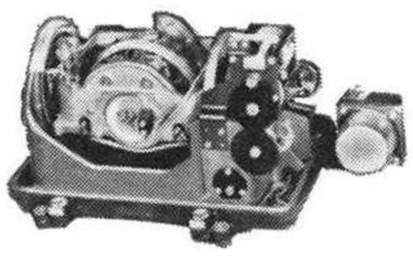
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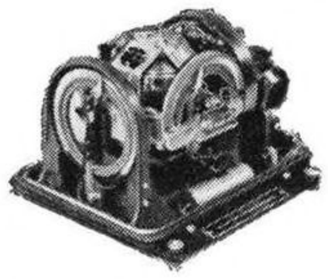
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Vertical Gyro (JG7003)



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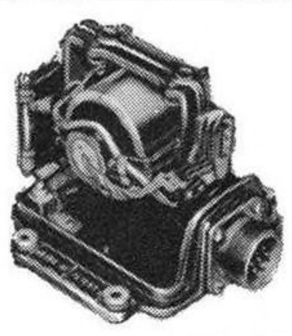
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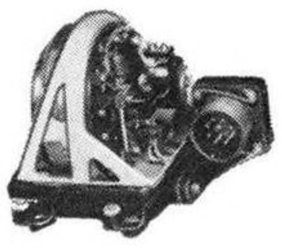
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Rate Gyro (JG7005)



Rate Gyro (GG13)



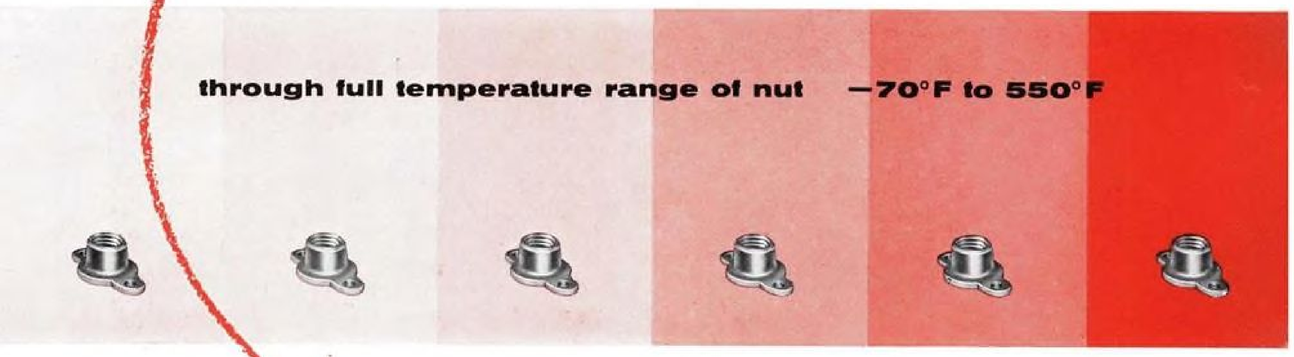
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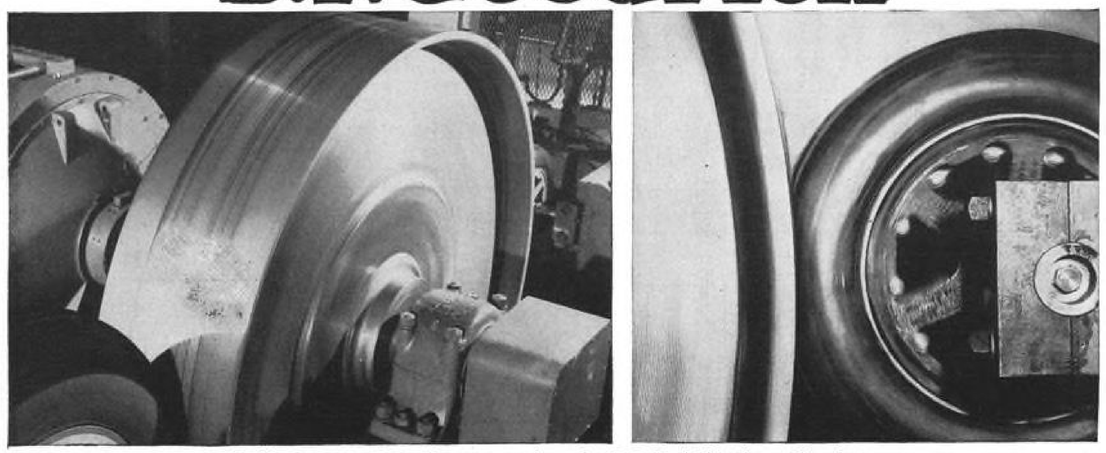
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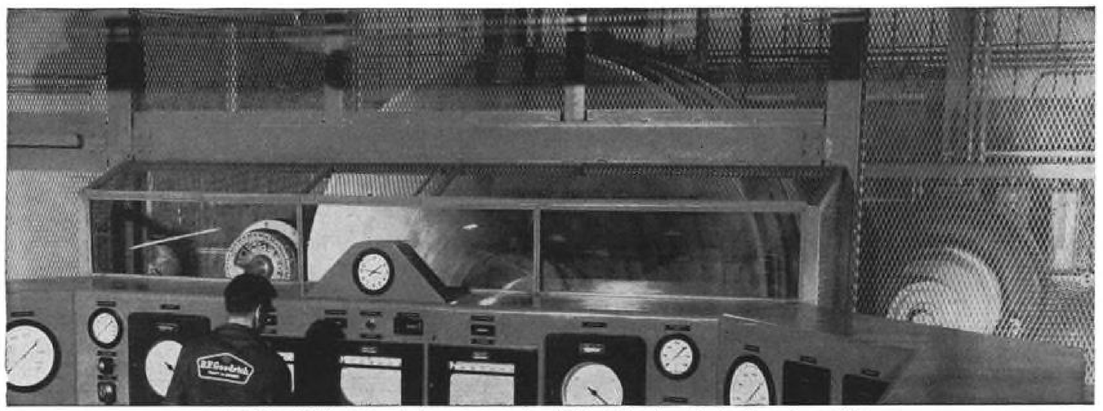
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THE DYNAMOMETERS above give B. F. Goodrich tires, wheels and brakes the toughest tests they can get. They simulate landings at speeds up to 250 and 300 mph.

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Suddenly, the brakes are applied. They have to stop the dynamometer wheel and absorb all the energy in a matter of seconds. The single wheel and dual brake combination must absorb more than 30,000,000 ft-lbs. of kinetic energy—as much force as is generated by stopping approximately 65 automobiles going 60 mph—but the B. F. Goodrich brakes bring the plane to a standstill in the specified landing time which assures a safe stopping distance. The wheel is undamaged.

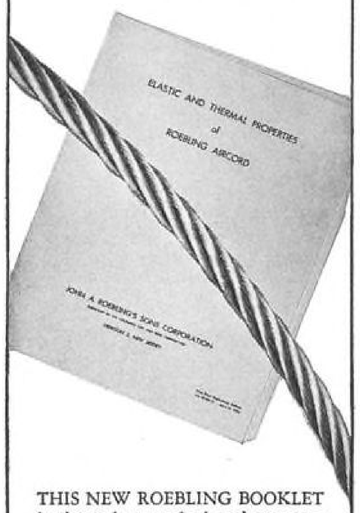
How do you benefit? We can give you faster delivery by speeding up qualification of our tires, wheels and brakes to your specifications. And we give you better landing assemblies because we can quickly confirm new engineering and design ideas. With our unmatched testing and research facilities, we're looking forward to helping you solve more of your landing and take-off problems. *The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.*

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Aviation Week

MAY 30, 1955 VOL. 62, NO. 22

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Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

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AVIATION WEEK • MAY 30, 1955 • Vol. 62, No. 22
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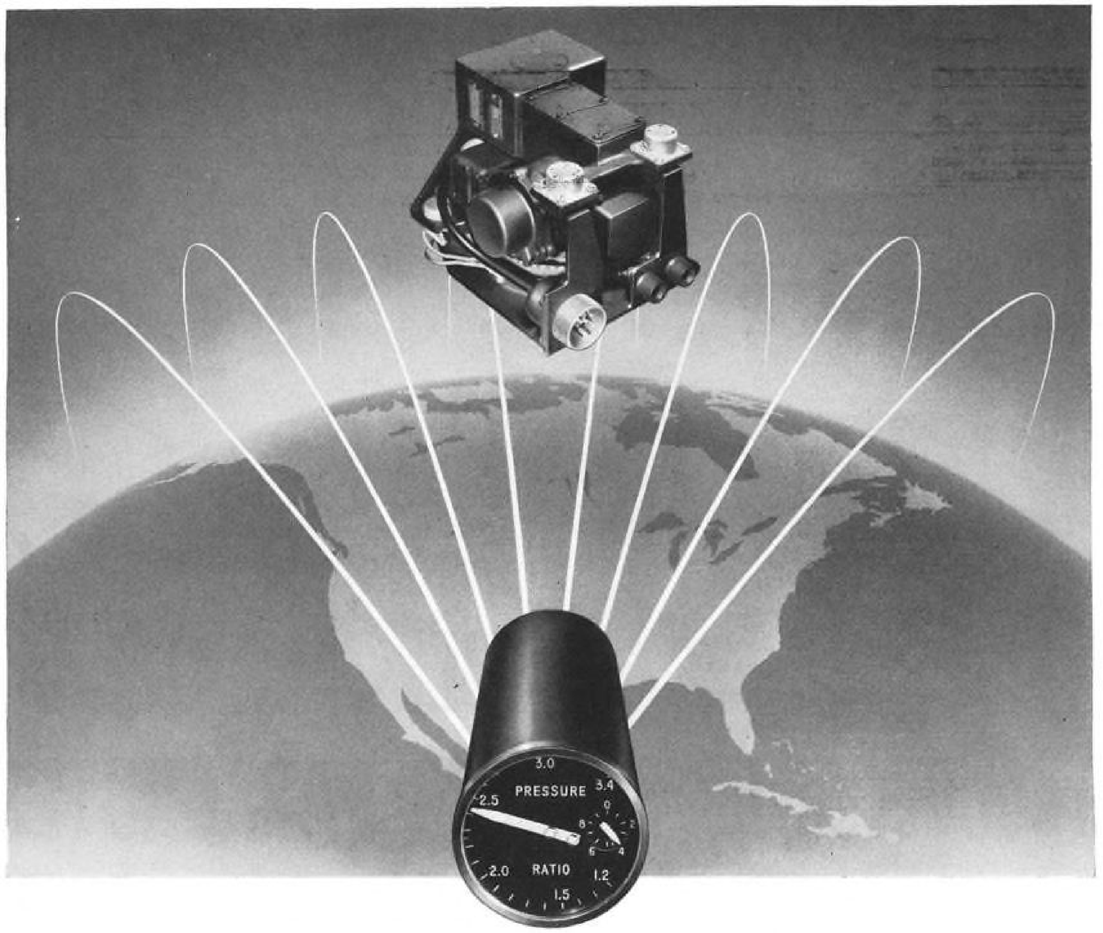
Published weekly by the McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. Executive, Editorial, Advertising and Subscription Offices: **McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.** Publication Offices: 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Paul Montgomery, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Circulation Director.

Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow 10 days for change of address.

Subscriptions are solicited only from persons who have a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.

Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Other Western Hemisphere and the Philippines $10 a year; $16 for two years; $20 for three years. All other countries $20 a year; $30 for two years; $40 for three years. Entered as second class matter July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879.

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New transducer-indicator system

increases range of modern jet aircraft

Jet pilots have always had the problem of inadequate information on the thrust their engines were producing. This resulted in improper power and control settings with an accompanying waste of fuel and loss of range.

The new AiResearch pressure ratio system provides immediate, accurate thrust information by indicating the exact pressure relationship between the intake air and the exhaust air.

This allows the pilot to adjust throttle and controls in accordance with the Mach Number called for by his flight plan ... particularly important under cruise climb conditions ... to get maximum utilization of fuel and increased range. It also provides the positive thrust indication the pilot needs at takeoff to determine when his loaded airplane is capable of becoming airborne.

This new pressure ratio system is another example of AiResearch ability to combine accuracy and reliability with ruggedness in equipment vital to high speed, high altitude aircraft.

Qualified engineers in the fields of turbo-machinery, heat transfer and electronics needed now. Write for information.

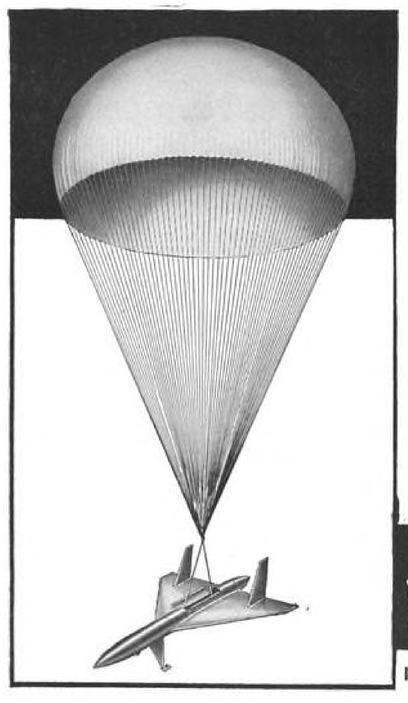
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NEWS DIGEST

Domestic

Sperry Gyroscope Co. resumed production on a $20-million backlog of defense orders last week after 7,000 members of the International Union of Electrical, Radio & Machine Workers (CIO) voted to accept a two-year contract and end their 35-day strike at three plants on Long Island. The new pact calls for an immediate 8-cent-an-hour raise plus an additional 5.3 cents next year.

Ryan Aeronautical Co. received a contract from Curtiss-Wright Corp.'s Aeronautical Division to produce afterburners for a "new jet engine." Amount of the San Diego firm's new contract: more than $1 million.

Titanium pilot plant will be built and operated by National Research Corp. at Newton, Mass., under a $1,183,000 contract awarded by the General Services Administration. Designed to produce 1,000 lb. of titanium a day, the plant will demonstrate the company's new non-Kroll process.

Temco Aircraft Corp. received a Navy prime contract for a limited number of the Alpa airborne electronics system. It is the first Temco-designed product ordered into regular production by the Navy.

Aerojet-General Corp.'s LR63-AJ-1 liquid-propellant rocket is being tested on three Republic F-84Fs at Edwards AFB, Calif.

H. M. Sawyer & Son Co. was purchased by a group headed by Charles F. Foote, president of the firm. Sawyer, with plants at Cambridge and Watertown, Mass., produces coated aviation fabrics.

De Havilland Aircraft Co. will send its four-engine Heron 2 on a demonstration tour of the U.S. this summer in an effort to increase executive and short-haul transport sales.

Boeing 707 made its 100th test flight at Seattle May 19, raising flight time of USAF's prototype jet tanker-transport to more than 150 flight hours.

Transocean Air Lines signed a contract to furnish Lufthansa with 10 navigators for one year for trans-Atlantic flights.

Mohawk Airlines and the Air Carrier Mechanics Assn. (AFL) negotiated a wage contract amendment that increases pay by 7 cents an hour across the board. The new agreement will be effective from Aug. 1, 1955, through Oct. 31, 1956.



Outboard Powers One-Man Copter

Goodyear Aircraft Corp.'s one-man GA-400R starts its vertical lift on power supplied by a 31 hp. outboard motor. Price of the small helicopter would be about $2,000, if produced in quantity. Designed as a liaison craft, the GA-400R can fly at speeds up to 60 knots. It weighs 235 lb. empty and carries a useful load of 200 lb. at normal cruising speed of 40 knots, endurance is 45 min. on 3.2 gal. of fuel. First model of the GA-400R helicopter is making test flights at Goodyear's Akron plant.

Financial

Bendix Aviation Corp., Detroit, reports a net income of $12,965,000 from sales totaling $291,782,000 for the six months ended Mar. 31, compared with an $11,113,000 net on sales of $315,793,000 for the same fiscal period last year.

Aeroquip Corp., Jackson, Mich., earned a record $851,000, in the first half of its current fiscal year, an 182% increase over the six months ended Mar. 31, 1954. Sales totaled $10,574,000, a 10% gain.

Captial Airlines' net profit increased to $301,000 during the first quarter of 1955, compared with a net loss of $711,000 for the same period of 1954. Passenger revenues climbed to $9,590,000 from $8,717,000.

Jack & Heintz, Inc., Cleveland, had first quarter earnings of $559,000 on sales of $8,067,000, compared with a profit of $480,000 and sales totaling $8,907,000 for the same period of 1954. Present backlog of orders: $22.5 million.

Sperry Corp., New York, declared a second quarter dividend of 50 cents, payable June 22 to stockholders of record June 1.

McDonnell Aircraft Corp., St. Louis, will pay a regular 25-cent quarterly dividend July 1 to shareholders of record June 17.

Solar Aircraft Co., San Diego, declared a regular quarterly dividend of 25 cents a share on common stock, payable July 15 to holders of record June 20.

International

Australian Government will order approximately 80 more two-place Vampire jet trainers from de Havilland Aircraft Pty, Ltd. Decision to place the new contract came as the company's Bankstown plant prepared to shut down after rolling out the last of 42 Vampires previously ordered.

Gen. Sir John Capper, 93, lighter-than-air pioneer who held Britain's No. 1 airship license, died May 24 in Eastbourne, England.

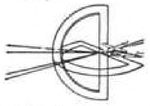
Bahamas Helicopters, Ltd., ordered two S-55s and spares from Westland Aircraft, Ltd., Yeovil, England.

Saudi-Arabian Airlines took delivery on the first Convair 340 of six on order.



TOPP POTENTIOMETERS





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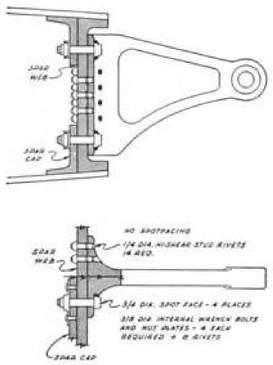
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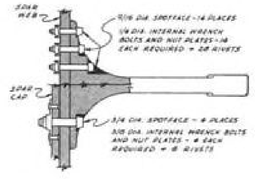
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WHY SPOT FACE AWAY THE FITTING?



Excessive spot facing, weight, and bulk are eliminated from removable fittings such as aileron hinge brackets, when HI-SHEAR stud rivets are used to carry the shear loads. On the above example four bolts speed up removal or installation of the fitting in the shop or on the flight ramp.



Fittings using bolts to carry the shear loads, require spot facing in fillet areas. These fittings must be heavier in weight to retain strength to avoid stress concentration and are larger in size to obtain bolt clearances. In example, the fitting with bolts suffers a weight increase of about 30% and requires removal or installation of an additional fourteen bolts.

WRITE
for the HI-SHEAR Standards Manual for specific data on the HI-SHEAR stud rivet.

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WHO'S WHERE

In the Front Office

A. F. Burke, chairman of the board, de Havilland Engine Co., Ltd., Leavesden, England. He succeeds the late **Maj. F. B. Halford.**

Robert P. Lord, executive vice president and treasurer, Greer Hydraulics, Inc., Jamaica, N. Y. Other changes: **David Fromson,** secretary; Controller **J. Stanley Crum,** a company officer.

Honors and Elections

Wing Cmdr. Jerauld Wright, inventor of the Royal Canadian Air Force's R-Theta computer, awarded the McKee Trans-Canada Trophy for 1954.

James C. Floyd, vice president-engineering of Avro Aircraft, Ltd., elected a fellow of Great Britain's Royal Aeronautical Society. Other new RAE fellows: **Capt. J. C. Kelly-Rogers,** deputy general manager of Aer Lingus; **Capt. Paget McCormack,** chief engineer of the Irish airline.

M. E. Balzer, United Air Lines meteorologist, and **R. J. Shafer** and **P. Funke,** meteorologists for Eastern Air Lines, won Air Transport Assn.'s 1954 Edgar S. Gorrell Awards.

Changes

Jacques Nicolle, general traffic and sales manager for the North, Central American and Caribbean Division of Air France.

Raymond F. Hall, assistant vice president of the Eastern Division of Van Dusen Aircraft Supplies, Teterboro, N. J.

Ellis S. Boynton, assistant to the vice president-aviation sales, New York Air Brake Co., New York.

Donald W. Cook, assistant general manager of the LearCal Division of Lear, Inc., Santa Monica, Calif.

Walter B. Powell, general manager of Air Associates' Chicago branch.

F. A. Monahan, manufacturing and development coordinator, Convair-San Diego.

Ralph A. Lamm, manager of special missile development, **Arthur C. Prine,** assistant to the general manager, Bendix Aircraft Corp.'s Research Laboratories Division.

Lawrence J. Torn, chief electronics control engineering, Airborne Instrument Laboratory's Engineering and Production Division, Mineola, N. Y.

Mathias Klein, chief manufacturing engineer, Marquardt Aircraft Co., Van Nuys, Calif. Also promoted: **Anthony J. Kreiner,** chief engineer of the Accessory Engineering Division.

John R. Bly, quality control director, Hoffman Laboratories, Inc., Los Angeles, Calif.

W. H. Sear, chief test pilot, Westland Aircraft, Ltd., Yeovil, England.

Hugh Vick, chief of contracts administration, Technical Products Division of Packard-Bell, Los Angeles, Calif.

Frederick Quanjer, U.S. assistant sales manager of Swissair, and **Joseph Verini,** New York district sales manager.

(*Continued on page 28*)

INDUSTRY OBSERVER

► Grumman will build a two-seat version of the F9F-8 sweptwing Cougar as a high speed trainer for the Navy. Prototype should be flying at Bethpage, L. I., this summer.

► **Convair is adding a pair of Fairchild J44 or Continental J69 turbojets to its T-29 trainers scheduled for service at the Air Academy at Colorado Springs. The 2,000 lb. thrust produced by the two auxiliary jets will boost the T-29's speed to more than 350 mph. These trainers will be used for flight orientation of USAF cadets at the Academy. High altitude of the field at Colorado Springs would limit performance of the piston-powered T-29 without the jets to a point where they would be hard-pressed to perform the Air Academy mission.**

► Lockheed Aircraft Corp.'s 1049G Super Constellation has been certified for a gross takeoff weight of 137,500 lb. by the Civil Aeronautics Administration.

► **Atomic Energy Commission is seeking bids on the heat to be produced in experimental operation of the sodium graphite reactor under construction at North American Aviation's Santa Susana facility. Southern California Edison Co. already has submitted a proposal to purchase the heat and install the necessary equipment to convert it to electricty.**

► Avionics industry gets 45 cents from each dollar Air Force pays Convair on its XB-58 program compared with 38 cents Convair retains for its own efforts.

► **A trailer-mounted, high precision localizer unit for instrument landing systems is being produced for the Air Force by Federal Telephone and Radio Co. The precision units, which mount 80-ft. antennas, are needed to furnish clean beams for auto-pilot controlled low approaches. Ready hangars now built at the ends of runways, cause bounce-off and distortion of standard localizer beams.**

► Simulated carrier takeoff and landing tests of Lockheed Aircraft's T2V-1 were scheduled to start last week at Inyokern Naval Air Station. Lockheed test pilot Ray Crandall will fly the carrier-based trainer prototype during the six-week test period.

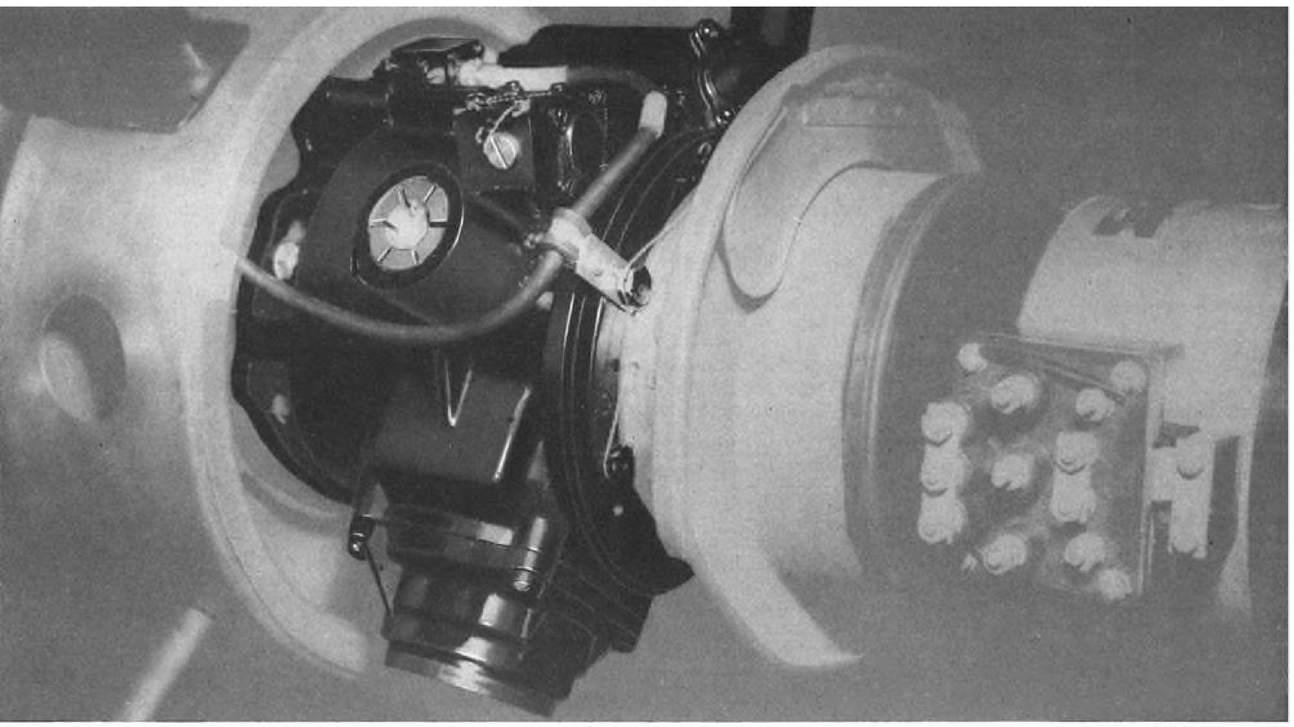
► **Royal Canadian Air Force has placed a $1.4 million order with de Havilland Aircraft of Canada for 60 Chipmunk trainers. RCAF order is based on a plan to have an elementary trainer available for fast training of pilots in the event of an emergency. RCAF is reported considering a replacement for its Harvard trainer with U. S., British and French jet trainers being studied for that purpose.**

► Lockheed Aircraft is producing P2V-7's at a rate of eight a month. Production of T-33's is at a rate of 3½ a day.

► **Tests of the Alouette II helicopter, powered by a Turbomeca engine, are under way. Initial performance figures show that the aircraft has a considerable reserve of power at an all-up weight of 2,870 lb. Forward cruising speed is about 110 mph. French Navy has ordered three of the Alouette II helicopters.**

► Engineering on Lockheed's advanced jet tanker design contract will be done at the Marietta, Ga., Division.

► **No flying saucers have been officially encountered in Canada, W. B. Smith, senior radio engineer of the Department of Transport, Ottawa, told the Canadian House of Commons Committee on Radio. A special electronics observation station had been set up by the department near Ottawa in 1953 and continued its observations during 1954 to measure objects entering the earth's atmosphere. After more than a year's observations the operation was stopped, since no data of any significant importance had been collected during that period.**



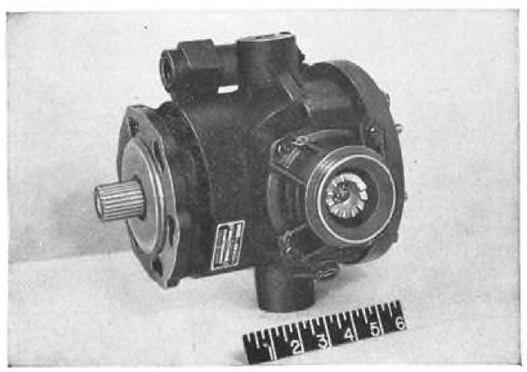
Lightweight General Electric constant speed drive mounts directly to A4D Skyhawk engine's single nose pad.

How G-E drive provides jet engine starting and a-c power from one engine pad

Having only one engine pad available for both jet engine starting and a-c power, Douglas Aircraft faced a difficult problem in the design of the A4D Skyhawk. The flexibility of the General Electric 9 KVA hydraulic constant speed drive permitted the addition of starting gears with no performance penalty and only a small increase in weight.

Ideal for airborne applications, the G-E constant speed drive features a ball piston design that provides light weight and high reliability due to the small number of moving parts and simple mechanical operation. Drives can be supplied from 9 KVA to 60 KVA for most engine speed ranges.

FOR SPECIFIC INFORMATION on how the General Electric hydraulic constant speed drive can be tailored to your particular application, contact your nearest G-E Apparatus Sales Office.



9 KVA constant speed drive with engine starter adapter

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Please send me these two bulletins:

GEA-5979 G-E Hydraulic Constant Speed Drive
GET-2480 Theory of Operation of G-E Drive

☐ For immediate project ☐ For reference only

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Position .....

Company .....

City ..... State .....

Washington Roundup

Exit Carney, Enter Burke

Rear Admiral Arleigh A. "31 Knot" Burke, 53-year-old veteran of controversy and deepwater sailing, has been selected by President Eisenhower to succeed Admiral Robert R. Carney, Chief of Naval Operations who tangled with the Administration on the outlook for war in China. Carney is scheduled to retire Aug. 16, following General Matthew B. Ridgway, Army Chief of Staff who crossed with the Administration on Army manpower cuts.

Continued chairmanship of the Joint Chiefs of Staff by the Navy was assured by the President's nomination of Admiral Arthur W. Radford to another two-year term in that post. At the same time he has called for reappointment of General Nathan F. Twining to serve another two years as USAF Chief of Staff.

Choice of Burke as CNO, including advancement to full admiral, puts this 1919 Annapolis graduate over the heads of 90 officers who outrank him in seniority. In addition to his claim to fame as a World War II destroyer leader, he was boss of "Operation 23," the organized Navy opposition to USAF's B-36 bomber program.

White House insisted that Carney's retirement does not result from his famous "leak" to the press that Chinese Communists would be in a position to attack Quemoy and Matsu by last Apr. 15. Radford's reappointment as JCS chairman is the only one for which he is eligible. Twining, now scheduled to head USAF until June 30, 1957, is 57 years old and would be eligible to succeed Radford at that time.

Honaman Meets AIA

In his first direct approach to the aircraft industry, R. Karl Honaman, new Deputy Assistant Secretary of Defense for Public Affairs, appeared at recent Washington meeting of the Aircraft Industries Assn. Public Relations Advisory Committee with a plea that industry recognize new "grey area" of unclassified information which he labels "strategic." Honaman called on PRAC, which already has rejected his invitation to lend him an AIA representative (AW May 2, p. 11), to recognize his thesis and submit unclassified material to his new office for clearance. Committee members suggested that Defense Department should alter its classification system if necessary, cited difficulty of controlling their organizations without clearcut rules. Honaman then pleaded for cooperation, repeating Secretary Wilson's assertion that new plan will work if it is tried, and urged that industry public relations men confer with his office. Reception to Honaman's proposal was cool.

Trouble for PAA, Braniff

Prospect is that only two carriers will be hit by the lack of funds to pay May and June subsidy claims under the policy adopted by Civil Aeronautics Board: Pan American World Airways and Braniff Airways.

The estimated amounts the Board won't be able to pay: PAA, $3.2 million; Braniff, $352,000.

Payments to all other carriers, however, will probably be delayed.

Congress voted the Board $8.9 million for subsidy payments for the Apr. 22 to July 1 period—$6.3 million less than the Board thought it needed.

On advice, CAB decided that the only "string" tied to the $8.9 million was that it should not be used to pay carriers whose payments might be affected by the Supreme Court's "offset" decision. PAA and Braniff are the only two.

This is what the Board plans to do:

- **The $1.6 million** CAB already had on hand Apr. 22 is to be used for PAA and Braniff payments; $1.5 million will go toward meeting PAA's total estimated claims for the period of $4.7 million and $163,000 will meet Braniff's estimated $515,000 total in claims.
- **The $8.9 million** will be used to pay all other carriers —without priority—as their claims fall due. The Board thinks its deficit for the period will be substantially less than the $6.3 million calculated some months ago. For example, payments for Hawaiian operations have already been reduced $700,000. The claims the Board can't pay, though, will be met out of Fiscal 1956 funds, which will probably be available around mid-July.

PAA is confident the Board will also meet its claims out of new funds for the coming fiscal year.

Procurement Revision

Defense Department has postponed the deadline for receipt of comments and suggestions on its proposed revision of Section XV of the Armed Services Procurement Regulation (AW Apr. 25, p. 12). Originally set for May 23, industry observations now will be received up to June 20. In addition to expected opposition to more stringent control over allowability of bonus and pension costs, it now appears likely that strong objections will be offered to at least two other items: the threat that most aircraft firms will have to revise their accounting practices and an alleged discrimination on expenses for general research. Firms predominately in defense work feel strongly they will be at disadvantage under terms which make "blue sky" research costs allowable only for competitors who do 75% of their business with non-governmental customers.

Meanwhile, Defense has added new paragraphs to existing ASPR Section XV, declaring that allowances for depreciation as provided by the Internal Revenue Code will be acceptable for costing purposes on contracts placed after June 1, 1955. Industry reaction is one of optimism, with hope that the trend is toward a more realistic viewpoint. On the surface, the new ASPR paragraphs are intended to clear up an existing obscure point, but the shift in philosophy has been noted as significant.

Subsidy Outlook

The House left the door open for Civil Aeronautics Board to request additional subsidy funds. The subsidy request was reduced $23 million by the House Appropriations Committee (see p. 95).

Pointing out in floor debate that the committee trimmed the $63 million asked by the Board to $40 million, Rep. Prince Preston, chairman of the Commerce Subcommittee, observed: "While it may be necessary to provide some additional funds for this purpose at a later date, the committee recommendation is adequate for the Board to commence operations during the next fiscal year. The committee feels that this approach to the problem of financing air carrier subsidies is desirable, in that it encourages the Board to take whatever steps may be necessary to protect the taxpayers in handling of these claims."

—Washington staff

AVIATION WEEK VOL. 62, NO. 22
MAY 30, 1955

President Accepts CAB Alaska Ruling

Eisenhower asks Board to increase Pacific Northern, Alaska Airlines certificates from three to five years.

Washington, D. C.—The explosive States-Alaska case has been settled by President Eisenhower by accepting with little change recommendations of the Civil Aeronautics Board that certificates of Northwest Airlines, Pacific Northern Airlines and Alaska Airlines be renewed.

The President asked the CAB to issue Pacific Northern Airlines and Alaska Airlines five year temporary certificates instead of the three year authorizations set by the Board, and expressed full approval of a merger of the two Alaskan carriers.

This is how the White House and CAB actions leave the air route pattern between the United States and Alaska at the present time:

- **Pacific Northern's** certificate between Portland/Seattle and Anchorage is renewed for five years, adding Ketchikan as an intermediate point.
- **Alaska Airlines** is renewed between Portland/Seattle and Fairbanks for five years.
- **Northwest Airlines'** Seattle-Anchorage temporary certificate is made permanent.
- **Northwest's** inner route between Anchorage and Minneapolis/St. Paul is renewed for three years.

The application of Pan American World Airways for Anchorage as a co-terminal with Fairbanks is denied, as is a projected all-cargo service by Air Transport Associates.

The States-Alaska case was instituted as a general investigation of service between the U. S. and Alaska with an emphasis on cutting subsidy of the routes.

The main issue became a question of whether there are too many carriers serving the route for economic operation.

Congressional Reaction

An examiner's report issued last July recommended the routes of Northwest and Pacific Northern be retained and the route of Alaska Airlines be discontinued. This has caused much disturbance in Alaskan circles, and reports last fall that the CAB had decided to eliminate Pacific Northern and Alaska Airlines in favor of Northwest and PAA caused an uproar of protests from Alaska, the Pacific Northwest and their congressional delegations.

Alaska interests were "thoroughly delighted" with the decision on the States-Alaska case, according to E. L. Bartlett, Alaska delegate, congressional pressure from the Pacific Northwest and Alaska was against CAB's original decision cutting Alaska and Pacific Northern out of Alaska service (AW Jan 31, p. 78). The Washington-Oregon-Alaska congressional representatives were insistent that four lines should serve the territory.

"The Board's altered decision for three year certificates was a victory," Bartlett declared, "and the President's suggestion for five year certificates is a second victory." He pointed to "the great competitive disadvantage" of the two small carriers, Alaska and PNA, operating DC-4s, while PAA and Northwest operate DC-6s, Constellations, and Stratocruisers, and concurred with the President that longer-term certificates would help correct this competitive imbalance.

The Territorial Route Case, decided by a split vote, is the first major proceeding to go through the mill at the White House in which Chairman Ross Rizley has participated, and its handling shows a marked contrast with that accorded the Trans-Pacific Route Case earlier this year.

Approves Merger

The CAB recommendations were approved almost without alteration, and the changes made were confined to an extension of the certificates of the two Alaskan carriers.

The President agreed strongly with the view of the Board that a merger of Pacific Northern and Alaska Airlines would be an important step in strengthening States-Alaska air transportation and reducing subsidy. In his letter to Chairman Rizley, Eisenhower said: "While three year certificates might well encourage and facilitate such a merger, such certificates would create serious problems for both carriers in the matter of financing new equipment.

"I am convinced that there are other steps that the Board can take within its authority to encourage and facilitate such a merger, and I trust that the Board will take all such steps as are reasonable and appropriate."

The President noted in his letter that he had been advised by the CAB, through the Director of the Bureau of the Budget, that a five year extension of Alaska Airlines and Pacific Northern would better enable them to finance equipment purchases on a sound basis.

In its recommendations, the Board told the President:

"We have now had the opportunity of reviewing the benefits of the new services in the light of experience, and have concluded that, subject to certain modifications, the current route pattern should be retained for an additional experimental period. In so doing, we have weighed on the one hand the isolation of Alaska, the needs of the economy, and the interest of the national defense against the possible saving in mail pay support resulting from a reduction in the number of States-Alaska carriers. We have concluded that competitive air service between the States and the gateways of Alaska is most conducive to the development of Alaska and is required by the national defense interests, and that these considerations far outweigh the cost of the government of maintaining such a pattern."

Dissenting Views

The Board cited a number of factors in recommending renewal of Northwest's inner route, the principal one being national defense. The CAB pointed out that such a route can't be established on the spur of the moment in an emergency, while it can be easily expanded if already in operation.

Also, according to CAB, the route has shown much improvement and has developmental possibilities. It is 400 miles shorter over the inner Great Circle routing between the Twin Cities and Anchorage than it is via Seattle.

CAB Members Gurney and Denny disagreed with the majority decision to renew the certificate of Alaska Airlines and favored a longer renewal for Pacific Northern. Gurney also dissented on renewal of Northwest Airlines' inner route.

Gurney estimates that elimination of the two routes would save the taxpayer $2 million yearly, and he sees slight prospects of successful operation on them.

Pleases Legislators

The President's action in the States-Alaska case is likely to take some steam out of the move on Capitol Hill to make Board decisions on route cases to territories and possessions final, eliminating the presidential review authority.

