AVIATION WEEK

A McGRAW-HILL PUBLICATION

Oct. 23, 1950

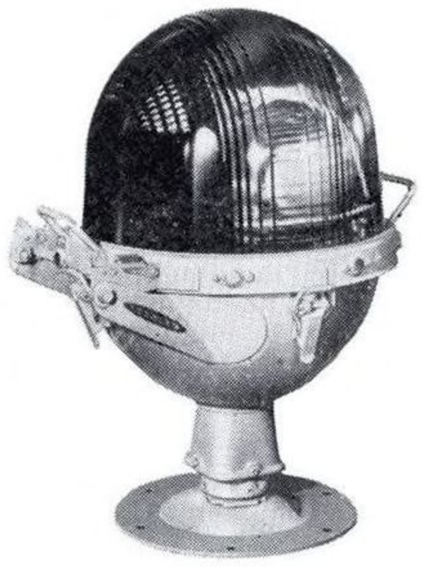
$6.00
A YEAR

Ask the men who KNOW L-M high intensity runway lighting

Ask airport managers, airline men, and pilots who use and know L-M high intensity runway lighting. They can tell you from their own experiences and observation how important it is to have the 180,000 beam candle power, the freedom from halo and glare, that only L-M lighting offers, with its extremely high intensity and controllable beam. Then ask the L-M Field Engineer for details or write Airport Lighting Division, Line Material Co., East Stroudsburg, Pennsylvania (a McGraw Electric Company Division).

Francis Fox at Worcester KNOWS!

Worcester, Mass., was one of the first city-owned airports with L-M High Intensity Lighting on all runways. Manager Francis T. Fox and members of the City Airport Commission made a very careful check of lighting and the experience of other airport managers before the decision was made. Captain Fox, a pilot himself, recently told us: "We've had nearly three years of operation now with high intensity lights on all runways. Our experience has convinced us that our choice was a wise one, and our lights have proved their value with better operations in all kinds of weather."



L-M's 180,000 cp. high intensity runway light with the famous controllable beam.

J. E. Hightower at Knoxville KNOWS!

"Here in the Tennessee mountains, we get all kinds of weather," says J. E. Hightower, manager of Knoxville's McGhee Tyson Airport. "And not all of it is good flying weather. So we are very much concerned with the high penetration of our lights, so that we can give the pilot the best possible delineation of the runway. Our experience with the lights has been most gratifying, and an important factor in maintaining a good safety record here."

Vic Dallin at Philadelphia KNOWS!

"Whenever other eastern airports are closed by weather and our Philadelphia International Airport is marginal, all pilots appreciate the great advantage of the controllable-beam high intensity runway lights," says J. Victor Dallin, chief of Philadelphia's Bureau of Aeronautics. "We have had as many as 79 airliners in a single day take refuge here due to weather conditions. We are presently extending our instrument runway and
feet and naturally this extension will
these lights."

LINE MATERIAL . . . Airport

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

These leading U. S. Navy

SHIPBOARD FIGHTERS

are *POWERED* by Westinghouse

All twin engine fighters for the Navy's newest carrier-based jet squadrons are powered by the J-34. This light and slim Westinghouse engine lends itself ideally to a twin engine installation which in turn provides the reassuring safety factor of single engine operation in times of emergency.

The designers of these airplanes chose the J-34 because it combines high power with low weight. These features plus the power, dependability and performance of the engine assure that the air striking force of the United States Navy will be second to none. J-54003-B

Westinghouse

AVIATION GAS TURBINES

B.F.Goodrich

How to get more landings out of a lining

A NEW KIND of brake block that lasts longer, provides better braking and saves weight has been developed by B. F. Goodrich. It is now in use on the C-124 Globemaster II (above) built by the Long Beach Plant of Douglas Aircraft Company, and on the B-36, B-45 and B-47.

Secret of the new brake block is revealed in the inset photo above. There are *no rivets*. Instead, the brake lining is *cemented* onto a special magnesium shoe with a new, super-strong B. F. Goodrich cement.

Elimination of the rivets makes it possible to use *more* of the brake lining. You get full, positive braking down almost to the metal backing!

The magnesium backing also makes the brake block more rigid, providing full, even contact between lining and drum for better braking, slower wear. The magnesium shoe is perforated for more rapid dissipation of heat. And this construction is both lighter and stronger than the rivet-type.

The new-design B. F. Goodrich brake also has a narrow-cavity expander tube that gives greater braking pressure with less fluid. And a new spider-type frame that provides extra strength with less weight.

The basic BFG expander tube design offers still other advantages. Quicker, easier maintenance. No locking or grabbing. Less weight for a given amount of kinetic energy than any other brake design. Ability to take emergency overloads better. Longer life.

Constant improvement of B. F. Goodrich brakes is a typical example of how BFG research works for you. It pays to specify "B. F. Goodrich". *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

FIRST IN RUBBER

Aviation Week

ABP Member ABC

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NEWS DIGEST

DOMESTIC

Air Traffic Conference of the Air Transport Assn. elected the following airline representatives as its officers for 1951: president, Walter Sternberg, vice president—traffic and sales for National; first vice president, James W. Austin, vice president—traffic and sales, Capital; second vice president, Harding Lawrence, vice president—traffic, Pioneer.

Air Force appointments made by the President included that of Lt. Gen. Nathan F. Twining as Vice Chief of Staff with the rank of four star general. Lt. Gen. Lauris Norstad was appointed Commander-in-Chief of the U. S. Air Forces in Europe, succeeding Lt. Gen. John K. Cannon. Lt. Gen. Idwal H. Edwards was appointed Deputy Chief of Staff, Operations. He had been acting DCSO since May 1950. Gen. Norstad had been Acting Vice Chief of Staff. Gen. Cannon, whom he succeeds, has been named Commanding General of the Tactical Air Command at Langley AFB, Va.

An employment agreement covering about 1200 Pan American Airways pilots has been signed by the airline with the Air Line Pilots Assn. The contract, to be effective from Nov. 1, 1950 through Dec. 31, 1951, provides pay increases for pilots and copilots, liberalized transfer procedures and improved working conditions. Pilots will receive a guaranteed wage plus extra money depending on aircraft weight and speed, with pay increases after 70 hours a month instead of the previous 80 hours. Copilots pay will range from $300 a month to $700 a month for 70 hours work, compared with $275 to $625 for 80 hours under the previous contract.

Joseph J. O'Connell, Jr., former CAB chairman, has joined a law firm—now Chapman, Bryson, Walsh & O'Connell—with offices in New York and Washington. The Washington office opened Oct. 1.

A Northwest Airlines 2-0-2 crashed near Almelund, Minn., killing five of the six men aboard for a routine check flight. The plane took off from Minneapolis, 50 miles away.

Maj. Gen. Orvil A. Anderson, former head of the Air War College at Montgomery, Ala., has been shifted to the command of the 3750th Technical Training Wing, Sheppard AFB, Wichita Falls, Tex. Gen. Anderson was suspended from the War College post for allegedly favoring "preventive war."

The American Airlines DC-6 that landed safely last August after a propeller and engine tore loose and ripped a hole in its fuselage as it flew over the Rockies is being test flown after preliminary repairs.

Striking employes at Wright Aeronautical Corp., Wood-Ridge, N. J., rejected union pleas to return to work accompanied by company offers of salary increases. Neither of two workers' groups involved would accept limitations of grievance procedure and a request that contract negotiations be by-passed in December and go over to October, 1951.

FINANCIAL

Aeroquip Corp. has declared a quarterly dividend of 5 cents per common stock share, payable Nov. 15 to stockholders as of Nov. 1.

40

PAN AMERICAN WORLD AIRWAYS, INC.
26-19 BRIDGE PLAZA NORTH
LONG ISLAND CITY 1, NEW YORK

No. 20380 1-114/210

September 25, 19 50

PAY TO THE ORDER OF American Overseas Airlines, Inc. $17,450,000.00

Seventeen Million Four Hundred Fifty Thousand and xx/100 DOLLARS

PAN AMERICAN WORLD AIRWAYS, INC.

TO THE NEW YORK TRUST COMPANY
MADISON AVE. AND FORTIETH STREET
NEW YORK

BIGGEST CHECK in the history of airline transactions was paid by Pan American World Airways to American Overseas Airlines late last month when PAA took over AOA's employes, assets and routes. Pictured above, the $17,450,000 document was signed by two PAA officials—Comptroller J. S. Woodbridge and Treasurer R. G. Ferguson.

AVIATION CALENDAR

Oct. 22-28—31st annual meeting, American Welding Society, Hotel Sherman, Chicago, Ill.

Oct. 23-27—Fall general meeting of the American Institute of Electrical Engineers, Skirvin Hotel, Oklahoma City.

Oct. 24-26—Third biennial Materials Handling Conference, sponsored by Westinghouse Electric Corp., Hotel Statler, Buffalo, N. Y.

Oct. 24-26—Annual meeting of Society for Non-Destructive Testing, in conjunction with National Metals Congress, Morrison Hotel, Chicago.

Oct. 26-27—Fifth annual Arizona aviation conference, sponsored by the aviation committee of the Tucson Chamber of Commerce, Tucson, Ariz.

Oct. 30-31, Nov. 1—Flight Safety Foundation annual Safety Seminar, Denver, Colo.

Nov. 1-3—Eleventh annual convention, National Aviation Trades Assn., Chase Hotel, St. Louis.

Nov. 9-10—Sixth annual meeting, The Magnesium Assn., Biltmore Hotel, N. Y.

Nov. 14—ICAO rules of the air and air traffic control meeting, fourth session, Montreal, Canada.

Nov. 28-30—Airport fire safety clinic sponsored by the National Fire Protection Assn. committee on aviation and airport fire protection, Baker Hotel, Dallas.

Nov. 29-Dec. 1—Eighth annual meeting of Aviation Distributors and Manufacturers Assn., Ambassador Hotel, Los Angeles.

Nov. 30—Airport fire safety clinic, sponsored by Committee on Aviation and Airport Fire Protection of the National Fire Protection Assn., Baker Hotel, Dallas.

Dec. 7-8—Auction sale of aeronautical books, furniture, paintings, prints and furnishings, Plaza Auction Rooms, 9 E. 59 St., New York.

Dec. 16—14th Wright Brothers Lecture, Institute of Aeronautical Sciences, U. S. Chamber of Commerce Auditorium, Washington, D. C.

Jan. 8-10, 1951—Florida Air Pilots Assn. air show and exposition of planes and equipment, Opa-Locka Airport, Fla.

Jan. 15-18—Plant maintenance show and concurrent conference on plant maintenance techniques, Cleveland, Ohio.

Jan. 29-Feb. 1—19th annual meeting of the Institute of Aeronautical Sciences, Hotel Astor, N. Y.

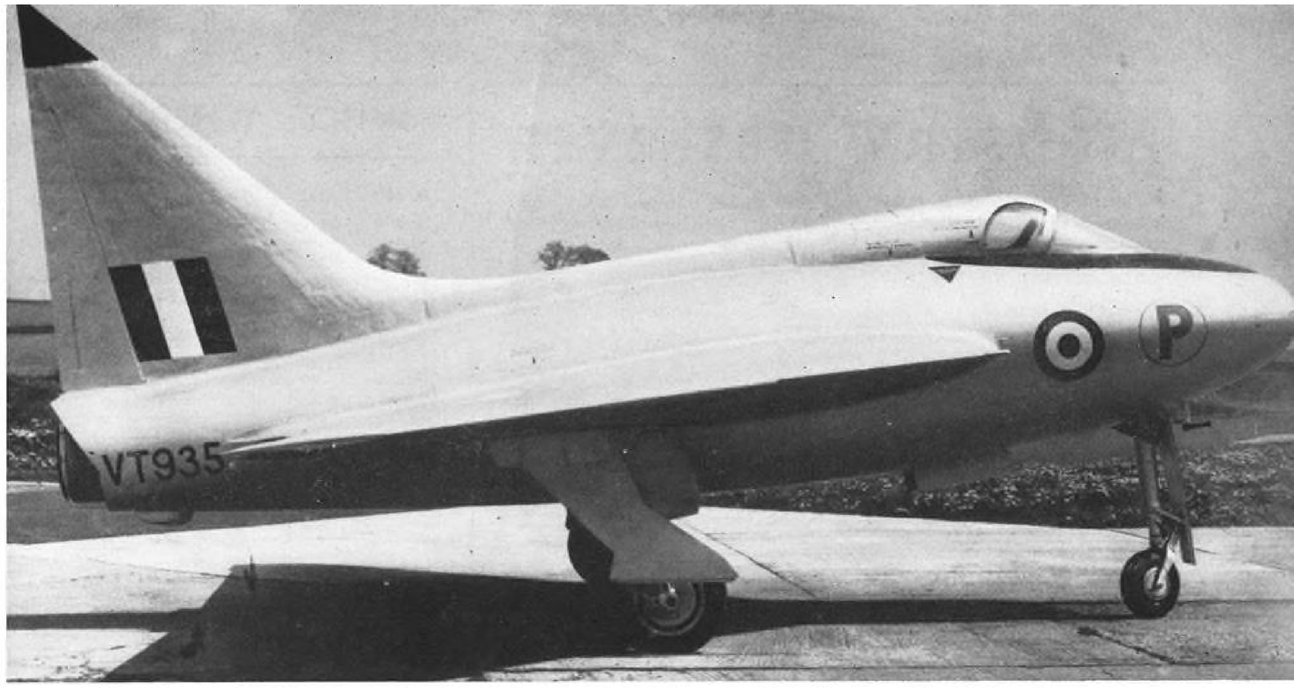
Apr. 24-26—ATA annual engineering and maintenance conference, Hotel Drake, Chicago.

Sept. 7-11—Third annual Anglo American Aeronautical Conference, convened jointly by Royal Aeronautical Society and IAS, Brighton, England.

Sept. 10-14—Sixth national instrument conference and exhibit, sponsored by Instrument Society of America, Sam Houston Coliseum, Houston, Tex.

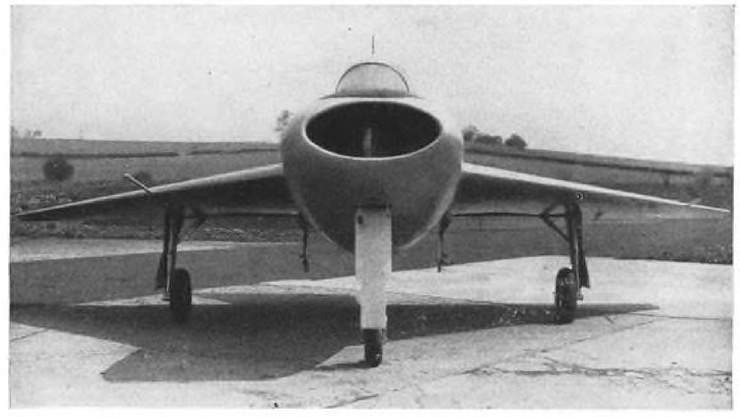
PICTURE CREDITS

9—(top) Keystone, (bottom left) Convair, (bottom right) Sikorsky; 11—(upper) Howard Levy, (lower) Chase; 12—Boeing; 13—Lockheed Aircraft Corp.; 14, 15—Convair; 17—Pratt & Whitney; 22, 23—Douglas; 34—McGraw-Hill World News; 57—Copyright, Airborne Instruments Lab.; 58—(lower) CAA; 59—(upper) Sperry Gyroscope Co.; 61—PAA.

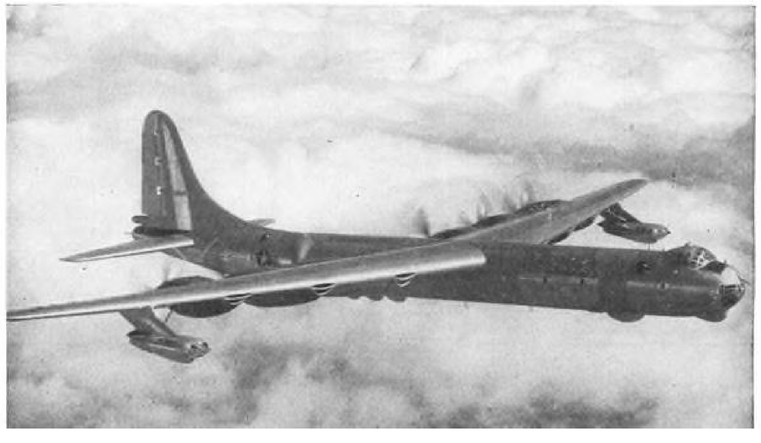


ANOTHER TRIANGLE—Boulton-Paul's P.111, second of three current British delta-wing aircraft, is powered by Rolls-Royce Nene 5000-lb. jet engine fed from bifurcated inlet. Sweepback of wing leading edge is approximately 45 deg.; trailing edge is straight. Wingspan is 33 ft. 6 in., overall length, 26 ft. 1 in., height to fin, 12 ft. 6 in.; wing area, 287 sq. ft. It is in same class as Avro's 707B (AVIATION WEEK Oct. 9). Plane is fitted with ejection seat. Fuel is carried in two tanks in each wing, near leading edge.

News Picture Highlights



BIG EYES—Newest flight of Convair's RB-36 reconnaissance version of the B-36 bomber shows the variety of special housings along the underside of the fuselage. For photographic purposes, the RB-36 carries 14 cameras in the forward bomb bay, one with a 42-in. focal length lens.



H-19 WETS ITS FEET—USAF already is equipping its new Sikorsky H-19 eight-to-ten-place helicopter with the type of amphibious gear used on the four-place H-5H. It adds versatility, says the Air Force.

INDUSTRY OBSERVER

► **Fairchild is expected to license its C-119 Packet transport for military manufacture in England and France, with sales restricted to Sterling Bloc countries.**

► In spite of the huge orders which Republic Aviation has for its F-84 jet fighters, approximately twice as many more may be built overseas by French and Italian plants under license as part of the Mutual Defense Assistance Program.

► **While Curtiss-Wright's Propeller division has pioneered the technique of using reverse propeller pitch for extremely rapid emergency descent, both Hamilton Standard and Aeroproducts are now getting into the act, as the technique gets greater acceptance by the military. First military airplanes to use it are expected to be the Boeing B-50 and Convair B-36 bombers, and the Navy's Grumman F8F and Chance Vought F4U fighters.**

► Air navigation equipment circles are buzzing that CAA's dropping of all 7 precision approach radars from the 1951 federal airways program is a revival of the old CAA prejudice on radar, which led to the violent ILS-GCA feud in government agencies.

► **First two Avro Canada CF-100 twin-jet night fighters have now racked up over 50 flights, while two of Avro Canada's 6500-lb.-thrust Orenda turbojet engines have made more than 20 flights in their Lancaster flying test bed installation. Orenda ground test runs now total more than 3000 hr.—one engine has already had about 784 hr. of test run without overhaul.**

► Grounding of the four-place Dutch Promoter air taxi plane, developed by Fokker and now built by Royal Dutch aircraft factories, is expected to be lifted shortly following thorough investigation into the matter of propeller vibration troubles which have resulted in the breaking of the controls of the air taxi craft.

► **Observers who looked at the British Sapphire jet engine, on display at the Pentagon recently along with the Armstrong Siddeley Mamba and Python turboprops, say that the Sapphire displayed was not complete enough to give away many engineering details.**

► At least two American engine companies are looking into ducted fan developments as the next step beyond propellers. Idea is to use a multi-stage short-bladed fan something like a jet engine compressor, turned by a unit comparable to a turboprop engine, and all shrouded into one nacelle-like casing which ends in a tailpipe.

► **Consolidated Vultee now has about one-fourth of its B-36 program subcontracted to other manufacturers in such an extensive program that a new subcontract department has been set up to handle it at Ft. Worth. Principal subcontractors, in addition to Bell Aircraft which has been making jet engine pod nacelles for the B-36D since this model was started, are: Beech, making lower nacelles, landing gear doors, rudders, vertical fins; Spartan (Tulsa), making engine mount extensions, turret doors and elevators; Intercontinental (Garland, Tex.), making wing center section trailing edges, and Texlite (Dallas), making horizontal stabilizers.**

► National Airlines is "plushing" up the DC-6Bs it ordered in coach version from Douglas for first-class daytime service, indicating it has accepted, however unwillingly, CAB's decision against the daylight DC-6 New York-Miami coach run. National had taken delivery on all but one of the four planes, and it was too far along to change the interior at the Douglas plant. But National is prepared to reconvert them to 68-passenger coaches anytime that the CAB gives the authorization for the daylight coach service.

WHO'S WHERE

In the Front Office

Bruce Smith has been made director of engineering of Ryan Aeronautical Co. Smith stepped up from the position of chief engineer of the firm's Airplane division. Before coming to Ryan in 1949, he was chief design engineer for 9 years at Convair. Executive engineer under Smith will be **W. T. Immenschuh**, formerly project engineer.

Milton G. Montgomery has been appointed director of traffic for Flying Tiger Line, succeeding **Albert J. Jansen**, who returns to duties as assistant to the president. Montgomery has had 14 years of freight traffic experience with trucks and railroads and served as transportation officer of the Fourth Air Force during the war. Jansen was a KLM and Seaboard & Western executive.

Promotion of **A. H. Engstrom** to acting engineering manager for American Hammered Piston Rings made by the Metal Products division, has been announced by the Koppers Co. He was assistant to the manager of the engineering and research department.

Changes

Col. J. A. Villamor, consultant on Far East aviation to the Administrator of Civil Aeronautics, has resigned from the CAA to go back on active duty with the Air Force. Villamor formerly was Administrator of the CAA of the Philippines and general manager of the National Airports Corp. CAA also announced the resignation of **Glen A. Gilbert**, air traffic control expert, to enter private business.

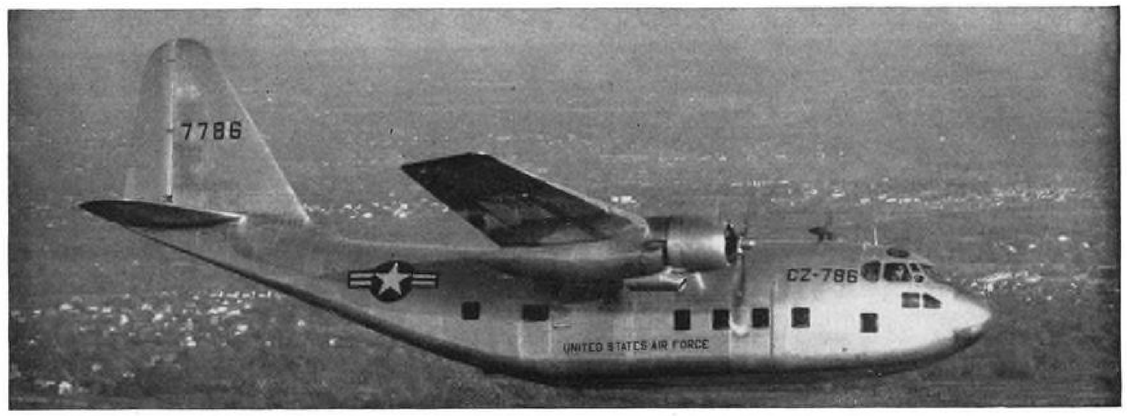
Jean L. (Skip) Ziegler has been named chief of flight test at Bell Aircraft. A rocket engineer for Bell in 1948, Ziegler returns from North American Aviation where he put in a year as a pilot-engineer on the F-86, B-45 and AJ-1. He formerly was a production test pilot for Curtiss-Wright.

What They're Doing

RESTING ON HIS LAURELS: J. W. Larson, Convair's chief engineer at Ft. Worth, stretches out on one of the two new bunks being added in the forward cabin of B-36D bombers. Without these, crews would have to split their sack time between six bunks.

AVIATION WEEK VOL. 53, NO. 17 OCTOBER 23, 1950

IMMEDIATE PRODUCTION for a limited quantity will be started on YC-122C, one winner in the assault transport group, and . . .



FUTURE PRODUCTION in quantity will be started on Chase's XC-123, both planes to be produced in Birmingham.

Assault Transport Order Goes to Chase

With both its entries in the competition winners, company moving to larger plant.

