did not increase in ratio with the other two, for two reasons. Many pre-war planes dropped out of the private flying picture in favor of new replacements, and number of new planes produced dropped to approximately one-half that turned out in the previous year.
- **Certificated pilots** numbered 455,000 according to CAA 1947 year-end statistics, compared to 400,061 at the end of 1946.
- **Registered civil aircraft** as of Nov. 1, 1947, latest available, totaled 92,644, of which 80,537 are single-engined. Comparative tally as of Jan. 1, 1947, shows 81,002 registered aircraft of which 75,637 were single engined.
- **Civil airports** climbed to 5,759 at the close of 1947 as compared to 4,490 at 1946's end.
- **Personal aircraft sales** showed a sharp drop for calendar 1947 over calendar 1946, from 33,254 to 15,515 commercial lightplane sales with an additional 508 nearly standard lightplanes sold to the Army Ground Forces which brought the grand total for 1947 to 16,023.

▶ **1947 Forecast**—Market analysts for 1948 have variously predicted total sales **of from 8,000 to 20,000 personal planes,** but most agree that total sales will be less than the 1947's 16,000, with an average figure around 12,000 planes.

Swing of the lightplane manufacturing industry to major sales emphasis on airplanes with more utility, is a factor affecting future sales which cannot be accurately forecast, until the 1948 competition between the four-place planes gets into full operation. However, even at this early time, it may be predicted that if 12,000 planes are sold in 1948, at least 8,000 of them will be four-placers, and that dollar volume of sales in 1948 will not lag far behind the $53,206,000 reported for 1947.

The dollar volume comparison between 1947 and 1946 sales is not as gloomy as a comparison of volume. The 1946 sales, in the biggest year the lightplane industry has seen, amounted to $92,524,000. The difference is partly **attributable to increased plane prices in** 1947, which undoubtedly had some effect in cutting volume of units sold, but a more significant factor was the buying trend toward airplanes which could carry more than two persons. There were 8,083 of the three and four-place planes sold in 1947 as against 7,940 two-placers, including the military.

Long-term prospects for growth of private flying beyond 1948 are clouded by many variables.

▶ **Wright Analysis**—Best documented long-range analysis is that of T. P. Wright, Administrator of Civil Aeronautics who six months ago renewed his 1945 prediction that personal plane production would climb to 150,000 a year by 1955, if personal planes with **sufficient utility are offered the public. He** predicted a plane price of around $4,900 would be possible for a 200 hp. four-placer with optional two-control, non-vicious spin, tricycle gear, castering wheels for crosswind landings, and other equipment not standard on most of to**day's planes. (By comparison, lowest** priced 1948 four-placer announced is **Aeronca's 145 hp. Sedan, prices at $4,795, and probably the nearest thing now** flying to the Administrator's proposed plane is the 185 hp. Ryan Navion quoted at $8,750.)

Wright pointed out that the 1946 personal aircraft sales were out of scale with the real average demand, because people had been prevented from buying planes during World War II. He forecasts that even with a drop of sales in 1947 and 1948, aircraft registrations would continue above the long range forecast line of growth, and predicted that production would follow along that line thereafter, to around the 150,000 mark by 1955.

Despite private flying's importance in developing national air consciousness, prospects for immediate future assistance from the Federal Government appear confined to the Federal Airport Program and to the Veterans' Administration funds available for flight courses under the GI Bill of Rights. One estimate is that 85 percent of the airport operators in the country would be unable to continue in business without the funds derived from their GI flight schools.

▶ **Training**—Controversy is now going on between ground-minded Washington officials of the Veterans' Administration, who are seeking to undercut the flight training along with other vocational training, **and Congressional representatives who insist that VA must** follow the Congressional mandate in the Bill of Rights and continue flight training.

President Truman's Air Policy Commission **recently took the view that GI flight training schools** provided a sufficient government cash contribution, along with the airport aid, and discouraged other contributions.

While paying tribute to the very material contribution of private flying to air power in World War II, the Finletter commission predicted that the reservoir of pilots built up by World War II pilot training would be sufficient for the next 15 years to instruct, and fly patrols and transports. In making the prediction, the Commission closed its eyes to the fact that few of these World War II pilots would be usable in an emergency if they did not have opportunity to continue their flying in a healthy private flying industry.

In event that the GI flight training is

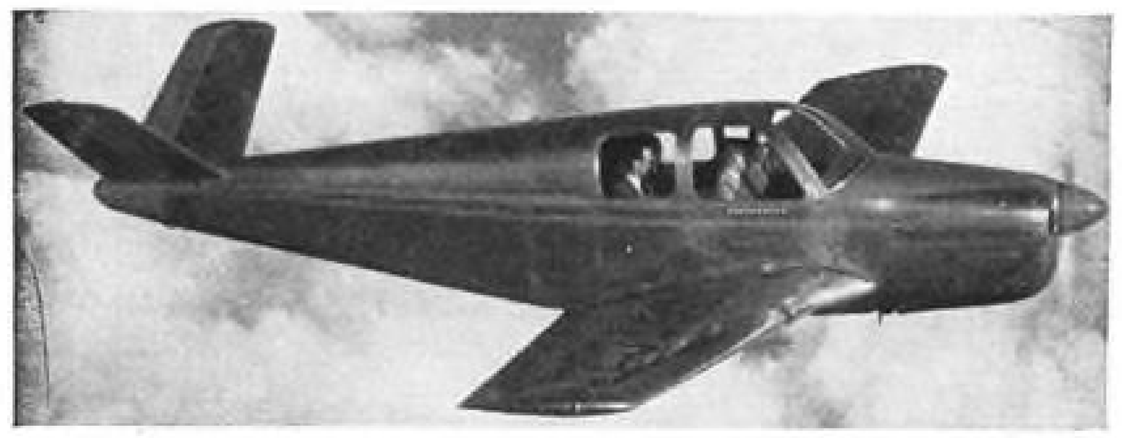
(Continued on page 62)

455,000 Pilots

There were 455,000 certificated civilian pilots in the U. S. as of Jan. 1, 1948, CAA estimates. These were classed as:

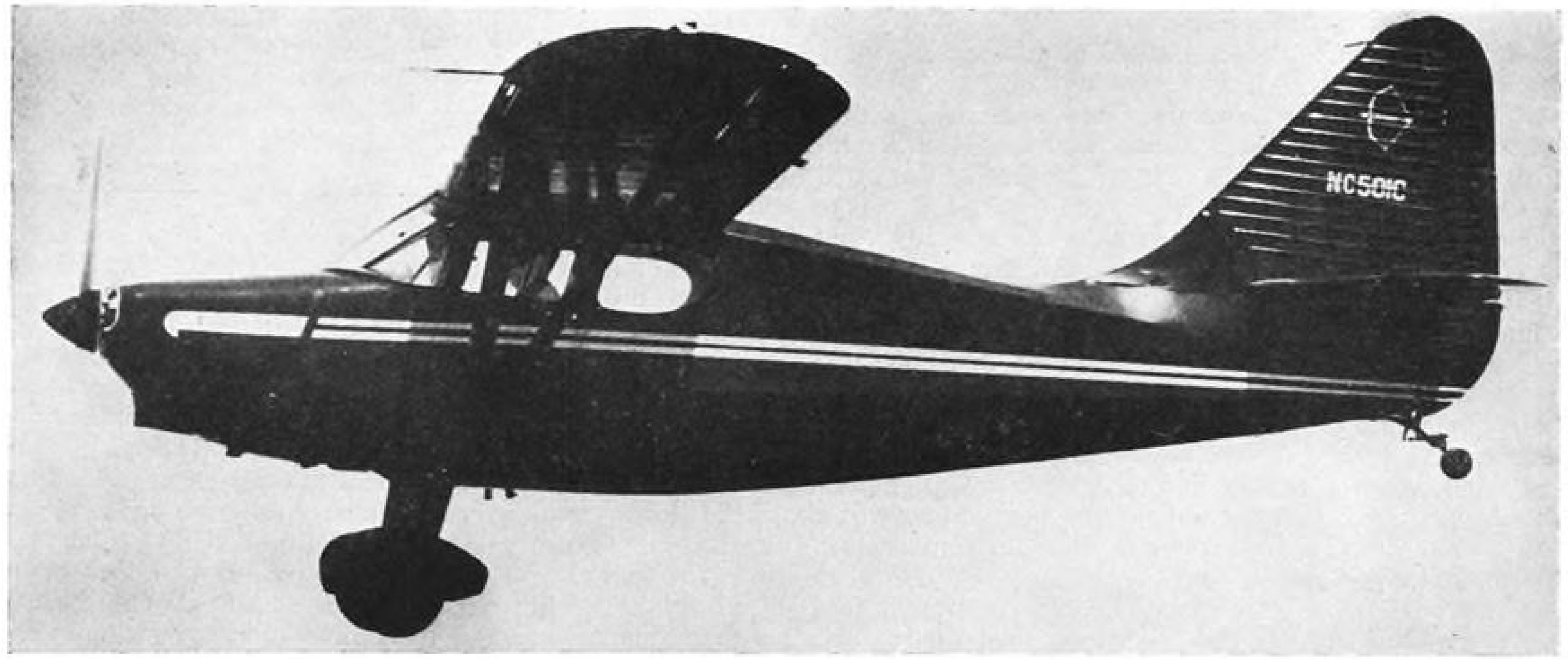
Airline Transport Pilots	7,750
Commercial Pilots	200,000
Private Pilots	247,250
Total Certificated Pilots	455,000

Number of student pilot certificates issued in 1947	200,000
Number of private pilot certificates issued in 1947	125,000



BEECHCRAFT BONANZA MODEL 35, four-place executive plane, climbs 950 fpm. Stalling speed is 55 mph., with flaps. Fuel capacity, 39 gal., Beech propeller.

RYAN NAVION has seating capacity of four and climbs 830 fpm. Stalling speed is 54 mph. and fuel capacity 39½ gal. Propeller is made by Hartzell.



STINSON VOYAGER AND FLYING STATION WAGON, four-placer, was most widely-sold personal plane in 1947, with sales totaling 2662, 45 percent of all personal planes delivered. Climbs 580 fpm., and has fuel capacity of 50. gal.

CESSNA MODEL 170 is four-place personal plane. Climbs 700 fpm. Stalling speed is 50 mph. Fuel capacity is 37.5 gal. Propeller is manufactured by Sensenich.

LUSCOMBE SILVAIRE SEDAN, the Dallas company's entry in the four-place field, climbs 900 fpm. Stalling speed is 58 mph., and fuel capacity is 42 gal.

AERONCA SEDAN has a fuel capacity of 38 gal., its power-off stalling speed is 35 mph. With full load (four passengers) its sea level rate of climb is 600 fpm.

GOODYEAR AMPHIBIAN MODEL GA-2, three-place, climbs 650 fpm. Stalling speed is 56 mph., and fuel capacity 30 gal. Koppers "Aeromatic" propeller is used.

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Because they are styled to the high-speed, streamlined efficiency of today's multi-motored air giants, Butler Built Refuelers are first on the field for the world's leading air lines and oil companies.

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CALLAIR MODEL A-3, two-place, climbs 1,000 fpm. Stalling speed 45 mph., fuel capacity 30 gal. Propeller by Sensenich. Production in 1947 totaled 14.

CESSNA MODEL 140, seats two. Climbs 690 fpm. Stalling speed is 41 mph. Fuel capacity is 25 gal. Sensenich propeller is used. (Ross-Pix)

AERONCA CHAMPION MODEL 7AC, two-place, climbs 500 fpm. Stalling speed is 40 mph., and fuel capacity 13 gal. Sensenich propellers are used.

ERCOUPE MODEL E and F, two-place, climbs 560 fpm. Fuel capacity is 23 gal. Equipped with McCauley 1-A-90 or Sensenich Model 74FKT-48 propeller.

BELLANCA CRUISAIR SENIOR, four-place, climbs 800 fpm. with Sensenich propeller, 1130 fpm. with Aeromatic. Stalling speed 45 mph., fuel capacity 30 gal.

AERO-FLIGHT STREAK 85, two-place, climbs 950 fpm. Stalling speed is 52 mph. Has fuel capacity of 20 gal. Uses Sensenich propeller.

FUNK CUSTOMAIRE MODEL B85C seats two. Rate of climb is 800 fpm. Stalling speed is 37 mph. Fuel capacity is 20 gal. Lewis propellers are used. Landing gear features hydraulic shock struts and tail wheel assembly. Brakes are also hydraulic (toe operated).

MONOCOUPE MODEL 90AF-115, two-place, climbs 1100 fpm. Stalling speed is 45 mph., and fuel capacity 28 gal. Equipped with Sensenich 2 position hydraulic propeller. The twin-engine Model H MONOCOACH has four-to-five seating capacity.

Private Flying

(*Continued from page 55*)

discontinued (and of course ultimately it will be, in any case, when the bulk of veterans who wish such training have received it), it is likely that some form of civilian pilot training program will be advocated with Federal contributions.

On the basis of the present state of health of the fixed base operators generally, some form of Federally-sponsored training program for flight schools should be considered seriously.

► **Prewar Training**—Prewar civilian pilot training programs, instituted in 1939, involved CAA contracts with universities and colleges for teaching of aviation ground courses and with commercial flight schools for flight courses. At its peak the program had trained approximately 100,000 private pilots. In 1942 the program had approximately 675 college training centers. Meanwhile approximately 68 of the largest civilian flight schools contracted with the Army Air Force to give primary training to Air Force cadets.

As the Finletter report says: "Personal aviation clearly proved its value to the military services in the last war. The fact that the nation was air-minded was a national asset. Without pilots and mechanics drawn from personal aviation and the use of civil airports and ground facilities, the Air Force and the Navy would have been retarded. The Civilian Pilot Training Program was especially successful. Light aircraft developed originally for private flyers were of value as artillery spotters, for personnel transports and other uses. Private pilots of the Civil Air Patrol made an admirable contribution. In any future conflict there is little doubt that an air-minded nation with hundreds of thousands of civilian pilots and mechanics and a network of airports and navigation aids is better prepared for an air war than a nation with undeveloped civil air facilities."

$6 an Hour for 200 Hours

Minimum economic use of a personal aircraft by a private owner under current conditions has been set by various analysts at **200 hr. a year. A CAA breakdown** of costs on a $2,000 airplane estimates that operating costs of $6 an hour can be maintained on that basis, whereas for 100 hr. a year, operating costs mount to $10.24 an hour. Fixed costs, including hangar rent, depreciation, hull insurance, liability-property damage insurance, remain constant, regardless of use, but if these can be apportioned over more hours of flight, along with the direct cost of fuel, oil and repairs, the reduction in hourly cost mounts rapidly with increased use.

Variety of Companies Reports Use of Planes

Increasing dependence on aircraft by industry adds national airmindedness.

From ice cream and soft drinks to lingerie, dental supplies, and lumber and building materials, there is a wide range of manufacturers using their own airplanes in their business, it is disclosed by a study of business plane users by the Personal Aircraft Council of the Aircraft Industries Association.

From 100 replies to the questionnaire circulated by the Council, the following results are reported:

- **Advantages of using a business plane:** 64 percent listed time saving; 30 percent listed convenience of being free from time-table restrictions and ability to reach off-route localities; 22 percent listed economy and comfort; 13 percent listed company prestige derived from operating its own plane.
- **Who flies in the planes?:** 73 percent said company executives from president down, for general transportation; 48 percent listed special purposes such as sales promotion, trouble shooting, customer flights to plants, inspection, supervising logging operations, etc.; 32 percent said planes were used by buyers and salesmen for wide area coverage; 11 percent said planes were used for delivery and customer service, often in emergencies. The Council points out that many of these uses overlap and that the same plane is frequently used for many or occasionally all of these uses.
- **What are disadvantages?:** 43 percent complained about airport facilities and service in general; 32 percent pointed to adverse weather as a limit to full plane utility; 27 percent reported maintenance and repair charges are too high; 24 percent criticised lack of ground transportation at many airports; 20 percent emphasized need for more airports; 15 percent asked for more hangars; 10 percent listed as a disadvantage the poor location of many existing airports.
- **Suggested improvements:** Improved ground transportation, good tiedown facilities, close in airparks and flight strips, good marking of office and parking areas, clean rest rooms, good food, flat rate repair service, increased night flying facilities, standardized field rules, improved fueling service, bigger and better wind direction indicators, more hangar space, better airport marking, and suggestions to "show a little interest in the guy who pays the bill."
- **Suggested improvements for planes:** Reduced noise level, increased passenger comfort, slower landing but faster cruising speed, economy of manufacture and

(Continued on page 66)

L-M *Announces*

a complete lighting package for Class I, II, and III airports

Ⓐ **L-M Elevated Runway Lights:** set at 200-foot intervals along runway, and, with green screens, across end, as range lights. Two-piece refractor produces 360-degree horizontal and 180-degree vertical light distribution; almost glare-free. Taps on control transformer provide three steps of brightness—remotely controlled. Easy to install, highly efficient.

Ⓑ **L-M Obstruction and Marker Lights:** Red lens. Furnished with or without transformer in base, as required. Many parts interchangeable with runway lights.

Ⓒ **L-M Rotating Beacon:** CAA-approved for class I and II and limited class III airports. Two standard 100-watt sealed beam units provide rotating beam from 110,000 to 400,000 cp.; life up to 4000 hours. Ceiling height indicator and locator beam set at 5 degrees from vertical. Spare lamps switch on automatically with telltale to control tower. Light weight, only 75 pounds; pole or roof-top mounting. Long life low speed motor. Entire unit requires only 325 watts. No exposed moving parts.

Ⓓ **Bartow type 36" Rotating Beacon:** CAA-approved for class III to VII airports. Large rotating glass sphere produces one vertical and four horizontal 6-degree beams. Two adjacent 24" bullseyes produce high candle power beams elevated 1.25° above horizontal. Two Fresnel lenses tilted 12° above horizontal produce secondary wobbling beams visible up to 24° above horizontal. Bullseye on top of beacon produces wobbling beam 7 to 12° from vertical. Beam angles adjustable. Clear primary beams; choice of clear, green, or red secondary beams. 1000-watt lamp; magnetic lamp-changer switches to spare lamp if primary lamp burns out, and energizes telltale to control tower. Silico-aluminum base; 1/6-hp. ac. motor drives beacon at 6 rpm. through safety clutch and worm. Heavy duty ball lower bearing; heavy duty tapered roller upper bearing; give 7 to 1 safety factor. For other details, features, write for Bulletin.

Ⓔ **L-M Power Unit and Control Panel:** all necessary equipment, switches, brightness controls, runway selector switches; main breaker, runway breaker, five accessory breakers for windsock, beacon, etc.; indicator lights; transformer; fuses.

Ⓕ **L-M Cable Splice Kit:** for 2, 3, or 4 cables; greatly simplifies connections in making installation. *Cable* for primary: 600-volt single conductor insulated cable in standard reels ready to cut to exact length on the job. Primary cable and bare neutral are laid together in ploughed trench, and connected with cable clamps provided on lights.