The legislation to accomplish this was introduced by Washington's Sen. Warren Magnuson, chairman of the Senate Commerce Committee. This came as a result of the President's original action in the Pacific Case overruling CAB and eliminating Northwest Airlines' service to Hawaii. After vigorous protest by the Washington, Oregon, Minnesota and other congressional delegations serviced by Northwest, the President changed his mind and authorized service to Hawaii by Northwest as well as PAA (AW Feb. 14, p. 12). In the Alaska Case, the President's action is in line with the position of the Oregon and Washington delegations.

CAA Certifies T56

Allison T56 turboprop has become the first engine of this type to be certificated for commercial service by the Civil Aeronautics Administration. The T56 has been specified by both Douglas and Lockheed for new transport designs in an American Airlines competition from which substantial orders are expected to result soon (AW May 16, p. 12). The T56 was certificated by CAA at 3,750 eshp., a cruise specific fuel consumption of .44 lb. fuel per eshp. per hr., and a dry engine weight of 1,630 lb.

Commercial designation of the T56 is Model 501.

E. B. Newill, Allison general manager, said commercial deliveries could begin in quantity by March 1957 but that engines would be made available immediately to customers for commercial aircraft flight testing and CAA certification operations.

Certification was based on performance during a USAF 150 hr. official test run plus additional testing to meet CAA requirements.

Whittle Hits Socialists

London—Jet engine pioneer Sir Frank Whittle, formerly a confirmed Socialist, broke with the Labor Party during the recent British elections, charging that nationalization of Power Jets Ltd. by Sir Stafford Cripps in 1944 had set back British jet engine development.

". . . I will never forgive myself that I was largely to blame for putting the idea of nationalizing jet engine production into Sir Stafford's head," said Whittle, who was Power Jets' chief engineer at the time. Two years after nationalization, he added, the Power Jet board fought a losing battle to preserve its rights to design and make improved engines.

People who knew nothing about engines dictated company's work, he charged, and thus drove the "brilliant engineering team," which had been growing restive under the Ministry of Aircraft Production's stifling policies, to break away when told they would become civil servants.

Aviation Week Story Spurs Debate On U. S., Red Airpower Positions

Washington, D. C.—Bitter controversy raged here last week in the Pentagon, White House and on Capitol Hill over the relative development and production rates of U. S. and Russian military aircraft. The battle was spurred by publication in AVIATION WEEK May 23 of exclusive details on the types and numbers of new Russian aircraft displayed by the Soviets over Moscow early this month. AVIATION WEEK's exclusive story was widely reprinted by daily newspapers and discussed on radio and television programs.

Here are the latest developments:

- **Defense Secretary Charles E. Wilson** confirmed all the types and numbers of Russian aircraft reported by AVIATION WEEK to have participated in the Moscow aerial display.
- **Senate Armed Services Committee** held a preliminary investigation in executive session with top USAF leaders on the issues raised by AVIATION WEEK and Sen. Stuart Symington. Sen. Richard Russell, chairman of the Senate Armed Services Committee, said this preliminary hearing would determine whether the preparedness "watchdog" sub-committee headed by Sen. Lyndon Johnson would proceed with a full-scale inquiry into the relative position of USAF and Russian aircraft and missile development and production.
- **Aviation Week's** exclusive report on the Moscow air display and an accompanying editorial "Double Shock for Americans" and its production box score on U. S. and Russian planes were inserted in the Congressional Record as part of debate by Sen. Symington.
- **Defense Department** in an official statement denied that the U. S. had lost total air superiority to the Russians but evaded the issue of whether Russian progress during the past three years had cut the once-wide U. S. margin to a slim lead and whether the Russians were now moving at a faster development and production rate than the U. S. on jet aircraft and missiles.
- **USAF military leaders** confirmed extreme Pentagon concern over the rate of Russian progress during the past year in a series of Armed Forces Day speeches throughout the country.

In placing AVIATION WEEK's production box score in the Congressional Record as part of floor debate, Sen. Symington said:

"Most important in these publications is a box score of the comparative military production which I now ask to have printed in the body of the Record at this point in my remarks. . . . Some might call a box score an accounting—in other words a balance sheet.

"Now that this balance sheet has been supplied by a magazine of high standing in the aviation industry, I again urge that the Administration either confirm or correct the accuracy of this published accounting."

Secretary Wilson's formal statement confirming the accuracy of AVIATION WEEK's description of the Moscow air display occurred the day after Sen. Symington's statement on the Senate floor. Defense Department has not yet issued a formal statement on AVIATION WEEK's production box score but it is certain that it was a point of discussion in the Senate Armed Services Committee executive session.

Growing congressional support for Sen. Symington's demand for a full-scale investigation of what the true facts were on the relative positions of the U. S. and Russia in aircraft and

Reds to Join Air Show

Toronto—The Soviet Air Force will send "counterparts of your own modern equipment" to participate in next year's International Air Show at Toronto, Russian Ambassador Dmitri Chuvakhin informed officials of the Canadian International Trade Fair last week.

Canada invited Russia to participate in this year's air show, but the invitation had come too late, Chuvakhin explained. He and air show officials announced that at least six Soviet observers will attend the show June 4.

The show will feature products of the Canadian Aviation Industry. The flying displays are to include a Boeing B-47 medium bomber, F-86s and Avro CF-100s.

missile development and production came from Sen. Richard Russell, chairman of the Senate Armed Services Committee; Sen. Henry Jackson, a member of the Joint Congressional Atomic Energy Committee; Sen. John Kennedy and Sen. Margaret Chase Smith.

Administration defense to the rising tide of criticism over its handling of the Russian air display story and U. S. military air policy was to stoutly maintain that Russia does not yet have all of the elements required for total air superiority. It dodged any attempts to pin down its top spokesmen on the questions of whether Russia had significantly narrowed the U. S. lead in aircraft development and production and was now proceeding in these fields at a more rapid rate than the U. S.

However, repercussions were already being felt by aircraft manufacturers. They were ordered to accelerate such key production programs as the Boeing B-52 heavy jet bomber at Seattle and Wichita and the Convair F-102 supersonic interceptor at San Diego. Another program expected to be accelerated is the Lockheed F-104 supersonic day fighter now being built at Burbank.

President Eisenhower's Statements

The following statements on the question of Russian military aviation progress were made by President Dwight D. Eisenhower at his press conference held after release of the Department of Defense text on the Moscow aerial display but before publication of Aviation Week's exclusive description of this event May 23, p. 12.

Question by Merriman Smith, United Press:

Mr. President, Senator Symington wants to know whether this country has lost control of the air to Russia. Do you think so, sir?

Answer—Well, that is a very generalized statement, "lost control of the air."

As anybody who is experienced in warfare knows, control of the air is a relative thing, and anybody with a certain amount of air force in action can gain control over a place where he chooses to concentrate his air, and for a given space of time, or temporary space of time, even in the face of quite great general superiority on the other side.

The Germans did it to us as late as Jan. 1, 1945. Those of you who were in the European theatre on that day will remember what a drenching our airfields got even though we later destroyed a great deal of that attacking force.

Now, as of today, most of you people are rather familiar with the character of our Air Force, including its scientific character.

Back in about 1948-49, we began to build heavily these B-36s, well knowing it was a transition aircraft. It was an aircraft that did give us a big intercontinental bomber at the same time that we knew that the day of the big jet bomber was coming along.

But you have to standardize at different periods on particular types. Now, those B-36 planes were good planes for their day, and they are now being phased out as others will come along.

So in the very new ones, since with this possession of this intermediate bomber, we had a chance to work for a really fine type in the B-52 and its successors, which will certainly come along, we may not have as many B-52s as we should like at this moment.

I don't know the exact number, but to say that we have lost in a twinkling all of this great technical development and technical excellence as well as the number in our total aircraft is just not true.

Question by Martin S. Hayden, Detroit News:

Mr. President, going back to this air power question, apparently Senator Symington was aroused because of a report that in Moscow they had seen a flight of new intercontinental bombers or something of the sort.

I would like to ask you, sir, has there been any Russian air development reported that has thrown off your previous planning as to Russian air strength? In other words, have you been greatly startled by any of this.

Answer—Well, this is what I—I believe this: That from time to time, in several lines of endeavor, scientific endeavor, aircraft and others, there has come in evidence that exceeded predictions of what—where they would be at any particular moment.

Now, I remember of approving the statement that was issued on that aircraft, and I've forgotten the details of it, so I want to be a little bit guarded in my speech, but we do know that they flew past—they didn't fly past on May Day, you know, it was bad weather—but in practice for the May Day they flew past several times, a number of airplanes, among which were a few of items which, by the size of their engines, the size of the airframe, would certainly be capable of long-distance flight, carrying heavy loads.

Now, what their condition is inside, what their readiness of technical perfection and all the things that we know go into one of these things, nobody knows.

Sen. Symington accused Secretary Wilson of withholding "the truth" from the American people about Russian air progress.

He said Mr. Wilson only released information about Russian air developments when "forced" to do so by prior unofficial disclosures or congressional protests.

Sen. Symington was referring to Mr. Wilson's detailed disclosure on May 24 of the new types of planes observed over Moscow.

Wilson, in a rebuttal to the Democratic questioning, asserted that the United States was maintaining "a military capability superior to that of any potential enemy."

Sen. Symington, firing back at Wilson, said he had never asserted that Russia had gained air superiority over the U. S. What he is fearful of, the senator said, is that Russia "is in the process of surpassing us."

Sen. Symington said "one of the bad things about the present situation is that Mr. Wilson is not giving the truth to the American people until forced to do so."

Sen. Symington, Air Force Secretary in the Truman Administration, noted that Wilson had asserted that the information about the Russian planes had been known for some time.

"If this is true," Symington said, "why didn't he release it before instead of waiting until the pressure was on him?"

Sen. Jackson said Wilson "fails to tell the American people that our lead is only temporary."

"Based on Russian airplane progress to date," Jackson said, "it is only a matter of time until they will be able to surpass us in the air."

"The best proof that Wilson is not telling the full story will come when the Air Force is compelled to step up its production of B-52 bombers and other jet type planes," Jackson said.

Light Weight Orpheus Completes Type Tests

London—Bristol's Orpheus turbojet designed for light weight fighters has completed its 150-hr. type test at a rating of 3,285 lb. thrust. The engine weighs 746 lb., for a thrust-weight ratio of 4.4, highest of any British engine to pass the 150-hr. test.

First Orpheus ran last Dec. 17; since then, Bristol has completed at least five engines, all now available for test running. Among these is one rated between 4,800 and 4,900 lb., and weighing less than 850 lb., for a thrust-weight ratio approaching six. Rolls-Royce Soar expendable turbojet has a six-to-one ratio, but is a short-life engine, and does not need to qualify at 150 hr.

Aircraft Firms Lead Contract List

Aircraft and related industries won the lion's share of Defense Department prime contracts in the 18 months from July 1, 1953 to Dec. 31, 1954, and Defense Secretary Charles E. Wilson expects they will continue to dominate future contracting.

Figures released last week by the Pentagon on the 100 firms receiving largest net value of contracts in the period show that aircraft and related industries are listed 60 times. The top 11 firms in rank all were aircraft companies, which alone received more than 41% of the total dollar awards.

Top rank went to United Aircraft Corp., and its subsidiaries. They sold $1,061.1 million of equipment which includes Pratt & Whitney engines, Sikorsky helicopters and Hamilton-Standard propellers. United's share of the total defense contract business in the period was 6.5%.

Other leading firms were Douglas, North American, Boeing, Lockheed, General Dynamics (Convair), Grumman, Curtiss-Wright, Republic, Hughes and Martin.

Secretary Wilson said he is confident that the existing aircraft companies are substantially competent to meet current U.S. requirements. He indicated that the trend is toward firm domination of the field by the specialized prime contractors and that in case of another national emergency there will be less invasion of the field by companies primarily in outside fields.

Defense Department's figures were compiled at the request of congressional committees. Accompanying the list of awards from mid-1953 to the end of 1954 was another listing firms that had lost their rating among the top 100 Defense Department contractors.

These companies, including 12 in the aircraft and related fields, for the most part had suffered cancellations and cutbacks in the post-Korea period.

No data was given out on backlogs, but the Defense Department said many of these firms still remained among the most important suppliers of military goods despite the fact that they did not figure in the list of 100 top new contractors in late 1953 and 1954.

Top interest was shown in General Motors Corp., once the government's biggest defense supplier. Cancellations of contracts with GM exceeded new procurement from the company by nearly $60 million.

Lag on New Awards

Here is a list of corporations in the aircraft and related industries who were among the 100 largest military prime contractors as of June 30, 1953, but not among the first 100 in awards made in the following 18 months. The letters "CR" in the last column refers to net credit, the negative amount left after cancellations and cutbacks exceeded new procurement awards made in the period.

Rank (June 1953)	Company	Amount (in millions)
1.	General Motors Corp	$−58.9 (CR)
6.	Chrysler Corp	−111.0 (CR)
14.	Westinghouse Electric Corp	−255.9 (CR)
16.	Northrop Aircraft	−10.8 (CR)
19.	Kaiser Motors Corp	3.9
21.	McDonnell Aircraft Corp	12.4
27.	Studebaker Packard Corp	−199.3 (CR)
28.	Bell Aircraft Corp	−111.4 (CR)
34.	Firestone Tire & Rubber Co	4.5
41.	Collins Radio Co	9.4
45.	U. S. Rubber Co	9.6
98.	Sun Oil Co	7.6

Companies Among 100 Largest Military Contract Winners

Corporations in aircraft and related industries included among top 100 firms in net value of military prime contract awards made in the 18-month period from July 1, 1953 to Dec. 31, 1954:

Rank	Company	Amount (in millions)	Percent of Total
	Total awards for work in the U. S.	$16,337.2	100.0
	Total, 100 companies and their affiliates	11,109.1	68.0
1.	United Aircraft Corp	1,061.1	6.5
2.	Douglas Aircraft Co	1,041.8	6.4
3.	North American Aviation	910.2	5.6
4.	Boeing Airplane Co	764.9	4.7
5.	Lockheed Aircraft Corp	673.6	4.1
6.	General Dynamics Corp	597.9	3.7
7.	Grumman Aircraft Engineering Corp	377.1	2.3
8.	Curtiss-Wright Corp	339.9	2.1
9.	Republic Aviation Corp	329.5	2.0
10.	Hughes Tool Co	313.3	1.9
11.	Glenn L. Martin Co	276.4	1.7
12.	American Telephone and Telegraph Co	263.5	1.6
13.	Bendix Aviation Corp	214.7	1.3
14.	General Electric Co	213.3	1.3
15.	Fairchild Engine and Airplane Corp	170.2	1.0
17.	Sperry Corp	165.2	1.0
19.	Piasecki Helicopter Corp	108.7	0.7
20.	Goodyear Tire & Rubber Co	101.9	0.6
21.	Standard Oil Co. of California	96.8	0.6
22.	Standard Oil Co. of New Jersey	95.6	0.6
24.	International Business Machines Corp.	94.2	0.6
26.	Radio Corporation of America	75.8	0.5
29.	Avco Manufacturing Corp	66.6	0.4
30.	Philco Corp	65.5	0.4
33.	Ford Motor Co	58.4	0.4
34.	Hayes Aircraft Corp	54.4	0.3
35.	Phillips Petroleum Co	53.6	0.3
37.	Raytheon Manufacturing Co	50.7	0.3
41.	Thompson Products, Inc	42.8	0.3
42.	Massachusetts Institute of Technology	40.8	0.3
44.	Beech Aircraft Corp	39.3	0.2
46.	Minneapolis Honeywell Regulator Co.	35.9	0.2
47.	Sylvania Electric Products Inc	35.8	0.2
49.	General Tire and Rubber Co	34.8	0.2
52.	Reeves Instrument Corp	32.5	0.2
53.	Continental Motors Corp	32.1	0.2
54.	Tide Water Associated Oil Co	32.0	0.2
55.	Hazeltine Corp	31.5	0.2
57.	Motorola, Inc	30.4	0.2
58.	Cities Service Co	28.7	0.2
64.	Westinghouse Air Brake Co	25.9	0.2
65.	Pan American World Airways	25.2	0.2
66.	General Mills, Inc	25.0	0.2
69.	Bill Jack and Scientific Instrument Co.	24.1	0.1
70.	Shell Oil Co	23.7	0.1
71.	Johns Hopkins University	23.6	0.1
72.	Fairchild Camera and Instrument Corp.	23.6	0.1
74.	Gilfillan Brothers	22.2	0.1
76.	Sundstrand Machine Tool Co	21.1	0.1
77.	Garrett Corp	20.8	0.1
78.	Sinclair Oil Corp	20.1	0.1
79.	Socony Vacuum Oil Co	19.8	0.1
80.	Borg-Warner Corp	19.7	0.1
81.	Houdaille-Hershey Corp	18.5	0.1
83.	Reynolds Metals Co	18.2	0.1
86.	Gremco, Inc	17.1	0.1
88.	American Bosch Arma Corp	16.9	0.1
96.	Kaman Aircraft Corp	14.9	0.1
98.	Admiral Corp	14.7	0.1
100.	Hiller Helicopters	14.2	0.1

White Outlines Soviet Technical Gains

The following statement by General Thomas D. White, vice chief of staff of the U. S. Air Force, is considered by Aviation Week Editors to be an accurate exposition of the relative positions of American and Russian technologies as applied to development of airpower and atomic weapons. Made by an authoritative military leader, it is important evidence on the controversy over the comparison of Russian and U. S. airpower now boiling in Congress and in the press. Because it was made before a limited audience in Pittsburgh as an Armed Forces Day speech, Aviation Week is presenting the text of General White's statement as a service to its readers.

". . . Our main problem today is to maintain a position of strength. Much of our strength must be military. Our defense establishment must fulfill a two-fold need.

"First, we must have the forces to meet and beat an attack if one should come today. This emphasizes the importance of forces-in-being.

"Second, we must keep up our effective strength for an indefinite period, ten-twenty years or perhaps even longer. I stress the word effective. Large numbers of planes, ships, and divisions would be worthless unless they are effective against an enemy; and to be effective they must be superior. This means we must develop weapon systems that keep us ahead of the enemy.

Larger Forces

". . . We must be ready at any time and for a long time. Meeting these needs poses a problem more difficult than any we have ever faced in history and it means larger and more expensive peacetime forces than we have ever had.

"In the years after World War II the Soviets were building up their forces while we were reducing ours. They outnumbered us in men, guns, tanks and planes. They still do. But despite their great numerical advantage we were, and still are the main obstacle to their aggressive aims. Their massive army and their many planes have been a powerful influence on the Eurasian land mass. But these forces have not been capable of exerting strong military pressure directly against the United States.

"On the other hand, the United States had the means of exerting military pressure directly against the vital centers of the Soviet Union. The fact that we had this ability while they did not put them in an inferior strategic position. Although their ambitions for conquest were not dampened, they were wary of starting anything that might result in their having to face the full power of the United States.

"Faced with this situation, the Soviets looked for a way out. The answer was obvious. The practical way for them to put real pressure on the United States—and at the same time relieve some of the cold war pressure we were able to put on them—was to develop long range nuclear air power. With long range air power they would have the ability to strike directly at this continent. With nuclear weapons they would have the ability to use their air power with tremendous effectiveness.

First Step Forward

"Building this force and these weapons presented the Soviets with a problem they had never before faced. In the past they had created little in the way of new weapons of war. In World War II, their allies provided most of their up-to-date weapons. Their ships, planes, tanks and guns were largely adaptations and modifications of existing weapons.

"The Soviets further developed this ability to copy, and they used our B-29 as well as captured German planes and missiles as models. In the post-war period they profited by the spying and defection that was going on in the field of nuclear weapons, and they copied some more.

"However, the Soviet goal was not just to catch up; it was to get ahead. They had entered a race in which we had a head start. The result was this: For the first time they had to develop a technical structure that could create new weapons. This decision to embark on an air power-nuclear program is significant. It marked the first real forward step by the Communists into the field of technology.

"When they embarked on this program to create new weapons it marked the beginning of the technological race we are in today. . . . Our whole future depends on the outcome of this race.

"How do we stack up in this contest for technological superiority? What are our prospects for the long ten or twenty year pull?

'Dangerous Complacency'

"Throughout the whole Twentieth Century we have been one of the leaders in technological progress. Our industries have consistently produced commodities of superior performance and value. We have made these things in greater volume and at less cost than other nations. We have also been the leaders in substituting mechanical devices for manual labor. However, our great strength has been more along the lines of production rather than invention. Many of the key scientific breakthroughs of this century were made in England, France or Germany.

"Nor have we always been first in the development of military weapons. We were not the first to have tanks. We were not the first to have jet aircraft. In the end, however, our production paid off. In every war we equipped our forces with large amounts of superior weapons—and won.

"As a nation we take great pride in our achievements. It has become habit to believe that we are bound to win any technological race, particularly with the Soviets. This is a dangerous complacency. We must be careful not to overrate ourselves and underrate our competitors.

"Just as the technical leadership of the United States seems unquestioned, some take it for granted that Soviet technology is primitive and backward. Although many admit that the Soviets have produced some first-class scientists and even a few inventors, we are often amused by Soviet claims of technological firsts. This amusement leads to the belief that they could never be first. Most people are convinced that because of our great record in the past, we will continue to out-invent and out-produce everybody else in the future.

"This is a comforting thought, but it may prove to be dangerously in error. The records of the past few years indicate that our technological lead is by no means self perpetuating.

Soviet Maturity

"The Soviets are showing signs of technological maturity. What many of our experts predicted they could not do, they did. Even more surprising, some of the things they were supposedly unable to do at all, they not only did, but they did in a big hurry.

- **"For example, we thought they could not duplicate the B-29 in less than six or seven years. They duplicated it in two years.**
- **"We estimated that it would be difficult for them to make a good copy of the British jet engine. They produced a better version of this engine in less than a year.**
- **"In 1946, our experts thought they could not produce an atomic bomb in less than six to ten years, if at all. They rocked the world with a nuclear explosion in about three years. This is just about the same time it took the United States to produce its first weapons.**

"Now it is true that all these accomplishments were for the most part duplication. They were not original achievements. But they duplicated and even improved upon some very complicated weapons. This is significant. As a nation acquires the technological ability to duplicate complex weapons, it becomes capable of building new and original weapons.

Red Production Progress

"We have seen examples of this. The MiG-15 may not be superior overall to the F-86. But who can deny the fact that it was a first-class fighter and in many ways, an original design? Even more important, could a backward technology produce 15,000 of these modern jets in just a few years?

"They now have the MiG-17, an aircraft comparable to the F-100, one of our newest fighters. We can forget the MiG-15 because the 17 is replacing it. They now have thousands of these new models.

"Although weather interfered with their May Day show, we saw two new models of fighters during rehearsals for the big parade. One is a new supersonic model. The other is an all-weather fighter.

"You may say, 'well, they have concentrated on fighters.' But this is not the case. They are developing and producing the planes for a great bomber force.

"Last year we observed a completely new medium bomber. We expected they might develop such an aircraft taking several years to get into production. But this year they showed us enough of them to make us realize that they were already in production. These are great steps of progress.

Bomber Threat

"But the airplane that gives us real reason for concern here in the United States is the long range jet bomber. The Soviets have no use for a long range bomber except to attack the United States. Last year we saw one Soviet model. This year we saw numbers of them in formation.

"These observations establish a new basis for our estimate of Soviet production of the heavy jet bomber and the medium jet bomber. This knowledge is evidence of the modern technology of the Soviet aircraft industry and the advances which are being made by them.

"We must continue to be on the alert and maintain our own forces to insure the lead over the Soviets that we have.

"The Soviets may have started slowly, but they are learning fast.

"The national resources needed in a race for technical superiority are not God-given endowments like minerals. They are man-created resources like industry or transportation. To be strong in technology a nation needs alert scientific leadership and it must invest in basic and experimental research, in laboratories and in testing facilities. It must also have a broad population base, so that numerous young people can be channeled into the scientific and engineering professions. The more people you can funnel into training, the better selection you have to choose from.



General Thomas Dresser White, 54, combines extensive diplomatic service with combat command experience to serve as the No. 2 airman in the USAF command hierarchy. He is a West Point graduate who had infantry service before learning to fly and transferring to the Army Air Corps in 1924. Gen. White's diplomatic assignments have taken him to Moscow, Peking, Rome and Rio de Janeiro in military attache posts.

During World War II he served as assistant chief of the Air Staff for intelligence in Army Air Force headquarters and had combat experience in the South Pacific theater where he was deputy commander of the 13th Air Force, commander of the Seventh Air Force. After the war he served in the Orient as chief of staff of the Far East Air Forces with headquarters in Tokyo and later as commander of the Fifth Air Force in Japan until 1948.

He returned to the Pentagon for four years in legislative and operations assignments before becoming vice chief of staff in 1953. He is rated as command pilot, combat observer and technical observer.

Engineer Output Lead

"In the past, we in the United States have had the physical resources, and many of our people entered scientific and technical careers. We are continuing to invest in technical resources, but our production of trained people is not increasing.

"Russia is making rapid progress. The Soviets have come from a period in which most of their population was illiterate, to a point where their present output of scientists and engineers exceeds that of the United States. This is one area where they have gained leadership.

"Of course, they did not have to start from scratch. They had the resources for a sizeable production base. They had scientists and engineers of their own and they 'borrowed' large numbers of German scientists and engineers who were experts in the field of aircraft and missiles.

"Furthermore, their population is larger than ours by about a third. This gives them a greater educational potential, which they can be expected to use to the limit.

"Here are some cold facts: In 1950, the United States graduated 50,000 engineers—an all-time high. This peak was composed of veterans studying under the G. I. Bill. Last year we graduated only 20,000 engineers. By contrast, the Russians graduated 28,000 engineers in 1950, 40,000 in 1953, and 54,000 in 1954. Russia now has almost caught us in total numbers of engineers and has passed us in total numbers of scientists. These figures are nothing to be optimistic about.

Sound Information Position

"Of course, questions can be raised about the quality of the Soviet graduates. The United States does have the advantage that our young men are brought up in a machine-age environment. They soak up a lot of technical background. But the Soviets work their students harder.

"In summary, we had the lead in scientific manpower—but this lead is going, if it has not already gone. On the technical manpower front, time does not seem to be working in our favor.

"Turning now to another phase of technical resources, we find the Soviets have another advantage—the Iron Curtain. This security barrier allows the Communist bloc to hold on to their inventions and discoveries. Free nations cannot share them.

"By contrast, the United States and free nations are liberal with technical information. This is an outgrowth of the democratic system. Besides, we believe that exchange of information aids scientific and industrial progress. I do not believe that all releases we have made are based on sound reasoning, but I believe our position of freedom of information is sound.

"However, we must recognize that we are paying a price for this freedom, just as we must pay the price for other



RF-84F THUNDERFLASH noses up to the flying boom of Boeing KB-29P tanker for aerial replenishment of its fuel tanks, while another waits its turn. The Republic reconnaissance-fighter is capable of high-or low-altitude, day or night missions. Four F-84Gs recently flew from Tokyo to Australia non-stop with 3 aerial refuelings (AW May 23, p. 7).

freedoms we enjoy. The price is this: The Soviets profit from our efforts.

Shorter Lead Time

"A final point in this comparison of Soviet technological systems with ours is speed of production. I do not mean the speed of one production and assembly line. I am referring to what we call lead time—the whole period from invention of a weapon through development, test, training and finally a combat capability. With the complex weapons of today lead time is a matter of years.

"**There is also evidence that the Soviet technological structure is simpler and more streamlined than ours. Their programs are controlled by military necessity and the urgency of getting ahead. Ours are somewhat confined by democratic processes of decision-making and influenced by the need for economy.**

"Whatever the reasons are, we do know that they have produced first-class equipment and their lead time across-the-board is shorter than ours.

"On our side we have cut down some of our bottlenecks. In the Air Force we have reorganized and streamlined our research and development activity.

"This has saved valuable time, but there are other complicating factors that are not so easy to remedy.

"For example, our budget cycle. However beneficial this system of budgeting may be, it undoubtedly costs us in time lost.

"Our desire to build safety into our equipment and the need to keep equipment in service for a long time; our tendency to build multi-purpose weapons—all these lengthen our weapon lead time.

"We must do everything we can to reduce it. Under United States policy we will not start a war. This means we must maintain many weapons programs, against many eventualities. By contrast, the Soviets can choose their time and their strategy and work toward it. They can select particular weapon systems and put on a crash program. By concentrating in this way they may be able to telescope progress in specific areas. The danger is that they may do this in areas that can be decisive.

Need for Break-Through

"**These comparisons of scientific manpower, the safeguard on our technical effort and weapon 'lead times' indicate how foolhardy it would be to assume that we will automatically keep the lead. Technical superiority is not automatic. It must be made to happen.**

"Of course, a major technological break-through could again give us the lead for a period or two, three or even five years. But we cannot gamble that this will happen. The only sure way is to make the effort needed for a progressive improvement. Any break-through would then be a bonus. It would be further insurance for us.

"The future will not hold an encouraging picture unless we make the right decisions and then act decisively. But we cannot neglect the other main need I mentioned in the beginning—strength-in-being.

"We are up against an enemy that could strike at any time. If war came today—and it could—we would have to fight it with the trained divisions that are ready to take the field, the airplanes that can fly, and the ships that are afloat today. Our strength-in-being is a shield. Behind this shield we can go on working to get better weapons. Our strategy will undergo change. But it must change as our combat strength changes, not as we get the ideas for some new weapon system.

"Despite the improving strength of the Communists, our prospects for the future look bright. We can fail to win the technological battle only if we fail to recognize its importance.

"Unless we keep up our day-to-day strength we will have no shield to assure our future developments . . ."

PanAm Will Borrow $60 Million For DC-7s

Pan American World Airways has completed a $60-million, 25-year financing arrangement to cover payments on its orders for 40 Douglas DC-7s (AW May 2, p. 86).

The DC-7s represent a total investment of a $110 million.

PAA President Juan T. Trippe revealed the new loan last week at the airline's 27th annual meeting of stockholders in New York. He also reported Pan Am's commercial revenues increased to an all-time high of $44,697,000 during the first quarter of 1955.

Pan American will borrow the $60 million from 18 insurance companies as installments are due on 33 DC-7Cs and seven DC-7Bs. The international air carrier paid a 25% deposit on the new transports and, with throw off of depreciation, should be able to cover the remaining 75% with its new financing arrangment.

The loan is in addition to a $59-million credit agreement negotiated with banks in 1953.

In his report of first quarter results, Trippe said the record revenues represented an increase of 21% over the first three months of 1954. Passenger-miles flown during the period gained 26%.

He also forecast air traffic between the United States and foreign countries would be the greatest in history during 1955.

PAA's chief executive backed up this prediction with charts showing that the airlines are winning an increasing share of international and overseas travel from the United States.

Airlines carried an all-time high of 68% of the total international volume last year, Trippe said, and Pan American's slice of the 1954 market was 28% of all persons traveling abroad on both air and sea carriers.

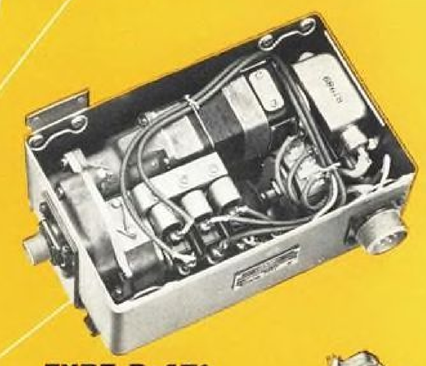
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TYPE D-638



TYPE D-471



TYPE D-665

TYPE R-149

Throughout EEMCO's entire history, we have devoted ourselves entirely to the design, development and testing of prototype models and in meticulous quality production of motors and actuators for aircraft industry leaders. EEMCO has always kept pace with the spectacular development of supersonic aircraft and missiles, because our search for better materials and processes has been as constant as our standards have been high. Note specifications of the EEMCO products shown below.

A Few Typical EEMCO Products

MOTOR TYPE D-638: 400 cycle, 6½ HP A.C. motor for intermittent duty, made to drive a hydraulic pump on a guided missile. Duty cycle is 3.0 seconds at 6.5 HP with 2250 r.p.m., 15.0 seconds at 1.5 HP. Has continuous rating of 5 HP at 2300 r.p.m., 15.8 amperes, 200 volts. Weight: 17½ lbs.

ROTARY ACTUATOR TYPE D-471: Flexible universal rotary power package combines in one small container: motor, radio noise filter, magnetic clutch and brake, main reduction gear and auxiliary gears for driving adjustable limit switches, light switches and position indicator. It has a wide variety of possible adaptations utilizing flexible shafting to drive small rotary or linear actuators singly or in multiples. Dimensions are only 7⅛" x 4⅝" x 2¾". Weight: only 3⅜ lbs. Specifications may be varied to suit special requirements.

ANOTHER ROTARY ACTUATOR TYPE D-665: Designed as a trailing edge actuator for jet fighters. It has a normal peak load of 28,000 inch-pounds and a total angular travel of 30°. Speed is .675 r.p.m. with an average load of 14,000 inch-pounds on a 28 volt D.C. system (18.75 amps). Ultimate static load is 77,000 inch-pounds. Weight: 25½ lbs. Design incorporates auxiliary power take-off and non-jamming end stops.

LINEAR ACTUATOR TYPE R-149: This unique linear actuator is entirely self-contained; the motor, clutch, planetary reduction gear and limit switch are all enclosed within the smaller inner cylinder. Type R-149 has an unusually long stroke of 9.625" at .3" per second under a normal load of 4000 lbs. on a 28 volt D.C. system. Maximum operating load is 8000 lbs., maximum static load, 15,000 lbs. Compact Type R-149 has adjustable load limit switches, non-jamming end stops, and a motor that shuts off automatically when end stops are reached, or load exceeds a pre-set limit. Weight: 10 lbs., 5 oz.

PROJECT ENGINEERS *Please Note!*

Before you go into a completely new unit, with all the inevitable, time-consuming design and development that so often holds up delivery and increases costs, investigate EEMCO. Consider first, the possibilities of modifying a standard EEMCO model. Remember, these motors and actuators are the products of specialists who have designed, developed and tested scores of such precision products in all sizes and of all capacities for many leading aircraft producers. Your inquiry is invited.

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Only Robinson will do when, for best performance, you ***must*** have complete protection of vulnerable equipment against shock or vibration –

Or, when you ***must*** save weight and cost of a device, and only greater protection will make this possible. ***You can build a thing stronger or shake it less: the latter is by far the more economical procedure.***

Note that even the latest specifications for shock and vibration control are becoming obsolete, because of the rapidity of aeronautical progress.

Unprecedented engine power, speeds, and extremes of temperature subject electronic equipment to conditions never before encountered.

Unless these sensitive devices are fully and properly protected, their performance is interfered with, and their service life shortened.

At stake are no less than the safety of pilots and passengers, the performance of civil and military aircraft, and huge deterioration costs of equipment.

In the military field, it is not too much to say that the performance of jet aircraft and guided missiles is limited by the degree of protection afforded their control mechanisms. ***The success of a mission — the defense of an area — may stand on the performance of shock and vibration control mountings.***

WHAT TYPES OF CONTROLS ARE AVAILABLE?

Starting with crude rubber and springs, progress in shock and vibration control has now resulted in ***one*** and ***only one*** method for energy dissipation, which has ***all*** the following essentials:

1. Degree of control commensurate with shock or vibration to be controlled.
2. Multi-directional absorption – i.e., handling of shock and vibration from every angle.
3. Indifference to extremes of heat and cold and the presence of dirt, oil, grease, or other deteriorative influences.
4. Insurance against installation errors; reduction of installation time.
5. Long extended and unchanging performance of mountings.
6. Effective reduction of bulk, weight, and cost of equipment protected, from 15% to 25%.

Only in Robinson all metal mounts and Met-L-Flex Engineered Systems are all six of these essentials available. ***A direct comparison between Robinson and any other method under consideration will quickly prove the presence or absence of these vital characteristics.***

THE INADEQUACY OF SPRINGS

Springs alone, or combined with auxiliary dampers, where the springs do most of the work, have been outmoded by the Robinson resilient cushion concept. Spring-damping combinations fail because:

1. They are linear in action, and unable to cope with varying loads, or to afford protection against dynamic overloads.
2. They vary in performance with altitude and reduced atmospheric pressure and when dirt, oil, and moisture affect the surface friction between spring and damping devices.
3. Their service life is definitely limited.

HOW ROBINSON ALONE OVERCOMES THESE DIFFICULTIES

The fundamental advantage of all Robinson shock and vibration control is the dissipation of energy by means of fabricated wire resilient cushions and shock pads of patented Met-L-Flex.

These cushions, ***which are exclusive with Robinson,*** have the following advantages:

1. They possess inherent damping throughout, nearly five times greater than rubber.
2. Their interlocking wire loops resist compression progressively as the load increases.
3. They are highly effective in multi-directional design and application.
4. They are completely unaffected by changing atmospheric pressures; high or low temperatures; dirt, oil, moisture, or other deteriorative influences.
5. They provide ample protection against dynamic overloads.
6. Their service life is practically unlimited.

Note that in the Robinson Mounting, the spring that surrounds the Met-L-Flex cushion acts as a retainer, and handles only a small part of the work to be done. It is the cushion that carries the load.

WHAT ARE ROBINSON SYSTEMS?

Years of engineering experience supplying shock and vibration controls to more than 500 aircraft and commercial users have taught us that each job is a separate and individual problem. Good as the Robinson individual mount is, our engineered systems are not made simply by attaching a number of mounts to a tray. Using the engineering essentials incorporated in the basic Robinson concept, Robinson ***engineers each shock and vibration control system for the work to be done*** – the maximum performance and protection of the equipment involved.

WHO USES ROBINSON?

Robinson is a leading supplier to the Government of shock and vibration control systems for the protection of airborne electronic equipment. Robinson Systems are in actual use in practically every military and commercial aircraft now flying and in a number of guided missiles; hundreds of designs are on our drawing boards for controls to be used in aircraft of the future. Robinson Systems are used by most of the leading manufacturers of military and civilian mobile ground equipment, by makers of light and heavy machinery, and by producers of shipping and carrying containers.

WHAT IS ROBINSON'S HISTORY?

Robinson has pioneered in the solution of shock and vibration control problems since 1936, culminating in the development of the revolutionary Met-L-Flex cushion first marketed in 1950.

In 1947 Robinson received from the Navy Department the award for "outstanding cooperation and assistance in producing for the Naval Service new and radically different shock mounts which greatly decreased electronic equipment failures due to vibration."

Steady advances have been made in all-metal mounts and systems, in multi-directional mountings (which Robinson has quantity-produced for 4 years), in fully engineered protection. Years of research, laboratory work and practical applications have enabled Robinson Mounting Systems to cope uniquely with the formidable problems involved in our defense operations. Robinson now supplies both the airborne and the industrial fields, serving its clients by both Eastern and West Coast engineering staffs.

The business of Robinson Aviation, Inc. has increased 8-fold in the past five years.

A WORD OF WARNING

Robinson success and the pressing need for effective shock and vibration control have encouraged the manufacture of low cost mounts and so-called systems which are definitely inadequate for the job that must be done. ***While such devices may meet existing specifications, they may not fulfill the actual requirements of this jet and atomic age.***

Robinson seeks only a clear definition of the work to be done, and an engineering appraisal of all available devices aimed at doing it. ***It is on this direct comparison that Robinson success has been built.***

ROBINSON AVIATION INC.
TETERBORO, NEW JERSEY
Vibration Control Engineers
AIRBORNE DIVISION

West Coast Engineering Office: 3006 Wilshire Boulevard, Santa Monica, Calif.