By Ben S. Lee

Chase Aircraft Co. is the principal winner of the recent assault transport competition and will move from Trenton, N. J., to produce the YC-122C and XC-123 assault transports at the former Bechtel-McCone-Parsons B-24 modification plant at Birmingham, Ala., AVIATION WEEK has learned.

As a result of its success in the competition which pitted it against Northrop Aircraft (C-125A Raider) and Fairchild Engine and Airplane Co. (stripped down C-82 Packet), Chase Aircraft will be asked for immediate but limited production of the YC-122C, while it tools up for quantity production of the XC-123.

► **Assault Controversy**—The assault transport, principal point of contention between Army and Air Force over roles, needs and technique in the tactical air support of ground troops was a hot issue during "Exercise Swarmer" conducted in the Carolinas this summer. Success of the Phase I problem in the controlled maneuver of Swarmer—initial airhead assault—was doubtful, according to critiques. Maintaining the airhead (AVIATION WEEK May 8) also presented many unprecedented battle problems.

Lessons learned at Swarmer, strengthening previously presented Army pleas, indicated that an assault transport was urgently required in support of the unified Army-Air team. Recent lessons learned the hard way in Korea (AVIATION WEEK Aug. 21) have strengthened that contention.

As a result of Swarmer, the long delayed assault transport evaluation competition was ordered and took place in rapid sequence at Wright-Patterson AFB, Ohio, Elgin AFB, Fla., and at Ft. Bragg, N. C.

► **Thorough Evaluation**—The actual evaluation of the Northrop C-125A, the modified Fairchild C-82, Chase's YC-122C, XC-123 and G-18 and G-20

122C, XC-123 and G-18 and G-20 gliders took place at Eglin and proved a masterpiece in test technique (AVIATION WEEK Sept. 11).

All entries suffered considerable damage during rough field landing and take-off problems. Eglin test flight personnel stated that in conformance with military requirements the test included maneuvers probably more rigorous than an assault transport would likely face in actual battle.

The tactical evaluation, conducted at Eglin and later at Ft. Bragg, sought to prove among other special examinations that a powered aircraft could get into and out of the same airhead areas as could a towed assault glider under combat conditions.

Army has long been concerned with the high loss ratio of personnel and equipment in the towed glider in assault use. This is borne out by statistics of loss in combat operations sustained by gliders and infantry teams during World War II.

Similarly, Army is concerned about high loss ratio of airborne troops parachuted into assault operation. It admits high priority for initial airborne assault troops, but deplores that so far it must depend entirely upon parachuted troops to secure an airhead.

► **Conversion Scrapped** — Originally, USAF had under consideration an interim plan to convert a number of the obsolescent C-82 Packet troop carriers to assault transport category. The plan is now said to be shelved in favor of immediate production of the YC-122C for a number of reasons. Among them is the urgent need of C-82s now available for presently assigned missions of troop and cargo transport. Another factor opposing conversion of a "sizeable quantity" of the C-82s is cost. It has been estimated that it would require from $35,000 to $45,000 each for assault transport modification. USAF sources consider this cost excessive for a temporary expedient.

► **Northrop**—Sources close to top Northrop Aircraft management report that the C-125A has already been written off company books as a loss. Northrop had hoped to convince USAF that the C-125, developed originally in a lighter version to capture the short-haul commercial transport market, could be converted to meet Army Field Forces need for assault transport. USAF now has a service quantity of C-125s in Arctic rescue operation.

While award of the assault transport contract to Northrop would have come as an added "plum," contracts for nearly 500 F-89 Scorpion jet fighters out of fiscal '50 and '51 regular and supplemental budgets, not counting programmed production for 1952 and 1953, will keep Northrop at previously planned production levels.

► **Fairchild**—Meanwhile, officials of Fairchild, while watching the entry of another manufacturer in the medium transport field, are hard at work at the design of a new four-engined transport as eventual replacement for the C-119. Air Force is now crystallizing requirements for such a transport.

C-119 production schedules for both domestic military requirements and to augment troop and cargo transport needs of nations allied under the North Atlantic Treaty are exceedingly heavy. Plans are fairly firmed up for acquisition of another assembly plant to speed production. If Fairchild is awarded some of USAF's trainer production contract, a second plant will be essential to meet production schedules of both C-119 and T-31.

► **Chase**—Assignment of the Birmingham, Ala., B-24 modification plant to Chase Aircraft has not as yet been officially sanctioned. But Chase will certainly need larger quarters for planned USAF production of the C-122 and C-123. Company officials state only that it is negotiating for larger facilities to handle planned expanded production. Washington sources indicate that Chase is very probably scheduled for Birmingham.

YC-122C, the lighter of the two Chase assault transports is a twin-engined version of the CG-18 glider. The plane features rear ramp loading. The ramp operates by hydraulically actuated full width doors. The main door opens downward and forms a shallow ramp for vehicle loading. Door may be opened in flight for para-dropping men and supplies.

Heavy shipments of vehicles without power can be pulled aboard by means of a cable running through the craft to a power source. Provisions for loading at truck-bed height are also incorporated. Reversible propellers of the YC-122C enable the plane to back into loading areas to receive or discharge typical military loads. These include: A one and one-half ton truck, 105mm. howitzer, plus one jeep—or comparable combinations of wheeled units used by the armed forces.

For evacuation of wounded the plane can transport 24 litter patients and two medical attendants and all their equipment.

Capable of being towed by other aircraft from airfields or by snatch-pickup, the plane incorporates both tug and tow equipment in nose and tail sections.

Span of the YC-122C is 95 ft. 1 in.; length, 61 ft. 8 in.; height to fin tip, 24 ft. 1 in. Cargo compartment dimensions are: height, 6 ft. 6 in.; length, 31 ft. 8 in.; width, 7 ft. 8 in. Usable floor area, 240 sq. ft.; usable cubage, 1560 cu. ft.

Weight empty, 19,000 lb.; max. gross, 40,000 lb.; normal useful load, 13,000 lb.; max. useful load, 21,000 lb.

Top speed of the YC-122C is 240 mph.; cruising speed, 200 mph.; landing speed, 85 mph.; range, 1070 mi. with 650 gal. fuel; service ceiling, 29,100 ft.

Powerplant consists of two Wright R-1820-101 engines developing 1425 hp. at 2700 rpm. at takeoff.

Propellers are Curtiss, full feathering, reversible, three-bladed, of 12 ft. 6 in. diam.

XC-123, heavier Chase assault transport for which USAF will ask major production, tops its lighter counterpart by nearly 8000 lb. Developed specifically to fill Army's requirements for an assault transport as well as to meet certain USAF transport requirements, the XC-123 incorporates special welded steel nose structure, providing a heavy degree of crash protection to plane's occupants during assault operations; cockpit floor raised above the cargo compartment floor with a heavy bulkhead between cockpit and cargo compartment in case of a cargo shift; and jettisonable self-sealing fuel tanks.

The plane has a rear loading ramp for easy loading. The ramp can be lowered or raised to intermediate positions for direct loading of cargo from truck trailboard or cargo platform.

Conversion from cargo carrier to troop transport or to litter carrier for wounded can be accomplished within minutes with self-contained equipment.

AT FIRST HAND

First-hand information on the operation of a Boeing B-47 Air Secretary Thomas K. Finletter (right) and Under Secretary John A. McCone got first-hand information on the operation of a Boeing B-47 Stratojet recently during a flight over Carswell AFB at Ft. Worth, Tex. The Secretary handled the co-pilot's controls during part of the flight. McCone was at the navigator's post. Picture shows the pair in flight togs after landing.

As a personnel carrier the XC-123 can carry 60 fully equipped troops or 50 litter patients, 6 ambulatory patients and 6 medical attendants.

Designed to carry a useful load of 27,200 lb., the plane includes installation of a tow release mechanism in both the nose and tail, as it is designed to operate as a tow plane, or as a towed aircraft, either with or without engine nacelles.

Span of the XC-123 is 110 ft.; length, 77 ft. 1 in.; height to fin tip, 32 ft. 8 in. Cargo compartment dimensions are: height, 8 ft. 2 in.; length, 36 ft. 8 in.; width, 9 ft. 2 in.; usable floor area, 450 sq. ft.; usable cubage of the XC-123 is 3570 cu. ft.

Weight empty is 26,800 lb.; normal gross wt., 54,000 lb.; useful load, 27,200 lb.; max. gross wt., 70,800 lb.; useful load, 44,000 lb.

Of all-metal construction, the XC-123 is powered by two Pratt and Whitney R-2800-CB-14 engines rated at 2100 hp. on takeoff at 2800 rpm. Propellers are constant-speed, full-feathering, reversible, three-bladed, 15-ft. Hamilton Standard.

Top speed of the XC-123 is 245 mph.; cruising speed, 205 mph.; landing speed, 85 mph.; range, 1160 mi.; service ceiling, 29,000 ft.

Bristol Proteus Will Be Built in U.S.

An authoritative Defense Department spokesman has told AVIATION WEEK that a second powerful British gas turbine, manufactured by Bristol, has received approval for manufacture by Curtiss-Wright Corp.

It is probable the Proteus, single and twin power-pack, figures in the British package-engine deal. It is reported that a newer Bristol engine design is the principal attraction in the arrangement.

The Proteus single-airscrew turbine engine has a sea level power of 3200 shaft hp., plus 800-lb. static jet thrust.

The twin Proteus develops 6400 shp., plus 1600 lb. static jet thrust.

The coupled Proteus engines are scheduled to provide power packs for two of Great Britain's largest aircraft—the Bristol Brabazon Mk.2, and the Saunders-Roe Princess flying boat.

South Africa Tours

(*McGraw-Hill World News*)

Johannesburg—South African Airways will offer the public air excursions to enable them to undertake a 15-day round trip to Britain, the United States and Canada at reduced cost. Stopping places will be London, New York and Montreal. The excursion is a result of the recent air conference in Madrid.

SUPER-CONNIE shows its greater length when parked on the Lockheed ramp beside a conventional Model 749.

Lockheed Shows First Super-Constellation

Lockheed Aircraft Corp. apparently has decided its future course in transport aircraft: Now the Super-Constellation, first with compound engines, then with turboprop power; next a pure jet transport.

There will be no Lockheed transport designed especially for turboprops, at least according to present thinking. And turboprop power on the Super-Connie would be merely an interim step until airlines were ready for pure jet.

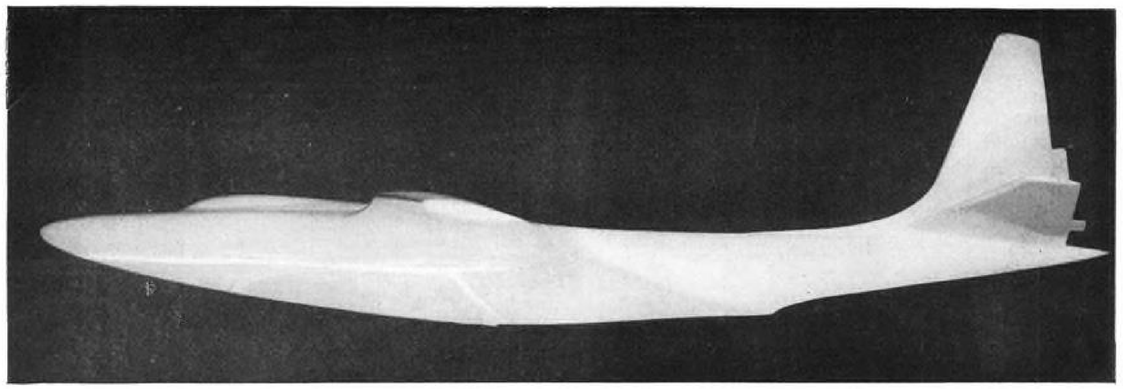
Lockheed President Robert Gross told AVIATION WEEK that he thought an aircraft manufacturer should have a guaranteed order of 25 to 50 planes before undertaking to produce a jet transport. But he added that Lockheed might go ahead if it had an order for 25 to 30 such planes.

That Lockheed is seriously weighing a jet transport project was evident last week as the company made its first official announcement of its Super-Constellation in connection with the meeting in San Francisco of the International Air Transport Assn. (See page 15). It billed the Super-Connie (Model 1049C) as "designed to bridge the gap between modern planes and the first American jet transport."

The Super-Connie, 18 ft. longer than the Model 749, was due to be flown for IATA delegates when they visited Los Angeles. In order to speed the plane's development, Lockheed modified its original Model 049. The first production plane is scheduled to fly next April. To date, the company has $50-million worth of orders from the Air Force, Navy, Eastern Air Lines and KLM.

First of the Super-Connies will be powered by Wright R-3350 C-18CA-1 engines which, with water injection, will develop more than 2500 hp. each. Later versions will use the Wright R-3350-DA compound engines which develop up to 3500 hp. each. The compound engines, says Lockheed, will permit a gross weight of 130,000 lb. and 40-percent more payload than the Model 749.

With a fuselage 113 ft. 7 in. long, the Super-Connie will carry 76 first-class passengers, or accommodate up to 110 coach passengers. Use of compound engines will increase range, depending on speed and load, and in addition the Model 1049C is designed to carry wing-tip fuel tanks for even greater cruising range.



SKATE 1 is one of the nine major model changes that have taken place in Convair's years of research on flying boat design.

Design for a Supersonic Flying Boat?

Years of research has put Convair in position to go ahead with prototype as soon as Navy gives signal.

By Alexander McSurely

Almost everybody in aviation thinks seaplanes are inherently slower than landplanes. But a small group of American designers, who question the infallibility of that premise, has been working for years to build a case in disproof. Barring a delay due to immediate plane requirements by Navy—their sponsor—a prototype high-speed seaplane embodying their designs may be flying within two years.

▶ **Supersonic Seaplane**—The Navy calls their highly unorthodox undertaking Project Skate. When it is launched and flown as a full scale prototype developed by Consolidated Vultee, it may well be the world's first supersonic flying boat. Already the Skate has passed through at least nine major model changes and refinements to reach the stage now approved for full scale flying prototype construction.

▶ **Slimming Program**—But that is only a fraction of the experimenting and testing which has gone into the long, painstaking program to slim down the bulky old workhorse seaplane, into a streamlined supersonic racer.

Its tough to design a supersonic plane to begin with. But when you have to make it seaworthy to boot, then you really multiply your problems.

▶ **Convair is Designer**—High priest of the new supersonic flying boat designer's cult is a ruddy-faced, husky, Convair engineer, Ernest G. Stout. Latest on his list of credits as a designer is the Convair X-P5Y-1 turboprop flying boat prototype.

Ernie Stout's introduction into this country, in July 1938, of seaplane research using dynamically similar plane models, probably marks the beginning of higher performance U. S. water-based aircraft. By towing unpowered models and by launching powered flying models —some of which are radio controlled— he has been able to collect a towering stack of design criteria. To this has been added the considerable store of knowledge obtained in model towing tanks such as those at NACA's Langley Laboratory and at Stevens institute of Technology.

▶ **Roundup**—There is space here only for a short roundup of the basic ideas going into the new flying boats, and which soon are expected to make it possible to achieve a parity in speed with even the fastest land based aircraft.

But these are the main points to be considered:

- Increased ratio of hull length to beam. This is illustrated by comparison of the hulls of the new XP5Y-1 and the old Navy Curtiss NC-4 which flew the Atlantic in 1918. Both hulls have 10-ft. beam, but the Convair hull is approximately 100 ft. long, as compared to 45 ft. for the earlier Curtiss hull.
- Blending of hull and wing into a high Mach number aerodynamic form.
- Use of a newly devised spray suppression strip or dam to control effectively all spray without need for any flare, sharp chine, or discontinuity of any kind on the bottom of the hull. The spray dam is designed to be retracted flush into the hull in flight, leaving a clean blended wing and hull contour for higher speeds.

▶ **Advantages**—Advantage of the increased hull length-to-beam ratio shows up in better seaworthiness and stability plus an increased hull loading up to 300 percent of that formerly carried.

- Ability to control the spray without sacrificing aerodynamic cleanness makes it possible to power the water-based craft with high-powered jet engines for the supersonic designs now under development.

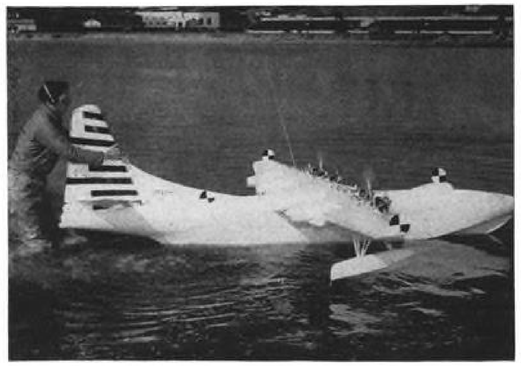
▶ **It Means**—And what does this all mean for the future of airplane designs? Supersonic flying boat designers, and some hard headed Navy engineers say that you will be able to do anything with a flying boat that you can do with a landplane, and still have the additional advantage of water based operation. The all-purpose high speed plane of the future, then, may be a supersonic amphibian.

▶ **Blended Hull-Wing**—There isn't too much that may now be said about the form of the first full scale flying development of Project Skate, except that it will be a considerable refinement of the blended hull-wing configuration. There is little data available on its specifications or performance, except for a general statement that it or its successors are expected to be capable of supersonic flight.

▶ **More Ordered**—But some idea of recent flying boat progress may be gained from a look at Convair's big turboprop flying boat XP5Y-1. The Navy likes the first one so well that they have ordered several more. Recently the prototype made an 8-hr. nonstop flight and it is designed for speeds up around 400 mph.

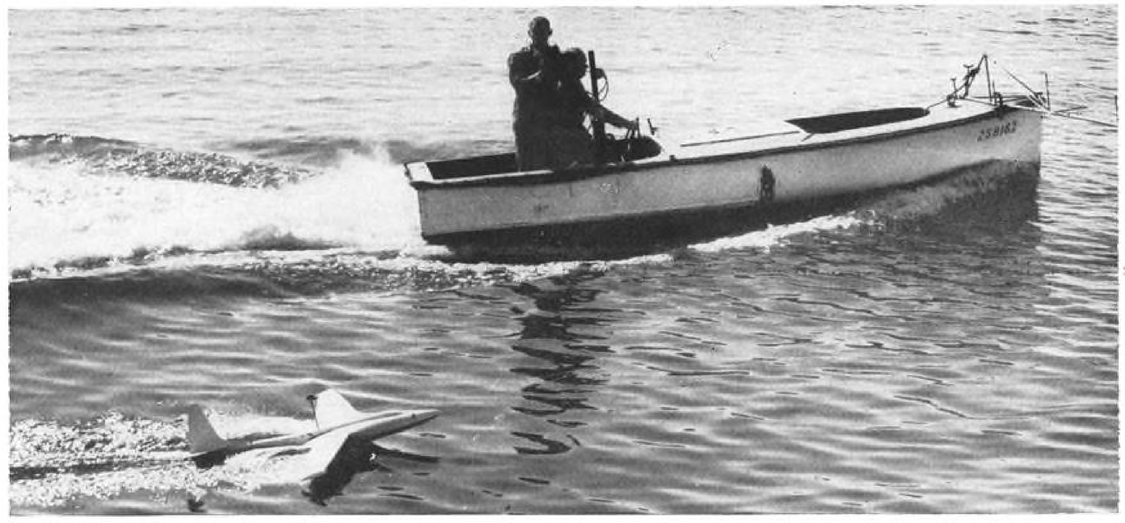
In case you don't know, that is fast for flying boats. Only one water-based plane on record has been faster.

▶ **Fastest Seaplane**—It was a tiny Italian Macchi Castoldi floatplane which was literally a flying powerplant.



MODELS of flying boat were launched by hand or . . .

CATAPULT as part of hull design tests. Finally, Skate 1 model was . . .



TOWED from bridle extending from power boat, with engineers photographing the model of the plane as it cut through water.

A double Fiat engine rated at 3100 hp. whirled a pair of counter-rotating propellers to drive this little speedster to a world speed record of 440.681 mph. 16 years ago today, Oct. 23, 1934. Francesco Agello, the pilot, couldn't find runways long enough for the plane's takeoff so it was designed with long slim floats which used quite a bit of the increased length-to-beam ratio principle. It was nearly five years later when a German Messerschmitt 109R plane regained world speed leadership for landplanes.

Actually, the turboprop flying boat designed speed is already considerably higher than those of most piston-engine landbased transports flying today.

This is interesting in the light of the fact that immediately after World War II most airline operators abandoned the flying boat as a transport, except for very special purposes. This takes the story back to the beginning. The reason was because the operators all know, like everybody else, that "seaplanes are inherently slower than landplanes."

IATA Meeting

San Francisco convention is organization's first in the United States.

San Francisco—Delegates to the first International Air Transport Assn. convention ever held in the United States heard Dr. Albert Plesman, KLM's president, say predictions about the future possibilities of commercial air transportation are impossible.

"Some people think they can already visualize the volume to which air transport can grow," the retiring president of IATA said before he turned the opening meeting here over to the new president, Warren Lee Pierson, TWA board chairman. "In my opinion this is impossible. Technical developments and greater freedom will make air transport so big it is out of the question to visualize the volume to which we will come."

Plesman forecast that transportation of immigrants will play an increasing part in building up high density traffic on the world's trunk routes. He said "some" attention must be paid to developing air freight, suggesting lower rates that would be necessary to build this business. He called the past twelve months the safest in international airline history.

▶ **Nonsked Problem**—Pierson in his opening address struck out at uncertificated charter airlines as representing one of the most urgent problems facing IATA members. He conceded that the certificated carriers must always seek to reduce the price of their services while improving safety, reliability and appeal. But he contended that price reductions must be preceded by a reduction in costs "because an industry as large as ours must ultimately come to a basis of commercial self-support."

A promising avenue for reducing costs is to eliminate or minimize seasonal or

directional unbalances, he emphasized, and he praised the work done to date by IATA in instituting seasonal and promotional fares.

"But our efforts have been offset by the inroads of certain so-called charter operators, who bear no part of the burden of providing services in the off-season, and who rush in to skim the cream from the peak-season traffic. This exaggerates the certificated carriers' seasonal unbalances and increases the cost of air transport to the general public." He urged IATA members to study the problem carefully and to "do all possible to educate the public and their governments as to its dangers."

▶**Hildred Deputy**—Appointment of Stephane Thouvenot, deputy secretary general of civil aviation in France, as deputy director general of IATA was announced by the association's executive committee.

Thouvenot will assist Sir William P. Hildred "in the routine and documentation of the association and act for him during the frequent absences from the head office at Montreal which his worldwide responsibilities make inevitable," the committee explained.

He will have special responsibility for the work of the IATA traffic conference.

To insure members' compliance with IATA traffic conference resolutions governing international fares, rates and conditions of carriage, an IATA enforcement section has been established, the committee said. The self-policing measure will permit association members to settle their disputes amicably within the organization, rather than force them upon the notice of governments, the committee pointed out.

▶**Montreal Home**—The committee proposed an amendment to the articles of association which would drop the present rule that its headquarters must be located wherever the International Civil Aviation Organization has its office. This would permit IATA offices to remain in Montreal in the event ICAO moves to the United Nations Building in New York.

IATA has been invited by the Universal Postal Union to meet jointly with it next January, the committee added, to reach an understanding on foreign air mail rates. Meanwhile, UPU has accepted airline proposals for reduced rates for printed matter and newspapers, and agreed for the time being not to reduce foreign air mail compensation.

Also announced was the formation of a new standing medical committee, charged with the medical and hygienic aspects of matters affecting the safety and efficiency of aircrew and passengers.

▶**No Change on Liability**—The Warsaw Convention special committee, which holds a "watching brief" on the international agreement drafted in Warsaw in 1929 to set up rules governing carriers' liability to passengers and cargo, recommended that IATA continue to oppose revision of the Warsaw agreements now under consideration by ICAO.

The IATA committee pointed out that the many recent currency devaluations have substantially raised the real limit of carriers liability in many countries. Any change now in the Warsaw convention would be premature and undesirable, the report maintained.

The financial committee predicted that Holy Year traffic would bring the 1950 total of interline traffic transactions put through the IATA clearing house for settlement to $200 million. The 1949 total was $166 million, as compared with $124 million in 1948 and $52 million in 1947.