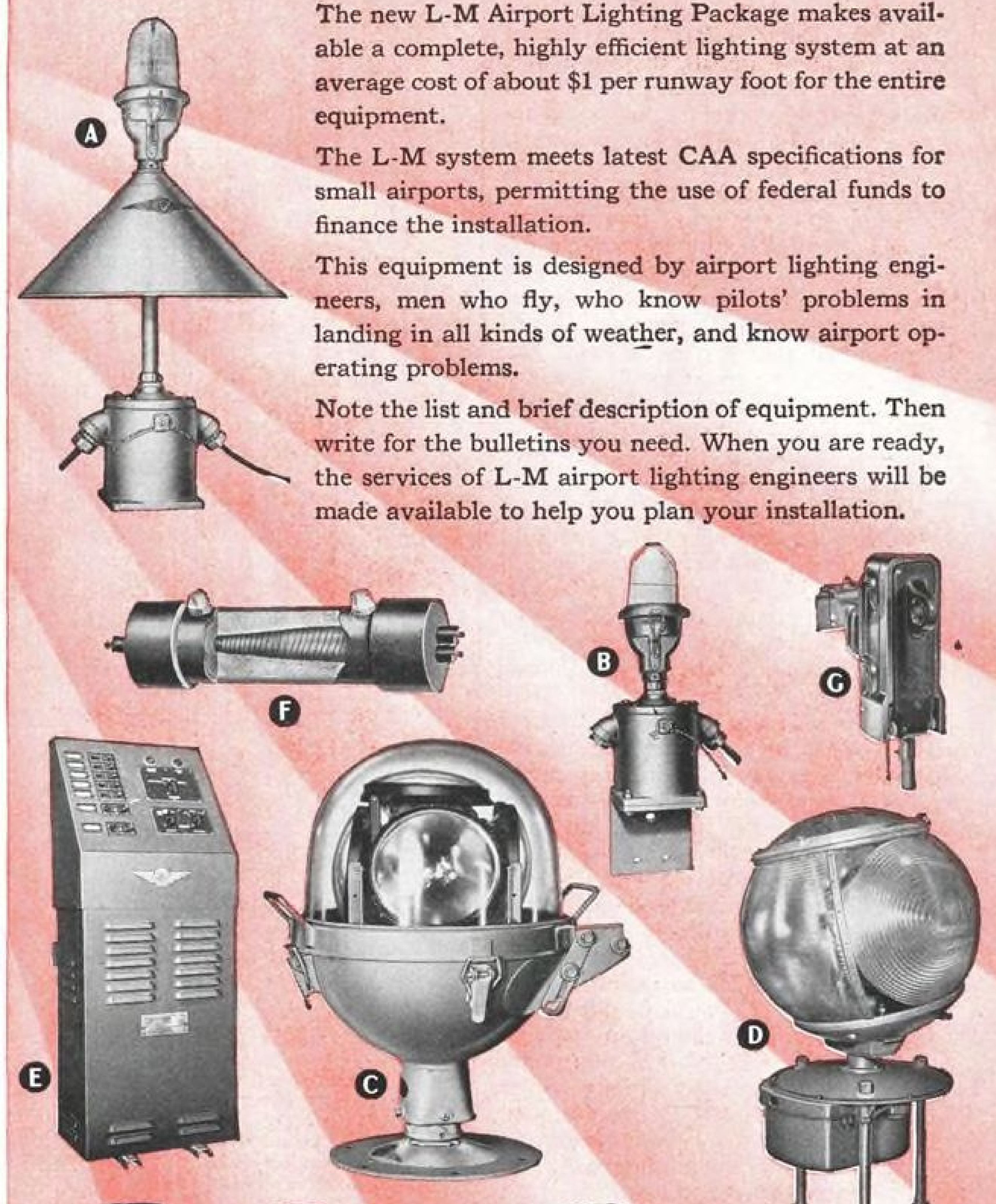
Ⓖ All other equipment required—transformers, fuse cutouts, potheads, connectors, etc. L-M Engineers will design your job, list the required equipment, supply layout and complete wiring diagram.

The new L-M Airport Lighting Package makes available a complete, highly efficient lighting system at an average cost of about $1 per runway foot for the entire equipment.

The L-M system meets latest CAA specifications for small airports, permitting the use of federal funds to finance the installation.

This equipment is designed by airport lighting engineers, men who fly, who know pilots' problems in landing in all kinds of weather, and know airport operating problems.

Note the list and brief description of equipment. Then write for the bulletins you need. When you are ready, the services of L-M airport lighting engineers will be made available to help you plan your installation.



"Open All Night" describes the new L-M package for class I, II, and III airports.

"L-M Rotating Beacon for Class I and II airports" describes in detail the construction, operation, and simple installation of this highly efficient, weatherproof beacon.

"Bartow Rotating Beacon" describes the big 36" beacon for class III and larger airports.

"The Lights that Bring Them In" is a brochure for large airports describing the principles of the famous Bartow High Intensity Approach and Runway Lighting System.

Also available are detailed diagrams and specification sheets and wiring diagrams for individual equipment and the entire systems. *Address Line Material Company, Airport Lighting Division, East Stroudsburg, Pennsylvania.*

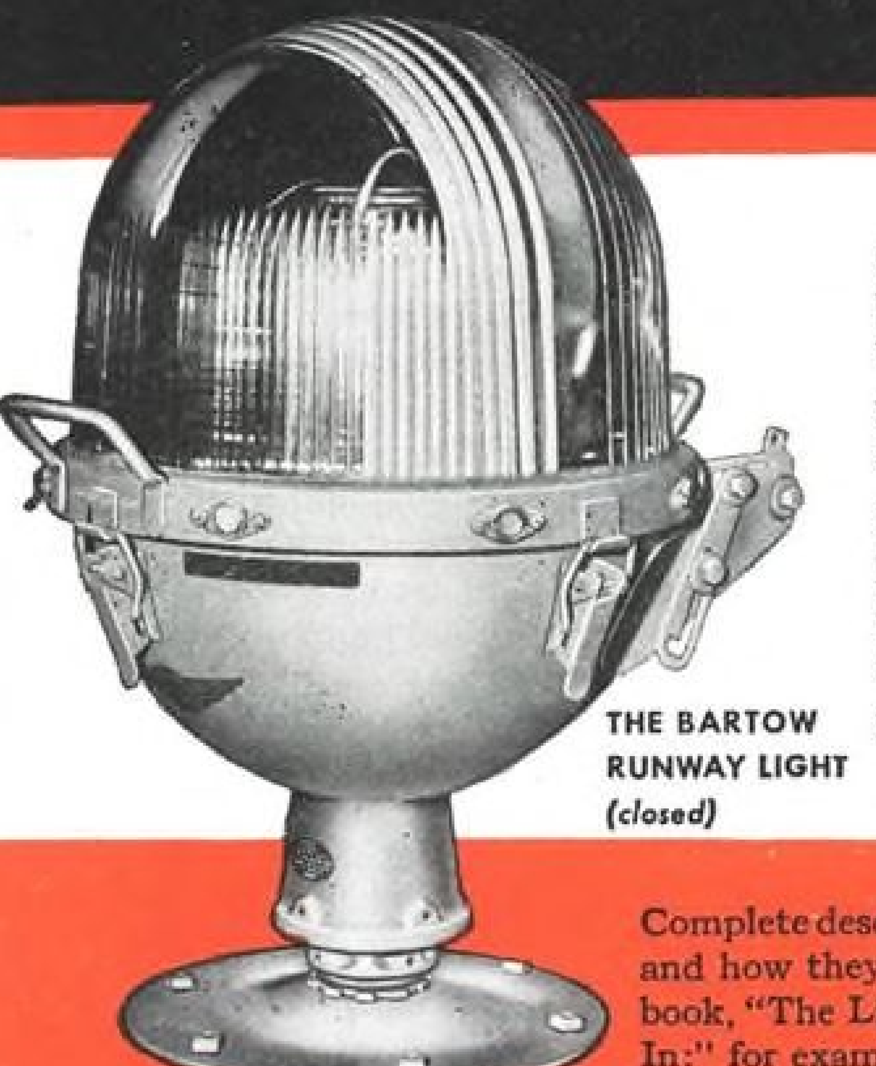
LINE MATERIAL
AIRPORT LIGHTING

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street and Airport Lighting Equipment • Wired Radio Control Equipment • Capacitors

Reduce Stacking and Overshooting...

Land Ships Faster, More Safely with BARTOW High Intensity Approach and Runway Lighting

Bartow high intensity approach and runway lighting, as seen by a pilot going onto visual contact.



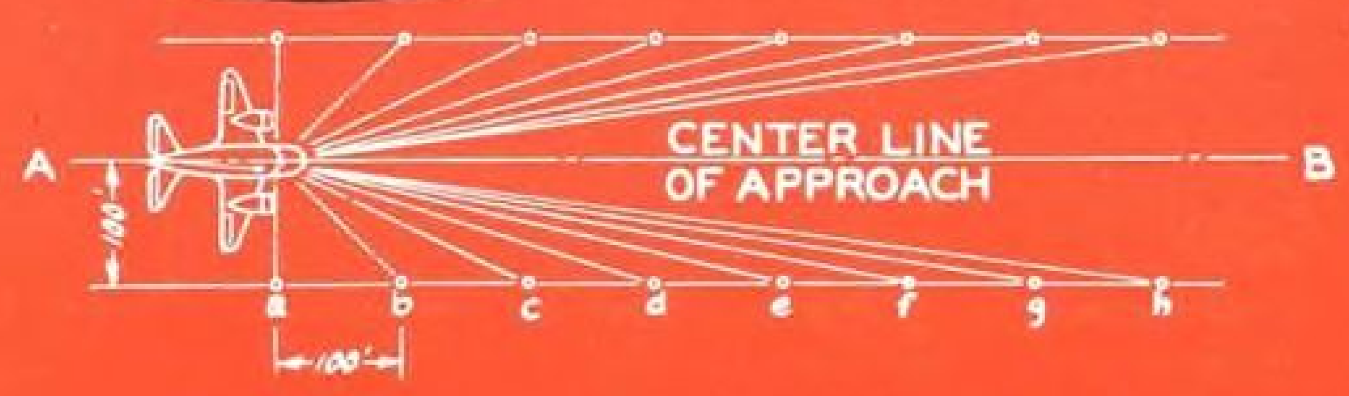
THE BARTOW RUNWAY LIGHT *(closed)*

On a Bartow-equipped runway, landings can be made safely and regularly under low visibility conditions, without reducing present proved safety standards. Therefore stacking and overshooting are greatly reduced.

Bartow high intensity approach and runway lights provide powerful, scientifically controlled beams that give maximum penetration of all atmospheric conditions to guide pilots to a safe landing. Properly controlled direction of light—free of glare—gives the pilot the visual perspective he must have after leaving instruments to make a safe landing under low-visibility conditions.

Bartow runway lights were used during the war by the armed forces in the Aleutians and other particularly bad weather spots. Now available for civilian use, they are being installed at, or ordered for, many airports in the United States and foreign countries.

Complete description of Bartow lights and how they work are given in the book, "The Lights That Bring Them In;" for example . . .



The diagram shows that the light from the Bartow unit reaches the pilot at converging angles. The lens system is so designed that at these angles the light from each unit will appear of equal value to the pilot. Glare is eliminated, and the pilot is given perspective to judge location, speed, altitude, attitude, and direction.

Ask us to send you a copy of this new booklet

Now available is a new booklet on low visibility landings discussing restricted visibility problems . . . perspective—its importance to elements of landing . . . also glare and light penetration.

If you are concerned with airport or airline operation, and are interested in approach and runway lighting, ask us to send you a copy of the booklet, "The Lights That Bring Them In." Write Line Material Company, Airport Lighting Division; East Stroudsburg, Pa.

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L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street and Airport Lighting Equipment • Wired Radio Control Equipment • Capacitors

Plane Use

(Continued from page 63)

servicing though simplification and standardization, wider landing gear tread, better ventilation, better heating, improved visibility, windshield de-icer and defogger, eliminate portable door step, plane-to-ground telephone, improve doors and windows, curtail vibration, improve ground handling, increase plane ceilings, increase fuel capacity. (It is noted that these requirements were based on the particular plane or planes owned by each company while many planes now available include some of these improvements suggested.)

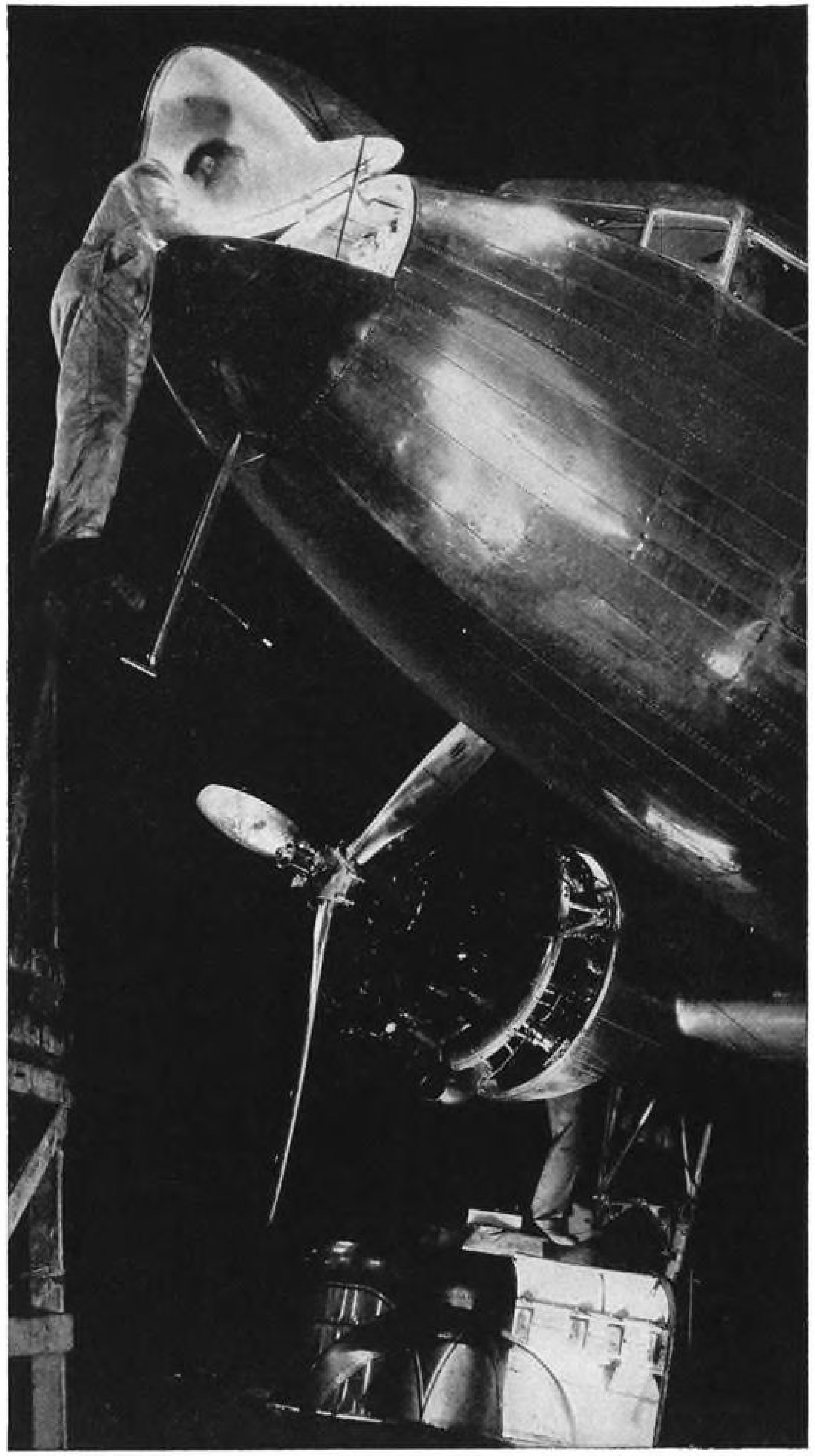
Other significant findings of the questionnaire:

- Reports from 20 percent of the companies indicated that the use of the planes in business had sold company personnel on buying their own planes.
- Company personnel, rather than professional pilots, are listed as flying the planes in 76 percent of the replies. (One company reported its field men were all pilots before coming to the company, and were selected for their flying ability and trained for the business. Other companies reported that their employes took pilot training to use the airplanes.)
- Emergency uses of the planes are reported by 47 percent of replies, including: rush delivery to prevent worker lay-off, carrying serum to train wreck victims, flying physician 600 miles in polio emergency, locating distressed motor boat party, providing transportation during rail strike, and in the investigation of thefts.

Companies reporting included manufacturers of tires, hardware, ice cream, ventilators, ball bearings, rubber products, heavy machinery, electrical equipment, radios, lingerie, soft drinks, food products, farm machinery, dental supplies, oil field supplies, refrigeration equipment and lumber and building materials. Other businesses included mining, insurance, real estate, motion picture theater chains, marine shipments, general construction, financing, livestock, bus operation, automobile sales, steel fabrication, newspaper publication and petroleum products.

First Simplified Control Dates to Wright Brothers

Recent personal plane design trends toward connecting rudder and aileron controls trace their origin back to the first Wright power plane. Orville and Wilbur Wright recognized a deficiency in their wing-warping means of control and mechanically connected the rudder of the plane with the lateral control, to give automatic compensation.



Airports As Base of Air Power

U. S. airport network is key to extent of commercial-military activity and training operations.

By STANLEY L. COLBERT

Airport Classes

Sub-1	up to 1800 ft.
Class 1	1800 to 2699 ft.
Class 2	2700 to 3699 ft.
Class 3	3700 to 4699 ft.
Class 4	4700 to 5699 ft.
Class 5	5700 to 6699 ft.
Class 6	6700 to 7699 ft.
Class 7	7700 to 8699 ft.
Class 8	8700 to 9699 ft.
Class 9	9700 ft. and up

In ten years and one air war, little has been done to remedy the country's dire shortage of airports—a basic facility of air power.

When the U. S. went to war, $3,238,526,640 had to be spent to increase the number of, and improve existing airports.

About 700 have now been released—many to be plowed up and reverted to farmland.

Others have gone to municipalities and states—too big, too far from population centers to be supported economically.

► Today . . .—Today, of the 5759 existing airports, 1818 are municipal, more than one third of the total. Commercial fields number 2849; 178 are CAA intermediate and 501 are military airfields. Private and miscellaneous government airports account for 413. Texas and California lead state development with 470 and 406 airports respectively.

Class I and Sub-I airports number 3575; Class II, 886; Class III, 529; Class IV, 446; Class V, 184; Class VI, 94; Class VII, 23; Class VIII, 9; Class IX, 9.

According to the National Airport Plan for 1948, work will be done on 4835 airports; 2745 will be new ones; 2090 others will be improved. Total estimated cost to the government: $469,700,000; to the sponsor: $578,800,000.

► Yesterday . . .—In May, 1918, the first air mail was carried from a race track in Long Island to a polo field in Washington, D. C. That year a survey revealed a total of about 60 airports in the U. S. With 5759 existing airports registered with the Civil Aeronautics Administration, the country is still far from an ultimate goal of one airport for every community—or 20,000 airports.

Ten years ago there were 2299 airports in the country, or roughly, half the number of airports today. Last year (1947) 1360 new air ports were recorded, or more than half the total number of airports ten years ago.

Such erratic development of the nation's air power backbone has given ground to off-balance statistics such as the following recorded during 1947:

125,000 private pilot certificates issued . . . 200,000 student pilot permits issued . . . 14,200,000 passengers riding the airways . . . 965 commercial aircraft using the airways . . . 95,000 registered civil aircraft ready for the airways. . . .

. . . All from 5759 airports.

► Tomorrow . . .—Along with the recommendations of the President's Air Policy Commission, the Federal Airport Act ranks with the most important medicine ever prescribed for an ailing aviation industry. Briefly:

1. It authorizes the expenditure by the Civil Aeronautics Administrator of a total $500,000,000 over a period of seven fiscal years, with provisions of restriction on administrative costs and appropriations for U. S. territories.

2. It gives a percentage proportion limiting the amount of appropriation for each state, totaling 75 percent of the entire funds available, with 25 percent remaining for the Administrator to apportion without regard to geographical location.

3. It requires, generally speaking, that all Federal grants be matched equally by any public agency, defined as "the United States Government or any agency thereof; a state, the Territory of Alaska . . . Hawaii, or Puerto Rico, or any agency of any of them; a municipality or other political subdivision; or a tax supported organization."

4. It makes project sponsors guarantee that the airport will be available for "public use on fair and reasonable terms and without unjust discrimination;" that its approaches will be clear and protected, and that among other things, space in airport buildings will be furnished rent-free to any civil agency of the Government.

Under terms of the Federal Airport Act, or Public Law 377 as passed by the 79th Congress, $77,500,000 was appropriated for airport construction, rehabilitation and repair, in line with the provisions of the act, during the fiscal years 1947-48. To date, administrators of the program have approved 133 projects for a total of $13,326,134.