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Manufacturers of Cabin Pressurization and Low Pressure Pneumatic Equipment...cabin pressure regulators · safety valves · shut-off and modulating valves · flow controllers · pneumatic power pressure regulators · Aero Pneumatics Div., Burbank, Calif. or Russell Associates, Brightwaters, L.I., N.Y.

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Manufacturers of a Complete Line of Test and Ground Handling Equipment...portable hydraulic test stands · hydraulic test benches · magneto and propeller test stands · "tilt-arc" engine handling units · Fully staffed and equipped to design and manufacture specialized high capacity equipment to customer requirements.

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SEC Lists Aviation Transactions

Securities and Exchange Commission reports the following transactions of aviation stock from Mar. 11 to Apr. 10:

American Airlines, Inc. Acquisition of 600 common shares through exercise of option by L. E. Glasgow, officer, making a holding of 600; disposal of 1,000 common shares by William J. Hogan, officer, leaving a holding of 4,000.

Avco Manufacturing Corp. Disposal of 1,500 capital shares by Irving B. Babcock, director, leaving a holding of 4,897.

Bendix Aviation Corp. Acquisition of 200 common shares by Edward R. Foster, officer, making a holding of 400.

Borg-Warner Corp. Acquisition of 1,000 common shares through exercise of option by R. C. Ingersoll, officer and director, making a holding of 6,000; acquisition of 200 common shares by H. H. Gehlbach, officer, making a holding of 500; acquisition of 1,292 common shares by Robert S. Ingersoll, officer, making a holding of 2,252; acquisition of 624 common shares by Lester G. Porter, officer, making a holding of 1,224.

Braniff Airways, Inc. Acquisition of 600 common shares by Eugene C. Eppley, director, making a holding of 7,400; acquisition of 200 common shares by Milton McGreevy, director, making a holding of 300.

Capital Airlines, Inc. Disposal of 500 common shares by Robert J. Wilson, officer, leaving a holding of 235.

Colonial Airlines, Inc. Acquisition of 100 common shares by Orville Cameron, officer, making a holding of 500; acquisition of 5,000 common shares through exercise of option by Thomas J. Dunnion, officer, making a holding of 5,100; acquisition of 500 common shares by John J. Murphy, officer and director, making an indirect holding of 500.

Electronics Corp. of America. Disposal of 2,334 common shares by Arthur G. B. Metcalf, officer and director and beneficiary, leaving a direct holding of 22,333 and an indirect holding of 142,000.

General Dynamics Corp. Disposal of 300 common shares by Lawrence B. Richardson, officer and director, leaving a holding of 4,930.

General Electric Co. Acquisition of 500 common shares by Charles D. Dickey, officer and director, making a holding of 7,500; acquisition of 1,070 common shares by Clarence H. Linder, officer, making a holding of 2,640; acquisition of 1,500 common shares by John D. Lockton, officer, making a holding of 2,019; acquisition of 3,300 common shares by Philip Reed, director, making a total holding of 6,300.

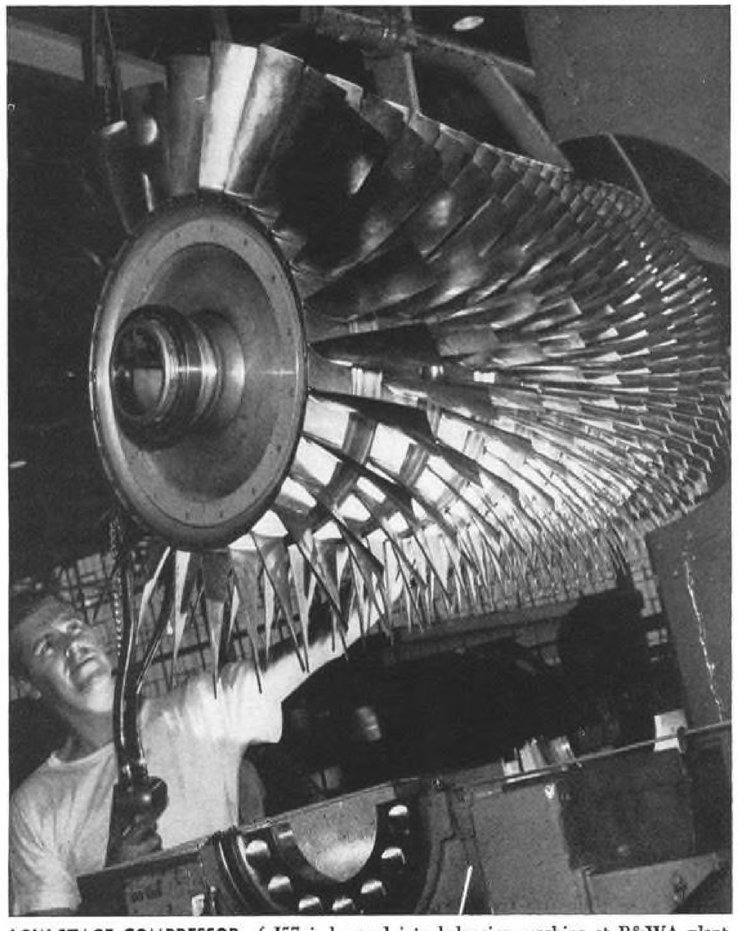
General Motors Corp. Acquisition of 100 common shares through exercise of rights by Lammot du Pont Copeland, director, making a holding of 900; acquisition of 360 common shares through exercise of rights by John J. Cronin, officer, making a holding of 7,545; acquisition of 102 common shares through exercise of rights by Nelson C. Dezendorf, officer, making a holding of 2,146; disposal of 100 common shares by Charles L. McCuen, officer, leaving a holding of 6,068; acquisition of 1,420 common shares through exercise of rights, by R. S. McLaughlin, director, making an indirect holding of 51,706; acquisition of 174 common shares through exercise of rights by Ivan L. Wiles, officer, making a holding of 3,653.

Lear, Inc. Acquisition of 393 common shares through compensation as bonus by Andrew F. Haiduck, officer, making a holding of 22,222; disposal of 4,500 common shares by A. G. Handschumacher, officer, leaving a holding of 1,396; acquisition of 3,000 common shares through exercise of option by George K. Otis, officer, making a holding of 3,222.

Glenn L. Martin Co. Disposal of 500 common shares by the estate of Duncan M. Spencer, director, leaving a holding of 1,000.

Minneapolis-Honeywell Regulator Co. Acquisition of 100 common shares by C. D. Lyford, officer, making a holding of 100; acquisition of 100 common shares by Gerry

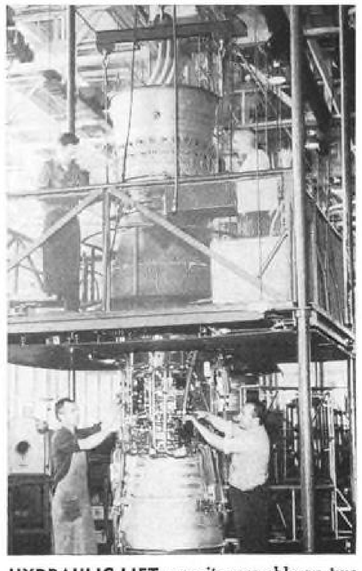
Pratt & Whitney Aircraft Assembles the J57 Power Unit



LOW-STAGE COMPRESSOR of J57 is lowered into balancing machine at P&WA plant.



INSPECTION of J57 turbojet engine's three-stage compressor take place after complete assembly and final balance of unit.



HYDRAULIC LIFT permits assembly on two level, with J57 in a vertical position.

Still gets that wonderful feeling . . .



"After 9 years of flying behind many Airwork engines, I still get that wonderful feeling that they are completely dependable. This confidence has been justified many times by their performance.

After looking over other deals, I'll still stick to Airwork as my factory authorized overhaul agency — *and fly with that wonderful feeling!*"

Charles F. Sowa

Chief Pilot

Virginia Coal & Iron Company

BRANCHES IN—
ARLINGTON, ATLANTA,
MIAMI, NEWARK.

Airwork
CORPORATION
Millville, New Jersey

E. Morse, officer, making a holding of 150.

National Airlines. Acquisition of 110 common shares by Edwin C. McDonald, director, making a holding of 410.

National Aviation Corp. Acquisition of 500 common shares by Luis de Florez, director, making a holding of 2,500; acquisition of 137 common shares by Frederick F. Robinson, officer, making a holding of 637; acquisition of 1,200 common shares by Elmer Wellin, director, making a holding of 6,900.

Northrop Aircraft, Inc. Acquisition of 2,200 common shares through exercise of option by John R. Allison, officer, making a holding of 2,200; disposal of 1,400 common shares by Kenneth P. Bowen, officer, leaving a holding of 2,592; disposal of 3,000 common shares by William B. Collins, director, leaving a holding of 1,000; disposal of 1,000 common shares by Earle M. Jorgensen, director, leaving a holding of 1,000.

Northwest Airlines, Inc. Disposal of 200 common shares by Malcolm S. Mackey, officer and director, leaving a holding of 1,000; acquisition of 500 common shares by Donald W. Nyrop, officer and director, making a holding of 500; disposal of 700 shares of 4.6% cumulative convertible preferred stock by Malcolm S. Mackey, officer and director, leaving a holding of 3,000.

Philco Corp. Acquisition of 3,300 common shares by the profit sharing plan of Philco Corp. and subsidiaries, making a holding of 524,414.

Radio Corp. of America. Acquisition of 100 common shares by E. W. Engstrom, officer and director, making a holding of 600; acquisition of 180 common shares by Robert A. Seidel, officer, making a holding of 680.

Seaboard & Western Airlines, Inc. Disposal of 1,000 common shares by Raymond A. Norden, officer and director, leaving a holding of 27,537; disposal of 1,000 common shares by Warren H. Renninger, officer, leaving a holding of 12,250.

Solar Aircraft Co. Acquisition of 300 common shares by Richard R. Rollins, director, making a holding of 300.

Sperry Corp. Disposal of 2,200 common shares by Thomas B. Doe, director, leaving a holding of 2,555.

Thompson Products, Inc. Acquisition of 5,500 common shares through exercise of option by Lee M. Clegg, officer and director, making a holding of 17,910; acquisition of 1,760 common shares through exercise of option by M. E. Price, officer, making a holding of 2,394; acquisition of 440 common shares by Edward P. Riely, officer, making a holding of 570; disposal of 800 common shares by Horace A. Shepard, officer, leaving a holding of 1,000.

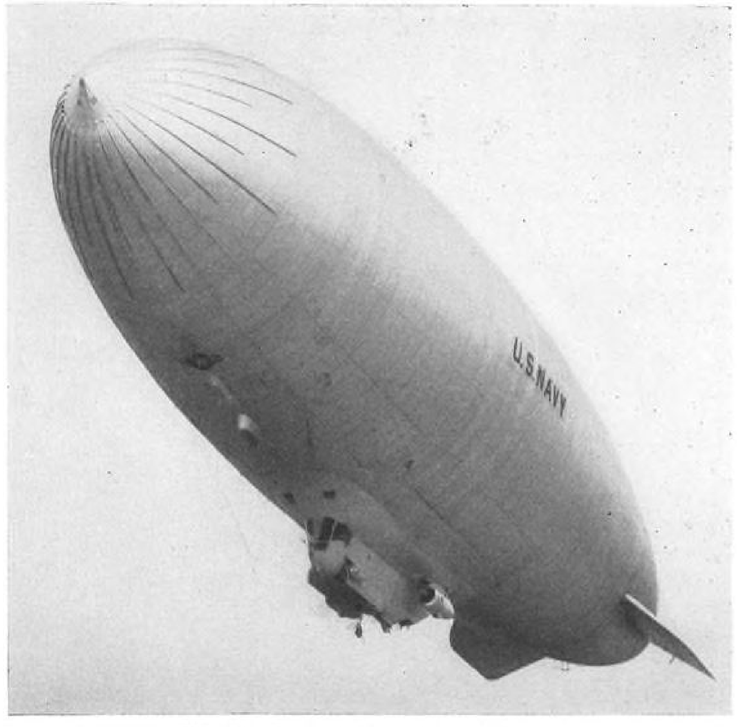
Trans World Airlines. Disposal of 500 common shares by R. S. Damon, officer and director, leaving a holding of 1,190.

United Air Lines. acquisition of 200 common shares by Paul A. Bissinger, director, making a holding of 500.

United Aircraft Corp. Disposal of 100 common shares by Lauren D. Lyman, officer, leaving a holding of 900.

Western Air Lines, Inc. Acquisition of 2,500 capital shares through exercise of option by Arthur F. Kelly, officer, making a holding of 3,050; acquisition of 2,500 capital shares throegh exercise of option by Marvin W. Landes, officer, making a holding of 2,865.

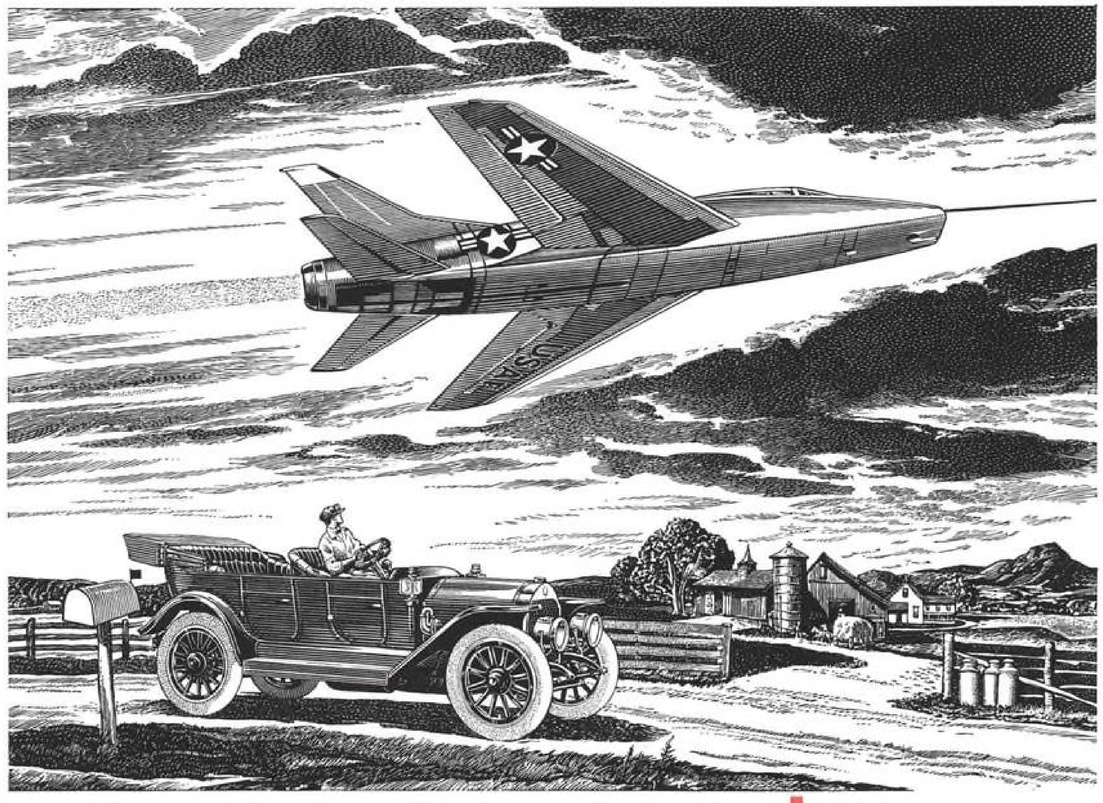
Westinghouse Electric Corp. Acquisition of 150 common shares through exercise of option by R. D. Blasier, officer, making a holding of 833; acquisition of 725 common shares by Leslie E. Lynde, officer, making a holding of 1,510.



XZS2G-1 Joins the Navy

Navy has taken delivery of Goodyear Aircraft Corp.'s prototype XZS2G-1 scout-type anti-submarine blimp, the first of a series. Planned as replacement for the K-type ships used for anti-sub patrol in World War II, the ZS2G design is reported to have duration of about 24-36 hr. Tail is inverted-Y shape, to shed snow loads. The craft is now scheduled for a series of intensive operational tests by the Navy's Board of Inspection and Survey.

From the Stoddard-Dayton to the Super Sabre



Speco's creative engineers have opened new horizons in precision!

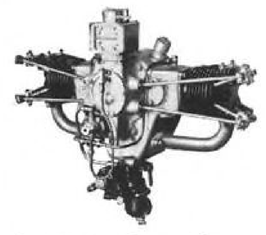
If you recall the Stoddard-Dayton, then surely you remember the Jenny – the sweetheart of World War I. They were a couple of kids who "grew up together" . . . the car and the airplane. And today their grandchildren are the mainstays of our national economy.

We like to feel that our leadership in precision on a mass production basis has played a big role in this growth. Our work in all industries—automotive, aviation, industrial . . . in fact, in all fields of mechanics and hydraulics – has made great contributions. Our team of precision engineers, toolmakers and machinists makes certain that *If We Ship It . . . It's Right!* If you have a job with which you feel we might help, a short letter or a telephone call will bring prompt, sound guidance. Or if you'd like the whole SPECO story–from plant to people to products, send for our new Plant Brochure. The Steel Products Engineering Company, Springfield, Ohio.

THE STEEL PRODUCTS ENGINEERING COMPANY

SPECO

BEAUTIFUL 11" X 14" REPRODUCTIONS OF THIS PICTURE SUITABLE FOR FRAMING WILL BE SENT ON REQUEST—FREE.



One of our early contributions to aviation–this two cylinder, Opposed Piston Blower Engine produced by Speco in 1924.



Today we're building precision mounts for nearly every major manufacturer of radar equipment–and many other component parts.

FASTENER PROBLEM



Type LH2424, for temperatures to 550° F.



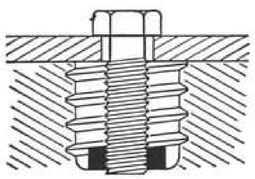
Type N2424, for temperatures to 250° F.

Strong, self-locking threads for tapped holes in soft metals

Tapped holes in soft metals have long presented problems to aircraft manufacturers. Threads wear rapidly, are easily damaged and are susceptible to stripping. Bushings made of harder alloys are a partial solution. Such inserts, however, have a tendency to shake loose under vibration, or to back out when the bolt is removed. The only alternative is to position them with a secondary fastening device such as a key or a "Dutchman" pin which then presents a difficult and costly service problem. In cooperation with aircraft and aircraft engine builders, ESNA has developed a new bushing design which eliminates these problems. Type 2424 bushings are self-locking externally and internally. They provide a one-piece, vibration-proof steel threaded insert that develops AN tensile loads, is dependably self-retaining, yet can be readily removed with simple tools.

Easily inserted in an NC-2 tapped hole, using simple tools, the type 2424 bushings are locked in place by the interference action of the patented Lok-Thred system, which reforms the socket thread to the equivalent of a perfect selective fit.

The internally-threaded sections use one of two thoroughly-proven ESNA self-locking devices. For temperatures up to 250° F., the new bushing is available with the famous red nylon locking collar. For service between 250° and 550° F., it comes equipped with the all-metal LH locking device that has been tested on many types of ESNA high temperature locknuts. Both bushings are available in sizes #10 through ⅜" and the locking devices provide performance and reusability per Specification AN-N-5b and AN-N-10a.



"Lok-Thred" contour displaces metal from crests of socket threads to produce equivalent of a perfect selective fit. Original socket threads can be reworked as many as ten times and new bushings inserted.

Type 2424 bushings can be installed in any material whose hardness is less than 25 Rockwell C, including aluminum, magnesium, plastic and mild steel castings. Simplified installation and field maintenance techniques save costs. And because Lok-Thred method of external locking creates less hoop stress in the base of the casting, edge distance or boss size is reduced . . . with resulting weight savings.

MAIL COUPON FOR DESIGN INFORMATION

ESNA

Elastic Stop Nut Corporation of America
Dept. N81-525, 2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastener information:

☐ Details of type 2424 bushings.

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone_____ State_____

Packaged Vacations Boost Taloa Bookings

Transocean Air Lines' packaged Hawaiian vacation tour is beginning to pay off. The nonsked has flown or lined up approximately 100 plane loads so far this year. Its tour schedule is presently booked to capacity through September.

With this rapid growth after only three years of offering the service, Taloa believes there is a greater potential in its vacation package. The airline figures every service organization and big company in the U. S. is a prospect.

So far, Transocean has gone no farther from its Oakland base than Salt Lake City to pick up vacationers. But inquiries have come in from as far east as Milwaukee and Ann Arbor, Mich.

Transocean stepped up its tour activity when Pan American and Northwest Orient Airlines cut their Hawaiian rate to $125. Taloa reduced its tariff from $121 to $109. By purchasing the standard Hawaiian tour in wholesale lots and reselling it at cost, the nonsked is able to offer a low-cost vacation.

An eight-day tour out of Santa Barbara costs $267. This includes a double hotel room, transportation to and from the airport, city tours in Hawaii, three meals a day and a "luau." Transocean estimates an individual would pay $100 more for the same services.

Load factors on Taloa's tour transports averaged about 70% through April. May through September load factors are expected to increase to about 90%.

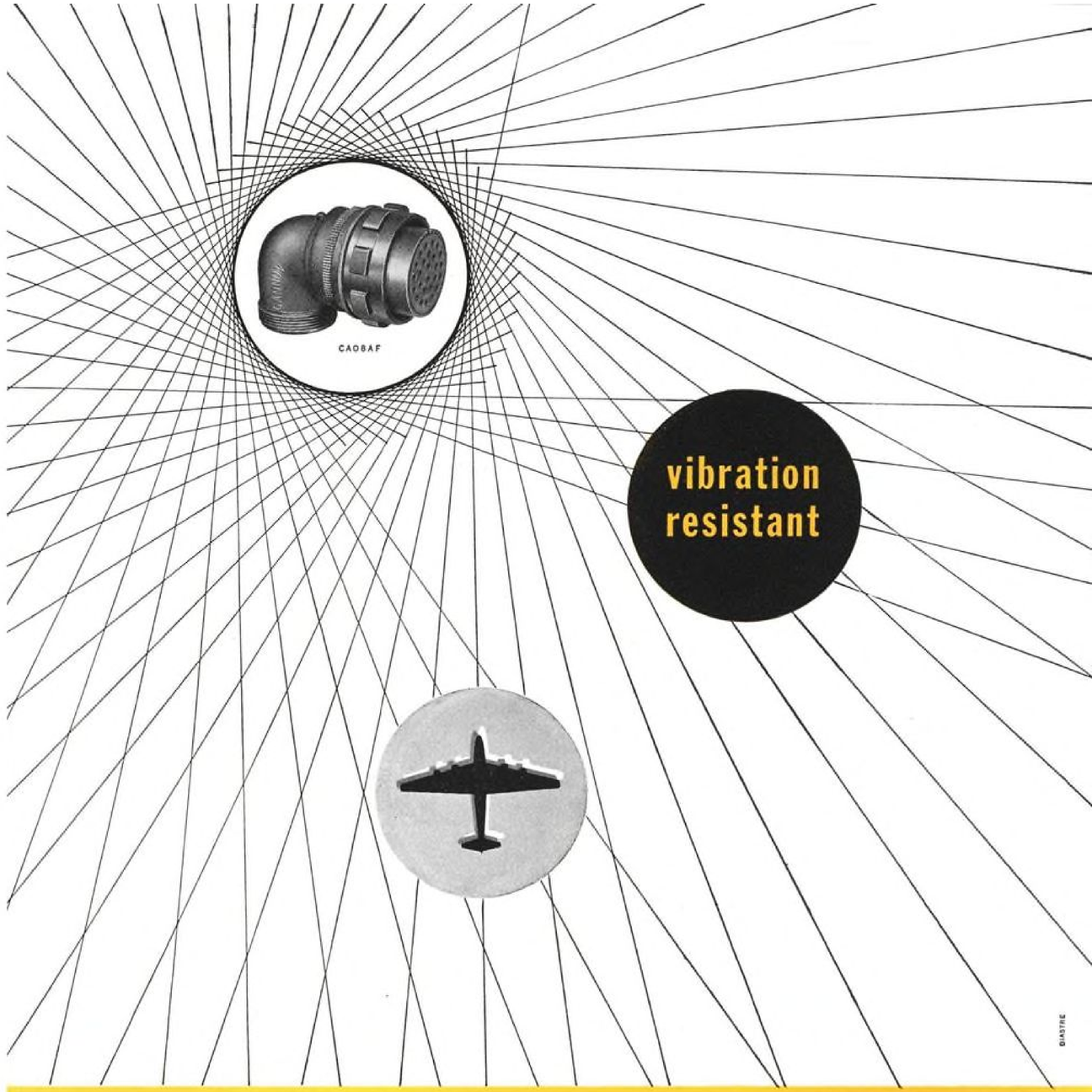
Plane utilization also is good. The two DC-4s average about 12 hours a day, climbing from a low point that seldom is below 10 hours to 16 and 17 hours in the peak summer season.

Light VHF Receiver Sells for $99.50

A small VHF receiver, priced at $99.50, is being produced for lightplane owners by Aeronautical Electronics, Inc., Raleigh, N. C. Weighing less than 1.5 lb., Model 300 receiver measures 2⅜x5½x6⅞ in. It covers the 108-128-mc. range and can be operated with LF or VHF receiver or with the Aerotron Model 220 modulator/power unit.

The new receiver is said to be free of "hiss" even at signal levels of less than one microvolt. A squelch adjustment on the panel enables setting threshold of audio sensitivity to any level in a range of ¾ to 100 microvolts.

Exclusive distributor for Aerotron equipment is Air Associates, Inc., Teterboro, N. J.



designed to combat vibration problems



Points of high vibration are critical! Connectors having plastic or other non-resilient inserts will not take the beating of high vibration. Resilient inserts of polychloroprene or Cannon's exclusive Silcan . . . the kind used in Cannon high-quality Vibration Proof AN Series Connectors . . . are the answer.

You'll find new connector components, telescoping rubber bushings, strong AN3057A clamps, means for safety wiring, new grounding lugs, grommets, ferrules . . . holding together vital circuits under the most extreme conditions, providing moisture proofing, permitting increased voltage ratings. And . . . there is a Cannon Vibration Proof connector for your every application. Not just one, but several . . . CA-AF, CA-F, AN-M, AN-E. Also, specials built for potting which resist vibration . . .

Write for new AN10 Edition Bulletin for Vibration Proof connectors in the AN and Associated Series — 144 pages.

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The newest EDISON fire detection system now provides positive protection for another of America's great aircraft—CONVAIR's B-36 long-range intercontinental bomber.

Prompt fire detection is assured even if the sensing cable breaks, for each half will function as a closed circuit. And the entire EDISON system operates directly from the aircraft power supply without the need of electronic tubes.

Years of actual experience and constant research in the world-famous EDISON Laboratory provide this aircraft fire detection system to keep pace with the advancements of modern flight.

Other outstanding features:

▸**exclusive snap clamps** simplify installation and speed maintenance—no tools needed

▸**maximum sensitivity** for each zone because a single detector circuit can provide varying temperature alarm settings

▸**low impedance design** completely eliminates false alarms due to moisture or capacitive effects

▸**minimum weight construction**—d.c. control assembly weighs only .8 lbs., 100 ft. of sensing cable only 1 lb.

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INSTRUMENT DIVISION • 49 LAKESIDE AVENUE • WEST ORANGE, NEW JERSEY

WHO'S WHERE

(*Continued from page 9*)

Harold M. Niles, manager of Navy contracts, and **Roy Schoenhaar,** assistant chief draftsman, Ford Instrument Co., Long Island City, N. Y., division of Sperry Corp.

Robert D. Fagely, technical manager of the new engineering laboratory established at Pasadena, Calif., by Houdaille-Hershey Corp.'s Aircraft Division.

Donald J. MacFadgen, engineering manager, Pierce Governor Co.'s Aircraft Accessories Division, Anderson, Ind.

Donald H. Alder, manager of field project engineering, Robinson Aviation's western region.

Kenneth Koyen, Washington public relations representative, General Dynamics Corp.

James E. Mays, assistant manager, Southwest Airmotive Co.'s jet engine overhaul operations at Dallas.

Charles K. Krause, factory superintendent, Hermetic Seal Products Co., Newark, N. J.

Philip L. McGovern, assistant controller, Air Associates, Inc., Teterboro, N. J.

Arthur C. Hartman, assistant plant manager of the Aircraft Products Division.

J. A. Manfre, West Coast supervisor of technical sales service, Rem-Cru Titanium, Inc.

Gordon T. Ersted, military sales representative, AC Spark Plug Division of General Motors.

Douglas F. Bush, Detroit district sales manager, Airwork Atlantic, Ltd.

Ben Nicks, public relations representative at Kansas City, Kan., for Trans World Airlines.

Russell E. Linn, sales manager, General Aviation Supply Co., St. Louis.

Oliver V. Mahan, Jr., New York district sales manager, Northwest Orient Airlines.

J. F. Dellaria, special coordinator, Dow Corning Corp., Midland, Mich.

Kenneth Davis, Western region manager, Kaylock Division, Kaynar Co., Los Angeles, Calif.

Reynold W. Malmer, system writer-photo editor, Northwest Orient Airlines.

Max DeZemplen, general sales manager, Voishan Manufacturing Co., Culver City, Calif.

Maurice A. Barbettini, distributor-sales representative, Southwest Airmotive Co., Dallas.

Walter B. Voisard, sales and service manager, McCauley Industrial Corp., Dayton.

Walter W. Fowler, eastern regional traffic manager, Trans-Canada Air Lines.

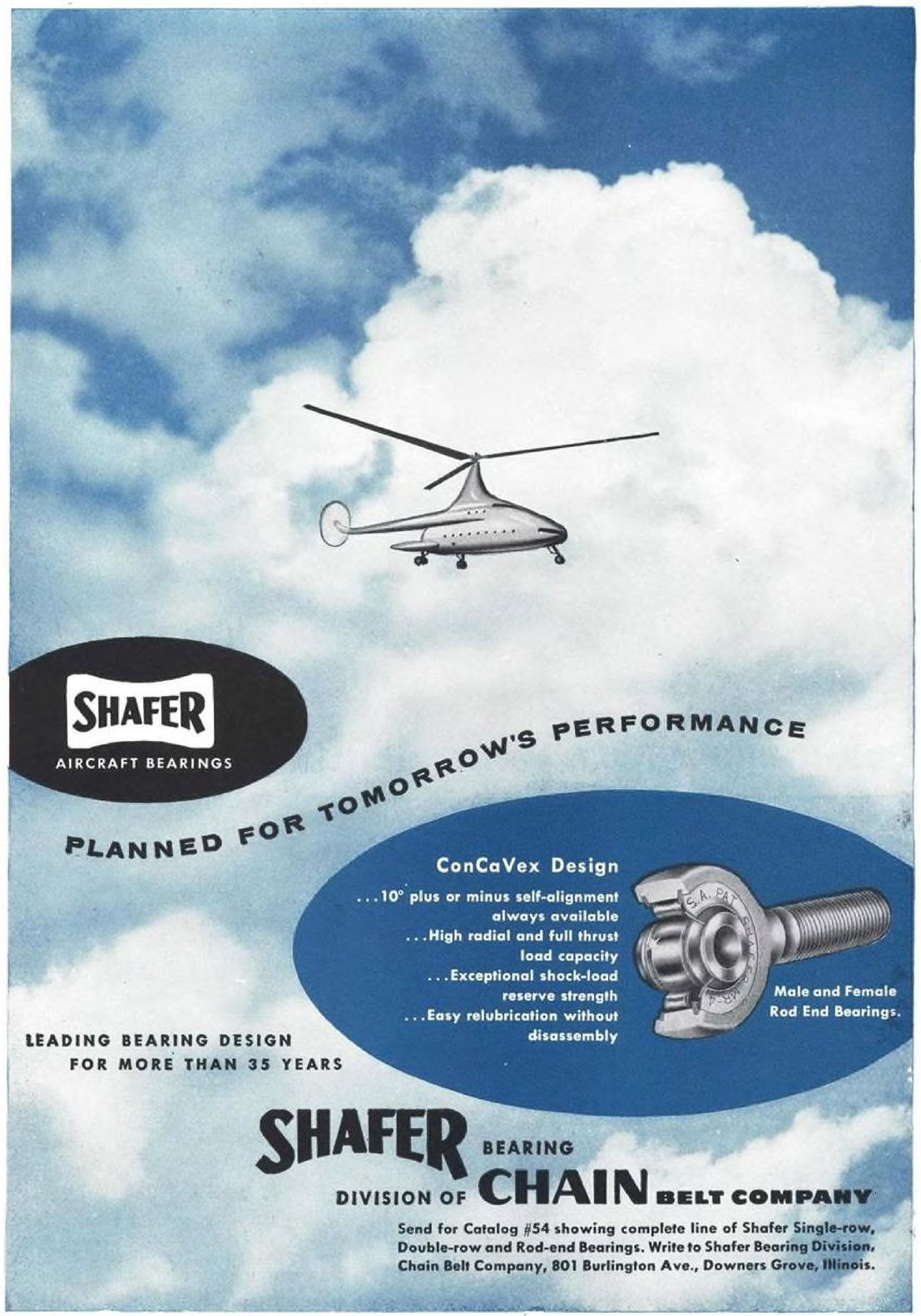
Robert P. Hubley, passenger traffic manager, California Central Airlines.

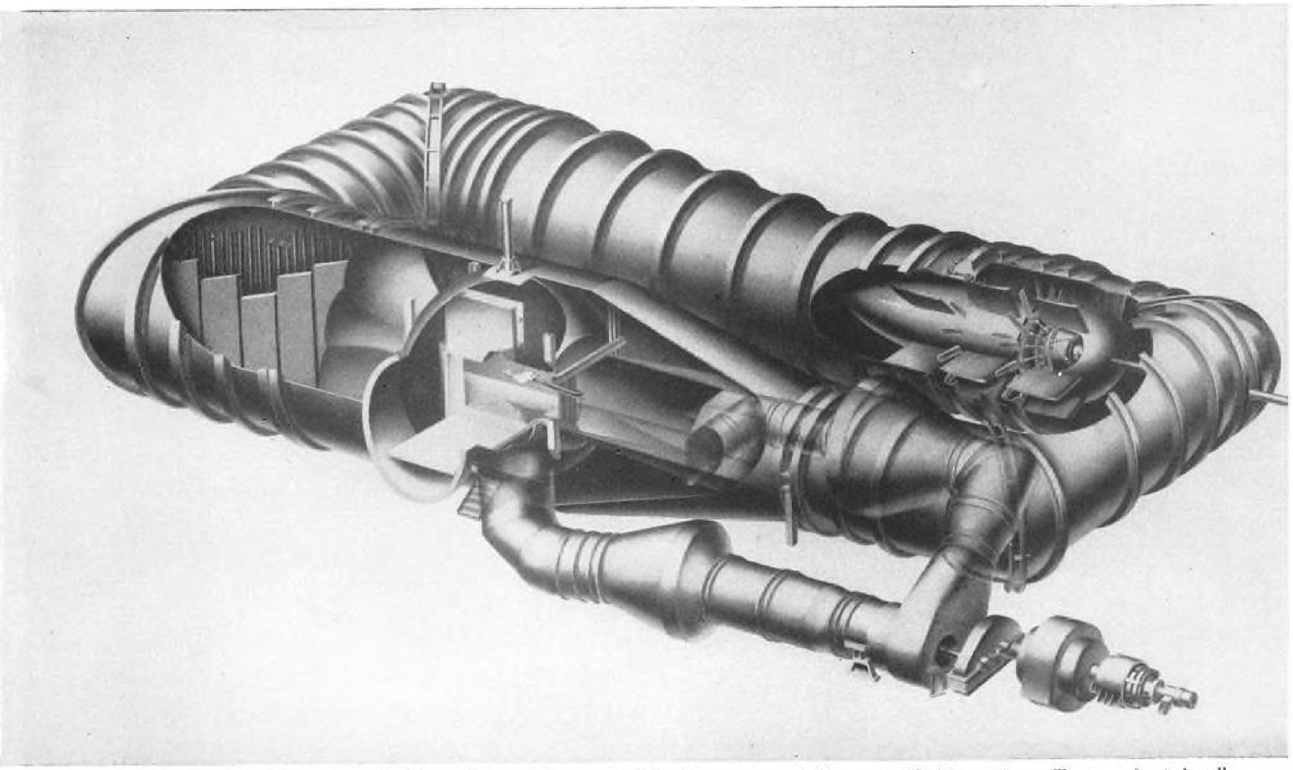
Kenneth Hatfield, quality control supervisor and **Walcott O. Kinder,** accessory overhaul shops superintendent, Aerodex, Inc., Miami, Fla.

John G. Hallin, assistant contract manager, Sundstrand Aviation Division of Sundstrand Machine Tool Co., Rockford, Ill.

Andrew W. Abela, on loan from Pan American World Airways to Avianca as chief of the maintenance training school in Barranquilla, Colombia.

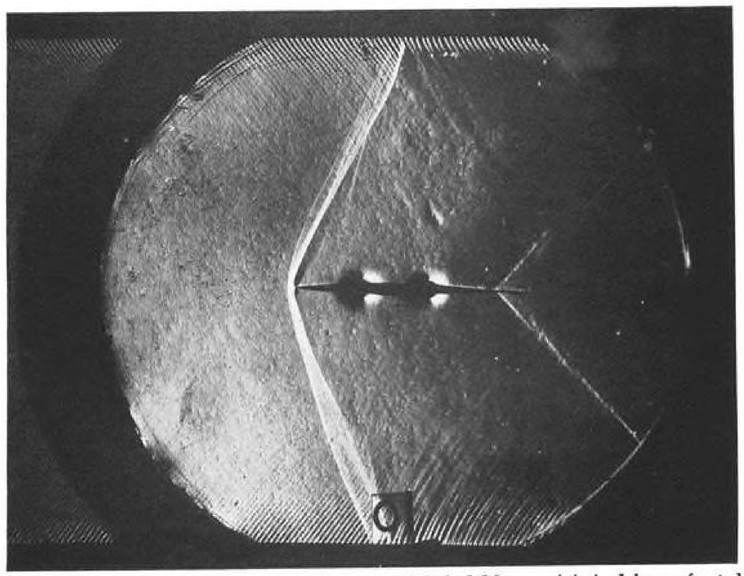
Gordon T. Ersted, military sales representative for AC Spark Plug Division of General Motors, Flint, Mich.





TRANSONIC THROAT of modified Cornell Aero Lab tunnel will be 8 ft. square and, like present 3x4-ft. section, will use perforated walls.

Scientists Clear Wind Tunnel Throats



REFLECTIONS OFF WALL from shock wave at Mach 1.26 are minimized by perforated throat in Cornell tunnel. Alternate shock and expansion waves at wall merge quickly

By David A. Anderton

The bag of transonic tunnel testing tricks has not yet been completely emptied.

Two variations on the basic theme of the ventilated throat, invented and pioneered by scientists at the National Advisory Committee for Aeronautics, have improved current operations with a pair of transonic wind tunnels:

- **At Cornell Aeronautical Laboratory,** a perforated throat reduces the interference of shock waves reflected from the tunnel walls, permits the use of larger test models to give more accurate test results.
- **At Boeing Airplane Co.,** downstream diffuser re-entry doors—called "Boeing flaps"—minimize the power required for the highspeed testing.