Basic minimum standards for voluntary passenger insurance are now being worked out, the committee said. While differences in airline and insurance company procedures presently make a single worldwide standard policy impossible, it is believed that it may be practicable to set up such policies for all airlines operating within certain regions.

▶**Miles and Passengers**—Plane miles flown by the world's scheduled airlines in 1949 increased along with the number of passenger miles flown, Director General Hildred told the meeting in his annual report.

Hildred's general statistics listed 1949 aircraft miles of 870 million, 10 percent above 1948. The scheduled airlines carried 27 million people, he said, or 3 million more than in 1948, a total of 15 billion passenger miles. This figure was 15 percent above that for 1948.

Even greater percentage of increase was reported for air cargo, which Hildred said went up to 370 million ton miles, 20 percent above the previous year.

Meanwhile, he said, safety records had continued to improve.

▶**Trans-Atlantic Traffic**—Across the North Atlantic, Hildred said, payload between America and Europe had picked up in both directions. The 50,000 air passengers who traveled over the North Atlantic to Europe from October, 1949, to March, 1950, represented 35 percent more than flew the route the year before. During the second quarter of this year, the total was 15 percent above the same period last year.

In the other direction, after devaluation increased fares nearly 40 percent in terms of sterling, a decrease was reflected at first in passenger traffic from Europe to America, but by the end of 1949 "the effect worked itself out," and this year's first quarter showed a 20-percent rise above the same period of 1949.

After devaluation, air cargo bound for North America showed an increase of 40 to 50 percent. Shipments from America to Europe, on the other hand, dropped 10 percent below the corresponding period a year earlier. But they recovered, and in the second quarter of this year were 10 percent above the spring of 1949.

KLM Gets Rights In French Africa

(McGraw-Hill World News)

Johannesburg—KLM Royal Dutch Airlines has received commercial rights from the French government to land at Brazzaville in French Equatorial Africa. KLM will now be able to take passengers to Brazzaville in contrast with the previous arrangement under which it was allowed only to land and refuel at Leopoldville, Belgian Congo.

KLM will start using Brazzaville on the Johannesburg-Amsterdam flight from Nov. 15, and passengers for Leopoldville will disembark there and cross the Congo River by ferry—a ten-mile journey.

Heavy Cessna Backlog Poses Many Problems

First Cessna L-19 liaison plane is expected to be delivered to the Army Field Forces late this month, the initial plane in an order for about 480 amounting to approximately $4 million.

The L-19 (Model 305) last summer won the competition staged by the AFF and the Air Force, and orders for this plane constitute the most prominent part of Cessna Aircraft Co.'s military backlog.

This order and increasing subcontracts from jet aircraft manufacturers brought Cessna's total backlog at the end of its fiscal year, Sept. 30, to more than $25 million.

Cessna's two principal subcontracts are with Boeing, for major assemblies for the B-47 Stratojet, and with Lockheed, for empennage and aft fuselage sections of the F-94 and T-33.

In summing up the situation at the close of the fiscal year, Frank A. Boettger, secretary and treasurer, said, "With backlog increasing, our production problems have been enlarged." Cessna needs skilled workers, and it has had to reshuffle its manufacturing space.

Some work done at Wichita was moved to Hutchinson to make way for the B-47 subcontract work.

A new plant was bought southwest of Wichita to handle the Lockheed jobs.

Despite its military work, Cessna has retained a good position in the market where it is best known, personal aircraft.

Present personal plane production rate is 110 per month, equivalent to annual sales of more than $10 million.

PRODUCTION

Government Backs Defense Loans

Program empowering federal agencies to guarantee advances is similar to World War II's V-loan plans.

If your aircraft company gets a defense contract, the government will see that you also get the money you need to fill it. The fact that the funds you need exceed your normal line of credit won't be permitted to slow up the rearmament program.

The Defense Production Act gave the President power to set up a loan program with the sky as the limit. Since then government agencies have worked feverishly on the machinery for passing out the cash. Some loans have already been made.

▶**Face Is Familiar**—The program is going to seem familiar; it resembles the one used in the last war. Then, aircraft, engine parts and accessories manufacturers had the use of $3 billion of government cash or facilities. They received about $2 billion through the Federal Reserve Board's V-loan program, another several hundred million from the Reconstruction Finance Corp. and $570 million from the Defense Plants Corp., which built, equipped and leased factories to them.

Federal Reserve has already re-activated the V-loan program. Under it, each of the 12 District Banks is empowered to guarantee all or part of defense loans made by local lenders. The request for a guarantee must be approved by one of the armed services, General Services Administration or the Departments of Commerce, Agriculture or Interior.

Maximum rate of interest a contractor will have to pay is 5 percent, and the local lender has to split the interest with the District Bank. If the percentage guaranteed is 70 percent or less, Federal Reserve's guaranteed fee is only one-tenth of the interest; if the local bank wants Federal Reserve to cover more, the proportion he has to pay rises (to half, when the guaranteed part of the loan exceeds 95 percent).

Generally, V-loans will go to subcontractors who can't get advance payments from the armed services—though some prime contractors will get them, too. V-loan money is expected to be used almost entirely for short-term working capital.

▶**No Cash Needed**—The only limit to the volume of loan guarantees is the amount the military is going to spend. In effect, a contract with the government is a contractor's collateral. And as long as such collateral is available, the loans will be made. They don't take any cash to start with.

The contractor never gets directly involved in getting the V-loan. All he has to do is ask for credit at his regular bank. If the bank doesn't think his assets or his credit standing warrant a loan of that size, it calls for a guarantee from the Federal Reserve District office. From there, it's forwarded to Washington.

While waiting for an okay, the District Bank checks the borrower's credit. Meanwhile, in Washington, the Federal Reserve Board shoots the request over to a certifying officer at the Pentagon, getting approval in a matter of hours in many cases. The District Bank is then notified by teletype, the local bank by phone, and the cash is made available on the spot.

▶**Loan Agencies**—But what if the contractor has to buy equipment or needs a lot of working capital? In World War II, he would have been sent right to the RFC for a direct loan. This time, however, the procurement agencies would rather see a contractor get one or more of the other kinds of aid provided in the Defense Act.

Why? Because the procurement agencies know that once a contractor has RFC money free and clear, they lose one control over his operations. They don't expect any shenanigans, but they would like to feel that they can put pressure on if necesesary. So they would rather see a contractor first apply for one of the other kinds of aid spelled out in the Defense Act.

Simplest way of all would be for the contractor to get advance payments from the procurement office he's dealing with. The money could be doled out in amounts scaled to the contractor's performance. Trouble is this would help only a relatively few prime contractors.

For the subcontractor, though, there is the government's power to purchase goods under whatever terms it deems necessary. So the General Services Administration could help out, say, a tube producer by contracting to buy any part of his output for years to come, then advancing cash against delivery.

Or GSA could lease machinery to him—existing units owned by the government or new equipment bought direct from the manufacturers. Finally, a certificate of necessity permitting accelerated amortization of any new facilities might be the answer.

The kind of help a contractor got would depend on how much he wanted, the purpose and the amount of cash available for advance payments or for purchases of output and equipment. Only when such funds are fully committed will the contractor be sent to RFC with the certificate that will get him some of the $2 billion Congress has authorized.

HIDDEN ASSET

Almost invisible under its wartime coat of camouflage is the Southington, Conn., plant being reactivated by Pratt & Whitney Aircraft division of United Aircraft Corp. to meet increased military demands for piston and jet engines. The 661,000-sq. ft. facility, built during the war as one of three satellite plants to feed assembly operations at P&W in East Hartford, has been idle since the end of World War II.

Ohio Contracts

Five Ohio companies have gotten close to a million dollars in USAF business. Top contractor is Cincinnati's Ingersoll Rand which received a $307,-

977 contract for compressors for the Air Materiel Command. Next was Pesco Products division of Borg-Warner, which received two orders totaling $221,805 for fuel booster pumps ordered by AMC.

Jack & Heintz, of Cleveland, received four contracts amounting to $194,310 for wing flap assemblies ($84,750), speed governors $26,350), aircraft starters ($58,310) and assemblies ($25,000).

Other successful contractors were the Colson Corp., Elyria bicycle manufacturer which has turned to defense production. The concern got a $51,000 order for aerial delivery release assemblies. Air Flow Compressor Co., Akron, received a $39,900 contract.

Boeing Opens Mechanics School

With the work force presently available in the Seattle, Wash., area unable to meet the growing need of the Boeing Airplane Co. for skilled and semi-skilled mechanics, Boeing has opened a training school to equip men to perform basic mechanic jobs. Classes will be filled by employees who have completed successfully the company's own in-plant indoctrination training course. Forty will be trained at a time, in periods two weeks long, five days a week.

Boeing also has reinstituted its apprenticeship training program suspended more than two years ago. Under the renewed program, a four-year program is offered for aircraft and engine mechanic and aircraft machinist training and a five-year course for tool and die maker apprenticeship.

AF Invitations

Bids openings are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who state bid invitation number.

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. LaSalle St., Chicago 3; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

Rivet, 1-15 items, bid invitation No. 51-634, issue date 2 Oct., delivery complete within 120 days after date of award.

Joint assembly, 1-12 items, bid invitation No. 51-635, issue date 2 Oct., delivery to start within 30 days, complete within 90 days.

Grommet, 1-5 items, bid invitation No. 51-636, issue date 2 Oct., delivery complete within 120 days after date of award.

Technical Reps in Far East

Air activities during the Korean campaign provided a combat proving ground for many postwar planes and pieces of equipment. To observe results, and to assist in service problems, a number of manufacturers' representatives were assigned to the theater. At one time last month, this was the list:

- **Allison div., GMC,** Leonard Davidson, William F. Kraineck.
- **Bendix Stromberg Carb.,** Albert Gutirrez.
- **Boeing Airplane Co.,** Olaf Hansen.
- **Douglas Aircraft Co.,** Michael C. Hanrahan, Bert D. Schwab.
- **Fairchild Camera & Instrument Co.,** Barry T. Henshaw, Robert A. Troidl.
- **Fairchild Engine & Airplane Corp.,** Vincent Thurn, Gene R. Tibbs.
- **Hamilton Standard div., United Aircraft,** Joseph C. Dabek, William H. Furnivall.
- **Lockheed Aircraft Corp.,** Glenn C. Fulkers, Ferrall D. Gun, Noble G. Hueter, Ralph T. Slusser.
- **North American Aviation,** William H. Wagoner.
- **Pratt & Whitney,** Parliaman, Howard L. Smith.
- **Wright Aeronautical Corp.,** Ivan Reese.

Adapter and Connector, 1-10 items, bid invitation No. 51-637, issue date 2 Oct., delivery complete within 60 days after date of award.

Radio receiver, 1-10 items, bid invitation No. 51-639, issue date 2 Oct., delivery 300 articles on or before 180 days, and 400 additional articles every 30 days thereafter.

Control panel, 282 each, bid invitation No. 51-640, issue date 2 Oct., delivery of first articles within 60 days, production items within 30 days after approval of first article at rate of not less than 50 units each per week.

Gloves, 1-4 items, bid invitation No. 51-641, issue date 2 Oct., delivery to start within 30 days, complete within 120 days.

Lead pig, 1-6 items, bid invitation No. 51-644, issue date 2 Oct., delivery within 120 days after date of award.

Iron welding rod, 1-6 items, bid invitation No. 51-649, issue date 2 Oct., delivery within 60 days after date of award.

Bolt, 1-20 items, bid invitation No. 51-646, issue date 2 Oct., delivery complete within 90 days after date of award.

Standing wave meter, 1-3 items, bid invitation No. 51-651, issue date 5 Oct., delivery within 90 days after approval of first article.

Indicator, 1-27 items, bid invitation No. 51-652, issue date 5 Oct., delivery complete within 120 days after date of award.

Aluminum tubing, 1-38 items, bid invitation No. 51-656, issue date 5 Oct., delivery within 90 days after date of award.

Steel, chrome nickel molyb, 1-85 items, bid invitation No. 51-657, issue date 5 Oct., delivery within 120 days after date of award.

Aircraft accessories Cl 03, 1-15 items, bid invitation No. 51-666, issue date 6 Oct., delivery complete within 7 months after date of award.

Leather, Cl 21, 1-8 items, bid invitation No. 51-667, issue date 6 Oct., delivery complete within 60 days after date of award.

Bit and drills, 1-28 items, bid invitation No. 51-665, issue date 6 Oct., delivery complete within 120 days after date of award.

Electrical equipment, Class 10, 1-20 items, bid invitation No. 51-668, issue date 6 Oct., delivery within 30 days after date of award.

Electrical equipment, Class 10, 1-19 items, bid invitation No. 51-669, issue date 6 Oct., delivery within 30 days after date of award.

Box bomb auxiliary switch, 3000 each, bid invitation No. 51-672, issue date 6 Oct., delivery within 60 days and continue at rate of 500 per month until complete.

Quilted soundproofing blankets, 100,000 sq. yd., bid invitation No. 51-676, issue date 6 Oct., delivery complete within 120 days after date of award.

Clock, electric, wall, and time-stamp machine, 1-3 items, bid invitation No. 51-677, issue date 6 Oct., delivery complete within 60 days.

Bolts, 1-12 items, bid invitation No. 51-678, issue date 6 Oct., delivery to start within 30 days, complete in 90 days.

Dehumidifier kit, 508 each, bid invitation No. 51-679, issue date 6 Oct., delivery 75 per month after approval of first article.

Interphone control, 4412 each, bid invitation No. 51-682, issue date 9 Oct., delivery within 60 days after date of award.

Sander, 50 each, bid invitation No. 51-685, issue date 9 Oct., delivery to start within 30 days and complete within 60 days.

Inverters, 708 each, bid invitation No. 51-690, issue date 9 Oct., delivery 25 per month starting in Feb. 1951.

Guide rail assembly, 1-2 items, bid invitation No. 51-691, issue date 9 Oct., delivery of first articles 45 days, and complete within 60 days after approval of first articles.

Lens, 150 each, bid invitation No. 51-693, issue date 9 Oct., delivery of reproduction samples within 60 days, complete within 90 days after approval of samples.

Drums, 1 item, bid invitation No. 51-694, issue date 9 Oct., delivery to start during Jan. 1951, delivery at rate of 3500 per week until complete.

Aluminum rod, 1-29 items, bid invitation No. 51-695, issue date 9 Oct., delivery within 90 days after date of award.

Shipping cases, 1-28 items, bid invitation No. 51-696, issue date 9 Oct., delivery 50% within 45 days, balance within 90 days after date of award.

Pins, 1-22 items, bid invitation No. 51-697, issue date 9 Oct., delivery 30% within 45 days, complete within 90 days after date of award.

Cylinder assembly, 1-6 items, bid invitation No. 51-698, issue date 9 Oct., delivery to start in the month of Jan. 1951.

Steel, 1-25 items, bid invitation No. 51-699, issue date 9 Oct., delivery within 120 days after date of award.

PRODUCTION BRIEFING

▶ **Goodyear Aircraft Corp.,** Litchfield Park, Ariz., will boost its present working force from 50 to 550 by Jan. 1 in order to handle new orders including plastic and metal aircraft components.

▶ **Cessna Aircraft Co.,** Wichita, has purchased the former Aero Parts plant 4½ mi. from the city and will activate it for additional production. The building contains 160,000 sq. ft. of floor space on a 144-acre tract. Cessna currently is building major subassemblies for the Boeing B-47, Lockheed F-94 and T-33, in addition to turning out the L-19 and LC-126 for the services and its personal planes.

FINANCIAL

McDonnell Splits Common, 2-for-1

Stock dividend, encouraging broader ownership base, may foreshadow try for listing on national exchange.

The improving fortunes of the McDonnell Aircraft Corp. are reflected in its current action of declaring a 100-percent stock dividend or splitting its common stock, two-for-one. Instead of the authorized 360,000 shares formerly outstanding, there will now be an authorized issue of 720,000 shares.

This stock dividend creates no additional value in itself, as the equity remains the same. In other words, two new shares of the company have the same value as was possessed by one old share. But stock dividend action is generally prevalent during periods of rising earnings. Frequently it is a forerunner of increased cash distributions to stockholders.

▶**Heading for the Curb**—In the McDonnell instance, this stock dividend was declared to encourage broader ownership of the company's shares. This may well prove to be a preliminary move in an attempt to obtain listing of the shares on a national stock exchange, probably the New York Curb. McDonnell is the only major aircraft company which does not now have such national listing.

Stock dividends are not entirely foreign to the aircraft industry. Grumman, in June, 1948, declared a 100-percent stock dividend, increasing its outstanding shares from 500,000 to 1,000,000. This not only encouraged broader ownership interest but was soon followed by increased cash distributions to stockholders.

Beech Aircraft Corp. declared a stock dividend of 50 percent, increasing its outstanding shares from 400,000 to around 600,000 as of Dec. 31, 1948. Constructive results followed this action as well.

Financial circles have rumored that Boeing may soon declare a stock dividend on its shares. The company's earnings are in the ascendancy and a less conspicuous manner of increasing dividend distributions can be achieved by maintaining the same rate on a larger number of shares outstanding.

Douglas with only 600,000 shares of common stock outstanding and selling in the 80s has frequently been cited as a logical candidate for a stock split-up. From all reports, however, the Douglas management has resisted this move. Nevertheless, there is reason to believe that a stock split in this instance, creating broader investment interest, would do much in improving the company's market evaluation.

▶**Passes War Peak**—McDonnell continues in the unique position of achieving a new peak in earnings surpassing anything recorded during the war years. For the fiscal year ended June 30, 1950, the company showed net earnings of $2,815,219 as compared with only $1,731,832 for the previous year—the former top in profits. (AVIATION WEEK Oct. 16). The impact of Korea on aircraft production is absent from the June 30, 1950 fiscal results.

During the past year, the company's common stock submitted to considerable dilution. On June 30, 1949, there were 227,424 shares of common outstanding with a book value of $20.70 per share. Following the initial dividend declaration of $1 per share on the common payable May 31, 1950, McDonnell also declared four quarterly payments of 50 cents each, beginning July 3, 1950, or a total of $2 per share for the 1951 fiscal year.

This had the effect of forcing conversion of the outstanding 5232 preferred shares into common at the rate of ten shares of common for one share of preferred for a total of 52,320 shares. The preferred paid $6 per share annually. The common received in exchange will return the equivalent of $20 in dividends per share based on the old preferred.

In view of the dividend policy, it also became advantageous for the exercise of options outstanding and the purchase of stock subject to such rights. Accordingly, a total of 58,265 shares of common stock were acquired at a price of $10 per share. (The recent market quotation, before the stock split, was in the mid-30s.) The warrants already exercised, together with an additional 21,708 remaining outstanding, were issued to J. S. McDonnell, founder and president, under an agreement dated July 20, 1939.

The changes in the capital stock account resulted in the complete elimination of the preferred shares together with a substantial reduction in the number of outstanding warrants, increasing the common shares to 338,229 as of June 30, 1950. As a result, net book value as of that date increased to only $22.54 per share.

After the 1945 peak in sales of more than $20.6 million, McDonnell's billings fell sharply to $6.5 million in the 1946 period. From that point, deliveries began to mount steadily, reaching $32.7 million for the 1949 fiscal year and on to an all-time high of $38.7 million for the 1950 current period.

McDonnell's net profit margin on sales, after taxes, for 1950, averaged 6.93 percent. The company, in a footnote in its report, however, calls attention to the fact that $377,733 in additional earnings accrued in the 1950 fiscal year, represent a settlement on a completed contract proposed by the management but not yet ratified by the government.

▶**Backlog Jumps**—The effect of the rearmament program is reflected in the sharp jump in backlog figures. As of June 30, 1950, unfilled business amounted to $62,695,281. On Sept. 8, 1950, the total backlog was stated at more than $200 million.

The company's chief customer is the Navy. The single main product has been centered around an all-jet Navy plane. This was first represented by the FH-1 Phantom and now by volume orders for the F-2H Banshee. The company also has developed the XF-88 twin jet fighter as a hope of obtaining Air Force orders.

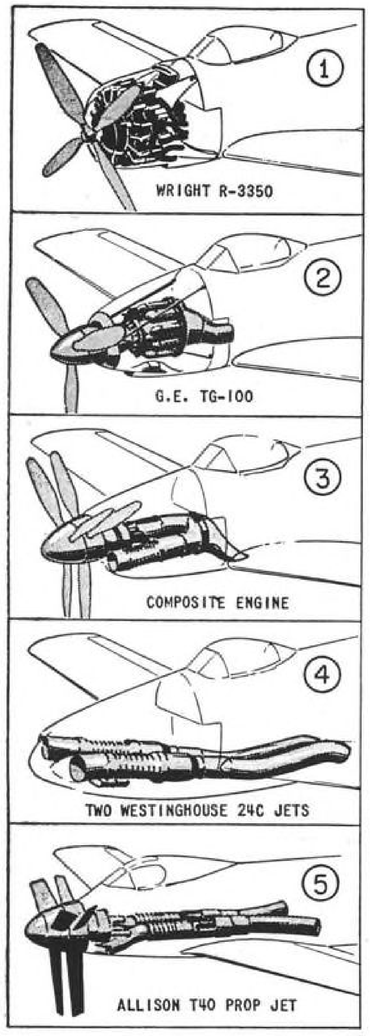
Leasing its main plant facility at Lambert-St. Louis Municipal Airport, McDonnell has been able to avoid extensive property commitments. This modern plant, built for Curtiss-Wright during the war, facilitates low overhead burden and is a factor in confining costs to an efficient basis.

▶**Costs Should Drop**—McDonnell should reap increasing benefits from the efficiencies inherent in producing only one major type aircraft in volume. As the level of activity increases, unit costs should tend to decline.

The company's financial position is the strongest it has ever been. At June 30, 1950, its net working capital amounted to almost $6.5 million. This compared with $4.3 million a year earlier and is a far cry from only $29,418 in the same category as of June 30, 1941.

A sustained volume of activity is assured for McDonnell for a number of years to come. At what speed it can accelerate deliveries to meet Navy requirements and at what cost to its profit margins remains to be determined. In the past, the company has managed to complete Navy orders ahead of schedule. Satisfactory profit margins have been prominent once the company passed successfully beyond its formative development period. The continuation of this pattern would result in the maintenance of high level earnings for McDonnell.

—Selig Altschul

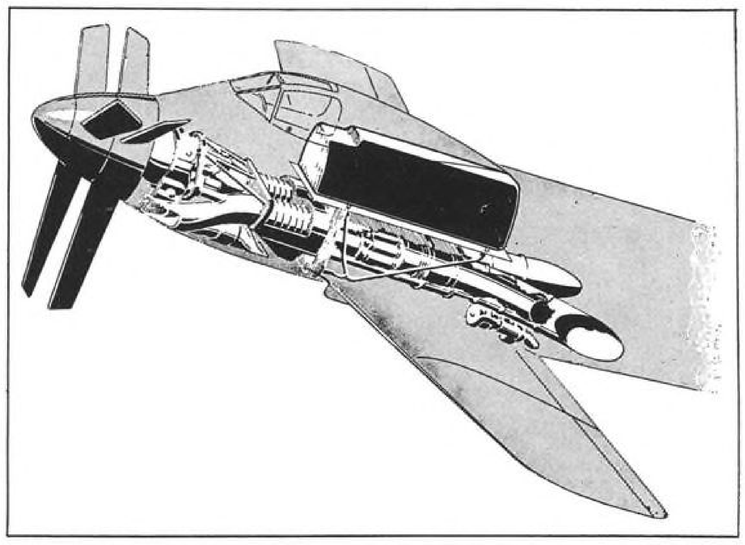


POWERPLANT STUDIES followed this progression: (1) Installation in the AD Skyraider was a Wright R-3350. (2) Next scheme considered for flight test in AD was a General Electric TG-100 turboprop. Engine was built but the project did not materialize. (3) After this, a composite jet and turbine engine arrangement was planned by Douglas, but not built. This scheme was to utilize two Westinghouse 24-Cs arranged so that the exhaust would drive a turbine, in turn driving two contra-rotating props. (4) Next plan considered was a jet power arrangement embodying two Westinghouse 24Cs, but scheme was dropped in favor of: (5) This final power configuration used in the A2D Skyshark—the Allison T-40 driving coaxial propellers through a reduction gear.