Of the Federal Airport Program, CAA Administrator T. P. Wright said: *"The airport program has moved out of the slow stage and into the stage where fast, quantity production action is possible. From now on the program will move along at a speed normal for such Federal-local activities."*

But this may not be fast enough.

► Where to Start?—In order to provide the physical base and theoretical basis for air power, the expansion of the country's airport program must keep pace with such rapidly expanding factors as private pilots, air transportation and personal plane utilization. With the 1948 National Airport Plan showing 4835 airports as needing to be developed or further improved, the airport program must first attempt to catch up to the present proportionate increases in these factors—and then keep one step ahead.

A most important aspect of the Federal Airport Act, and possibly one which could set a trend for further government footholds in transportation is: the law is only the second time that the Federal government has embarked on a joint program with another level of government, entailing direct Federal expenditures, to aid the development of a medium of transportation. The only other example is the Federal-Aid Highway Act.

► What Could Be Done—Purely for comparison of figures, the total cost to date of all projects programmed or in a more advanced stage, under the Federal-Aid Highway Act is $1,596,722,566. This includes both state and Federal funds. In 1946 the automotive industry accounted for $3,215,898,000 worth of business; it speaks for approximately 7,000,000 jobs—about 12 percent of total employment in this country. What effect Government's aid in the aviation industry's "roads" will have, remains to be seen.

► What Has Been Done—Not uncommonly parallel with growth of the aircraft industry, airport development has been in spurts.

In 1920 there were 271 flying fields, 145 of which were municipal. By 1925 there were 310 municipal airports, 225 privately owned fields, and 60 intermediate fields.

Static progress in airport construction, accumulated through the years, was brought to an untimely stop by the depression. In 1930, $35,000,000 was spent on airport construction and improvement; in 1931, $20,000,000; in 1932, $5,000,000. In 1935 the airport construction balloon sputtered, then almost expired, with a sum total of $1,000,000 spent on airport construction and improvement.

Big relief budgets marked the year 1935, and airport construction, already proven as an easy way for the government to spend money, was earmarked for a large share. From 1933-38, the Federal government put up 76.7 percent of money spent on airports; and as private capital was slowly being withdrawn from airport construction, cities were taking over private fields in order to benefit from this Federal dowry.

▶ **What Will Be Done?**—The economic stability of the airport system is still in a fluctual stage. With such municipal organizations as the Port of New York Authority registering profit from fields under their jurisdiction, it is evident that airports can be profitable, enterprises. This may then, let the trend for either the Authority or Commission system to be further adopted by municipalities that heavy losses are being experienced from airport operations. Generally, it can be anticipated that proper planning and management will make airports pay their way.

Maximum and Minimum Standards For Runways Constructed With Federal Funds

Air Carrier Service	Runway Feet Length	Width	Taxiway Feet Width	Landing Strip Feet Width	Pavement Loading per Wheel in Lb. Single Wheel	Dual Wheel
Feeder	3500	100	40	300	15,000	20,000
Local	4200	150	50	400	30,000	40,000
Express	5000	150	60	500	45,000	60,000
DeLuxe	5900	150	75	500	60,000	80,000
International	7000	200	75	500	75,000	100,000
Intl. Express	8400	200	100	500	100,000	125,000

Definitions: Feeder—Airports to serve certificated feeder airlines.
Local—Airports to serve smaller cities on airline trunk routes.
Express—Airports at important cities or junction points on trunk routes.
Deluxe—Airports serving aircraft making long non-stop domestic flights.
International—Airports terminating long international flights.
International Express—Airports serving the highest type of transoceanic flights.

Airports by Class (As of January 1, 1948)

	Total	Size Classification: Sub I[1] & I	II	III	IV	V	VI	VII	VIII	IX
Alabama	98	54	14	14	13	1	1	0	1	0
Arizona	163	58	39	37	14	13	2	0	0	0
Arkansas	85	51	14	13	7	0	0	0	0	0
California	406	219	64	33	36	33	17	2	2	0
Colorado	99	54	28	8	1	3	5	0	0	0
Connecticut	32	23	1	3	4	1	0	0	0	0
Delaware	22	15	4	0	1	0	2	0	0	0
Florida	200	58	25	47	45	11	10	0	0	4
Georgia	133	62	15	27	22	4	2	1	0	0
Idaho	93	68	13	8	1	0	2	0	1	0
Illinois	181	127	39	5	6	4	0	0	0	0
Indiana	163	115	29	9	8	2	0	0	0	0
Iowa	163	132	22	1	7	0	1	0	0	0
Kansas	183	130	19	13	4	9	4	3	0	1
Kentucky	64	53	2	4	5	0	0	0	0	0
Louisiana	77	42	13	10	7	2	2	0	0	1
Maine	76	54	4	12	1	3	2	0	0	0
Maryland	53	26	14	3	8	0	1	0	0	1
Massachusetts	75	52	4	9	7	0	3	0	0	0
Michigan	224	163	36	10	12	2	1	0	0	0
Minnesota	126	93	23	4	4	1	1	0	0	0
Mississippi	103	60	15	16	10	0	2	0	0	0
Missouri	126	87	19	11	5	3	1	0	0	0
Montana	98	61	18	7	6	2	0	3	1	0
Nebraska	105	71	17	1	4	3	8	1	0	0
Nevada	54	20	8	7	10	8	1	0	0	0
New Hampshire	34	25	3	3	2	0	1	0	0	0
New Jersey	84	54	16	8	4	0	0	2	0	0
New Mexico	104	61	14	6	10	6	4	0	3	0
New York	241	183	27	12	14	4	1	0	0	0
North Carolina	151	104	15	14	12	3	3	0	0	0
North Dakota	68	51	9	2	6	0	0	0	0	0
Ohio	199	145	36	8	6	2	1	1	0	0
Oklahoma	163	107	20	13	14	6	1	2	0	0
Oregon	106	67	9	11	14	4	0	1	0	0
Pennsylvania	199	150	28	13	8	0	0	0	0	0
Rhode Island	11	7	0	2	0	2	0	0	0	0
South Carolina	70	35	10	6	10	6	2	0	0	1
South Dakota	62	46	5	3	4	2	1	1	0	0
Tennessee	71	44	13	7	6	1	0	0	0	0
Texas	470	237	100	55	43	26	6	2	1	0
Utah	46	18	6	13	4	4	1	0	0	0
Vermont	17	13	0	4	0	0	0	0	0	0
Virginia	113	76	12	11	10	2	2	0	0	0
Washington	136	78	19	9	18	5	3	3	0	1
West Virginia	48	34	8	2	3	1	0	0	0	0
Wisconsin	109	77	21	6	4	1	0	0	0	0
Wyoming	52	21	18	6	3	3	0	1	0	0
District of Columbia	3	0	0	0	1	1	1	0	0	0
Total	5,759	3,581	888	526	444	184	95	23	9	9

State-by-State Record of Airports on January 1, 1948

(Data covers existing airports recorded with CAA)

State	Total	Type of Operation				
		Commercial	Municipal	CAA Inter-mediate	Military[1]	All other[2]
Total	**5,759**	**2,849**	**1,818**	**178**	**501**	**413**
Ala.	98	44	31	2	17	4
Ariz.	163	41	37	7	51	27
Ark.	85	49	21	1	0	14
Calif.	406	188	111	10	61	36
Colo.	99	32	43	2	8	14
Conn.	32	21	10	1	0	0
Del.	22	16	2	0	1	3
D. C.	3	0	0	0	2	1
Fla.	200	49	82	3	60	6
Ga.	133	47	51	4	12	19
Idaho	93	14	52	4	2	21
Ill.	181	125	27	5	16	8
Ind.	163	121	28	2	7	5
Iowa	163	106	45	4	1	7
Kans.	183	76	69	3	25	10
Ky.	64	48	9	2	3	2
La.	77	25	23	4	8	17
Maine	76	44	23	0	3	6
Md.	53	32	5	0	7	9
Mass.	75	48	21	0	4	2
Mich.	224	107	106	0	5	6
Minn.	126	63	62	0	0	1
Miss.	103	48	34	4	11	6
Mo.	126	79	33	5	7	2
Mont.	98	15	56	11	1	15
Nebr.	105	40	42	5	10	8
Nev.	54	19	15	9	8	3
N. H.	34	19	12	0	1	2
N. J.	84	61	12	0	5	6
N. Mex.	104	35	31	10	10	18
N. Y.	241	174	42	3	11	11
N. C.	151	107	28	1	15	0
N. Dak.	68	27	34	6	0	1
Ohio	199	152	34	6	4	3
Okla.	163	73	75	2	5	8
Oreg.	106	37	46	5	1	17
Pa.	199	148	40	3	5	3
R. I.	11	6	1	0	3	1
S. C.	70	23	34	2	6	5
S. Dak.	62	24	34	1	1	2
Tenn.	71	36	21	6	4	4
Texas	470	184	141	21	64	60
Utah	46	7	26	9	3	1
Vt.	17	8	9	0	0	0
Va.	113	70	19	3	17	4
Wash.	136	58	52	3	14	9
W. Va.	48	29	14	2	0	3
Wis.	109	61	45	2	1	0
Wyo.	52	13	30	5	1	3

[1]*Indicates Army, Navy, Army-operated and Navy-operated (latter two are municipal or commercial airports taken over by Army or Navy)*.
[2]*Includes private and miscellaneous government airports.*

Air Safety Need Shown in Analysis

Need for improved safety in non-air carrier flying is indicated forcibly in the recently published CAB analyses of accidents in the 9,425,000 hours flown in non-carrier aircraft, during 1946 (last year for which complete figures are available).

In the biggest year which private flying has yet known there were 7,618 accidents in which persons were injured or killed. That reckless flying in disregard of safety regulations was responsible for a large percentage of the accidents was indicated by a breakdown of the hours flown into three types of flying.

Instructional flying with 5,749,000 hr. resulted in 172 fatal accidents and 2755 injury accidents; non-commercial flying had the biggest number of fatal accidents, 336, and non-fatal accidents, 2869, although only 2,639,000 hr. were flown; while commercial and miscellaneous flying, totaling 1,036,750 hr., resulted in 173 fatal accidents and 1260 non-fatal accidents. Not included in these totals are 53 propeller accidents of which nine were fatal.

Accident analyses have invariably indicated that there is a higher danger to pilots when they are out without instructor supervision than when they are supervised. These figures provide further proof of this fact.

▶ **CAR Violations**—Civil Air Regulation violations were prominent in fatal accidents in the non-commercial flying division including: reckless flying, low acrobatics, attempted visual flight during instrument conditions, and unauthorized night flight with passengers. Private pilots had 122 fatal accidents in which one or more violations were reported.

Accident conditions are classified as follows: landing accidents, 2592; forced landings, 1372; collision with objects other than aircraft, 1261; taxiing accidents, 790; stall-spin accidents, 760; takeoff accidents, 567; structural failure in flight, 49; collision between aircraft, 45; propeller accidents, 53; fire accidents, 24; miscellaneous, 64 and undetermined, 43.

Stall-spin accidents accounted for 300 fatal accidents (43.5 percent) of the total fatalities, and 127 (26.6 percent) serious injury accidents. The significance of this single classification in the overall serious accident total points again to the need for technical steps to eliminate spin-stall hazards in private flying.

Increasing trend toward designing spinproof or spin-resistant personal and executive type planes noted in postwar planes and the marketing of stall-warning indicators may be expected to result in a noticeable decrease in stall-spin accidents in the near future.

Training Is Mainstay Of Fixed Operators

Aviation training, long financial mainstay of non-airline civil aviation, is more than ever in that position at the beginning of 1948 with approximately 3,500 flight schools participating in GI flight training programs, under Veterans' Administration financing.

Of flight schools in operation in the country 3,115 are now CAA-approved. These are divided into 885 flight and ground schools, 2,048 flight schools and 182-ground schools. Divided by another classification, the CAA-approved total includes 2,886 schools approved for private pilot courses, 1,824 approved for commercial pilot courses, 618 approved for instrument rating courses, 1,790 approved for instructor rating courses, 1,001 approved for basic ground school, and 660 approved for advanced ground school. (All CAA figures as of Jan. 15, 1948.)

Observers estimate that approximately 85 percent of existing private flying revenue is derived from flight training and associated business.

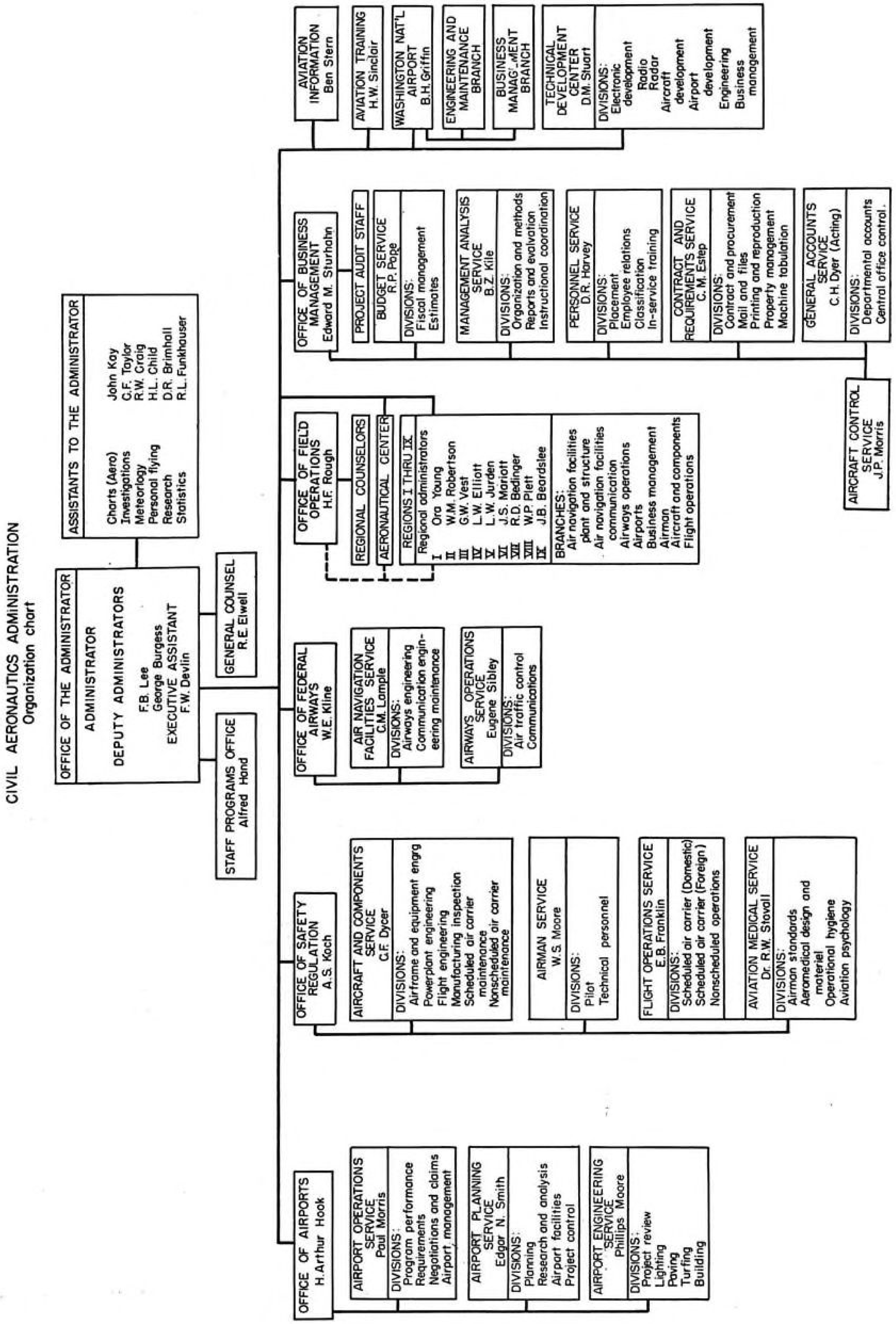
▶ **Training Vital**—In light of these facts, impact upon U. S. civil aviation of any radical change in the flight training overall situation threatens diaster and invites serious study and industry-wide cooperation in developing a constructive alternative.

Terms of the GI Bill of Rights provide for completion of the program within nine years after July 25, 1947, but veterans must enroll within five years of that date. GI flight training may be expected to begin tapering off within two years, even if there is no change made in the regulations before that time.

Number of GI flight schools has nearly doubled since the beginning of 1947, when there were 2,000 schools approved for such courses. Veterans' Administration estimated that $125,-000,000 was expended for GI flight courses in 1946. No more recent estimates have been made. A sampling survey made in GI schools in April, 1947, indicated a total of 80,000 students enrolled for flight courses at that time.

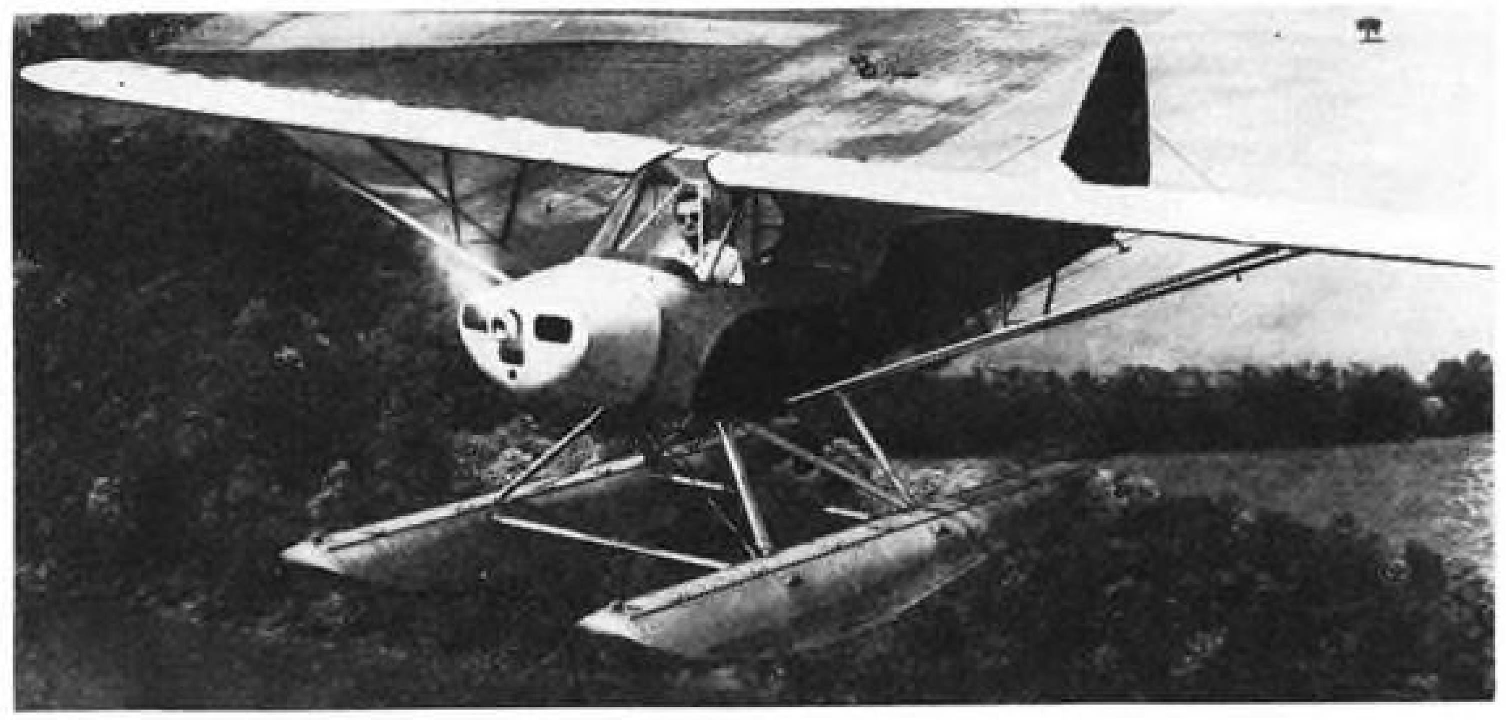
▶ **Training Widespread**—Comparison of the total number of GI schools with the total number of airports (5,759 according to CAA year end estimate) indicates that more than half of the airports have such schools. Approximately half of the personal airplanes produced in 1947 were of types used primarily for flight training.