The Theory

Behind these two refinements lies a long history of development and a technological break-through. The development began before 1942 at NACA; the break-through was the concept of the ventilated throat, conceived and developed by John Stack and his associates in 1946.

Before then, transonic tunnel testing was impossible. There were some tricks to get limited numbers of test points, but full-range, thorough aerodynamic research was impossible.

The reason lay in the characteristics of wind tunnels and of transonic flow.

Any obstacle stuck in a pipe—and a wind tunnel is, for theoretical analysis, simply a pipe—obstructs the flow. It's possible to block the flow completely, if the obstacle is big enough; if it is smaller than the diameter of the pipe, then the air rushing through the pipe must speed up to keep the flow constant.

A test model partially blocks the wind tunnel test section. If the model is small enough, and the flow is slow enough, there is no trouble. Make the model larger and the airspeed higher, and the trouble begins. The cross-sectional area of the test section is smaller at the model than it is upstream; the air must accelerate to get past the model. As speed approaches the sonic mark, a local shock will form at the model.

But when the shock forms at the model—because local flow has reached sonic speed even though the tunnel main stream has not—flow characteristics change. For all practical purposes, the tunnel won't operate any faster without an enormous expenditure of extra power. The flow on the model is not an accurate picture of the flow that exists at the free-stream tunnel speed.

This formation of the local shock and its consequent blocking of the tunnel is called "choking."

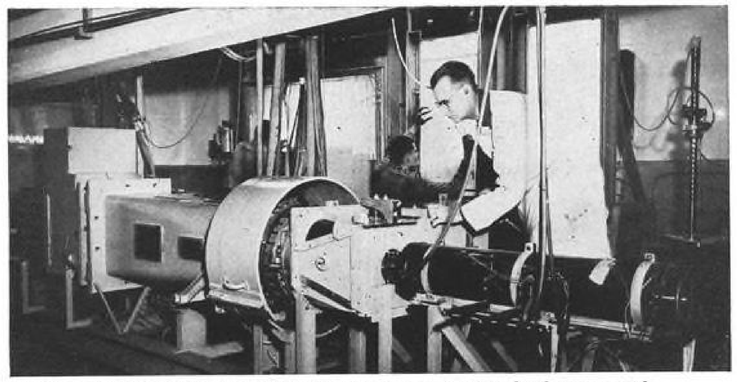
However, choking is not the only problem. One of the worst, which plagues wind tunnel technicians and always will, is accounting for the effect of the walls.

Wind tunnel walls confine the flow and impose a rigid outer envelope on the tube of air passing through. Subsonic flow streamlines that have to curve to get around the test model retain that curvature at a considerable radial distance from the model. If the model is small and the test section large, then this wall interference is minimized. But for larger models and smaller sections, the flow pattern is distorted by the presence of the walls.

Nor can the walls be removed. There still exists interference between the moving stream of air and the static air envelope outside the test section. This interference tends to distort the flow, also, but in a sense opposite to the wall effects.

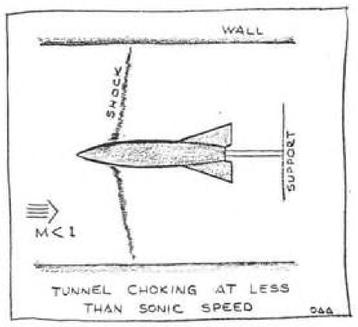
Different flow conditions at supersonic speeds also present problems because of the wall effects. Shock waves generated at the nose of the model are reflected from the walls and criss-cross the test section downstream. If these reflected waves hit the model, the flow pattern around it becomes non-uniform and the test results mean nothing.

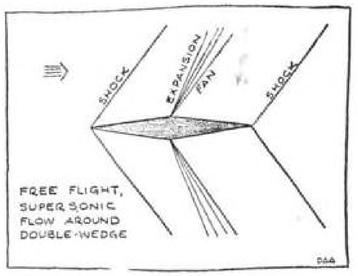
Removing the walls doesn't solve this one either. Instead of a compression wave formed at the nose, expansion waves form as the flow inside the tunnel tries to adjust to the pressure of the flow outside. These expansion

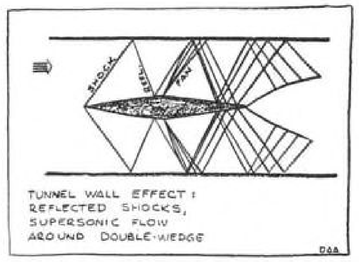


BOEING BABY TUNNEL is one-twentieth scale, was valuable development tool.

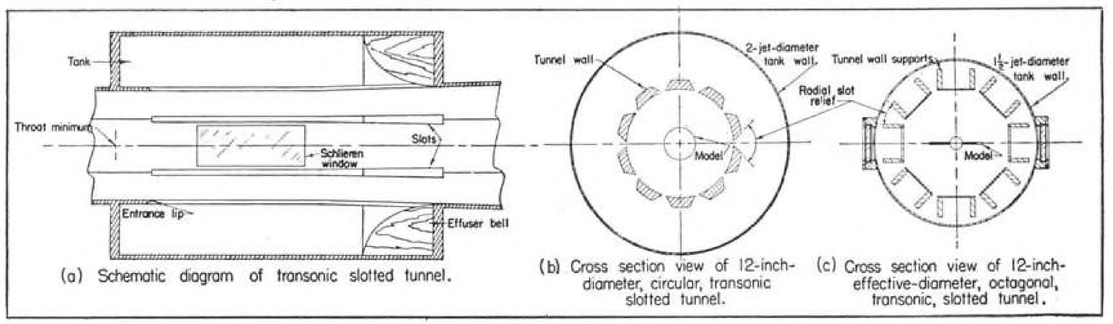
TUNNEL AND FLIGHT FLOW

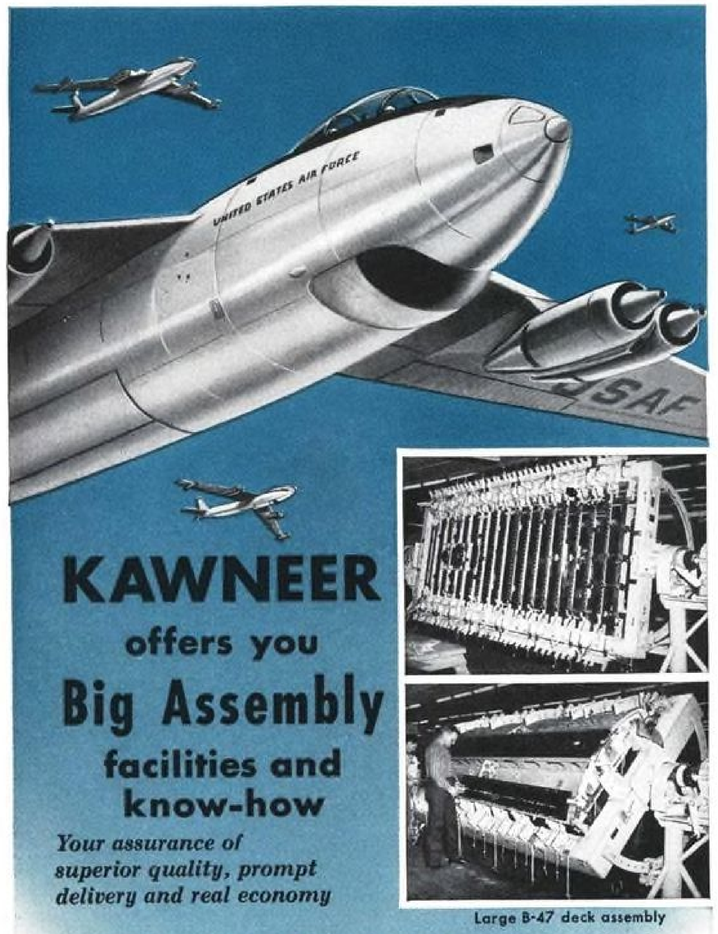






SLOTTED THROAT, invented by National Advisory Committee for Aeronautics scientists, follows general scheme of sketches below.





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waves also can be reflected and ruin the test.

Considering these objectives, it seems that under normal tunnel techniques, the model would have to get smaller as the speed increased.

It would have to be smaller in cross-sectional area to delay choking and to minimize wall interference at subsonic speeds; it would have to be shorter at supersonic speeds to avoid entanglement with the reflected shocks.

As a matter of fact, under the old scheme, the model would have been vanishingly small at Mach 1. These frustrating facts started the chain of thinking that led Stack and his associates to the idea that revolutionized wind tunnel testing and made a technological break-through possible.

It was a simple solution, but not at all obvious. The answer was to ventilate the test section of the wind tunnel by cutting slots in the tunnel walls in direction of flow. These slots simply bypassed air around the test section.

The slots reduced the model-blocking interference to nearly zero and choking did not occur. The combination of some compression shocks and some expansion waves pointed to a net result of canceled interferences for supersonic testing (although this did not completely prove out).

There was a bonus: Tunnel Mach number could be increased by a power increase and variation in Mach number could be obtained with power variation.

Design of the transonic throat got under way in 1946. NACA was gambling one of its most valuable wind tunnels and millions of dollars on the ability and inventiveness of its team of scientists.

The first transonic tunnel operations began in late 1950 at the Langley Laboratory of NACA. A few months later, the second tunnel was completed.

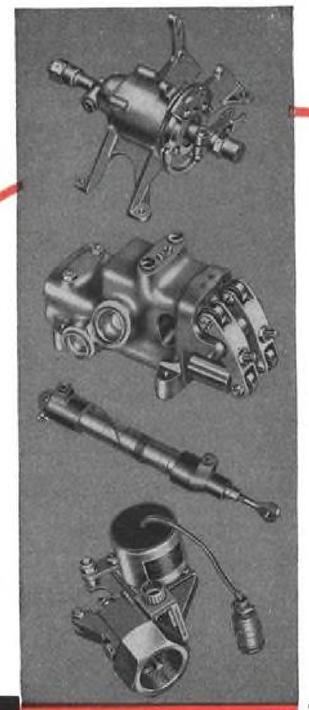
Now, both Langley and the Ames Aeronautical Laboratory of NACA have these useful tools.

Cornell Tunnel

With more than two years of transonic test experience, Cornell Aeronautical Laboratory is currently loaded with a backlog of 1,000 test hours scheduled for the next six months in its transonic tunnel. CAL operates a 3x4-ft. test section fitted within the 8½x12-ft. variable-density tunnel, but is about to install a permanent 10-ft.-square transonic test section.

Cornell's tunnel is based on the same principle that gave the NACA its transonic throats, but there is a refinement aimed at reducing even further the effects of reflected shocks.

Supersonic flow is discontinuous, abrupt, unpredictable. Unfortunately

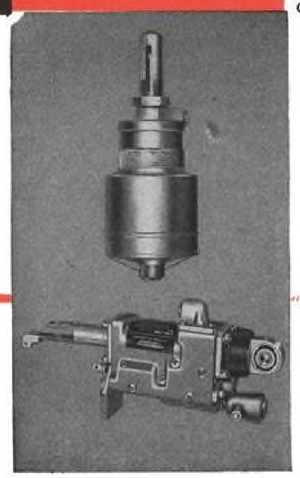


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*Source — Aviation Week Research Dept.

HERE IS THE STORY of the biggest advertising gain in AVIATION WEEK's history — a smashing 203-page increase for the first four months of 1955! With 1,310 advertising pages published through April, 1955 compared to 1,107 for the first four months of 1954, AVIATION WEEK is zooming to an unprecedented space high. As the chart indicates, AVIATION WEEK's gain exceeds the increase of all other magazines by a huge margin, even though 1955's new record was achieved in the face of the largest advertising volume of any magazine serving the aviation industry. AVIATION WEEK published 3520.16 pages of advertising in 1954.

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* Aviation WEEK's *tremendous readership among engineers and management men* has been proven through the years by 37 independently conducted reader-preference studies by major aviation companies, their advertising agencies, and by government research establishments . . . is further validated by Advertising Research Foundation's current study of AVIATION WEEK, Readex studies, and a continuing program of editorial research by the Research Department of the McGraw-Hill Publishing Company. AVIATION WEEK's top-level subscriber group now totals 49,368 (December, 1954 ABC audit) with the current weekly print order exceeding 56,000 copies and the current net paid figure (May, 1955), 52,850.

Contact your local representative for the facts about Aviation Week and the booming aviation market.

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1955 (First Four Months)



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the compression and expansion waves generated by the closed and open parts of the throat do not cancel each other, and there are some reflections back across the test section. The more slots there are, the relatively weaker each reflection is.

This leads to consideration of a porous throat. Suppose, reasoned the Cornell scientists, the throat were perforated with lots of tiny holes instead of the bigger slots. Then the expansion and compression waves would be weak, close together and could coalesce easily.

Small-scale tests were begun in 1950 with sintered bronze screens, and later repeated with commercial perforated metal mesh to approach a practical structure. These were started in 1950; by late 1952, the 3x4-ft. test section was in operation. These were the first perforated-wall tests in the country.

Cornell engineers say that the perforated wall works in other ways to increase the efficiency of the tunnel.

The test section is surrounded with a plenum chamber which can be evacuated with a suction pump. This is equivalent to increasing the area of the test section and controls the Mach number by controlling the amount of pumped air.

CAL tunnel time is about half devoted to the transonic throat work; the laboratory's customers include airframe manufacturers, the USAF and Army Chemical Corps.

When the 10-ft. transonic throat is available, it will operate over a Mach number range continuously variable from zero to 1.3. Model spans up to 5 ft. will be handled in the new section.

Boeing Tunnel

Development of Boeing's transonic test tunnel started right after company engineers got the word from NACA in 1948.

Today Boeing operates an 8x12-ft. tunnel with a slotted throat, and tests its airplanes and missiles from low speeds right through into the supersonic range in the same test section.

Recently modernized, the tunnel uses a downstream ejector—the "Boeing flaps"—to reduce power requirements for transonic operation.

Air which passes out of the slots at the throat enters a plenum chamber and must be returned efficiently to the tunnel stream again for minimized power requirements. Boeing engineers developed re-entry doors from ejector theory and located them just downstream of the test section. They are hinged at the aft end to vary the area available for re-entry, and can be swung into the airstream to choke the tunnel.

The doors were selected as an alternate scheme to filler blocks, placed downstream of the test section and fair-



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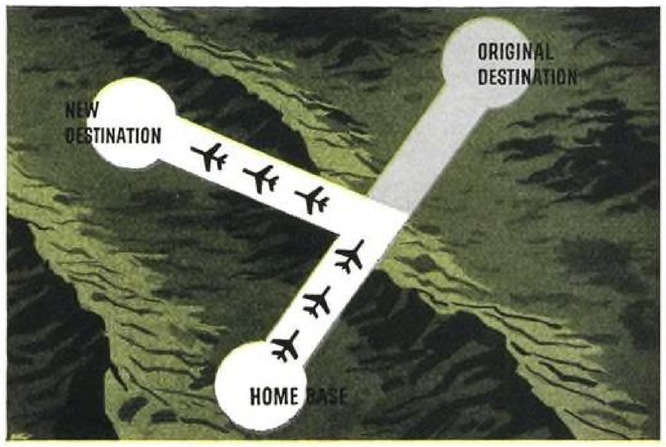
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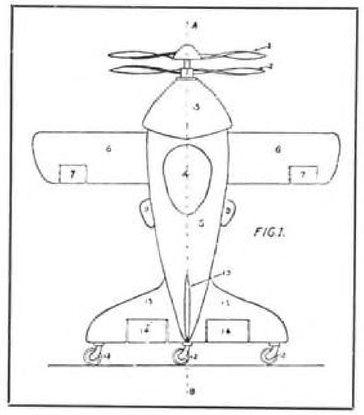
ing the actual air passage back into the tunnel from the plenum. The Boeing flaps proved to be the more efficient method of doing the job.

Boeing engineers credit their little development tunnel—a 1/20th-scale model of the big thing—with being a great help during the Boeing flap evolution. The original slotted test section development, plus the configuration tests on the re-entry doors were tested first in the small tunnel.

THRUST & DRAG

Indian Patent 27362 is held by a Mr. Mitra, the chief commercial engineer for Hindustan Aircraft Ltd. Mitra received the patent in 1940, which was rather early in the game to be thinking about VTOL aircraft.

But that's what he had been doing. Mitra's drawings show an open-cockpit, straight-wing airplane with coaxial props, cruciform tail surfaces and an adjustable pilot's seat. He proposed sliding weights to shift the center of gravity and thus change the trim for vertical and horizontal flight.



The patent says the primary object of the design is to enable vertical take-off without taxiing, and landing with little taxiing, depending on the relative wind strength. Another object, says the patent, is to enable an airplane to hover.

* * *

Vance Breese's Beech Bonanza cruises 12 mph. faster than anybody else's Bonanza, because AiResearch stuck some smoothness on the wing, according to last week's AW (p. 55).

The idea was that commercial production gives wing panels which are a little unsymmetrical, left and right, and are not true to the original wing contours so laboriously developed by appropriate French curves.

So AiResearch smoothed off the rivet heads and stuck on some surfacing material and smoothed out the wing. Now nobody but nobody is breezier than Breese.

Would anybody care to try the same thing on a jet aircraft to see if it helps cure wing drop at high subsonic speeds?

* * *

Conscious efforts are continually made to improve relations between military evaluation test pilots and the industry that produces airplanes.

In Britain, Air Commodore A. H. Wheeler, air officer commanding the Aeroplane and Armament Experimental Establishment at Boscombe Down, said recently that his pilots were being instructed to foster the spirit of goodwill and smooth running. As an example, he cited the rewording of one pilot's report which originally said: "This aeroplane stalls without any warning at all and is dangerous."

The report was changed to read: "A more definite stall warning would enable pilots to exploit fully the otherwise excellent slow-flying characteristics of this aircraft."

And in a couple of years, there's some poor RAF pilot waiting for the more definite stall warning that never comes. Meantime over at the local at Boscombe, company and AAEE pilots are downing bitters in a spirit of goodwill and smooth running.—DAA

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Frankly, vacuum-melted metals are so new that many applications for them have not yet been explored. But where they have been used, they've *proved* their effectiveness in improved performance. Superalloy jet engine turbine blades, for example, have given more than *twice* the performance life of blades made of conventional air-melted alloys. And ball bearing rejects dropped from 50% to 3% when vacuum melted steels were used.

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WEST GERMANS CELEBRATE return of sovereignty with flight of powered Moraa.

Bonn Flies First Powered Plane

Bonn—Four days after Germany had regained her sovereignty, the first German-made powered plane, named the Moraa, was in the air at Bonn-Hangelar Airport. It was not yet painted and the motor cowling was not completed, but German enthusiasts felt they could not wait a day longer after having been barred from flying for 10 years.

It was possible to "build" the plane in so short a time only because a previously constructed glider was used. The glider was converted into a propeller-driven aircraft simply by installing a 30-hp. Volkswagen engine.

The plane was financed and built by the Bonn firm Alfons Puetzer K. G., the Munich glider designer Raab, and a group of plane enthusiasts.

The aerodynamic design of the Doppel-Raab glider, with its long-proven qualities, was left unchanged, and only the structure was adapted to the new requirements. The plane is a two-seater. Wingspread is 43 ft., wing area is 194 sq. ft.; keeping the small engine in mind, the wing loading was kept unusually low. Cruising speed is 62 mph.; minimum flying speed is 31 mph.

Since the plane is also designed for training purposes, a second set of rudder pedals is installed. There is only one control stick, which can be operated by both occupants.

Alfons Puetzer, the manufacturer, says, "We have not yet figured the exact cost of this first model plane, but it is somewhere between 12,000 and 13,000 deutschmark ($2,850 and $3,100). If we get enough orders to start producing on a large scale, we think we can reduce the cost to 10,000 deutschmark.

"This, in addition to the extremely low operating cost of 5 deutschmark an hour, should be a strong incentive for the many plane enthusiasts in Germany and abroad for whom the other sports planes now offered by foreign companies are too expensive."

Armour Flame-Sprays Ceramic Coatings

A method of flame-spraying aluminum oxide and zirconium oxide ceramics on metal surfaces for high-temperature protection has been developed by Armour Research Foundation of Illinois Institute of Technology, Chicago.

The technique, which appears to be similar to one developed by Ryan Aeronautical Co. (AW Apr. 26, 1954, p. 38), permits the ceramic coating to be laid on by flame gun without unduly heating the metal base. The coating has great temperature and chemical stability. In many cases, the underlying metal can be melted without causing failure of the coating, according to Samuel W. Bradstreet, of the foundation's ceramics and mineral research department.

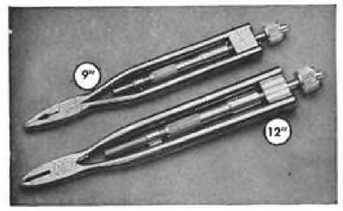
Bradstreet says the alumina coating is harder than tool steel and is unusually adherent in thicknesses up to 10 mils. He sees it as offering protection against temperature erosion in steel and aluminum rocket nozzles. Its hardness may help protect softer metals, such as aluminum, die-cast alloys and mild steels against erosion and abrasion in pump impellers, fan blades and turbines, and piping that is subject to cavitation.

Since it is poorely wetted by certain molten metals, it may be useful as a permanent mold coating for aluminum casting.

The zirconia may be even better, Bradstreet reports, because it is more refractory and chemically inert than alumina.

The flame-spray ceramic coatings have a residual porosity of about 10-15%, cutting down on the protection

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they offer against chemical corrosion. However, overcoating with ARF-developed "solution ceramics" is said to improve this property.

The foundation has licensed Continental Coatings Corp. of Illinois, 2333 S. Michigan Ave., Chicago, for use of ARF patents covering the technique.

The Ryan development utilized a metal-spray-welding gun converted for flame spraying. Success was reported in depositing a nickel-magnesia cermet on stainless steel and Inconel. Four valves controlled operation of the gun —one each for the cermet powder, oxygen, acetylene and the nitrogen which propelled the cermet. Temperatures of 5,500F were created at the gun.

Rotorcraft History, Handbook Set Issued

An 18-volume set of rotary-wing aircraft handbooks and history is being published and distributed by the U. S. Dept. of Commerce. It was compiled for the Air Force by the Prewitt Aircraft Co. and edited by Eugene K. Liberatore, now with Flettner Aircraft Corp.

The volumes are unclassified and will be available to the general public. Copies of Volumes 6, 7, 13 and 14 are now available at a price of $2.00 each. Orders should be sent to the U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C., with check or money order made payable to the Treasurer of the United States.

Abstracts are presented below:

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Volume 2. Helicopter development, 1900-1938, by Eugene K. Liberatore.

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Volume 4. Helicopter development, 1939-1950, foreign, by Eugene K. Liberatore.

Volume 5. Weights and balance, by Eugene K. Liberatore.

Volume 6. Aerodynamics and performance of helicopters, by Alexander Klemin and Igor A. Sikorsky.

Volume 7. Vibrations handbook for helicopters, by Robert A. Wagner.

Volume 8. Mechanical design and description, by Harris S. Campbell.

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Volume 10. Stability and control of rotary-wing aircraft, by William E. Cobey.

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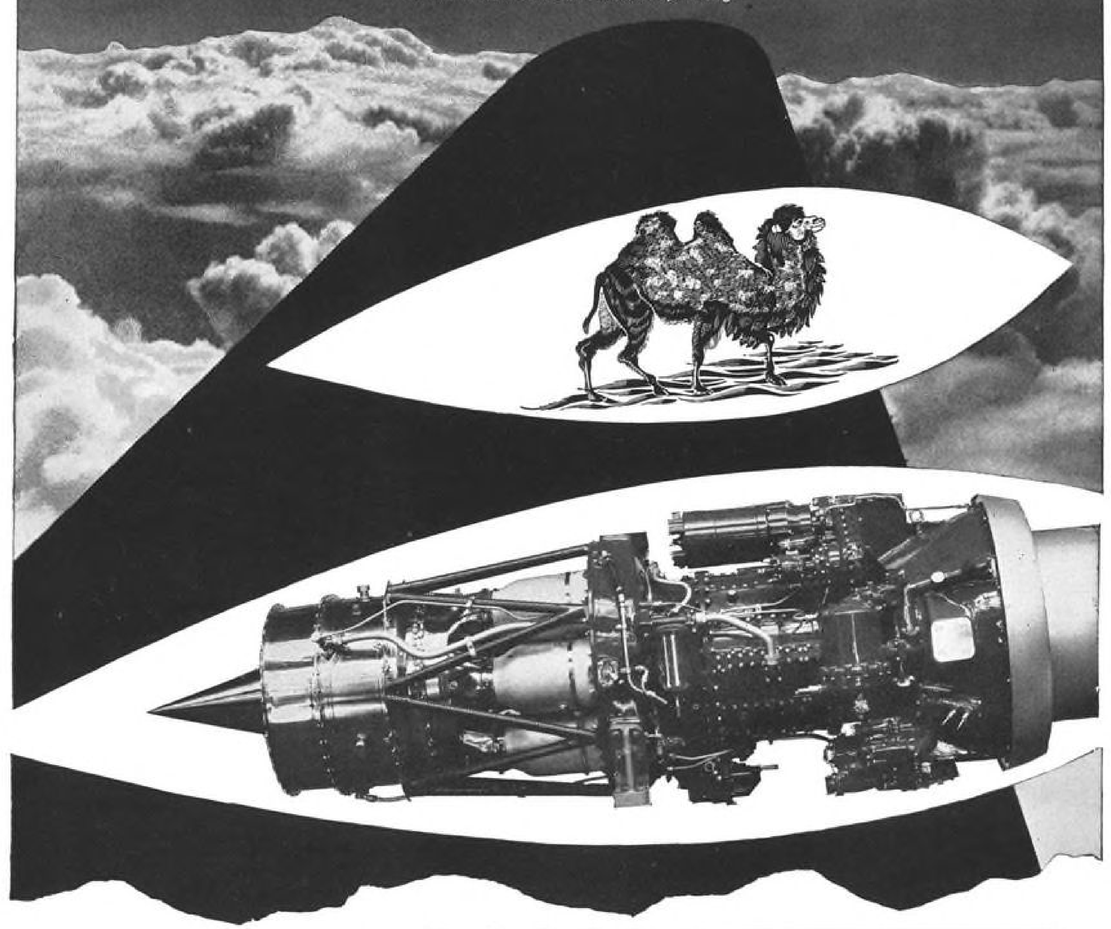
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by E. T. Hale, E. K. Liberatore and R. J. Trainor. Part I, abr. no's. 18,002 to 1,153,-073; Part II, abr. no's. 1,155,485 to 1,713,-421; Part III, abr. no's. 1,713,874 to 2,-111,975; Part IV, abr. no's. 2,111,988 to 2,491,260.

Volume 16. Foreign patent abridgements, by E. T. Hale, E. K. Liberatore and R. J. Trainor. Part I, abridgements from Australia and Britain (6-1895 to 404,-237); Part II, abridgements from Britain (410,532 to 601, 952), Denmark, France, Finland, Italy, the Netherlands, Norway, Sweden, Switzerland and Russia.

Volume 17. Subject and inventors index of rotary-wing aircraft patents of the world, by Eugene K. Liberatore.

Volume 18. Bibliography of rotary-wing aircraft, by Eugene K. Liberatore and Elizabeth S. Zimmerman.

Permanent Shortage of Engineers Seen Due to Technological Growth

By Henry Lefer

America must expect a permanent shortage of engineers and scientists. Not only is the number of new engineers less than the current demand, but the shortage is accumulating each year, creating an expanding backlog of demand.

These are the views of H. N. Muller, Jr., assistant to the vice president, engineering, Westinghouse Electric Corp.

However, the situation with regard to trained technicians such as mechanics is improving somewhat, according to figures compiled by D. C. Metz, director of the University of Dayton's Technical Institute, and chairman of manpower studies, Technical Institute Division of the American Society for Engineering Education.

Enrollment of students in programs for training as engineering technicians rose last year to 56,000, a 12% increase from the previous year's figure of 50,000.

The most encouraging feature of this increase, says Metz, is the 35% jump in full-time enrollments—to 30,000 from 23,000—while part-time enrollments showed a slight drop.

Metz's figures are based on a survey of the approximately 200 schools in the United States believed to be offering programs of about two years in length for training engineering technicians. Replies were received from 143 schools. Of these, 27 offer programs accredited by the Engineers' Council for Professional Development; the rest do not.

The wider use of qualified technicians can increase the effectiveness of the nation's engineers by freeing them from many time-consuming tasks, industry observers point out.

Furthermore, the assignment of engineers to duties they consider below their professional capabilities is a widespread source of discontent.

Muller pins his pessimistic forecast on the nation's growing reliance on technology, typified by an expected doubling in electric power generating capacity and use in the next ten years, and continuing in the future. The supply of trained manpower to service this expanded technology just will not be available, Muller says.

He quotes these figures to support his view:

"Practically all people who are able to complete any kind of truly professional education are in the top 16% of the population in ability. In 1955, this percentage amounts to just 170,-000 men. Again, records show that only about half of this top intelligence group finishes college, or 85,000.

"Since just one-third of American professional people are engineers and scientists, our share of the select group figures to be less than 29,000 per year. This number is significantly less than current demand, so a very real shortage is accumulating each year."

Although today's rising birthrate means an increase, in due time, in the total number of engineering graduates, Muller says this will not be sufficient, because of a corresponding increase in our total manpower requirements. He suggests a multi-prong attack on the problem:

• **Increase motivation**, effectiveness and rate of professional development of the individual. Westinghouse's approach is through an educational foundation providing scholarships, fellowships and professorships. The foundation has also started a five-year plan providing monetary contributions to colleges and universities.

• **Give engineers opportunity** to do work challenging their knowledge and capabilities. See that responsibility increases as fast as professional growth. "The engineer should be able to keep his head above water, but not without some struggle. . . . Hiring engineers to do technicians' work is the most expensive way to do the job. . . . This work can be done cheaper and with more honest satisfaction by sub-professional personnel."

• **Show the young engineer** where his growth can lead him. Westinghouse follows a management development program that applies to some 7,000 persons in supervisory positions. Each man's performance is evaluated periodically, and the evaluation discussed with



Spar sets sail for Europe

Bendix-International recently took delivery of its first SPAR, the low-cost portable GCA radar. The equipment went directly from Laboratory for Electronics' test field at Norwood, Mass., above, to foreign markets for demonstration before fourteen interested European governments.

The United States Air Force has already taken delivery of its order of SPAR units and recently completed tests of the equipment under arctic conditions at Ladd Field, Alaska.

This should be ample proof that SPAR, the original portable GCA and the only lightweight approach radar designed to satisfy the rigid requirements of the U. S. Air Force, is also the only tested, safe and foolproof equipment of its kind on the market.

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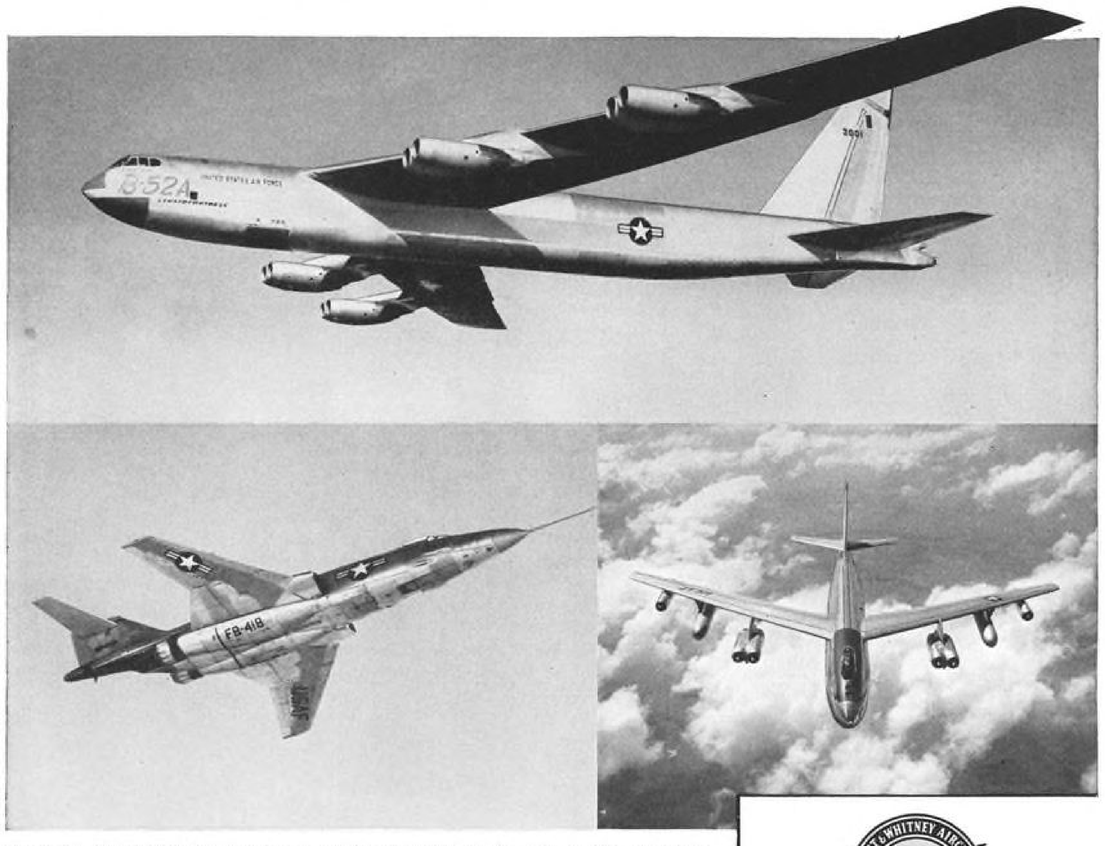
NEW TANKERS GIVE JET

Boeing and Lockheed Receive Awards in Air Force Tanker Competition

Intercontinental range for high-speed jet bombers and fighters will be assured by new jet-powered tanker-transports, the result of a major industry-wide competition.

These tanker-transports are Boeing Airplane Company's KC-135, which has been ordered into production, and a new Lockheed Aircraft Corporation tanker on which design and development engineering has been authorized. The Boeing tanker-transport was designed around four Pratt & Whitney Aircraft J-57 turbojet engines.

With efficient, high-thrust engines, these modern tanker-transports will be able to deliver tremendous fuel loads to big jet bombers and fighters flying at combat speeds and altitudes. They will be practical—and essential—additions to America's air strength, giving global "reach" to her combat aircraft wherever they must fly.

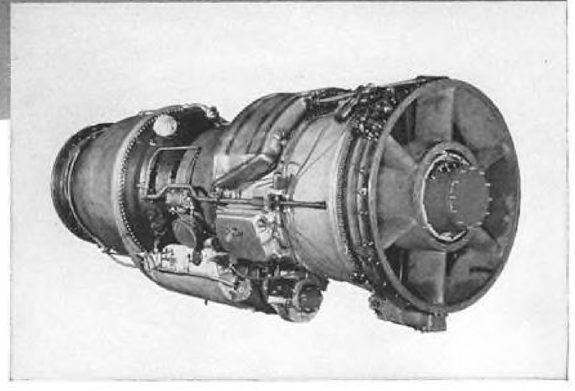


GLOBAL "REACH" for jet bombers like Boeing B-52s and B-47s, and for long-range escort fighters such as McDonnell's F-101, will be assured by a new generation of tanker-transports. The first will be Boeing's KC-135, winner of a major industry competition. It will be powered by Pratt & Whitney Aircraft turbojet engines.

ONE OF THE DIVISIONS OF
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BOMBERS GLOBAL "REACH"





NEW JET TANKERS ordered into production are Boeing KC-135s. They will be similar in appearance to this sleek and modern tanker-transport prototype, the Boeing 707. Four advanced Pratt & Whitney Aircraft J-57s, shown at right, will power them. Refueling tanks can be removed quickly when the aircraft are needed for other cargo missions. Production and operation of the new aircraft will be of major significance throughout American aviation.

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Many engineers complain that the shortage of trained manpower is more apparent than real; that efficient use of engineers in the jobs they are fitted for could wipe out this "shortage."

Industry observers point out, however, that use of manpower is not a problem that can be set up on a slide-rule, with everybody accepting the resulting solution as the answer. There is bound to be a measure of inefficiency in its use.

Within the context of this inefficiency, they see suggestions such as those made by Muller as leading to an improvement of the situation.

Alcoa Develops Alloys To Take High Heats

A new aluminum alloy with "excellent properties" in the 500-600F temperature range has been developed by Aluminum Company of America.

The company also reports that it is developing another aluminum alloy, for the 300-400F range, for structural use on supersonic aircraft. Skin friction encountered at speeds of over 1,000 mph. generates intense heats that compromise strengths of existing aluminum alloys, Alcoa point out. This has become an increasingly serious problem in aircraft design.

Alcoa's 500-600F alloy, designated X2219, is now available in experimental quantities in the -T6 condition produced by a solution heat treatment and water quench followed by an artificial aging treatment. The company suggests its use for jet and piston engine structural applications and airframe parts that are located close to the engines.

Some of the mechanical properties of X2219-T6 (properties of Alcoa 2218-T61, a standard forging alloy, are in parenthesis):

• **Tensile strength**—1,000 hr. at 500F, 29,000 psi. (13,000); at 600F, 18,000 psi. (6,000).

• **Yield strength**—500F, 21,000 psi. (9,000 psi.); at 600F, 14,000 psi. (3,500).

• **Elongation**—500F, 24% (50%); at 600F, 26% (75%).

Alcoa also quotes these guaranteed minimum figures for X2219-T6's room temperature properties: Tensile strength, 55,000 psi.; yield strength, 35,000 psi.; elongation in 4D, 6%.

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Automatic Electrolytic Shaping with Electronic Control gives cost savings of standard grinders fitted with automatic equipment, Anocut Engineering Co., 531 W. Washington Blvd., Chicago 6, Ill. . . . **Damping Devices—Past, Present, Future,** includes load-velocity charts for measuring performance, Gabriel Co., Dept. 1G, 1148 Euclid Ave., Cleveland 15, Ohio.

Dip tank and flow-coat finishing bulletins, giving advantages of each method, du Pont Finishes Division, E. I. du Pont de Nemours & Co., Rm. 7145-D, Wilmington 98, Del. . . . **Vibration, shock and noise control products,** including selector chart covering wide range of equipment, Korfund Co., Inc., Long Island City, N. Y. . . . **Precision and non-ferrous permanent mold castings,** including analysis of various casting processes, B-Mold Division, Buckeye Brass & Manufacturing Co., 671 N. Main St., Mansfield, Ohio.

Mil-Ac mobile air conditioners, designed for military trailers, also applicable in fixed installations, Ellis & Watts Products, Inc., P.O. Box 33, Cincinnati 36, Ohio. . . . **Valve Technical Data** covers stainless steel items, Public Relations Division, Cooper Alloy Corp., Hillside, N. J. . . . **Ceramicast (R),** a molding process using ceramic, stated to give surface variations of 125 microinches maximum and 0.003-0.005-in. tolerances, John H. Boyd, general sales manager, Lebanon Steel Foundry, 63 Lehman St., Lebanon, Pa.