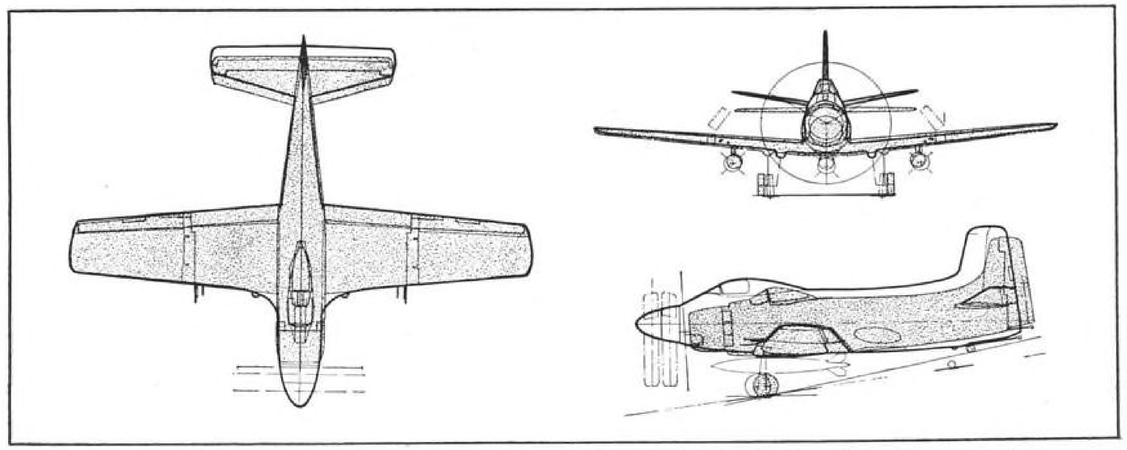
A2D SKYSHARK is classic example of how basic features of a proven configuration can be modified and adapted efficiently and economically to the changing needs of military service. This new Douglas Navy attack bomber, powered by an Allison T-40 turboprop, is a studied evolution of the AD Skyraider piston-powered series to produce a plane with a major increase in performance to permit it to operate unescorted and defend itself against jet fighters. Studies showed that the AD's 2700 hp. would have to be approximately doubled, with no appreciable increase in the weight of the airplane (16,065 lb. gross). Result: The turboprop-powered Skyshark attacker was evolved with 5500 hp. and a gross weight of approximately 17,000 lb.

Evolution of the Skyshark

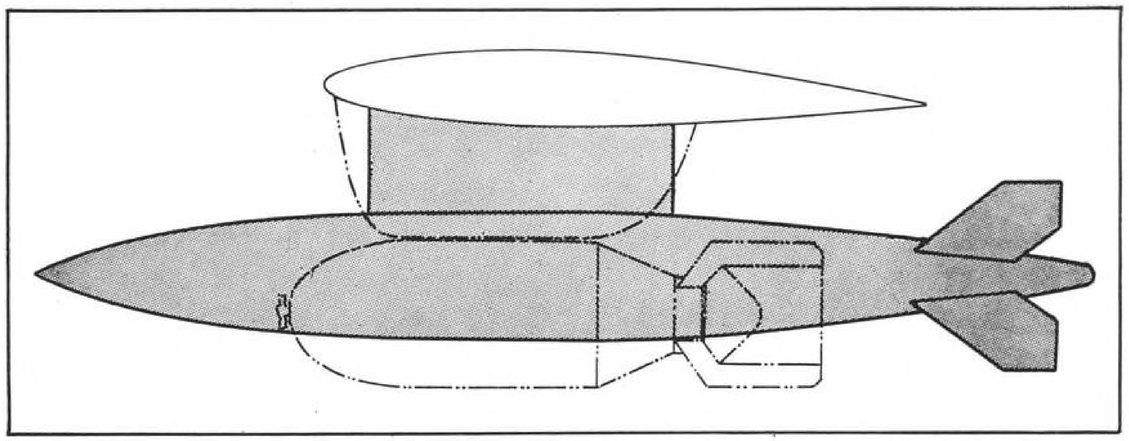
Turboprop power teams with basic Skyraider design to give Navy attack plane with greater effectiveness.



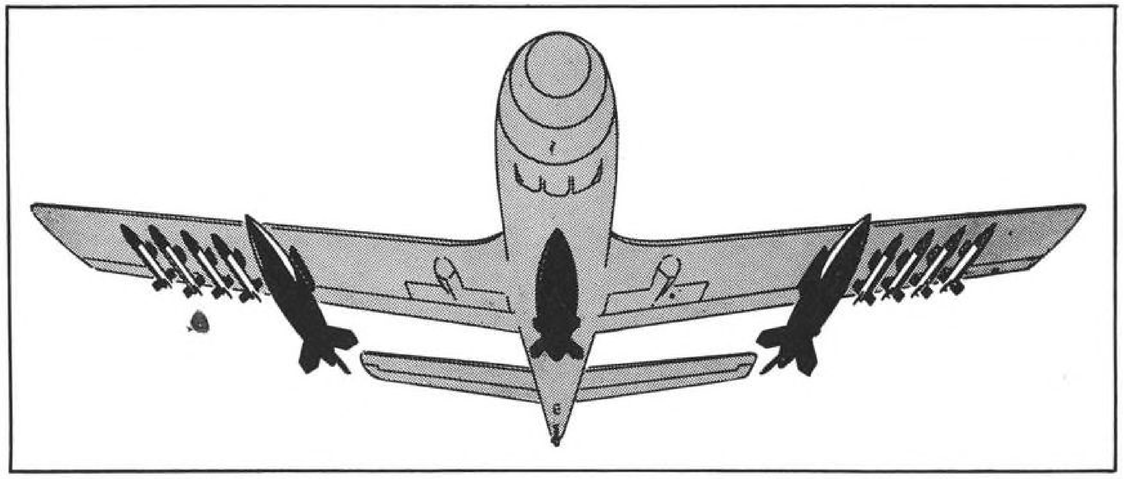
ENGINE INSTALLATION runs under cockpit and is decked by fireproof bulkhead which supports fuel tank. Bulkhead has overboard drains to prevent any fuel leakage into engine area. Intakes are just aft of prop disk, exhaust aft of trailing edge.



COMPOSITE THREE-VIEWS indicating evolution of A2D Skyshark from AD Skyraider (shaded outline). Wing area and span remain same but wing and tail thickness are less. Horizontal tail has about same area but has dihedral. Vertical tail area is increased. Height at the tip prop plane is about 1 ft. more than on the AD. Cockpit is pushed forward to provide better vision.



NEW BOMB, PYLON SHAPE (shaded areas) developed in accord with high speed of A2D Skyshark. Craft is 50 knots faster with this streamlined scheme than with standard 2000-lb. bombs (shown dotted).



EXTERNAL ARMAMENT SCHEME shown here includes three 2000 lb. bombs of new streamlined shape and eight 5-in. rockets under outer wings. Alternate installations provide for 150- or 300-gal. fuel tanks, torpedoes or Tiny Tim rockets.

PASSENGER OR CARGO is accommodated on S-4's deck aft of pilot, while . . .

LITTER HANDLING is facilitated by location of the deck close to the ground.

Seibel Copter Stresses Simplicity

Newest rotary winger on U.S. market slated to sell for $11,500. Development expense kept low.

Latest helicopter certificated in the U.S., the Seibel S-4, accents two characteristics essential for customer appeal—a rigid simplicity and a low price.

In its certificated form, this rotary winger, built by Seibel Helicopter Co., Inc., Wichita, Kan., essentially is a double-decked flying frame, one level carrying the powerplant, rotor and tail boom, the other the usefeul load and pilot.

▶ **Cost Low**—Development cost of the S-4 is reported to be less than $80,000—greatly below development expense associated with other copters previously certificated in the U.S.

Since this expense is reflected in production model selling price, this factor, plus the simple makeup of the S-4, has worked to make copter's price the lowest in the U.S. helicopter market. Seibel says the commercial retail price is $11,500.

Four production models are nearing completion. Because of material allocations, future production will depend on the military.

▶ **Four-Man Team**—Many of the features incorporated in the S-4 were proved in the S-3, a 65-hp. experimental copter designed by Charles M. Seibel (now company president) and built in 1947.

Development time for the S-4 was less than two years. Seibel performed the engineering work to complete the design and obtain CAA certification. Richard D. Ledwin and George Lub-

ben, copter mechanics, assisted by John Gibbs, manufactured parts and did all shop work under the development program. Pilot Gibbs did the flying.

Seibel's previous work on copters was with Bell Aircraft Corp., on development of that company's Model 30 and 47 rotary-wing jobs.

▶ **Load Details**—Design gross of the Seibel S-4 is 1500 lb. and actual empty weight 950 lb., affording a favorable useful load/gross weight ratio. Cargo or passenger space on the lower deck is at the craft's center of lift, as are two 18-gal. fuel tanks on the engine (upper) deck. This arrangement is intended to produce no effect on balance in variation from full load to no load.

Load area is unobstructed and easily accessible. This deck measures 79 in. long, 26 in. wide and 36 in. high. Level of the deck is but one foot above the ground.

▶ **Powerplant Data**—Engine is a Lycoming Model 0-290-D rated at 125 hp. Power is transmitted to the main rotor through a set of standard automotive spiral bevel gears with a 6.66:1 reduction ratio. In addition to provision for normal starting, hand cranking is provided for alternate use.

Complete powerplant installation—engine, accessories, cooling fan, oil radiator, clutch and free-wheeling unit, cowling, and exhaust stacks—may be replaced as a unit by two men in 45 min., Seibel reports.

Position of the powerplant on the top deck gives practically unrestricted access for inspection and maintenance.

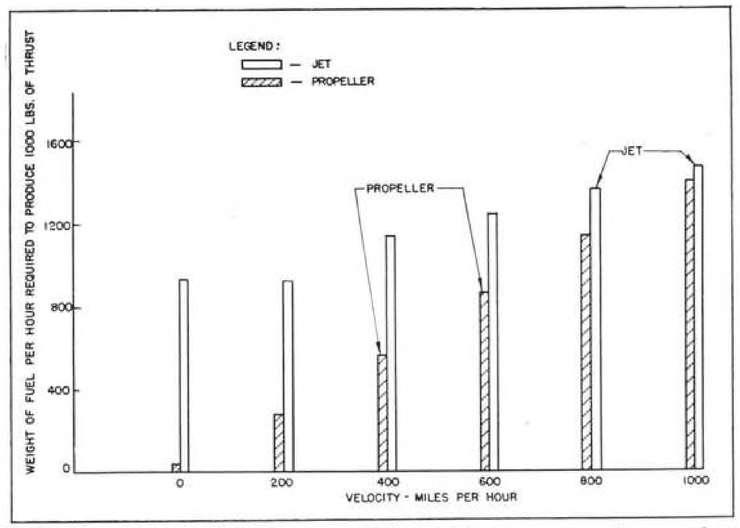
▶ **Hub-Blade Connection**—Rotor hub and blade attachment is a highlight in the design's simplification. The hub is cast magnesium and the solid laminated wood blade is connected to it by a piece of flexible steel sheet formed in an angular cross-section. This arrangement allows continuously varying pitch of the blades. This makeup was adopted to eliminate the need for expensive pitch-change bearings, and Seibel says that the blade-attaching angle is simple to manufacture, low in cost.

It reports that in almost 500 hours of operation, the rotor hub has required no attention other than inspection and lubrication.

Primary cockpit controls are standard, linked to the main rotor by push-pull and torque tubes. Rotating portion of the linkage passes through center of the rotor drive shaft.

Two ball bearings and two universal joints are used in the full length of the extension shaft to the tail rotor. The cast magnesium tail rotor gear box encloses standard spiral bevel gears.

Tail rotor hub incorporates same type of blade attachment as does the main rotor. Pitch control mechanism is operated by a cable system connecting to the cockpit pedals.



Fuel weight per hour for 1000 lb. thrust vs. flight speed for two representative powerplants —turboprop and turbojet, both with the same compressor and basic turbine.

Why We Still Need the Propeller

Detailed analysis of turboprop and turbojet propulsion factors explains why prop should not be discarded.

By Ivan H. Driggs*

Let's not discard the propeller—yet! At least not before we have examined all the facts. It never pays to jump to conclusions before a clear understanding of principles has been reached.

Romance and "Buck Rogers" ideas have uses but have no place in the making of final decisions affecting the welfare of a nation. Jet propulsion, including both the turbojet and the rocket, falls into this glamorous category, and undoubtedly has been responsible for the attainment of present high speeds, even above the velocity of sound.

But do we want to fly **continuously** at such speeds? Air races are all very well in their place, but what useful purpose will be served by aircraft designed upon a basis of high speed alone? An airplance must carry something of value and must fly a required distance to be of use. This principle applies to all aircraft whether military, commercial or private, and the type of propulsion, whether propeller or jet must be chosen in the light of obtaining the greatest usefulness for the least overall cost.

► **Propulsion Efficiency**—Many comparisons have been made attempting to demonstrate that the jet is a more efficient means of propelling an airplane at high speeds than a propeller.

In such comparisons graphs are usually used to show the so-called propulsive efficiencies of the two systems. Such graphs which give the ratio of thrust power to shaft power for the propeller along with the ratio of the jet thrust power to the power added to an airstream as it passes through the jet engine fail to provide a true comparison.

Therefore, such data may be misleading to those who are not familiar with the derivations of the two efficiency definitions used above and who do not realize that these two values are in nowise comparable. In fact, such values should not be drawn on the same graph or even quoted as comparative results. It is hoped these statements will be clear from these derivations:

Let u_j = velocity of gas out a jet, with no friction losses in nozzle, fps.
u_o = velocity of flight, fps.
m = mass of gas used by engine, slugs
η_n = nozzle efficiency = u_j actual/u_j with no losses
T.Hp$_j$ = thrust horsepower of jet.

$$\text{Then T.Hp}_j = \frac{mu_o}{550}(\eta_n u_j - u_o) \qquad (1)$$

If the propeller is applied to a gas turbine engine, which is the only way a true comparison can be made, then the thrust power may be expressed as follows:

Let T.Hp$_{Tp}$ = thrust horsepower of turboprop.
α = ratio of the power absorbed by extra turbine and gears driving the propeller to the total power available.
η_p = propeller efficiency — T.Hp/S.Hp.
S.Hp = shaft power expended in driving propeller.
η_g = efficiency of gears used for speed reductions.
η_t = efficiency of turbine driving the gears.

$$\text{Then T.Hp}_{Tp} = \eta_p \eta_g \eta_t \alpha \frac{m}{1100} u_j^2 + \frac{mu_o}{550}[(1-\alpha)^{1/2}\eta_n u_j - u_o] \qquad (2)$$

Then

If Eq. (2) is maximized with respect to α it will be found that for maximum thrust horsepower

$$\alpha = 1 - \frac{u_o^2}{u_j^2}\left(\frac{\eta_n}{\eta_p \eta_g \eta_t}\right)^2 \qquad (3)$$

The value of α may be found from Eq. (3) for any given set of conditions and substituted into Eq. (2) for the maximum possible T.Hp$_{Tp}$.

It appears that there are three ways the above values of thrust horsepower may be reduced to a comparative basis.

• **Method 1.** Divide both equations (1) and (2) by the power added in passages through the machine,

$$\frac{m}{1100}(u_j^2 - u_o^2).$$

• **Method 2.** Divide both equations by the total power available in the machine at a point immediately after the gas has passed through the compressor driving turbine, that is, by

$$\frac{m}{1100}u_j^2.$$

• **Method 3.** Reduce both equations to values for thrust by multiplying by $\frac{550}{u_o}$ and then compute the weight of fuel per hour required per 1000 lb. of thrust. This comparison requires the use of actual engine characteristics rather than an algebraic solution.

If the method suggested in (1) above is employed, we have a definition of efficiency for the jet as,

$$\eta_{\text{jet}} = \frac{2u_o[\eta_n u_j - u_o]}{u_j^2 - u_o^2} \qquad (4)$$

or

$$\eta_{\text{jet}} = \frac{2}{1+\frac{u_j}{u_o}}, \text{ neglecting } \eta_n \qquad (4a)$$

If η_n equals unity (ideal conditions) and if u_o equals u_j, Eq. (4) is an indeterminate, $\frac{0}{0}$. Additional algebraic manipulation as shown by Eq. (4a) gives the value of this indeterminate as unity as u_o approaches u_j (or vice versa). This is, the jet efficiency becomes 100% when the two velocities are equal and when the thrust power is zero. This does not appear to be a satisfactory definition since, normally, one would expect a maximum value of thrust power when the efficiency is 100%. At least the thrust power would not be expected to be zero.

However, this is the definition of jet propulsive efficiency that is usually employed when comparing the jet and propeller and has caused much confusion in the thinking regarding the usefulness of the jet. The statement has often been made to the writer that, "As you go faster and faster the efficiency of a jet approaches 100% and surely a propeller cannot do that." That is true, of course, but one is not interested in propulsion efficiency in the last analysis but only in thrust or thrust power or power per unit fuel flow. **These values should be the maximum.**

Considering the suggestion in (2) above, it appears that a more logical definition of efficiency can be obtained than that derived for Eq. (4). In this case

$$\eta_{\text{jet}} = \frac{mu_o(\eta_n u_j - u_o)}{\frac{m}{2}u_j^2}, \qquad (5)$$

$$\text{or} \quad \eta_{\text{jet}} = 2\left[\eta_n \frac{u_o}{u_j} - \frac{u_o^2}{u_j^2}\right] \qquad (5a)$$

Again setting η_n equal to 1 and letting u_o and u_j approach each other the thrust power approaches zero at the same rate as the efficiency approaches the same value. That is, when the thrust power is zero the efficiency is zero. This makes much more sense and

* Chief, Research Division, Bureau of Aeronautics

surely is not as confusing as the previous definitions. Maximization of Eq. (5a) shows that η_{jet} is a maximum when

$$\frac{u_o}{u_j} = \frac{\eta_n}{2} \quad (6)$$

$$\text{and } \eta_{\text{jet max}} = \frac{(\eta_n)^2}{2} \quad (6a)$$

If η_n equals 100% then the maximum thrust power from a jet is but 50% of the total power available in the hot gas stream and this maximum occurs when the jet velocity is twice the flight speed.

These are very interesting conclusions and ones which are much more realistic and understandable. Furthermore, this conception of efficiency gives a more direct comparison with the efficiency of a turboprop unit. In this latter case

$$\eta_{T.P.} = \eta_p \eta_g \eta_t \alpha + 2(1-\alpha)^{1/2} \frac{u_o}{u_j} \eta_n - 2\frac{u_o^2}{u_j^2} \quad (7)$$

Inserting Eq. (3) for α,

$$\eta_{T.P.\,\max} = \eta_p \eta_t \eta_g + \left(\frac{u_o}{u_j}\right)^2 \left[\frac{\eta_n^2}{\eta_p \eta_t \eta_g} - 2\right] \quad (7a)$$

If a realistic value for $(\eta_n)^2$ of .95 is inserted in equation (7a), and if the product $\eta_p\eta_g\eta_t$ equals .475, the last term in equation (7a) equals zero, consequently the value of $\eta_{T.P.\,max.}$ will be .475. Comparing this value with Eq. (6a), it will be noted that the efficiency of the jet will be indentically the same, i.e., $(\eta_n)^2/2 = .475$. If however, the efficiency product is greater than .475, the last term of Eq. (7a) becomes negative, and reduces the efficiency, not below .475, but below the value of the product $\eta_p\eta_g\eta_t$.

Thus, to use this product as a means of comparing the efficiency of the two systems of propulsion is improper and leads to overestimation of the efficiency of the turboprop. However, for a first same, i.e., $(\eta_n)^2/2 = .475$. If, howthis product may be employed for comparison with Eq. (5a) or (6a), realizing that an unconservative approximation has been made. Eq. (4a) should not be used since the basis of derivation of this equation is not the same as for Eq. (5) or (6). However, the present writer has seen comparisons made between the product $\eta_p\eta_g\eta_t$ and equation (4a), with considerable confusion. The definition of propulsive efficiency given by Eq. (5) and (7) have been discussed previously in the pages of AVIATION WEEK by the present writer, consequently this line of reasoning will be pursued no further in this paper.

► **Third Means**—The third means of comparing the jet and propeller will be the subject for discussion in the balance of this article. If the equations for thrust power derived above are revised to become equations of thrust, then the weight of fuel per hour to produce 1000 lb. thrust can be found from the characteristics of any given engine used either as a turbojet or as a turboprop. By using the known characteristics of a given engine, all internal losses that might affect a result are maintained constant and therefore a true comparison of two propulsion means can be obtained.

The accompanying chart shows the weight of fuel required per hour to produce 1000 lb. thrust for two representative power plants, one a turboprop unit and the other a turbojet, both with the same compressor and basic turbine. The comparison is given for a series of flight speeds from zero to well above the velocity of sound (760 mph.).

Even up to 1000 mph. the propeller will give more thrust per pound of fuel than the jet. At low and moderately high speeds the difference in the fuel required to produce 1000 lb. thrust is very great—at 200 mph. the jet will consume 3⅓ times as much, at 400 mph. twice as much, and at 600 mph. nearly half as much more.

Although the propeller, gears and added turbine will increase the weight of the engine materially, it does not take many hours of flight to make up for this added weight. of the power

plant and then the smaller fuel requirements of the propellered engine make for an overall reduction in airplane size.

In some cases the time of flight may not be long enough that the saving in fuel compensates for the added machinery, but even then it may be better for some operations to accept a slightly heavier airplane.

Operation from carriers is a case in point. The quantity of fuel that can be carried aboard is limited and refuelling requires the carrier to retire from action. A large consumption of fuel reduces either the number of airplanes that can be operated or the number of strikes possible before retirement for refueling. Also, the much lower thrust at takeoff speeds requires many powerful auxiliary devices for launching. The propellered airplane, on the other hand, will take off under its own power with no assistance.

Also, the supply and transportation of fuel to battle area becomes a very critical and possibly decisive element in the prosecution of a war. Can we afford to waste fuel and overburden our transport and supply services by even a small increase in requirements above those absolutely necessary? The fuel supplies in this country are not limitless. Will a civilian economy stand up in time of war under extremely limited or nonexistent supply of fuel for necessary civilian uses?

The fundamental facts as outlined in this article, then, indicate that we must not discard the propeller at all.

Temco Trainer Data

Footnote to AVIATION WEEK's article on three competing Air Force trainers (Aug. 28, 1950) was supplied recently by the Texas Engineering & Manufacturing Co., Inc., which has entered the Temco YT-35 Buckaroo.

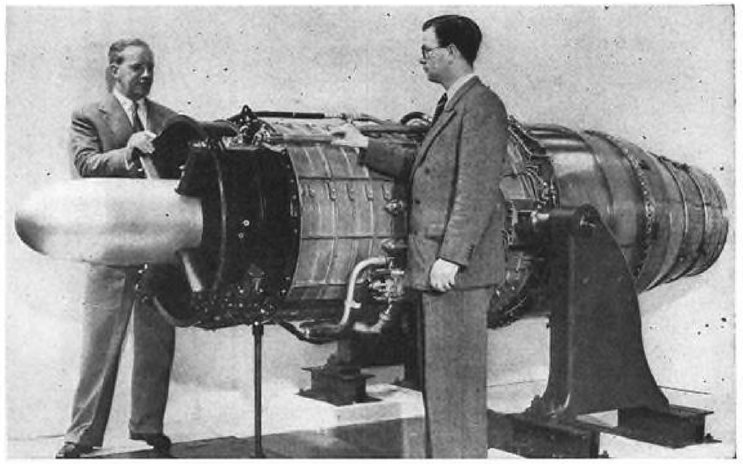
Temco says that it is ". . . a hitherto-well-kept secret . . ." that its entries (which bear the company designation of TE-1B) have been fitted with 165-hp. Franklin engines to step up the Buckaroo's performance.