Spokesmen for the National Associa-



tion of State Aviation Officials told the Congressional Air Policy Board that the present Public Law 346 does not provide the best machinery for administering veterans flight training. They asked that special legislation be provided for flight training, similar to that in Public Law 377 which provides for on-farm institutional training. NASAO contends that administrative decisions made since the original act was passed have made it virtually "impossible for operators to develop specific flight training for veterans and develop independent civil aviation training programs."

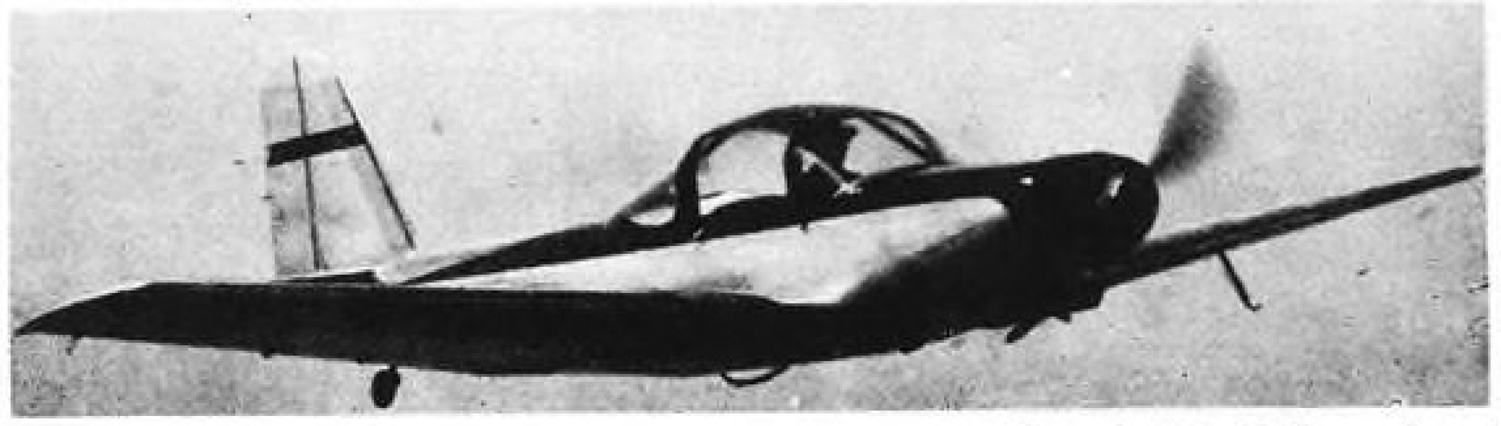
Necessity of developing some other type of flight training program, which can take the place of the GI training as that drops off, may lead to a demand for a revival of a federal-sponsored Civil Pilot Training Program through colleges and universities.



PIPER CUB SPECIAL MODEL PA-11 is two-placer. Rate of climb is 514 fpm. Has fuel capacity of 17 gal.

TAYLORCRAFT MODEL 47, two-place, climbs 550 fpm. Stalling speed is 38 mph., fuel capacity 18 gal. Propeller manufactured by Lewis.

TEMCO SWIFT, two-place, climbs 1000 fpm. Stalling speed is 48 mph., and fuel capacity 27½ gal. Aeromatic or Sensenich propeller used.



MEYERS 125, two-place, climbs 750 fpm. Stalling speed is 45 mph. Has fuel capacity of 32 gal. Fahlin propeller is used.

CAA Study Shows Private Plane Use

What are private airplanes used for, who uses them, and how much are they used?

These questions, important to any evaluation of the present status of private flying, its past growth, and its future prospects, are best answered in a recently published statistical CAA study on the use of aircraft in 1946, biggest year yet in the history of private planes.

The study shows the importance of flight training in the total aviation picture, with the disclosure that 61 percent of all flying done by private and non-scheduled planes was done as instruction, while personal and business flying together accounted for only 28 percent. Remainder of the flying was divided between charter flying and other revenue producing flights.

Total of 9,800,000 hr. was flown by private and nonscheduled aircraft, more than five times the 1,934,000 revenue hr. flown by all the domestic scheduled airlines in the same year.

▶ **Trainer Use**—High use factor of the training planes (261 hr. per plane in 1946) contrasts with much lower use factors for other types of flying, 62 hr. for personal flying, 68 for business flying, 87 for charter flights, 73 for other revenue flying, and 32 hr. per plane in 1946 for unclassified flights. High utilization of trainer planes brought the hourly average for all the other planes up to 183 hr. per plane in 1946.

Analysis of planes used in different types of flight showed that 51 percent were used for personal flying, 29 percent for business, 43 percent for instruction, 10 percent for charter, 13 percent for other revenue and 6 percent for other flying. (Percentages total more than 100 percent because many planes were used for several different purposes.)

▶ **Business Use Grows**—Interpreting the 1946 report in the light of 1947 and 1948 conditions leads to the conclusion that a growth of business flying in these years will undoubtedly show up in later analyses although flight instruction will continue to dominate the total flying through 1947, and probably through 1948, unless the GI flight training program is curtailed or discontinued.

Breakdown of 1947 production figures indicates that less than half of the planes produced were the two-placers commonly used for training purposes, while the others were larger types more generally used for business and pleasure flying and flying for revenue. This may be attributed to two factors:

• **The 1946 production** was concentrated in the two-place planes, to a point where the demand was more than satisfied, and 1947 strongly felt the effects of this market glut.

• **More manufacturers** began to produce planes above the minimum airport trainer type, and sought a 1947 market outside of the flight schools and airport operators who were the main market in 1946.

Early signs reported by some manufacturers of a firmer basis for the two-place market might mean a further growth in training if it is more than merely an indication that flight school operators are getting their trainer fleets in readiness for their best season of operation.

Probability is that the business plane use will continue to increase in 1948 in proportion to other types of plane use, but whether the total 1948 volume of business planes sales will increase beyond 1947 is doubtful.

Plane Concentration

More than half of all the civil airplanes in the U. S. are concentrated in 10 states (CAA report as of Nov. 1, 1947), with 10 percent of the planes in one state, California. The ten states have a total of 48,972 planes, as against a national total of 92,644 planes registered. Leading states in order are: California, 9,997 and Texas, 8,341.

United Kingdom:

Civil Air Power:

For 2423 civil aircraft registrations in the United Kingdom, there are 5847 commercial pilots.
Its three scheduled airlines, British Overseas Airways Corp.; British South American Airways, and British European Airways, flew respective passenger miles of 302,319,606; 40,626,870 and 106,914,763 in 1947. They carried freight respectively totaling 4,343,360 lb., 3,230,000 lb. and 5,700,200 lb. in the same year. Together, they account for 183 of the total aircraft for the United Kingdom.
There are 72 non-scheduled air operators, utilizing a total of 463 aircraft.

No. of aircraft produced (excluding military types for domestic use but including military types exported): 1947—751

Export:	1947	1946	Value 1947	Value 1946
Complete aircraft exported	1758	1408	£13,774,570	£6,426,592
Aircraft engines exported	1611	870	£ 4,016,441	£1,876,067

The Production:

Fifteen major aircraft companies—eight operating a single factory; seven operating two factories, have in production 48 types of aircraft and 19 additional types in development. Twelve smaller companies have four types in production and 14 under development.

Nine engine builders, each with one major factory, have in production 32 types of engines (21 piston-engine, 4 turbo-prop and 7 turbo-jet) and an additional 15 types of engines under development.

The Expenditures:

	1947-8	1946-7
Gross Total Expenditure	**£32,599,500**	**£31,400,000**
Recovered from aircraft purchases or leases by three corporations	£ 7,300,000	£ 8,750,000
Recovered from other Government participation	£ 80,000	£ 100,000
Recovered from rents, license fees, etc.	£ 730,000	£ 350,000
Net Total Expenditure	**£24,489,000**	**£22,200,000**

British Air Power Stands at Low Ebb

Lack of manpower and resources, plus gamble on at least half decade of peace, force emphasis to long-term research.

BY FREDERICK R. BREWSTER

LONDON—America cannot count on any effective help from Great Britain in the way of combat air power for at least the next five years.

About all that the British could contribute immediately would be a considerable fleet of transport aircraft, and combat planes of 1945 performance.

The huge aircraft-building machine mobilized in the United Kingdom during the recent war is now—by comparison—only idling along.

These statements summarize the sorry state of Britain's air power as of now.

The British recognize the risk they are taking with this situation—they even admit it, though not too publicly.

They are frankly gambling on at least five years of peace, within which time they hope to be able to rebuild their present weak air power. They haven't either the manpower or the resources, now, to do it any sooner.

▶ **Long-Range Development**—The long-range nature of their development projects would be a leading clue to this decision of the British, if it had not been made quite clear publicly by the Minister of Defense and Sir Henry Tizard, chairman of the Defense Research Policy Committee.

In general, the British are putting their limited resources into further research, into projects that won't come to fruit for 7 to 10 years. This applies particularly to military aircraft and engines —the plans for civil aircraft development are being laid out to allow for a little earlier blossoming. Defense research has first call on available materials and men, the Cabinet has decided, and nothing must be allowed to interfere with it.

▶ **"Attacker" Laid Aside**—This explains why the British aren't ordering, in quantity, any of the new postwar jet-engined types that have yet flown. For one example, the Vickers-Armstrongs Nene-powered "Attacker," which could far outstrip anything the RAF or the Navy now have in their fleet, has been laid aside.

This explains also why the British haven't rushed into the air with as many different new jet-powered types as have the Americans. They could, quite easily, build a competitor to the XB-47. But the British prefer to test out their many new engines in existing airframes like the Lancaster, rather than build a special airframe for the purpose. They definitely have no intention of putting any plane into the air for which they do not clearly see a future operational use. Feeling here is that the U. S. is going ahead with airframe development far more rapidly than U. S. engine technology warrants.

Consequences of losing this gamble might be disastrous for the British—certainly so in the event of a war in the next few years, but equally so if they have miscalculated anywhere in the long chain of assumptions on which their scheme of development work depends. Each link in this chain is vital to the succeeding ones; if one of the links fails or is delayed, the whole chaih is imperiled.

▶ **Low On Fighters**—Right now, and for succeeding years until the procurement policy just cited be changed, both the RAF and Naval Aviation (new term for the Fleet Air Arm) are starved for the calibre of planes needed to fight an air war today. The RAF could muster only a few squadrons of jet-powered Meteors and Vampires. The Royal Navy's carriers are stocked with Fireflies and Sea-fires, whose speed and range are well below those of the latest American planes joining our fleet.

Both services have stripped themselves of the American types which the British reluctantly brought themselves to accept and use toward the end of the war. The policy is "Buy British"—but the British-built replacements haven't kept up with the parade of progress in faster, farther-ranging performance.

Right now, neither of the two services could do much good if they did have better planes. Their strength has fallen so low and their discharge rate is so high, in order to free the maximum manpower for Britain's domestic economy, that a state of well-nigh complete disorganization exists. Technical skills are needed to keep today's air fleets flying—and Britain's air services are suffering the effects of a very rapid turnover among, as well as a great deficiency of, skilled craftsmen. This lack and its concomitant: inadequate maintenance of planes, are what keep the British services from doing very much flying. Not a desire to save gasoline.

▶ **Government Spending Less**—Government expenditures for aircraft this current year are down to less than half those of a year ago, when many war-time contracts still carried over. In the fiscal year 1946-47, expenditures for military aircraft engines and spares totaled £140,000,000 ($560,000,000) (not broken down between the two services). For the fiscal year ending March 31, 1948, the RAF will spend £42,750,000 and the Navy approximately £17,000,000, a total of roughly £60,000,000. Civil aircraft ordered for government account, including three semi-public airline corporations, totaled £10,000,000 this year, against £15,000,000 the year before.

Splitting this smaller melon (£70 million compared to £156 million) meant lean pickings for Britain's 15 major aircraft builders and practically no pickings at all for the 12 smaller firms. Signs point to an even smaller melon next year. Naturally, those firms whose planes were suitable turned to the export market for their jam, if not actually for their bread-and-butter. Shipments abroad in 1947 rose to an all-time high for peaceful years—£24,800,000 or five times the figure for 1938.

▶ **Found Rough Going**—Nonetheless, at least two firms found the going too rough. Cunliffe-Owen, whose neat little Concordia feeder transport deserved a better fate, has tossed in the sponge, and the factory was auctioned off early in February and will be dismantled. And Miles (the "new-plane-every-week" firm) found out at last that it would have paid them better to concentrate on production instead of design—when creditors forced the company into receivership late in the fall of 1947.

Nazi Labs Spur Russian Research; Soviet Speeds Up Production

U. S. Air Force officials are deeply concerned by big gains in aviation development in USSR; American transports sought here.

By ROBERT H. WOOD

Russia's aeronautical research program is at least five years ahead of schedule, thanks to captured Nazi wind tunnels, German scientists, and laboratories operating day and night.

High U. S. Air Force officers are deeply concerned by unofficial reports of speeds attained by some of these new fighters, and there is some opinion in Washington military air circles that Russia may have broken the supersonic barrier as long ago as six months. Russia's 100 jet aircraft which it put into the air on Russian Aviation Day last August represented several new types.

While most of the new combat planes shown last August appeared to be hand-made prototypes, there is no doubt in Washington that the Russian aircraft industry is already well along in a change-over to the latest models.

In 1946 Russian industry had a production capacity of 40,000 planes a year. Air Secretary Symington gives cognizance to a "report" that Russia now is producing at the rate of 75,000 to 100,000 planes a year.

The latest official statement, given by USAF Chief of Staff Spaatz to the President's Air Policy Commission, set Russia's first line air combat force at 14,000. An official report issued last June 30 by the United Nations said Russia had "10,000 to 16,000" combat aircraft.

Russia's emphasis on air transportation is giving U. S. military authorities as much worry as the combat design and production program, and is primarly responsible for the recent moves in this country to expand our own military air transport facilities.

All Russian "civil" airline growth is planned first to meet military emergency needs. Commercial air transport, as we know it, simply does not exist in Russia. All aircraft used on these vast government-operated services are ready for war on short notice.

Russia's current production of a 70-passenger transport version of our Boeing Superfortress, which it calls the Tupolev 70, has been given wide publicity recently. It is not generally known, however, that Russian authorities have discussed with certain U. S. aircraft industry officials recently the possibility of buying small numbers of the latest type American commercial transport planes.

"While the talks have mentioned purchasing the manufacturing rights, as well as actual planes, we have no illusions about getting any further revenue once the Russians learn how to build our newest airliners," one industry executive says. "We know they seek only a few samples of each plane to train their factory forces. Then before long we'll see a rash of Russian copies."

Air Force officials already have conceded that the Russians tried to order B-29 type tires, wheels and brake assemblies. These orders were rejected.

The Russians have also discussed contracting with U. S. companies for overhauling Russian transport engines here. Some of this work has been done on the West Coast.

Washington is also showing interest in some efforts which have been made in this country by the Czech air lines to shop for U. S. transports. It is pointed out that the Czechs are probably the only country which is operating a "commercial" airline into Russia proper. It seems likely that the Czechs may be the intermediaries for purchase of equipment needed by Russia if the Soviets' own efforts fail here.

Civil air transport expansion plans are indicated by a cable to Aviation Week from the Moscow correspondent of McGraw-Hill World News. It discloses that in 1948 and 1949 the Soviet contemplates a 12-fold expansion in passenger traffic, and a 5-fold increase in air freight, over prewar figures. Based on previous statistics, this would mean a gain from about 40,000 tons in 1939 to 500,000 tons.

The cable also forecasts that regularly operated Russian airways will be increased to 180,000 miles by the end of 1949. Last August they totaled 93,000 miles.

Air Transport magazine estimates that 307,000 passengers were carried on Russian airlines in 1946, with 700,000 estimated for 1947. Washington defense officials emphasize that Russia's peacetime passenger traffic may not approach corresponding U. S. figures for many years to come.

French Air Power Weak and Outmoded

Although manufacturing industry on decline, national airline's prospects good.

BY MICHAEL J. MARSH

PARIS—French military air power is weak and out of date already, and prospects are it will become even more so for at least the next two or three years. In the civilian field, there is wide interest in flying, an impressive number of airports (mostly small), but pitifully few planes. Only in the transport field can the French hold up their heads—in Air France they have a live organization constantly improving the number and quality of its planes and the volume of its business. The aircraft building industry is still on the decline from its war peak and is increasingly becoming a political football.

▶ **3500 Planes**—The French air force today has about 3500 planes of all sorts, including 72 different types. Its first-line force (number unknown) consists wholly of American and British craft from the last war—P-47s, P-51s, B-29s, Halifaxes, etc. The French find it extremely difficult to get replacement parts for these, and many of them are already past the age of their service life.

It should be recalled in this regard that France is at present fighting a war in Indo-China, in which air power has played some part. In the first nine months of 1947, the air force there flew 8000 military sorties (22,530 hours), and the transport craft flew about 16,000 hours.

The Air Minister admits the country will not begin to have a jet force until 1950 or 1951. Until then the present planes must largely suffice, though some new ones may be bought in the U. S. or Britain.

▶ **Aircraft Output Down**—Aircraft output fell from 1959 in 1946 to 1445 in 1947. The government plans in 1948 to concentrate output, apart from military craft, on half a dozen types of civilian planes and engines, produced in large enough quantities by both nationalized and private factories to make them profitable. Employment, which reached 120,000 after the Liberation, and is now 72,000, will level off at about 60,000; and it is expected output this year will fall to 800.

In other words, the period of experimentation with scores of civilian prototypes and "reconversion" products is about over for a while. This also is true of the period of Communist control when output was pushed regardless of quality.

DEPENDABLE ELECTRICAL POWER — *for the world's largest bomber*

Backbone of the B-36 electrical system is Westinghouse

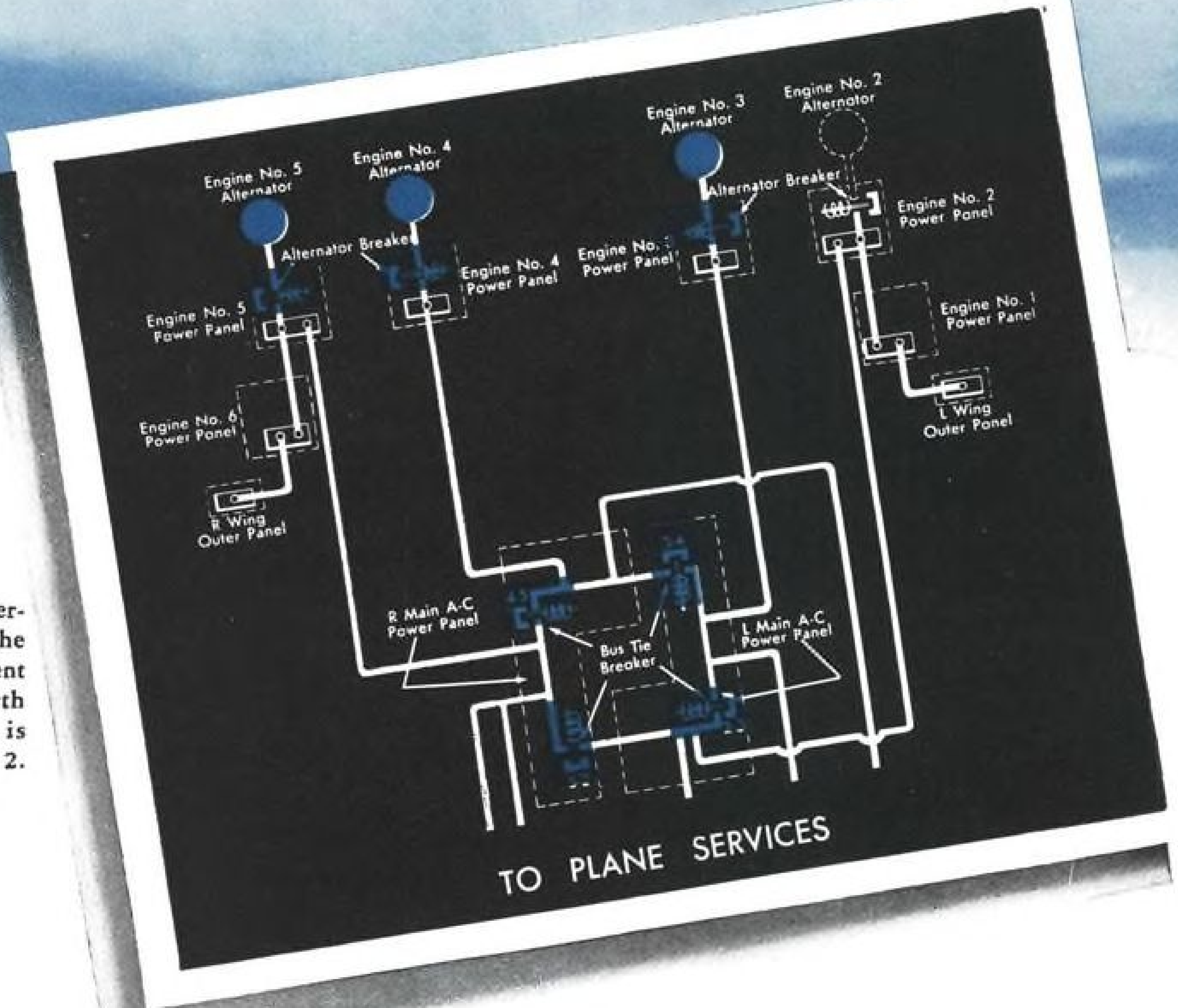
When a single plane requires for its operation *five* electrical circuits, involving *twenty-seven* miles of wire . . . *three hundred* electric motors and associated controls . . . its electrical system must offer unprecedented dependability.