High-velocity spray technique for cleaning precision parts such as low-torque instrument bearings, Cobehn, Inc., Passaic Ave., Caldwell, N. J. . . . **Over 1,000 sizes of drawn metal boxes** for use as cases and housings for prototype electronic and similar equipment, 1955 catalog, Zero Manufacturing Co., P.O. Box 509E, Burbank, Calif. . . . **Stainless fasteners Brochure P5A,** All-metal Screw Products Co., Inc., 821 Stewart Ave., Garden City, L. I.

Facilities for custom-made precision screw machine products, brochure, Beamco, Inc., General Offices, Irving Park & Church Roads, Bensenville, Ill. . . . **Kellerflex carbide hole finishing burs** for diameters of 0.3 in. and up, Pratt & Whitney Division, Niles-Bement-Pond Co., W. Hartford 1, Conn. . . . **Thermocouple assemblies and packing glands,** Catalog 1542, Conax Corp., 7811 Sheridan Drive, Buffalo 21, N. Y.

Price list for **SR-4 strain gages, instruments, accessories and cements,** Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. . . . **Industrial electrical standard and special plugs and receptacles,** Bulletin B59, Joy Manufacturing Co., 4235 Clayton Ave., St. Louis 10, Mo. . . . Norelco MG 60 bulletin gives design details and application on **lightweight X-ray units for laboratory and industrial use. Sperry Gyroscope Employs X-Ray for Development Prob-**



Hi-Per DC-3 Overcomes Altitude Factor

Here is a Pan American-Grace Airways Hi-Per DC-3 (Aviation Week Nov. 1, 1954, p. 70), at La Paz, Bolivia, billed as the world's highest commercial airport (altitude: 13,404 ft.). This modernized version of the DC-3 can cruise approximately 34 mph. faster than a standard version because DC-4 P&W R2000 powerplants replace its P&W R1830s. This modification and others also give the plane better takeoff, climb, high-altitude and single-engine performance. Advantages are particularly desirable when operating from fields located at high altitudes, such as that at La Paz.



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lems is case history. Both bulletins available from Research & Control Instruments Division, North American Philips Co., Inc., 750 S. Fulton Ave., Mt. Vernon, N. Y.

Running nuts, bolts, cap screws and other types of fasteners, case histories of uses, Form 5200-A, Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Opportunities Through Automation, particularly for small plants, Ex-Cell-O Corp., Detroit 32, Mich. . . . 16-mm. sound movie covers **complete line of sheet and plate working machines,** E. G. Kihlstrom, American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, Ill. . . . **Accumet Precision Castings,** booklet describing techniques developed for lost-wax method, Advertising Dept., Crucible Steel Co. of America, P.O. Box 88, Pittsburgh 30, Pa.

Sili-Kool Silicone paint stated capable of taking 1,600F heat and weather extremes is described in folder, C. H. Dragert Co., Inc., 2518 Chalk Hill Rd., P. O. Box 5092-L, Dallas, Tex. . . . **Scientific research and development facilities** of firm are described in brochure, Truesdail Laboratories, Inc., 4101-4107 No. Figueroa St., Los Angeles 65, Calif.

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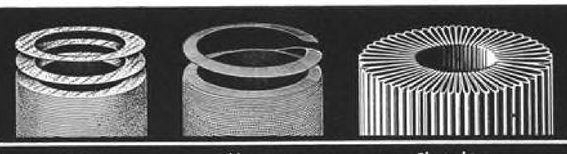


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Publications Received

• **The Army Air Forces in World War II: Men and Planes.** Volume VI—Edited by W. F. Craven and J. L. Cate—Pub. by University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill. $8.50; 807 pp. Concerned with activities of the Army Air arm in the Zone of the Interior, this volume provides a record of development of an effective air organization, forging and distribution of weapons, and recruitment and training.

• **Flight Handbook, Fifth Edition**—Edited by Maurice A. Smith—Pub. by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $6.00; 282 pp. New edition, rewritten and enlarged, presents basic information on airplanes, engines, and associated aviation subjects.

• **Wave Diagrams for Nonsteady Flow in Ducts**—by George Rudinger—Pub. by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. $6.00; 278 pp. Contains computing procedures covering problems of nonsteady flow encountered today, with illustrated examples and worked-out wave diagrams.

• **The Chemical Industry Facts Book,** Second Edition—Pub. by Manufacturing Chemists' Assn., Inc., Cafritz Building, 1625 Eye Street, N. W., Washington 6, D. C. $1.00 single copy. Discounts available on bulk quantities; 160 pp. Basic reference source on the chemical industry and its activities.

• **U. S. Marine Corps Operations in Korea: The Pusan Perimeter**—by Lynn Montross and Capt. Nicholas A. Canzona, USMC—Pub. by U. S. Marine Corps, for sale by U. S. Government Printing Office, Washington 25, D. C. $2.00; 271 pp. First of four volumes on Marine participation in the Korean conflict.

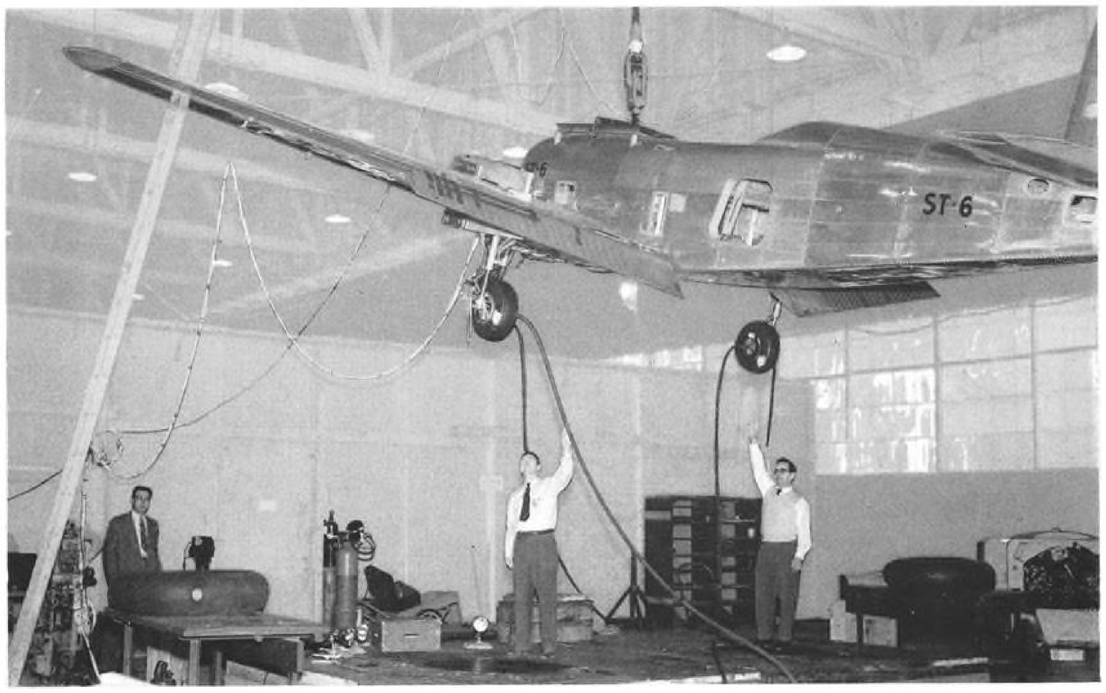
• **America's Needs & Resources: A New Survey**—by J. Frederic Dewhurst and Associates—Pub. by Twentieth Century Fund, Inc., 330 West 42nd St., New York 36, N. Y. $10.00; 1,148 pp. Reference source on past achievements, present status and future possibilities of the American economic system. It is revised version of the original work published in 1947.

• **Gas Turbine Series, Vol. 1**—Cycles and Performance Estimation—by James Hodge—Pub. by Academic Press, Inc., 125 East 23rd St., New York 10, N. Y. $9.00; 329 pp. Series is designed to present a concise, balanced account of current theory and practice concerning the gas turbine.

• **Gas Turbines for Aircraft**—by Ivan H. Driggs and Otis E. Lancaster—pub. by Ronald Press Co., 15 East 26th St., New York 10, N. Y. $10.00; 349 pp. Reference volume for those concerned with design and performance of gas turbine powerplants.

• **1954 Supplement to the Metal Cleaning Bibliographical Abstracts**—Prepared by Jay C. Harris—pub. by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $1.50; 40 pp. There are 227 new references in this booklet which brings up-to-date coverage of the published data on metal cleaning.

• **Plastics Tooling**—by Malcolm W. Riley—Pub. by Reinhold Book Div., Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $2.50; 123 pp. Report on the resins and methods used and the major applications of plastics tooling.



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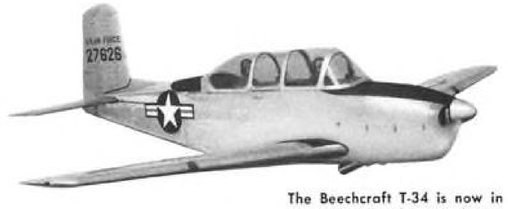
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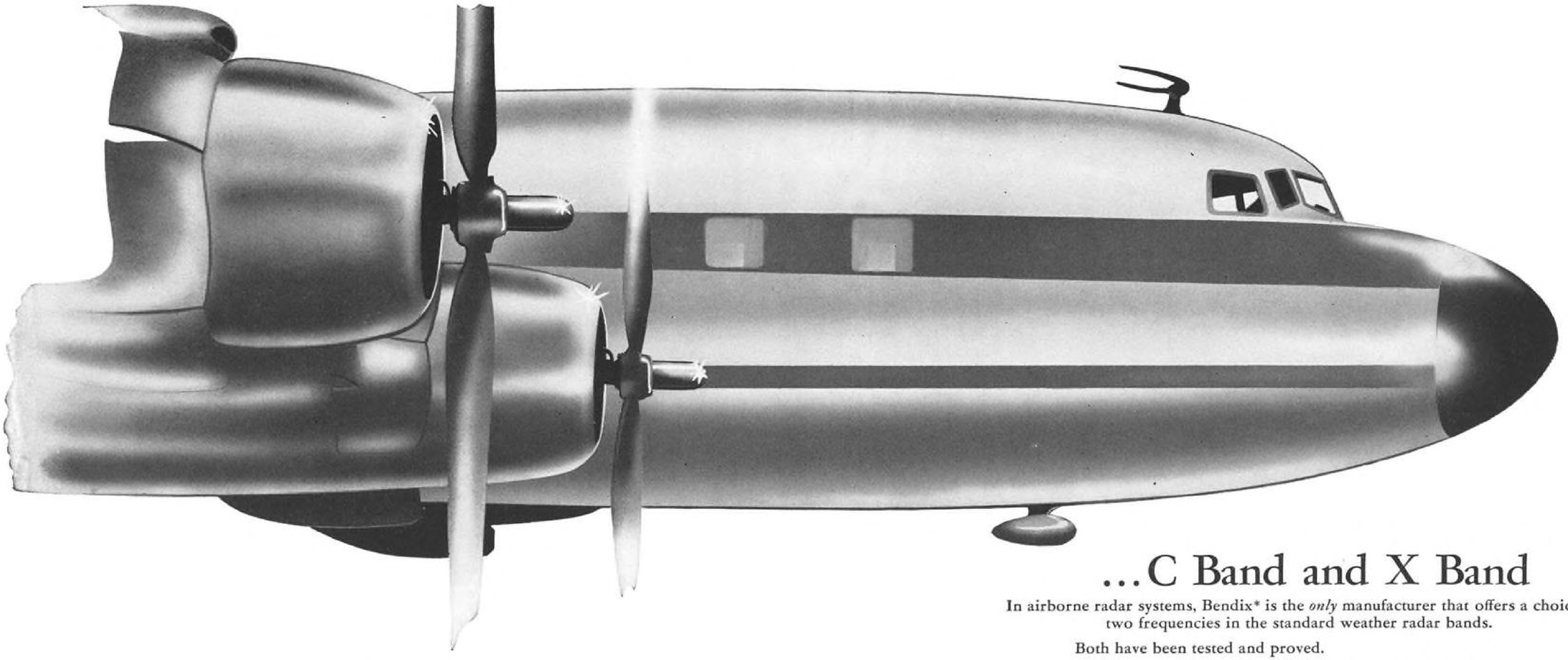


The Beechcraft T-34 is now in production for the U. S. Navy, U. S. Air Force, and the military services of Canada, Chile, Colombia, El Salvador, Japan.

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McDONNELL *Aircraft Corporation*

Casting Gives Way To Sheet Metal In Some Aircraft Applications

By George L. Christian

Deer Park, N. Y.—A program to save weight of aircraft components by substituting sheet metal parts for castings wherever possible is being inaugurated by Skyline Products, Inc., here. Program dovetails with USAF's overall weight reduction effort.

Skyline technicians are specialists in manufacturing precision sheet metal aviation equipment, with emphasis in seam-welding techniques. They call themselves "tin knockers."

First Skyline venture in the area is substituting "tin" for a casting in a volute for an unspecified plane's air conditioning system. William Jung, company president, told AVIATION WEEK that by making the assembly out of Type 347 stainless steel (upper and lower halves welded together) instead of casting it out of aluminum saves 1.1 lb., cutting weight from 3.8 lb. to 2.7 lb.

Two corollary benefits result from using stainless steel:

- **Rejection rate** is appreciably reduced. Reason, Skyline says, is that the situation cannot arise where a machining operation—such as must be performed on a casting—reveals a metal flaw, or the machining job itself is incorrectly done, resulting in scrapping the whole part.
- **Heat resistance** of stainless steel is much higher than that of aluminum.

Price of stainless steel vs. casting is directly comparable, according to company officials.

Growing Trend

According to Jung, substitution of sheet for castings as a growing trend which will soon spread to other aircraft components where such changeover is feasible.

Another trend at Skyline towards producing lighter, more serviceable aircraft equipment is the use of a thin aluminum sheet-and-foaming plastic sandwich material to form light, yet rigid, aircraft components.

Jung cites these two examples where such construction proved to be superior to previously used methods.

Fairchild Camera uses an 8x15-in. rectangular platen made of solid ½-in.-thick magnesium slab. Skyline turned out an identical platen made of two 1/32-in. sheets of aluminum, sandwiching a piece of Lockfoam to give the assembly the same ½-in. total thickness. Result: a platen of equal rigidity, but much lighter.

American Airlines was having trouble with roll warmers used on its DC-6-type airliners. Original warmers were made up of inner and outer box-like case with loose Fiberglas insulation between. When the warmers were washed, water often seeped into the Fiberglas, making the units heavy and causing them to emit a disagreeable odor when heated.

Skyline is making the warmers with inner and outer aluminum sheet structures. These are jigged the correct distance apart and the intervening space filled with Lockfoam. Result is a very rigid structure with a filler which is impervious to water, provides excellent insulating properties and is not harmed by the temperatures at which the warmer operates.

Lifetime heating elements are sealed in the walls. Two thermostats keep the unit at the desired temperature and are easily removable.

Jung says he will adopt this sandwich technique to the manufacture of other commissary items, such as hot and cold liquid containers.

One of the Skyline firm's specialty is seam-welding Monel. This technique is particularly applicable and economical when used to fabricate tanks of all kinds—water tanks for aircraft, and fuel tanks for boats in the Chris Craft to private yacht size range. The combination of seam welding and Monel is ideal, Jung says. Seam welding gets the job done at the lowest possible cost, while using Monel results provides a structure which is virtually uncorrodable. Jung says he has developed seam welding techniques of his own which permit him to weld unusually large or long structures with ease, resulting in unusually low costs.

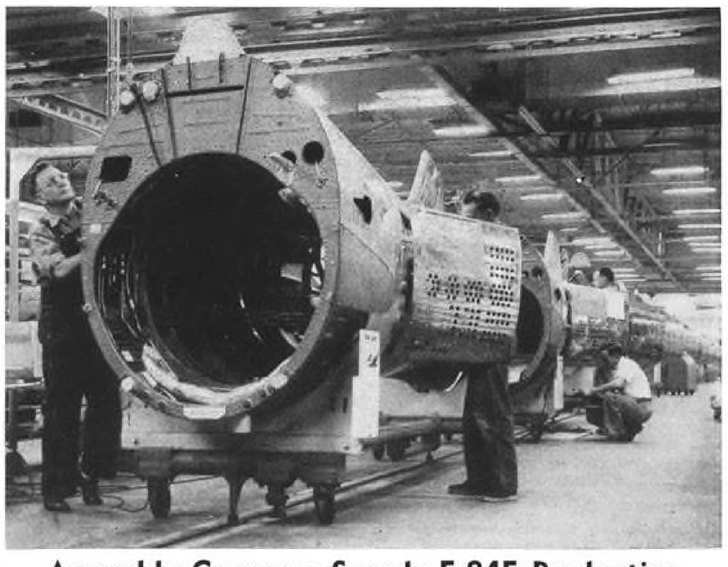
Jung is also experimenting with a stainless steel fuel tank for the Piper Cub, to replace the standard steel tank currently used.

Improvization

Small plants that are lacking in large financial resources often have to fall back on ingenious ways of getting things done to avoid large investments in costly machinery.

Here is an example of how Skyline improvised a good-size drop hammer at a fraction of the cost of buying such a machine:

Jung won a contract to manufacture rocket carriers for Republic Aviation's



Assembly Conveyor Speeds F-84F Production

Aft fuselage sections for USAF's Republic F-84F Thunderstreak, produced by Temco Aircraft Corp. under subcontract, move down the assembly line at a top speed of eight feet an hour on the Dallas company's drag chain conveyor. Temco expects its two 500-feet conveyors to simplify and speed production of the fighter-bomber units. Each oval-shaped assembly track is moved by a three-quarter horsepower electric motor; the gear ratio on one of Temco's production conveyors is 70,000-to-one and 50,000-to-one on the second belt.

Unusual Positions With Established Flight Research Organization

ENGINEERING TEST PILOT

Graduate Engineer with sufficient flying experience to participate in development & flight test of new ideas in the field of automatic controls, flight instruments & instrumentation. Bachelors degree in Engineering required: MS or PhD preferred. Minimum of 2,500 hours first pilot time; comml multi-engine land, single engine land and instrument rating essential. ATR, rotary wing & jet exp desirable.

FLIGHT TEST ENGINEER

For experimental flight research organization, engaged in the development, installation & flight testing of aircraft instrumentation and flight control equipment. Must be familiar with all operational phases of electrical and mechanical aircraft control systems. Engineering degree or equivalent technl exp required.

Aircraft Structures ENGINEER

Requires minimum 5 years aircraft structural design and stress analysis experience, including prime responsibility for the structural integrity of major air frame components.

SUBMIT RESUME
Att: Robert Stewart
or
PHONE FOR APPOINTMENT
Ronkonkoma 9-8086

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GYROSCOPE COMPANY
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F-84F. The job required a drop hammer capable of handling a 5x8-ft., 21-ton male die. Jung did not have a drop hammer, but he thought he could subcontract the job locally. Investigation showed that he could not. So he bought two garage-type auto hydraulic lifts and set them in eight feet of concrete in his new plant here.

Hydraulic action was too slow for drop hammer operation so the twin lifts were converted to pneumatic action.

The male die was attached to an arch joining the two pistons. The female die was placed on an aligning platform under the male die and secured in place. The rapid-action, 4-ft. drop provided by the pneumatic conversion worked out fine.

To squeeze every bit of utility out of his machine, Jung and his technicians fastened attach angles to the concrete bed so that, with hydraulic operation, it became a stretch press.

Skyline's do-it-yourself technicians also built a titanium welding chamber out of two, 30-in.-dia. commissary mixing bowls. Unit incorporates two rubber gloves to allow welder to work within the chamber, a work window and an observation window. Chamber is mounted on a ring which permits it to be positioned in any way the operator desires. It is charged with argon because of titanium's tendency to oxidize during welding.

Among other aviation activities at Skyline are: manufacture of entire galleys for American Airlines, Pan American World Airways and Arabian-American Oil Co's DC-6-type aircraft; and repair and recovering surface controls for the Air Force and Colonial Airlines.

Jung is also starting on water and ADI fluid carts for PAA and AA. The carts will be fitted with Piper Cub brakes and standard 6.00x9 wheels, large enough to cope with snow and deep ruts.

In the sheet metal line, the company is manufacturing many parts for a Stratos water separator and a venturi section for a Stratos pressure regulator.

Jung has almost completed setting up an electronics laboratory, where he intends to develop and manufacture electronic subassemblies.

In a very preliminary mock-up stage is a small convertiplane which will operate on the pulsejet principle.

In the marine field, Jung is putting out a wide line of Monel hardware, such as running lights and cleats, plus the Monel boat fuel tanks.

The Skyline Products organization was born with the dissolution of Ameri-

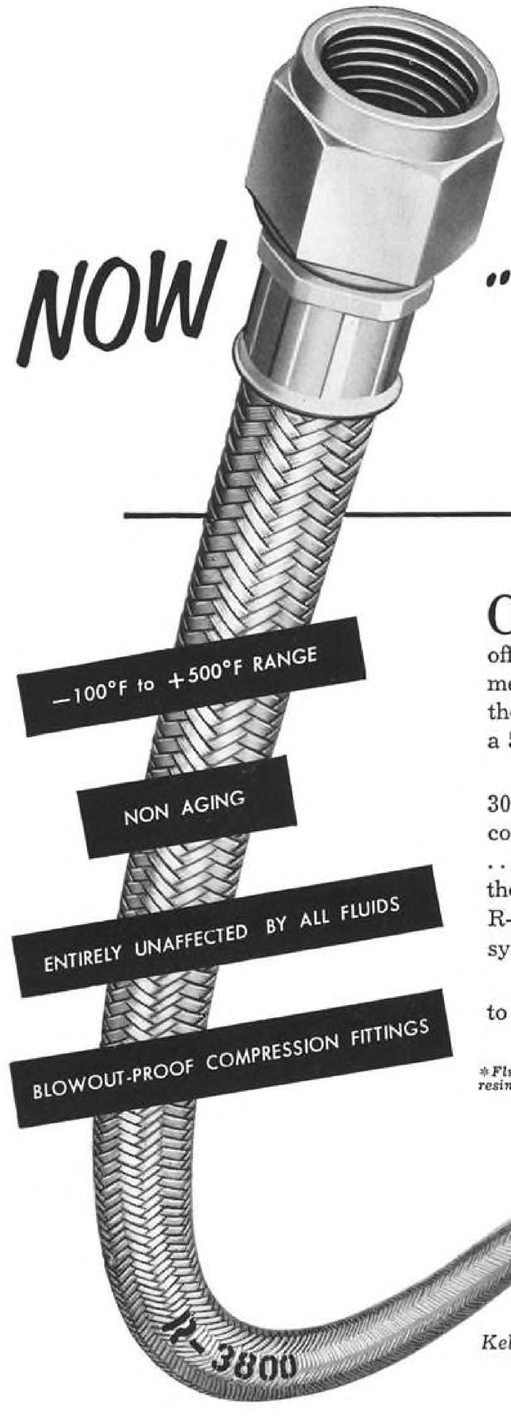


More Bad News for Subs

Four Lockheed P2V-7 anti-sub Neptunes are shown nearing completion at Burbank, Calif. New straight-line production system is said to save four man-hours of moving time per plane, compared with previous crab-wise aircraft alignment. To the right of the 400-ft. final line (and not shown in the picture) is final assembly line for Neptune's anti-sub teammate, the radar-equipped Super Connie. Centralized floor stockroom for spare parts (bottom, right) also helps save production man-hours. Building measures 800x300 ft.

NOW ...rated at 500°F!

Another advance in lightweight flexible hose assemblies



Constant hose development work at Resistoflex has paid off again. Service experience has permitted an improvement in temperature rating of Fluoroflex*-T R-500 hose... the first aircraft hose to use Teflon*... the first to warrant a 500°F rating at 1000 psi (750 psi in the larger sizes).

Made with Fluoroflex-T (Teflon-compound) tube, SAE 304 stainless steel reinforcing braid and blowout-proof compression fittings, the lines offer *permanent* plumbing ... no swelling, no erosion, no aging. Their flexibility stays the same throughout the temperature range. Fluoroflex-T R-3800 hose assemblies are A-N approved for use with synthetic oils, fuels, and fuming nitric acid.

Bulletin FH-2 gives detailed data... send for your copy to RESISTOFLEX Corporation, Belleville 9, N. J.

*Fluoroflex is a Resistoflex registered trade mark for products from fluorocarbon resins. Teflon is the DuPont registered trade mark for its tetrafluoroethylene resin.

P.S. *Resistoflex also manufactures other specialized products for the aeronautical industry made from Teflon, Kel-F and Fluorothene... such as rod, sheet, tube, parts, electrical sleeving, spiral back-up rings.*

RESISTOFLEX CORPORATION
Belleville 9, N. J.
West Coast Plant: Burbank, Calif.

can Export Airlines. Jung and three other ex-employes moved into an 8x15-ft. store in Jamaica near La Guardia, and financed the new venture with $500 each. That was seven years ago.

Today, at Deer Park, a new 15,000-sq. ft. addition to a two-year-old, 18,000-sq. ft. plant is nearing completion.

Employment is just under 100, all ex-airline people. Yearly sales last year topped $1 million, according to Jung, but this year should reach approximately $1½ million.

PRODUCTION BRIEFING

► **Raytheon Manufacturing Co.,** Waltham, Mass., has purchased a 210,000-sq. ft. plant in Tewksbury and South Lowell, which it had been leasing since 1952. The electronic manufacturing facility employs approximately 700.

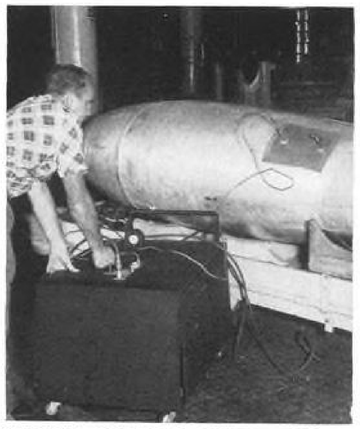
► **Continental Aviation & Engineering Corp.** expects to have some 600 employes working on J69 turbojets, built under license from Turbomeca, by year's end in USAF-owned facility at Toledo.

► **Aeroquip Corp.,** Jackson, Mich., has purchased a recently completed 30,000-sq. ft. plant in Toronto, for its new Canadian subsidiary.

► **Cessna Aircraft Co.,** Wichita, has received a $5-million contract for F-84F horizontal stabilizers from Republic Aviation Corp.

► **W. C. Twiggs Industries, Inc.,** Brazil, Ind., maker of jet engine components, is adding approximately 23,000 sq. ft. to production facilities.

► **Photo process puts nameplates** on valves, thrust chambers and other parts made by Aerojet-General Corp., Azusa, Calif., eliminates need to rivet plates on parts.



VACUUM CORRECTS DENTS quickly to original smooth contours, using portable equipment devised at Glenn L. Martin Co., Baltimore, Md. Here a wingtip fuel tank undergoes straightening. A plate, formed to the tank's contour, is placed over the dent and sealed with a sponge rubber gasket. Vacuum is applied by two-stage pump. Company says that even deformed internal stringers or stiffeners are corrected by this method.

► **Assembly Products, Inc.,** Chesterland, Ohio, maker of meter relays, plans to have a new subsidiary, Assembly Products of California, producing near Desert Hot Springs this summer.

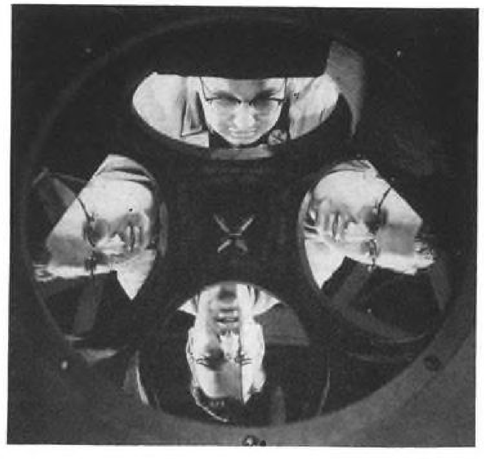
► **Acme Industrial Co.,** Chicago, Ill., maker of tool room standards and machine shop aids, has remodeled a 38,000-sq.-ft. acquisition to provide increased working area.

► **Safety Tool Division,** Ampco Metal, Inc., Milwaukee, Wis., has appointed Aviation Supply Co. as distributors for its spark-resisting hand tools for Kansas City, Missouri and Ogden, Utah. Company has named Amco Corp. as representatives in Linden, N. J., for these items. General Distributing Co., Great Falls, Mont., is its agent for the Ampco-Weld line.

► **Sundstrand Machine Tool Co.,** Rockford, Ill., started construction of a $5-million plant near Denver, Colo., to make jet aircraft constant-speed drive mechanisms. Plant is expected to begin operation in November.

► **Garrett Corporation** of Los Angeles is erecting new $1.3-million administrative and engineering office building at its AiResearch Manufacturing Division plant adjacent to Los Angeles International Airport.

► **Avien, Inc.,** Woodside, N. Y., maker of plane instrument and control systems, is adding 11,000 sq. ft. to its engineering and administration facilities.



Northrop Does It With Mirrors

Four mirrors, precisely ground and aligned, are the optical heart of a new radar plotting board being built for USAF by Northrop Aircraft's Anaheim, Calif. division. The company's interest in optics goes back to the start of its Snark guided missile program, because of the advanced optical techniques used in proposed navigational systems. Northrop has a complete optical processing center for producing extremely precise glass components.

USAF Contracts

Following is a list of recent USAF contracts announced by AMC.

Advance Machine & Mfg. Co., Hinton, W. Va., photographic processing sink, 185 ea., $76,452.

Aero Instrument Co., Cleveland 2, pilot tubes, Aerno 60-9650, 5,061 ea., $44,283.

Aircooled Motors, Inc., Syracuse, N. Y., enignes, 72 ea.; special tools, 49 ea., $387,491.

AiResearch Mfg. Co., Los Angeles, actuators, gear boxes, shaft assys., screwjacks, power units, 458 ea., $733,699.

Airpath Instrument Co., St. Louis, compass, pilot's standby, magnetic, 2,462 ea., $45,128.

Ampro Corp., Chicago 18, kit, tool and gauge for motion picture projection equipment, 89 ea., $41,576.

Lycoming Div., Avco Mfg. Corp., Stratford, Conn., R1300-4 engine, 14 ea., 4 ea., $708,040.

Bendix Radio Div., Bendix Aviation Corp., Baltimore 4, dynamotors, mountings, $246,332.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., generators, 317 ea., $60,470.

Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y., relays, transformers, dynamotors, $93,326.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., wheel assys. for KC-135 aircraft, 543 ea.; brake assys., 786 ea., $954,543.

Boeing Airplane Co., Seattle, one mobile training unit, MD-5 fire control system, $161,358.

Charles Beseler Co., Newark, N. J., projector AP-5, opaque object, 430 ea., $98,900.

Chicago Aerial Survey Co., Melrose Park, Ill, inclusion of approved spare parts list, $94,834.

Cline Electric Mfg. Co., Chicago, regulators, voltage, magnetic, 800 ea., spares, 300 ea., $462,466.

Continental Aviation and Engineering Corp., Detroit, starter generators, 41 ea.; J69-T19 engines, 41 ea., $812,834.

Compco Corp., Chicago, simulator, radar signal, 195 ea., $124,523.

Fairchild Camera and Instrument Corp., Long Island, spare parts for aircraft cameras, $47,488.

Flexonics Corp., Maywood, Ill., facilities for the functional testing of ducts and flex sections for high-performance aircraft, $41,000.



Shown here is a giant step toward tomorrow.

Conceived and developed by a team of Martin people who have been working with Navy scientists since 1946, Viking 12 is the latest of a series of high-altitude research vehicles.

It was designed to explore the problems of controlled flight in the near-vacuum conditions of the outer atmosphere and at speeds in excess of 4,000 m.p.h.

In this long-range Viking program, technical problems are continuously being solved which support advancements that are now being made toward the next frontier of flight—rockets having intercontinental ranges.

And beyond that lies space itself!

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LETTERS

Engineers on Shortage

The letter from W. H. Moesel and his criticisms to the "Engineer Shortage" (AW Mar. 7, p. 37) are appreciated. It was about time somebody interrupted the chain of articles claiming shortages of engineering manpower all over the technical magazines of the nation.

Every author of these clamorous articles points out some plausible reasons to protect each industry's claims; this is not because they are telling the truth, but only to conceal their engineering troubles.

Problem Is Selection

The truth is that in America there is not a shortage of engineers, rather it could be said that there are enough to supply all industries, if selected and employed intelligently.

A lot of graduate engineers of American colleges cannot find jobs at all and the others, if they find work, find it out of their specializations.

So, the industries to cover themselves, state that these engineers have not had enough experience. This means that there is not a shortage of manpower, but only of capable direction to guide and train these engineers.

Admitting that there is a shortage of engineers, what are the industries doing to alleviate this shortage? Nothing! Only, a lot of claims and words which mean nothing, but not a step in facts to solve the problem.

Everybody calls loudly to the "lupus," but nobody thinks and proposes the necessary defense against it. Then, why all these articles with warnings to the industries? What is the purpose of this clamor, if nothing will be done? Why alarm the nation on the shortage of people in engineering fields when the industries do not request more professionally trained individuals.

Some requests are made from the aircraft industries, but with the privilege to choose the engineers full of engineering wisdom and with eight to 10 years or more of experience. Now you can laugh at the shortage.

Is this doing justice to engineering education? As far as we know, the colleges only give to the students a full background of the engineering branch they choose, but never the required experience.

If the industries do not wish to train the *junior engineers*, as they wish them, then perhaps they should build electronic robots or supermen. This will eliminate the need for the human brain in engineering pursuits.

It is known that in this country there are many engineering people looking for guidance to lead them into the special training desired; then, the industries could distribute them where they are needed most.

In addition to graduate engineers in American colleges, there are many engineers with foreign training that live in America. Most of these people do everything except the work they are specialized in.

If the industries were to give some con-

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Lockheed

P2V NEPTUNE

The U. S. Navy's first line of air-to-sea defense—that's the new P2V Neptune multi-mission patrol bomber. Two jets plus turbo-compound engines give extra speed when needed . . . special apparatus spots subs deep under the sea. Its many uses for patrol, for attack, for minelaying all spell "security" for America's coastline.

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Design engineering	Aerodynamics
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Write to me today: Felix Gardner
Fairchild Engine Division, Farmingdale, L. I.

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FAIRCHILD
Engine Division
FARMINGDALE, LONG ISLAND, NEW YORK

"where the future is measured in light-years"

sideration to these people, they could help the so-called shortage and in the meantime, the industries could have themselves a ready engineering group who are well-trained in the metric system, etc.

The problem of shortages in engineering fields can easily be solved if someone would only take an interest in helping to discover the actual facts and reasons for such a shortage.

The real truth might be that such a problem does not exist and even though there might be such a shortage, it is probable that the so-called "shortage in the engineering field" stems from other sources!

Training in Specialties

It is useless to cry out about the shortage of manpower and it is not helping to solve the need for an increase of engineering students, because these new engineers will only be compelled to locate work in other fields because of their lack of experience.

So, the problem is not solved, but only rendered worse because the industries are also claiming shortage for the simple reason that they want well-trained people with considerable experience and not "freshmen."

The problem is not "quantity" but essentially "quality" and to supply this quality, it is absolutely necessary to train the junior engineers with pre-industry training courses relative to their own specializations.

The teachers shall be the oldest engineers of the industries with practical production experiences whereby they will give to the junior engineers the basic skills.

At the end of the training courses, a series of examinations shall be given to the "trainee" engineers in order to establish their professional aptitude and inclinations, so as to better serve industry's needs.

I believe that the institution of such training courses in the respective specializations in common accord with all the industries in that field, will give you the solution to the shortage and quality of the manpower.

Simply and clearly, I would like to say that the present opinions among the industries on the shortage of engineers is entirely different.

Every leader of an engineering group applies his own method to solve his engineering shortage. No coordination exists among the different leaders of the industries and nobody is really interested in what they are looking for; nobody seeks to find the real solution and this is due to the competition between factions of the industry. This is a serious condition!

As a graduate of a foreign college in aeronautical engineering with serveral years of design experience, and as a reader of AVIATION WEEK, I would like to repeat to the American industries the Latin phrase: *Concordia res parvae crescant discordia etiam maximae dilabuntur.*

CARMEN DEANGELIS
62 Fourth St.
Waterford, N. Y.

(Roughly, this is what Roman historian Sallust, 86–34 BC, invoked by Reader DeAngelis on the misuse of engineers, had to say: Agreement helps small things


Robert F. Wood, Newport Air Park, Newport, Rhode Island.


A. M. "Sime" Bertolet, Reading Aviation Service, Inc., Municipal Airport, Reading, Pennsylvania.


Max R. Brand, Aero Commander Distributors, Hangar 3, P.O. Box 8426, Municipal Airport, Tulsa, Oklahoma.


H. Leibee Wheeler, Buffalo Aeronautical Corporation, Buffalo Municipal Airport, Buffalo, New York.


Gene Hudman, Stonnell and Holladay Aircraft Sales, Carolina Division, Municipal Airport, Charlotte, North Carolina.


Don Vest, Vest Aircraft & Finance Co., P. O. Box 5306, Sky Ranch Airport, Denver, Colorado.


B. G. Vandre, Van's Air Service, Municipal Airport, St. Cloud, Minnesota.


Art Meurer, Arthur Meurer Co., Inc., LaGuardia Field, New York, N. Y.


H. Warren Holladay, Stonnell and Holladay, Easton Municipal Airport, Easton, Md.

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ORGANIZATION


Louis Humphreville, Executive Aircraft Corp., Detroit City Airport, Detroit 13, Michigan.


Don Pennington, Southern Aero, Inc., Municipal Airport, Atlanta, Georgia.


Peter Graves, Southern Ohio Aviation Sales Co., Dayton Municipal Airport, Vandalia, Ohio.


John A. "Jack" Baumann, Santa Monica Aviation, Santa Monica Airport, Santa Monica, California.


Paul Bailey Indianapolis Executive Aircraft Corp. Indianapolis Municipal Airport Indianapolis, Indiana


John Wilsdon, Executive Flying Corporation, P.O. Box 122, Lambert Field, St. Louis, Missouri.


O. B. Callan, National Aero Sales Corp., Midway Airport, Chicago, Ill.


Charles H. E. Westerman, British Colonial Airlines, Calle Lopez No. 1 — Despacho 502 Mexico, (1) D.F., Mexico.

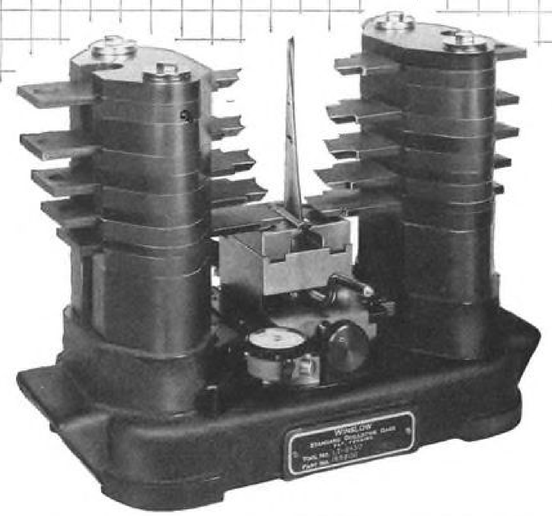
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THE WINSLOW STANDARD GUILLOTINE GAGE

- assembled from stock components
- interchangeable parts
- quick delivery
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- maintains original accuracy
- lower original cost
- less down-time
- quickly re-worked for parts changes

Already in use by the leaders of the jet engine industry, this new kind of guillotine gage solves the problem of maintaining accuracy. Templates are supported over a much larger area of their surface, making wear negligible. And alignment is guaranteed by heavy stacked towers that are bolted together for ruggedness and complete rigidity. Winslow's new design and assembly from precision-built interchangeable parts give six big advantages. You get quick delivery and lower original cost. You save on maintenance—in case of damage substitution of some parts can be made without even removing the gage from your inspection line.