First change, of course, is a gross weight increase—from the earlier figure of 1920 lb. (in the Continental-powered TE-1A) to the latest of 1975 lb. in the TE-1B.

Takeoff ground run is increased from 475 ft. to 610 ft., but the important distance to clear a 50-ft. obstacle has been reduced to 925 ft.

Sea-level rate of climb is now 1000 fpm., contrasting with the TE-1A's rate of 925 fpm. At 3000-ft. altitude, rate of climb is now 800 fpm.; at 5000 ft., it is 665 fpm.

Recommended approach speed with no flaps is 77 mph. indicated air speed; with flaps, this can be reduced to 72 mph.



Details of Sapphire Jet Revealed

New high-power British engine has completed 150-hour service type test at 7200 lb. thrust.

(*McGraw-Hill World News*)

London—Partial details were released recently of the Armstrong Siddeley Sapphire, claimed by its builders to be the world's most powerful jet engine so far flying. Its rated static thrust at sea level is 7200 lb.

With a specific fuel consumption of 0.907 lb./hr./lb. of thrust, the Sapphire is claimed to go a long way toward countering the problem of high fuel consumption which has so far greatly limited the range and endurance of all jet aircraft.

▶**Annular Burner**—The Sapphire has an axial-flow compressor and an annular combustion chamber. This last is a marked change from the multiple array of combustion chambers that has been the usual practice on earlier designs of jet engines.

Sapphire dimensions are as follows: Diameter over bare engine, 35.25 in.; diameter over trunnion mounting, 37.3 in.; length overall from front of nose fairing to exhaust cone rear flange, 135.85 in.; jet pipe diameter over heat shroud, 24.5 in.; frontal area, 6.8 sq. ft.

Thrust per square foot of frontal area is 1100 lb., and the net dry weight is 2500 lb.

Further improvement in the thrust of the Sapphire may be expected. While all other performance figures for this new engine are still classified, it is disclosed that the Sapphire has successfully completed the 150-hr. service type test at the 7200-lb. thrust figure. This is 1000 lb. greater than the officially disclosed thrust of the Rolls-Royce axial-flow Avon jet engine or of Rolls - Royce's centrifugal - compressor Tay jet engine, both of which are rated at 6200 lb. (Pratt & Whitney's J-48, basically identical to the Tay, is rated at 6250 lb.)

▶**One Equals Four**—For some measure of the Sapphire's potential usefulness in future jet fighters, bombers and civil transports, the builders comment that "one Sapphire has the same power as the four piston engines in a B-29 Superfortress or a Stratocruiser."

This statement was checked with Armstrong Siddeley Motors Ltd., who stated that they based it on the 2500 hp. of the Wright Cyclone engines—which have been replaced by P&W Wasp Majors in the Stratocruiser.

The Sapphire has been extensively test-flown in the two outboard nacelles of a Lancastrian since last January, and in the Sapphire Meteor which flew for the first time Aug. 14. The latter craft was flown at the recent SBAC Farnborough display.

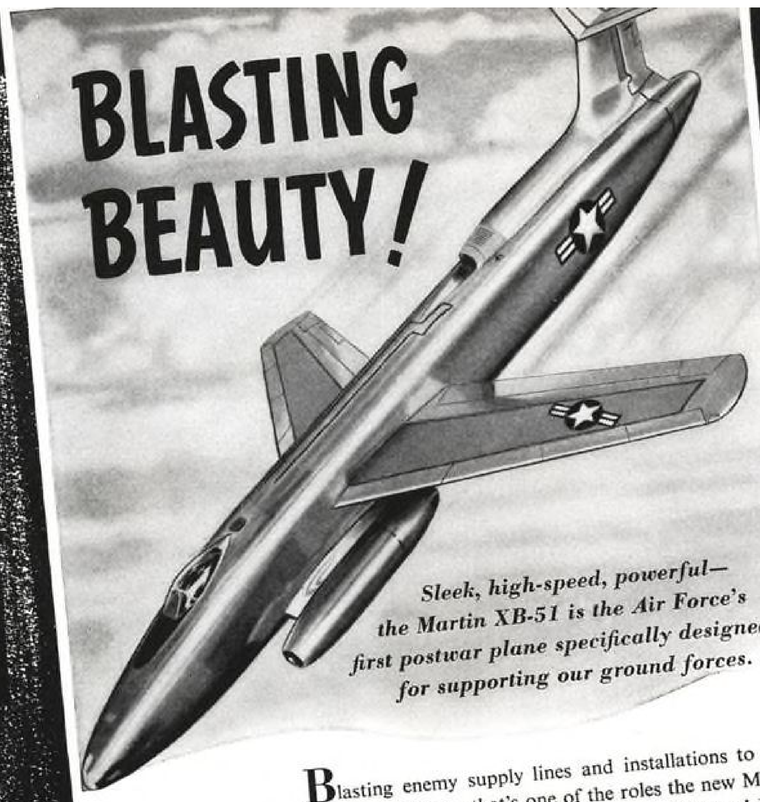
Mach Number Chart

A Mach number chart, prepared by the Kollsman Instrument division of the Square D Co., is available to engineering departments of organizations in aviation and allied fields.

The chart presents indicated air speed, Mach number, altitude, absolute pressure and differential pressure as interrelated functions. A tabulation of pressure ratio, differential pressure and stagnation pressure is given for various Mach numbers at sea level.

Chart may be obtained free from Kollsman, 80-08 45th Ave., Elmhurst, N. Y.

BLASTING BEAUTY!



Sleek, high-speed, powerful—the Martin XB-51 is the Air Force's first postwar plane specifically designed for supporting our ground forces.

Blasting enemy supply lines and installations to help keep our ground forces rolling—that's one of the roles the new Martin XB-51 is designed to play in America's preparedness program! It's a teamwork bomber—versatile, powerful, super-fast, highly maneuverable, designed to be capable of operating from combat area fields. Its lines are clean and graceful, yet radically different. A unique power plant arrangement includes two jets mounted on fuselage pylons and a third in the tail. Drastically sweptback wings, a T-shaped tail and tandem landing gear—plus many other features still classified under military security regulations—make it as modern as tomorrow!

Like all Martin developments, the XB-51 is the product of a highly skilled engineering team. Electronic, aerodynamic, metallurgy research, servo-mechanism studies—all play their parts in the technical leadership Martin offers its customers today. All play their parts as Martin extends research frontiers in advanced design aircraft, rocketry, jet propulsion, supersonic missiles and other far-reaching fields! THE GLENN L. MARTIN COMPANY, Baltimore 3, Maryland.

Powered for faster starts, the Martin XB-51 is designed to have great versatility for operations to and from smaller combat area fields. For landings, the new Martin bomber has a parachute stowed aft which may be released

at the pilot's discretion for more rapid deceleration.

Martin
AIRCRAFT
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carrying air power's story to *America*

air power to guard the peace, air transport to serve it! That's the story Martin advertising develops for millions of alert American readers. Attention-getting advertisements like this reach the general public and business circles in *Time*, *Newsweek* and *Business Week* . . . explain aviation's important role in our country's preparedness program and in the development of travel facilities. "Martin Air Memos" bring news of latest developments to the men and women who write and edit the news through *Editor and Publisher*, *American Press* and *Publisher's Auxiliary*.

engineering has become food for discussion even among laymen in this highly technical age. So this advertising also highlights the manner in which Martin *systems engineering* is meeting the challenge of tremendously complicated air power needs. Today, the Martin engineering staff is designing aircraft and missiles as integrated air-borne systems, not merely as flying vehicles. Martin design work embodies electronic flight and navigational controls and military armament or passenger facilities, as well as airframe and power plant. And the complete development of the aircraft or missile is so scheduled that the end product represents a completely coordinated system.

A well-informed public . . . fully aware of preparedness needs, problems and measures . . . is one of the finest safeguards for peace. Martin advertising helps spread the facts!

THE GLENN L. MARTIN COMPANY, Baltimore 3, Maryland.

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Avionic Aids Pay Off for AIL

All-weather flying aids have spelled success for many an airline flight—and they have also spelled success for the Airborne Instruments Laboratory in Mineola, N. Y.

Airborne can currently boast of a $6 million backlog the greater part of which can be attributed to its exploration of ways to improve those navigational and landing aids. And now, with the increased importance of all avionic problems, Airborne is devoting its time and facilities completely to government work.

▶ **Corporate Status**—AIL formally began business as a corporation in September, 1945. The initial staff was a merger of groups from the Radio Research Lab at Harvard, the Radiation Lab at Massachusetts Institute of Technology and the Columbia University Airborne Instruments Lab. (This last group was originally assembled by the National Defense Research Council and Columbia to tackle the job of submarine detection.)

Capital for the venture was supplied by the scheduled airlines industry, because of its stake in all-weather flying. Facilities were supplied by the Navy, because of its need for the particular type of electronics laboratory exemplified by Airborne.

Capital stock of the concern is owned by Aeronautical Radio, Inc., which in turn is owned by the scheduled airlines.

AIL currently employs somewhat more than 400 people, about equally divided between professional and technical levels. The ratio of one engineer per worker is an exceptionally high one.

▶ **All-Weather Flying**—In general, the task assignments at Airborne revolve around the task of improving all-weather flying. And this means the research, development and limited production of ground-based radars as well as plane-borne antennas and equipment.

Specifically, AIL has performed an evaluation program of the Omni-Bearing-Distance navigation system for the Air Navigation Development Board. These tests, prompted by the U.S.-proposed adoption by ICAO of the Omni-system, were conducted at three different locations in this country—locations where terrain differed greatly.

The program included the operation of ground and airborne equipment, the modification or selection and construction of test equipment and the evaluation of the flight-test program.

During the Berlin Airlift, AIL modified and installed a number of MTI (Moving Target Indicator) kits for the CPS-5 radars at Tempelhof Field, Berlin. Personnel from the lab worked alongside service crews, sweating out landings with them and the lift pilots.

▶ **Submerged Antennas**—Outstanding among AIL accomplishments is its continued development of broad-band, submerged antennas for high-speed aircraft.

For VHF and UHF, tail cap antennas with vertical polarization have been developed. In the long-range communication band (2 to 24 mc.), the whole airplane is excited to act as an antenna.

But AIL does not produce antennas—it develops the geometry, tests the equipment and then suggests to the manufacturer how the antenna should be built.

▶ **Plastic Tower Tester**—It was as an aid to its antenna development that Airborne designed a large, all-plastic tower.

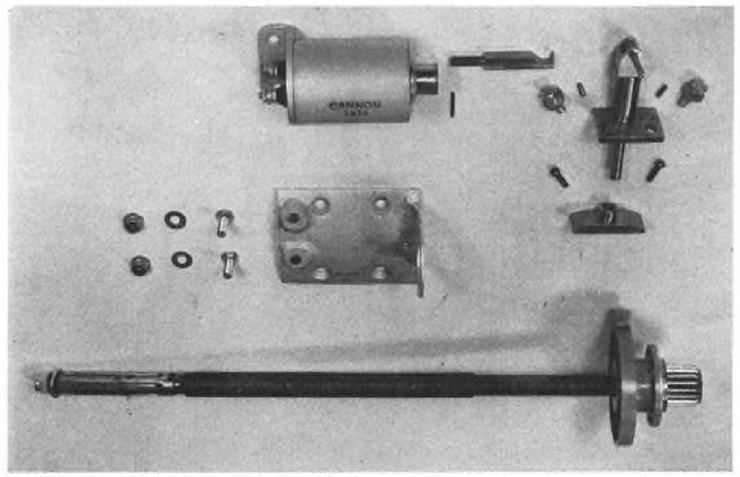
The tower is a single pylon, 30 ft. high, made of a Fiberglas plastic, helically wound. (No metal parts were used in the pylon—even bolts were made of Micarta.) It can be lowered to a horizontal position by a system of gears and a hand crank in order to make installations at the top of the tower.

Small aircraft models (maximum span 8 ft.) are mounted on the top, the tower is raised to a vertical attitude, and the models are revolved to simulate flight attitudes. A model is illuminated from the ground vertically by a frequency generator and, as the model rotates, the field strength pattern of the small-scale antenna mounted in the plane is recorded. Whether the antenna is ultimately to be used for receiving or transmitting, its field strength pattern remains the same.

The tower is used to prevent distortion, caused by ground proximity, to radio waves of the considered frequencies. Line of sight for transmitter and receiver is straight up, not only solving the ground distortion problem for this case, but also eliminating spurious noises or echoes for other experiments.

▶ **Dollar Record**—The business done by AIL has increased steadily since the formation of the concern. A total of $1,032,967 in 1948 was topped by a figure of $2,868,029 for 1949.

With its current backlog of $6 million, business dollar volume during 1950 will approximate $4 million. These figures are a high for AIL.



PARTS KIT enables airlines to install disconnect with only minor reworking of accessories.

Disconnect Makes Flights Safer

PanAm to install Stratos units which permit safe operation of engine despite generator failure.

By Scott Reiniger

A new device which makes it unnecessary to cut off an engine because of generator or alternator failure soon will be installed on its over-ocean Stratocruisers by Pan American World Airways.

The disconnect will make it possible for pilots, with the flip of a switch, to free the failing accessory from the engine drive and continue flying on all four engines, without fear of fire.

The new engine accessory disconnect has been developed at PAA's request by the Stratos division of Fairchild Engine and Airplane Co., Farmingdale, N. Y.

The carrier recently placed a preliminary production order for the new device after 500 hours of service testing.

▶ **All Will Be Equipped**—It plans first to install the electrically controlled equipment on all Atlantic division B-377s to smoke out any "bugs" which may appear after extensive operational use. Then the unit, possibly modified, will be put in Stratocruisers operated by the carrier's Pacific-Alaska division. Each of the big planes' two alternators and six generators driven off the engines will be provided with a disconnect.

PanAm intends to equip generators on its new DC-6Bs with these units, also, when those planes are delivered. In all, 28 Stratocruisers and 18 DC-6Bs are involved in the modification. Without specifying any particular make, PanAm says all its planes eventually will be provided with generator and alternator disconnects. Where feasible, other engine accessories may in time be similarly equipped.

PanAm has one eye on present needs and the other on gaining experience with this kind of equipment for future jet operations, where loss of an engine (which may operate at 80 percent power at cruise, instead of about 50 percent as with present reciprocating engines) will be even more critical.

The new disconnect, Model D-3, was specially designed for use with Westinghouse 11kva. alternators and General Electric 2CM75C1 generators. But Stratos says the unit, with modification, can be used with other makes and types of engine accessories.

The principle employed in the D-3 disconnect is not new. A similar device Model D-2A, developed by Stratos over three years ago, is being widely used by L-049 Constellation operators as an emergency disconnect for cabin supercharger drive shafts made by another firm. Also, new Stratos cabin superchargers come equipped with this disconnect as an integral part of the unit.

The disconnect modification requires replacement of the generator or alternator shaft, a slight change in the generator rear section and minor reworking of the housing. The disconnect is designed to make good use of the external configuration of the generators and alternators used with the Stratocruiser's Pratt & Whitney R-4360 engines. A deep well or indentation on the front (mounting) face of these units gives ample room for the shaft disconnect device—removing the need for hanging or extending the accessory further rearward.

▶ **Parts Kit**—All parts required for the modification are supplied in a moderately priced kit (shown in cut), consisting essentially of:

- **A solenoid with actuator arm** and provisions for mounting it on the generator housing.
- **A solenoid-operated trip** mechanism and disconnect plunger.
- **A special generator** or alternator shaft, threaded just aft of the splined end which engages the engine drive.
- **A disconnect nut,** screwed on the threaded shaft and locked by shear rivets to a serrated front plate which mates with the splines on the shaft.

Basically, the disconnect acts to back the generator shaft out of engagement with the engine. Normally, the large disconnect nut (lower right in cut), threaded to the shaft and locked to it by the riveted front plate which mates with the splines, is free to rotate with the shaft.

But when the pilot throws the disconnect switch in the cockpit, the solenoid (upper center) actuates the trip mechanism, dropping the plunger (upper right) so that it engages a shoulder on the rotating nut. This stops the nut, completely preventing further rotation. The front plate, riveted to the nut, still wants to go around with the shaft since it is mated to the splines—and it does. The moving shaft simply tears the plate loose from the disconnect nut, shearing the rivets which lock the parts together.

By breaking the lock which normally insures the disconnect nut will rotate with it, the shaft permits the nut, to which it is threaded, to remain stationary, while the shaft continues to be driven by the engine. The result is that the shaft screws itself linearly out of engagement with the engine drive. Clearance is provided, so that as the shaft backs out of engagement, its aft end projects into the generator blast tube.

A critical job in development of the disconnect, according to Stratos engineers, was riveting the front plate securely enough to the disconnect nut so that the plate would not shear loose from high torque loads and vibration under normal loads, and thus unlock

WHAT'S DOING *at Pratt & Whitney Aircraft?*

When World War II ended, just a little more than five years ago, Pratt & Whitney Aircraft had the immense satisfaction of knowing that its piston engines had powered almost exactly as many allied war planes as all other makes combined.

But we were then just about at the bottom of the list as designers and builders of the new gas turbine engines. In fact, we hadn't built a single turbine. The reason? The military demand for our reciprocating types had been so great, right up to V-J Day, that we were not permitted to do more than a token amount of research and engineering on gas turbines. Yet British, German and American jets were already flying, and several other American manufacturers were hard at work on their own designs.

As the war drew to a close, however, we began intensive design and development work on gas turbines. That was in the summer of 1945. We started with the realization that we had a very tough job on our hands to catch up with the others and to stay in business.

But we did it. Just a few weeks ago, we proudly watched the first flight tests of *the most powerful turboprop engine* that has ever flown, the Pratt & Whitney T-34 Turbo-Wasp. Work on this project had started five long years before, under Navy auspices. Meantime, we had already reached the production stage on *the most powerful turbojet engine* flying in the United States, the J-48 Turbo-Wasp, and on the smaller J-42, both developed in collaboration with Rolls-Royce. In addition, we have continued to refine and produce, in increasing quantities, the Wasp Major, *most powerful reciprocating engine* in the aircraft world.

Reaching this height was a real up-hill climb, and we think it points up a moral. It's this: Real progress in this aviation business is not easily or quickly achieved.

The story of these past five years at Pratt & Whitney is one of headaches and heartaches and midnight oil, of millions of man-hours of hard work and of millions of dollars risked to reach the goal. The next five years — or ten — won't be any different. We must continue to devote our skill, our energy, our time, and our money to one task — developing superior aircraft power plants. Only by doing this faithfully can we help maintain the air supremacy without which this country cannot survive.

HOW MANY MAN-HOURS HAVE WE SPENT ON GAS TURBINE DEVELOPMENT ?

The answer to this question is a very impressive figure and we'd like to publish it here, but to disclose it would reveal restricted information. But we can give you a clue to the answer. The simplest job in our gas turbine program was development of the J-42 turbojet. That engine, as you know, was only an adaptation of an existing design. And yet more than a million man-hours were spent in preparing it for production. Development work was even more extensive on the powerful J-48 turbojet and T-34 turboprop engines. The time devoted to development on all three and several other gas turbine projects already has run into many, many millions of man-hours.

WHAT ARE THE RATINGS OF OUR MOST POWERFUL ENGINES ?

Wasp Major	J-48 Turbojet	T-34 Turboprop
☐ 3,000 Hp. ?	☐ 5,000 Lb. Thrust ?	☐ 5,000 Hp. ?
☐ 3,500 Hp. ?	☐ 5,500 Lb. Thrust ?	☐ 5,700 Hp. ?
☐ 4,000 Hp. ?	☐ 6,250 Lb. Thrust ?	☐ 6,000 Hp. ?

The Wasp Major, which went into production with a rating of 3,000 horespower, exceeds 4,000 horsepower in its latest version and is the most powerful piston engine in the world. The J-48, most powerful turbojet in this country, has a static thrust of 6,250 pounds, but its power is increased tremendously when afterburner and water injection are used. And you can be sure that, as development work continues on this power plant, its basic power rating will go much higher. The T-34, although it is in the early phase of its development cycle, is the most powerful turboprop now flying. It has officially passed its fifty-hour test at 5,700 horsepower, but Pratt & Whitney Aircraft confidently predicts its power will be increased by a very substantial margin.

WHAT TYPES OF PLANES USE THESE POWERFUL PRATT & WHITNEY ENGINES ?

☐ Bombers ?
☐ Fighters ?
☐ Cargo Transports ?
☐ Interceptors ?

The big Wasp Major piston engines are used in many famous planes flown by the Navy and the Air Force. In addition to Consolidated's B-36 and Boeing's B-50 bombers, Wasp Majors are used in the Douglas C-124 and Boeing C-97 long-range transports, and the Fairchild C-119 and C-120 — all Air Force planes. In the Navy, it powers the Martin Mauler, carrier attack plane, and the Martin Mercator, patrol bomber. The J-48 turbojet already has been chosen to power three of the fastest fighters in the world — the Navy Grumman F9F-5 Panther, and the Air Force's North American F-93A and Lockheed F94-C. The T-34 turboprop, of course, is so new that to date it has only been test-flown. But its performance is so promising that already the Navy and Air Force are considering its use in several types of aircraft.

PRATT & WHITNEY AIRCRAFT

EAST HARTFORD, CONNECTICUT

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

the nut, but would shear easily enough not to damage parts when the solenoid plunger blocked movement of the nut.

▶ **Warning Light**—The pilot or flight engineer is warned to throw on the disconnect switch by a light indicating excessive bearing temperature or if there is an indication of radical amperage fluctuation. To make certain the accessory won't be inadvertently operated until the fault has been corrected, the device is designed so that the generator or alternator must be removed from the engine to reset the shaft for engagement. The disconnect can be used over again after cleaning up and re-riveting, and replacement of any worn parts.

The device saves accessories from damage, in addition to removing the danger of fire when the engine must be kept running in an emergency.

▶ **Melting Danger**—The frictional heat, caused by a rotor rubbing against the stator at high speed, in a generator kept in operation after bearings have failed, has more than once melted the insides of the accessory so that molten aluminum and copper spewed out the cooling air vents of the unit into the engine accessory section. The high temperature blast from these vents has, on several occasions recently, destroyed the nearest static pressure lines, to fuel transmitter and torquemeter transmitter, and ignited the oil and fuel in these, starting a major fire.

The Civil Aeronautics Administration has expressed interest in the Stratos disconnect modification, according to PAA engineers. PanAm does not believe installation of disconnects should be mandatory. One engineer told AVIATION WEEK the unit was especially suitable for use in craft flying at extreme ranges without alternate landings points spaced along the route, but he could see no reason for its use by domestic airlines with shorter routes and alternates.

The Eclipse-Pioneer division of Bendix Aviation Corp. reportedly is developing a disconnect for its own generators. Other large electrical manufacturers are showing interest in the Stratos design. Some engineering thinking now inclines toward incorporating disconnects, where needed, in the basic design or as an integral part of electrical components.

'Wingless Wonder' Tests Engines

Trans-Canada Air Lines' North Star airliners will no longer waste time on the ground running in newly overhauled engines. Instead, the two-hour test run will be accomplished on the "Wingless Wonder," a mobile test bed consisting of a beefed-up International K-2 truck

chassis fitted with a North Star engine mounting.

The Wingless Wonder was designed and built by TCA's engineering and maintenance departments after more than two years of research. Engine controls and a complete set of instruments are located in the cab of the truck. Provisions are also made for engine accessory drives and special tanks supply aviation fuel and oil.

The Wingless Wonder is restrained from taking off during full power operation of the 1725-hp. Rolls-Royce Merlin engine, by anchoring the truck to specially built emplacements. The mobile test unit itself was stressed to withstand a 20,000-lb. pull. To prevent the terrific torque from rolling the truck over TCA engineers used the oleo struts from a war-weary Lancaster and built them into the sides of the unit as sway braces.

The Wingless Wonder is also equipped with radio so that it may run around Montreal's Dorval Airport safely, being in constant contact with the control tower.

AIEE Meeting

Aluminum conductors, circuit breakers, fault protection discussed.

Use of aluminum conductors in the electrical systems of aircraft offers appreciable weight savings, according to W. H. Schumacher, of the electromechanical department of the Glenn L. Martin Co.