This explains the unusual care exercised in selecting electrical components for Consolidated Vultee's new B-36 bomber—the world's largest! And among the equipment selected for this vital task the Westinghouse name appears with significant frequency . . . particularly in those applications where dependable performance counts most. Typical examples are the Alternators for engines 3, 4 and 5 and the Voltage Regulators for each . . . the Alternator Breakers and the Bus Tie Breakers.

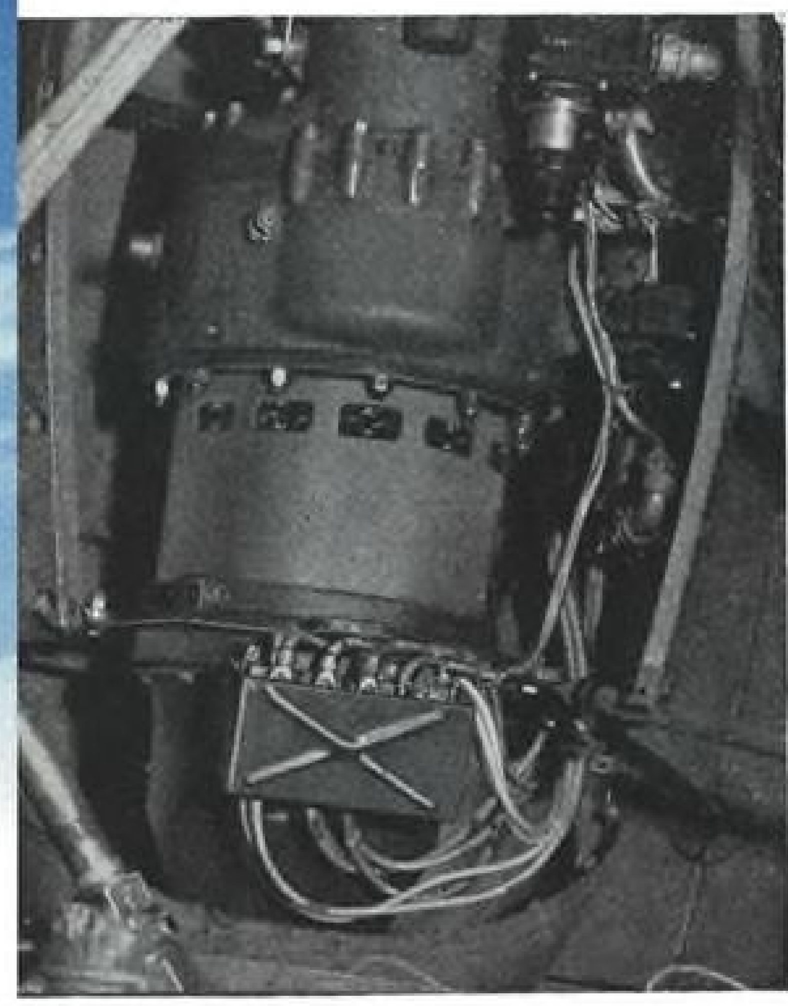
Westinghouse is proud to have its name linked with another important achievement in aircraft design, but more so because of what it implies to you . . . *superiority in all Westinghouse products for the aviation industry.*

For more information on Westinghouse aircraft products, ask for a copy of B-3775. Call your local Westinghouse office or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

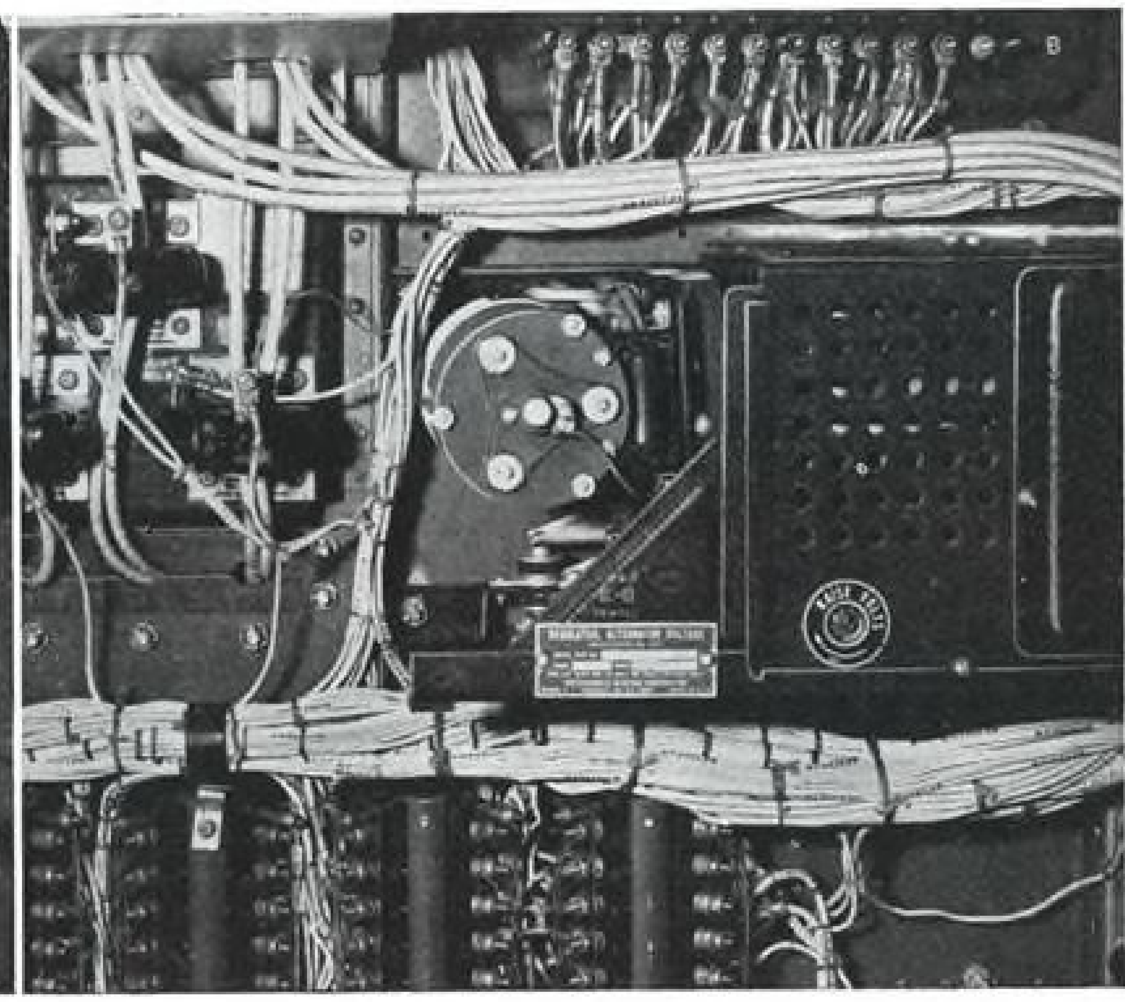
J-94772



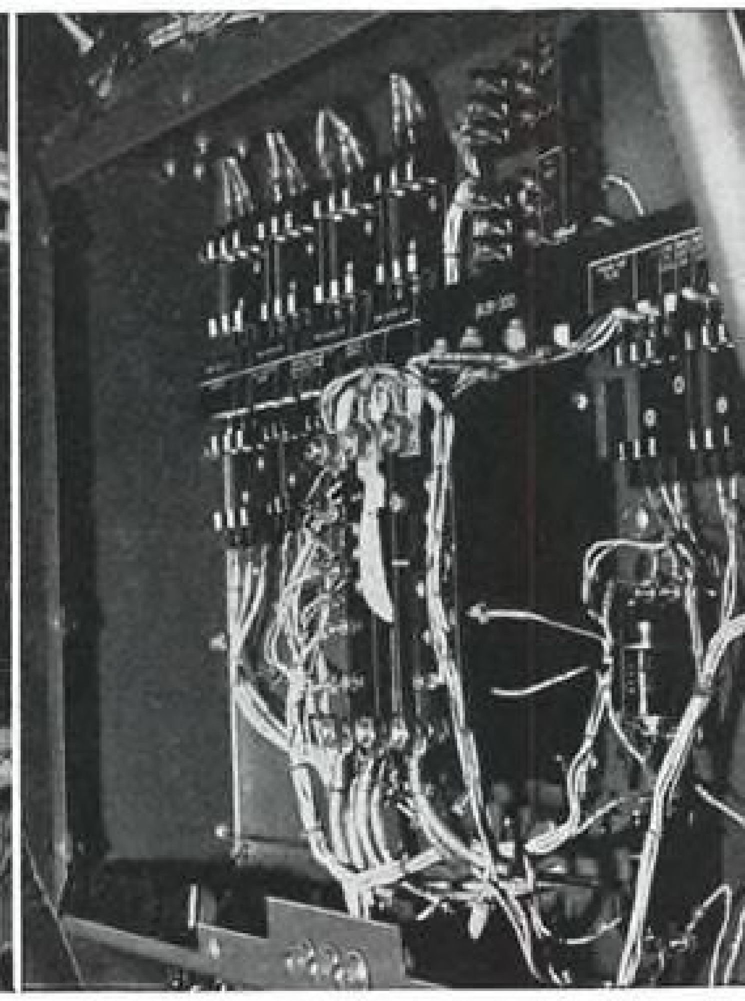
Schematic diagram of the alternating-current system on the B-36. Westinghouse equipment is shown in blue. A fourth Westinghouse Alternator is proposed for engine No. 2.



Here is an installation view of one of the Westinghouse 40-kva Alternators attached to a constant-speed drive in the forward wing area. (Inspection cover has been removed.) Special impregnation guarantees long brush life at high altitudes. Excitation is furnished by an integral d-c exciter.



This view of an engine power panel shows the Westinghouse Type AVR-370-A Voltage Regulator installation. Regulation provided is within $\pm 2\%$ over the whole range of 0 to 15% load, -60° C to +55° C, and 0 to 50,000 feet altitude. Good anti-hunting stability at all temperature and load conditions.



The Westinghouse Type AVR-10 Circuit Breaker (cover removed). There is a Westinghouse breaker for each Alternator in the bomber's electrical system. Arc interruption is accomplished by (1) self pressurized arcing chamber (2) multiple arc gaps and (3) surface deionization.

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ON THE GROUND

ENGINE STARTERS, BATTERY CHARGERS • AIRPORT LIGHTING • TEST EQUIPMENT • RADIO AND MICROWAVE APPARATUS • LAMPS

Swedish Aviation

The Swedish airline company, ABA, has 19 DC-3s and three DC-4s in operation, while the Scandinavian joint transatlantic company (SAS) operates seven DC-4s. ABA has ordered ten DC-6s and SAS seven, as well as four Boeing Stratocruisers.

Route km. flown by ABA in 1947 ran at 8,783,500 compared to 6,750,000 in 1946. SAS route km. for 1947 were 5,430,000. ABA's passenger km. figure for 1947 was up at 102,855,000, as compared with 72,850,000 the previous year.

SAS carried 19,000 passengers in 1947, 16,300 to N. America and 2700 to S. America. Baggage, freight and mail total was 842 metric tons, 733 tons of which was between Scandinavia and N. America. ABA carried over 4000 tons of baggage, freight and mail in 1947.

Total number of civil aircraft registered in Sweden is about 350, while the number of pilots with valid certificates is just over 1000.

Swedish Air Power Dependent on West

Country building small air force designed primarily to fight delaying action.

BY G. HOWARD SMITH

STOCKHOLM—Sweden's air power is a paradox. In any conflict between the great powers, it can only be of significance if Sweden manages to remain neutral.

The explanation is simple. A population of less than 7 million has no chance of defending for long a land area about the size of California against a powerful invader. Resistance could probably be kept up for a considerable time by withdrawing the ground forces to sparsely inhabited mountain and forest parts, and harassing the enemy by constant sallies. But in such circumstances the air force would be reduced to a negligible factor.

If one looks at the possibilities for the whole of Scandinavia, it would seem that Norway and most of Sweden north of a line Gothenburg-Gävle could be held for a while, but not south Sweden or Denmark. Plans for a combined defence of Scandinavia have always fallen down over the difficulty of defending these areas against a big continental power.

In a memorandum on the defense question issued last April, General Helge Jung, supreme commander of the Swedish armed forces, declared openly that Sweden's only possibility was to fight a delaying action until help arrived from the outside. In the present situation, that could only mean: from the West.

▶ **Dependence on West**—But it is not only militarily that Sweden (and all Scandinavia) is dependent on the West. Apart from a few Vickers Vikings and Sandringham flying boats owned by the Danish and Norwegian companies, the airline fleets of all three countries consist entirely of American planes.

Sweden is the only one of these countries with an airplane industry. Still manufacturing Junkers Ju 86-Ks and Douglas Northrop 8A-1s on license at the beginning of the war, the Swedes developed their own designs with remarkable speed. One of these was the J-21 fighter, the jet version of which has a performance only slightly inferior to the British Vampire.

The costs of keeping up with design developments, however, are beyond the resources of a small nation. As soon as the war was over they equipped two wings with surplus Mustangs as a stop-gap, and invested heavily in Vampires—in which they are being followed by the Norwegians.

At the same time one Swedish light bomber wing is being converted to a night fighter unit using Mosquito Mk 38s. But this type also is only a stop-gap—by 1953 they will have been exchanged for a jet-driven design, as part of the general policy of complete conversion to jet propulsion during the next 10 years.

▶ **Emphasizing Research**—During the production lull involved in the change-over, effort is largely going into research and construction experiments. The latest batch of Vampires are being fitted with Goblin III engines—the Swedish version of Goblin II. De Havilland Ghost jet units will also soon be manufactured on license at Trollhättan—followed later by an entirely Swedish engine designed on the Lysholm system.

Meantime the SAAB company is concentrating on the development of a fighter model capable of over 650 mph. The prototype should be ready any time now.

Such moves indicate the whole trend of Swedish defense thinking: build up a force capable of keeping an enemy at bay as long as possible—and making attack a costly business for him—but give up the hopeless effort to compete in offensive strength.

All signs point to the expansion of fighter formations at the expense of light bombing and reconnaissance. The latest recommendations of the National Defense Committee include increasing the fighter wings from ten to eleven, and reducing the light bomber and reconnaissance units from eight to four.

That would mean about 400 fighter planes in the first line (reserves are unknown). The question is whether this number would be sufficient.

▶ **Mechanical Minded**—During the last war, with production facilities intact, Sweden was able to expand its air force at quite a respectable rate in the face of danger. But it took all six years of war to do it. In event of an invasion, it is questionable how much in the way of repair and replacement shops still would be available after the first few weeks—not to mention the plane and engine factories. It's no good having the plants safely tucked away underground if you can't hold the territory they lie in.

However, the Swedes are nation of ingenious mechanics, and their ability to keep an air force flying, even in difficult circumstances, perhaps should not be underestimated. Given time, they have considerable facilities. Their developed metal working industry, for instance, enabled them to produce their first fighter, the J-22 (an improved Republic EP 1), as a pure assembly job with over 800 subcontractors.

SAAB is the only aircraft manufacturer in Scandinavia and has its main factory at Linkoping. Production figures on military aircraft have never been revealed although the plant was geared to turn out one plane a day and was operating somewhere near that rate when the war ended. During the last year the company has been working on a series of 120 J-21R—jet version of the J-21.

Pending determination of new types, production facilities are not being allowed to disperse, either, although government contracts are thinning out. In addition to the jet fighter, the SAAB company is working on the twin-engined Scandia airliner and the Safir sports model, as well as producing a light car.

Svenska Flygmotor, Trollhättan, are making rotary presses, as jet engine production requires less of their working force than the piston type did. Jet propulsion is in fact a windfall for the Swedes: it means they can at last manufacture adequate power units within the country. Thus the main hindrance to the development of their own types of military aircraft is removed.

But the cost is not. And it is most unlikely that Sweden—especially with a government whose chief raison d'être is to raise the living standard of the masses—will take out the full insurance of an entirely adequate airforce. A small power cannot exist alone, anyway.

U. S. Air Transport Planes

Manufacturer	Designation	Engines: Make; Model; hp.	Propellers	Range	High Speed, mph.	Cruise, mph.	Climb, ft./min.	Gross Weight	Empty Weight	Span	Length	No. Places
Beech Aircraft Corp.	Twin-Quad	4 Lyc; 375	2 HS	1,450	230	180	1,000	19,500	NA	70′	53′	22–23
East Central Ave.	D-18-C	2 Cont; 525	Hy	1,370	240	224	1,450	9,000	5,900	47′ 7″	33′ 11½″	4–9
Wichita 1, Kan.	D-18-S	2 P&W; 450	HS	1,300	230	211	1,250	8,500	5,615	47′ 7″	33′ 11½″	4–9
Boeing Aircraft Co. Box 3107 Seattle 14, Wash.	377 Stratocruiser	4 P&W R-4360; 3,500	C	4,200	375	340	1,100	135,000	78,920	141′ 3″	110′ 4″	57–85
Consolidated Vultee Aircraft Corp. San Diego 12, Calif.	240 Convair-Liner	2 P&W R-2800-CA18; 2,400	C rev.	800+	336	300	NA	39,500	8,509	91′ 9″	71′ 8″	44
Curtiss-Wright Corp., Airplane Div. Columbus 16, Ohio	CW-32	P&W; 2100	C	1,500	326	300	1,100	98,450	45,415	130′ 2″	88′ 11½″	(cargo)
Douglas Aircraft Co., Inc.	DC-3	2 P&W R-1830-92; 1,050	HY	1,510	234	202	1,230	25,200	17,100	95′	64′ 5½″	23
3000 Ocean Park Blvd.	DC-4	4 P&W 2 SD 13 G; 1,200	HS	4,250	246	231	1,090	73,000	40,200	117′ 6″	93′ 5″	47
Santa Monica, Calif.	DC-6	4 P&W CA-15; 1800	HS or C	4,480	352	301	1,100	93,200	50,600	117′ 6″	100′ 7″	55
	DC-6A	4 P&W R-2800 CA 15; 1,800	HS or C rev.	4,000	365	310	1,200	96,000	47,500	117′ 6″	105′ 7″	(cargo)
	DC-9	2 P&W 2180; 1,650	HS	2,125	257	242	NA	30,000	19,600	101′	75′	28
Grumman Aircraft Engineering Corp.	G-44-A Widgeon	2 Ran 6-440C-5; 200	S or CR	640–810	165	130	1,000	4,525	1,285	40′	31′	5
Bethpage, L. I., N. Y.	G-73 Mallard	2 P&W R-1340-S3H1; 550	Hy	721–1,330	215	180	1,290	12,750	9,350	66′ 8″	48′ 4″	12
Lockheed Aircraft Corp. 2555 No. Hollywood Way Burbank, Calif.	749 Constellation	4 Wr 749C18BDI; 2,500	C rev.	5,450	346	309	1,280	102 000	58,971	123′	95′ 3″	44–62
Glenn L. Martin Co. Baltimore 3, Md.	2-0-2	2 P&W R-2800; 2,400	HS	1,435	310	260	1,520	39,900	24,649	93′ 3¼″	71 4″	40–44
Northrop Aircraft Inc. Northrop Field Hawthorne, Calif.	N-23 Pioneer	3 Wr; 700	HS	1,700	175	150	1,400	27,500	NA	87′	66′ 6″	(cargo)

Engines
Cont—Continental
Lyc—Lycoming
P&W—Pratt & Whitney
Ran—Ranger
Wr—Wright

Propellers
HS—Hamilton Standard
C—Curtiss Electric
CR—Curtiss-Reed
S—Sensenich
Hy—Ham. Standard Hydromatic
rev—reversible pitch

NA—Not available

Air Transport's Role in Air Power

Carriers' strength founded on greatest and most extensive airline system in the world, with continued growth being forecast.