Gage down-time is cut, requiring fewer gages and avoiding costly production holdups. And finally, you reduce your gage investment with a truly multi-purpose instrument—check all 10 features of a jet engine blade with a single gage; check forging and finished part with only one gage. No more gage obsolescence—Winslow's Re-Work Service quickly up-dates the gage when your part changes. Easy to use and easy to read, the Winslow speeds production, gives "more accuracy for less money."

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prosper; discord brings even the greatest things to destruction.—Ed.)

Your recent publication of letters on the "Engineering Shortage" effectively reflected the intelligence of your readers.

It also represents the first time, within my knowledge, that a magazine had any space devoted to this touchy subject other than the usual canned patter of personnel men, and I feel compelled to add a few of my own observations.

First of all, it cannot be denied that more graduates are being hired at higher salaries than ever before, but the percentage increase in salary per years of experience has become woefully small.

In brief, there are comparatively few industrial establishments that are paying engineers at a rate that is commensurate with their experience. All this is much to the sorrow of the "old-timers" who have not moved into executive positions, and find themselves threatened by replacement with young, recent grads.

Net result: thousands of engineers have left the profession for better-paying positions in administration, sales, liaison, and a multitude of non-engineering businesses.

I feel certain that these men would not have left, if they could have gained the recognition and professional status mentioned in your ads.

Robert P. Goldstein
2355 Eldridge St.
Pittsburgh 17, Pa.

Control for Platform

The Hiller ducted fan flying machine pictured on page 4 of the Apr. 25 issue appears to me to have terrific possibilities, but is lacking in one very essential feature, viz., a good control system, especially considering the high center of gravity.

With a good control system, the machine can be increased to a useful size, with the pilot sitting down in a bubble-enclosed cockpit and the powerplant placed below the fans. The duct ring is essential, and can be faired out on the outside to the shape of the popular idea of a "flying saucer" streamlining it for forward motion.

For a good lateral and pitch control, shutter flaps, hinged at the top, can be pushed out from the inside of the duct ring above the fan blade tips, shutting off part of the intake air supply on one side and thus causing loss of lift which will tilt the vehicle.

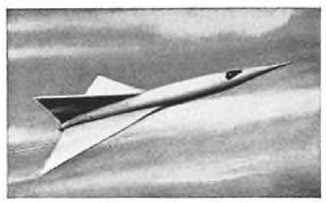
About eight of these shutter flaps around the inner circumference of the ring could be connected by control cables to a single control stick which could be moved in any direction to cause the craft to tilt in that direction. Additional power would have to be applied to maintain altitude when the machine is tilted and traveling horizontally.

This idea is so simple and obvious that a hundred people have probably thought of it, but so far as I know no one has tried it and it seems to me that someone should give it a whirl.

Kenneth B. Ruhle
Annette, Alaska



experience plays a vital role in every success



Pressure actuated switches for every requirement from zero absolute to 12,000 psi. Meletron switches are used by every major manufacturer of aircraft in the United States.

Man's efforts to increase life expectancy comprise one of the noblest of all human endeavors. In this field it is significant that several men compare experiences when major surgery is indicated.

Since Meletron products are used by every major aircraft manufacturer, much has been gained from their experiences. Reports of their experiences have enabled us to build pressure actuated switches that are not only reliable, but exceed the requirements in the specifications.

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NEW AVIATION PRODUCTS



Fast Stress Calculator

A true-stress calculator similar to a circular slide rule has been developed as an aid to the analysis of ductile materials.

True stress calculations normally are lengthy. They are based on determination of the reduced cross-sectional area of the structural member while it is under load, rather than on the unstressed full area.

One manual movement of the new calculator gives true stress values opposite any applied loads for a given size and material of the structural member. The calculator is applicable to rods with diameters between 0.1 and 0.51 in.

Research Services Co., Box 2492, Cleveland 12, Ohio.



Mobile Cargo Conveyor

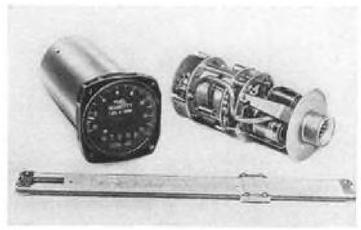
Air cargo conveyor unit mounted on a Ferguson tractor can load 14,000 lb./hr. with belt speed of 75 fpm. Designated Skyloader Mk. 1, the conveyor assembly was designed and built by Bishops Implements Pty., Ltd. (Conveyor Division), Melbourne, Australia. Initial orders for the conveyor were placed by Ansett Airways. Here it works with an Ansett Convair.

Cuts 10-ft. Thread Lengths

Thread lengths to 10 ft. can be ground in one setting with Style 120 machine designed to handle aircraft actuator screws and machine tool lead screws.

Automatic features include feed-to-finish size, grinding wheel dressing, resumption of grinding cycle after dressing, backlash compensation, control of coolant flow, lubrication and retracting the grinding wheel end of the working cycle.

Ex-Cell-O-Corp., Detroit 32, Mich.



One Fuel Gage Gives Two Displays

Single dual-display fuel quantity indicator gives both total and individual tank readings. Selection of total or single-tank gage is pilot-controlled by means of a panel switch. Reading of any tank is obtained by setting the panel selector.

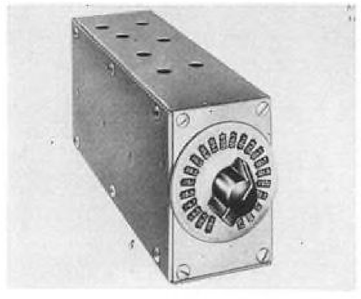
During totalized reading, the pointer is automatically driven off scale and concealed by mask to eliminate ambiguous readings. With the pointer section of the dial in operation, a dial "flag" indicates that a single tank is being gaged.

Indicator is hermetically sealed and meets all applicable MIL specs, the manufacturer states.

Avien Inc., 58-15 Northern Boulevard, Woodside 77, N. Y.

Transmitter Covers 118-127 Mc.

New VHF transmitter, weighing 1 lb. 6 oz., covers channels from 118 to 128 mc. and features a uniform 3 to 4-watt power output on any channel. Uniformity is provided by condenser tuning system, whereby rotation of the channel selector switch also turns a ganged segmented condenser, providing precision peaking for three tuned circuits.



Frequency stability is reported at 0.01%, or better, on all crystal channels. Transmitter measures 2½x3¼x7¾ in., and is available with either local or electrically operated remote channel selection.

Dayton Aviation Radio & Equipment Corp., Troy, Ohio.

ALSO ON THE MARKET

Mauser vernier depth gages of 3 and 6-in. capacity have 0.001-in. vernier. Standard pin can be replaced by hardened long straight pin for small deep holes.—George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.

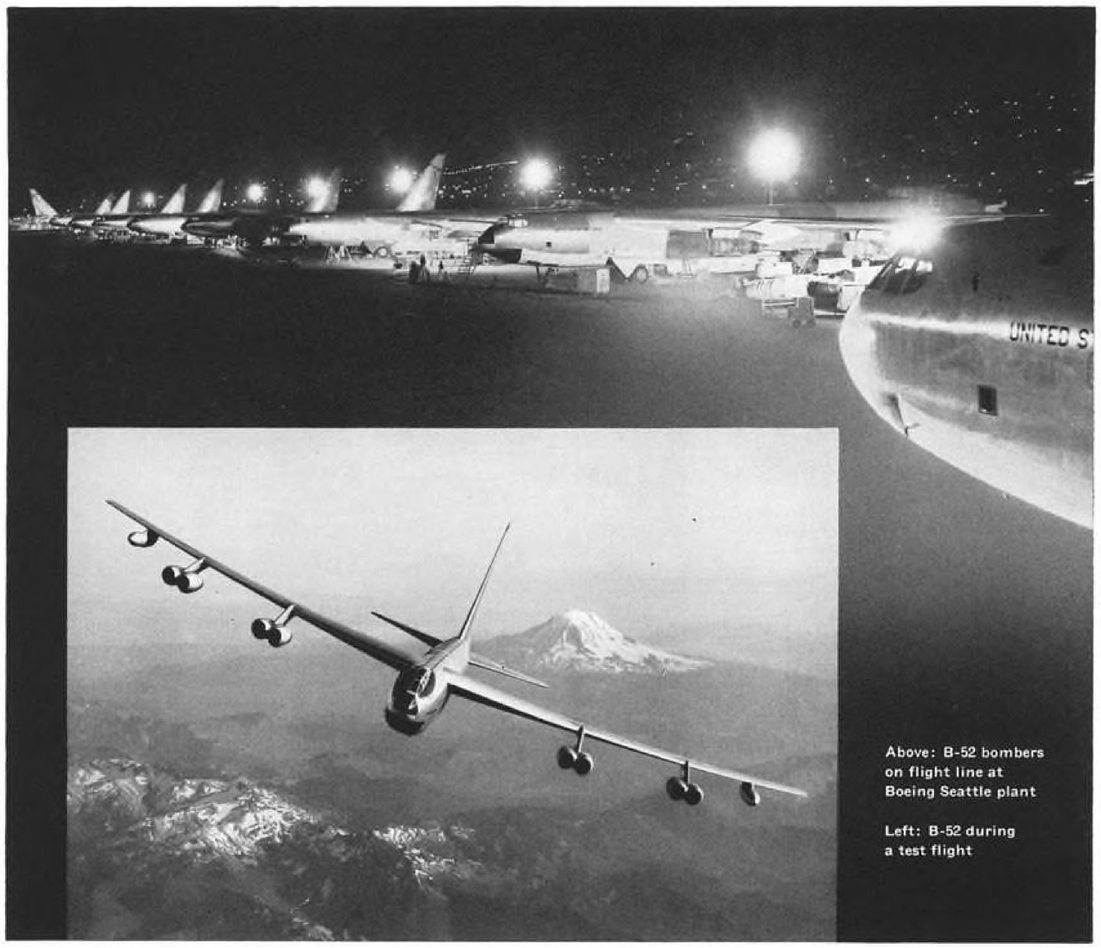
Electronic Count-O-Larm for Brown & Sharpe automatic machines accurately counts parts produced and gives visual and audible alarms when stock is exhausted. — Count-O-Larm Co., 1271 W. North Ave., Chicago 22, Ill.

Wire-stripping induction generator, Ther-Monic Model 50 WS, prebonds ends of tinned stranded wire to No. 26 gage; on solid or non-tinned wires the unit loosens most plastic insulations in the stripping area, the maker reports. Device also converts for use in hermetic sealing, soldering or brazing. — Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y.

Solvent removes Neoprene compounds from radomes in less than two hours, the manufacturer reports, compared with eight hours for other methods. Ether 181 has a high flash point and low toxicity. Cost is $1.10 per lb. in 450-lb. container.—Ansul Chemical Co., Marinette, Wis.

High-temperature wire enamel, Isonel, is stated to be less expensive than silicone varnishes and gives better heat shock characteristics. Product is also said to show no tendency to craze.—Schenectady Varnish Co., 200 Congress St., Schenectady 1, N. Y.

Press brake develops 12 tons of pressure with a 36-in. length of bed. Ram features stroke control that can be preset and the ram stopped or reversed at any desired point. Di-Acro Hydra-Power unit has a 60-stroke-per-minute



Above: B-52 bombers on flight line at Boeing Seattle plant

Left: B-52 during a test flight

America's big jet bombers are meeting all schedules

Boeing B-52 global jet bombers are now well into the advanced stages of their flight test program—while production airplanes are coming from the factory on schedule. The airplanes assigned to this continuing test program are averaging nearly twice as many flight hours per month as any previous high-performance aircraft.

This record, in part, is a measure of the success of the B-52 design. It is also a reflection of the huge engineering resources of Boeing's new Flight Test Center—the largest, most complete facility of its kind in the country. This Center enables Boeing to achieve a higher percentage of productive flight test time than was possible before. Programs are planned far ahead, and so organized that on each flight, tests begin the moment the aircraft's wheels leave the ground.

Another part of the B-52's success stems from the earlier experience Boeing gained designing and test-flying the six-jet B-47. The high-altitude front-line B-47 today is the backbone of Strategic Air Command's striking force. It has logged hundreds of thousands of hours of pressurized flight at extreme altitude.

Boeing's experience in this field is unique. For in addition to building more high-altitude, multi-jet aircraft than any other company, Boeing 19 years ago developed the world's first pressurized transport, the Boeing Stratoliner, and the world's first pressurized bomber, the B-29, mighty air weapon of World War II.

Out of this Boeing background grows America's dominant position in the field of pressurized, high-altitude, multi-jet aircraft. It is a position backed by one of the country's largest pools of engineering manpower, by advanced research facilities, and by the Boeing tradition of creating airplanes that open new eras of military and commercial flight.

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production rate on a ¼-in. stroke. Price: $1,555. — O'Neil-Irwin Manufacturing Co., 516 Eighth Ave., Lake City, Minn.

Belt grinder and sander, Superspeed No. 150, offers belt speeds exceeding 10,000 sfm. using 1.5x60-in. belt. Bench or pedestal versions available at prices from $245-$265.—Anchor Machinery Co., 229 W. Orange Grove Ave., Burbank, Calif.

Electric indexing table has automatic timer adjustable from six to 54 indices per minute. Repeat accuracy is stated to be 0.001 in. Table is available as a packaged unit with an electric impact hammer.—Black & Webster, Inc., 445 Watertown St., Newton 58, Mass.

Adjustable draw key for locking Morse Taper shank tools in machine spindles in one wrench adjustment comes in sizes to fit machines with spindle diameters from 3 through 8 in. and draw key slots from ⅜x1⅝-in. through ⅝x1⅞-in. There are no exterior attachments to machine spindle.—Davis Boring Tool Division, Giddings & Lewis Machine Tool Co., Fond du Lac, Wic.

Spray nozzles, check valves provide capacities of one to eight gallons per minute, maker reports.—Spraying Systems Co., 3201 Randolph St., Bellwood, Ill.

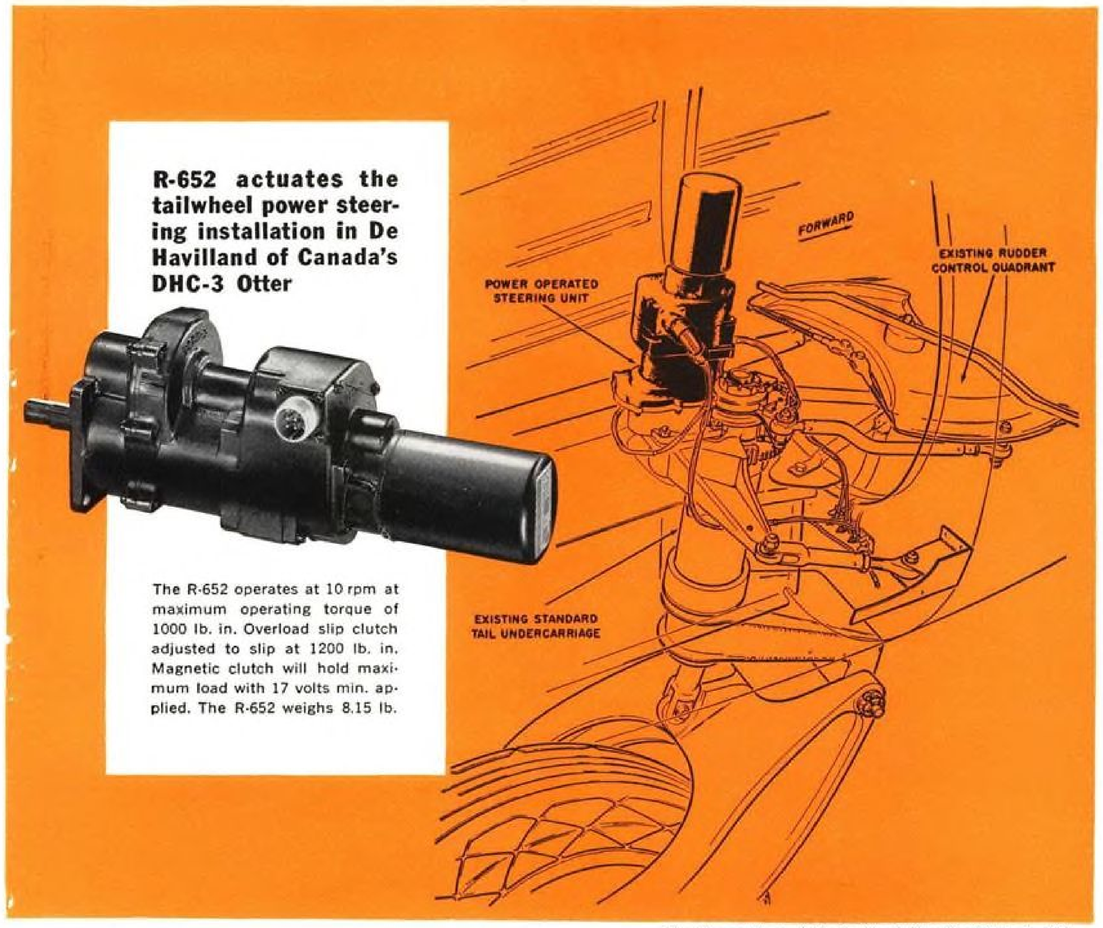
Service By-Way studder extracts studs with only ¼-in. exposed length without damaging threads and gives fully adjustable control over driving depth, the maker states.—E. V. Nielson, Inc., 128 Broad St., Stamford Conn.

Type B-1 Flux, for silver alloy brazing of stainless, chromium heat-resisting alloys, chromium and tungsten carbides. Takes heating at 1,400-1,6000F for short times, manufacturer states.—Handy & Harman, 82 Fulton St., New York 38, N. Y.

Highspeed Synchro-Snap rotary switches for overspeed or underspeed limit control can be furnished for any speed to 13,000 rpm. Minimum life is stated to be one-million cycles.—Torq Engineered Products, Inc., Interstate St., Bedford, Ohio.

High-frequency generators for induction and dielectric heating are 36 in. wide. Generators are used for frequencies to 9,600 cps. and vacuum tubes for 450 kc. to 40 mc.—New Rochelle Tool Corp., 322 Main St., New Rochelle, N.Y.

Aerosol dispensers handle lubricating and penetrating oils, rust inhibitor and all-weather clear-coat. Cans contain six ounces.—Crown Industrial Products Co., 1022 Amsterdam St., Woodstock, Ill.



Drawing courtesy of De Havilland Aircraft of Canada, Ltd.

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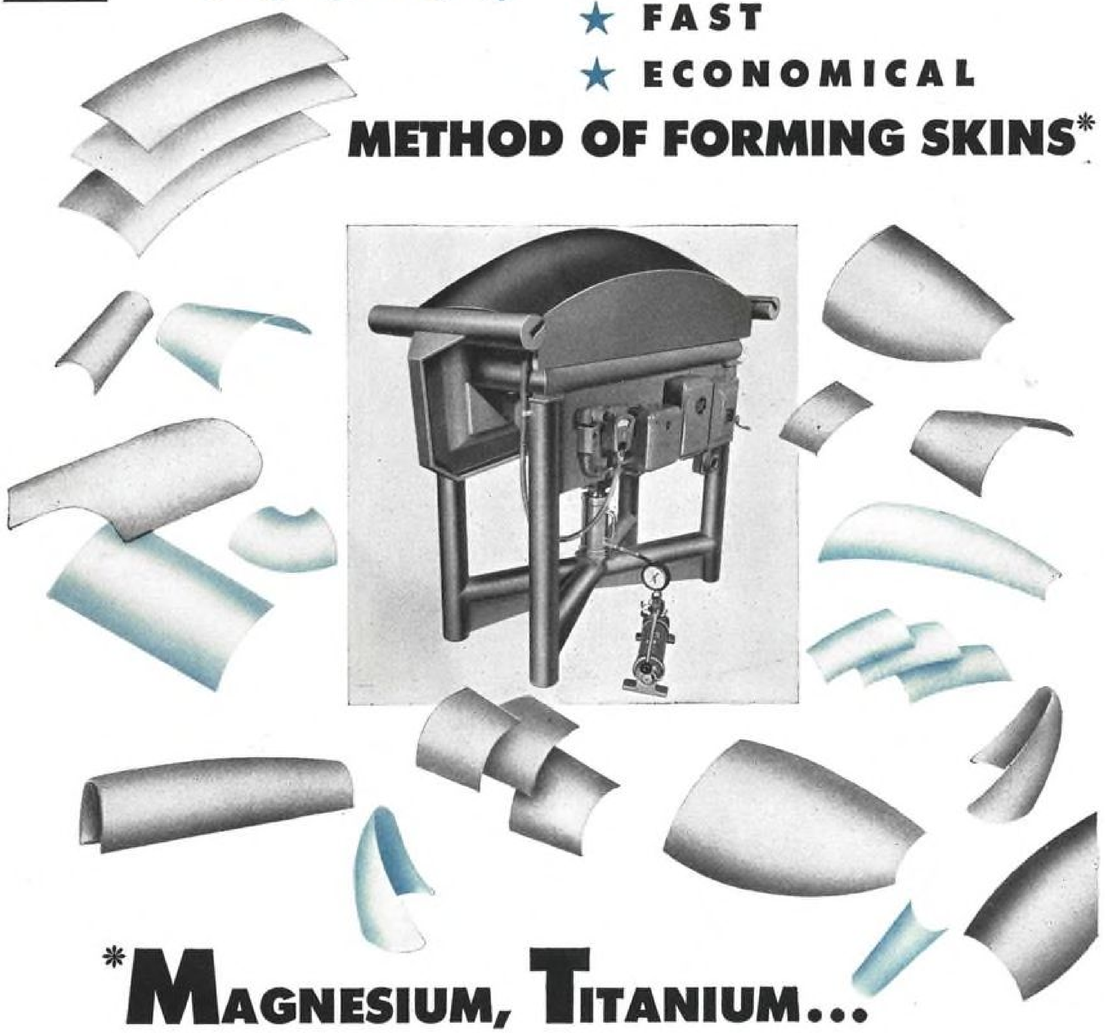
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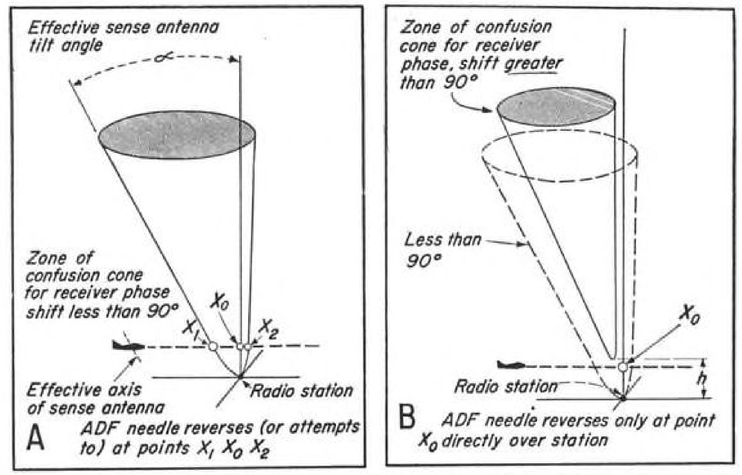
Phase Shift Cleans Up ADF 'Confusion'

By Lt. Cmdr. H. H. Ward 3rd, USN

The "zone of confusion," long a characteristic shortcoming of automatic direction finders, can be eliminated to provide a single clean-cut reversal of the ADF needle over the station, for aircraft altitudes up to several thousand feet.

This conclusion is based on a theoretical investigation of the basic problem, followed by flight tests which confirmed the theoretical findings.

Of particular importance, the new technique can be applied to existing ADFs without internal modification, by inserting a phase shifter in the sense antenna input which will vary phase shift angle proportional to the incoming signal frequency, up to a maximum value of about 30 deg. The principle can be demonstrated by detuning an ADF receiver slightly.



DIAGRAMS SHOW how shift of phase angle can end confusing ADF needle reversals.

Explanation

A theoretical investigation into the zone of confusion problem by the author produced an equation which predicts those points in space where the ADF needle will try to reverse. The equation is that of a roughly conical or paraboloidal semi-infinite surface oriented as shown in Sketch A, above right.

The tilt angle (α) of the conical surface is determined by the effective airplane sense antenna pattern tilt, a function of its longitudinal location along the plane's fuselage. Other variables in the equation include:

- **Phase advance** of the ADF loop antenna signal by the receiver.
- **Airplane altitude** above the ground.
- **Aircraft track and location** relative to the vertical axis of the radio station.
- **Frequency** of the station carrier wave.

If the sense antenna pattern were truly vertical (tilt angle zero), and if the receiver phase shift were exactly 90 deg., there would be no zone of confusion problem. However, both of these are difficult to achieve because of airframe and receiver design considerations.

Under conditions when the receiver phase shift is less than 90 deg., there are three positions of the aircraft near the station where the ADF needle will try to reverse, as shown in Sketch A.

It will try to reverse when the plane first intersects the conical surface (X_1), when the plane passes over the station (X_0), and when the plane again intersects the conical surface (X_2).

The same condition exists even when the sense antenna null is vertically under the aircraft (tilt angle zero), if receiver phase shift is less than 90 deg. The conical surface would be symmetrical about the station axis, and much more contracted than that shown in Sketch A.

The gyrations of the ADF needle would be determined by whether the needle has sufficient time to completely reverse before another reversal point is passed; this would depend upon the speed of the airplane and the time constants of the ADF loop drive servo system.

If, instead of less than 90 deg., the phase shift within the ADF receiver is greater than 90 deg., then the conical surface effectively is elevated in space above ground, as shown in Sketch B.

An airplane flying below the tip of the conical surface completely misses two of the points of reversal, encountering only the correct one (X_0) directly over the station.

The amount by which the zone of confusion cone is elevated above ground is determined by:

- **Tilt angle** of the effective sense antenna.
- **Receiver loop antenna phase shift.**
- **Station carrier frequency.**

A graph setting forth the relationship between the height of cone elevation (h) and receiver phase shift and sense antenna tilt angle is shown on p. 74, top.

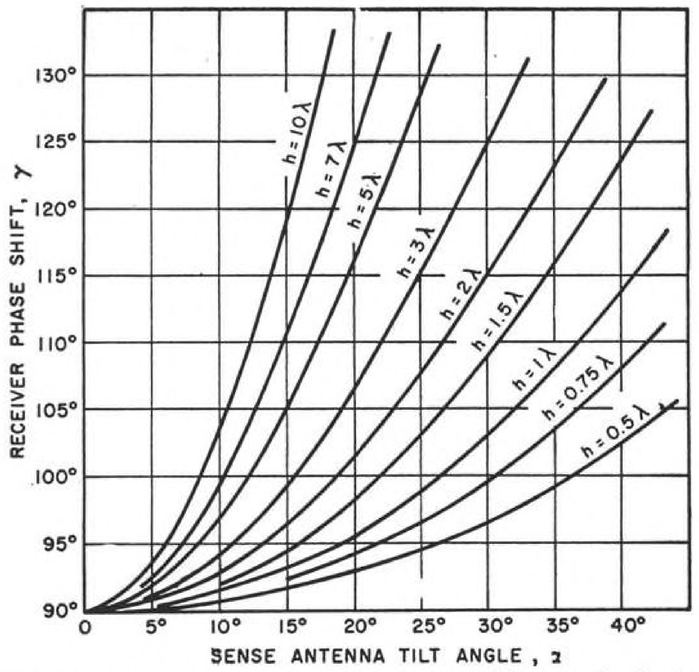
The elevation (h) is shown in terms of radio station carrier wavelength. Second graph on p. 74 shows the

Zone Of Confusion

The "zone of confusion" has long handicapped the automatic direction finder, one of aviation's oldest, yet still widely used, nav-aids.

As the airplane approaches the radio station to which the ADF is tuned, the indicator appears to be confused, not knowing exactly when the plane has passed the station. The ADF needle may first point ahead, then start to turn around. Then it may return to the ahead bearing, and finally turn around again. When passing another station, the ADF needle may act differently, but still erratically. This makes it difficult for the pilot to use the radio station as a position check point.

The author of this article suggests a simple cure which can be applied to existing ADFs or designed into new systems. The cure is the outgrowth of an investigation made by the author at Stanford Research Institute during a 10-week industrial experience tour, part of a three-year course at the Naval Postgraduate School in Monterey, Calif. The investigation was supported in part by USAF funds.



ELEVATION OF ZONE OF CONFUSION CONE above ground (h) in wavelengths of carrier as function of sense antenna tilt angle and radio phase shift angle.

conversion of "h" into feet above ground.

For reasonable phase shift angles and antenna tilt angles, the spurious-reversal cone can be elevated 3,000 to 4,000 ft.

Flight Tests

Having thus predicted what should happen, a series of flight tests were flown in which the variables were controlled, and the "point forward" or "point aft" signals to the loop were recorded on an Esterline-Angus recorder.

The loop was kept pointed 90 deg. to the right by disconnecting the leads to the loop drive motor.

The point in time that the plane passed over the station was established by having a ground observer, with a portable radio, located at the station site. The observer sighted up a vertical structure and gave the aircraft a "mark" when it was over the station.

Flight test results agreed extremely well with theoretical predictions. When the phase shift of the receiver was adjusted to a value greater than 90 deg., the tip of the zone of confusion cone would lift off the ground, making it possible to fly under the surface.

This produced a single clear-cut needle reversal which occurred when the plane passed over the station.

Flight tests also showed that when the plane flew through the "zone of confusion" there was no time when the needle would have been wandering aimlessly about. Instead, it always was moving under positive control of the radio station signal, except for the split second when the conical surface was penetrated, and at the point of passage over the station (if the station axis was hit).

When the plane is at any point inside the conical surface, the ADF needle tends to point away from the ground station. At all points outside of this surface, the ADF needle is driven toward the correct bearing.

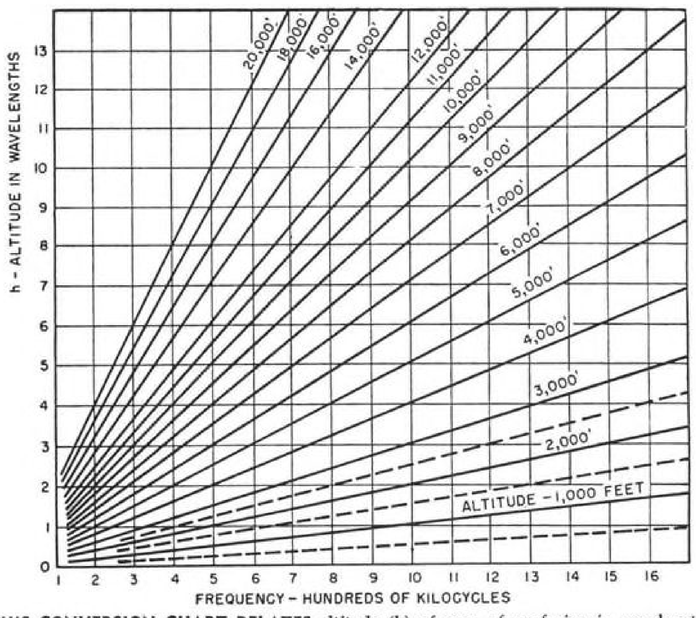
Anyone can verify the validity of this analysis as follows:

- **Tune in station** on ADF and note maximum tuning indicator reading.
- **De-tune the receiver** toward a higher dial reading so that the tuning indicator drops back to about 85% of the maximum reading previously noted. This provides receiver phase shift of more than 90 deg.
- **Fly the airplane** at or below an altitude equal to 1,000,000 divided by the frequency of the station in kilocycles (kc.). For example, if the radio station broadcasts at 500 kc., fly toward the station at 2,000-ft. altitude or less. (1,000,000/500). Only one ADF needle reversal should take place, and that when the plane passes directly over the station.

If the receiver is now retuned to the maximum reading (first step), and then tuned toward a lower dial reading until the indicator reads about 85% of the maximum reading, the receiver phase shift will be less than 90 deg., and the ADF will behave in its normal confused manner.

The results gathered from this investigation show that it should be possible to produce single ADF reversals over any station in the conventional 100 to 1,750-kc. band below an altitude of 3,000 to 4,000 ft., providing the tilt angle of the sense antenna is not excessive.

Manual de-tuning of the receiver can



THIS CONVERSION CHART RELATES altitude (h) of zone of confusion in wavelengths to feet as a function of the carrier frequency in kilocycles.

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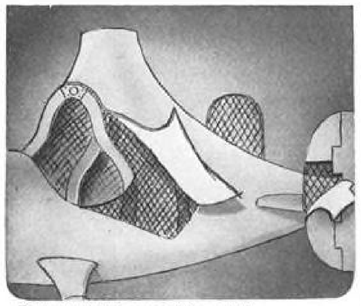
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be used to introduce the required sense antenna phase shift, but this complicates ADF tuning procedures and introduces the possibility of human error by the operator.

The same result could be achieved by employing a phase shifter in the sense antenna input, which introduces a negative phase shift whose angle is approximately proportional to radio signal frequency, up to a maximum of 30 deg.

This has a disadvantage for long-distance ADF operation because the torque developed to turn the ADF loop decreases with phase shift (from 90 deg.).

Conflicting Requirements

This points up a basic conflict in ADF requirements for long and short-distance operation. Close to the station it is desirable to have a small sense antenna tilt angle, a higher-speed loop drive motor, and a phase shift of more than 90 deg. in the receiver.

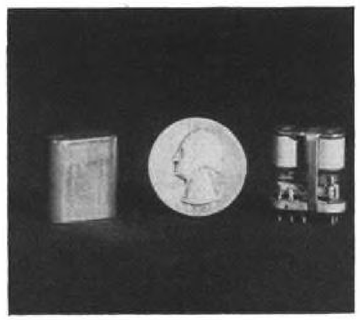
For long-range use, however, the ADF needs a short sense-antenna cable run to reduce losses, a longer loop motor time constant to damp out static interference, and a phase shift of approximately 90 deg.

The solution may be a dual-speed motor and the use of two separate sense antennas. At longer ranges, a sense antenna located near the nose of the plane would be used, without phase shift, and with the slow motor speed. For close-in work, the ADF would be switched to a small sense antenna farther back on the fuselage; phase shift would be increased beyond 90 deg., and motor speed would be three times as great.

Switchover might be accomplished manually by the pilot or automatically, according to received transmitter signal strength.

New Subminiature Devices on Market

A micro-miniature relay, reportedly the smallest ever developed with contacts rated at 2 amp., is one of several recently announced midget-size components of interest to designers.



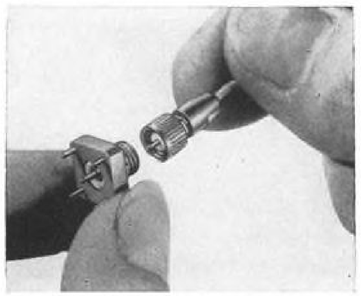
The new General Electric relay, hermetically sealed, reportedly withstands more than 50G shocks and 20G vibration between 55 and 500 cps.

Model CR 2791G200, measuring 0.81 in. high, comes in standard coil resistance of 600 ohms for 28-v. d.c. operation, or with coils up to 4,800 ohms.

GE's Model CR 2791G210, measuring 1.12 in. high, is a current-sensitive model with maximum coil resistance of 9,600 ohms and a pick-up current of 3.2 ma.

Other new sub-miniature components include:

• **Co-axial connector** for printed circuit boards. Receptacle, Pt. B-3841, measures ¼ in. square, with terminals for mounting and dip-soldering on printed-



boards. Associated co-axial plug is Pt. B-3840, and measures ⅝ dia. x ¾ in. long.

Manufacturer: H. H. Buggie, Inc., 518 Jefferson Ave., Toledo 4, Ohio.

• **Ceramic rotary switch,** Series M, occupies a panel area of less than 1½



sq. in. and employs ceramic wafers with coin silver contacts. Single-pole style has 18 shorting type contacts and is available in many combinations including multi-deck stacks.

Two or three poles per deck also are available. Contact capacity is 2 amp., with flash-over voltage of 1,000 v. at 60 cps.

Manufacturer: The Daven Co., Dept. SZ, 191 Central Ave., Newark, N. J.

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Tiny Switch Is Less Than 1 In. Long

A tiny rotary selector switch, only ¾ in. in diameter x 1⅛ in. long, was recently put on the market.

The new series BH selector switches are available in single-pole/12-position, two-pole/six-position, three-pole/four-position, and four-pole/three-position models, with standard ¼-in. shaft and ⅜-in. bushing. Current rating of contacts is 50 ma. at 300 v. a.c. or d.c.; 500 ma. at 30 volts.

The manufacturer of the switches is Clarostat Manuf. Co., Inc., Dover, N. H.

Other new miniaturized components include:

• **High-temperature power transformer** can be operated at 400 to 6,000 cps., from −55C to 155C, with up to 95% efficiency, according to manufacturer. Transformer occupies only 1.65 cu. in., comes in hermetically sealed plug-in type case.

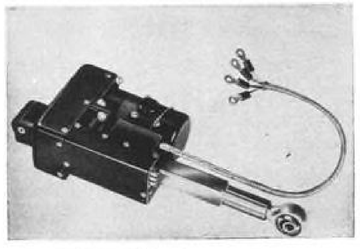
Manufacturer: Communication Accessories Co., Hickman Mills, Mo.

• **Interference filters,** new series of small high-insertion-loss units, are available in ratings of 0.1 to 20 amp., 125 v. d.c. or a.c., for 400-cps. use. Units meet pertinent MIL specs, can be operated at −55C to 85C, and come in hermetically sealed cans that have solder terminals.

For engineering data, write to Technical Literature Section, Sprague Electric Co., 327 Marshall St., North Adams, Mass.

• **Toggle switches,** rated for 10 amp. at 50 v. d.c., in SPDT and DPDT models, reportedly are half the size and weight of their predecessors.

SPDT unit weighs 0.15 oz., measures



Small Actuator

New linear actuator that weighs only 1.4 lb. has been made 25% smaller than its predecessors by integrating motor and reduction gearing. Speed of the new Type ACT-3090 can be changed from 1.6 to 30.0 in./min. in convenient increments by interchanging only two gears. Unit has built-in slip clutch and limit switches and is designed for use in high ambient temperatures, according to manufacturer, John Oster Manufacturing Co., Avionic Division, 1 Main St., Racine, Wis.

UAP COOLING SYSTEMS FOR ELECTRONIC EQUIPMENT





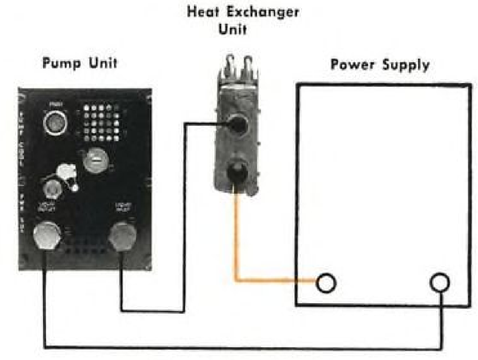
This cooling package for electronic equipment guarantees sufficient pressure at pump inlet to insure constant flow of cooling fluid from the pump from sea level to any altitude and at the same time insures a constantly low pressurization of electronic equipment.