In a technical paper presented before the recent annual Middle Eastern Meeting of the American Institute of Electrical Engineers at Baltimore, Md., Schumacher pointed out that the only way a designer of aircraft electrical systems can save weight other than by choosing lightweight components is to use the lightest possible cable. He quoted the cable weight of current large military and commercial aircraft as being approximately 32 percent of the total electrical system weight, which means that the use of aluminum bus bars and cable could result in a reduction of 40 to 100 lb. per plane.

Although aluminum has been used successfully for high voltage distribution (electric railways, heavy industry) for the past 50 years the ". . . use of insulated aluminum cable on aircraft in lower voltage distribution systems is comparatively new and has required considerable development and testing to obtain reliable means for termination and joining," according to Schumacher.

▶ **Fault Protection**—At the same meet-

ing, K. W. Carlson and E. S. Sherrad, General Electric Co. engineers, discussed the importance of protecting the electrical systems of large multi-engined aircraft.

Their paper was entitled "Distribution System Reliability of 28.5-Volt DC Aircraft Electrical Systems."

The authors stated that a considerable increase in reliability of electrical systems could be obtained by relatively minor modifications in bus arrangement.

They continued that ". . . present day aircraft are dependent for best operation on the reliable, continuous service of their electrical ssytems . . . The importance of protecting the system by an integrated fault protection design and a well disciplined program of installation and maintenance cannot be overemphasized."

According to the engineers, the development of a fault protection system should envision three types of faults: continuous short circuits, continuous arcs with arc voltage of 12 to 20 v., and intermittent arcs.

► **Prerequisites**—They listed these desirable characteristics of a fault protection system:

• **Faults should be cleared** quickly, before damage is done to the system components.

• **Protective devices** should isolate only the faulted section and so retain the maximum amount of available feeder and generator capacity.

• **Adequate back-up protection** should be included in the system in case any one of the protective devices fail.

• **The system should operate** without false or nuisance trips.

► **Conclusions**—After discussing the problems of fault protection in detail, the engineers drew these conclusions:

• "**A two-section bus** appears to be the best main bus arrangement for ease of fault clearing and general reliability of the system."

• "**Symmetrical arrangement** of feeders to a forward bus from both sections of the main bus results in a better coordinated system."

• "**For the split bus system,** battery location at the forward bus gives clearing and coordination of main bus faults."

► **New Circuit Breaker**—Another team of GE engineers, B. S. Beall and P. J. Reischneider, described a compact and efficient circuit breaker designed to protect aircraft from short circuits.

Planned especially for installation in the generator circuits of multi-engine planes, they stated that the new breakers had ratings of 300 to 600 amperes at 28 v. and 250 amperes at 120 v., that they would operate efficiently from sea level to 50,000 ft., and that they meet the requirements of present-day electrical systems.

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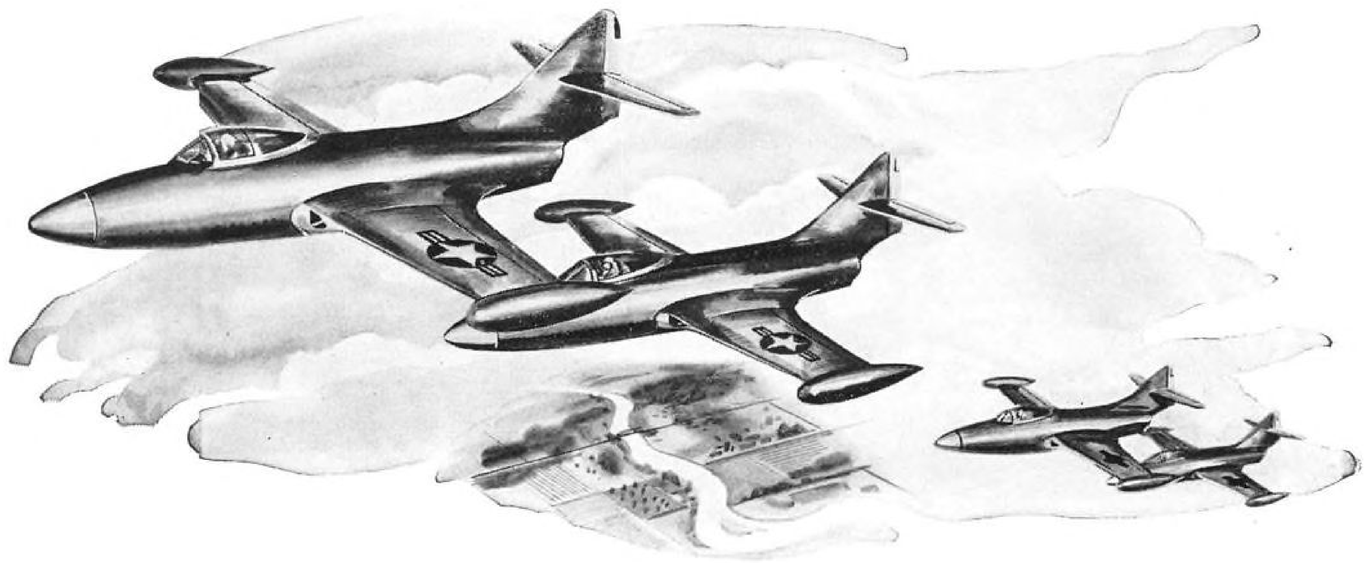

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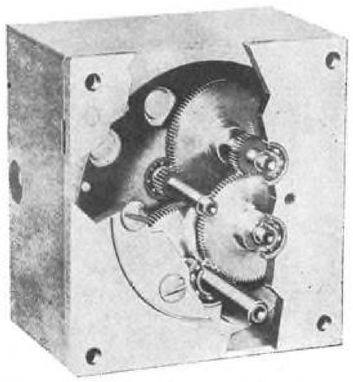


Hi-Ratio Gear Boxes

A line of lightweight, high-performing gear boxes has been made commercially available for the first time by Link Aviation, Inc.

Up to now, these precision devices have been used exclusively in the latest-type training equipment produced by Link for the Air Force. They were built to permit rapid and extremely accurate positioning of sensitive indicators and computers—components in high gain servo loops used in the trainers.

Link originally tried to buy gear boxes from outside sources, but none were available to meet the exacting and specific needs of the firm. So it designed its own units, "Hi-Reduction" gear boxes, with gear ratios ranging from 20:1 all the way up to 3125:1.

The units were designed with an eye particularly on keeping friction and backlash to an absolute minimum. Finger pressure alone on the output shaft suffices to turn the input shaft in the 1000:1 ratio gear box—one of the models in the "Hi-Reduction" line. During a recent life test, made under a load of 150 in.-oz. with direction reversed each minute, the gear box being tested showed no appreciable wear and negligible backlash at the end of a 3000-hr. run, Link engineers report.

The 24ST aluminum-alloy gears used in these boxes are coated with a special molecular compound, furnishing lubrication that penetrates the pores of the metal and lasts for the life of the gear. The class 7 precision ball bearings on the shafts are sprayed with a special polarized oil to insure corrosion-free lubrication at these vital points.

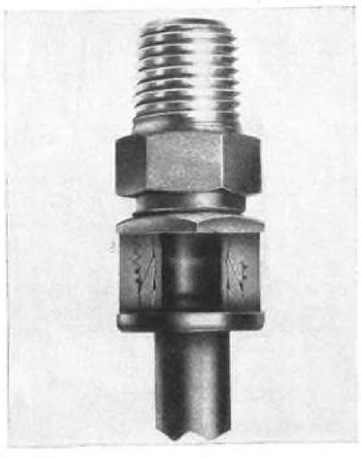
All models measure 3¼x3¼x2 7/32 in. and weigh about 24 oz. In lots of 500, prices range from $84 for double reduction gear boxes to $142.10 for quintuple reduction models. Address: Hillcrest, Binghamton, N. Y.

Eases Tire Handling

"RuGlyde," a rubber lubricant designed to promote quicker and safer tire and tube mounting and dismounting, reportedly has been adopted by the Latin American division of Pan American World Airways after extensive service testing.

The producer of this lubricant, American Grease Stick Co., says PanAm is the first airline to use RuGlyde. Tests at PAA's Miami maintenance base showed that the lubricant does not make tubes sticky or gummy and difficult to remove and handle, according to the maker.

The lubricant is reported to have reduced the danger of damaging tubes and beads when dismounting tires. American Grease Stick adds that other tests showed that after RuGlyde was used for proper positioning of the inflated tube within the casing, the lubricant film dispersed in such a manner that there was no evidence of tire slippage on the wheel from ground impact on landing. Also, there has been no evidence of RuGlyde causing rubber detioration, says the firm. Address: 154 East Erie St., Chicago 11.



Tube Fittings

Small leaks in instrument tubing around connections are "completely eliminated" by the use of "Swagelok" fittings.

So says Crawford Fitting Co. whose engineers have found in tests that the tubing will burst before the fitting leaks. Swageloks are designed to provide a vacuum-tight seal, save time in assembly and eliminate the need for flared ends on the tubing. They reportedly will secure heavy- or thin-wall tubing equally well and can be used with aluminum alloy, brass, copper, steel, stainless steel and plastic.

Two ferrules and a threaded chuck inside the Swagelok's nut, clinch tight around the tubing wall to provide a leak-proof seal. To install, the tubing simply is inserted into the nut which is then tightened 1¼ turns. No damaging torque or twisting motion is transmitted to the tubing since it remains stationary while the nut is being tightened, says the firm.

It recommends use of these fittings to overcome problems involving pressure, vibration and torque. They are available in brass, Monel, aluminum alloy, steel and stainless steel, and come in various sizes for use with tubing ⅛ to 1 in. outside diameter. Address: 1621 Euclid Ave., Cleveland 15.

Lightplane Refueler

A midget refueling truck designed to speed servicing of lightplanes is being marketed by the Harman Equipment Co., 3695 Olympic Blvd., Los Angeles 23.

The unit, called "Fuel-A-Plane," will pump gasoline into a small plane at the rate of 10-to-20 gpm. It has a 220-gal. capacity and is equipped with compartments for bottled oil and record books.

The Fuel-A-Plane cruises at 10 mph., powered by a 97-lb., opposed twin-cylinder Model CK engine built by D. W. Onan and Sons, Inc., Minneapolis. The engine is mounted in the rear, covered by a fold-back, latticed housing which mounts the driver's seat, and is located as far as possible from the fuel dispensing equipment in the front end of the truck.

Rugged, marine-type transmission is provided to get fully loaded vehicle over uneven, soft or muddy terrain. The truck has two-wheel, 9 x 2-in. heavy-duty automotive hydraulic brakes and is highly maneuverable, the company says.

A similar unit, the "Lube-A-Plane," is also produced by Harman. This truck supplies engine oil at 5-20 gpm. to large aircraft, without need for heating the oil.

Betters Runway Joints

Cleaning joints on concrete landing strips is speeded up with new accessories for Model G joint-cleaning and grooving machine. One gives more accurate control of cutter bite, another reportedly prevents tire gumming in hot weather. A towing frame enables operators to move machine quickly from one job to another. Made by: G. H. Tennant Co., 2530 N. Second St., Minneapolis 11.

Aircraft Compressor

What is reportedly the first successful 3000-psi., high-capacity, pneumatic compressor for use in aircraft has been developed by the Cornelius Co., Minneapolis, makers, among other things, of pneumatic systems for actuation of gun chargers and bomb bay doors.

The device delivers two cu. ft. of free air at 3000 psi. delivery pressure. It weighs 15 lb. and is available with ac. or dc. electric or hydraulic motor drives. The firm says valves and other accessories for 3000 psi. systems also are available. Address: 1141 Metropolitan Life Insurance Bldg., Minneapolis 1.

Refreshes Cabin Air

A mobile air conditioner, designed to keep in step in the years ahead with the growing size of transport-aircraft, has been developed by the Airtemp division of the Chrysler Corp., Dayton, Ohio.

Set up to deliver 2500 cu. ft./min. of refrigerated air, enough to supply the largest commercial planes now in use, the equipment also includes means for increasing capacity to meet needs of future aircraft. To enable airlines to get maximum use out of the new air conditioner for the greatest length of time, long-life and dependability have been "engineered into this unit," emphasize Airtemp engineers. Other advantages, they add, are that it is flexible and operates with a minimum of maintenance.

Air is cooled to a temperature of about 50 F., filtered, dehumidified and then introduced into the plane's ventilating duct system through a flexible air hose. Uniform air temperature is accomplished by an automatic capacity reduction device built in the radial compressor. It automatically holds refrigeration output to load conditions, regardless of weather, Airtemp says.

The self-contained air conditioner is housed in a 12-ft. production-built body. Equipment consists of a 7-cylinder radial compressor directly connected to a 150-hp. internal combustion engine, large cooling coils and an evaporative condenser. Auxiliary equipment is V-belt driven and adjustable for belt take-up. Flexible pipe connections are used between the rubber-mounted engine compressor and the auxiliary equipment. Water storage tanks are located underneath the truck and space is provided for a 200,000Btu. heater to permit year around air conditioning.

The unit is controlled from a panel located on the outside of the truck. Safety precautions include an alarm system which cuts off the ignition whenever there is loss of engine oil pressure, excessively high engine water temperature, low compressor suction pressure or high compressor discharge pressure. Access to the equipment for maintenance is provided by doors on sides and back of the truck body.

Hot Dimpler Control

A device which automatically controls heat to dies, used for hot dimpling of aluminum alloy, is being offered to speed production and machine maintenance in aircraft plants.

This modulating hot dimpler control permits die temperature to be finely adjusted over a wide range, the maker says. A signal from a temperature-sensitive element is applied to a first stage of magnetic amplification which regulates a main power magnetic amplifier. The magnetic amplifier closely regulates electrical power applied to the heater unit on the dimpling die.

The controller, for use with 100 w. to 100 kw. portable or stationary dimplers, contains no moving parts, delicate meter movements or vacuum tubes. It is designed to withstand vibration, shock, moisture and variations in ambient temperatures. The device is made by Industrial Electronics & Transformer Co., 8655 S. Main St., Los Angeles 3.

Has Pure Iron Rotor

A new type of low inertia servo motor, reportedly having the highest torque to inertia ratio of any servo motor now available, has been developed by engineers of the Ford Instrument Co., division of the Sperry Corp.

This high performance is credited to the use of a pure iron rotor—in place of a copper bar unit. Ford explains the use of pure iron permits construction of a much smaller rotor and elimination of "cogging" and "single phasing" inherent in some copper-bar types.

The new 10-watt motor, designed to comply with military specifications, "permits new uses of servo mechanisms," Ford says. Since diameter of the rotor is only 0.665 in., compared to 1¼ in. required in the former model using a copper bar rotor, a saving of one lb. in overall weight has been realized, accompanied by a sevenfold increase in the torque to inertia ratio.

The motor has linear torque speed characteristics over the entire operating range and a rotor inertia of .23 oz. in.². It operates either from single- or two-phase, 115v., 60c. current and can be flange or foot mounted. It weighs 4.3 lb. Address: 31-10 Thomson Ave., Long Island City, N. Y.

ALSO ON THE MARKET

Tubing is protected by new Tenite plastic caps that snap over beaded ends and provide a positive, dust-proof seal. Available in various colors, caps reportedly can be used over many times without losing sealing properties; will not loosen from ordinary handling of tubing. Distributed by: Hall Industries, Inc., 111 W. Jackson Blvd., Chicago.

Model P69 pressure transducer for measurement of gage or differential pressures in the ranges from 0-1 to 0-20 psi. also is offered as an absolute pressure transducer in the range 0-15 psia. Acceleration response is less than 0.1 percent of full scale per G up to 10 G in any axis. Made by: Stratham Laboratories, Inc., 9328 Santa Monica Blvd., Beverly Hills, Calif.

Instrument for measuring amplitude of machine vibrations is held by hand against the machine being checked. A detachable 8-in. probe, supplied with unit, Model P Vibrometer, permits measurements, indicated on built-in scale, to be taken directly off the surface of a moving shaft. Made by: The Vibroscope Co., 6 E. 39 St., New York 16.

Small fuel pumps for tank trucks, intended for service where delivery requirements don't exceed 50 gpm., is suitable for use with gasoline and other liquid hydrocarbons having viscosities up to 500 S. S. Made by: Marlow Pumps, Ridgewood, N. J.

Starting relay for fractional horsepower, single-phase motors reportedly has wide application where it can be used to advantage over conventional centrifugal switches. Having a balanced armature construction, the unit is not restricted to mounting in one position only. Made by: R-B-M division, Essex Wire Corp., Logansport, Ind.

Soldering gun spotlights work, features trigger-switch and new terminal arrangement designed to better brace chisel-shaped soldering tip and remove visual obstructions from work. Useful in radio work, device is lighter than previous models, has dual heat (100/135 w.) and two built-in spotlights aimed ahead of soldering tip. Made by: Weller Electric Corp., Easton, Pa.

LETTERS

Wright Field Staff

I have just returned from a ten-day visit to Wright Field to find several weeks' accumulation of AVIATION WEEK awaiting me, amongst them the issue for Sept. 4.

You are to be complimented for the most timely article by Mr. McSurely entitled "What Every Supplier Must Do." It is most pathetic to see the huge stream of vendors' representatives which daily flood the Contractors Relations Office at Wright Field. Captain Mac Wells and his efficient staff are to be highly complimented on the speed and diplomacy with which they handle this flood every day.

I feel that public attention, especially the air-minded public attention, should be drawn to the stupendous and most efficient job being done in both the Procurement division and the Industrial Planning division at Wright Field. Both Brig. Gen. P. W. Smith and Brig. Gen. A. H. Johnson, respective directors of the above divisions, should be complimented on the courteous and efficient manner in which the personnel, military and civilian, under their command treat the public. . . .

I have no objection to the publication of this letter if it will help convince other businessmen that our Air Force personnel are going a job comparable to that being done in many industrial empires of today.

JAMES M. GULICK, Vice President
Hubbard, Dilley & Hamilton, Inc.,
Industrial and Management Consultants
527 Fifth Avenue
New York 17, N. Y.

British Production

One of the London daily newspapers this morning quotes a statement by Mr. William A. Patterson, president of United Air Lines, in Washington yesterday, saying that whilst the British need make no apologies to any U. S. manufacturer for their engineering and design ingenuity, as applied to jet and propeller-turbine aircraft, when they start to build them the British are behind the American manufacturers in production methods.

It seems likely that Mr. Patterson is referring more particularly to factory layout than to actual methods of fabrication.

There can be no doubt that the engineering methods employed in the building of the de Havilland Comet jet airliner, for example (in which riveting is almost eliminated by a cementing process, to name but one highly advanced method), are in advance of current methods of building American airliners—as indeed the Comet itself is in advance of any other airliner.

Design and production methods are so closely integrated nowadays that the design could not be highly advanced unless the production were likewise.

Factory layout is a different matter. The Americans are not accustomed to seeing a relatively small number being built of any aircraft, large or small, and although Comets cost nearly half a million pounds apiece the sight of a production shop based upon an initial batch of only 18 aircraft tends to look "old-fashioned" to them, even if the methods employed are highly advanced.

In jet fighter production British quantities and therefore factory layout are more nearly comparable with American quantities and layout, thanks mainly to export business done in the past three or four years. But American airline operators visiting Europe are less aware of this aspect, being mainly interested in airline manufacture.

The relative efficiency of British aircraft production methods and factory layout as a whole were well demonstrated during the 1939-1945 war, when large quantities could be laid down with a minimum of design modification. And, when design development did call for modifications the British were notably resilient in introducing these modifications into production with little disturbance in the flow.

MARTIN SHARP, Public Relations Manager
The de Havilland Aircraft Co. Ltd.
Hatfield, Hertfordshire, England

Rails Casualties

Your editorial in the Sept. 11 issue about the railroad's toll was interesting.

I was in New York Sunday, and it was so foggy that it seemed dubious at one time as to whether I could reach Dayton by means of the TWA afternoon flight. For an hour, it was a question as to whether I would take the TWA flight or would board the Spirit of St. Louis, which arrives at Dayton at about 7:30 a.m., and which would have served my purpose. I am glad that I took TWA, because it would have been unpleasant to have been involved in the train accident which killed so many soldiers when the Spirit of St. Louis ran into the back of the troop train.

A few years ago, I was on the Spirit of St. Louis when it ran into a truck load of roller skates, about the same place and the same time of day. It killed the truck driver and disabled the locomotive so that we did not reach Dayton until late afternoon.

I feel about the railroads' advertising of safety about the same way that I feel about the cigarette advertising of freedom from choking to death, etc. It is scare advertising in a negative way, and not constructive.

JOHN P. GATY,
Vice President—General Manager
Beech Aircraft Corp.
Wichita 1, Kan.

Navy Designations

I refer to the article headlined "Navy Connies" in the Production section of your Sept. 4 issue.

I have been noting with no little concern and aggravation the manner in which AVIATION WEEK has repeatedly misprinted Navy designations for aircraft. In the reference article the designation for an R70-1 was printed in two different ways, one correct and one incorrect. Other similar errors are too numerous to quote.

In case you and your staff are not aware of the proper method of printing these designations, I refer you to Navy Department Aviation Circular Letter 65-48, dated 22 July 1948, which deals specifically with this subject. For your immediate enlightenment, the proper designation is R70-1 or Roger-Seven-Oboe dash one, not Roger dash seventy dash one. The "R" stands for transport, the "seven" for the seventh aircraft of this class built by the manufacturer, the "0" for the manufacturer, Lockheed, and the "dash one" for the first model of the series. When you print this designation as R-70-1 it looks like an Air Force designation and has no meaning in regard to naval aircraft.

It is hoped that this discrepancy will soon be corrected so that the rest of the aviation field will not continue to be disgraced by one of its foremost publications.

JOHN A. HARPER
Aeronautical Research Pilot
NACA, Langley Aeronautical Laboratory
137 Clyde Street
Hampton, Va.

Pilot Contract

This is in regard to your article on page 46 of the Sept. 11 issue of AVIATION WEEK, by Charles Adams, concerning our current contract negotiations.

It is noted and appreciated that the pilots' side of the picture has been presented. Thanks a lot.

THEODORE S. GRAW
(American Airlines Captain)
581 Larch Ave.
Fair Lawn, N. J.

Credit Where Due

The Sept. 11 AVIATION WEEK contains an article, "XC-12: Tomorrow's Cargo Plane?" which states ". . . the landing gear retraction is electrical, developed by the Lear Corp." This is not so. The retraction actuator was developed by the Victory Engineering Corp., and manufactured and sold by the Breeze Corp., Inc.; both companies of Newark, N. J.

Neither is it accurate to say that a final hydraulic boost is required to lock the landing gear in the down position. Our actuator has a built-in downlock which is engaged automatically at the fully extending position. This lock has been in constant service on the main gear actuator of the C-119B, which is identical to that used on the XC-120 except for the length of stroke.

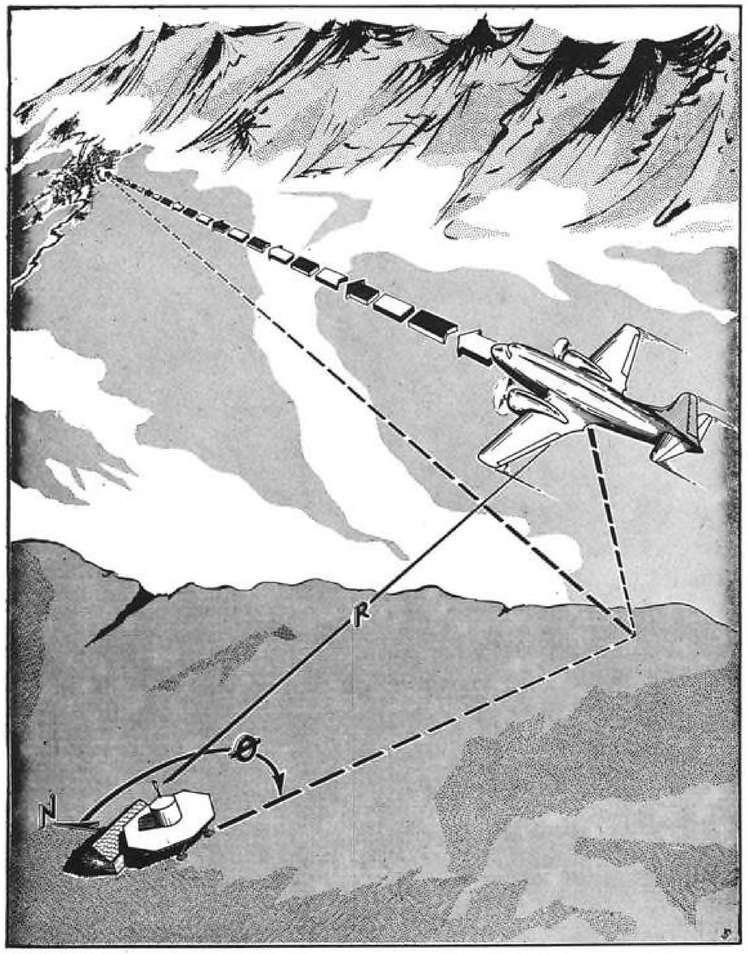
Incidentally, Victory-Breeze also supplies the nose gear actuator and the paratainer actuator now in use on the C-119B.