By CHARLES ADAMS

The air transport industry's vital role in air power—set down by Congress a decade ago and spotlighted by the carriers' important work in World War II—has been reaffirmed by top planners of this country's future security program.

Civilian groups already have begun working with the Air Force to implement recommendations by the President's Air Policy Commission that the carriers be ever-ready in peacetime for emergency mobilization. Importance of this perpetual readiness to national security warrants direct government financial aid to the commercial airliners, the Commission declared.

Congress Acts—The nation's basic air law—the Civil Aeronautics Act of 1938—specified that the U.S. air transport system should not only be adequate for commerce and the postal service but for national defense as well. Thus, within six months after the start of World War II, 193 of the 359 planes on the certificated airlines were turned over to the government, and a third of the carriers' top management, pilots, maintenance men and other personnel had joined the armed forces.

By the end of the war, Allied military services were operating 10,000 transport planes.

▶**Mission Cited**—One week after Pearl Harbor, the War Department called on the Air Transport Association for an immediate secret movement of special troops. Within a few minutes after the official notification, airline pilots in the air were being ordered to land, discharge their passengers and proceed to a military installation to pick up the contingent. The procedure was in accordance with a plan laid down six years before.

During the war, the airlines flew 650,000,000 plane miles, eight billion high-priority passenger miles and 850 million cargo ton miles.

Non-scheduled Air Carrier Operations

Certificates Received and Filed (Washington Office) as of December 31, 1947	2,527
Certificates Cancelled as of December 31, 1947	31
Certificates in Effect (Washington Office) as of December 31, 1947	2,496

REGIONS	1	2	3	4	5	6	7	8	9	TOTAL
OPERATORS										
Multi-Engine Operators 10,000 lb. or more	20	25	6	18	10	29	14	15	4	141
Multi-Engine Operators less than 10,000 lb	53	15	73	71	28	30	13	5	5	293
Multi-Engine Operators	73	40	79	89	38	59	27	20	9	434
Single-Engine Operators	474	315	345	314	302	140	156	15	1	2,062
Total Operators	547	355	424	403	340	199	183	35	10	2,496
Multi- and Single-Engine Operators[1]	36	13	59	65	23	13	11	15	0	235
Seaplane or Amphibian Operators[1]	101	26	44	13	8	7	17	23	1	240
Helicopter Operators[1]	1	0	1	0	0	1	0	0	0	3
AIRCRAFT[2]										
Multi-Engine (Model and Gross Wt.)										
Lockheed 49 . . . 90,000	19	0	0	0	20	0	0	0	0	39
Douglas DC-4 . . . 73,000	28	88	0	10	0	56	2	1	0	185
Boeing 307 . . . 54,000	0	6	0	0	5	0	0	0	0	11
Curtiss C-46 . . . 45,000	0	3	0	9	0	0	1	0	0	13
Consolidated 28–4 . . . 27,000	0	0	0	0	0	1	1	0	0	2
Douglas DC-3 . . . 26,900	65	106	6	51	111	66	28	28	17	478
Douglas B-18 . . . 21,000	0	4	0	0	0	1	0	0	0	5
Lockheed 18 . . . 19,500	0	4	1	1	1	0	1	2	0	10
Boeing 247 . . . 13,500	0	0	0	0	0	0	0	1	0	1
Grumman G-73 . . . 12,500	5	0	0	0	0	0	0	0	0	5
Lockheed 10 . . . 10,500	0	0	1	0	0	0	0	0	0	1
Stinson A . . . 10,200	0	0	0	0	0	0	0	1	0	1
Ford Ate . . . 9,300	0	0	3	0	0	0	3	0	0	6
Beechcraft 18 . . . 8,750	8	4	11	14	5	4	2	0	7	55
Lockheed 12 . . . 8,650	2	0	0	1	0	1	0	0	0	4
Grumman G-21 . . . 8,000	1	1	0	0	0	0	0	7	0	9
Curtiss Kingbird D2 . . . 6,360	0	0	0	0	0	0	0	1	0	1
Cessna UC-78 . . . 5,700	51	17	88	80	31	32	15	3	9	326
Grumman G-44 . . . 4,225	9	4	1	0	0	2	1	0	1	18
Multi-Engine Aircraft	188	237	111	166	173	163	54	44	34	1,170
Single Engine Aircraft	933	756	749	793	498	274	347	105	1	4,456
Total Aircraft	1,121	993	860	959	671	437	401	149	35	5,626
Helicopters[3]	4	0	1	0	0	1	0	0	0	6
MISCELLANEOUS										
Pilots Employed	2,211	2,370	1,233	1,455	1,351	1,169	669	186	82	10,726

(1) Included in total operators

(2) Break-down of aircraft by types is not a definite index to equipment of operators engaged only in non-schedules work as several scheduled airlines also have non-scheduled air carrier operating certificates, which accounts for the Constellations (L-49) Stratoliners (307) and some of the DC-4s

(3) Included in total aircraft.

► **Responsibilities Seen**—The carriers' peacetime responsibility is to help provide a domestic and international system of airways tailored to instant military requirements. The domestic transport fleet, fully-equipped and adapted to ground navigation facilities, flying over tested airways and under the control of experienced pilots, should be able to place all U.S. cities, factories and air bases in emergency status insofar as the rapid transfer of persons, cargo and mail is concerned.

Internationally, the carriers during peacetime can provide a pool of air bases, facilities and pilots who know from experience the topography and conditions surrounding world flight. At present, U.S. certificated carriers employ 25,500 service-trained personnel whose skills are kept up for use in event of emergency.

► **Widespread Operations** — During 1947, trunklines and feeder operators combined to serve about 473 U.S. communities. American flag carriers were serving 229 cities in other parts of the world.

Nearly 13,200,000 passengers traveled on the certificated domestic airlines and 1,400,000 on U.S. flag international carriers in 1947. Certificated domestic carriers had 8,200 miles of routes in operation in 1926, 41,000 in 1940 and 115,000 in 1947. American flag carriers had 152 route miles in operation in 1926, 53,000 in 1940 and 175,000 in 1947.

► **Rapid Growth**—Capacity of planes operated by U.S. certificated airlines has increased ten-fold since 1938, with the larger size of the average aircraft accounting for most of the gain. In December, 1938, the certificated domestic carriers had 253 planes, mostly of DC-3 size or smaller. Available seat miles flown during 1938 numbered 949,000,000, and ton-mile capacity was 128,000,000.

By December, 1941, at the outbreak of the war, planes in certificated domestic operation had increased to 359; available seat miles in the year totaled 2,316,000,000, and ton-mile capacity ag-

U. S. Scheduled Air Transport Industry

DOMESTIC AIRLINES

Carrier	Assets (Sept. 30, 1947)	Employes (Sept. 30, 1947)	Payroll Per Year	Certificated Route Miles (Jan. 1, 1948)	Dom. Scheduled Rev. Pass. Miles, 1947	Dom. Scheduled Rev. Pass. Miles, 1946	Planes in Scheduled Service, December, 1947
All American	$2,237,000	148	$542,000	1,521	....	....	2 Beech D-18C, 7 Stinson
American	125,134,000	12,067	40,126,000	19,457	1,379,323,000	1,307,908,000	41 DC-6, 46 DC-4, 60 DC-3
Braniff	11,545,000	2,071	6,126,000	4,831 (Dom.) 7,600 (For.)	199,634,000	212,921,000	6 DC-6, 10 DC-4, 17 DC-3
Chicago & Southern	6,099,000	1,408 (Dom.) 30 (For.)	4,263,000 (Dom.) 101,000 (For.)	6,162 (Dom.) 3,697 (For.)	111,643,000	137,843,000	4 DC-4, 13 DC-3
Colonial	3,378,000	524 (Dom.) 30 (For.)	1,724,000 (Dom.) 166,000 (For.)	1,367 (Dom.) 2,030 (For.)	38,582,000	45,592,000	2 DC-4, 10 DC-3
Continental	2,651,000	655	2,234,000	2,918	58,926,000	75,622,000	12 DC-3
Delta	9,315,000	2,051	5,536,000	5,811	201,048,000	209,582,000	7 DC-4, 19 DC-3
Eastern	39,062,000	7,296 (Dom.) 16 (For.)	24,007,000 (Dom.) 45,000 (For.)	13,507 (Dom.)* 917 (For.)	884,300,000	803,026,000	19 DC-4, 14 L-649 Constellation 53 DC-3
Inland	1,006,000	143	516,000	1,910	27,810,000	22,362,000	(See Western)
Mid-Continent	3,405,000	1,074	2,957,000	4,474	81,873,000	75,570,000	15 DC-3
National	10,868,000	1,798 (Dom.) 16 (For.)	5,217,000 (Dom.) 36,000 (For.)	2,632 (Dom.) 445 (For.)	157,343,000	173,174,000	4 DC-6, 7 DC-4, 12 Lockheed Lodestar
Northeast	3,818,000	892	2,670,000	2,109	62,142,000	83,848,000	3 DC-4, 11 DC-3
Northwest	29,332,000	3,947	11,751,000	11,043 (Dom.) 15,198 (For.)	346,873,000	378,440,000	16 DC-4, 21 DC-3, 9 Martin 2-0-2
PCA (Capital)	17,506,000	3,062	9,693,000	4,888	288,470,000	373,331,000	23 DC-4, 25 DC-3
TWA	79,884,000	9,419 (Dom.) 3,960 (For.)	30,704,000 (Dom.) 12,238,000 (For.)	11,405 (Dom.) 21,108 (For.)	817,883,000	744,290,000	15 DC-4, 22 L-49 Constellation, 69 DC-3, 5 Boeing 307
United	85,539,000	11,017	36,695,000	17,887*	1,186,604,000	1,067,937,000	32 DC-6, 33 DC-4, 79 DC-3
Western	14,022,000	1,544	5,196,000	3,121 (Dom.) 1,640 (For.)	166,396,000	191,660,000	6 DC-4, 13 DC-3
	$144,801,000	63,168	$202,543,000	167,678**	6,008,850,000	5,903,106,000	

*Includes overseas routes: EAL to San Juan; UAL to Hawaii. **Includes foreign mileage.

U. S. FLAG AND TERRITORIAL CARRIERS

Carrier	Assets (Sept. 30, 1947)	Employes (Sept. 30, 1947)	Payroll Per Year	Certificated Route Miles (Jan. 1, 1948)			Planes in Scheduled Service, December, 1947
American Overseas	$26,250,000	2,959	$10,199,000	9,066	....	....	6 DC-4, 7 L-49 Constellation, 1 DC-3
Caribbean-Atlantic	392,000	121	262,000	206	....	....	3 DC-3
Hawaiian	2,104,000	520	1,681,000	356	....	....	9 DC-3, 1 Beech D-18C
Pan American	134,402,000	14,788	51,270,000	94,517	....	....	3 DC-6 (also used by Panagra), 4 L-649 Constellation, 15 L-49 Constellation, 68 DC-4, 31 DC-3
Panagra	13,381,000	3,104*	4,684,000*	10,666	....	....	14 DC-3 plus planes shared with PAA
UMCA	65,000	17	21,000	382	....	....	
	$176,594,000	21,509	$68,117,000	115,193			

FEEDERS IN OPERATION SEPT. 30, 1947

Carrier	Assets	Employes	Payroll Per Year	Certificated Route Miles			Planes
Challenger	$576,000	158	$404,000	1,613	....	....	4 DC-3
Empire	670,000	107	368,000	709	....	....	4 Boeing 247-D
Florida	729,000	81	278,000	463	....	....	3 Beech D-18C
Monarch	754,000	208	575,000	1,609	....	....	5 DC-3
Pioneer	1,504,000	351	946,000	1,417	....	....	7 DC-3
Southwest	1,262,000	376	1,088,000	1,179	....	....	9 DC-3
West Coast	1,317,000	163	558,000	885	....	....	2 DC-3
	$6,812,000	1,444	$4,217,000	7,875			

*As of June, 1947.

gregated almost 291,000,000. Planes in certificated domestic operation at the end of 1947 numbered around 797; available seat miles for the year aggregated 9,710,000,000, and ton-mile capacity totaled about 1,350,000,000.

▶ **Douglas Forecast**—Donald Douglas has estimated that by the end of 1950 the certificated domestic trunklines will have 730 passenger and 85 cargo planes in operation; will be flying nearly 15,100,000,000 passenger seat miles annually, and will have a 2,307,000,000 ton-mile capacity.

Internationally, U.S. flag carriers had an average of 74 planes in operation during 1939 with 79,500,000 available seat miles and 11,940,000 ton miles capacity. At the start of World War II, U.S. flag carriers had 94 planes in operation, flew 265,000,000 available seat miles during the year and had a ton-mile capacity of 39,790,000.

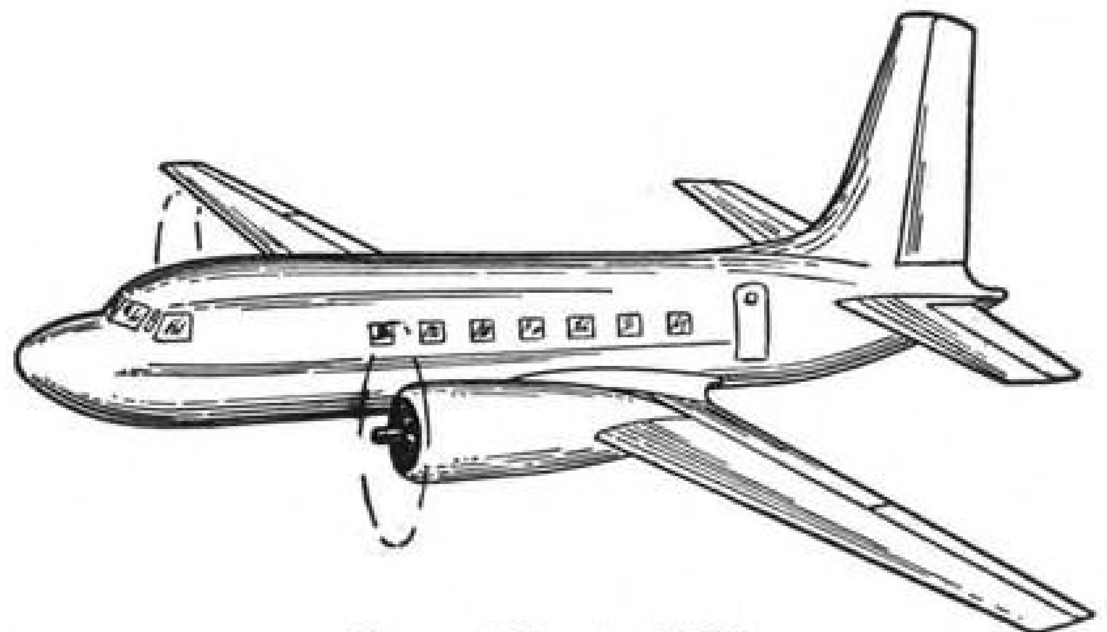
▶ **Further Increase**—In December, 1947, international carriers had about 174 planes, flew around 3,135,000,000 available seat miles during the year and reported a ton-mile capacity of around 440,000,000. By the end of 1950, Donald Douglas expects certificated U.S. flag carriers to be operating about 180 planes flying 5,720,000,000 seat miles annually with a 697,000,000 ton-mile capacity.

Although the size of the Russian transport fleet is an important question mark, the U.S. is far ahead of the rest of the world in commercial aviation. In the spring of 1947, 61 percent of all scheduled plane miles operated by the world's common carrier airlines were flown by American companies.