Filling, with OS-45 fluid, pressurizing and bleeding of the entire system (heat exchanger, strainer and thermal valve; pump and control package; electronic power supply) is accomplished without the aid of special equipment. The heat exchanger unit can be mounted in a ram or refrigerated air duct.

The pump and control package maintains pressure between 5-9 psig within the temperature limits of −65°F. to 212°F.

For adaptations of this system to fit your requirements or for information concerning other types of systems for ambient installations, please contact Engineering Department, Dayton, Ohio.

CONNECT TO YOUR ELECTRONIC POWER SUPPLY for a neat, compact installation weighing but 9.31 lbs. displacing 447.19 cu. in. dissipating 350 watts.



Schematic of Hose Hook-up

a famous family of aircraft essentials



UAP INC. UNITED AIRCRAFT PRODUCTS ®

UNITED AIRCRAFT PRODUCTS, INC.

1116 BOLANDER AVENUE, DAYTON, OHIO

approximately ¼ x ½ x 1 in.; DPDT unit weighs 0.22 oz., measures ½ x ½ x 1 in. Both reportedly are corrosion-proof, designed for −55C to 85C operation.

Manufacturer: Torsion Balance Co., Clifton, N. J.

• **Ruggedized relay,** Type FC-6, withstands 30G vibration from 0 to 2,000 cps., and 60G shock without contact opening. Unit is designed to meet or better MIL specs, is available for 85C or 125C ambient temperature, and has coil rated for 26.5-v. d.c. operation. Bulletin FC-6 gives information on its application.

Manufacturer: Struthers-Dunn, Inc., Pitman, N. J.

FILTER CENTER

▶ **Is Hughes an Exacting Company?**—This is the title of an interesting brochure prepared by Hughes Aircraft Co. for its suppliers to explain why extremely high order component reliability is required. Simple example illustrates how even a small number of component failures can pyramid to give low equipment reliability.

▶ **Art and Electronics**—Cash prizes and free vacation trips are offered for the best "objects d' art" employing electronic components and associated materials in a contest sponsored by West Coast Electronic Manufacturers Assn. Prizes are offered in four categories: photography, painting and sculpturing, decorative accessories, and jewelry. Competition entries will be exhibited at Wescon, Aug. 24-26, in San Francisco. For details, write Berk Baker, Eitel-McCullough, Inc., 798 San Mateo Ave., San Bruno, Calif.

▶ **New Microwave Communications**—General Electric has announced a new 25-channel microwave communication system, operating in the 1,700 to 1,990 −mc. Band, which employs a newly developed "Quadriphase" method of time-division multiplexing of individual channels. The new technique reportedly reduces number of tubes by 33% and eliminates over 150 controls while cutting required floorspace by up to 50%, GE says.

▶ **Transistorized Auto-Approach**—Eclipse-Pioneer reports first automatic approaches ever made with a completely transistorized autopilot and approach coupler, using its new PB-20. Prototype model has made eight automatic ILS approaches and has demonstrated tiein with VOR stations for cross-country flying. Eclipse-Pioneer says it will use transistors in a new integrated navigational flight system which ties into airborne radar and DME, and displays autopilot signals to pilot on cockpit instruments.

▶ **Bell Labs and the Sun**—Efficiency of the solar battery has been raised to 11%, from the previous 8% (AW Nov. 1, 1954, p. 68) by Bell Telephone Labs. One square yard of the improved silicon semiconductor material can now generate 100 watts. Present efficiency is comparable to that of gasoline engines and 20 times better than earlier photovoltaic devices, Bell says.

Avionics Bulletins

Recently announced bulletins and catalogs of interest to the avionics industry include:

• **Varistors** (asymmetric non-linear resistors) are described and application data given in 6-page Bulletin SR-3. Bulletin T-1 (4 pp.) describes resistance strips and concentric disk resistors. International Resistance Co., 401 No. Broad St., Philadelphia 8, Pa.

• **Synchros, motors, tach generators,** and actuators are described in 8-page folder available from John Oster Mfg. Co., Avionic Div., 1 Main St., Racine, Wis.

• **Ferramic magnetic cores,** for use in digital computer storage (4 pp.). General Ceramics Corp., Keasbey, N. J.

• **Miniature precision AN connectors** with one-piece molded inserts. DeJur-Amsco Corp., Electronic Sales Div., 45-01 Northern Blvd., Long Island City 1, N. Y.

• **Polar pattern recording system** for antenna design research. Four-page folder describes new versions of Model 116 and

Pioneers in Development of
Vibration-Resistant Electrical Connector



The unsatisfied demand for a rugged, dependable connector capable of meeting the exacting requirements of modern aircraft led the Scintilla Division of Bendix* to develop the *first* vibration-resistant electrical connector. These connectors using the revolutionary new insert material known as Scinflex were first used on Scintilla Division's ignition equipment for piston engines.

So outstanding was the performance of this new and better connector that its acceptance and use have now become world-wide. Today the Scintilla Division is a major contributor to the electrical connector industry.

This pioneering has never stopped. Bendix was first in the field with cadmium plated connectors, which were later made a requirement of military specifications. Our latest contribution is the best engineered closed entry socket contact available anywhere—one which cannot be mechanically overstressed.

*TRADE MARK.

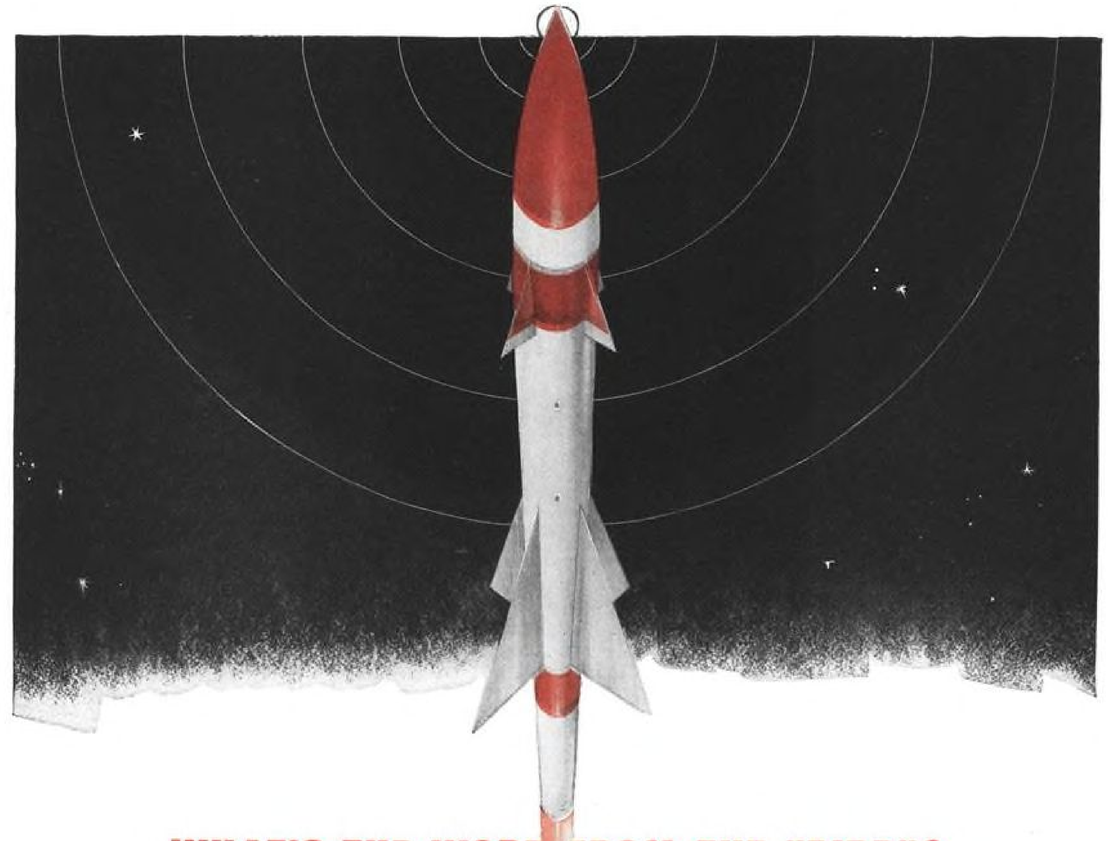
SCINTILLA DIVISION
of Bendix
AVIATION CORPORATION
SIDNEY, NEW YORK

AVIATION PRODUCTS: Low and high tension ignition systems for piston, jet, turbo-jet engines and rocket motors . . . ignition analyzers . . . radio shielding harness and noise filters . . . switches . . . booster coils . . . electrical connectors.

Bendix

Export Sales: Bendix International Division • 205 East 42nd St., New York 17, N. Y.

FACTORY BRANCH OFFICES: 117 E. Providencia Ave., Burbank, Calif. • Stephenson Bldg., 6560 Cass Ave., Detroit 2, Mich. • 512 West Ave., Jenkintown, Pa. • Brouwer Bldg., 176 W. Wisconsin Ave., Milwaukee, Wisc. • American Bldg., 4 South Main St., Dayton 2, Ohio • 8401 Cedar Springs Rd., Dallas 19, Texas • Boeing Field, Seattle 8, Washington • 1701 "K" Street, N.W., Washington 6, D.C.



WHAT'S THE WORD FROM THE "BIRD"?

The audible subcarrier complex of a multiplexed FM instrumentation system sounds like a busy aviary. The message is significant and the telemetering of intelligence from missile-borne instrumentation is standard procedure. The technique is being applied to aircraft, permitting simultaneous, single-link transmission of many data channels. This data can be recorded on magnetic tape, either in the air or on the ground, while a flight is in progress.

Telemetry is a major concern of Electro-Mechanical Research. Contributions to the FM multiplexed instrumentation art include design and development of ground station subcarrier discriminators and frequency calibrators, airborne subcarrier oscillators, electronic commutators, and chopper stabilized DC amplifiers. A description of a recent development may be of interest.

Model 75 Voltage Controlled Oscillator for use with transducers of nominal 0-5v. output, at all RDB frequencies and deviations.

Model 76 Strain Gage Oscillator for use with strain gage transducers. Compensated for gage and cable capacity variations and provides a 100% of bandwidth output with a change of △R/R from +0.5% to −0.5% in one active arm. For all frequencies from 7.35Kc to 22Kc.

Model 77 Reactance Controlled Oscillator for use with variable reluctance transducers. For all frequencies from 1.3Kc to 14.5Kc.

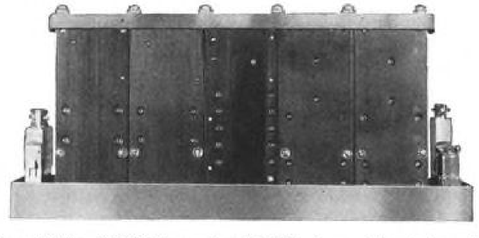
Model 78 Stabilized DC Amplifier for use with transducers and thermocouples of nominal 0-5mv. output. The amplifier is flat from DC to 10Kc, has a gain of 1000, and may be used to modulate the Model 75 or 94 oscillators.

Model 94 Potentiometer Controlled Oscillator for use with potentiometer type transducers or with the DC Amplifier above. Can be supplied for all RDB frequencies and deviations.

Model 79 Electronic Commutator for time division multiplexing of a number of transducers. Compatible with RDB specifications and can be provided for any number of inputs and any switching rate desired.

Model 84 Voltage Regulator for B+ regulation of the above equipment.

TYPE N10 AIRBORNE PACKAGE For accurate telemetering or recording of data, from DC to 10Kc, the package is 11" long and consists of combinations as required of the units described in the adjacent columns.



We shall be glad to discuss with you the application of EMR instruments and facilities to your telemetering and data recording problem, or send further information about available items if you prefer. Write or phone Sales Engineering Department, Electro-Mechanical Research, Inc., Ridgefield, Conn.

Electro-Mechanical Research, INC. RIDGEFIELD, CONN.
e·m·r



Have you heard about Permadizing?*

*Stillman's exclusive Permadizing Process can solve your rubber-to-metal bonding problems with completely flash-free parts. Steel-smooth sealing surfaces allow effective sealing at almost zero pressure.

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Please write giving complete details and we will answer immediately.

Mr. Ned DeWitt, Personnel Department 15
Rohr Aircraft Corporation
Chula Vista, California

9 miles south of San Diego on sunny San Diego Bay.

105 systems. Airborne Instruments Laboratory, Inc., 160 Old Country Road, Mineola, N. Y.

• **Precision wire-wound potentiometers,** Series 970, in eight sizes ranging from 2 to 20 watts (4 pp.). General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.

• **"A Precise, Wide-Band, Continuously Variable Delay Line"** is the subject of a 10-page technical paper, No. 266, available from Helipot Corp., South Pasadena, Calif.

• **Colloidal graphite** and its uses in the electronics field are described in Bulletin No. 433 (4 pp.). Acheson Colloids Co., Port Huron, Mich.

• **Low-frequency noise generator,** covering frequency spectrum from 0 to 10 cps., and offering Gaussian, Rayleigh or uniform probability distribution, is described in 4-page folder. Statistical Instrument Co., 330 Haven Ave., New York 33, N. Y.

• **Packaged transistor circuits,** miniaturized, for audio, IF and pulse use (2 pp.). Electronic Research Associates, Inc., 67 East Centre St., Nutley, N. J.

• **Silicon power rectifiers,** hermetically sealed, for high-voltage, high-current applications (4 pp.). Bogue Electric Mfg. Co., Paterson 3, N. J.

• **Precision voltmeter multipliers,** sealed, designed to meet JAN-R-29. Bulletin D-2 (2 pp.) is available from International Resistance Co., 401 No. Broad St., Philadelphia 8, Pa.

• **Miniaturized angle-of-attack** (or yaw) measuring system, which also measures total and static pressures (4 pp.). Young Instrument Co., P. O. Box 176 Station A, Dayton, Ohio.

• **Connectors,** in variety of types, are described in Catalog R1. Catalog W1 (34 pp.) describes line of wire and cable products, including RG/U coaxial types. American Phenolic Corp., Chicago 50, Ill.

• **Power tubes,** twin-triode and hydrogen thyratron types as well as voltage-regulator tubes are described in 4-page folder. Chatham Electronics, Livingston, N. J.

• **Universal logical building blocks** for digital computer use (4 pp.). Also, booklet entitled "Symbolic Logic, Binary Calculation, and 3C PACS" (16 pp.). Computer Control Co., Inc., Wellesley, Mass.



Miniature Blowers

For spot cooling of electronic equipment and to change air in small equipment-filled boxes, small-tube axial blowers have no brushes and operate without arcing or causing radio interference, the maker reports.

Typical units measure 2 in. in diameter by $3\frac{3}{8}$-in. At speeds of 11,000 rpm. and 20,000 rpm., standard 400-cycle units produce 32 and 58 cfm. at zero-inches static pressure. Variable-frequency 360-to-1,600-cycle equipment produces about 25 cfm. Units meet applicable MIL specs.

Eastern Air Devices, Inc., 389 Central Ave., Dover, N. H.



EASING DOWN 50 TONS OF AIRCRAFT

"We want to drop a 100,000-pound weight 4 feet at a speed of 12 feet a second... and do it so gently that even a full cup of coffee won't spill a drop!"

Cleveland Pneumatic engineers solved the problem. Our shop is building the shock absorbers (or "landing gears") for the customer's 58-passenger, four-engine airliner right now.

The principles we have developed to land tons of aircraft at high speeds smoothly are now being adapted to the solution of complex industrial shock and impact problems. If your problem hasn't responded to ordinary shock-absorption devices, let Cleveland Pneumatic engineers tackle it.

Write for "Booklet C-555" which describes some typical Cleveland Pneumatic solutions to shock-absorption problems. Or tell us your complex impact problem in as much detail as possible.

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Tool Company CLEVELAND 5, OHIO
Department C-555
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BALL-SCREW MECHANISMS • AIR-OIL IMPACT ABSORBERS



WORLD'S LARGEST MANUFACTURER OF AIRCRAFT LANDING GEARS

Heat treating to unheard-of strength at CLEVELAND PNEUMATIC

Now you can design many of your highly stressed steel parts to weigh less than you ever thought possible, and without sacrificing strength.

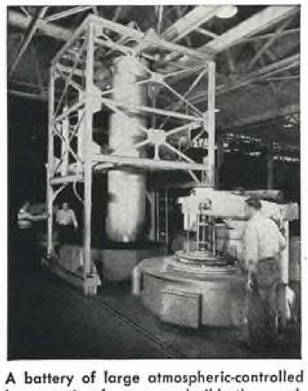
A heat-treating process developed at Cleveland Pneumatic is delivering steel parts with tensile strengths as high as 260,000 psi. in alloys that only a few years ago were limited to 180,000 psi.

By utilizing the high strength-to-weight ratios of such heat-treated steel parts in aircraft, weights can be reduced without reducing strength ...or strength can be increased without "beefing up" the size and weight of parts.

Designers and engineers are invited to discuss uses for this high-heat treatment with Cleveland Pneumatic engineers.



This forced-circulation electric heat-treating furnace 13 feet deep can take parts up to 12 feet long and 46" in diameter.



A battery of large atmospheric-controlled heat-treating furnaces and oil-bath quench tanks helps provide predictable extra-high strengths in large alloy-steel parts.

CLEVELAND PNEUMATIC TOOL CO.



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This man is important to you. He is one of an ever-growing number of U. S. business pilots who together fly almost 4,000,000 hours every year. He wants to know about you—your airport—your services and products—because he is one of the legion of business pilots who are responsible for operating and maintaining an ever-growing business aircraft fleet that now numbers 21,500. For you, he represents a typical member of the business flying market that the most recent annual figures show spends more than $280 million on maintenance and modification, fuel and oil, and related airplane operating expenses . . . mostly at non-airline airports. Growing at its present rate, business flying will become a billion dollar business by 1965.

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Give yourself the representation you deserve Make your advertising reservations now. Hurry—closing date is June 13. Your advertisement—or a cooperative advertisement with your suppliers—can be placed next to any airport listing in any geographical section you are interested in. Rates are low—about the same as for classified advertising in most newspapers, depending on the size of your advertisement, and your advertisement can be any size—even down to a single line. Fill out the coupon without delay to assure special attention and a good position for your advertisement. Make sure now—today—that leading business and private pilots will know about you.

Aviation Week Airport Directory,
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Please reserve advertising space for me in the 1955-56 Aviation Week Airport Directory and send me full information on rates, sizes, and positions available.

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FINANCIAL

Aircraft Industry and Investors Find Convertible Bonds Attractive

Convertible bonds today enjoy wide investment popularity and to a great extent have replaced the offering of common stock in the industrial field. Now, the aircraft builders, having improved their investment and speculative acceptance, may find it advantageous to use this vehicle for their financing purposes.

The upcoming sale of $30 million in convertible debentures by Lockheed Aircraft Corp. not only highlights the demand for additional capital by the aircraft industry, but the popular utilization of these "two-way" securities, as well.

Earlier this year, in April, General Dynamics Corp. successfully marketed a $40-million issue of 3¼% convertible debentures.

At recent annual shareholders meetings, both the Glenn L. Martin Co. and United Aircraft Corp. sought and obtained approval to increase the number of their authorized shares to be available for issuance. Whether convertible debentures will be used is not yet decided.

Why Convertibles?

What are the features of this type of financing that make it attractive to industry and investors alike?

The issuing company benefits in that interest paid is regarded as an operating expense for income tax purposes. With the corporate tax currently at 52%, managements can, in effect, save half their interest cost as compared with dividend payments on the common stock.

Although interest on borrowed capital, such as that available from debentures, is not an allowable cost in the pricing processes on government contracts, the cost of capital to a company is generally lower through the convertible debenture route than through direct stock financing.

In effect, issuance of convertible debt frequently is nothing more than a delayed action issuance of new common stock. The conversion does not take place until the market value of the common stock reaches the usually higher price designated by the conversion contract.

By issuing convertible debt, a company can for practical purposes place itself in a position to sell equity at a price above the current market. This is accomplished by setting the price for conversion into common stock at a point above the market price at the time of the sale.

The purchaser is also generally happier with a convertible debt issue. While the convertible bond carries little or no premium for the conversion feature, its market price tends to reflect money rates in the corporate bond market. It is only when the conversion feature becomes of value that the market price of the bond reflects changes in the equity market.

In other words, there is a floor under, but no ceiling over, convertible bond prices. This offers downside price protection. As the market price of the stock rises to equal or exceed the conversion price of the bond, both types of security advance or fall together.

While obtaining an interest return on his investment, the buyer of convertible debt also regards the exchange option as a "call" on the common stock. Once having faith in the upward course of the stock market, most purchasers are not likely to be deterred by the spread between market and conversion price.

These characteristics of the convertible bond have led to its ready adaptability to financing by General Dynamics and Lockheed. It is likely that this same medium may be used as other aircraft builders seek additional capital funds for expansion or other corporate purposes.

Lockheed

Lockheed proposes to use the net proceeds to be received from the sale of its debentures, among other things, to:

- **Meet increased cash requirements** resulting from increased investment in inventories as the company changes from certain government cost-plus-fixed-fee-type contracts to target price-incentive-type contracts, and from the recently established government policy of reducing progress payment percentages to manufacturers.
- **Place company in a position** to accept orders or undertake government projects (in addition to current commitments).
- **Maintain its financial ability** so that it can further advance its position in the development of commercial aircraft.
- **For additions and improvements** to



the company's properties and facilities.

Glenn L. Martin

The Martin company previously had 3 million shares authorized, of which 2,676,283 shares were outstanding or reserved for issuance upon the exercise of warrants and options. It is now authorized to issue up to 6 million shares.

The company has declared: "No transaction is currently proposed which would require the issuance of any shares of the authorized but unissued stock. . . . These shares could in the future be used for the acquisition of another company or companies, a merger, options to officers or key employes, stock dividends, sale for additional capital in a favorable market or for other corporate purposes in the discretion of the directors."

In other words, management has complete flexibility to sell additional securities if it so desires.

General Dynamics

The General Dynamics $40-million issue of 3¼% convertible debentures was well received, being initially offered at 102½ ($1,025) but attaining an immediate "free" public price of around 116 ($1,160). They have since sold off to around 106 ($1,060).

A big attraction, here, as will be true with the Lockheed issue, is the conversion feature. The General Dynamics debentures are convertible into common stock at $75 per share.

United Aircraft

United Aircraft has received stock holder sanction to issue up to 7.5 million common shares. The total previously authorized was 4.5 million, of which 3,241,004 were last outstanding. Further, a new issue of 500,000 shares of preference stock was also authorized.

Also outstanding at the present time are 233,442 shares of the preferred stock of par value of $100 each. This preferred was offered early in 1942, shortly after Pearl Harbor, at a time when securities markets were unsettled. To make the stock attractive it was found necessary to set a $5 dividend rate.

Management, in April, stated: "Under present conditions, the standing and financial position of the corporation do not seem to warrant the payment of such a rate. Accordingly, the board of directors is now considering the redemption of the entire issue of outstanding preferred stock out of funds which, for the most part at least, it is expected will be procured from the sale of stock of another class, thus avoiding any substantial reduction in the working capital of the corporation.

"The directors plan to adopt a definite financing program at a meeting to be held after the annual meeting of stockholders on Apr. 26, 1955, if market conditions should then be favorable. At the present time they have in mind an offering of new common stock to the holders of outstanding common stock, pro rata, in an amount sufficient to raise approximately $20 million to 25 million, the proceeds of such offering, together with any other corporate funds which may be required, to be used to redeem the entire issue of now outstanding preferred stock.

"However, between now and the time of the annual meeting, conditions may change in such manner as to lead the directors to favor some other program, such as an offering of part of the preference stock, if such stock is authorized by the holders of the common stock at the annual meeting; or the directors my determine to defer the new financing and the redemption of the present preferred stock for the time being . . . ."

Although no conclusive course has as yet been revealed by United Aircraft, the company may be certain to do such public financing as will lead to the redemption (at $102.50 per share) of its present preferred stock.

Further, it will have the means to move quickly to issue additional securities for new capital to "meet possible future needs." —Selig Altschul



FROM HELICOPTERS TO MISSILES

Advance gear assemblies serve many important needs

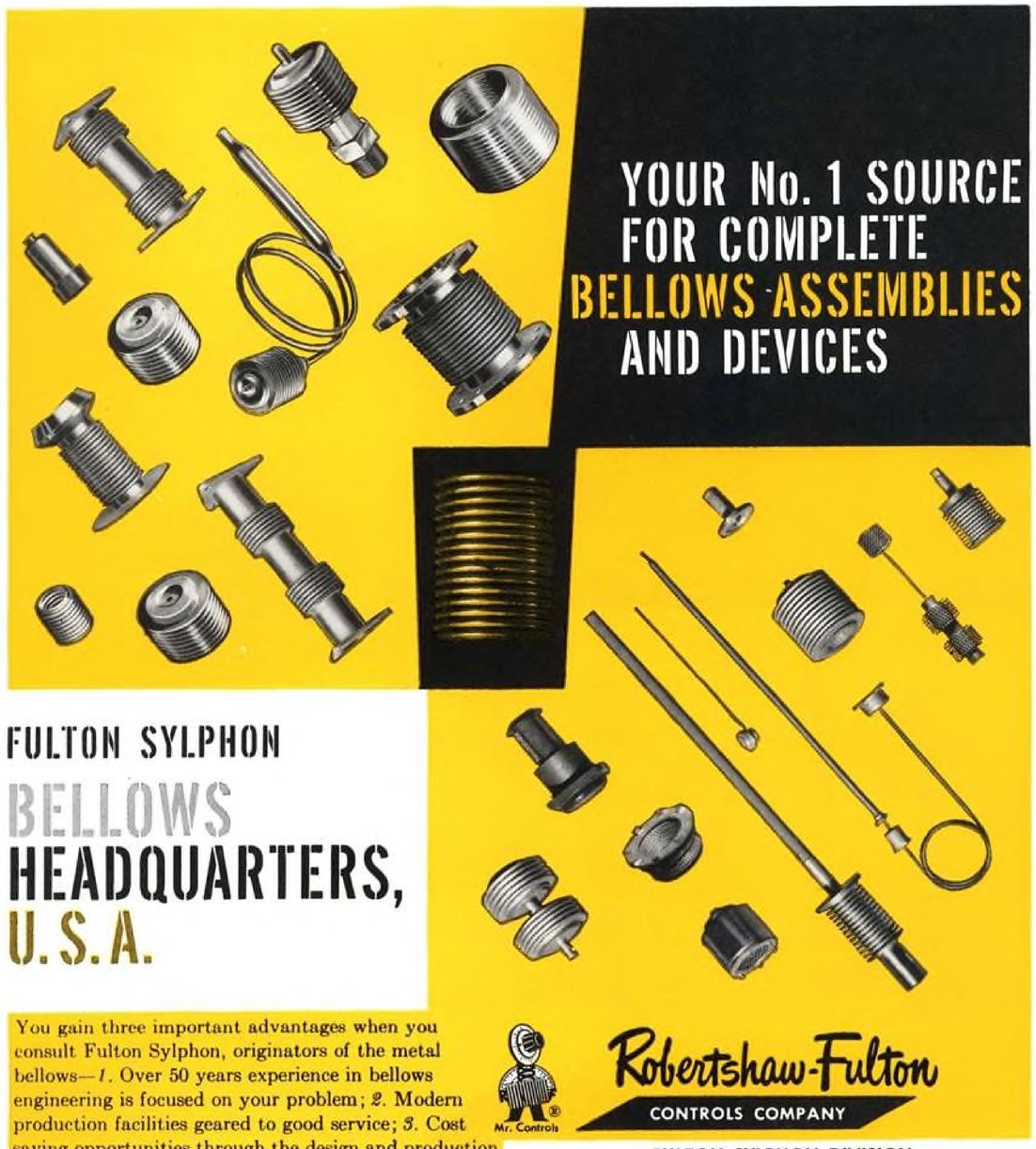
As the aviation industry continues to advance you will find more and more of the nation's aircraft using ADVANCE gear assemblies. Whether it's a helicopter in the hands of a private pilot or a missile being built under maximum security conditions, you'll find ADVANCE gear assemblies being used again and again.

ADVANCE engineers are gear specialists trained to interpret the toughest gear problems and come up with the right answer. ADVANCE facilities are adequate to meet your production requirements. Call ADVANCE for assistance on all your gearing needs.



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HERE'S HELPFUL INFORMATION

This 32 page catalog covers basic bellows engineering, conversion tables, metals available and other bellows data. Use the handy coupon for your free copy.

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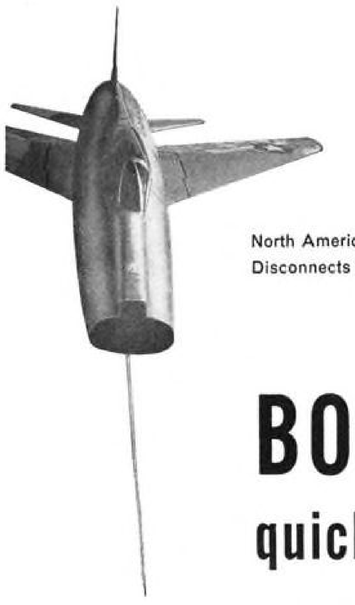
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Company_____

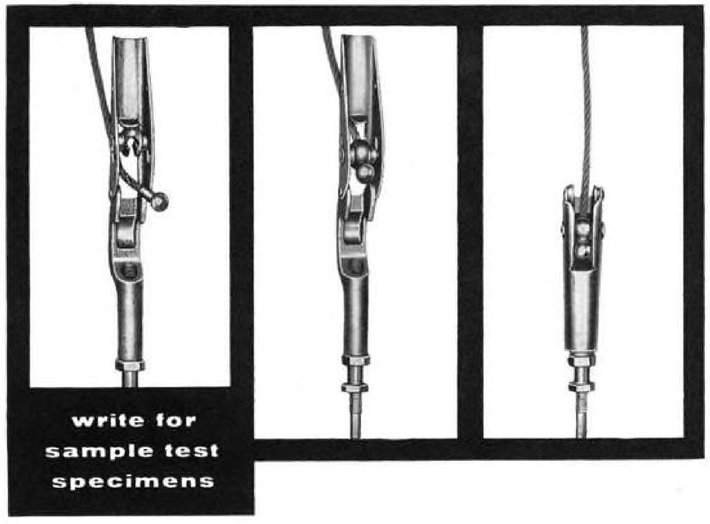
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North American F100 uses Bohanan Quick Disconnects in all cable control systems.

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quick disconnect



write for sample test specimens

Bohanan Quick Cable Disconnect provides:

1. instant disconnect for cable in tension;
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STOCK SIZES:

1/16" - 3/32" - 1/8" - 5/32" with 3" adjustment.

note—stressed to 140% of cable strength.

BOHANAN MFG. CO.

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Los Angeles 25, Calif.
BRadshaw 2-5421

Bohanan Engineers looking for a future, submit resumé.

AVIATION CALENDAR

June 4—Reading Aviation Service, sixth annual Maintenance and Operation Meeting, Reading, Pa.

June 4—Canada's National Air Show, Toronto.

June 8-10—American Meteorological Society, 137th National Meeting, Hotel President, Kansas City, Mo.

June 9-14—Sixth All-Women's International Air Race, Washington, D. C., to Havana, Cuba.

June 10-19—Twenty-first International Aviation Display, LeBourget Field, Paris, France.

June 12-17—Society of Automotive Engineers, Golden Anniversary Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 12-19—Pennsylvania Pilots Council, Pilot's Proficiency Contest, Graham Field, Butler, Pa.

June 13-14—Women's Aeronautical Assn., annual Skylady Derby, Little Rock, Ark., to Raton, N. M.

June 13-24—Formal course on Boundary-Layer Control, University of Wichita.

June 16-18—American Society of Mechanical Engineers, 19th National Applied Mechanics Conference, including sessions on aeronautical and guided missile research, Rensselaer Polytechnic Institute, Troy.

June 17-24—Federation Aeronautique Internationale, 50th Anniversary Conference, Paris.

June 18-25—Philadelphia Junior Chamber of Commerce, third annual Transcontinental Air Cruise, Palm Springs, Calif., to Philadelphia.

June 19-23—American Society of Mechanical Engineers, semi-annual meeting, with five aviation sessions, Hotel Statler, Boston.

June 19-23—American Rocket Society, semi-annual meeting, Hotel Statler, Boston.

June 20-23—Institute of the Aeronautical Sciences and the Royal Aeronautical Society of Great Britain, fifth international Aeronautical Conference, IAS Building, Los Angeles.

June 20-25—Symposium on Electromagnetic Wave Theory, University of Michigan, Ann Arbor, Mich.

June 20-July 1—Special short course on Parachute Technology, Massachusetts Institute of Technology, Cambridge.

June 22-24—Aviation Distributors & Manufacturers Assn., Silver Anniversary Meeting, Breezy Point Lodge, Brainerd, Minn.

June 23-25—1955 Heat Transfer & Fluid Mechanics Institute, University of California, Los Angeles.

June 23-25—Institute of Navigation, 11th annual meeting, Maxwell AFB, Montgomery, Ala.

June 27-July 1—American Society for Testing Materials, 58th annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

July 2-4—International Aviation Exposition, Detroit.

July 2—Air Force Assn., second annual Earl T. Ricks Memorial Trophy competition for Air National Guard jet pilots, Los Angeles to Detroit.

July 2-14—22nd National Soaring Contest, Harris Hill, Elmira, N. Y.



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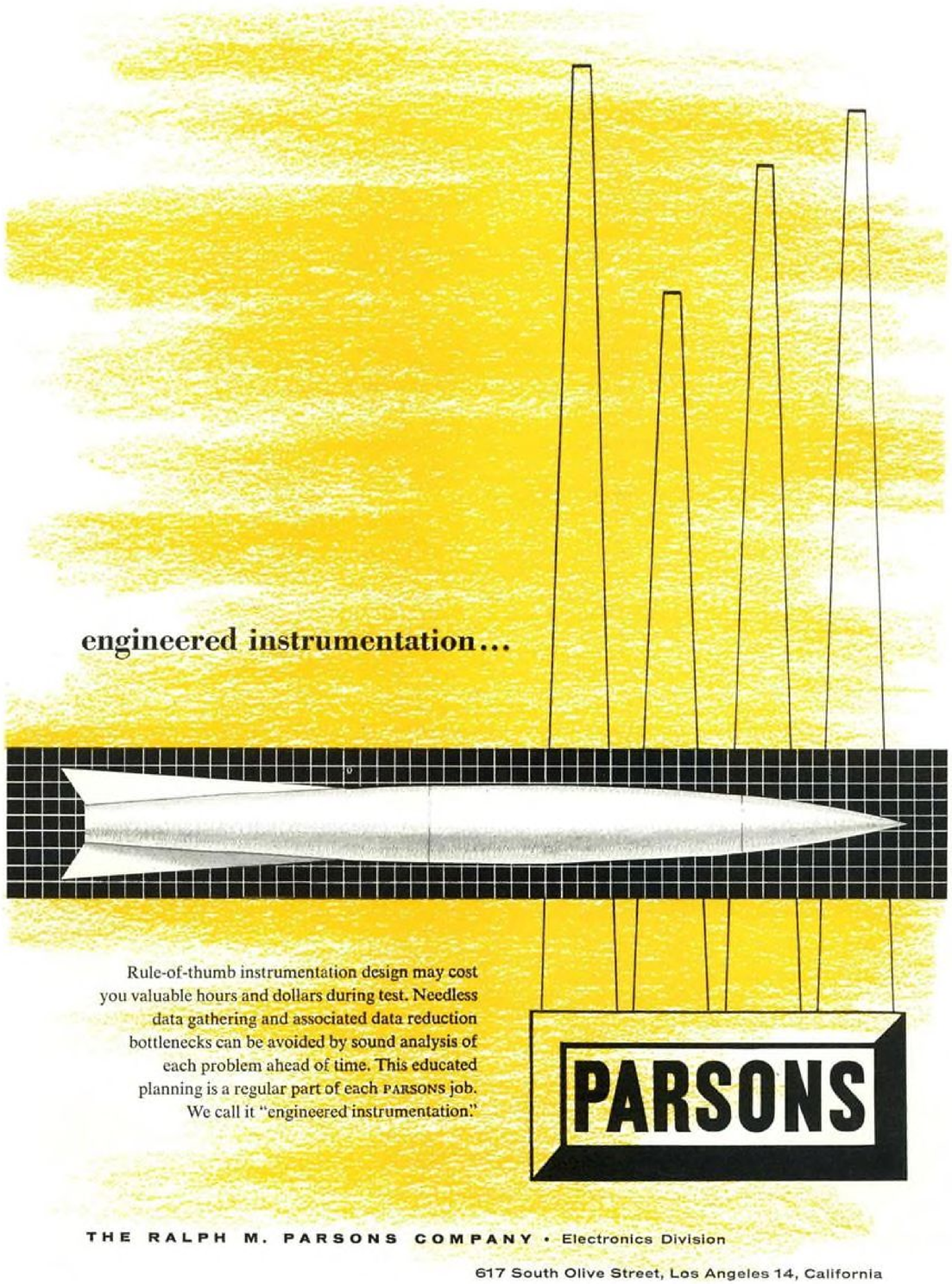
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Capital May Get N. Y.-Chicago Nonstop

CAB examiner's proposal would make CAP competitive with AA, UAL, TWA; favors limited Northwest service.

By Craig Lewis

Capital Airlines would become an effective competitor in the lucrative New York-Chicago air travel market under terms of the long awaited report of Civil Aeronautics Board Examiner William F. Cusick in the New York-Chicago service case.

The decision would give Capital equal footing on the heavily traveled route with American Airlines, United Air Lines and Trans World Airlines and would also give Northwest Airlines a smaller share of the traffic with a restricted authorization.

Here are the major recommendations:

- **Remove** restrictions on Capital's service between New York and Chicago, New York and Detroit, and New York and Pittsburgh.
- **Authorize** Capital to serve Buffalo, Rochester and Syracuse between Detroit and New York.
- **Allow** Northwest to serve Chicago on its Milwaukee-Detroit route, with restrictions.
- **Modify** restrictions on United's service at Detroit to allow UAL to operate turn-around service between Detroit and Philadelphia. Restrictions on United's service between Fort Wayne, Toledo and Detroit would also be removed.
- **Replace** Eastern Air Lines' present "closed-door" restriction at Pittsburgh with a long-haul restriction requiring that flights serving Detroit, Cleveland and Akron/Canton from Pittsburgh originate or terminate at Roanoke, Va., or a point south of that city.

Application Deferrals

The report also recommends that a number of applications in the case be referred for consideration in other proceedings. American's application to serve Pittsburgh would be deferred for consideration with the additional Southwest-Northeast service case. United's Pittsburgh application would be considered with the Denver service case.

Cusick also recommends that TWA's request that Detroit be added as a point on its New York-Chicago route be put off for consideration with an investigation to determine whether the carrier's Detroit-Cincinnati segment should be shifted to another carrier.