We are proud of the quality and serviceability of our units and hope you will give us the recognition we feel we deserve in the minds of your readers.

RICHARD MASCUCH, Sales Engineer
Victory Engineering Corp.
744 Broad Street
Newark 2, N. J.

(A Fairchild technical spokesman gave our Alex McSurely the incorrect data. Fairchild and AVIATION WEEK regret the error.—ED).

AIR TRANSPORT



OMNI-BEARING DISTANCE system of navigation makes possible the Pictorial Computer.

Flying a 'Bug' Instead of a Beam

Newly developed Pictorial Computer traces course on map to make navigation easier and more certain.

By F. Lee Moore

Navigating through fogbound mountain valleys to over-field position should soon be as easy to a transport pilot as climbing into bed.

On his map a moving position-indicating "bug" draws a line showing him exactly where he is now, where he's headed, and where he's been.

He turns, and the line on his map turns too. Watch over his shoulder and you can see your course on the map as easily as he does—as he skirts around the contour lines that mark a shrouded peak, down a snaky valley, and over the hidden airport. Over the field, the pilot flies a holding pattern, and the moving "bug" on his chart tracks every move.

► **What Is It?**—This is the Pictorial Computer—today a technical reality, probably next year a production item, year after next the pilot's demand. By 1953, it should be in operational use on airlines, some military planes, and well-equipped executive planes, according to the Air Navigation Development Board.

That is the inference some observers draw from a technical report just completed by Airborne Instruments Laboratory—"Summary Report of Evaluation of Omni-Bearing Distance System of Air Navigation (OBD)."

The project is sponsored by ANDB.

Observers say that success of the OBD system in flight tests means the day of easy navigation is near, in the form of the Pictorial Computer. Its operation is dependent on the OBD single-ground-station system.

Says ANDB research scientist J. Wesley Leas, who is shepherding Pictorial Computer development over technical-practical crags:

"The summary report evaluating the Omni-Bearing-Distance system of air navigation shows that the VOR-DME equipment operates satisfactorily in extremely poor terrain as well as at good site conditions. The results of the tests at three widely different sites should convince pilots and engineers alike that the OBD system is a practical navigation aid and far superior to devices now in use along federal airways.

"Overall accuracies of ±2 to 3 degrees in azimuth and ±0.2 miles in distance can be expected in practical operation.

"With the addition of the Pictorial Computer or the Course Line Computer now being developed, the OBD system provides an accurate, reliable, highly flexible navigation aid."

The Omni-Bearing-Distance system is a combination of Visual Omnidirectional Range (VOR), giving your bearing from a station and Distance-Measuring Equipment (DME), giving your distance from the same station. The OBD system presents these two coordinates automatically, giving you your exact range and bearing.

Install a Course Line Computer and you can fly a preselected course between any two points. (Naturally, you must choose a course that is within the service area of your ground station, or stations.) CLC does this by coordinating OBD position readings and desired course.

► **Price $500**—The portable "lap model" Pictorial Computer is now slated for production cost of about $500 (down from original estimate of $1000). Development models cost $3000 each in quantities of five. Flight tests start in mid-December.

There are three models of Pictorial now under development contract:

- **Portable**, by Aero Electronics Co., to cost about $500 when it hits production. It will be flight-tested within two months.
- **Panel**, by Sperry Gyroscope Co., to cost about $1000 without CLC attachment, $1500 with it.
- **Console**, by Arma Corp., to cost about $1800.

Before you look at the details of how

Pictorial Computer works, look first at the other equipment on which it relies.

► **Operation**—Everything is computed electronically—where you are with reference to the single OBD station at, say, Ogden, Utah—and where you want to go.

If you crank in the proper settings on the Course Line Computer, you can fly straight to Ogden Airport, merely by keeping the cross-pointer needle on the instrument panel centered.

Install a Pictorial Computer instead of CLC and you do not have to preselect your course. On Pictorial you may change course as often as you wish. You don't re-figure your new course to destination or crank in new coordinates.

In essence, all the Pictorial Computer does is put a pencil in the hand of a Course Line Computer and stick a map under the electronically guided pencil.

Actually, CLC and the Pictorial use their bearing-distance information in different ways. On CLC you figure two things: range and bearing of destination from the ground station, and the magnetic course you want to fly to that destination. Then you crank these figures into the CLC. Its needle gives left-right deviation from the course selected.

► **The Bug and You**—On Pictorial, all that happens is that the computer keeps recording your present range and distance from the station all the time. The station is the center of the chart and the bug is you. Range and bearing from the station is the same as the bug's range and bearing from the center of the chart.

If you have a Pictorial, you do not necessarily need to buy Course Line, too, although you could navigate a little more precisely on a straight preselected course using the Course Line instrument.

► **Error Maximums**—Range of overall error on Pictorial Computer performance, including error of ground station and airborne VOR and DME, is a maximum of $\pm 3\frac{1}{2}$ degrees azimuth and one-half mile distance.

Close in, where it counts most, the $\frac{1}{2}$-mile distance error is greater than azimuth error (in terms of miles). So the maximum error from dead center is $\pm\frac{1}{2}$ mile.

You can count on hitting a spot one mile square, says ANDB.

Pictorial Computer works with all three official airways map scales: world area charts (1 in. = 16 statute miles), sectional areonautical charts (1 in. = 8 mi.), and instrument approach charts (1 in. = 4 mi.). On these charts, the viewing screen of the computer takes in chart area diameters of 160 miles, 80 miles and 40 miles respectively.

CAA will take its standard airways maps and merely cut them to fit the Pictorial Computer. Each map will be cut for use with the particular OBD ground station of its airport or area. But even here, you will not be limited to one map or station in a crowded area.

You can hit a Washington airport or objective using either the Washington map and OBD range or the Baltimore set. The same is true for other areas.

► **Portable-Pictorial**—Here is a rough description of the $500 Portable Pictorial Computer. ANDB researcher Leas has set the general specifications, but he can not yet set the exact functional design. Months of pilot testing will determine final model.

The Portable is a flat box designed for stowing anywhere in the cockpit when not held on the pilot's lap for observation. Weight is probably around six lb., certainly under eight. Thickness is $3\frac{1}{2}$ in.

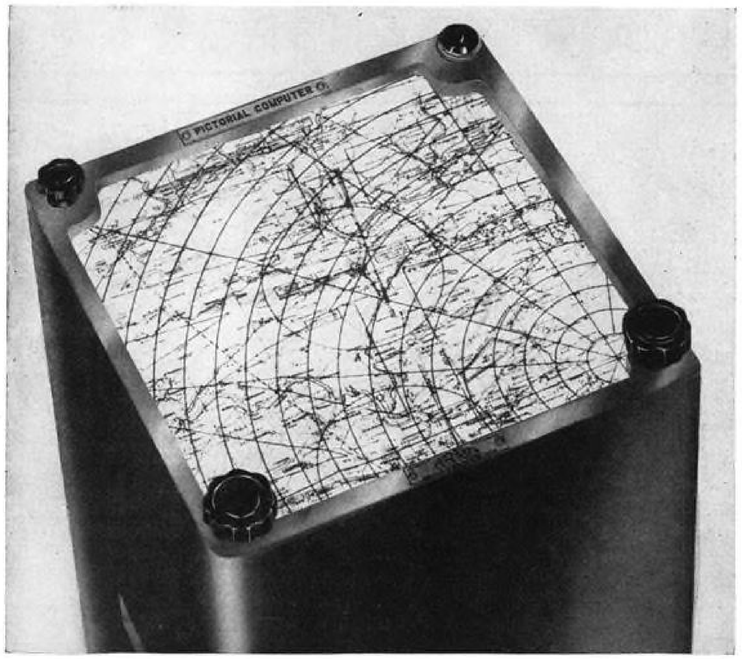
The portable has a round face, with an overall diameter of $11\frac{1}{2}$ in. Map-viewing surface is also round, with diameter of 10 in. A transparent plastic cover tops it, to protect the armature of the course-writing bug from damage.

ANDB says the gadget will take normal cockpit handling without losing its built-in accuracy of $\pm\frac{1}{2}$ degree of azimuth and 0.4 nautical miles.

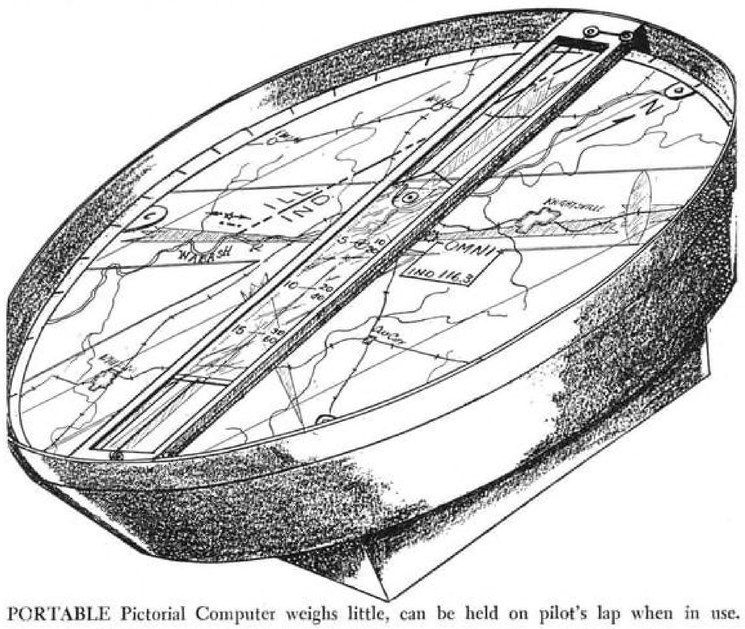
The whole box is simply styled—no snags to catch on the pilot's earphone cords or controls. Only attachment is the cord to a jack box for the OBD gear.

The position-indicating bug is a small ring. Through the hole in it you can insert a pencil to track on the map, or you may leave the pencil out if there's no need of a penciled track. (Permanent tracking on the panel and console models may be done automatically in one of several ways—such as facsimile printing—but ANDB hasn't yet decided which way.)

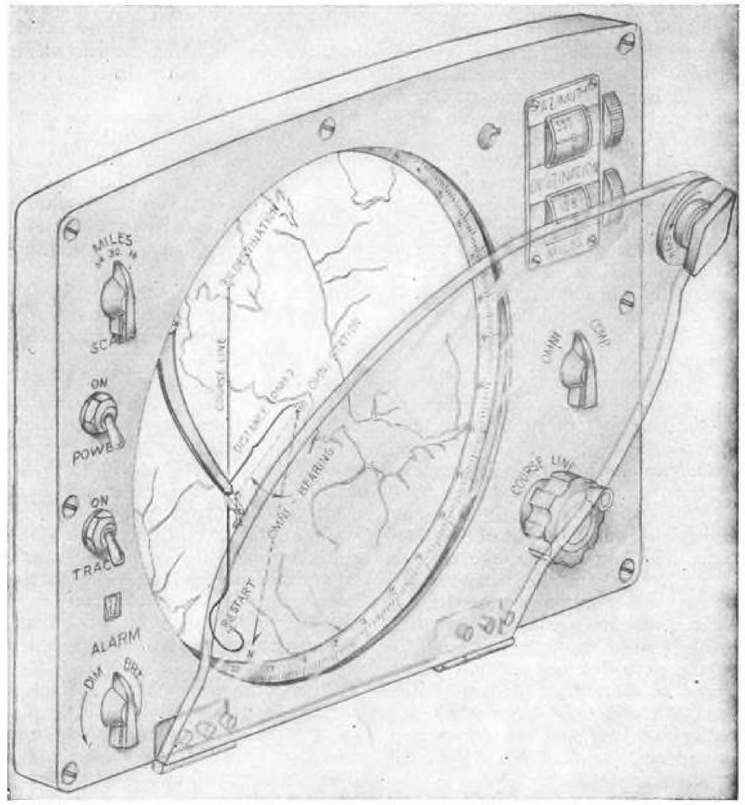
The Portable is like the other models in its general use and operation, only



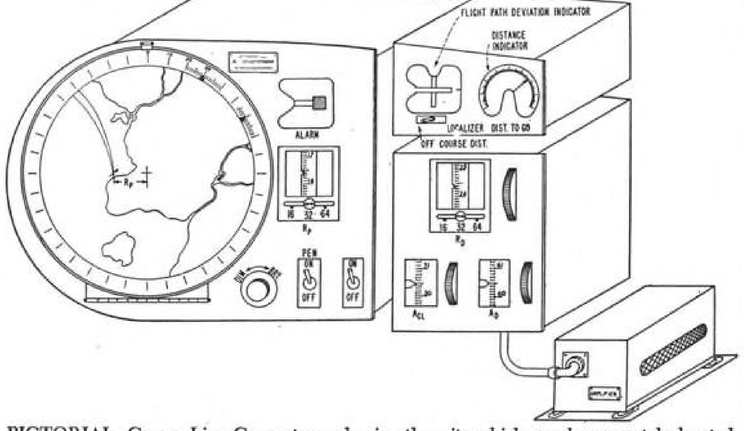
CONSOLE Pictorial Computer shows position by the moving circles and radials on map.



PORTABLE Pictorial Computer weighs little, can be held on pilot's lap when in use.



PANEL Pictorial Computer, being made by Sperry, combines essential elements of . . .



PICTORIAL, Course Line Computer and azimuth units which can be separately located.

simpler. They all have a magnetic-heading indicator scale that goes all the way around the 10-in. viewer's circumference. Because of the large scale of this heading indicator, the pointer is easily read by the pilot to within half a degree of actual heading.

▶ **How to Fly It**—You navigate with the Portable in the same general way as with the more elaborate Panel and Console models.

If you fly from San Francisco to New York, you will probably start out by placing the San Francisco area chart in the Pictorial shortly after takeoff. The local OBD station is in the center of your map.

Turn the tuning knob to the frequency of that OBD station, and switch on the gear, selecting the proper map scale for this map.

The position bug immediately moves to your present position and starts tracking your plane. By this time, you are probably several miles east of San Francisco. The bug moves to the right on your chart as you climb eastward on course. If you are on instruments, you will perhaps save gasoline using the Pictorial because you can negotiate the mountains with more certainty of position and course than you could before you had the Pictorial Computer.

You may lay your Pictorial aside after you get in the clear, but it will still track you.

A flag alarm jumps up when you fly beyond the range of the OBD station you have tuned the Pictorial to. This flag alarm is just like the ILS cross-pointer flag alarm indicator.

The alarm signals whenever:

- **Plane goes outside** the range of the OBD station the Pictorial is tuned to (range is limited by DME to optical line-of-sight).
- **Interference** gets into the receiver.
- **Equipment fails.**

If you find the flag alarm is up, and the bug has come up against the side of the viewer frame, you know you should switch to another range. You know also that when you left the limits of the presently installed chart, your course was that indicated by the trail of the bug.

If you find the flag alarm is up while the bug is still traveling a proper course on the map, you are probably behind a mountain and have broken your line-of-sight contact with the ground station you are tuned to.

If the flag alarm is up and the bug is behaving erratically, something is wrong.

To switch maps, look at the next map, tune the Pictorial to the OBD range indicated, remove the old map, and put in the new.

Nonstop transcontinental flight using Pictorial Computer would require about 18 map changes if you wanted to see your position at all times. If you want to land at Chicago, you may switch from an area chart to a sectional about 40 miles out and then perhaps to an approach map at about 20 miles.

▶ **Handy at High Speeds**—Jet plane speeds are where the Pictorial will come in most handy. Pictorial is undoubtedly the simplest way to navigate at high speed, because even contact conditions give the pilot little help, since he moves too fast to keep track of his checkpoints.

At jet speeds, of course, you have to change Pictorial charts every 15-20 minutes, but each switch takes only 15-20 seconds.

Pictorial Computer will probably be favored over Course Line Computer, but only pilot evaluation will tell definitely. Production price of Pictorial and CLC is estimated at $500 each.

▶ **CLC Drawbacks**—Here are apparent relative disadvantages of Course Line:

- **Shifting course** on Course Line Computer requires you to compute a new set of coordinates and set them into the instrument. This not only takes time but also allows room for pilot error. Same risk occurs every time you switch course on CLC.
- **"Flying the needle"** on CLC gives only a left-right deviation, plus a figure on distance, whereas on Pictorial you have the "feel" of where you are going. Only a map picture or contact flight can give you that.
- **Map reading** is still necessary when you fly CLC.

On Pictorial, you fly your course and read your map all at once. Pictorial's combined operation reduces pilot fatigue, time, and chance of error. It is in line with today's trend toward "combination" instrument groupings (see AVIATION WEEK Oct. 9, p. 44—"Bendix' Three-in-One Flying Aid").

▶ **Panel Model**—You fly the more elaborate Panel and Console models of Pictorial Computer the same as the Portable. But these have added features.

The Panel has a magnetic compass heading arrow mounted on top of the moving position-indicator bug. This extra heading indicator is supposed to help orient the pilot as he glances at the map. But so far, accuracy of the magnet-controlled arrow is so poor (±7 degrees), it hardly seems worth the effort.

On the Panel you may change the north-south alignment of the map. Thus, while you install the map in the conventional way, with north up, you may rotate the chart with a special control. So you may fly your plane "up" the chart, whether that be north, south, east or west.

The Panel model is not portable. It is designed for permanent mounting in the cockpit, probably in the instrument panel.

Frontal area is about the same as the Portable (just two inches wider, same height). Depth is not over eight in., so it is suitable for instrument panel mounting. Weight is about 20 lb.

The Portable is available alone, or combined with the two Course Line Computer flight instruments and/or CLC controls.

▶ **Console Model**—The Console is automatic. You dial the identity code of the range you want and the chart flashes on the screen (projected from inside). Thus there is no manual map insertion. The same dialing has already tuned in the proper range for the map.

Your position shows up on the Console's screen as a grill, or reticle. Your position is surrounded by radial lines giving you bearings, and concentric circles giving you distances—as on a 360-degree radar screen. As the plane moves across the map, the radials and circles move, too. The radials rotate under the influence of a magnetic compass.

Weight of this equipment is under 25 lb. Size is less than 1½ cu. ft., with probably about the same frontal area as the Portable and Panel models, but deeper.

Inside the Console is a projector with a roll of 35-mm film. There are 150 charts at your disposal—touch-tunable. ANDB figures this is ample map selection for the main routes of an airline.

▶ **Interference Slight**—Some questions about Pictorial's practicality come to mind:

- **Will two stations** on the same frequency confuse the Pictorial's little bug? No, as long as you stay on your map

NEW SCOREBOARD

This neat new plane arrival-departure-destination board being installed in all Pan American World Airways terminals is replacing present harder-to-read black-boards. The new boards have interchangeable block letters and numerals for easier visibility.

there can be no normal interference from other stations on the same frequency.

• **Will "skip,"** or freak reception of far-distant ranges upset Pictorial? Yes, just as it can upset any other electronic receiver. But the skip signal must be stronger than your local signal. Otherwise there's no interference, ANDB says.

One of the good things about Pictorial is that erratic movement of the bug leaves a penciled record. So you wouldn't have to be watching it all the time to learn that the skip had occurred.

• **Is it reliable?** Yes, it should be as reliable as ILS or any other such equipment. This all depends on careful engineering design and construction. Pictorial Computer is not a radical idea—it is an application of long-known principles and components.

▶ **When Can You Buy?**—If all goes well, Pictorial Computer, Course Line Computer, and DME will be available about mid-1952. Then the airlines will probably to take a year installing the new navigation gear in their planes (at overhaul time).

Big catch right now is that the airlines haven't decided on specifications for airborne DME. That's despite the fact CAA is already taking delivery on 30 airborne DMEs from Federal Telecommunications Labs this fall, for large-scale evaluation.

Ground equipment is already going into place. CAA has 450 ground DME units (transponders) on order from Hazeltine Electronics Corp. for installation starting next March.

Airfreight Skirts Inventory Risks

The Slender-Lee Skirt Co., Philadelphia, has worked out a system of airfreighting stocks to retailers, enabling them to keep full inventory control with a minimum investment in goods. American Airlines does the flying of the freight.

The retailer anywhere in the U. S. buys his minimum needs of skirts for only a week's business. On each skirt is a duplicate stock tag.

Every time the retailer makes a sale, he tears off the tag and airmails it to the manufacturer in Philadelphia. The maker guarantees to fill retailer reorders within a week.

American offers one-day delivery to Slender-Lee retailers east of the Mississippi, and second-day delivery elsewhere in the U. S.

Slender-Lee's President Carl H. Stenzler call his system "riskless merchandising." It helps overcome the usual retailer fear of stocking normal-size inventory of goods.

Continental Tests Omnirange System

Continental Air Lines pilots last week started navigating the first official VOR "Omnirange" controlled airways system. The new very-high-frequency radio range system covers 4380 miles of airways. Continental will give VOR the acid test. The device claims many advantages over the old low-frequency, four-course range system. Among the advantages are: Little static interference; bearing identification from any point within range of a single station; a definite position "fix" within range of any two stations (requires pilot calculation); visual orientation on instrument, instead of sound codes in earphones.

Pilot navigates directly toward or away from the station by centering a needle, which gives left-right deviation from the homing course.

The air mail pilot of the 1920s, had to see the ground to keep to his trails. In the 1930s he could fly his airplane at a greater speed along roundabout, but well defined, sky trails, marked by the beep-beep of the "radio range" in his earphones. Trouble was, when he needed the range most, in a storm, the static on the low-frequency radio nearly drove him mad. And if he

got off the radio beam he sometimes had a hard time finding it again.

Now 1950 brings the very-high-frequency Omnirange, which lets him plow through bad weather while he keeps his eye on a simple needle. He still has to fly a prescribed trail, but even when he gets off it, he knows how to get back.

A pilot won't be able to fly a really straight line to any destination he chooses until 1953, when distance measuring equipment will be added to the bearing information that VOR now provides.

Slick Buys Three DC-6A Cargo Planes

New high-speed overnight transcontinental air cargo service, in 300-mph. airplanes is assured as a result of the Slick Airways purchase last week of three Douglas DC-6A cargo planes for approximately $3 million.

The new air freighter order by Slick may stir up competitive purchases of comparable cargo planes by other air cargo haulers, and may result eventually in a considerable reshuffle of the present air cargo ton-mile costs and rates.

Details of the transaction were wrapped up last week by President Thomas E. Grace, of the air cargo line and Nat Paschall, Douglas vice president in charge of commercial sales.

The planes are essentially similar to 11 new Navy R6D-1 transports which have just been ordered for fleet logistic support wing. Presumably the service order made it possible for Douglas to offer Slick a more attractive price, than if Slick had been the sole purchaser.

Deliveries of the Slick order are to start in Feb. 1951.

▶**High Flyer**—The first postwar commercial cargo planes to be purchased will have pressurized cabins and will operate at relatively high altitudes—around the 20,000-ft. level.

They will carry a 30,000-lb. payload, well in excess of that hauled by any other commercial cargo plane now used by Slick or any other line.