Northrop Pioneer

Glenn L. Martin 2-0-2

Douglas DC-6 (Army C-118)

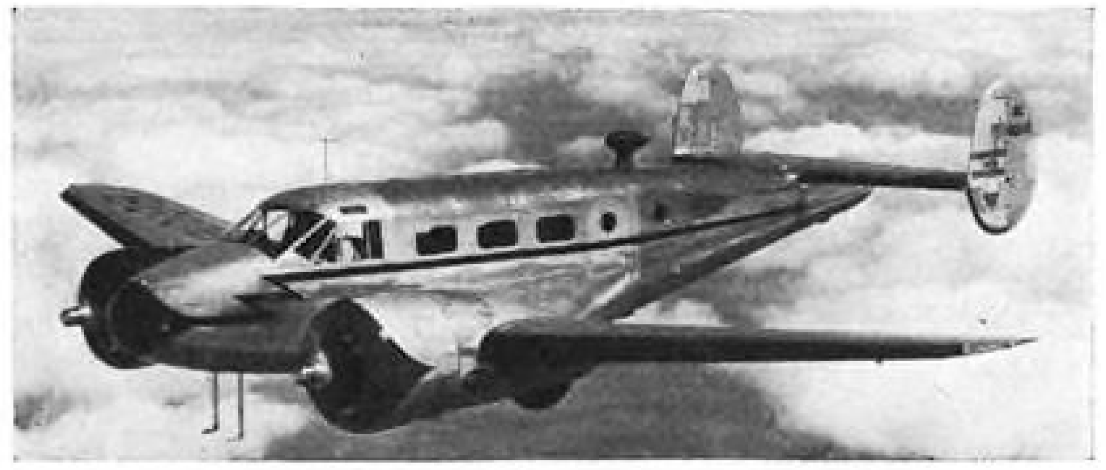


Proposed Douglas DC-9

Convair-Liner (240)

Douglas DC-4 (Army C-54; Navy R5D)

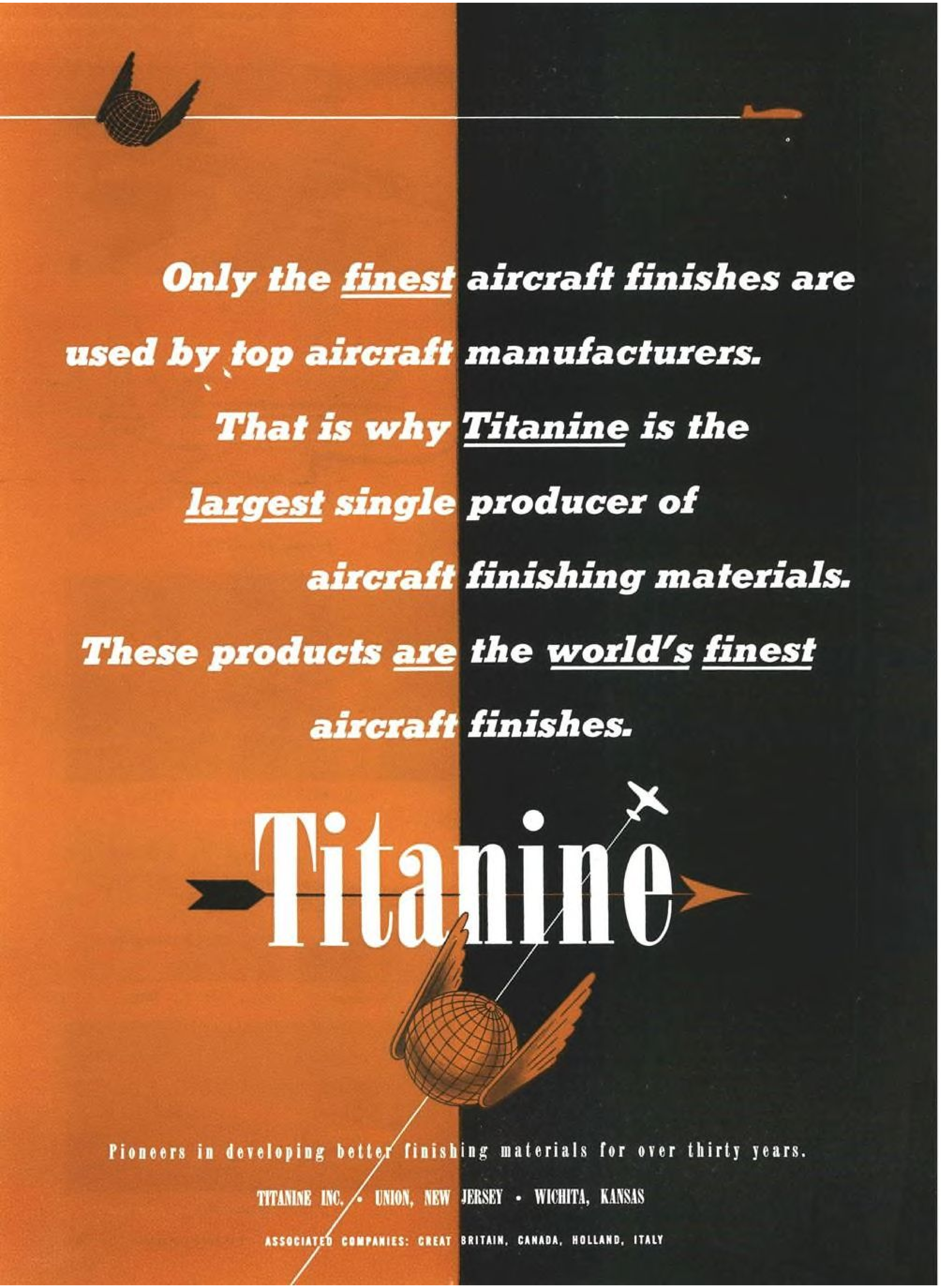
Beechcraft Twin Quad



Beechcraft D-18-S (Army C-45; Navy JRB)

Lockheed Constellation

Boeing Stratocruiser



Certificated Airlines' Safety Record

Fatal Domestic Accidents in 1947
(Scheduled Passenger Flights)

Date	Location	Type Plane	Carrier	Fatalities Crew	Fatalities Passenger	Cause
Jan. 12	Galax, Va.	DC-3	Eastern	3	15	Hit mountain: Pilot error in navigation and letdown.
May 29	New York, N. Y.	DC-4	United	2	41	Gust lock in locked position during takeoff from LaGuardia.
May 30	Port Deposit, Md.	DC-4	Eastern	4	49	Crashed in steep dive: cause undetermined.
June 13	Lookout Rock, W. Va.	DC-4	PCA	3	47	Hit mountain: errors by both pilot (in descending below minimums) and Washington, D. C., airway traffic control.
Oct. 24	Bryce Canyon, Utah	DC-6	United	5	47	Fire in flight due to gasoline overflow.
Total				17	199	

Fatal International Accidents in 1947
(Scheduled Passenger Flights)

Date	Location	Type Plane	Carrier	Fatalities Crew	Fatalities Passenger	Cause
Mar. 11	Over North Atlantic	Constellation	TWA	1	0	Navigator lost when astrodome burst.
June 19	Mayadine, Syria	Constellation	PAA	7	7	Fire in flight caused by engine failure.
Oct. 26	Mt. Tamgas, Alaska	DC-4	PAA	5	13	Hit mountain; cause unknown.
Total				13	20	

Airline Traffic Trends Show Growth Depends on Safety

Long-term figures indicate fatalities per 100 million passenger miles are declining; money for air aids seen as greatest need of carriers to promote reliability.

Growth of commercial air traffic to the point where it can support a huge transport fleet in perpetual readiness for national emergency hinges to an ever-increasing extent on progress in the field of air safety.

Many industry executives feel that technological developments which will promote greater flying safety and all-weather operations are the airlines' most urgent need. To a considerable degree, the carriers' major financial setbacks in the post-war period and the leveling off of the upward traffic curve in late 1946 and 1947 stem from accidents.

▶ **Losses Cited**—Grounding of the Constellations in the summer of 1946 cost TWA several million dollars and started that carrier on a financial toboggan. Latest estimates are that the grounding of the DC-6s (also following fires in flight) will cost American Airlines, United Air Lines and other carriers between $10,000,000 and $12,000,000.

Until the post-war period, accidents had little effect on the rising volume of airline passenger traffic. But the series of four accidents between October, 1946, and January, 1947, apparently had a marked bearing on the business slump during that period.

▶ **Traffic Decline**—The same condition was noticeable following the three fatal crashes in May and June, 1947. In June, 1947, about 50,000 fewer passengers were handled by the airlines than in the previous month. This contra-seasonal decline was attributed almost entirely to the United Air Lines DC-4 accident at LaGuardia Field on May 29, the Eastern Air Lines mishap at Port Deposit, Md., on May 30, and the PCA crash at Lookout Rock, W. Va., on June 13.

Aircraft builder Donald Douglas believes that the fear of flying is still present to some degree among the U.S. population. This is particularly true among persons in age brackets above 50. Increased safety in the only answer to these fears.

▶ **Money Sought**—Achievement of greater safety, particularly in poor flying weather, is bound to be an expensive proposition. But United Air Lines President W. A. Patterson stated recently that if enough money is spent, and if proven developments are correctly applied, all-weather flying by commercial planes can be realized in three to five years. "With proper aids, the airplane is potentially as safe as any form of transportation," Patterson declared.

Development of new air aids is generally considered to be a job which should be financed both by the government, in the interest of national defense and the general welfare, and by the airlines. Donald Douglas said he considers government assistance for technical aids to flying more important than financial help in developing improved types of aircraft.

▶ **Safety Rules**—Stiffening of federal safety regulations also is getting serious consideration as a means of cutting down accidents. In many cases such action—on the surface at least—places a heavy burden on the carriers.

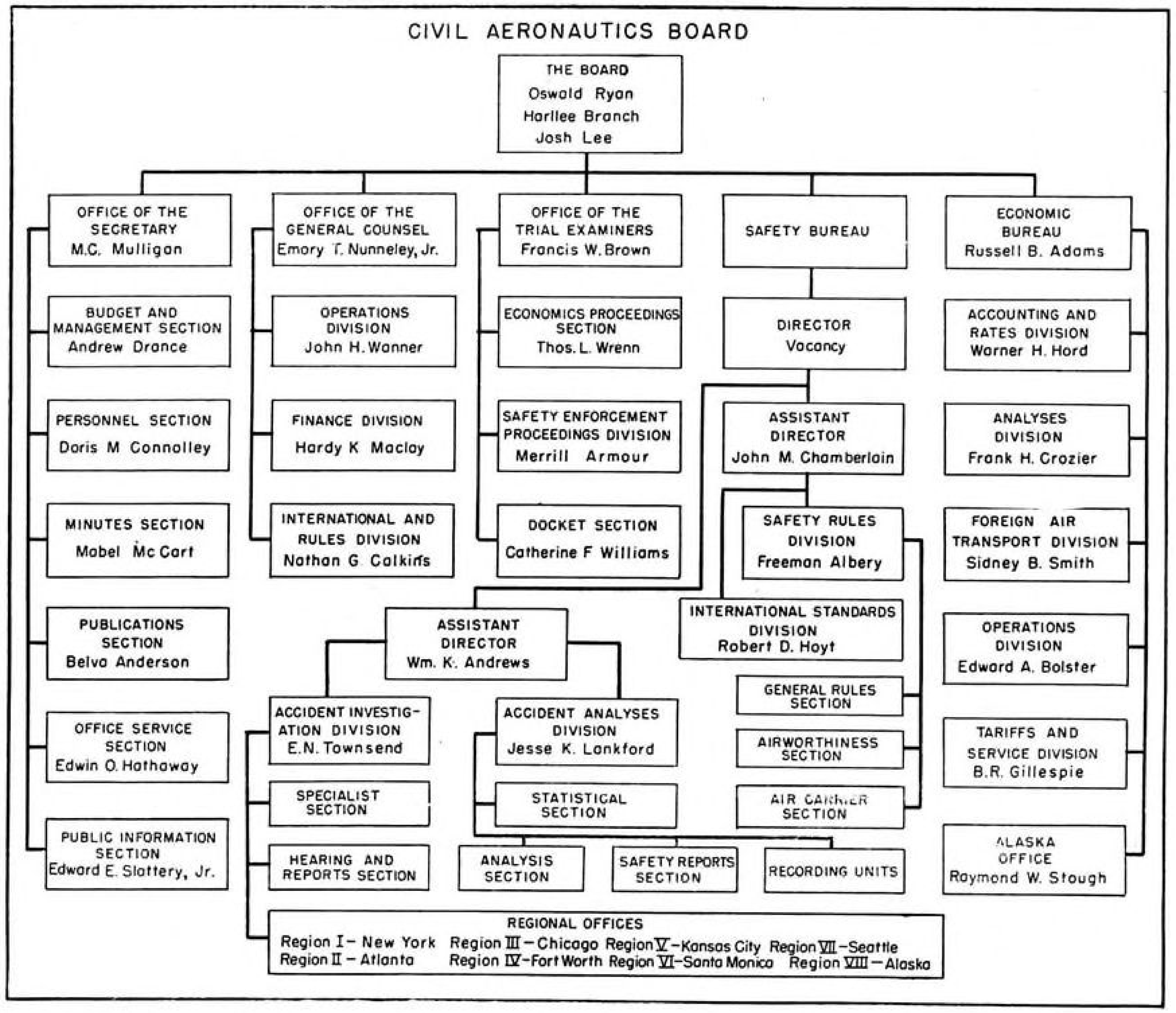
Instituting temperature accountability, adding airborne radar and theoretically chopping 300 ft. from the actual length of a runway in making weight limit calculations for takeoff were among recommendations made by the President's Special Air Safety Board last year. All measures are designed to provide a wider margin of safety, but at the same time they add up to smaller payloads.

▶ **Pilot Demands**—There are also the demands of the pilots for an extra man in the cockpit on four-engine planes and a reduction in maximum monthly flying hours. Whether these changes will mean more safety is highly controversial—but the immediate expense involved is not.

Accidents in the approach and landing category represent by far the largest number of mishaps in air transportation, according to the President's Air Safety Board. These crashes occur mainly during the winter months and at night.

▶ **Warning Issued**—In 1946, for example, they represented 35 percent of the fatal accidents and accounted for 85 deaths. The President's Air Safety Board stated that unless some provision is made immediately for procurement of necessary aids the tragic pattern of accidents in the winter of 1967-47 will repeat itself.

Degree of safety which can be achieved through installation of adequate aids rests to a large extent on Congress, the Safety Board declared. It noted that Congress last year was asked



for $4,750,000 for approach lights, $2,668,000 for GCA, $1,250,000 for surveillance radar and $4,760,000 for ILS—a combined total of $13,428,000. The Senate finally approved $139,706 for approach lights, $232,000 for GCA, $200,000 for surveillance radar and nothing for ILS—a total of $571,000.

▶ **Record Improves**—Despite limited funds for air safety, the frequencies of fatal accidents and deaths on the certified domestic airlines (when compared to total miles flown) has shown a long-term downward trend since the gathering of complete statistics was begun in 1938. And the reduction in the fatality rate on U. S. International carriers has been spectacular.

In the ten-year period between 1938 and 1947, domestic passenger fatalities ranged from 4.5 per 100 million passenger miles in 1938 to 1.2 per 100 million passenger miles in 1939 and 1946. Despite the frequent headlining of accidents in 1947, the rate for that year was only 3.1 passenger fatalities per 100 million passenger miles.

▶ **Larger Planes**—The number of fatal domestic accidents during the 10 year period remained fairly stable. They ranged from a high of nine fatal mishaps in 1946 (when the fatality rate was at a record low) to a low of two fatal mishaps in 1939 and 1943.

As larger planes came into use, and as mileage flown increased, the number of fatalities per fatal accident and the total number of fatalities quite naturally increased.

▶ **Mileage Gains**—In 1938, when the certificated domestic lines flew 560 million passenger miles there were five fatal accidents and 25 passenger fatalities. In 1947, when the domestic carriers flew more than six billion passenger miles, there again were five fatal accidents but 199 passenger fatalities. Yet the number of passenger fatalities per 100 million passenger miles dropped from 4.5 in 1938 to 3.1 in 1947.

In 1947, the certificated domestic airlines flew an estimated 62,740,000 plane miles per fatal accident—the best record in industry history from this standpoint.

In 1946, when the carriers achieved their lowest passenger fatality rate, plane miles flown per fatal accident numbered 33,222,082, considerably less than in 1947. Whereas eight of the nine fatal domestic accidents in 1946 involved DC-3s, three of 1947's five accidents involved DC-4s, another, a DC-6 and only one involved a DC-3.

▶ **International Lines**—Certificated U. S. flag carriers achieved one of the best records of the past ten years during 1947. The international operators flew an estimated 1,880,000,000 passenger miles in 1947 with three fatal accidents, 20 passenger fatalities and a fatality rate of 1.1 per 100 million passenger miles.

In 1938, when U. S. international carriers flew about 53,213,000 passenger miles, there were two fatal accidents and seven passenger fatalities, but the passenger fatality rate per 100 million passenger miles was a record 13.2. In 1940 and 1942 there were no fatal accidents involving U. S. certificated flag carriers.

▶ **Uncertificated Operators**—Accident rate among passenger-carrying uncertificated airlines has been a serious problem during the post-war period. Some observers have estimated that the passenger fatality rate on these lines is between 10 and 20 times as high as on the certificated carriers.

In 1946, when uncertificated domestic passenger lines using transport-type equipment flew no more than five percent of the mileage operated by certificated carriers, they accounted for 55 passenger fatalities against 75 for the certificated airlines.

U. S. Carriers Still Largest in World

Survey shows American and United have most planes in service at end of 1947.

American air carriers are far out in front of the largest foreign companies in scheduled plane miles flown and total aircraft in service.

As of December, 1947, American Airlines, with 147 planes, United Air Lines with 144 and Pan American Airways with 121, were the top three U. S. carriers from the standpoint of equipment. British Overseas Airways Corp. and Air France, the two largest foreign operators, had considerably fewer planes.

▶ **Breakdown**—American's record fleet consisted of 41 DC-6s, 46 DC-4s and 60 DC-3s. United during December, 1947, had 32 DC-6s, 33 DC-4s and 79 DC-3s. Pan American reported 3 DC-6s (also used by Panagra), 4 L-649 Constellations, 15 L-49 Constellations, 68 DC-4s and 31 DC-3s.

BOAC on Nov. 30, 1947, had 128 planes, including 28 Dakotas (DC-3s), 12 four-engine Handley Page Haltons (Halifax bomber conversions), 11 four-engine Avro Lancastrians (Lancaster bomber conversions), 29 four-engine Avro Yorks, 6 four-engine Consolidated Liberator II's, 6 Constellations, 18 four-engine Short Hythe flying boats, 7 four-engine Short Plymouth flying boats, 8 Lockheed Lodestars and 3 four-engine Boeing 314-A flying boats.

▶ **Craft Retired**—The Air France fleet in November, 1947, included 4 L-49 Constellations, 4 L-749 Constellations, 15 DC-4s, 3 six-engine Latecoere flying boats, 30 DC-3s, 10 four-engine Languedocs and 3 Catalina amphibians, for a total of 69 planes. Other craft were being retired as quickly as new equipment was delivered by French and U. S. manufacturers.

A report of CAB's Foreign Air Transport Division shows 16 of the 29 air carriers in the world flying more than 100,000 scheduled plane miles per week are U. S. operators. The study, which omits Russian carriers, was made as of Oct. 1, 1947.

▶ **UAL Largest**—The largest operators, on the basis of scheduled plane miles weekly, were: United Air Lines 1,355,700, TWA (domestic and foreign) 1,221,871, American Airlines 1,203,674, Pan American Airways 1,190,861, Eastern Air Lines 926,499, British Overseas Airways Corp. 493,836, Northwest (domestic and foreign) 407,969.

Air France 365,696, KLM 347,915, PCA 325,890, British European Airways 302,400, Trans-Canada Air Lines 299,372, Australian National Airways 269,945, Delta Air Lines 244,911, Braniff Airways 216,769, American Overseas Airlines 185,881. National Airlines 165,690, Sabena (Belgium) 155,748, Chicago & Southern Air Lines 153,853.

▶ **Other Carriers**—Trans-Australian Airlines 153,660, Mid-Continent Airlines 148,904, Compania Mexicana de Aviacion (CMA) 140,940, Western Air Lines 135,898, ABA (Sweden) 131,167, Panagra 125,366, Panair do Brasil 121,875, Servicos aereos Cruzeiro do Sul (Brazil) 116,448, South African Airways 102,177, Continental Air Lines 101,535.

Comparative Safety Statistics

Scheduled Domestic Operations, 1938–1947

(Trunk, Feeder & Territorial Carriers)

Year	Fatal Accidents	Passenger Fatalities	Crew Fatalities	Pass. Miles Flown Per Pass. Fatality	Pass. Fatalities Per 100 Million Pass. Miles
1938	5	25	10	22,400,205	4.5
1939	2	9	3	83,927,533	1.2
1940	3	35	10	33,114,118	3.0
1941	4	35	9	43,063,944	2.3
1942	5	55	16	27,286,599	3.7
1943	2	22	8	75,951,578	1.3
1944	3	48	8	47,907,077	2.1
1945	7	76	11	46,746,305	2.1
1946	9	75	22	80,894,782	1.2
1947*	5	199	17	32,198,814	3.1
Scheduled International Operations, 1938–1947					
1938	2	7	10	7,601,860	13.2
1939	1	10	4	7,826,592	12.8
1940	0	0	0	....	....
1941	1	2	0	84,261,841	1.2
1942	0	0	0	....	....
1943	1	10	4	25,437,434	3.9
1944	1	17	..	18,737,317	5.3
1945	2	17	10	19,584,343	5.1
1946	2	40	12	28,150,765	3.6
1947*	3	20	13	94,087,800	1.1

* *Estimated; subject to revision.*
(Figures include both revenue and non-revenue passengers and passenger miles.)

New Cargo Study

The newly-organized California Aeronautics Commission has adopted as its first major project the development of air cargo as a means of acquiring greater markets for perishable agriculture.

Transport Fleet In 1950 Estimated

Substantial growth in the U. S. transport fleet during the next three years has been forecast by Douglas Aircraft Co.

In December, 1947, planes operated in U. S. certificated scheduled domestic service numbered 797, and aircraft used by certificated American flag carriers and territorial lines totaled 174.

▶ **Domestic Planes**—Included in the domestic total at the end of 1947 were 83 DC-6s, 186 DC-4c, 447 DC-3s, 14 L-649 Constellations, 22 L-49 Constellations, 12 Lockheed Lodestars, 9 Martin 2-0-2s, 5 Boeing 307s, and 4 Boeing 247-Ds. Also listed were 5 Beech D-18Cs operated by All American Aviation and Florida Airways, 3 Sikorsky S-51 helicopters used by Los Angeles Airways, and 7 Stinsons used by All American.