In an investigation of a proposed Northwest-Capital interchange through Chicago, Cusick finds that the service is not required. Such an interchange would duplicate current through-plane services of both Capital and Northwest.

The applications of four carriers, which dealt with certification of new routes, would be denied by the examiner. Eastern, Colonial Airlines, National Airlines and the North American Airlines group all proposed various east-west services which would have meant entirely new authorizations. Eastern now serves a number of points in the area, but only on a north-south basis.

Heavy Traffic Area

Both National and North American based their cases on the need for increased coach services. The report points out that while the CAB has recognized the traffic generating potential of aircoach, it has also held that this new market represents additional revenue to the carriers presently serving the area. It will enable them to expand service on lean routes and to poorer traffic cities, the report states.

The New York-Chicago service case covers a large number of air carrier applications for service to the area bounded by New York City, Rochester, N. Y., Pittsburgh, and Chicago, an area which is highly populated and industrialized and is a prime generator of traffic.

The issue involved in the case is basically the need for modification and expansion of present services in light of the tremendous expansion of traffic volume in the area.

The largest market is the Chicago-New York route. American, United and TWA currently have unrestricted authorizations for the route, while Capital must make two stops. Cusick recommends removal of the restriction on Capital in the interest of better service to the public and in spite of the fact that there will be some diversion from the other three carriers.

"There is little doubt but that the service being rendered by the existing carriers is adequate," says Cusick. "However, the adequacy of the existing services should not operate as a block to further refinement in the route traffic pattern of other carriers or bar such carriers from participating in the tremendous growth of this traffic."

Northwest Entry

The report also recommends that Northwest be allowed to enter the Chicago-New York market on a restricted basis to relieve the problem of through service by improving load factors and removing transfer problems at Chicago. Northwest is the only transcontinental carrier which operates without support of Chicago traffic volume.

The recommendation on Northwest



Amphibious S-55 Starts Tests

Amphibious S-55, fitted with new dual flotation gear and an exhaust silencer, starts flight tests at Westland Aircraft's Yeovil, England, plant before delivery to British European Airways. The modified helicopter, BEA's second rotary-wing transport, will inaugurate regular passenger service between London Airport and the South Bank next month.

would add Chicago as an intermediate point between Milwaukee and Detroit, providing that all flights serving New York, Detroit and Chicago must originate or terminate at Minneapolis or points west, or at New York.

The examiner would also add service by Capital to the New York-Detroit route via Syracuse, Rochester and Buffalo, now served only by American. The New York-Buffalo segment is now the largest domestic traffic market without competitive service. Since Capital is not a trans-continental carrier, the report finds its certification would cause less diversion from American than would the certification of United, another applicant for the route.

Another factor in the selection of Capital is the substantial community of interest between the New York cities and numerous cities in Michigan served by the carrier. Capital also is recommended for removal of long-haul and one-stop restrictions on its Detroit-New York route to provide additional unrestricted service.

The report favors a change in Eastern's restriction at Pittsburgh. Currently, Eastern is subject to a "closed-door" restriction which prohibits carriage of local traffic between Pittsburgh, Akron/Canton, Cleveland and Detroit.

Cusick then would specify that all flights serving the three points from Pittsburgh be required to originate or terminate at Roanoke or farther south in place of the "closed-door" regulation.



Puerto Rico Opens New Airport

San Juan, P. R.—A new, $15-million International Air Terminal has been inaugurated at this key Caribbean traffic hub.

The airport, inaugurated in conjunction with Armed Forces Day exercises, replaces the outmoded Isla Grande installation. It is designed to accommodate a traffic volume which has exceeded all estimates and has a capacity of 750,000 passengers a year.

Opening of service at the international terminal brought to light a controversial passenger charge instituted by the airport authorities to focus attention on problems involved in housing federal services.

The service charge of 35 cents, to be applied to all incoming passengers who must go through inspection, has been accepted with great reluctance by the airlines. Airport authorities maintain that the charge is necessary to pay for space occupied free by such federal services as Immigration and Naturalization, Customs and Public Health.

The processing charge, which will apply to over 50% of passenger traffic, will be collected by the airlines through arrangement with a collection agent.

The airport has a six-story terminal building which includes a 30 room hotel. Facilities include a single 7,800-ft. runway; a second parallel runway is planned.

Soviet Airports

Russia has launched an ambitious airport terminal construction program at high-traffic points throughout the nation, according to the official government newspaper Izvestia.

The chief administration of the Civil Air Fleet approved plans for new terminal buildings in 20 cities. Projects to be started this year are at Minsk, Stalino, Adler, Frunze, Nikolaev, Tallinn, Alma-Ata and Chelyabinsk.

Hotels will be constructed at Moscow's Vnukovo Airport, and at Aktyubinsk, Omsk and Alma-Ata.

CAB Liberalizes Overseas Charters

A liberalized charter policy for trans-Atlantic travel this summer was ordered by Civil Aeronautics Board. Simultaneously, CAB instituted an investigation to determine if foreign air carriers should be permitted to perform offline charters.

The new trans-Atlantic charter policy, reached by a four-to-one vote, with member Chan Gurney dissenting, abolished the previous restrictive requirements for an exemption that the charter to be performed be "essential." They eliminated the right of first refusal by the regular carriers where charters are for the account of one group or for furloughed military personnel.

The Board majority noted that the new policy is primarily intended for the summer season because necessary revisions may be made on the basis of experience that is gained during this period.

Although the intent is to provide greater opportunity for charter movements, the Board said it must proceed cautiously in order not to jeopardize the existing scheduled trans-Atlantic services which are basic to an adequate air transportation service.

To minimize further the potential dangers to regularly scheduled services, CAB has also retained the definition of charter contained in the economic regulations.

This prohibits the offering by a direct air carrier of charter services to individual members of the public, and the performance by a direct air carrier of charter services for an indirect air carrier, promoter of charter groups, a ticket or travel agent, or for persons paying for such charter services an amount in excess of the direct carrier's published charter rate.

Gurney disagreed with the majority that there was any need for liberalization of the trans-Atlantic charter policy which, he said, "was adopted in 1951 following a period of unfortunate experience with a more liberal approach and I see no need to move in that direction again."

He contended there have been no complaints from the public. Gurney said that under the previous requirements, scheduled trans-Atlantic coach services grew and prospered, while at the same time all legitimate charters were satisfactorily handled.

More Tourist Flights

Pan American-Grace Airways will increase its tourist services to the west coast of South America to seven flights a week when it adds two DC-6B flights between Miami and Lima June 1.

SAS Trans-Polar Flights Sold Out, Additional Service Planned in '56

Los Angeles—Scandinavian Airlines System's Polar Route between California and Europe has gained quick public acceptance.

The airline reports that its Polar flights to Europe are sold out for the next two months—the first summer tourist season the Polar flights have been available.

"We are only sorry that we do not have additional equipment to enable scheduling of even more flights per week," says SAS President Henning Throne-Holst.

The carrier now makes three flights weekly in each direction over this route.

The third Polar flight was added a month earlier than planned in order to handle the increasing traffic. This makes available 416 seats per month, all of which are booked eastbound through July and westbound through September.

Nearly 1,600 revenue passengers have been carried in both directions since Polar service was inaugurated last November, SAS reports.

Schedules will be stepped up next year to handle the growing traffic demand.

When the airline takes delivery of its DC-7Cs in 1956, it plans both first-class and tourist-class flights. These will be one-stop flights. Present DC-6B flights stop at Winnipeg and Greenland.

SAS anticipates offering two types of tourist service: a mixed flight with 52 seats and 12 sleepers, and an all-tourist flight accommodating about 75 passengers.

Seven Seas first-class flights will carry from 38 to 40 passengers.

Also in SAS plans for 1956 is a commercial route from Copenhagen via Anchorage, Alaska, to Tokyo. Such service would include two to three flights weekly. These will start in early fall.

SAS President Throne-Holst feels Polar flying is a logical step in air route progression. Development of another top-of-the-globe route already is underway.

A few weeks ago the pioneering carrier flew the second passenger flight, a charter flight, across the geographical North Pole from Scandinavia to Japan.

Two weeks ago the airline asked the Scandinavian governments to approach the U. S. State Dept. for traffic rights between Anchorage, Alaska, and Europe.

The airline, prepared to start the new service upon receipt of the DC-7Cs, says it will cut 20 hours off the present air travel time between the European continent and the Far East.

"The use of Alaska as an intermediate stop may change the public's conception of it," Throne-Holst has pointed out. "It might well be thought of in terms of the center point of a busy thoroughfare rather than the end of a one-way street."

Pan American has asked the Civil Aeronautics Board for permission to fly from California to Europe on a route similar to that of SAS.

"We were particularly pleased with Pan American's request . . ." says Throne-Holst. "Their endorsement we consider further dramatic evidence of the acceptance of this new course to Europe."

BEA Credits Viscount For First Net Profit

London—British European Airways reports a net profit of $140,000 for 1954, the airline's first move into the black after eight and a half years of heavy losses.

BEA has attributed the profit to its 24 Vickers Viscounts and a company-wide economy drive.

The company had not expected to get out of the red until after 1955, a forecast based largely on 1953's $4,967,200 loss.

This predication was upset as Viscount load factors increased to a point where each turboprop transport earned a $100,800 profit last year, says BEA Chief Executive Peter Masefield.

With its combined fleet of Viscounts and 20 de Havilland-Airspeed Ambassadors, British European earned 17% more revenue and carried 19% more traffic than in 1953. Operating expenses increased by only 4%. The airline carried 54% of the air traffic between Britain and Europe, covering approximately 25-million miles without a single fatality.

BEA's chairman, Lord Douglas of Kirtleside, admits the Viscount was less economical to operate on short hauls than the piston-engine Ambassador. But he says the turboprop transport's speed, quietness and lack of vibration created strong appeal among passengers traveling on the airline.

The airline's utilization rate for its Viscounts is well over 2,000 hours a year.

House Approval

The House passed the Fiscal 1956 budgets for Civil Aeronautics Board and Civil Aeronautics Administration without change in the recommendations of the Appropriations Committee **(see p. 95).**

Viscount Sales Gain

Vickers-Armstrongs' Viscount is strengthening its sales lead on other medium-haul transports. Last week the builder had probable contracts from two airlines plus two firm orders.

Probable buyers were Continental Air Lines and KLM Royal Dutch Airlines (AW May 23, p. 9). Firm contracts came from Trans-Australian Airlines for three more transports and from U. S. Steel Corp. for three business versions.

In London, Continental President Robert F. Six, ending a two-week tour of Britain, indicated that the airline hopes to order 10 to 15 52-passenger Viscount 800s.

"Now we have to evaluate the statistics, but I should say there is very good hope of our ordering Viscounts," Six said. "We can get deliveries of the latter version (800) by August 1957."

Meanwhile, KLM Executive Vice President F. Besancon arrived in London last week for final talks with Vickers-Armstrongs about a Viscount 800 contract.

The negotiations followed several earlier meetings with the builder by KLM President I. A. Aler.

The Dutch carrier is considering a fleet of 10 Viscounts for delivery in two years. An order would be the first serious penetration of a U. S.-equipped European airline.

In Melbourne, Trans-Australia announced the government had authorized the new Viscount contract. The latest order would be in addition to 10 transports already purchased, including one replacement for an airliner that crashed last year.

TAA said it hopes to have the first nine Viscounts operating by the end of 1956.



SIMPLE STRAIGHT-LINE interior adds depth to Allegheny Airlines new Martin 2-0-2 Executives. Seating capacity has been increased to 44 for high density traffic.

Allegheny's Expansion Program Starts With Martin Transports

By Preble Staver

Allegheny Airlines begins a new era in local airline service for the Middle Atlantic states next month with the inauguration of Martin 2-0-2 service.

Supplementing its standard feeder line DC-3 operation, Allegheny will put the faster 44-passenger Martin aircraft into service this week between Pittsburgh and New York and Pittsburgh and Atlantic City.

Acquisition of the new equipment by Allegheny, for a mixed-fleet operation of four Martin 2-0-2s and 14 Douglas DC-3s, is the latest development in the 15-year history of the company.

The introduction of Martin 2-0-2s on Allegheny's highly concentrated seven-state, 50-city route system coincides with the airline's $1 million expansion program. This includes not only the new aircraft and services but also embraces further modernization of the carrier's DC-3 fleet.

Seasonal Demand

Latest additions to Allegheny's route system is the inauguration of scheduled services at Trenton, N. J., and restoration of direct air service between Lancaster, Pa., and New York which had been dropped by Trans World Airlines.

Arrival of Allegheny's new aircraft and streamlining of its fleet was timed to meet the approaching heavier summer traffic requirements, a seasonal demand due to the carrier's operational area. David L. Miller, vice president-traffic and sales, said: "We obtained the Martins to meet the anticipated demand. We needed additional equipment and had been looking for it. If it hadn't been Martin 2-0-2s, it would have been something else."

At the beginning of this year, Allegheny had a fleet of 15 DC-3's. The new equipment program, initiated less than two months ago, was completed in two transactions that increased the fleet to a total of 18 aircraft—four Martin 2-0-2s and 14 DC-3s.

Allegheny acquired the first three Martins in a joint purchase with Southwest Airways when the two companies successfully bid $800,000 for the assets of California Central Airlines, which included four 2-0-2s and a DC-3. The fourth Martin was obtained from Pioneer Aeronautical Services, a spin-off corporation established to sell Pioneer Air Line's Martin equipment. Pioneer resold the Allegheny DC-3 to Bonanza Airlines.

Favorable Financing

Financing for all four new planes, plus spares and parts, was provided by the Chase-Manhattan National Bank of New York with Riggs National Bank of Washington, D. C., also participating.

The banks took a 5-year, unsecured note at an interest rate of 3⅜%. Leslie Barnes, Allegheny's president, said: "We believe this represents the most favorable terms yet advanced to a local service air carrier."

Southwest Airways, the only other local service carrier now operating 2-0-2s, and Glenn L. Martin Co. of Baltimore, Md., builder of the aircraft are assisting Allegheny in the operational transition to 2-0-2s.

Southwest is sharing its cost and operating experience with Allegheny. Glenn L. Martin Co., located only 43 miles from Allegheny's headquarters at National Airport, Washington, also is cooperating.

Allegheny is not concerned about filling the 44-passenger Martins—a seating density believed to be the highest ever offered by any local service airline. Miller explained that a good percentage of Allegheny's current business is now on "wait list." And the summer season is only beginning.

"There is no question but our traffic will substantially increase," Miller said. "Our best flights have been running at a 75% load factor, which is about all a local line can handle with so many intermediate stops."

Limiting Stops

At present, Allegheny is scheduling only two of its three Martins now on hand.

The third plane is now being kept in protective schedule reserve until the fourth is delivered. At that time, probably in July, three Martins will be fully scheduled on the company's heaviest travelled routes with the fourth in semi-reserve.

Allegheny is trying to limit its Martin flights to only three intermediate stops between terminals. This can be done under existing skip-stop authority from the Civil Aeronautics Board. Allegheny still expects to maintain its practice of holding intermediate stops to a flat two minutes which is done by cutting only one engine for immediate unloading and loading.

It has been estimated that the Martins will mean a 30 minute saving per flight or a gain of one hour per day per plane in service. Initially a five hour daily utilization with the 2-0-2 is anticipated with a gradual increase up to six and eventually seven hours daily utilization.

As part of its new program, Allegheny has adopted an "executive" theme for its promotion and advertising. First step was to name the 2-0-2s "Martin Executives." Allegheny also has taken the name of "The Airline of the Executives." Its seven-state system is called "The Route of the Executives." Company officials believe the "executive" theme is highly appropriate for air services in the Middle Atlantic area. Recent Allegheny traffic surveys show that 80% of the airline's passengers are travelling solely for business reasons.

House Unit Increases Airport Funds for '56

House Appropriations Committee has increased airport development funds for Fiscal 1956 to $20 million, nearly double the $11 million proposed by the Administration. The $9-million increase was the first concrete move in Congress to accelerate the airport program.

The committee said the $20 million, plus $7.5 million to liquidate existing contracts, would permit the program to continue at the Fiscal 1955 level. The $22-million for 1955 earmarked $2 million for administration, included next year in another category.

Meanwhile, Rep. Oren Harris, chairman of the Transportation Subcommittee of House Commerce Committee, followed the lead of Sen. Mike Monroney, chairman of Senate Commerce's Aviation Subcommittee, and introduced legislation authorizing appropriations of $63 million annually for airport development for the next four years (AW May 9, p. 111).

The House Committee approved an overall $159 million Fiscal 1956 budget for Civil Aeronautics Administration, $30 million more than the $129 million provided for 1955. But $14.5 million of the increase is to liquidate contracts already made.

The appropriations unit made the following reductions in Administration requests for funds in other CAA categories:

- **Operation and regulation,** $103 million. This is $3 million less than the $106 million requested. It provides for administrative activities at the same level as Fiscal 1955. The committee directed that the cut should be applied "in such a manner that safety in aviation will not be affected." It suggested that $100,000 proposed for an aviation medical standards survey and $40,000 for a project to transfer safety responsibility to industry "can be eliminated without affecting aviation safety."
- **Establishment of air aviation facilities,** $18.5 million, plus $7 million to liquidate previous contract authorization. Although $4.5 million below the Administration's request, this is substantially more than the $5 million provided for this activity for 1955. The committee left to CAA's discretion whether the funds allowed are to be used for new DME installations.
- **Air navigation development,** $1.05 million. This is the same amount provided for 1955 and $950,000 less the Administration request.
- **Washington National Airport,** $1.35 million. The same as provided for 1955, this is $65,000 below the budget request.
- **Alaska airports,** $600,000 for operations and maintenance. This is the same as the Fiscal 1955 allocation but $150,000 less than requested.

The committee voted the full $525,000 requested for construction, to provide for additional gasoline storage facilities, apron paving, additional baggage facilities, standardization and replacement of field markings and lights, an emergency electrical generator, and improvement of fire protection facilities.

$23 Million Reduction Made in 1956 Subsidy

Fund request for airline subsidy payments in Fiscal 1956 was reduced $23 million by House Appropriations Committee.

The $40 million voted by the committee is $8.9 million less than the $48.9 million provided for Fiscal 1955. Civil Aeronautics Board reported this is $6.3 million short of the amount needed to meet claims.

The committee allowed a $123,000 increase over Fiscal 1955 appropriation in CAB administrative funds to strengthen the audit program in the hope that this "more careful verification of data supporting air carriers' claims . . . will make it possible to reduce subsidy funds in the future." The $3.9 million the committee recommended for administration, though, is $225,000 less than the amount proposed by the Administration.

Meanwhile, the Board has been instructed by the Chairman of the House and Senate Appropriations committees and the Comptroller General to use the available funds for May and June payments to meet the claims of local service carriers, domestic trunk line, helicopter services, states, Alaska, Intra-Alaskan and Hawaiian operations. This means that the $6.3 million deficit in funds will primarily affect international carriers.

SHORTLINES

► **Air India International** increased its weekly services between London and India from four to five. The new flight will operate London-Dusseldorf-Cairo-Bombay with Super Constellation equipment.

► **Ansett Airways** will start tourist operations between Eastern Australia and Perth in June with a DC-3.

► **KLM Royal Dutch Airlines** extended its deferred payment travel plan to the United States generally and also to American citizens living abroad.

CAB ORDERS

(May 12-17)

GRANTED:

Transocean Air Lines an exemption to operate one flight from Milan, Italy, to New York carrying refugees and their baggage pursuant to a contract with the Intergovernmental Committee for European Migration.

Piedmont Aviation an authorization to omit service at Princeton-Bluefield, W. Va., an intermediate point on Segment 2 of Route 87, on flights in excess of three daily round trips.

General Airways an exemption to operate one roundtrip passenger charter flight from May 19-24 between Chicago via Flint, Mich., and La Paz, Mex. A DC-3 will be used in this flight at a charter rate of $4,182.

APPROVED:

Interlocking relationships among Consolidated Air Freight, an international airfreight forwarder, Valencia Baxt Express, a general surface express company, and Valencia Service Co., a motor carrier, and among Rodolph A. Catinchi, Wallace Valencia and Ginette Catinchi as individuals.

Agreement between Northwest Orient Airlines and American Airlines and various other air carriers relating to intercompany arrangements.

DISMISSED:

Investigation of service to Basra, Iraq, because of Pan American World Airways' willingness to withdraw voluntarily from Basra.

Slick Airways' complaint against reduced rates on cut flowers from Los Angeles and San Francisco/Oakland to Chicago, Detroit and New York, proposed by Airborne Flower & Freight Traffic, since the rates have been canceled.

Application of David M. Segal for a permanent or temporary certificate authorizing scheduled air service between the terminal points of Texarkana, Tex.; Oklahoma City, Okla.; Austin and Houston, Tex., by request.

Val-Air Lines' application for exemption to pay lower rates of compensation for pilots than prescribed as moot in view of denial of applications for airline's operating authority.

DENIED:

Western Air Lines' application for exemption authority to extend its Route 13 from the intermediate point of Yuma, Ariz., to the terminal point of Phoenix, Ariz.

Application of the City of Springfield, Ohio, to have the intermediate point of Dayton, Ohio, redesignated on American Airlines' Route 4 and on Trans World Airline's Route 2 as Dayton-Springfield, Ohio, to be served through the Dayton Municipal Airport.

Petition of the County of Mercer, N. J., for reconsideration of CAB's decision adding Trenton, N. J., to the certificate of Allegheny Airlines insofar as it failed to provide for north-south air service at Trenton.

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SENIOR POWER PLANT ENGINEER Three to eight years aircraft power plant experience. Capable conducting power plant testing in conjunction with jet engine and induction system analysis. B.S. in M.E. or A.E.

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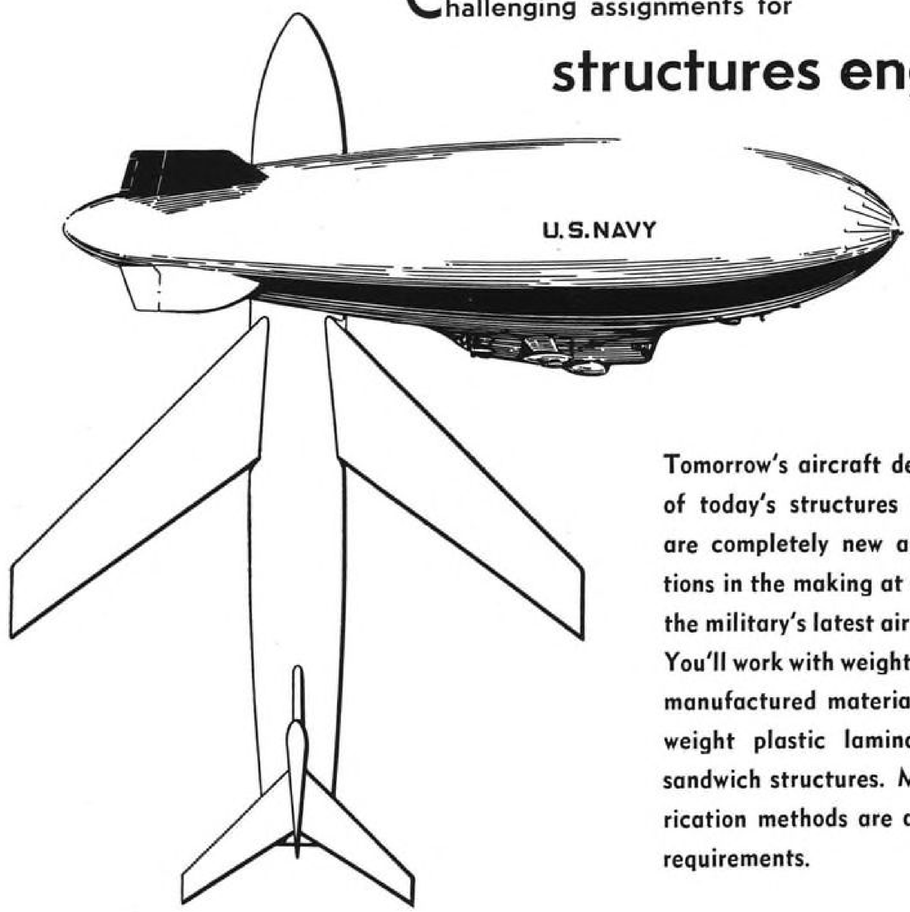
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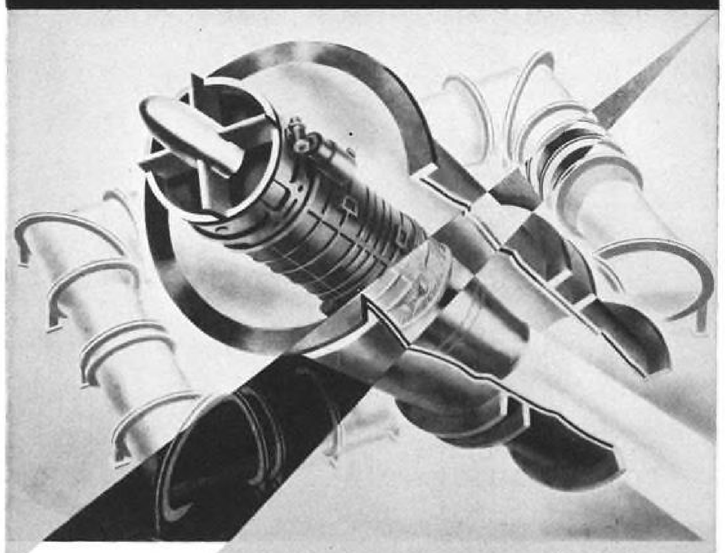
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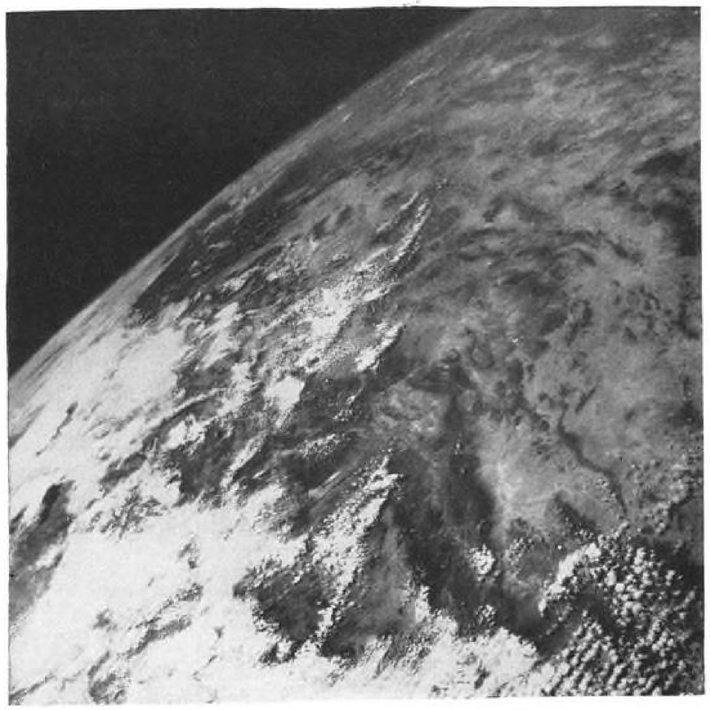
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NEW ISSUE May 10, 1955

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EDITORIAL

Evasions In The Defense Department

The Washington press corps and the American people to whom they report have been given another sorry demonstration of the careless, inaccurate and evasive manner in which the Department of Defense publicly handles matters of life and death concern to every citizen.

The occasion of this latest demonstration was a press conference held by Defense Secretary Charles E. Wilson last week in the Pentagon during which he confirmed details of the types and numbers of Russian bombers and fighters exclusively reported by AVIATION WEEK in its May 23 issue as having participated in the recent aerial display over Moscow.

Here are some examples of what we and other veteran Pentagon reporters consider to be evidence of this careless attitude toward vital facts by top level Defense Department civilian officials.

On May 13 the Defense Department issued a brief, vague statement on the Moscow air display mentioning four types of Soviet planes. AVIATION WEEK reported on May 23 that these types appeared in operational numbers and a new supersonic day fighter was seen in formation of 50 planes. Our story was widely reprinted on the front pages of daily newspapers and broadcast on radio and television on the same day. On May 24, the next day, Secretary Wilson issued a statement confirming the appearance of the 50 new supersonic fighters and confirmed the numbers of all-weather fighters, turboprop bombers, twin jet bombers and four jet bombers cited by AVIATION WEEK as visible in the Moscow fly-by.

Questions and Answers

When asked by AVIATION WEEK's military editor why these facts were not in the original Department of Defense statement, Mr. Wilson replied:

"The statement on May 13 was a very general one."

Mr. Wilson was asked by AVIATION WEEK's Washington editor if he planned to release publicly the pictures of these Russian planes flying over Moscow that are now available in the Pentagon. He replied:

"Hadn't thought about it."

When asked if he had changed his mind from a year ago when he stated the Russians were concentrating on building a purely defensive Air Force, Wilson said:

"Well, ten airplanes isn't very many airplanes to fight a war with and there isn't any question that the first big development in Russia was on the MiGs, the defensive airplane and they built a lot of them. They probably kept building them too long from our point of view. We would rather have spent the money on an improved and better one quicker. That is the technique over here."

Mr. Wilson knows or should know that the MiG-15 went out of production in Russia late in 1952 after 15,000 were produced. This was the year before Mr. Wilson made his "defensive" statement.

He also knows or should know that we are still building the F-86 Sabre series that was the MiG-15's contemporary.

He should know that we did not get into production on the F-100, successor to the Sabre, until late in 1953.

He also knows or should know that by July 1954 Lt. Gen. Earle Partridge, commander of the Far East Air Forces, reported that the MiG-17, the Soviet successor to the MiG-15, was already in squadron service with Red Air Force units opposite FEAF in Siberia. The first F-100 combat wing was equipped late in 1954; grounded for several months due to technical troubles, and became operational early in 1955.

Misquotes President

Mr. Wilson also misquoted President Eisenhower in his formal prepared statement. Mr. Wilson said the President said at his news conference last week " 'it is just not true' that we no longer have air superiority." What the President actually said was: ". . . we may not have as many B-52s as we should like at this moment. I don't know the exact number, but to say that we have lost in a twinkling all of this great technical development and technical excellence as well as the number in our total aircraft is just not true."

Nobody has stated we have lost anything "in a twinkling." What AVIATION WEEK and other critics of the Defense Department attitude on Russian airpower have said is that the 1955 Moscow air display offered definite proof that during the past three years our once wide margin of technical superiority had been whittled to a very slim margin and that Russians are moving at faster rates of development and production now than are the U. S. Air Force and Naval aviation. Neither Mr. Wilson nor anybody else in the Pentagon or White House has taken direct issue with that statement.

The May 13 Department of Defense statement noted that the Russian bomber display "observations establish a NEW basis of our estimate of Soviet airpower." In his May 24 statement, Mr. Wilson said on the same subject: "These are facts which are NOT NEW to the Department of Defense but which are currently causing public discussion about the relative air superiority of the United States.

Mr. Wilson is still apparently confused about how many twin jet Badgers flew which year. He said: "They displayed more than 40 new medium bombers known for the first time last year (1954) as a prototype." Actually, in the 1954 Moscow air display the Russians flew a formation of nine of these twin jet medium Badgers, indicating at that time that they were out of the prototype stage and into production.

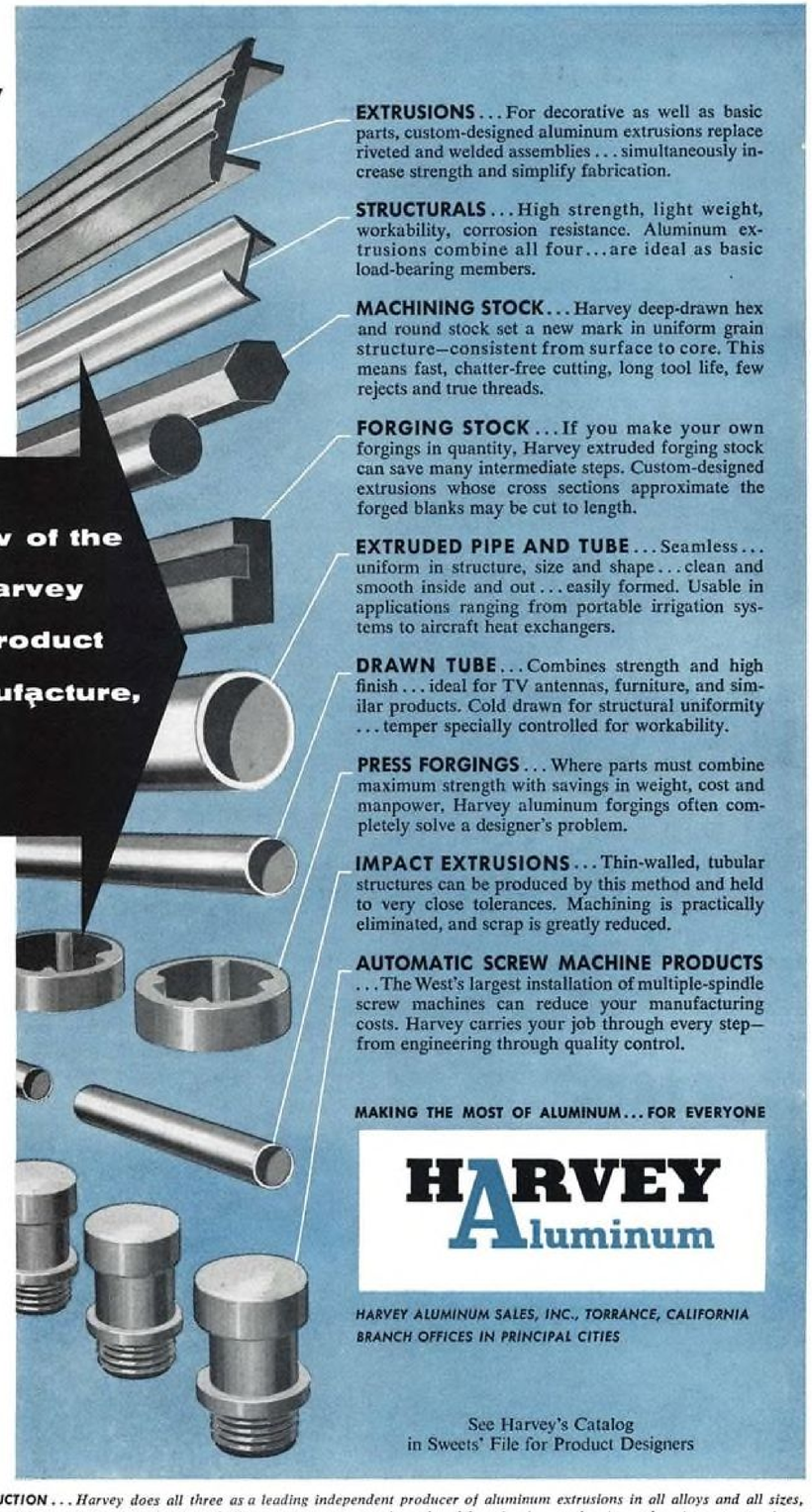
Events of the last three years have proved that Mr. Wilson has been wrong on every major evaluation he has made on Russian airpower developments since he took office in 1953. His performance at the Pentagon press conference last week on this issue of vital importance to every American did not inspire any new confidence in his accuracy or candor on the rapid rise of Russian jet airpower.

Nor did it inspire any confidence that Mr. Wilson's new requirement that all Defense Department public statements must make a "constructive" contribution will be administered either wisely or well.

The American people deserve more precise and accurate facts, more candor and a much deeper sense of public responsibility on the part of top level defense department leaders before they should place much faith in official utterances on the Russian airpower controversy.

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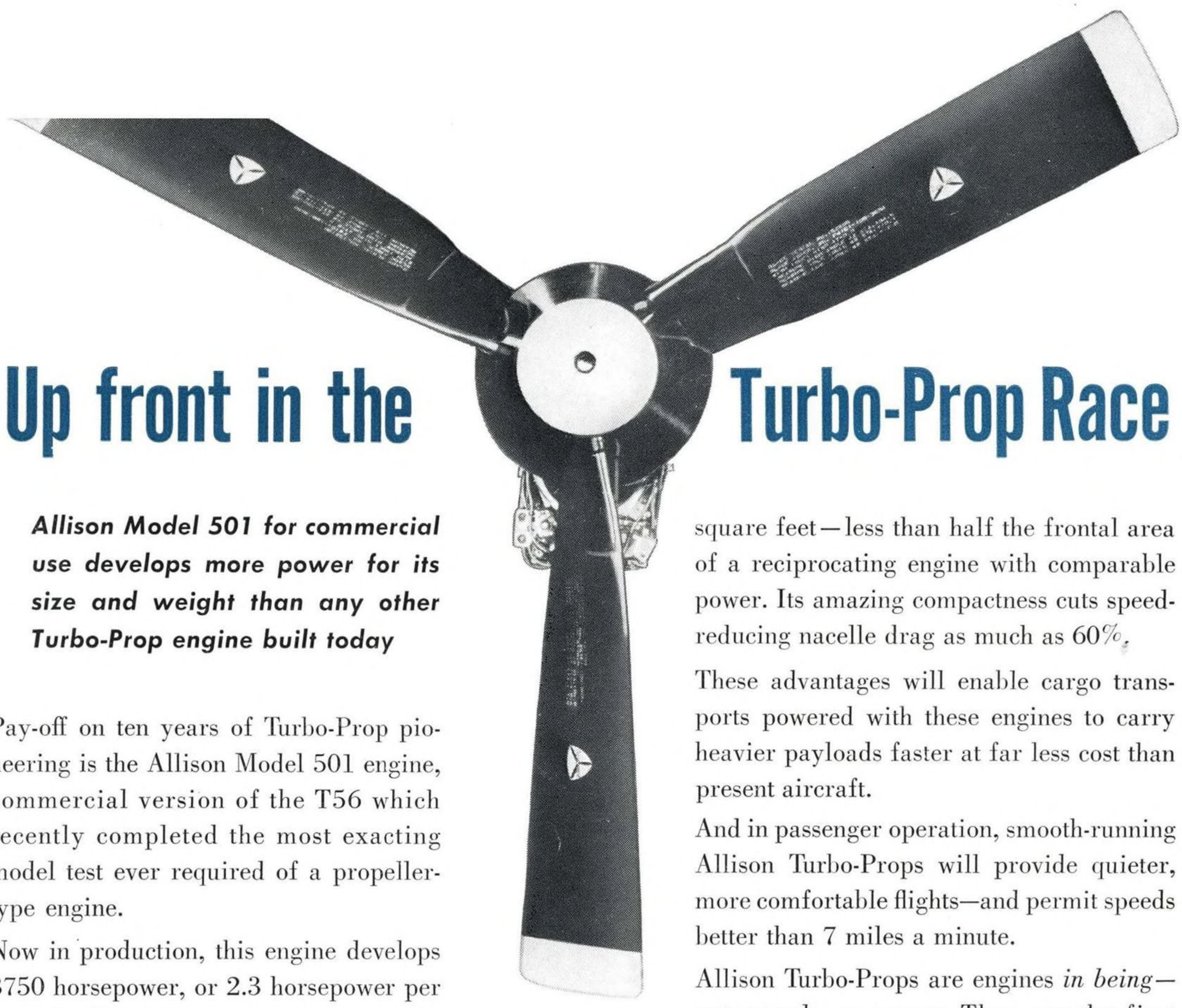
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