Biggest advantage of the DC-6A operation, will be the tapping of a rich cargo potential which analysts say has long awaited the establishment of a fast coast-to-coast service, leaving one coast at close of business one day and arriving at the other in time for opening of business the next day. Speed and range of the DC-6As is such as to make either a nonstop or a one-stop continental cargo run economically feasible. Operating at altitudes will also minimize need for refrigeration of even most perishable commodities.

Slick's decision to buy the Douglas plane, it is understood, followed a long study of comparative advantages of this plane and its principal competitor, a cargo version of the Lockheed Constellation 1049, which the Navy is also purchasing.

Additional commercial orders for both these planes, and possibly for a commercial cargo version of the Boeing Stratocruiser may be stimulated by the Slick program, when other principal cargo haulers such as American Airlines, United and Flying Tigers, start contemplating the competitive advantage that the new equipment will give Slick.

The Slick organization began hauling air freight in 1946, with twin-engine military cargo transports, Curtiss C-46 Commandos, and now operates a fleet of 22 of these planes.

Officials point out that the Douglas cargo planes would be a reserve cargo force for military use if needed, in addition to serving actively for commercial cargo.

Fly-By-Night Pays Off

London—To cope with the summer peak traffic, as well as to sample the public response to an offer of low cost air travel, Aer Lingus last June 15 introduced a late-at-night service between London and Dublin.

Two such flights were operated from each capital.

In all, 402 "Starflights" were operated, with no cancelations and only one bad weather postponement.

By the time the last of these Starflights landed at Dublin on Oct. 1, nearly 8500 people had traveled by this service.

A survey carried out by Aer Lingus shows that the greater proportion of night passengers were first-time travelers who were attracted by the low fare.

It is expected that the service will be re-introduced next summer with some modifications based on suggestions made in a passenger survey carried out by Aer Lingus during the course of the season's operation.

Sao Paulo's Busy Congonhas Airport

(McGraw-Hill World News)

Sao Paulo, Brazil—Sao Paulo's Congonhas civil airport handled 32,701 aircraft and 413,120 passengers in the first half of this year, setting new all-time records and giving it a place among the busiest airfields in the world.

By way of contrast, the 12 certificated airlines serving the New York metropolitan area made 92,303 departures, carrying 1,802,611 passengers, during all of 1949. These figures include La-Guardia, Idlewild, Newark, Teterboro and White Plains airports (AVIATION WEEK July 17, p. 46).

All but 3855 planes and 7541 passen-

gers at Congonhas (mostly either military or private aircraft traffic) were handled by the 14 airlines regularly serving the city. Three of the airlines exceeded 5000 flights during the period —Vasp with 5643, Real with 5597 and Cruzeiro do Sul with 5763. Vasp led the list in passengers carried, handling 92,298, to Real's 89,160 and Cruzeiro's 78,296.

Panair do Brasil made 3129 flights carrying 40,797 passengers, and PAA's through services totaled 678 flights and 10,348 passengers.

Full-year totals in the past at Congonhas have been: 1946—25,418 planes and 264,203 passengers; 1947—42,375 and 425,608; 1948—54,626 and 542,442; 1949—60,226 and 657,710.

SHORTLINES

► **Air Express**—Shipments out of New York City, Sept. 1 to 23, were up six percent over 1949.

► **Air Transport Assn.**—Vice President Milton Arnold tells civil engineers: no more than two parallel single-axis runways will be used in instrument operations of the future; and planes, airports and servicing lag electronics development. . . . ATA is looking at Western-proposed idea: Adopt an ATA symbol to distinguish members from nonskeds in advertising. Motto: "Fly a Scheduled Airline."

► **British Overseas Airways Corp.**—Starts Stratocruiser service on New York-Miami run Nov. 11—two roundtrips a week at $154.30.

► **Chicago & Southern**—Has ordered a sixth Constellation, a 57-passenger version.

► **Delta Airlines**—Reports net profit for year ended June 30 at $1.63 a share, or $815,751, well above last year's $1.28 a share, or 639,440. Operating revenues of $17,185,295 compare with $15,227,845 in 1949.

► **Eastern Air Lines**—Paid $186,000 in retroactive 5-cent pay hikes to IAM machinists. New 10-cent raise (including the 5-cent retroactive) brings machinists' wages to range of $2.08-$2.23 an hour.

► **Frontier Airways**—Is modifying some planes to handle larger freight loads and will work cargo-transfer with Flying Tiger Line at Denver.

► **Flying Tiger Line**—Collected "nearly a million dollars" on its maintenance and overhaul operations in 1949-50 fiscal year, company says. This compares with $200,000 the year before. . . . Company publicly blames subsidized competition for some problems, but says low back-haul volume is a major problem.

► **International Airways**—Signed a contract with Republic of Panama requiring that any structures built there by company revert to government in case contract is called off.

► **Pan American**—Latin American division "delay clinic" claims it has reduced Miami flight delays 70 percent since it started analysing headaches a year ago. Biggest uncracked nut is how to treat late-showing passengers.

► **Robinson Airlines**—Bought a DC-3 to replace the one that crashed near Utica. Engines are G-205 Wrights.

► **Sabena**—Now reports last year's loss at 89,100,000 Belgian francs; revenues came to only 88 percent of expenses. Belgium makes good the loss. Present fleet is 5 DC-6s, 7 DC-4s, 6 Convair Liners, 17 DC-3s, 7 C-47s, 4 DH Doves, and 6 small craft. . . . Carrier is putting another DC-4 flight on the Pacific airlift.

► **Southwest Airways**—Says August load factor was 57 percent, and September (16 days) 62 percent.

► **Southern Airways**—Got CAB show-cause order calling for temporary mail pay rate of 80 cents a mile for June 10, 1949-Apr. 30, 1950; 60 cents May 1, 1950-Dec. 31, 1950; and 50 cents after Jan. 1 next year—on base mileage of 5328 until start of Memphis-New Orleans service, after which it becomes 8476 miles.

► **Trans World Airlines**—Flew record 8200 passengers on trans-Atlantic routes in September. . . . Got CAB approval of 73-percent stock ownership by Hughes Tool Co.

► **United Air Lines**—Carried record passenger, freight, express and mail traffic in Sept. Passenger revenue miles came to 146,538,800—up 8½ percent over year ago. . . . United expects to serve 2.7 million meals in 1951, compared with estimated 2½ million this year, based on projection of annual volume, plus more food for new Los Angeles-Honolulu run.

► **Western Air Lines**—Carried its 200,000th air coach passenger on competitive Los Angeles-San Francisco run, at 3 cents a mile. Company says the route made a "reasonable profit on the route in the one-year period."

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT • BUSINESS EQUIPMENT — USED OR RESALE OPPORTUNITIES

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$1.20 a line. Minimum 4 lines. Count 5 average words as a line. POSITIONS WANTED (full or part time salaried employment only): ½ above rates, in advance.
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POSITIONS VACANT

THERMODYNAMICIST—Graduate engineer to perform theoretical and design analysis of gas turbine type power plants. Must be analytical with practical realization of manufacturing problems. Background of thermodynamics, fluid dynamics, and heat transfer necessary. Five years' experience in applied engineering in these subjects. Must be capable of writing good reports. Please direct reply to Industrial Relations Division, Solar Aircraft Company, 2200 Pacific Highway, San Diego 12, California.

DEVELOPMENT OR Experimental Engineer—Graduate engineer with five years' experience in applied engineering, preferably in development. Familiar with turbojet engines. Mechanical design ability with background in thermodynamics and combustion. Capable of supervising development tests and writing good reports. Please direct reply to Solar Aircraft Company, Industrial Relations Division, 2200 Pacific Highway, San Diego 12, California.

POSITIONS WANTED

CAL-AERO TECH. Aeronautical Engr. graduate; A&E Mech. License; Flight Engr. License; School experience only; willing to start at bottom; work or travel anywhere. Vet, single 24. Available about Dec. 1. PW-7873, Aviation Week.

EXPERIENCED REPAIR Station Service Manager, 10 years A&E, DAMI, and private pilot rating. B.S. in Maintenance Engineering. Capable of managing and working with people. Extensive knowledge of time studies and flat rate operations. Desires responsible position with manufacturer or large service organization. PW-7958, Aviation Week.

BUSINESS OPPORTUNITY

Complete facilities

of new Class 3 airport available. East Central New York State convenient to but outside populated area. Paved runways, buildings, ample adjacent acreage, all types transportation conveniently accessible. Unexcelled locale for research, testing, development, manufacturing. Contact Wm. W. Streever, 60 Hyde Blvd., Ballston Spa, N. Y.

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850 hrs. Engines, 5,000 hrs. on aircraft, Constant propellers. Full Narco-Omni, Two VHF Trans., Two VHF Rec., LF Rec., ADF Rec., Marker Beacon Rec., Aux. Receiver, 3105 Transmitter, 50 Watt, 3 Channel Radio Telephone Ship to Shore, Nose Landing light, Flashing position lights, dual Blind flight panel. Deicer on props, 38 gal. nose tank, I.A.S. 175. Ship recertificated June, 1950. Will demonstrate and deliver for expenses. Price $24,500.00. FS-7874, Aviation Week.

NEW ADVERTISEMENTS received Friday will appear in the issue mailed the following Friday subject to limitation of space available.

WHAT'S NEW

New Books

Airways Abroad is Henry Ladd Smith's attempt to do for the international transport field what he did so successfully in 1942 for the domestic transport system in "Airways." That first book was perhaps the most interesting and readable aviation history ever published; perhaps it was too entertaining, for Airways Abroad suffers in comparison.

That might have been expected. State papers seldom are as interesting as people. People—the colorful founders of the domestic airlines—dominated "Airways." The complicated pattern of international aviation agreements is the backbone of "Airways Abroad."

To set his stage, Mr. Smith skims the history of Pan American Airways and Imperial Airways (the forerunner of British Overseas Airways Corp.). The major part of the book, however, relates to the International Civil Aviation conference of 1944, its preliminaries and the aftermath. It all seemed extremely important at that time, and a knowledge of events then no doubt still is important to understand the present international air system. But the areas of today's conflicts—low fares, international freight—are barely touched. Mr. Smith devotes little space to developments later than 1946.

This book is very readable history, and contains much material about British-U. S. negotiations that has not previously been published.

Published by the University of Wisconsin Press, price $4.

Production Management in Small Plants, No. 5 in the business research series of Stanford University's Graduate School of Business, spotlights common shortcomings and contains practical suggestions to guide small-plant operators to increased efficiency.

Available from the Graduate school of Business, Stanford University, Stanford, Calif., 44 pages, price 50 cents.

First in a series of technical manuals designed to assist national defense agencies and contractors is entitled **Welding Engineering and Design**, and is being distributed by Eutectic Welding Alloys Corp. Further manuals intended for early publication: Jig & Fixture Design; Tool and Die Salvage; Machine Repair, Maintenance and Salvage. Copies of the engineering and design manual are available without charge by writing the company at 40 Worth St., New York 13, attention of Technical Information Service.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—OCTOBER 23, 1950

PROFESSIONAL SERVICES—
First issue of each month

SEARCHLIGHT SECTION
(Classified Advertising)

EDITORIAL

End the Security Confusion

The Air Force should tell its contractors what they can say publicly about their work.

Publicity directors in the aircraft industry are baffled and confused. Every company and every plant with Air Force business, after vague, conflicting secrecy warnings from Washington, is shakily deciding how much it can tell its employes, its neighbors and the press.

After all, it's impossible to wire and telephone Air Force Review in Washington on everything that comes up in a busy day. You wouldn't be able to wait for the individual answers if you did.

We are gathering the impression on a transcontinental tour that the Air Force itself hasn't come to grips with the subject.

At one extreme are the Air Materiel Command's top officers who stoutly hold to the thesis that complete silence is golden. Other Air Force generals are inclined to be more lenient, but not much. Secretary Finletter, with his keen perception of the broader picture, is believed to be far more cognizant of a democratic government's obligation to make the most complete report consistent with national security on how the public's money is being spent.

Just how or when these widely differing positions will be reconciled into a clearly written directive for USAF contractors is a moot question. Industry hopes soon.

The only post-Korean expressions from Washington are few and vague, with no coordination.

The Department of Defense released, somehow, two memoranda of generalizations urging caution in revealing too much information about our rearmament program, but we are finding that distribution was haphazard. We have found no aviation manufacturer—even USAF contractors—who received either of these memoranda directly. Most companies who know of them at all received them as mimeographed copies from a trade association. What about all of the government's contractors who don't belong to this particular group?

Apparently, these two bulletins have no connection with two other letters dated July 31 that were sent from Wright Field, one signed by Wright Field's Commanding General Chidlaw, the other by AMC's General Cook. These, too, were general caution warnings, without specific instructions. There were also two bulletins from Air Force's Public Information Office on the subject of "security guidance," dispatched to a nebulous mailing list from the Pentagon in Washington. These various "advisories" present puzzling inconsistencies and one or two concede that special conditions may require action contrary to the recommendations.

Also adding to the confusion on press relations was the announcement which came to some aircraft company public relations men through their Air Force plant representatives about June 29, announcing that all visitors "not having essential, official business" would be denied access to their plants. A few companies have had to decide that members of the press asking for news could not be classified as having "essential, official business" on the premises. One practice is to ask special AF clearance for each visit by a reporter or editor.

But in general, the companies are confused about this information picture. They concede that as U. S. Government contractors—many of them in government-owned facilities—they expect to be bound by strict publicity regulations. And every aircraft public relations director we have seen is more than willing to subordinate publicity for his company to the national interest.

But until the Air Force hands them a clear, comprehensive policy directive, agreed upon by everyone from Secretary Finletter through the reigning Pentagon generals and the Wright Field generals to the lowliest USAF public relations officer, many facts which could be released safely about our aircraft program will be withheld cautiously at the source, while other perhaps dangerous data will be let out thoughtlessly by unbriefed industry or government spokesmen.

Secretary Finletter certainly needs no memory jogging about where the Air Force's money comes from, although some of his unthinking but otherwise conscientious officers do. The public must have a constant stream of as much accurate, timely information as security permits. Public ignorance breeds public distrust.

Air Freight's Competition

The average speed of freight trains in the first six months of 1950 was 1.2 percent faster than in the same period of 1949, and 8 percent faster than in 1944.

This happy note was dispensed to the press by the Association of American Railroads Sept. 25. It was just one of a page of filler items titled, "Interesting Facts About the Railroads."

Since progress is always news, especially when it strikes the railroads, we respectfully requested more information than the AAR furnished in its tiny capsule of news. Just how fast was the average speed of freight trains in the first half of 1950, we wondered.

We quote the answers the AAR gave us:

The average speed of freight trains in the first six months of 1950, which was 1.2 percent better than last year's average, was 17.0 mph., whereas in the first half of 1949 it was 16.8 mph., and in 1944 it was only 15.7 mph.

Furthermore, AAR's helpful information people volunteered the added intelligence that average freight train speed is pulled down badly at way stations where the inter-city trains do their own switching—discharging and picking up cars. But these delays involve shipments "in which time is of no consequence," AAR assured us. This made us feel much better immediately.

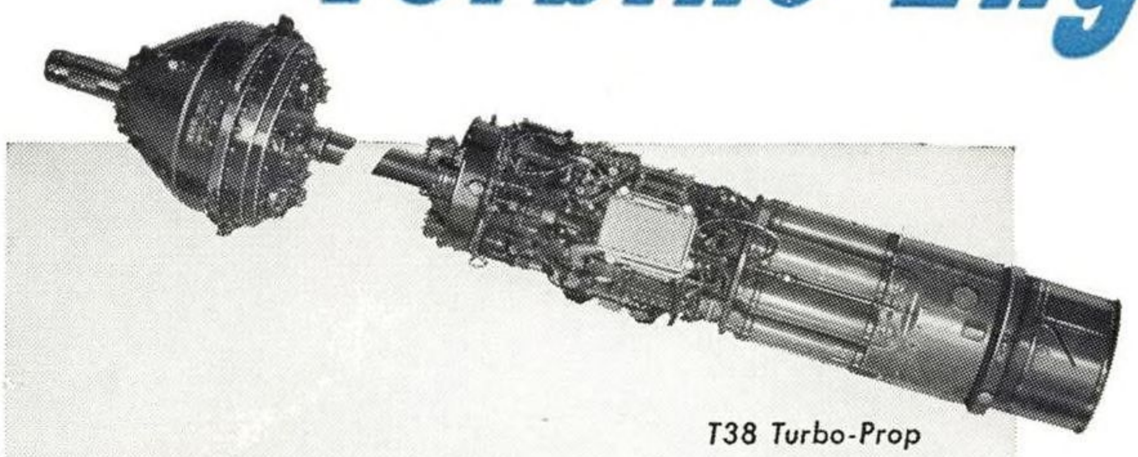
They were apologetic, too, about how the average freight speed is dragged down by such cargoes as livestock, "which have to be left off the trains at intervals."

Yet there really are "fast freight shipments" over some routes that average between 50 and 60 mph. For example, there is a five-hour New York-Washington run, and an overnight delivery from Chicago which reaches Memphis first thing in the morning.

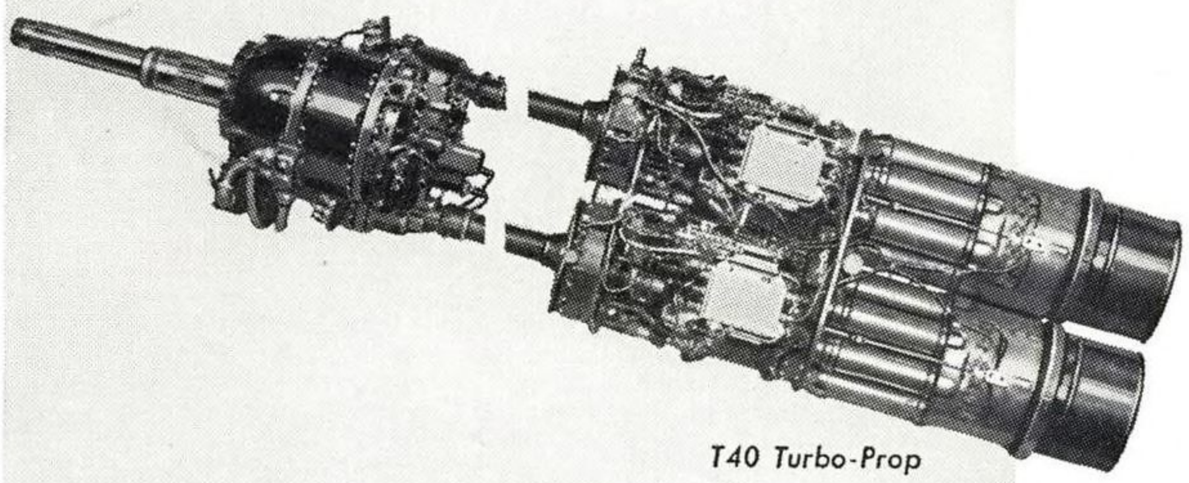
If the rails really worry about how cattle shipments hold down the average freight train speed, they might try figuring how many cattle would need stop-overs at all if such trains averaged 50 and 60 mph. On the other hand, that answer might only prove that a good way to raise average speed of freight trains would be to speed 'em up.

—Robert H. Wood

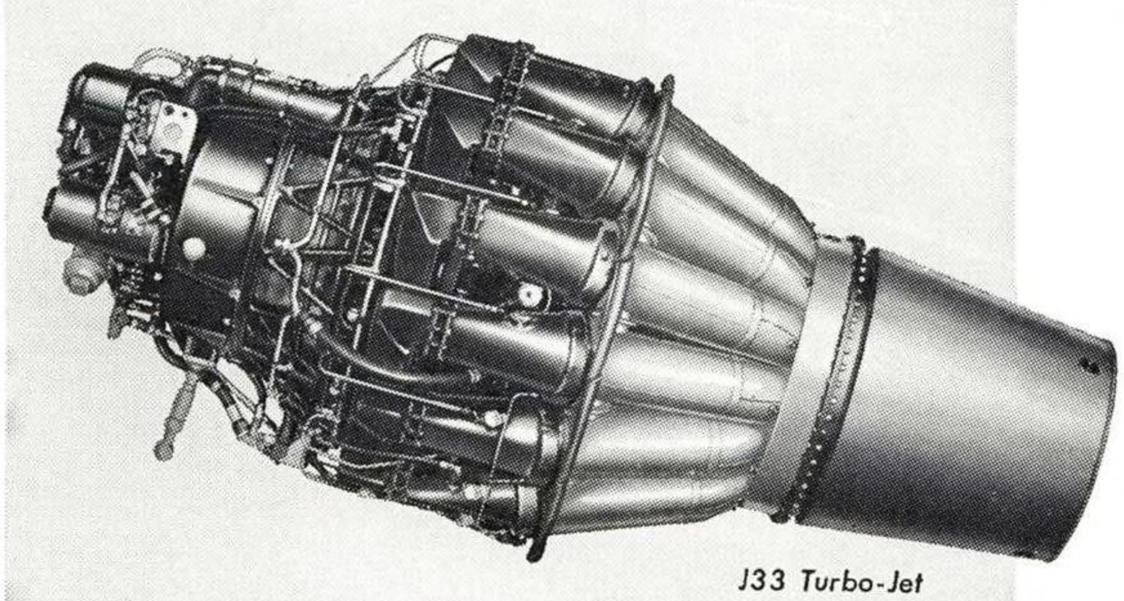
Allison FIRSTS — Proof of Turbine Engine Leadership



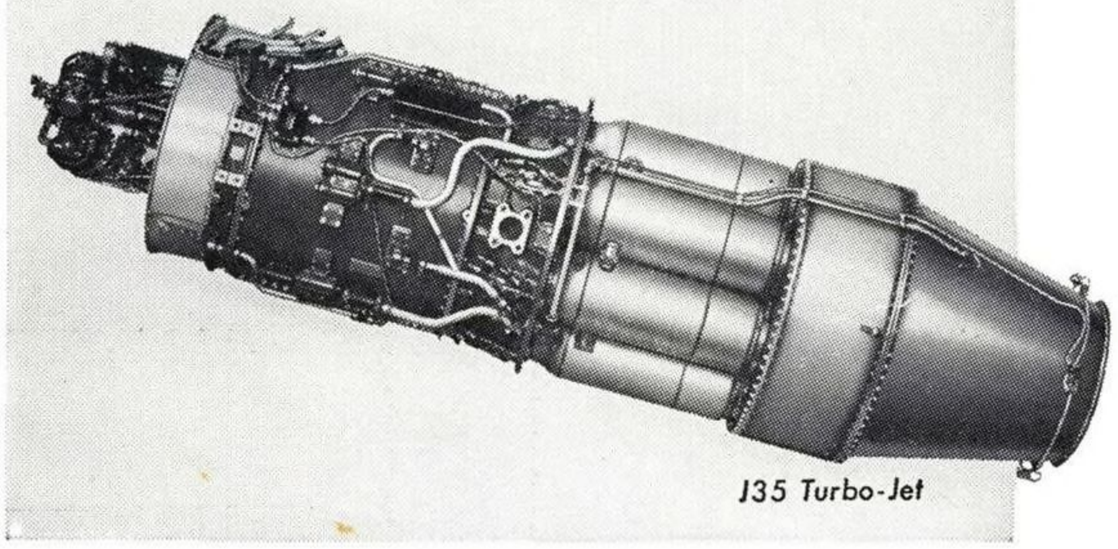
T38 Turbo-Prop



T40 Turbo-Prop



J33 Turbo-Jet



J35 Turbo-Jet

FIRST to complete 150-hour qualification test for Turbo-Jet engine with afterburner.

FIRST to complete 150-hour qualification test for Turbo-Jet engine with water/alcohol injection.

FIRST to complete 150-hour qualification test for any Turbo-Jet engine.

FIRST to complete 50-hour flight clearance test for U. S. Turbo-Prop engine.

FIRST to put Turbo-Jet engines in production with either afterburning or water/alcohol injection.

FIRST to purchase its own airplane to proof-test Turbo-Prop engines for commercial transport use.

FIRST to design and release for production a Turbo-Jet fuel control which meets combat operational requirements.

FIRST to get commercial certification of a Turbo-Jet engine.

FIRST to fly a propeller-type engine producing more than two horsepower per pound of weight.

Allison

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