Aircraft used on scheduled international and territorial service by U. S. certificated carriers as of December, 1947, included 3 DC-6s, 78 DC-4s, 66 DC-3s, 4 L-649 Constellations, 22 L-49 Constellations and 1 Beech D-18C.

▶ **Aircraft in 1950**—Douglas predicts the following fleets will be used in 1950:

• **U. S. domestic** scheduled airlines—10 Boeing Stratocruisers, 110 Constellations and DC-6s, 100 DC-3s, 80 DC-4s, 180 Convair 240s and Martin 2-0-2s, and 250 DC-3 replacements, for a total of 730 planes.

- **U. S. all-cargo** services—10 Curtiss-Wright C-46s, 50 DC-4s and 25 of a new type cargo-plane, for a total of 85 planes.
- **U. S. feederlines**—50 DC-3s, 24 other small transports and 30 helicopters, for a total of 104 planes.
- **U. S. flag** international and territorial carriers—40 Stratocruisers, 80 Constellations and DC-6s, 30 DC-4s, and 30 Convair 240s and Martin 2-0-2s, for a total of 180 planes.
- **All foreign airlines**—15 Boeing Stratocruisers, 100 Convair 240s and Martin 2-0-2s, 400 DC-3s, 180 DC-4s, 120 DC-6s and Constellations, 100 foreign-built transports, 110 DC-3 replacements, and 100 other small transports, for a total of 1,125.

Air Exports, Imports Continue Sharp Gains

Overseas air cargo transportation—a business of minuscule size in pre-war years—now moves more than $250,000,000 worth of goods a year, with all indications pointing to a continued rise in volume.

More than 60% of the foreign trade passes through Miami and New York. Uncertificated contract carriers have handled an important part of the freight volume at both ports.

Exports and imports during the first ten months of 1947 far exceeded the total for all of 1946, according to the Census Bureau. Over 33,800,000 lb. of freight and express worth $155,851,000 were exported in the first ten months of last year against 22,667,000 lb. worth $115,278,000 in the 12 months of 1946. Imports during the first ten months of 1947 aggregated 9,201,000 lb. worth $69,950,000 compared to 7,130,000 lb. worth $60,215,000 in all of 1946.

GCA Radar Systems

Ground Control Approach radar facilities are operated by CAA at three airports, by Navy at 25 air stations, and by Air Force at 29 air bases, all listed by CAA as available to civil pilots in emergencies. Navy and Air Force facilities usually require a 30 minute minimum alert before beginning GCA operation where services are not continuous. Facilities are:

▶ **CAA-Operated** — Chicago Municipal Airport, LaGuardia Field (N.Y.) and Washington National Airport (D.C.) all operating continuously.

▶ **Navy-Operated**—Atlanta (Ga.) Naval Air Station; Atlantic City (N.J.) NAS; Cherry Point (N.C.) Marine Corps Air Station; Corpus Christi (Texas) NAS; El Toro (Calif.) MCAS; Glenview (Ill.) NAS; Grosse Ile (Mich.) NAS; Jacksonville (Fla.) NAS also known as Lee Field; Los Alamitos (Calif.) NAS; Memphis (Tenn.) NAS; Miramar (Calif.) OLF; Moffett (Calif.) NAS; Floyd Bennett (N.Y.) NAS; Norfolk (Va.) NAS; Oakland (Calif.) airport; Olathe (Kan.) NAS; Patuxent River (Md.) NAS; Port Columbus (Ohio) NAS; Quonset Point (R. I.) NAS; Saufley Field (Fla.) NAAS; Seattle (Wash.) NAS; Squantum (Mass.) NAS; Whidbey Island (Wash.) NAS; Wold-Chamberlain Field, Minneapolis.

▶ **Air Force-Operated**—Andrews Field (Md.); Barksdale Field (La.); Biggs Field (Texas); Clinton Co. AFF (Ohio); Davis Monthan Field (Ariz.); Dow Field (Maine); Eglin Field (Fla.); Fairfield-Suisun AFF (Calif.); Ft. Worth AFF (Texas); Great Falls AFF (Mont.); Grenier Field (N.H.); Hill Field (Utah); Langley Field (Va.); Lowry Field (Colo.); MacDill Field (Fla.); March Field (Calif.); Mather Field (Calif.); Maxwell Field (Ala.); McChord Field (Wash.); Mitchel Field (N.Y.); Wright-Patterson Field (Ohio); Rapid City AFB (S.D.); Scott Field (Ill.); Selfridge Field (Mich.); Smoky Hill AFF (Kan.); Spokane AFF (Wash.); Tinker Field (Okla.); Tyndall Field (Fla.), and Westover Field (Mass.).

Aircraft Nationality Marks

Country	Nationality Marks
Afghanistan	YA
Australia	VH
Belgium and Colonies	OO
Bolivia	CB or CP
Brazil	PP or PT
British Colonies	VP, VQ, VR
Burma	XY
Canada	CF
Chile	CC
China	XT
Colombia	HK
Costa Rica	TI
Cuba	CU
Czechoslovakia	OK
Denmark	OY
Dominican Republic	HI
Ecuador	HC
Egypt	SU
El Salvador	YS
Ethiopia[1]	ET
France, Colonies	F
Greece	SX
Guatemala	LG
Haiti	HH
Honduras	XH
Iceland	TF
India	VT
Iran	EP
Iraq	YI
Ireland	EI
Lebanon[1]	LR
Liberia[1]	LI
Luxembourg	LX
Mexico	XA or XB
Morocco	CN
Netherlands	PH
Netherlands East Indies	PK
Netherlands West Indies	PJ
Newfoundland	VO
New Hebrides	YJ
New Zealand	ZK
Nicaragua	AN
Norway	LN
Panama	RX
Paraguay	ZP
Peru	OB
Philippine Commonwealth[2]	PI
Poland	SP
Portugal	CS
Portuguese Colonies	CR
Spain	FC
Surinam	PZ
Sweden	SE
Switzerland	HB
Syria[2]	
Thailand	HS
Turkey	TC
Union of South Africa	ZS
United Kingdom	G
United States of America	N
Uruguay	CX
Venezuela	YV
Yugoslavia	YU

[1] *The nationality marks herein are provisional.*
[2] *Nationality mark will be selected at future date.*

New Cargo Regulation

CAB has issued a special Civil Air Regulation permitting scheduled all-cargo carriers to continue operating under CAR Part 42 instead of the more stringent Parts 40 and 61 pending Board action on their applications for route certificates.

Passenger Fares Show Mixed Trend

The long-term downward trend in domestic airline passenger fares has been broken by skyrocketing costs and wages showing little promise of stabilizing.

Domestic carriers were forced to boost tariffs twice during 1947. International operators, already maintaining a higher rate level, kept fares on a more even keel.

From a high of slightly under 6 cents a mile in 1938 (when the domestic carriers' rates and fares first became subject to regulation) passenger tariffs dropped to about 5 cents a mile in the spring of 1945 and to 4.5 cents in August, 1945.

► **Two Increases**—In April, 1947, the average domestic fare went back up to 5 cents, and by the first of 1948 most carriers had instituted another 10 percent increase to about 5.6 cents a mile. This level, the airlines point out, is still under the average prewar fare.

Fares offered by U. S. flag carriers also are below prewar rates. Present tariffs over the North Atlantic average slightly under 9 cents a mile and in the Pacific a little over 8 cents. Until this month, when Pan American Airways and Panagra lifted rates 10 percent, U. S. carriers operating to Latin America charged a bit under 8 cents a mile.

► **Long Term Trend**—Average passenger revenue per revenue passenger mile received by U. S. domestic and international carriers between fiscal 1938 and fiscal 1947 was:

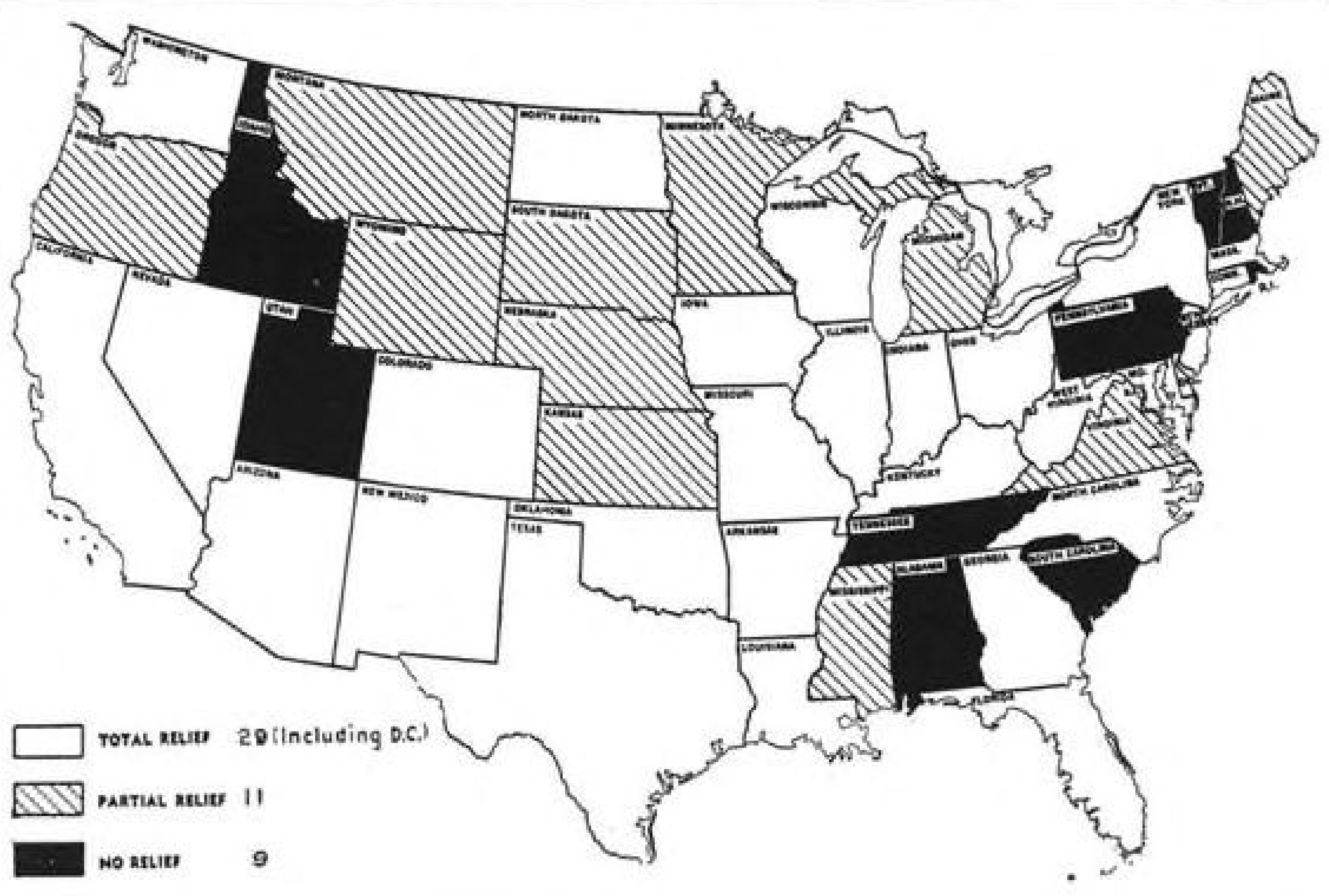
	Cents per Pass. Mile	
Year	Domestic	International
1938	5.26	9.03
1939	5.15	9.19
1940	5.09	8.89
1941	5.06	8.68
1942	5.05	10.23
1943	5.54	7.98
1944	5.20	7.94
1945	5.24	8.02
1946	4.73	8.68
1947	4.74	7.91

Domestic Airmail Volume At New Peak in 1947

Domestic airmail volume set a new peace-time record last year, rising 9 percent over 1946 to 80,646,837 lb.

Only during the war years of 1943, 1944 and 1945, when hundreds of millions of airmail letters were sent to and from the Armed Forces, did the total exceed 1947's. Last year's business was more than double the 1941 figure.

Volume for December, 1947—9,116,693 lb.—reached a peace-time monthly peak.



—Airlines Protest Heavy Tax Burden

The airlines' fight against discriminatory taxation is being waged with renewed vigor during the postwar period. Objectives include not only the elimination of present unjust levies but prevention of a welter of new tax laws proposed by legislators of revenue-hungry states.

In its 1948 report, the President's Air Policy Commission warned of the undue burden of taxation borne by the airlines. The Commission pointed to: 1. Multiple taxation by states and their subdivisions on air carriers engaged in interstate commerce; 2. Absence of adequate judicial protection against multiple taxation; and 3. Absence of statutory standards or administrative procedures for avoiding multiple tax burdens.

▶ **Constant Threat**—Taxation of aviation fuel by the states is an anomaly caused by the fact that state taxes on gasoline were intended to be paid by the operators of automobiles, the Commission declared. The policy group noted that a number of states were making total or partial refunds of such taxes, but added that "there is no assurance that these exemptions and refunds will not be rescinded, or taxes increased, by state legislation at any time."

Progress against the fuel tax was shown in an Air Transport Association survey as of Jan. 1, 1948. At that time, 29 states, including the District of Columbia, granted airlines either a total exemption or a full refund of fuel taxes. In 1947, Ohio and Oklahoma joined the list of states providing a full refund of aviation fuel taxes. Nebraska and South Dakota provided substantial refunds.

▶ **No Relief**—The nine states giving the airlines no relief from fuel taxes as of Jan. 1, 1948, were Idaho, Utah, Tennessee, Alabama, South Carolina, Pennsylvania, Vermont, New Hampshire and Rhode Island. The tax in these states ranged from seven cents a gallon in Tennessee to two and one-half cents in Idaho.

The airlines contend that state aviation fuel taxes prevent rate reductions and curb mass air transportation. As a result of the taxes, ATA points out, there is a corresponding need for higher federal mail-rate payments.

Court Bars Review Of Overseas Awards

Citing the strategic importance of international air route patterns to the national welfare, the U.S. Supreme Court has ruled that CAB orders approved by the President and affecting certificates for overseas or foreign air transportation are not susceptible to judicial review.

The court, by a five to four majority, held that a CAB decision on foreign and overseas routes is not final (and thus not subject to review) since it must be approved by the President. "After executive approval has been given, the final orders embody Presidential discretion as to political matters beyond the competence of the courts to adjudicate." (All domestic route orders issued by CAB are subject to court review.)

▶ **Waterman Case**—The question of law came before the Supreme Court as a result of the Latin American route decision in May, 1946, in which CAB granted Chicago & Southern Air Lines a New Orleans-San Juan, P.R., link sought by Waterman Steamship Corp. A previous circuit court decision held that any CAB order is incomplete until court review, after which, in the case of overseas or foreign routes, the completed action must be approved by the President. "Presidential approval," the minority of the Supreme Court declared, "cannot make valid invalid orders of CAB."

Waterman's contention that the problems involved in the establishment of foreign air routes are of no more international delicacy than those involved in routes for water transportation was disputed by the Supreme Court majority. The majority said that "it is common knowledge that aerial navigation routes and bases should be prudently correlated with facilities and plans for our national defense and raise new problems in the conduct of foreign relations."

▶ **Presidential Control**—The majority held that in foreign and overseas route cases, CAB's order is subordinated to a positive control by the President. "The President," it declared, "both as the Commander in Chief and as the nation's organ for foreign affairs, has available intelligence services whose reports neither are nor ought to be published to the world. It would be intolerable that the courts, without the relevant information, should review and perhaps nullify actions of the executive taken on information properly held secret.

Airfreight Booms In Postwar Period

The dramatic postwar development of air cargo is being watched with keen interest by U. S. military planners, who see in it promise of a transport fleet far larger than that which could be supported by commercial passenger and mail traffic alone.

In recommending that the Federal government set up an Aircraft Development Corporation, the President's Air Policy Commission stated that the unit's initial and primary task should be the development of an all-cargo transport. High Air Force officers have declared that direct government aid for development of new commercial airplanes should be channeled entirely toward cargo craft since they are far more adaptable to military uses than passenger ships.

▶ **High Potential**—Predictions that air cargo eventually will be the most important type of air traffic have abounded in the postwar period. Secretaary of Commerce W. Averell Harriman has emphasized that the air-freight and express potential is considerably greater than the passenger potential. Pan American Airways' cargo sales manager predicts that within 10 years PAA will be operating as many all-cargo planes as passenger craft.

In 1941, the last prewar year, the domestic airlines flew 5,242,000 ton miles of express. Freight tonnage was practically non-existent. In 1946, the first full postwar year, the certificated domestic lines flew 19,412,000 ton miles of freight and 24,072,000 ton miles of express, while independent contract and nonscheduled operators flew another 47,000,000 ton miles of freight.

▶ **Future Growth**—During 1947, domestic express increased to about 30,000,000 ton miles, while freight carried by the certificated lines soared to over 40,000,000 ton miles. Uncertificated carriers flew an additional 60,000,000 ton miles of freight.

By 1950, aircraft manufacturer Donald Douglas expects domestic airfreight and express volume to expand to 327,000,000 ton miles, with U. S. flag lines flying another 63,000,000 ton miles of cargo overseas.

Airfreight, contrary to predictions, has not been confined to high-value, low weight articles.

IATA Director General Sees Steady Progress

The air transport industry must spend the next 30 months in consolidation before going on to further dynamic developments, in the opinion of Sir William P. Hildred, director general of the International Air Transport Association. After this period, the IATA head believes, flying will become steadily cheaper, safer, faster, more dependable and more comfortable.

"The general public should not expect things to happen too fast in the immediate future," according to Sir William. "Perhaps the publicity given to many technical developments which are still experimental has created the impression that we shall have jet propulsion on a commercial scale next year, rocket propulsion in ten years and weekends on the moon in 15 years by atomic power. I do not think that things will move quite so fast."

Asserting that the application of technical developments to commercial practice has always been fairly slow and is likely to get slower, the IATA director general explains that the cost and size of new aircraft have increased from $4 a pound for a 20,000 lb. plane to nearer $10 a pound for the new models weighing up to 70 tons.

"A second reason is that as the size of an aircraft increases, so does the seriousness of any accident happening to it.

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RW-3890, Aviation Week
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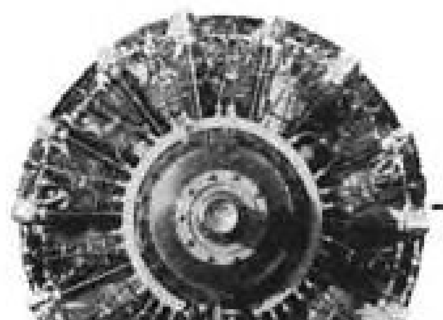

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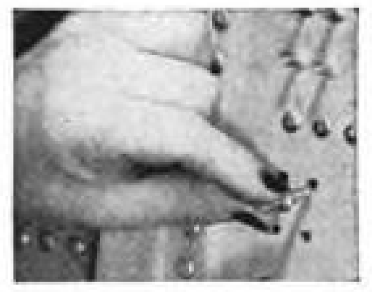

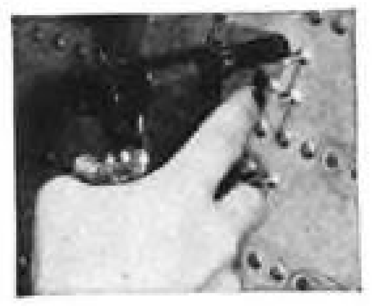

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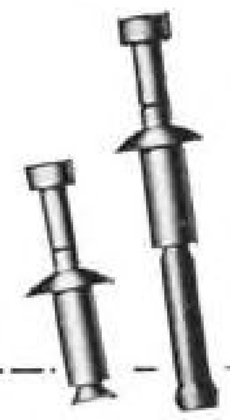

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AVIATION WEEK—FEBRUARY 23, 1948

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